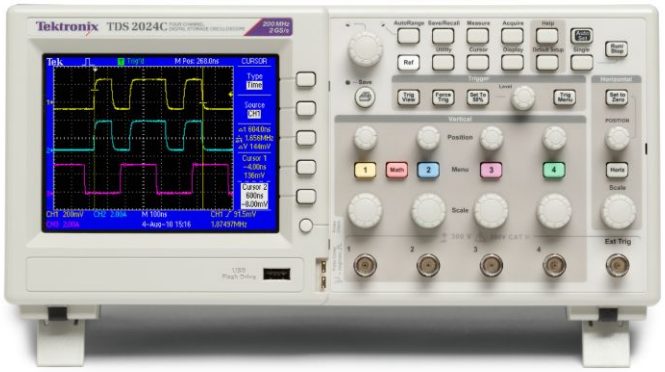
Digital Storage Oscilloscopes

TDS2000C Series Datasheet



The TDS2000C Digital Storage Oscilloscope Series provides you with affordable performance in a compact design. Packed with standard features - including USB connectivity, 16 automated measurements, limit testing, data logging, and context-sensitive help - the TDS2000C Series oscilloscopes help you get more done in less time.

Key performance specifications

- 200 MHz, 100 MHz, 70 MHz, 50 MHz bandwidth models
- 2- and 4-channel models
- Up to 2 GS/s sample rate on all channels
- 2.5k point record length on all channels
- Advanced triggers including pulse width trigger and line-selectable video trigger

Key features

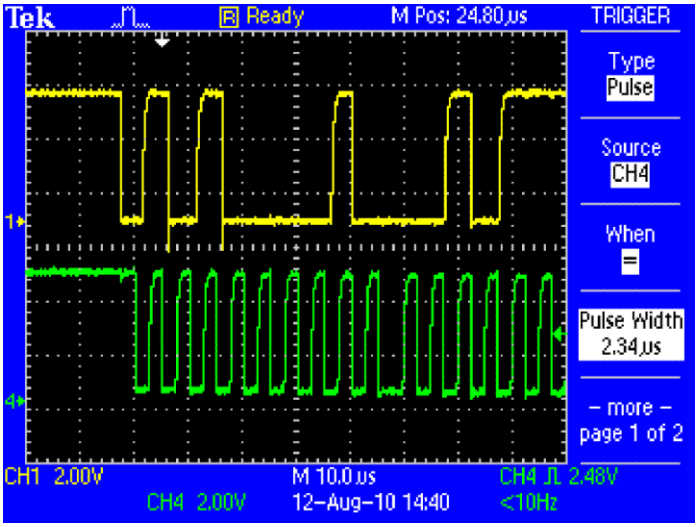
- 16 automated measurements and FFT analysis for simplified waveform analysis
- Built-in waveform limit testing
- Automated, extended data logging feature
- Autoset and signal auto-ranging
- Built-in context-sensitive help
- Probe check wizard
- 11-language user interface
- 144 mm (5.7 inch) active TFT color display
- Small footprint and lightweight - only 124 mm (4.9 inches) deep and 2 kg (4.4 lb)
- USB 2.0 host port on the front panel for quick and easy data storage
- USB 2.0 device port on the rear panel for easy connection to a PC or for direct printing to a PictBridge® -compatible printer
- Includes Tektronix OpenChoice® Software for connecting to your oscilloscopes
- Lifetime warranty. Limitations apply. For terms and conditions, visit www.tek.com/lifetimewarranty

