

Personal Lab Oscilloscopes

New TDS 430A • TDS 460A • TDS 420A

★ Features

TDS 430A/TDS 420A/TDS 460A

- 200 and 400 MHz Bandwidths
- 100 MS/s Sampling Rate on All Channels
- 30 K Records Standard, 120 K Optional
- 3.5 inch DOS Format Floppy Drive
- 1.5% Accuracy 1 – 10 V/div
- Proprietary Hi-Res Mode for up to 12-Bits of Single Shot Vertical Resolution
- Extended Waveform Math/FFT Optional
- 10 ns Peak Detect Mode for Glitch Capture
- 25 Automatic Measurements
- Pass/Fail (Template) Waveform Testing
- Roll and Triggered Roll Modes
- RS-232 and Centronics Type Interfaces Optional
- Tek Secure®

DIFFERENTIAL MEASUREMENTS

- ADA400A Analog Differential Amplifier (10 μ V/div sensitivity)
- P5200/P5205/P5210 High Voltage Differential Probes (up to 5600 V) for Floating Measurements

(Please see pages 498 and 500 for details on ADA400A, P5200, P5205 and P5210)

Ⓐ 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

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.



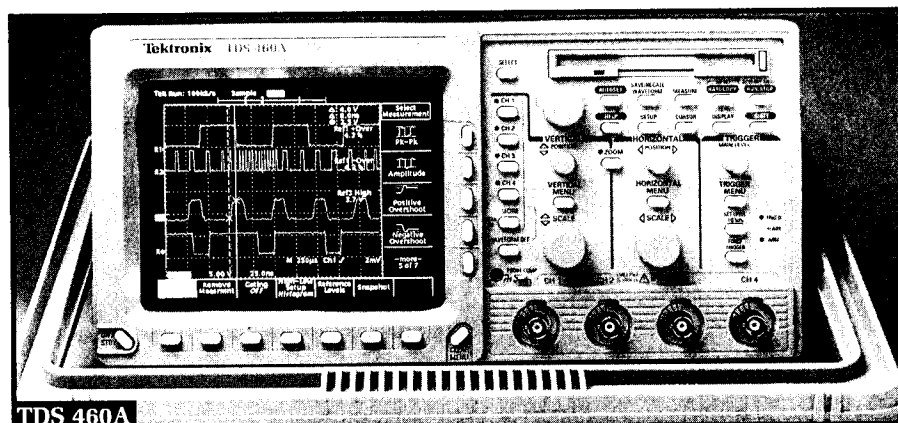
Product(s) complies with IEEE Standard 488.1-1987, and with Tektronix Standard Codes and Formats.



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



Tektronix Measurement products are manufactured in ISO registered facilities.



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 a broad feature set, all at affordable prices. A choice of 2 and 4 channel models ranging from 200 MHz to 400 MHz with 100 MS/s on all channels makes the TDS 400A Series a worthy fit for a variety of demanding applications.

Characteristics

SIGNAL ACQUISITION SYSTEM

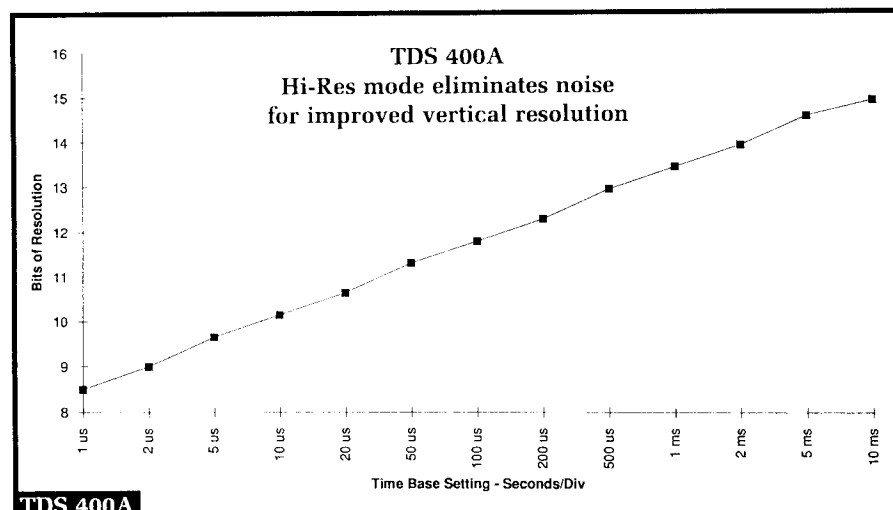
Bandwidth – 200 MHz (TDS 420A), 400 MHz (TDS 430A, TDS 460A).

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.



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

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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 signals,
e.g. 12-Bits at 10 ms/div and slower. Enhanced
vertical resolution (>12 -Bits) for noise reduc-
tion, on low frequency signals. Make precise
low-level signal measurements (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 waveforms
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 waveform detail
without affecting ongoing acquisitions. When
used with Hi-Res or Average acquisition modes,
Zoom provides an effective vertical dynamic
range of 1000 divisions or 100 screens.

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 measure-
ments on any combination of waveforms.

Thresholds – Settable in percentage or voltage.

Gated – Any region of the record may be iso-
lated 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

GPIO (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.

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

STORAGE

Waveforms – 30,000 waveform points of
non-volatile storage, 120,000 points optional.

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.

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

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POWER REQUIREMENTS

Line Voltage Range – 90 to 250 V RMS.

Line Frequency – 48 to 63 Hz.

Power Consumption – 240 W max.

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

ENVIRONMENTAL AND 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	6.4
w/acc. pouch	177	7.5
Width	362	14.25
Depth		
w/front cover installed	491	19.25
w/handle extended	576	22.2
Weight	kg	lbs.
Net ≈	9.1	22.5
Shipping ≈	12.5	32

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

Opt. J2 – 2 year Post Warranty Repair.

Opt. J5 – 5 year Calibration Services.

PROBES

See page 306.

Differential Probes –

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 Probe –

Up to 1300 V, 25 MHz. Order P5200.
Up to 1300 V, 100 MHz. Order P5205.

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.

RECOMMENDED ACCESSORIES –

Also see page 306.

Analog Differential Amplifier –

10 μ V sensitivity. Order ADA400A.

Current Measurement Capability –

Order TDS 400A and AM 503S.

Scope Cart – Order K212.

Rackmount Kit – Order 016-1166-00.

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

Transit Case – Order 016-1157-00.

Printer – Order HC411 Thermal Printer.

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

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

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.

Service Manual.

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.

See page 449 for further information.

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