

# Digital Storage Oscilloscopes

▶ TDS1002 • TDS1012 • TDS2002 • TDS2012 • TDS2014 • TDS2022 • TDS2024



## ▶ Features & Benefits

60 MHz, 100 MHz, and 200 MHz Bandwidths

Sample Rates up to 2 GS/s

2 or 4 Channels

Color or Monochrome LCD Display

CompactFlash® Mass Storage Option with TDS2MEM Module

Autoset Menu with Waveform Selection

Probe Check Wizard to Ensure Correct Probe Usage

Context-sensitive Help

Dual Time Base

Advanced Triggers, Including Pulse Width Trigger and Line-Selectable Video Trigger

11 Automatic Measurements

Multi-language User Interface

Waveform and Setup Memories

FFT Standard on All Models

OpenChoice™ Solutions Speed Documentation and Analysis of Measurement Results

- TDS2CMAX Communication Module
- TDS2MEM Storage Memory and Communication Module
- TDSPCS1 OpenChoice Software
- WaveStar™ Software
- Integration with Third-party Software

## ▶ Applications

Design and Debug

Education and Training

Manufacturing Test and Quality Control

Service and Repair

## TDS1000 and TDS2000 Series Oscilloscopes. Colorful Performance at a Black and White Price.

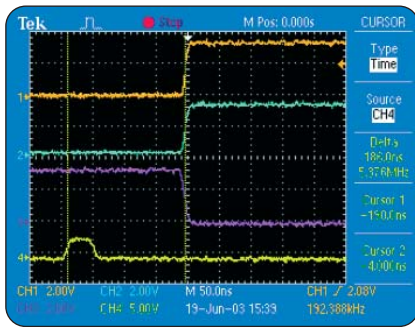
The TDS1000 Series and TDS2000 Series digital storage oscilloscopes deliver an unbeatable combination of superior performance, unmatched ease-of-use, and affordability in an ultra lightweight, portable package.

### Affordable Digital Precision

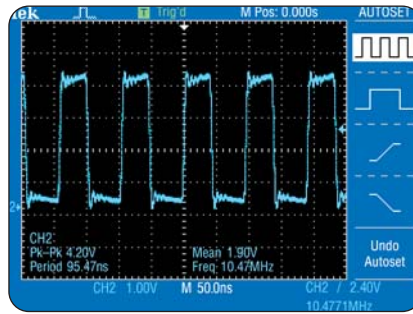
With up to 200 MHz bandwidth and 2 GS/s maximum sample rate, no other color digital storage oscilloscope offers as much bandwidth and sample rate for the price. The TDS1000 and TDS2000 Series oscilloscopes provide accurate real-time acquisition up to their full bandwidth, advanced triggers to isolate signals of interest, and 11 standard automatic measurements on all models. Their Fast Fourier Transform (FFT) math function allows the user to analyze, characterize and troubleshoot circuits by viewing frequency and signal strength (standard on all models).

# Digital Storage Oscilloscopes

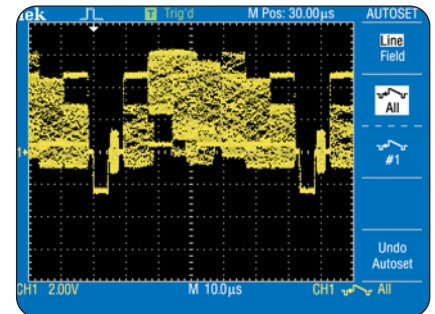
► TDS1002 • TDS1012 • TDS2002 • TDS2012 • TDS2014 • TDS2022 • TDS2024



► *Unparalleled measurement accuracy with up to 200 MHz bandwidth and 2 GS/s maximum sample rate.*



► *Automatically detects sine waves, square waves and video signals, with readouts of relevant measurements and additional user-selectable views of the signal.*



► *Pulse-width and field- and line-selectable video triggers make the oscilloscope ideal for a wide range of applications.*

## Ultra-fast Setup and Use

The simple user interface with classic, analog-style controls makes these instruments easy to use, reducing learning time and increasing efficiency. Innovative features, such as the autoset menu, probe check wizard, context-sensitive help menu and color LCD display (TDS2000 Series) optimize instrument setup and operation.