Digital precision for accurate measurements

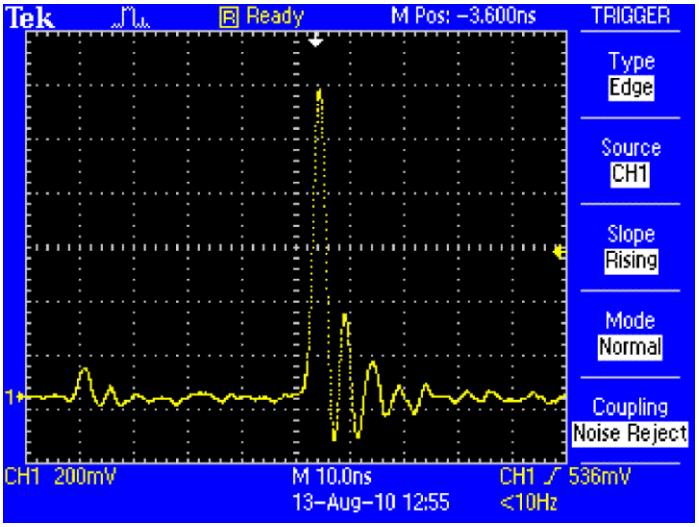
With up to 200 MHz bandwidth and 2 GS/s maximum sample rate, no other digital storage oscilloscope offers as much bandwidth and sample rate for the price. Tektronix proprietary sampling technology provides real-time sampling with a minimum of 10X oversampling on all channels, all the time to accurately capture your signals. Sampling performance is not reduced when using multiple channels.

Critical tools for troubleshooting your device

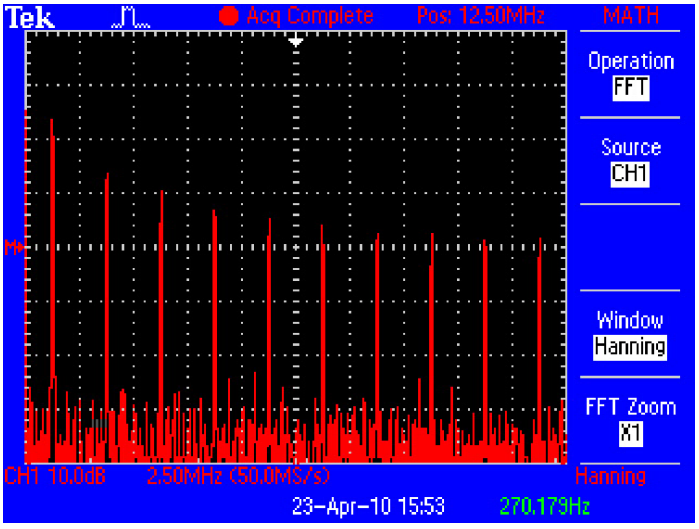
Advanced triggers - rising/falling edge, pulse width, and video - help you quickly isolate your signals of interest. Once you've captured a signal, advanced math capabilities and automated measurements can speed your analysis. Quickly perform an FFT or add, subtract, or multiply waveforms. Sixteen automated measurements quickly and reliably calculate important signal characteristics such as frequency or rise time, while the built-in Limit Test function enables you to easily identify problems in your signal.



Quickly and easily capture waveforms with advanced triggering.



See all the details other oscilloscopes might miss with Tektronix proprietary digital real-time sampling.



Quickly perform an FFT with the advanced math functions.

Designed to make your work easy

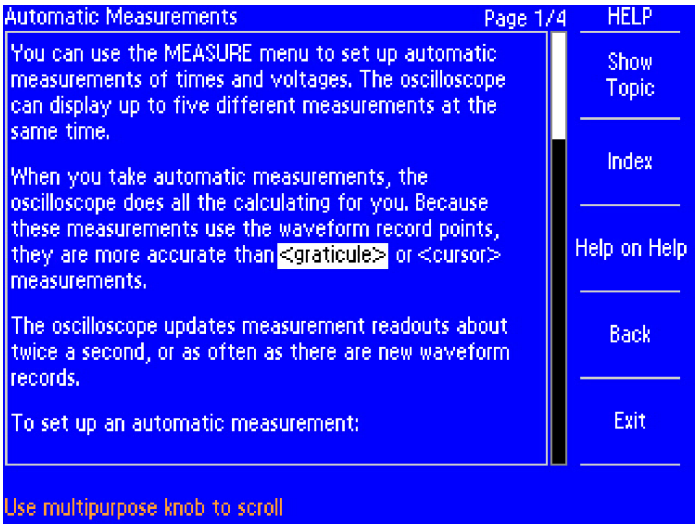
The TDS2000C Series oscilloscopes are designed with the ease of use and familiar operation you have come to expect from Tektronix.

