Digital Phosphor Oscilloscopes

TDS7000 Series

Features & Benefits

- 4 GHz, 1 GHz and 500 MHz bandwidth models
- Up to 20 GS/s real-time capture rate
- Up to 32 Megasamples memory depth
- >400,000 wfms/second maximum waveform capture rate
- Jitter measurements to 1 ps_{RMS}
- Graphical user interface
- Control via classic direct controls, touch-sensitive color display or mouse
- Open Windows® environment
- Built in networking

Applications

- Verification, debug and characterization of sophisticated designs
- Jitter and timing analysis
- Spectral analysis
- Disk drive analysis
- Investigation of transient phenomena

COMPUTING
TELECOM
VIDEO

Performance, Simplicity, and Connectivity

TDS7000 Series oscilloscopes are high performance solutions for verification, debug, and characterization of sophisticated electronic designs. The family features exceptional signal acquisition performance, operational simplicity and open connectivity to the design environment. Classic analog-style controls, a large touch-sensitive display and graphical menus provide intuitive control. Open access to the Windows operating system enables unprecedented customization and extensibility.

Superior Performance

TDS7000 models range from 500 MHz to 4 GHz bandwidth with single-shot sample rates to 20 GS/s, meeting demands of the latest high speed logic families and multi-Gigabit communication standards. Acquisition memory options from 2 to 32 Megasamples maximize the value of high sample rate and ensure that critical events are captured with fine detail. High performance jitter analysis to 1 ps_{RMS} is achieved through exceptional trigger and acquisition performance, deep memory and applied software.

TDS7000 Series high bandwidth signal access solutions include the P7240 4 GHz (120 ps rise time) active probe and the P7330 3 GHz (130 ps rise time) differential probe. Small form-factors and a wide array of tip accessories ensure effectiveness. In addition, the TDS7404 includes the TekConnect™ signal interconnect system. This interface replaces traditional BNC input connectors with a convenient positive-locking interface suitable for higher system bandwidths. P7000 Series probes are directly compatible with TekConnect signal interconnect system along with adapters that provide SMA, BNC and N connections.

Tektronix

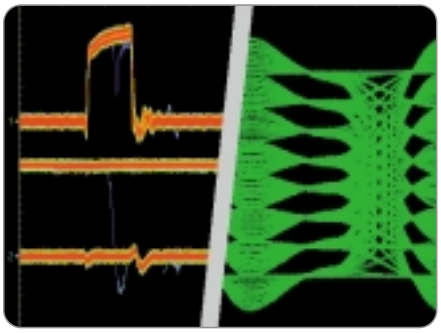


Figure 1. *Digital Phosphor technology provides unprecedented waveform capture rate, maximizing the probability of discovering hidden faults and revealing dynamic signal behavior.*

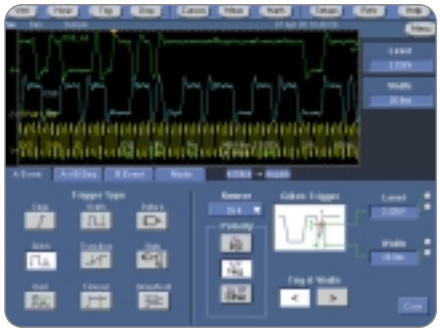


Figure 2. *Extensive use of illustrations helps users locate advanced features quickly and apply them with confidence.*

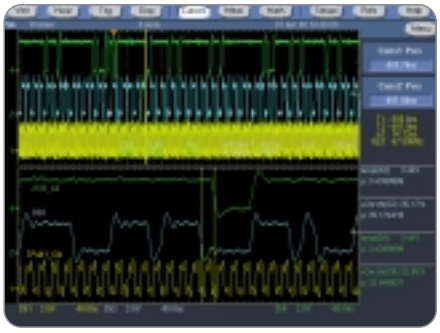


Figure 3. *Sophisticated analysis capabilities allow users to fully characterize and document design performance.*

Digital Phosphor Oscilloscopes

Signal observation time is critical for successful discovery of intermittent faults and characterization of complex dynamic signals. TDS7000 Series Digital Phosphor Oscilloscopes incorporate 3rd generation DPX technology to enable maximum waveform capture rates of more than 400,000 waveforms per second. This unprecedented performance allows users to fully visualize signal activity. In troubleshooting applications, Digital Phosphor can save minutes, hours, or even days by quickly revealing the nature of faults so sophisticated trigger modes can be applied to isolate them.