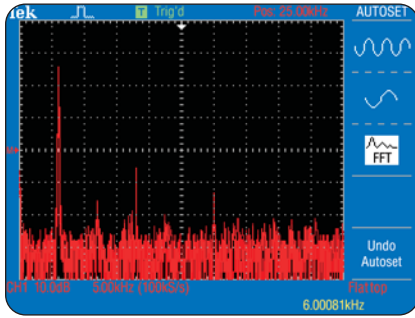
## Simple, Speedy Documentation and Analysis

OpenChoice™ solutions deliver simple, seamless integration between the oscilloscope and the personal computer, providing you with multiple choices to easily document and analyze your measurement results.

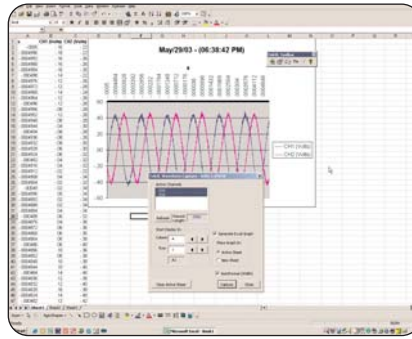
Choose from optional communication modules, CompactFlash® mass storage capability, OpenChoice software and integration with third-party software.

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► Precisely analyze, characterize and troubleshoot circuits – at the push of a button with the autoreset menu.



► Easily document and analyze measurement results using OpenChoice™ software.



► Quickly transfer waveforms and measurement data to an external PC or between oscilloscopes.

## ► Characteristics

### ► TDS1000 and TDS2000 Series Electrical Characteristics

	TDS1002	TDS1012	TDS2002	TDS2012	TDS2014	TDS2022	TDS2024
Display (1/4 VGA LCD)	Mono	Mono	Color	Color	Color	Color	Color
Bandwidth*1	60 MHz	100 MHz	60 MHz	100 MHz	100 MHz	200 MHz	200 MHz
Channels	2	2	2	2	4	2	4
External Trigger Input	Yes on all models						
Sample Rate on each channel	1.0 GS/s	1.0 GS/s	1.0 GS/s	1.0 GS/s	1.0 GS/s	2.0 GS/s	2.0 GS/s
Record Length	2.5 K points on all models						
Vertical Resolution	8-bits						
Vertical Sensitivity	2 mV to 5 V/div on all models with calibrated fine adjustment						
DC Vertical Accuracy	±3% on all models						
Vertical Zoom	Vertically expand or compress a live or stopped waveform						
Max Input Voltage	300 V <sub>RMS</sub> CAT II; derated at 20 dB/decade above 100 kHz to 13 V <sub>p-p</sub> AC at 3 MHz and above						
Position Range	2 mV to 200 mV/div ±2 V; >200 mV to 5 V/div ±50 V						
BW Limit	20 MHz for all models						
Input Coupling	AC, DC, GND on all models						
Input Impedance	1 MΩ in parallel with 20 pF						
Time Base Range	5 ns to 50 sec/div	5 ns to 50 sec/div	5 ns to 50 sec/div	5 ns to 50 sec/div	5 ns to 50 sec/div	2.5 ns to 50 sec/div	2.5 ns to 50 sec/div
Time Base Accuracy	50 ppm						
Horizontal Zoom	Horizontally expand or compress a live or stopped waveform						

\*1 Bandwidth is 20 MHz at 2 mV/div, all models. Bandwidth is 200 MHz typical between 40 °C and 50 °C, 200 MHz models only.

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## Acquisition Modes

**Peak Detect** – High frequency and random glitch capture. Captures glitches as narrow as 12 ns typical using acquisition hardware at all time/div settings from 5  $\mu$ s/div to 50 s/div.

**Sample** – Sample data only.

**Average** – Waveform averaged, selectable: 4, 16, 64, 128.

**Single Sequence** – Use the Single Sequence button to capture a single triggered acquisition sequence at a time.

## Trigger System (Main Only)

**Trigger Modes** – Auto, Normal, Single Sequence.

## Trigger Types

**Edge (rising or falling)** – Conventional level-driven trigger. Positive or negative slope on any channel. Coupling selections: AC, DC, Noise Reject, HF Reject, LF Reject.

**Video** – Trigger on all lines or individual line, odd/even or all fields from composite video, or broadcast standards (NTSC, PAL, SECAM).

**Pulse Width (or Glitch)** – Trigger on a pulse width less than, greater than, equal to, or not equal to a selectable time limit ranging from 33 ns to 10 sec.

## Trigger Source

**2-channel models** – CH1, CH2, Ext, Ext/5, AC Line.

**4-channel models** – CH1, CH2, CH3, CH4, Ext, Ext/5, AC Line.

## Trigger View

Displays trigger signal while trigger view button is depressed.

## Trigger Signal Frequency Readout

Provides a frequency readout of the trigger source.