Intuitive operation

The intuitive user interface with dedicated per-channel vertical controls, auto-setup, and auto-ranging makes these instruments easy to use, reducing learning time and increasing efficiency.

Help when you need it

The built-in Help menu provides you with important information on your oscilloscope's features and functions. Help is provided in the same languages as the user interface.



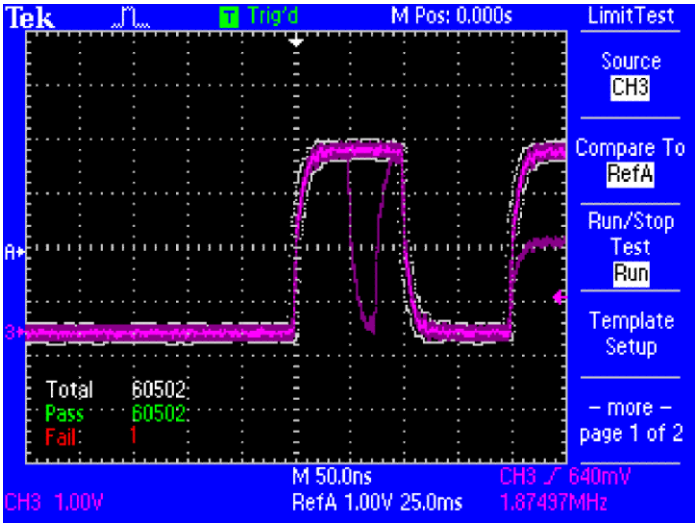
The context-sensitive Help system provides important information specific to the task you are working on.

Probe check wizard

Check out your probe compensation before making measurements with just one button that starts a fast, easy procedure.

Limit test

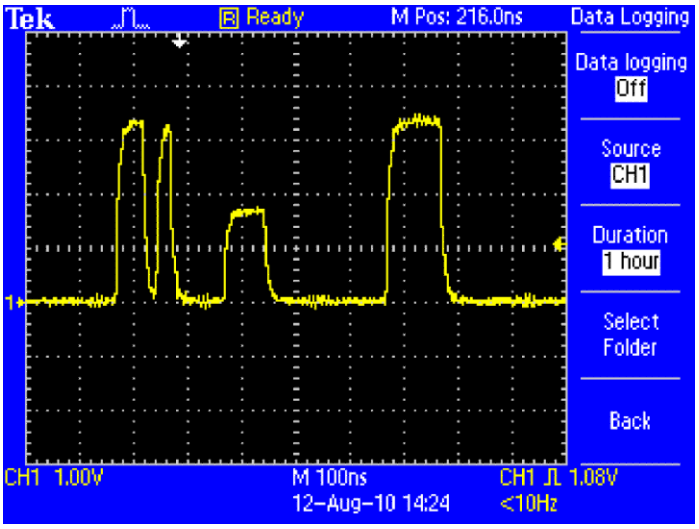
The oscilloscope can automatically monitor source signals and output Pass or Fail results by judging whether the input waveform is within predefined boundaries. Specific actions can be triggered on violation including stopping waveform acquisition, stopping Limit Test functions, saving the failed waveform data or screen image to a USB memory device, or any combination of the above. This is an ideal solution for manufacturing or service applications where you need to make decisions quickly.



Limit Test provides a quick Pass/Fail comparison of any triggered input signal to a user-defined template.

Flexible data transfer

The USB host port on the front panel enables you to save your instrument settings, screenshots, and waveform data in a flash. The built-in Data Logging feature means you can set up your oscilloscope to save user-specified triggered waveforms to a USB memory device for up to 24 hours. You can also select the "infinite" option for continuous waveform monitoring. With this mode you can save your triggered waveforms to an external USB memory device without a duration limitation until the memory device is full. The oscilloscope will then guide you to insert another USB memory device to continue saving waveforms.



Data Logging enables automatic saving of triggered waveforms.

Conveniently use your USB flash drive to store screenshots and waveform data.