Operational Simplicity

The TDS7000 Series graphical user interface delivers sophisticated capability to advanced users without intimidating occasional users. The front panel includes a complete set of classic analog-style controls for most commonly used features. For advanced use, the combination of large 10.4 inch (264 mm) touch sensitive display and graphical interface creates a highly visual environment with explicit illustration of instrument features. The waveform display area remains visible even when displaying control windows so changes in the waveform aren't missed when making selections or adjustments. Context-sensitive help supplements graphic control windows and encourages users to apply advanced capabilities to solve their problem.

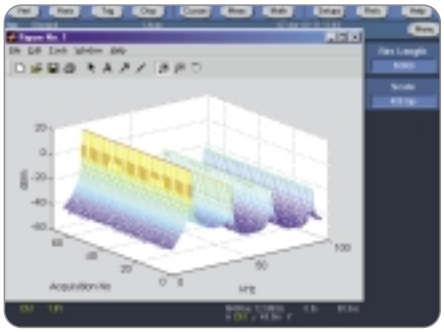
The adaptable TDS7000 Series human interface readily supports any operating style and environment. Users can select traditional instrument-style buttons for navigation or switch to a Windows menu bar. Classic analog-style controls provide instant access to the most frequently used functions while the large touch sensitive display provides intuitive menu operation. Waveform positions, cursor locations and trigger level can be directly dragged using the touch screen or a mouse. A graphical drag-box can be used to select a waveform area for zooming, histogram analysis or measurement gating. The USB interface allows a mouse, keyboard and other peripherals to be added without powering off the instrument. With this flexibility, TDS7000 Series instruments readily adapt to a cart, cluttered bench top, shelf, floor and other locations that otherwise make operation awkward.

Application-specific Extensions

The TDS7000 family contains many extended features to quantify and document signal characteristics. These features remain close at hand without cluttering the human interface. Applied measurement extensions can be installed to enhance TDS7000 capabilities. Optional applications include jitter analysis and disk drive measurements. These applications build on the precision signal acquisition performance of TDS7000 Series to address the need for application specific measurements to quickly quantify device performance.

Intuitive Zooming

TDS7000 acquired waveforms are always horizontally fit into the display. This "big picture" is retained for context while zoom is used to select areas of specific interest. Waveform zoom can be directly controlled with knobs or the graphical user interface for intuitive interaction.



▶ ***Figure 4.*** *Open access to the Windows desktop allows users to leverage standard tools for documentation, analysis, information browsing and communications.*

Parametric Measurements

The TDS7000 includes a complete parametric measurement system for signal characterization. Direct selection from a graphical palette makes locating choices simple. Users can quickly reassign measurements to a different waveform, simplifying verification tasks. Split cursors make it easy to measure trace-to-trace timing characteristics. Measurement statistics can be gathered for deeper insight. Measurement results are easily extracted for inclusion in a document or analysis in a spreadsheet using the Windows clipboard or an Export function.

Powerful Math

The TDS7000 Series allows user defined math expressions to be performed on waveform data giving them the opportunity to get on-screen results in terms that they can define. Common waveform math functions are provided at the touch of a button. For advanced applications, algebraic expressions consisting of waveform sources, math functions, measurement values and scalars can be created easily using a calculator-style editor. This allows users to quickly transform raw waveform data into powerful information that is readily interpreted.

Enhanced Spectral Analysis

The TDS7000 Series includes a unique spectrum-analyzer style interface for performing frequency domain analysis. Controls such as center frequency, frequency span, resolution bandwidth and reference level provide access to wide- or narrow-band frequency, phase, and group delay information. A gating function allows selection of only a portion of the time-domain signal for analysis. These controls allow users to focus on extracting spectral information instead of confronting the idiosyncrasies of FFTs found in typical DSOs.

Complete Connectivity

The TDS7000 Series includes open access to the Windows operating environment. While the instrument remains a dedicated oscilloscope, the ability to access the Windows desktop creates a powerful new tool. Built-in applications such as WordPad, Paint and a web browser allow users to concurrently maintain lab notes while working with the instrument. This saves time and eliminates error-prone steps associated with transporting images for later report development. Other applications such as Microsoft Excel, MATLAB® and MathCAD® can be installed in the instrument to accomplish local signal analysis. The installation of networking enables Web-based information browsing, e-mail exchange, printing and file sharing.

