

# Digital Real-Time™ Oscilloscopes

TDS 684B • TDS 680B • TDS 644B • TDS 620B • TDS 640A

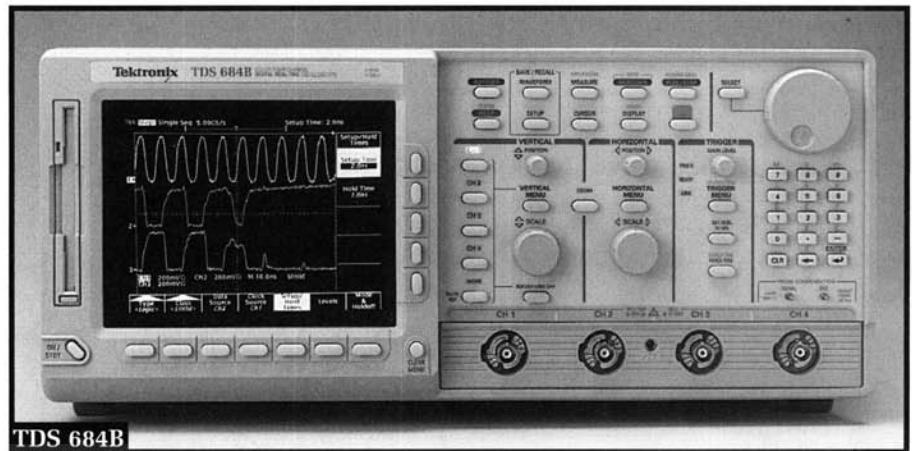
## ★ Features

### TDS 684B/TDS 680B/TDS 644B/TDS 620B/TDS 640A

- 1 GHz and 500 MHz Bandwidth
- 5 GS/s and 2.5 GS/s Sample Rates
- 4 and 2 Input Channels
- 8-Bit Vertical Resolution
- Greater than 11-Bits with Averaging
- Record Length to 15,000 Points
- 1 mV/div to 10 V/div Sensitivity
- 1.5% Vertical Accuracy
- Waveform Math and Advanced Waveform DSP
- 1 ns Peak Detect (not available w/TDS640A)
- Channel Deskew (not available w/TDS640A)
- Fully Automated Measurement System
- Waveform Pass/Fail Template Testing
- Color VGA Display
- 3.5 in. DOS Format Floppy Drive
- RS-232, Centronics, GPIB and VGA I/O Ports

## A Applications

- Digital Design and Characterization
- Telecommunications/Datacommunications
- Transient Event Capture
- High Energy Physics



Your designs may be digital but at today's speeds, many of your toughest problems aren't. Crosstalk noise. Transmission effects. Ground bounce. Not to mention sub-nanosecond edges. Today's design problems require high bandwidth oscilloscopes that can measure up to these challenges. The Digital Real-Time™ architecture of the TDS 600 Series simplifies capturing intermittent signals or non-recurring problems like glitches or metastable states caused by setup and hold time violations.

TDS 600 Series provides design engineers excellent single shot accuracy for multi-channel, high speed signal characterization. Additional features and specifications of the TDS 600 Series are explained in the TDS Reference section beginning on page 49.