Easy PC connectivity

Easily capture, save, and analyze measurement results by connecting to your PC with the rear-panel USB device port and the included copy of OpenChoice PC Communications Software. Simply pull screen images and waveform data into the stand-alone desktop application or directly into Microsoft Word and Excel. Alternatively, if you prefer not to use your PC, you can simply print your image directly to any PictBridge-compatible printer.

Connect to your bench for intelligent debug

SignalExpress supports the range of Tektronix bench instruments (For a complete listing of Tektronix instruments supported by NI LabView Signal Express, visit: www.tek.com/signalexpress) enabling you to connect your entire test bench. You can then access the feature-rich tools packed into each instrument from one intuitive software interface. This allows you to automate complex measurements requiring multiple instruments, log data for an extended period of time, time-correlate data from multiple instruments, and easily capture and analyze your results, all from your PC. Only Tektronix offers a connected test bench of intelligent instruments to simplify and speed debug of your complex design.

Performance you can count on

In addition to industry-leading service and support, every TDS2000C Series oscilloscope comes backed with a Lifetime Warranty as standard.

Limitations apply. For terms and conditions, visit www.tek.com/lifetimewarranty.

Specifications

All specifications are guaranteed unless noted otherwise. All specifications apply to all models unless noted otherwise.

Overview

	TDS2001C	TDS2002C	TDS2004C	TDS2012C	TDS2014C	TDS2022C	TDS2024C
Display (QVGA LCD)	TFT on all models						
Bandwidth	50 MHz	70 MHz	70 MHz	100 MHz	100 MHz	200 MHz	200 MHz
Channels	2	2	4	2	4	2	4
External trigger input	Included on all models						
Sample rate on each channel	500 MS/s	1.0 GS/s	1.0 GS/s	2.0 GS//s	2.0 GS/s	2.0 GS/s	2.0 GS/s

Vertical system

Record length	2.5k points at all time bases 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
Maximum input voltage	300 V_{RMS} CAT II; derated at 20 dB/decade above 100 kHz to 13 V_{p-p}AC at 3 MHz
Position range	2 mV to 200 mV/div ±1.8 V; >200 mV to 5 V/div ±45 V
Bandwidth limit	20 MHz for all models
Input impedance	1 MΩ in parallel with 20 pF
Input coupling	AC, DC, GND on all models

Horizontal system

Time base accuracy	50 ppm
Horizontal zoom	Horizontally expand or compress a live or stopped waveform

Trigger system

Trigger modes	Auto, Normal, Single Sequence
Trigger types	
Edge (rising/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 lines, 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 the trigger signal while the Trigger View button is depressed
Trigger signal frequency readout	Provides a frequency readout of the trigger source

Acquisition system

Acquisition modes	
Peak detect	High-frequency and random glitch capture. Captures glitches as narrow as 12 ns (typical) at all time base settings from 5 µs/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
Roll mode	At acquisition time base settings of >100 ms/div

Waveform measurements

Automatic waveform measurements	Period, Frequency, +Width, -Width, Rise Time, Fall Time, Max, Min, Peak-to-Peak, Mean, RMS, Cycle RMS, Cursor RMS, Duty Cycle, Phase, Delay
Cursors	
Types	Amplitude and time
Measurements	ΔT, 1/ΔT (frequency), ΔV

Waveform math

Operators	Add, Subtract, Multiply, FFT
Sources	
2-channel models	CH1 - CH2, CH2 - CH1, CH1 + CH2, CH1 x CH2
4-channel models	CH1 - CH2, CH2 - CH1, CH3 - CH4, CH4 - CH3, CH1 + CH2, CH3 + CH4, CH1 x CH2, CH3 x CH4
FFT	Windows: Hanning, Flat Top, Rectangular 2,048 sample points

Waveform math

Autoset menu	Single-button, automatic setup of all channels for vertical, horizontal, and trigger systems, with undo Autoset.
	Autoset-menu signal-type choices are:
Square wave	Single Cycle, Multicycle, Rising or Falling Edge
Sine Wave	Single Cycle, Multicycle, FFT Spectrum
Video (NTSC, PAL, SECAM)	Field: Alt, Odd, or Even
	Line: Alt or Selectable Line Number
Autorange	Automatically adjust vertical and/or horizontal oscilloscope settings when a probe is moved from point to point, or when a signal exhibits large changes

