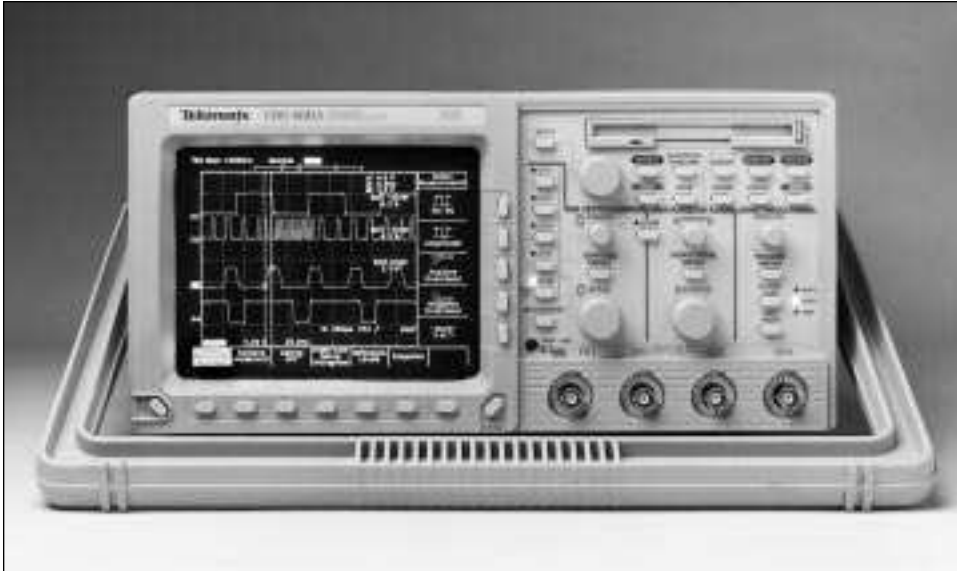




TDS 430A/TDS 460A/TDS 420A Personal Lab Oscilloscopes



The TDS 460A 400 MHz, four channel, Personal Lab Scope.

TDS 400A Personal Lab Oscilloscopes

For professionals who demand high precision and fidelity from their measurements, the TDS 400A Personal Lab Scopes combine excellent performance and broad feature set, all at affordable prices. A choice of 2 and 4 channel models ranging from 200 MHz to 400 MHz with a 100MS/s sample rate on all channels makes the TDS 400A Series a worthy fit for a variety of demanding applications.

The highly featured, portable, and easy to use TDS420A, 430A and 460A personal lab scopes are ideal for simple to complex applications, including electro-mechanical research and analysis, power

electronics/power supply design, bio-physical research and analysis, digital and analog design. With its standard video trigger capability, the scopes are ideal instruments for measuring video signals including NTSC, PAL and SECAM.

The TDS 400A Series uses the renowned TDS Graphical User Interface which offers intuitive icon-based menus along with help text, making scope operation extremely simple. Knobs and buttons allow easy selection of commonly used scope functions. The standard floppy disk drive makes the saving of screen images or data to a disk simple. The disk can then be inserted into your PC for importing to desktop publishing or spreadsheet programs.

TDS 430A/TDS 420A/TDS 460A

Be Confident You're Seeing Actual Signals with up to 400 MHz Bandwidth and $\pm 1.5\%$ Accuracy

Capture Transient Events to the Full Scope Bandwidth with its 100 MS/s Sample Rate

2 and 4 Channels

Record Lengths to 120K (option XL), 30K Standard

Floppy Disk Storage

Speed up your Circuit Analysis with 25 built-in Automatic Measurements and optional extended Waveform Math/FFT

Roll Mode Allows You to See Acquired Data Points Without Waiting for the Acquisition of the Complete Waveform

Use the Video Trigger Mode to See NTSC, PAL, SECAM Signals or your Own Custom Video Signals

Capture those glitches with the 10 ns Peak Detect Mode

Differential Measurements

ADA400A Analog Differential Amplifier (10 $\mu\text{V}/\text{div}$ Sensitivity)

P5200/P5205/P5210 High Voltage Differential Probes (up to 5600 V) for Floating Measurements

Applications

Biophysical/Biomedical Research

Electrophysical and Electromechanical System Design

Audio System Measurement and Analysis

Manufacturing Test and Quality Control

Power Supply and Power-related Design

Product Service and Maintenance

Characteristics SIGNAL ACQUISITION SYSTEM

Bandwidth – 200 MHz (TDS 420A),

400 MHz (TDS 430A, TDS 460A).

Channels – 4 (2 on TDS 430A).