### TIME BASE SYSTEM

**Time Bases** – Main and Delayed.

**Time/div Range** – 200 ps/div to 10 s/div. Except TDS 640A: 500 ps/div to 5 s/div.

**Time Base Accuracy** – Over Any Interval >1ms ±100 ppm.

**Record Length per Channel** – 500 to 15,000 pts. Except TDS 640A: 500 to 2,000 pts.

**Pre-Trigger Position** – 0% to 100% of Record.

### VERTICAL SYSTEM

**Vertical Resolution** – 8-Bits (>11-Bits with averaging).

**Vertical Sensitivity** – 1 mV/div to 10 V/div.

**Maximum Input Voltage** – 300 V CAT II ±400 V peak. Derate at 20 dB/decade above 1 MHz.

## Characteristics

	TDS 640A	TDS 620B	TDS 644B	TDS 680B	TDS 684B
Total Channels	4	2 + 2	4	2 + 2	4
Sample Rate (all channels simultaneously)	2 GS/s	2.5 GS/s	2.5 GS/s	5 GS/s	5 GS/s
Real-time Bandwidth	500 MHz	500 MHz	500 MHz	1 GHz	1 GHz
Maximum Record Length per Channel	2,000 pts	15,000 pts	15,000 pts	15,000 pts	15,000 pts
Vertical Resolution	8-Bits; >11-Bits with averaging				
Time Measurement Accuracy	<110 ps @ 2 GS/s	<100 ps @ 2.5 GS/s	<100 ps @ 2.5 GS/s	<50 ps @ 5 GS/s	<50 ps @ 5 GS/s
Advanced Waveform DSP/Math	Std.	Std.	Std.	Std.	Std.
Standard Probes	4 P6139A	2 P6139A	4 P6243	None	None
Display Type	7 in. mono	7 in. mono	7 in. color	7 in. mono	7 in. color
Disk Drive	Std.	Std.	Std.	Std.	Std.
GPIB Port	Std.	Std.	Std.	Std.	Std.
RS-232 & Centronics	Std.	Std.	Std.	Std.	Std.
VGA I/O Port Printer Ports	Std. Mono	Std. Mono	Std. Color	Std. Mono	Std. Color

For your local Tektronix representative see the list in the back of this catalog or outside the U.S. call: 1-503-627-1933, inside the U.S. call: 1-800-426-2200.

TDS620B and TDS640A available through your local Tektronix Distributor listed in the back of this catalog.

See Tektronix on the World Wide Web: <http://www.tek.com>



**ISO 9001** Tektronix measurement products are manufactured in ISO registered facilities.

**GPIB IEEE-488** The TDS Series complies with IEEE Standard 488.2-1987, and with Tektronix Standard Codes and Formats.

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**DC Gain Accuracy** – 1.50%.

**Position Range** –  $\pm 5$  divs.

**Offset** – Primary channels:  $\pm 1$  V from 1 to 99.5 mV/div,  $\pm 10$  V from 100 mV to 995 mV/div,  $\pm 100$  V from 1 V to 10 V/div.  
Aux. 1, Aux. 2 (TDS 620B, TDS 680B only): same as primary channels.

**Bandwidth Selections** – 20 MHz, 250 MHz, and Full.

**Input Impedance Selections** – 1 M $\Omega$  in parallel with 10 pF, or 50  $\Omega$  (AC and DC coupling).

**Input Coupling** – AC, DC or GND.

**AC Coupled Low Frequency Limit** –  $<10$  Hz when AC, 1 M $\Omega$  coupled.  $<200$  kHz when AC, 50  $\Omega$  coupled.

**Channel Isolation** –  $>100:1$  at 100 MHz and  $>30:1$  at BW for any two channels having equal V/div settings.

## ACQUISITION MODES

Peak Detect (TDS 620B, TDS 644B: 1 ns; TDS 680B, TDS 684B:  $<1$  ns), Sample, Single Sequence, Envelope, Average.

## TRIGGERING SYSTEM

**Triggers** – Edge (main and delayed); Pulse (Width, Glitch, Runt, Slew Rate\*1, Time Out\*1); Logic (Pattern, State, and Setup & Hold Time Violation\*1); HDTV Video (optional).

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

**Delayed Trigger** – Delay by time, events, or events and time.

**Delay by Time Range** – 16 ns to 250 s. Except TDS 640A: 16 ns to 250 s for t/div setting  $<10$   $\mu$ s; 15.1 to 250 s for t/div setting  $>25$   $\mu$ s.

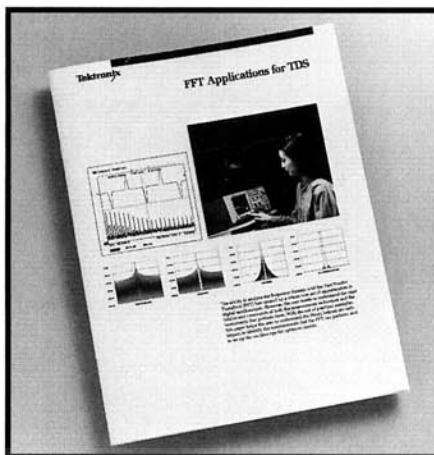
**Delay by Events Range** – 1 to 9,999,999 events.