View the Windows® Desktop on Separate Monitor

TDS7000 can also be expanded with the addition of an external monitor. With dual-monitor mode enabled the instrument retains live scope displays while other applications such as publishing, analysis or browsing tools reside on the external monitor. Users can easily transfer images and waveform data from TDS7000 to the locally running application or view Web-based reference information while using the scope for design work.

Standard Interfaces

The TDS7000 includes standard interfaces for control and peripheral expansion. The GPIB command set shares a high degree of commonality with previous TDS 500/700-class instruments while increasing hardware and software performance. Both USB and PS-2 interfaces are included for mouse, keyboard and other peripheral expansion. USB offers the advantage of hot-insertion and removal so devices can be added or removed without cycling power. The TDS7000 also includes a LAN interface for network connection.

▶ Characteristics

Vertical System

	TDS7054	TDS7104	TDS7404
Input Channels	4	4	4
Analog Bandwidth (–3 dB)	500 MHz	1 GHz	4 GHz
Calculated Rise Time 10 mV/div – 1 V/div	800 ps	400 ps	100 ps
Hardware Bandwidth Limits	250 MHz or 20 MHz		
Input Coupling	AC, DC, Gnd		DC, Gnd
Input Impedance	1 MΩ ±0.5% or 50 Ω ±1%		50 Ω ±2.5%
Input Sensitivity, 1 MΩ	1 mV/div to 10 V/div		
Input Sensitivity, 50 Ω	1 mV/div to 1 V/div		2 mV/div to 1 V/div
Vertical Resolution	8-bits (>11-bits w/averaging)		8-bits (>11-bits w/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 ±30 Volts		Determined by TekConnect accessory
DC Gain Accuracy	1.00%		1.00%
Offset Range	1 mV/div – 100 mV/div ±1 V 101 mV/div – 1 V/div ±10 V 1.01 V/div – 10 V/div ±100 V		2 mV – 50 mV/div ±0.5 V 50.5 mV – 99.5 mV ±0.25 V 100 mV – 500 mV ±5 V 505 mV – 1 V/div ±2.5 V
Channel to Channel Isolation Any two channels at equal vertical scale settings	≥100:1 at 100 MHz and ≥30:1 at the rated bandwidth		≥100:1 at 4 GHz
DC Measurement Accuracy Stated for average >16 waveforms	±((0.3% * |Reading – Net Offset|) + Offset Accuracy + (0.06 div * V/div)) Net Offset = Offset – (Position * Volts/div)		±((1.0% * |Reading – Net Offset|) + Offset Accuracy + (0.06 div * V/div)) Net Offset = Offset – (Position * Volts/div)
Delta-DC Measurement Accuracy Stated for average >16 waveforms	±((1.0% * |Reading|) + (0.1 div * V/div)+ 0.3 mV)		±((1.0% * |Reading|) + (0.1 div * V/div)+ 0.3 mV)

Timebase System

	TDS7054	TDS7104	TDS7404
Timebase Range	200 ps/div – 40 s/div		50 ps – 10 s/div
Timebase Delay Time Range	16 ns to 250 s		16 ns to 250 s
Channel to Channel Deskew Range	±25 ns		±25 ns
Time Interval Accuracy	±(0.30 sample interval) + (15 ppm * reading)		±(0.15/sample rate) + (10 ppm * reading)
Trigger Jitter (RMS)	8 ps_{RMS} (typical)		7 ps_{RMS}
Long Term Sample Rate and Delay Time Accuracy	±15 ppm over ≥1 ms interval		±10 ppm over ≥1 ms interval