Display characteristics

Display	QVGA Active Color TFT
Interpolation	Sin(x)/x
Display types	Dots, vectors
Persistence	Off, 1 s, 2 s, 5 s, infinite
Format	YT and XY

Input-output interfaces

USB Ports	The USB host port on the front panel supports USB flash drives
	The USB device port on the back of the instrument supports connection to a PC and to all PictBridge-compatible printers
GPIB	Optional

Nonvolatile storage

Reference waveform display	Two 2.5k point reference waveforms
Waveform storage without USB flash drive	TDS2001C, TDS2002C, TDS2012C, TDS2022C: Two 2.5k point waveforms
	TDS2004C, TDS2014C, TDS2024C: Four 2.5k point waveforms
Maximum USB flash drive size	64 GB
Waveform storage with USB flash drive	96 or more reference waveforms per 8 MB
Setups without USB flash drive	10 front-panel setups
Setups with USB flash drive	4,000 or more front-panel setups per 8 MB
Screen images with USB flash drive	128 or more screen images per 8 MB.
	The actual number of images depends on the file format selected
Save All with USB flash drive	12 or more Save All operations per 8 MB
	A single Save All operation creates 3 to 9 files (setup, image, plus one file for each displayed waveform)

Power source

Power source	
Source voltage	Full range: 100 to 240 V_{AC} RMS ±10%, Installation Category II (covers range of 90 to 264 V_{AC})
Power consumption	Power consumption: Less than 30 W at 85 to 275 V_{AC} input

Physical characteristics

Instrument dimensions	
Height	158.0 mm (6.2 inches)
Width	326.3 mm (12.8 inches)
Depth	124.2 mm (4.9 inches)
Instrument weight	
Instrument only	2.0 kg (4.4 lb)
Instrument with accessories	2.2 kg (4.9 lb)
Shipping package dimensions	
Height	266.7 mm (10.5 inches)
Width	476.2 mm (18.7 inches)
Depth	228.6 mm (9.0 inches)
RM2000B rackmount dimensions	
Height	482.6 mm (19.0 inches)
Width	177.8 mm (7.0 inches)
Depth	108.0 mm (4.3 inches)

EMC, environment and safety

Temperature	
Operating	0 to +50 °C
Non-operating	-40 to +71 °C
Humidity	
Operating	Up to 80% RH at or below +40 °C Up to 45% RH up to +50 °C
Non-operating	Up to 80% RH at or below +40 °C Up to 45% RH up to +50 °C
Altitude	
Operating	Up to 3,000 m
Non-operating	Up to 3,000 m
Electromagnetic compatibility	Meets Directive 2004/108/EC, EN 61326-2-1 Class A; Australian EMC Framework
Safety	UL61010-2004, CSA22.2 No. 61010-1:2004, EN61010-1:2001, IEC61010-1:2001, EU Low Voltage Directive 2006/95/EC

Ordering information

Models

TDS2001C	50 MHz, 2 Ch, 500 MS/s, TFT DSO
TDS2002C	70 MHz, 2 Ch, 1 GS/s, TFT DSO
TDS2004C	70 MHz, 4 Ch, 1 GS/s, TFT DSO
TDS2012C	100 MHz, 2 Ch, 2 GS/s, TFT DSO
TDS2014C	100 MHz, 4 Ch, 2 GS/s TFT DSO
TDS2022C	200 MHz, 2 Ch, 2Gs/s, TFT DSO
TDS2024C	200 MHz, 4 Ch, 2 GS/s, TFT DSO

Instrument options

Language options

Opt. L0	English (front-panel label on instrument)
Opt. L1	French (front-panel overlay)
Opt. L2	Italian (front-panel overlay)
Opt. L3	German (front-panel overlay)
Opt. L4	Spanish (front-panel overlay)
Opt. L5	Japanese (front-panel overlay)
Opt. L6	Portuguese (front-panel overlay)
Opt. L7	Simplified Chinese (front-panel overlay)
Opt. L8	Traditional Chinese (front-panel overlay)
Opt. L9	Korean (front-panel overlay)
Opt. L10	Russian (front-panel overlay)

User manual (PDF) in 11 languages are available on the documentation CD and for download from www.tek.com/manual/downloads. There are no printed user manuals.