**External Trigger Input** – Input Impedance:  $\geq 1.5$  K $\Omega$ ; Max. Input Voltage:  $\pm 20$  V (DC + peak AC).

## DISPLAY

**Color CRT Monitor (TDS 644B/684B)** – 7 in. diagonal NuColor™ liquid crystal full-color shutter, 256 levels.

**Monochrome CRT Monitor (TDS 620B/680B/640A)** – 7 in. diagonal, magnetic deflection. Horizontal raster-scan. P4 white phosphor.



*A wide selection of application notes and technical briefs have been written to help ease your understanding and use of specific instrument features. Contact your local sales office for details.*

## MEASUREMENT SYSTEM

**Automatic Measurements** – 25 (on entire record or gated region).

**Measurement Accuracy** – TDS 680B/684B:  $<50$  ps typical @ 5 GS/s single shot; TDS 620B/644B:  $<100$  ps typical @ 2.5 GS/s single shot. TDS 640A:  $<110$  ps @ 2 GS/s single shot.

**Cursors Measurement** – Absolute, Delta; volts, time, frequency, NTSC IRE units and line number with Video Trigger Option.

## WAVEFORM PROCESSING

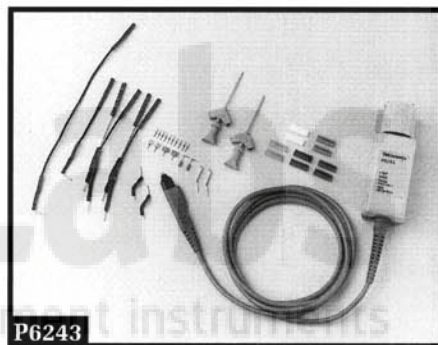
**Waveform Functions** – Interpolation (sin(x)/x or linear), Average, Envelope, Auto Setup.

**Advanced Waveform Functions** – FFT, Integration, Differentiation, Waveform (math or acquired) Limit Testing.

\*1 Not available in TDS 640A.



K420



P6243



## Accessories

### K420 INSTRUMENT CART

- Ergonomic design
- Durable steel and aluminum construction
- Large diameter smooth-rolling casters
- Heavy duty nylon instrument straps
- Simple height, angle and shelf adjustment

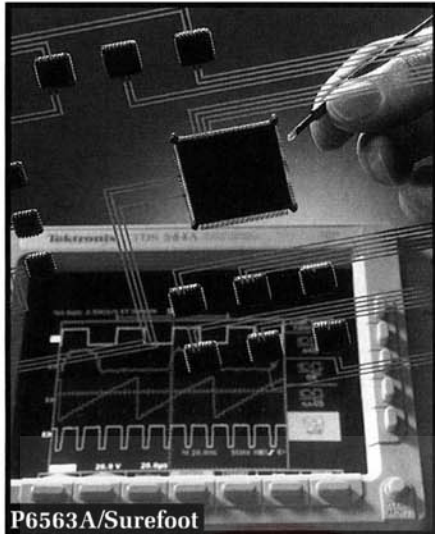
### P6243

- Standard on the TDS 644B
- Active FET Probes for SMDs
- FET Probe performance at a lower cost
- $<1$  pF/1 M $\Omega$  provides lower circuit loading than conventional passive probes
- Low mass probe head/cable
- Wide bandwidth (DC to 1 GHz)

*For complete selection information on all Accessory products, see page 517.*

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## P6563A

- Direct Access to SMD Packages
- SMD package support: 50 mil, 25 mil JEDEC, 0.65 mm, 0.5 mm EIAJ
- Low mass probe body and cable system
- DC to 500 MHz bandwidth, 5 pF/9.5 M $\Omega$  loading, 20X attenuation

## SUREFOOT®

- Easier Access to SMT Circuitry
- Handheld probing made easier
- No shorting
- No slipping off
- Direct tip connection

## P6245

- Active FET Probe for SMDs
- Low DUT loading ( $\leq 1$  pF/1 M $\Omega$ )
- Low mass probe head/cable
- 1.5 GHz bandwidth

For complete selection information on all Accessory products, see page 500.