Acquisition System

	TDS7054	TDS7104	TDS7404
Real-time Sample Rates			
1 channel (max)	5 GS/s	10 GS/s	20 GS/s
2 channels (max)	5 GS/s	5 GS/s	10 GS/s
3-4 channels (max)	2.5 GS/s	2.5 GS/s	5 GS/s
Equivalent time sample rate (max)	250 GS/s	250 GS/s	250 GS/s
Maximum record length per channel with standard memory	400 k (1 ch), 200 k (2 ch), 100 k (4 ch)		400 k (1 ch), 200 k (2 ch), 100 k (4 ch)
with Memory Opt. 1M	2 M (1 ch), 1 M (2 ch), 500 k (4 ch)		2 M (1 ch), 1 M (2 ch), 500 k (4 ch)
with Memory Opt. 2M	8 M (1 ch), 4 M (2 ch), 2 M (4 ch)		8 M (1 ch), 4 M (2 ch), 2 M (4 ch)
with Memory Opt. 3M	16 M (1 ch), 8 M (2 ch), 4 M (4 ch)		16 M (1 ch), 8 M (2 ch), 4 M (4 ch)
with Memory Opt. 4M			32 M (1 ch), 16 M (2 ch), 8 M (4 ch)

Maximum Duration at Highest Real-time Resolution (1 ch)

	TDS7054	TDS7104	TDS7404
Time Resolution (single-shot)	200 ps (5 GS/s)	100 ps (10 GS/s)	50 ps (20 GS/s)
Max Duration with Standard Memory	80 µs	40 µs	20 µs
Max Duration with Opt. 1M	400 µs	200 µs	100 µs
Max Duration with Opt. 2M	1.6 ms	800 µs	400 µs
Max Duration with Opt. 3M	3.2 ms	1.6 ms	800 µs
Max Duration with Opt. 4M			1.6 ms

Acquisition Modes

	TDS7054	TDS7104	TDS7404
FastAcq Acquisition	FastAcq optimizes the instrument for analysis of dynamic signals and capture of infrequent events		
Maximum FastAcq Waveform Capture Rate	>200,000 wfms/sec	>200,000 wfms/sec	>400,000 wfms/sec
Sample	Acquire sampled values	Acquire sampled values	Acquire sampled values
Peak Detect	Captures narrow glitches at all real-time sampling rates		
Minimum Peak Detect Pulse Width	≤1 ns	≤1 ns	400 ps
Averaging	From 2 to 10,000 waveforms included in average		
Envelope	From 2 to $2x10^9$ 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 150,000 waveforms per second. Time of arrival recorded with each event		

Trigger System

	TDS7054	TDS7104	TDS7404
Sensitivity			
Internal DC Coupled	0.35 div DC to 50 MHz increasing to 1 div at 500 MHz	0.35 div DC to 50 MHz increasing to 1 div at 1 GHz	0.35 div DC to 50 MHz increasing to 1 div at 3 GHz
External (Auxiliary Input)	400 mV from DC to 50 MHz increasing to 750 mV at 100 MHz	250 mV from DC to 50 MHz increasing to 500 mV at 100 MHz	250 mV from DC to 50 MHz increasing to 350 mV at 500 MHz
Main Trigger Modes	Auto, Normal and Single	Auto, Normal and Single	Auto, Normal and Single
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		
Trigger Level Range			
Internal	±12 divisions from center of screen	±12 divisions from center of screen	±12 divisions from center of screen
External (Auxiliary Input)	±8 V	±8 V	±8 V
Line	fixed at 0 V	fixed at 0 V	fixed at 0 V
Trigger Coupling	DC, AC (attenuate <60 Hz), HF Rej (attenuate >30 kHz), LF Rej (attenuates <80 kHz), Noise Reject (reduce sensitivity)		
Trigger Holdoff Range	250 ns minimum to 12 seconds maximum	250 ns minimum to 12 seconds maximum	250 ns minimum to 12 seconds maximum

Trigger Modes

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 1.0 ns with 200 ps resolution.

Width – Trigger on width of positive or negative pulse either within or out of selectable time limits (1 ns to 1 s).

Runt – Trigger on a pulse that crosses one threshold but fails to cross a second threshold before crossing the first again. Optional time qualification.

Timeout – Trigger on an event which remains high, low, or either, for a specified time period, selectable from 1 ns to 1 s with 200 ps resolution.

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.

Trigger Delay by Time – 16 ns to 250 seconds.

Trigger Delay by Events – 1 to 10,000,000 Events.

Waveform Measurements

Amplitude – Amplitude, High, Low, Maximum, Minimum, Peak to Peak, Mean, Cycle Mean, RMS, Cycle RMS, Positive Overshoot, Negative Overshoot.

Time – 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 (σ), μ+1 σ, μ+2 σ, μ+3 σ.

Waveform Processing/Math

Algebraic Expressions – Define extensive algebraic expressions including waveforms, scalars and results of parametric measurements e.g. (Integral (Ch1-Mean(Ch1))*1.414.

