

# Digital Storage Oscilloscopes

► TDS1000 Series • TDS2000 Series



## TDS1000 and TDS2000 Series Oscilloscopes. Brilliantly Engineered. Irresistibly Priced.

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).

### ► Features & Benefits

40 MHz, 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 PC Communication Software
- WaveStar™ Software
- Integration with Third-party Software

### ► Applications

Design and Debug

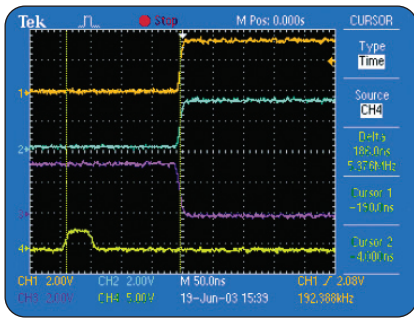
Education and Training

Manufacturing Test and Quality Control

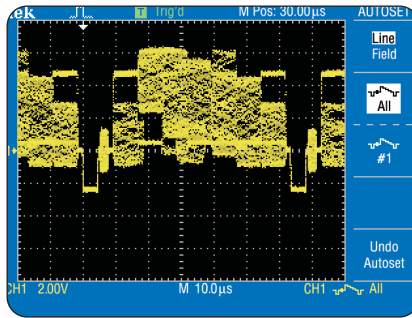
Service and Repair

## Digital Storage Oscilloscopes

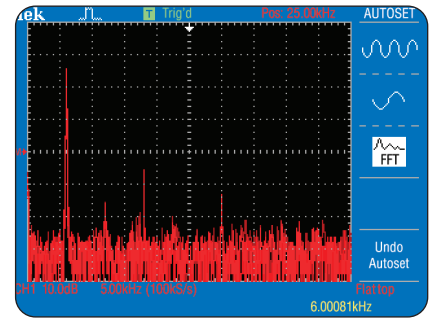
► TDS1000 Series • TDS2000 Series



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



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



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

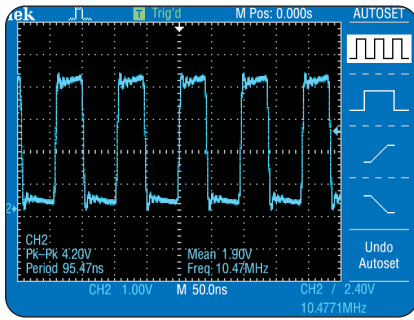
### Ultra-fast Setup and Use

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 autoselect menu, probe check wizard, context-sensitive help menu and color LCD display (TDS2000 Series) optimize instrument setup and operation.

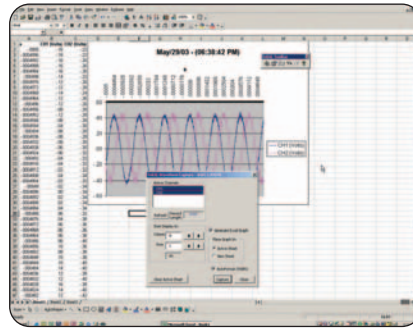
### Simple, Speedy Documentation and Analysis

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 or integration with third-party software.



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



- 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

|                             | TDS1001   | TDS1002          | TDS1012          | TDS2002          | TDS2004          | TDS2012          | TDS2014          | TDS2022            | TDS2024            |
|-----------------------------|---|------------------|------------------|------------------|------------------|------------------|------------------|--------------------|--------------------|
| Display (1/4 VGA LCD)       | Mono  | Mono             | Mono             | Color            | Color            | Color            | Color            | Color              | Color              |
| Bandwidth <sup>*1</sup>     | 40 MHz  | 60 MHz           | 100 MHz          | 60 MHz           | 60 MHz           | 100 MHz          | 100 MHz          | 200 MHz            | 200 MHz            |
| Channels                    | 2   | 2                | 2                | 2                | 4                | 2                | 4                | 2                  | 4                  |
| External Trigger Input      | Present 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         | 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>pk-pk</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 s/div  | 5 ns to 50 s/div | 5 ns to 50 s/div | 5 ns to 50 s/div | 5 ns to 50 s/div | 5 ns to 50 s/div | 5 ns to 50 s/div | 2.5 ns to 50 s/div | 2.5 ns to 50 s/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.