## Cursors

**Types** – Voltage, Time.

**Measurements** –  $[\Delta]T$ ,  $1/[\Delta]T$  (frequency),  $[\Delta]V$ .

## Measurement System

**Automatic Waveform Measurements** – Period, Frequency, +Width, –Width, Rise Time, Fall Time, Max, Min, Peak-to-Peak, Mean, Cycle RMS.

## Waveform Processing

**Operators** – Add, Subtract, FFT.

**FFT** – Windows: Hanning, Flat Top, Rectangular; 2048 sample points.

**Sources** – 2-channel models: CH1 - CH2, CH2 - CH1, CH1 + CH2.  
4-channel models: CH1 - CH2, CH2 - CH1, CH3 - CH4, CH4 - CH3, CH1 + CH2, CH3 + CH4.

**Autoset Menu** – Single-button, automatic setup of all channels for vertical, horizontal and trigger systems, with undo autoset.

## ► Autoset Menu for Multiple Signal Types

Signal Type	Autoset Menu Choices
Square Wave	Single-cycle, Multi-cycle, Rising or Falling Edge
Sine Wave	Single-cycle, Multi-cycle, FFT Spectrum
Video (NTSC, PAL, SECAM)	Field: All, Odd or Even Line: All or Selectable Line Number

## Display Characteristics

### Display –

Monochrome models: 1/4 VGA, backlit passive LCD with adjustable multi-level contrast and inverse video selectable from front panel.

Color models: 1/4 VGA, passive color LCD with color on black background with adjustable multi-level contrast.

**Interpolation** –  $\sin(x)/x$ .

**Display Types** – Dots, vectors.

**Persistence** – Off, 1 sec, 2 sec, 5 sec, infinite.

**Format** – YT and XY.

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### ► I/O Interface

I/O interface	TDS2CMAX Communication Module	TDS2MEM Storage Memory and Communication Module
Compatibility	TDS200, TDS1000, TDS2000 Series Oscilloscopes	TDS1000, TDS2000 Series Oscilloscopes
Printer Port	Centronics-type Parallel	
Printer Capability (Requires Module)	<b>Graphics File Formats</b> – TIFF, PCX (PC Paint Brush), BMP (Microsoft Windows), EPS (Encapsulated Postscript) and RLE <b>Printer Formats</b> – Bubble Jet, DPU-411, DPU-412, DPU-3445, Thinkjet, Deskjet, Laser Jet, Epson Dot (9- or 24-pin)* <sup>2</sup> , Epson C60* <sup>2</sup> , Epson C80 <b>Layout</b> – Landscape and Portrait	
RS-232 Programmability	Full talk/listen modes. Control of all modes, settings and measurements. Baud rate up to 19,200. 9-pin DTE RS-232 Cable (012-1651-00) included	
GPIB (IEEE std. 488-1987) Programmability	Full talk/listen modes. Control of all modes, settings and measurements.	Not Available
Mass Storage CompactFlash® Memory	Not Available	<ul style="list-style-type: none"> <li>• Type 1 CompactFlash memory card supplied with Module*<sup>3</sup></li> <li>• Accepts any Type 1 CompactFlash card, up to and including 1 GB               <ul style="list-style-type: none"> <li>• Built-in Clock/Calendar</li> </ul> </li> <li>• Includes CompactFlash to USB Memory Card Reader for use with Personal Computer</li> </ul>
OpenChoice™ PC Communications Software	<ul style="list-style-type: none"> <li>• TDSPCS1 OpenChoice PC Communications Software included with each Module               <ul style="list-style-type: none"> <li>• Seamless connection from oscilloscope to PC through GPIB and RS-232</li> <li>• Transfer and save settings, waveforms, measurements, and screen images</li> </ul> </li> <li>• Includes a Windows desktop data transfer application in addition to convenient Microsoft Word and Excel Toolbar Add-ins</li> </ul>	

\*<sup>2</sup>Requires instrument firmware version 2.12/4.12 or higher to support Epson C60/C80 printer formats.

\*<sup>3</sup>Supplied Type 1 CompactFlash memory card storage capacity 8 MB or greater.