Arithmetic – Add, subtract, multiply, divide waveforms and scalars.

Calculus – Integrate, differentiate.

Frequency Domain Functions – Spectral magnitude and phase, real and imaginary spectra.

Vertical Units – Magnitude: Linear, dB, dBm; Phase: degrees, radians.

Window Functions – Rectangular, Hamming, Hanning, Kaiser-Bessel, Blackman-Harris, Gaussian, Flattop2, Tek Exponential.

Display Characteristics

Display Type – Liquid crystal active-matrix color display.

Display Size – 211.2 mm (W) x 158.4 mm (H), 264 mm (10.4 in) diagonal.

Display Resolution – 640 horizontal x 480 vertical pixels.

Waveform Styles – Vectors, Dots, Intensified Samples, Variable Persistence, Infinite Persistence.

Computer System and Peripherals

CPU – Intel® Celeron™ Processor, 500 MHz.

PC System Memory – 128 MB.

Hard Disk Drive – Rear-panel, removable hard disk drive, >4.3 GB capacity.

Floppy Disk Drive – Front panel 3.5 in floppy disk drive, 1.44 MB capacity.

CD-ROM Drive – Rear panel CD-ROM drive.

Mouse – Logitech thumb wheel model included, USB interface.

Keyboard – Order 119-6297-00 (USB interface).

Input/Output Ports

Probe Compensator Output – Front panel BNC connector, requires Probe Cal-Deskew Fixture (included) for probe attachment. Amplitude 1 V±1.0% into a ≥50 Ω load, frequency 1 kHz ±5%.

Analog Signal Output Amplitude – Front-panel BNC connector, provides a buffered version of the signal that is attached to the Channel 3 input when Ch 3 is selected as trigger source. 20 mV/div ±20% into a 1 MΩ load, 10 mV/div ±20% into a 50 Ω load.

Analog Signal Output Bandwidth, Typical – TDS7054/TDS7104: 100 MHz into a 50 Ω load TDS7404: 1 GHz into a 50 Ω load.

Auxiliary Output Levels – Front-panel BNC connector, provides a TTL-compatible, polarity switchable pulse when the oscilloscope trigger.

Parallel Port – IEEE 1284, DB-25 connector.

Audio Ports – Miniature phone jacks for stereo microphone input and stereo line output.

USB Port – Allows connection or disconnection of USB keyboard and/or mouse while oscilloscope power is on.

Keyboard Port – PS-2 compatible.

Mouse Port – PS-2 compatible.

LAN Port – RJ-45 connector, supports 10Base-T and 100Base-T.

Serial Port – DB-9 COM1 port.

SVGA Video Port – DB-15 female connector; connect a second monitor to use dual-monitor display mode. Supports Basic requirements of PC99 specifications.

GPIB Port – IEEE 488.2 standard.

Scope 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.

Power Source

Power – 100 - 240 V_{RMS} ±10%, 50/60 Hz; 115 V_{RMS} ±10%, 400 Hz; CAT II, <300 W (450 VA).

Physical Characteristics

Benchtop Configuration

Dimensions	mm	in.
Height	277	10.9
Width	455	17.9
Depth	425	16.75
Weight	**kg**	**lbs.**
Net	18	39
Shipping	37	80

Rackmount Configuration

Dimensions	mm	in.
Height	277	10.5
Width	502	19.75
Depth	486	19.125
Weight	**kg**	**lbs.**
Net	19	41
Kit	5.6	12.25

Mechanical

Cooling – Required clearances:

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

Environmental

Temperature –
Operating: 0°C to +50°C, excluding floppy disk and CD-ROM drives; +10°C to +45°C, including floppy disk and CD-ROM drives.

Nonoperating: –22°C to +60°C.

Humidity –
Operating: 20% to 80% relative humidity with a maximum wet bulb temperature of +29°C at or below +50°C, noncondensing. Upper limit derated to 25% relative humidity at +50°C.

Nonoperating: With no diskette in floppy disk drive. 5% to 90% relative humidity with a maximum wet bulb temperature of +29°C at or below +60°C, noncondensing. Upper limit derated to 20% relative humidity at +60°C.

Altitude –
Operating: 10,000 ft. (3,048 m).

Nonoperating: 40,000 ft. (12,190 m).