Power plug options

Opt. A0	North America power plug (115 V, 60 Hz)
Opt. A1	Universal Euro power plug (220 V, 50 Hz)
Opt. A2	United Kingdom power plug (240 V, 50 Hz)
Opt. A3	Australia power plug (240 V, 50 Hz)
Opt. A4	North America power plug (240 V, 50 Hz)
Opt. A5	Switzerland power plug (220 V, 50 Hz)
Opt. A6	Japan power plug (100 V, 50/60 Hz)
Opt. A10	China power plug (50 Hz)
Opt. A11	India power plug (50 Hz)

Opt. A12	Brazil power plug (60 Hz)
Opt. A99	No power cord

Service options

Opt. D1	Calibration Data Report

Probes and accessories are not covered by the oscilloscope warranty and Service Offerings. Refer to the datasheet of each probe and accessory model for its unique warranty and calibration terms.

Standard accessories

Probes

TPP0101	100 MHz passive probe for TDS2001C, TDS2002C, and TDS2004C (one per channel)
TPP0201	200 MHz passive probe for TDS2012C, TDS2014C, TDS2022C, and TDS2024C (one per channel)

Accessories

Power cord	Please specify plug option
NIM/NIST	Traceable Certificate of Calibration
Documentation	TDS2000C and TDS1000C-EDU Compliance and Safety Instructions TDS2000C and TDS1000C-EDU Documentation CD
OpenChoice PC Communications Software	Enables fast and easy communication between a Windows PC and the TDS2000C Series using USB. Transfer and save settings, waveforms, measurements, and screen images
Limited Lifetime Warranty	Covers labor and parts for defects in materials and workmanship for a minimum of 10 years, excluding probes and accessories. Lifetime is defined as 5 years after Tektronix discontinues manufacturing the product, but the warranty length shall be at least ten years from date of original purchase. Lifetime warranty is nontransferrable. Proof of original purchase is required. Limitations apply. For terms and conditions visit www.tektronix.com/lifetimewarranty. Probes and accessories are not covered by the oscilloscope warranty and Service Offerings. Refer to the datasheet of each probe and accessory model for its unique warranty and calibration terms.

Recommended accessories

Probes

TPP0101	10X passive probe, 100 MHz bandwidth
TPP0201	10X passive probe, 200 MHz bandwidth
P2220	1X/10X passive probe, 200 MHz bandwidth
P6101B	1X passive probe (15 MHz, 300 V_{RMS} CAT II rating)
P6015A	1000X high-voltage passive probe (75 MHz)
P5100A	100X high-voltage passive probe (500 MHz)
P5200	High-voltage active differential probe (25 MHz)
P6021	15 A, 60 MHz AC-current probe
A621	2000 A, 5 to 50 kHz, AC-current probe
A622	100 A, 100 kHz, AC/DC current probe/BNC

TCP303/TCPA300	150 A, 15 MHz AC/DC current probe/amplifier
TCP305/TCPA300	50 A, 50 MHz AC/DC current probe/amplifier
TCP312/TCPA300	30 A, 100 MHz AC/DC current probe/amplifier
TCP404XL/TCPA400	500 A, 2 MHz AC/DC current probe/amplifier

Accessories

TEK-USB-488	GPIB-to-USB converter
AC2100	Soft carrying case for instrument
HCTEK4321	Hard plastic carrying case for instrument
RM2000B	Rackmount kit
077-0444-xx	Programmer manual, English only, PDF only, downloadable from www.tek.com/manual/downloads
077-0446-xx	Service manual, English only, PDF only, downloadable from www.tek.com/manual/downloads
174-4401-xx	USB host to device cable, 3 feet long

CE

Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.

Product(s) complies with IEEE Standard 488.1-1987, RS-232-C, and with Tektronix Standard Codes and Formats.

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

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.tek.com.

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