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## ► Nonvolatile Storage

Nonvolatile Storage	Standard	Optional TDS2MEM Storage Memory and Communication Module**4				
Reference Waveform Display	Two 2500 point reference waveforms	Same as instrument only				
Waveform Storage	<table border="1"> <thead> <tr> <th>2 Channel Models</th> <th>4 Channel Models</th> </tr> </thead> <tbody> <tr> <td>Two 2500 point reference waveforms</td> <td>Four 2500 point reference waveforms</td> </tr> </tbody> </table>	2 Channel Models	4 Channel Models	Two 2500 point reference waveforms	Four 2500 point reference waveforms	96 or more reference waveforms per 8 MB
2 Channel Models	4 Channel Models					
Two 2500 point reference waveforms	Four 2500 point reference waveforms					
Setups	10 front panel setups	4000 or more front panel setups per 8 MB				
Screen Images	N/A	128 or more screen images per 8 MB (the number of images depends on file format selected)				
Save All	N/A	12 or more Save All operations per 8 MB. A single Save All operation creates 2 to 9 files (setup, image, plus one file for each displayed waveform)				

\*\*4 Supplied with Type 1 CompactFlash® memory card, storage capacity 8 MB or greater.

### Environmental and Safety

#### Temperature –

Operating: 0 °C to +50 °C.  
Nonoperating: –40 °C to +71 °C.

#### Humidity –

Operating and Nonoperating: up to 90% RH at or below +30 °C.  
Operating: up to 60% RH up to 50 °C.  
Nonoperating: up to 60% RH up to 55 °C.

**Altitude –** Operating and Nonoperating: up to 3,000 m.

**Electromagnetic Compatibility –** Meets Directive 89/336/EEC, amended by 93/68/EEC, meets or exceeds EN55011 Class A Radiated and Conducted Emissions; FCC 47 CFR, Part 15, Subpart B, Class A; Australian EMC Framework, demonstrated per Emission Standard AS/NZS 2064; Russian GOST EMC regulations.

**Safety –** UL3111-1, CSA1010.1, IEC61010-1, EN61010-1.

### Physical Characteristics

#### INSTRUMENT

Dimensions	mm	in.
Width	323.8	12.75
Height	151.4	5.96
Depth	124.5	4.90
Weight	kg	lbs.
Instrument only	2.0	4.4
with accessories	2.2	4.9

#### INSTRUMENT SHIPPING

Package Dimensions	mm	in.
Width	476.2	18.75
Height	266.7	10.50
Depth	228.6	9.00

#### RM2000 RACKMOUNT

Dimensions	mm	in.
Width	482.6	19.00
Height	177.8	7.00
Depth	108.0	4.25

## ► Ordering Information

**TDS1002, TDS1012, TDS2002, TDS2012, TDS2014, TDS2022, TDS2024**

### Standard Accessories

**Probes –** P2220 200 MHz 10X - 1X Switchable Passive Probes (one per channel).

**Documentation –** User manual.

Power cord.

NIM/NIST-Traceable Certificate of Calibration.

Please specify the power plug and language options when ordering.

### Recommended Accessories

**TDS2CMAX –** Communication Module (GPIB, RS-232, Centronics-type Printer Port) includes: TDSPCS1 OpenChoice™ PC Communication Software, RS-232 cable (012-1651-00), Programmers manual.

**TDS2MEM –** Storage Memory and Communication Module (RS-232, Centronics-type Printer Port) includes: Type 1 CompactFlash® memory card (156-9413-00), CompactFlash to USB Memory Card Reader (119-6827-00), TDSPCS1 OpenChoice PC Communication Software, RS-232 cable (012-1651-00), Programmers manual.

**CompactFlash to USB Memory Card Reader** – (119-6827-00).

### TDSPCS1 OpenChoice PC Communication

**Software** – A collection of programs that enable fast and easy transfer communication between MS Windows PCs and TDS3000B, TDS2000, TDS1000, and TDS200 Series oscilloscopes; included with TDS2CMAX and TDS2MEM communication modules.

Minimum System Requirements:

- 500 MHz Pentium equivalent or greater
- 128 MB
- MS Windows 98 SE, XP Professional, Me, or 2000
- MS Office 2000 or XP (for TDS toolbars only) – Excel 2000 or 2002; Word 2000 or 2002
- Keyboard and mouse
- LAN, GPIB or serial connector

### WaveStar™ Software for Oscilloscopes

**(WSTRO)** – Windows 98/2000/ME/NT 4.0 application for waveform capture, analysis, documentation, and control from your PC. Provides enhanced oscilloscope data measurement, analysis, remote-setup, and charting features. Connects to a wide variety of Tektronix oscilloscopes over GPIB, RS-232, and Ethernet connections.