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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 s.

## 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<br>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.

► I/O Interface

| I/O interface                             | TDS2CMAX Communications Module   | TDS2MEM Storage Memory and Communication Module  |
|---|--|--|
| Compatibility                             | TDS200, TDS1000, TDS2000 Series Oscilloscopes  | TDS1002, TDS1012, TDS2002, TDS2012, TDS2014, TDS2022, TDS2024 Oscilloscopes* <sup>1</sup>  |
| 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<br><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<br><b>Layout</b> – Landscape and portrait   |  |
| RS-232 Programmability                    | Full talk/listen modes. Control of all modes, settings and measurements.<br>Baud rate up to 19,200. 9-Pin DTE<br>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                   <ul style="list-style-type: none"> <li>• Includes a Windows desktop data transfer application in addition to convenient Microsoft Word and Excel toolbar add-ins</li> </ul> </li> </ul> </li> </ul> |  |

\*<sup>1</sup> Not compatible with TDS1001 or TDS2004.

\*<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 <sup>*1</sup>  |                  |                                    |                                     |   |
|------------------------------------|--|---|------------------|------------------------------------|-------------------------------------|---|
| Reference Waveform Display         | Two 2500 point reference waveforms   | Same as instrument  |                  |                                    |                                     |   |
| 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) |                  |                                    |                                     |   |

\*1 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 –

UL61010-1, CSA61010-1, 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

**TDS1001, TDS1002, TDS1012, TDS2002, TDS2004, TDS2012, TDS2014, TDS2022, TDS2024**

### Standard Accessories

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

**Documentation** – User manual.

**NIM/NIST Traceable Certificate of Calibration.**

**Power cord.**

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**<sup>\*2</sup> – 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.

\*2 Not compatible with TDS1001 or TDS2004.



**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 TDS2CMA and TDS2MEM communication modules.

**Minimum System Requirements:**

- ▶ 500 MHz Pentium equivalent or greater
- ▶ 128 MB RAM
- ▶ Microsoft Windows 98SE, XP Professional, ME or 2000
- ▶ Microsoft 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-xx).

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

**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** – 200 MHz, 10X to 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.

**International User Manual (TDS1000 and TDS2000 Series Digital Storage Oscilloscopes, includes TDS2CMA<sup>\*1</sup> user information)**

**Opt. L0** – English (071-1064-xx).

**Opt. L1** – French (071-1065-xx).

**Opt. L2** – Italian (071-1066-xx).

**Opt. L3** – German (071-1067-xx).

**Opt. L4** – Spanish (071-1068-xx).

**Opt. L5** – Japanese (071-1069-xx).

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

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

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

**Opt. L9** – Korean (071-1073-xx).

**Opt. LR** – Russian (071-1074-xx).

Translated front panel overlays included with their respective user manuals.

**Warranty Information**

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

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

## Digital Storage Oscilloscopes

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### Tektronix Support Completes the Solution.

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ASEAN / Australasia / Pakistan (65) 6356 3900

Austria +41 52 675 3777

Balkan, Israel, South Africa and other ISE Countries +41 52 675 3777

Belgium 07 81 60166

Brazil & South America 55 (11) 3741-8360

Canada 1 (800) 661-6625

Central East Europe, Ukraine and the Baltics +41 52 675 3777

Central Europe & Greece +41 52 675 3777

Denmark +45 80 88 1401

Finland +41 52 675 3777

France & North Africa +33 (0) 1 69 86 81 81

Germany +49 (221) 94 77 400

Hong Kong (852) 2585-6688

India (91) 80-22275577

Italy +39 (02) 25086 1

Japan 81 (3) 6714-3010

Luxembourg +44 (0) 1344 392400

Mexico, Central America & Caribbean 52 (55) 56666-333

Middle East, Asia and North Africa +41 52 675 3777

The Netherlands 090 02 021797

Norway 800 16098

People's Republic of China 86 (10) 6235 1230

Poland +41 52 675 3777

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Republic of Korea 82 (2) 528-5299

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Spain (+34) 901 988 054

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Switzerland +41 52 675 3777

Taiwan 886 (2) 2722-9622

United Kingdom & Eire +44 (0) 1344 392400

USA 1 (800) 426-2200

For other areas contact Tektronix, Inc. at: 1 (503) 627-7111

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