Random Vibration –
Operating: 0.00015 g^2/Hz from 5 to 350 Hz, –3 dB/octave from 350 to 500 Hz, 0.000105 g^2/Hz at 500 Hz. Overall level of 0.27 GRMS.

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 GRMS.

Safety – UL 3111-1, CSA-22.2 No. 1010.1, EN61010-1.

▶ Ordering Information

TDS7054
500 MHz Digital Phosphor Oscilloscope.

TDS7104
1 GHz Digital Phosphor Oscilloscope.

TDS7404
4 GHz Digital Phosphor Oscilloscope.

All models include: Accessory pouch, Front cover, Mouse, Probe Calibration and Deskew Fixture (067-0405-00), Quick Reference (020-2335-00), User Reference (071-0700-00), GPIB Programmer's Reference, TDS 7000 Series Product Software CD-ROM, TDS 7000 Series operating system restoration CD-ROM, Performance verification procedure PDF file, NIST, MIL-STD-45662A and ISO9000 Calibration Certificate, Power Cord.

TDS7054 also includes: (4) P6139A 500 MHz, 10x Passive Probes.

TDS7404 also includes: (4) TekConnect to SMA adapters (TCA-SMA).

Power Cord Options for all Models
Opt. A1 – Universal European power cord (220 V, 50 Hz).

Opt. A2 – UK power cord (240 V, 50 Hz).

Opt. A3 – Australia power cord (240 V, 50 Hz).

Opt. A5 – Switzerland power cord (220 V, 50 Hz).

Opt. A99 – No power cord.

Opt. AC – China power cord.

Recommended Accessories
Keyboard (USB interface) – Order 119-6297-00.

Service Manual – Order 071-0711-00.

Transit Case – Order 016-1522-00.

TekConnect Adapters –

TCA-SMA TekConnect-to-SMA Adapter.

TCA-N TekConnect-to-N Adapter.

TCA-BNC TekConnect-to-BNC Adapter.

Software
TDSJIT2 Jitter Analysis Software.

TDSDDM2 Disk Drive Analysis Software.

WSTRO Wavestar™ waveform capture and documentation software.

Cables
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 012-1250-00.

Instrument Acquisitions Memory Upgrades
Acquisition memory upgrades equivalent to Options 1M – 4M can be ordered to extend instrument performance after initial purchase. Users can install upgrades without opening the instrument case or requiring on-site service. Order the appropriate TDS7Mxx kit from the following table according to current and intended configuration.

	To Opt. 1M	To Opt. 2M	To Opt. 3M	To Opt. 4M (TDS7404 only)
From Standard Memory	TDS7M01	TDS7M02	TDS7M03	TDS7M04
From Opt. 1M		TDS7M12	TDS7M13	TDS7M14
From Opt. 2M			TDS7M23	TDS7M24
From Opt. 3M				TDS7M34

Instrument Options (Available where indicated by "x")

		TDS7054	TDS7104	TDS7404
Acquisition Memory Options				
1M	2 Msamples max, 500 ksamples/ch	x	x	x
2M	8 Msamples max, 2 Msamples/ch	x	x	x
3M	16 Msamples max, 4 Msamples/ch	x	x	x
4M	32 Msamples max, 8 Msamples/ch			x
Mounting Options				
1K	K4000 Scope cart	x	x	x
1R	Rackmount kit	x	x	x
Software Options				
J1	TDSJIT2 Jitter Analysis Software	x	x	x
J2	TDSDDM2 Disk Drive Analysis Software	x	x	x
Probe Options				
30	No Probes	x	x	x
33	Add (1) P6158 3 GHz, 20x Low C Probe		x	
34	Add (1) P6247 1.0 GHz Differential Probe	x		
35	Add (1) P6243 1.0 GHz Active Probe	x		
36	Add (1) P6139A 500 MHz, 10x Passive Probe	x	x	
37	Add (1) P6245 1.5 GHz Active Probe		x	
39	Add (1) P6248 1.7 GHz Differential Probe		x	
51	Add (1)P7240 4 GHz Active Probe			x
52	Add (1) P7330 3 GHz Differential Probe			x
Service Options				
D1	Calibration data report	x	x	x
C3	Additional 2 years of calibration	x	x	x
D3	Calibration data report for Option C3	x	x	x
R3	Additional 2 years of repair	x	x	x

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