**AD007** – LAN/WAN GPIB converter.

**AC2100** – Soft case for carrying instrument.

**HCTEK321** – Hard plastic case for carrying instrument (requires AC2100).

**RM2000** – Rackmount kit.

**Service Manual (TDS1000 and TDS2000 Series Digital Storage Oscilloscopes)** – English Only (071-1076-00).

**Programmer Manual (TDS200, TDS1000 and TDS2000 Series Digital Storage Oscilloscopes)** – English only (071-1075-01).

**Operator Training Kit** – Extensive instructions and step-by-step lab exercises provide education about the operation of the TDS1000 and TDS2000 Series oscilloscopes. Kit includes a self-paced CD-ROM-based manual and signal source board (TNGTDS01). Optional hard copy manual is available for order separately.

### Recommended Probes

**P2220** – 10X - 1X switchable passive probe (200 MHz when 10X is selected).

**P6015A** – 1000X high voltage passive probe (75 MHz).

**P5100** – 100X high voltage passive probe (250 MHz).

**P5200** – High voltage active differential probe (25 MHz).

**P6021** – 60 MHz AC current probe.

**P6022** – 120 MHz AC current probe.

**A621** – 2000 A AC current probe/BNC.

**A622** – 100 A AC/DC current probe/BNC.

**AM503S** – AC/DC current probe system.

### Power Plug Options

**Opt. A0** – North America power.

**Opt. A1** – Universal EURO power.

**Opt. A2** – United Kingdom power.

**Opt. A3** – Australia power.

**Opt. A5** – Switzerland power.

**Opt. A99** – No power cord or AC adapter.

**Opt. AC** – China power.

### Accessory Cables

**GPIB, 1 m (3.3 ft.)** – Order 012-0991-01.

**GPIB, 2 m (6.6 ft.)** – Order 012-0991-00.

**RS-232, 9-Pin female to 25-Pin male, 4.6 m (15 ft.), for Modems** – Order 012-1241-00.

**RS-232, 9-Pin female to 9-Pin female, null modem, for computers** – Order 012-1651-00.

**RS-232, 9-Pin female to 25-Pin female, null modem, for computers** – Order 012-1380-00.

**RS-232, 9-Pin female to 25-Pin male, null modem, for printers** – Order 012-1298-00.

**Centronics, 25-Pin male to 36-Pin Centronics, 2.4 m (8 ft.), for Parallel Printer Interfaces** – Order 012-1214-00.



► *Tektronix probes are expressly designed for your oscilloscope, with identical quality standards and built-in compatibility for optimum performance.*

### International User Manual (TDS1000 and TDS2000 Series Digital Storage Oscilloscopes, includes TDS2CMAX\*1 user information)

**Opt. L0** – English (071-1064-00).

**Opt. L1** – French (071-1065-00).

**Opt. L2** – Italian (071-1066-00).

**Opt. L3** – German (071-1067-00).

**Opt. L4** – Spanish (071-1068-00).

**Opt. L5** – Japanese (071-1069-00).

**Opt. L6** – Portuguese (071-1070-00).

**Opt. L7** – Simplified Chinese (071-1071-00).

**Opt. L8** – Traditional Chinese (071-1072-00).

**Opt. L9** – Korean (071-1073-00).

**Opt. LR** – Russian (071-1074-00).

Translated front panel overlays included with their respective user manuals.

### Warranty Information

Three year warranty covering all labor and parts, excluding probes and accessories.

\*1 The user information for the TDS2CMA communication module that appears in this manual also applies to the TDS2CMAX communication module.

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## ▶ A Critical Component of the Complete Measurement Solution.

The AFG300 Series arbitrary function generator pairs with the TDS3000B, TDS2000 and TDS1000 Series digital oscilloscopes to deliver the two elements of a complete measurement solution – stimulus and acquisition. This instrument combines the capabilities of a function generator with the power of an arbitrary waveform generator, offering the performance needed to accurately verify, validate and characterize designs with ease and confidence at a price you can afford.



## ▶ Tektronix Support Completes the Solution.

We know you depend on Tektronix instrument solutions when you make and meet critical commitments. So we make and meet a support commitment you can depend on. Anytime you need support, anywhere in the world, Tektronix Support gives you the lowest possible exposure to inconvenience, delay or disruption of operations.



- Unsurpassed technical expertise and experience with 24-hour response to technical questions
- Interactive, online support to request assistance, check service status or arrange for training
- Industry-leading, turn-around service time
- Credible, reliable support with demonstrated on-time delivery
- 90-day unconditional service warranty
- No fine print, no exclusions, no surprises
- Global support in more than 50 countries

Depend on Tektronix. Visit [www.tektronix.com/support](http://www.tektronix.com/support)

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