Sample Rate – 100 MS/s on all channels.

Sensitivity – 1 mV to 10 V/div
(with calibrated fine adjust).

Position Range – ± 5 Divisions.

Offset Range – ± 1 V from 1 to 99.5 ;
 ± 10 V from 100 mV to 995 ; ± 100 V from
1 to 10 V/div.

DC Gain Accuracy – $\pm 1.5\%$.

Vertical Resolution – 8-Bits (256 levels
over 10.24 vertical divisions).

Analog Bandwidth Selections – 20 MHz,
100 MHz, and full.

Input Coupling – AC, DC or GND.

Input Impedance Selections – 1 M Ω in
parallel with 15 pF, or 50 Ω (AC and DC
coupling).

Maximum Input Voltage – 300 V CAT II
 ± 400 Vpeak. Derate at 20 dB/decade above
1 MHz. 1 M Ω or GND coupled.

Channel Isolation – $>100:1$ at 100 MHz for
any two channels.

AC Coupled Low Frequency Limit – ≤ 10 Hz
when AC 1 M Ω coupled. ≤ 200 kHz when AC
50 Ω coupled.

ACQUISITION MODES

Peak Detect – High frequency and random
glitch capture. Captures glitches of 10 ns
using acquisition hardware at all real-time
sampling rates.

Sample – Sample data only.

Envelope – Max/min values acquired over
one or more acquisitions, selectable from
2 to 2000, infinite.

Average – Waveform averages selectable
from 2 to 10,000.

Hi-Res – Vertical resolution improvement
and noise reduction on low-frequency sig-
nals, e.g. 12-Bits at 10 ms/div and slower.
Enhanced vertical resolution (>12 -Bits) for
noise reduction, on low frequency signals.
Make precise low-level signal measure-
ments (up to 5 μ V) with differential amplifier
(ADA400A).

TIME BASE SYSTEM

Time Bases – Main, Delayed.

Time/Division Range – 1 ns to 20 s/div.

Time Base Accuracy – 0.015% over any
interval ≥ 1 ms.

**Record Length (real time and equivalent
time)** – Sample points per channel: 500 to
30,000. Opt. XL offers 120,000 points.

Pre-Trigger Position – Selectable from
0 to 100% of record.

TRIGGERING SYSTEM

Triggers – Main, Delayed.

Main Trigger Modes – Auto, Normal, Single
Sequence.

Delayed Trigger – Delayed by time or
events.

Time Delay Range – 0 ns to 20 s.

Events Delay Range – 2 to 10,000,000
events.

External Rear Input – >1.5 K Ω ; Max input
voltage is ± 6 V (DC + AC peak).

Video Trigger Types – NTSC, PAL, SECAM,
and Custom; TV Field, field 2 or both,
Any line within a field.

Line Rates – 10 kHz to 64 kHz, interlaced,
non-interlaced, composite.

Video Trigger Sensitivity –
0.6 divisions of composite SYNC will
achieve a stable display.

DISPLAY

Waveform Style – Dots or vectors.
Infinite and variable persistence from
250 ms to 10 s.

Gray Scaling – With variable persistence
selected, waveform points gradually
decay through 16 levels of intensity,
providing “z-axis” information about rapidly
changing waveforms.

Update Rate – 200 ea. 500 point wave-
forms per sec with infinite persistence
mode selected.