## WaveStar™ SOFTWARE (WSTR0)

- Capture Measurement Waveforms and Data Easily, Without the Need for Programming
- Establish Instrument Links to Automatically Update New Measurements
- Insert Information Seamlessly in Microsoft Office Applications or Transfer to Mathcad®
- Communicate With TDS and THS Oscilloscopes Easily Through an Instrument Connection Wizard
- Generate Proxies (Drivers) to Communicate With Simple Instruments, Like Frequency Generators or Temperature Chambers
- Print Banner Function for Hardcopy of Long Record Lengths
- Control or Share Waveform Information Over the Network
- Step Away From Your Desk and Have WaveStar Automatically Capture Data Changes
- For Windows 95/NT Systems
- Use WSTRO Free For 30 Days

For complete information see page 100.

## ORDERING INFORMATION

For price information: Outside the U.S. contact your local Tektronix representative, inside the U.S. see the price list in the back of this catalog.

### TDS 684B

Four-channel Color 1 GHz, 5 GS/s Per Channel Digital Real-Time Oscilloscope.

### TDS 680B

Two-channel Monochrome 1 GHz, 5 GS/s Per Channel Digital Real-Time Oscilloscope.

### TDS 644B

Four-channel Color 500 MHz, 2.5 GS/s Per Channel Digital Real-Time Oscilloscope.

**Includes:** Four P6243 FET Probes.

### TDS 640A

Four-channel Monochrome 500 MHz, 2.0 GS/s Per Channel Digital Real-Time Oscilloscope.

**Includes:** Four P6139A Passive Probes.

### TDS 620B

Two-channel Monochrome 500 MHz, 2.5 GS/s Per Channel Digital Real-Time Oscilloscope.

**Includes:** Two P6139A Passive Probes.

**All Include (except where noted):** User Manual (070-9869-00); Quick Reference Guide (070-9382-00); Programmer's Manual in MS-Help format on floppy disk (063-2773-00); Technical Reference Manual (070-9874-02); Front Cover (200-3696-00); North American Power Cord (161-0230-01); Accessory Pouch (TDS 644B/TDS 684B Only: 016-1268-00).

### OPTIONS AVAILABLE (EXCEPT WHERE NOTED)

**Opt. 05** – Video Trigger, NTSC, PAL, HDTV, FlexFormat™.

**Opt. 1K** – Model K420 Instrument Cart.

**Opt. 1R** – Rackmount Kit.

**Opt. 2D** – (TDS 620B only) Delete Standard two P6139A Probes.

**Opt. 24** – Add four P6139A 10X Passive Probes.

**Opt. 26** – (TDS 684B only) Add four P6245 1.5 GHz, 1pF FET Probes.

**Opt. 27** – (TDS 680B only) Add two P6245 1.5 GHz, 1 pF FET Probes.

**Opt. 4D** – (TDS 644B only) Delete Standard four P6243 FET Probes.

**Opt. D1** – Calibration Data Report.

### INTERNATIONAL POWER PLUG OPTIONS

**Opt. A1** – Universal Euro 220 V, 50 Hz.

**Opt. A2** – UK 240 V, 50 Hz.

**Opt. A3** – Australian 240 V, 50 Hz.

**Opt. A4** – North American 240 V, 60 Hz.

**Opt. A5** – Switzerland 220 V, 50 Hz.

See General Customer Information Section for additional description.

### MEASUREMENT SERVICE OPTIONS

**Opt. C3** – Three years of Calibration Services.

**Opt. C5** – Five years of Calibration Services.

**Opt. D3** – Test Data (requires Opt. C3).

**Opt. D5** – Test Data (requires Opt. C5).

**Opt. R5** – Repair warranty extended to cover five years.

See page 643 for further information.

### SOFTWARE

**WSTR0** – WaveStar™ software for oscilloscopes. Windows 95/NT application for waveform capture, analysis, documentation and control from your PC.

**WSTR0U** – Upgrade from WSTR31 to WSTR0.

**WSTR31** – WaveStar software for Windows 3.1.

**WSTR31U** – Upgrade from DocuWave® software to WSTR31.

**LVWIN95** – LabVIEW® for Windows 95.

**LWCVI95** – LabWindows/CVI for Windows 95.

### PRODUCT UPGRADES

**Disk Drive** – 3.5 in., 1.44 MB DOS Format. For TDS 620/620A/620B, TDS 640/640A, TDS 680B. Order TDSXF1F.

### RECOMMENDED ACCESSORIES

See page 500.

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