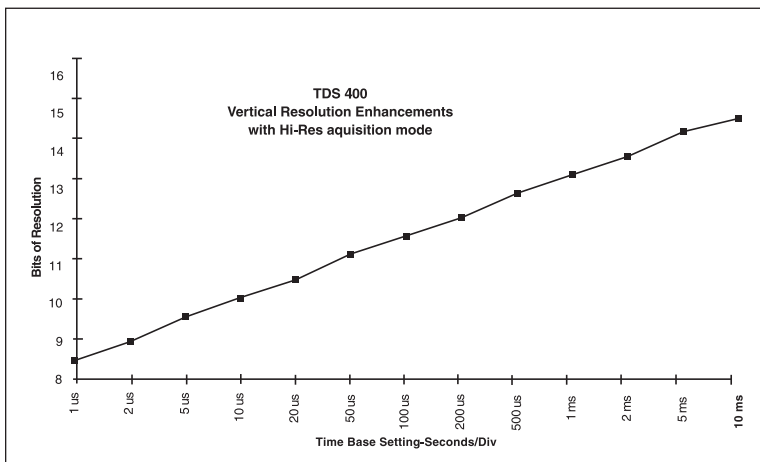
Graticules – Full, grid, cross hair, frame.

Format – YT and XY.

VGA Out – Drives VGA display monitors.

ZOOM

The zoom feature allows waveforms to be
expanded, compressed and positioned in
both vertical and horizontal axes. Allows
precise comparison and study of fine wave-
form detail without affecting ongoing acqui-
sitions. When used with Hi-Res or Average
acquisition modes, Zoom provides an effec-
tive vertical dynamic range of 1000 divi-
sions or 100 screens.



Theoretically achievable resolution with TDS 400A Hi-Res Mode.

**Characteristics
(Cont.)**

MEASUREMENT SYSTEM

Automatic waveform measurements –

Period	Frequency
High	Low
+ Width	- Width
Maximum	Minimum
Rise	Fall
Peak to Peak	Amplitude
+ Duty cycle	- Duty cycle
+ Overshoot	- Overshoot
Propagation delay	Burst Width
Mean	Cycle Mean
RMS	Cycle RMS
Area	Cycle Area
Phase	-

Continuous update of up to four measurements on any combination of waveforms.

Thresholds – Settable in percentage or voltage.

Gated – Any region of the record may be isolated for measurement using vertical bars.

Snapshot – Performs all measurements on any one waveform showing results from one instant in time.

Cursor Measurements – Absolute, Delta, Volts, Time, Frequency.

Cursor Types – Horizontal bars (volts); Vertical bars (time); paired; operated independently or in tracking mode.

WAVEFORM PROCESSING

Waveform Functions – Interpolate-selectable sin(x)/x or linear, Average, Envelope.

Advanced Waveform Functions – FFT, Integration, Differentiation (optional).

Arithmetic Operators – Add, Subtract, Multiply, Invert.

Autosetup – Single button, automatic setup on selected input signal for vertical, horizontal and trigger systems.

Waveform Limit Testing – Compares incoming waveform to a reference waveform's upper and lower limits.

COMPUTER INTERFACE

GPIB (IEEE 488.2) Programmability – Full talk/listen modes. Control of all modes, settings, and measurements.

HARDCOPY/DESKTOP PUBLISHING

Printer – HP ThinkJet, Epson, PostScript, Interleaf, DeskJet, LaserJet, TIFF, PCX, BMP (Microsoft Windows).

Plotter – HPGL.

Interface – GPIB standard.

Optional Hardcopy Interface – Centronics Type and RS-232 (option XL).

Available Printer Pack – 4 in. thermal printer and storage pouch (TDS4F5P).

STORAGE

Waveforms – 30,000 waveform points of non-volatile storage, 120,000 points optional (Option XL).

Floppy Drive – 3.5 in. 1.44 MB or 720 KB DOS compatible (store waveforms, screen data, and setups)*¹

Setups – 10 front-panel setups.

CRT

Type – 7 in. diagonal, magnetic deflection. Horizontal raster-scan. P31 green phosphor.

Resolution – 640 horizontal by 480 vertical displayed pixels.

**General
Characteristics**

POWER REQUIREMENTS

Line Voltage Range – 90 to 250 V RMS.

Line Frequency – 48 to 63 Hz.

Power Consumption – 240 W max.

ENVIRONMENTAL SAFETY

Temperature – Operating: 0°C to +50°C. Nonoperating: -40°C to +75°C.

Humidity – Operating and nonoperating: Up to 95% relative humidity at or below +40°C; to 75% relative humidity from +41°C to +50°C.

Altitude – Operating: 15,000 ft., nonoperating: 40,000 ft.

Electromagnetic Compatibility – Meets MIL-STD-461C, CE-03, Part 4, Curve # 1, RE-02, Part 7; meets VDE 0871, Category B, FCC rules and regulations, Part 15, Subpart J, Class A.

Safety – Listed UL 3111-1, certified to CAN/CSA – C22.2 No. 1010.1.

PHYSICAL CHARACTERISTICS

Dimensions	mm	in.
	Height	164
w/acc. pouch	177	7.5
Width	362	14.25
Depth w/front cover installed	491	19.25
Depth w/handle extended	576	22.2
Weight	kg	lbs.
Net approximately	9.1	22.5
Shipping approximately	12.5	32

*¹ Waveforms can be stored to file in MathCAD and Spreadsheet (Excel, Lotus 1-2-3) formats for analysis.

Ordering Information

TDS 430A

Two-Channel, 400 MHz Digitizing Oscilloscope.

TDS 420A

Four-Channel, 200 MHz Digitizing Oscilloscope.

TDS 460A

Four-Channel, 400 MHz Digitizing Oscilloscope.

All include: 1 Probe Per Channel (P6138A 10X Passive Probes); Video Trigger; Reference Manual (070-8035-03); User Manual (070-8034-03); Performance Verification Document (070-8721-02); U.S. Power Cord (161-0230-01).

Instrument Options

Opt. XL – 120,000 Point Record Length; RS-232 and Centronics Hardcopy Interfaces; Extended Waveform Math: FFT; Integration, Differentiation; Front Cover and Accessories Pouch.

Opt. 1R – Rack Mount.

Opt. D1 – NIST, MIL-STD-45662A and ISO 9000 Calibration Data Report.

Opt. J2 – 2 year Post Warranty Repair.

Opt. J5 – 5 year Calibration Services. 5 years total.

Probes

Differential Probe – 400 MHz, 30 dB CMRR. Order P6246.

High Voltage Probes – 2.5 kV, 25 MHz, 2.75 pF/10M, 100X. Order P5100.
20 kV, 75 MHz, 3pF/100M, 1000X, 3.1 m. Order P6015A.

High Voltage Differential Probes – Up to 1300 V, 25 MHz. Order P5200.
Up to 1300 V, 100 MHz. Order P5205.
Up to 5600 V, 50 MHz. Order P5210

Passive Probe 1x – Order P6101B.

Passive Probe – 10X. Order P6138A.

FET Probe – Order P6205.

SMT Probe – Order P6562A.

TTL Logic Probe – Order P6408.

Optical Converters – 500nm to 950nm. Order P6701B.
1100 nm to 1700nm. Order P6703B.

DC/AC Current Probe System – Order AM 503S, or TCP202 DC Coupled Current Probe.

Recommended Accessories –

Analog Differential Amplifier – 10 μ V sensitivity. Order ADA400A.

Current Measurement Capability – Order AM 503S, and appropriate probe.

Scope Cart – Order K212.

Rackmount Kit – Order 016-1166-00.

Soft-sided Carrying Case – Order 016-1158-01.

Transit Case – Order 016-1157-00.

Optional Printer Pack – 4 in. thermal printer and storage pouch. Order TDS4F5P.

Programmer's Manual – Order 070-9876-00.

Service Manual – Order 070-9703-04.

Video Clamp – Order 013-0278-00.

Software Support

LabWindows® – Order S3FG910.

WSTR31 – WaveStar™ waveform capture and documentation software.

Cables

GPIB – 1 meter. Order 012-0991-01.
2 meters. Order 012-0991-00.

International power 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.

International power options required on instruments and selected accessories for operation outside U.S. For operation outside U.S., specify A1-A5 power options. See General Customer Information Section for 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.

For further information, contact Tektronix:

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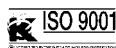
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From other areas, contact: Tektronix, Inc. Export Sales, P.O. Box 500, M/S 50-255, Beaverton, Oregon 97077-0001, USA 1 (503) 627-6877.



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