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NEW

2232/2221A *100 MHz, 100 MS/s DIGITAL STORAGE PLUS ANALOG OSCILLOSCOPES*

Waveform Confidence and Versatility Unmatched at the Price.

- *100 MHz Analog and Digital Storage Bandwidth*
- *100 MS/s Per Channel Sampling Rate*
- *10 ns Glitch Capture, Any Sweep Speed*
- *Selectable 1 K or 4 K Record Length*
- *8-bit Vertical Resolution*
- *Time and Voltage Waveform Cursors*
- *Trigger-Level Readout*
- *GPIB or RS-232-C Communications Options*

2232

- *Dual Time Base*
- *26 K Added Battery-Backed Waveform Storage*

GPIB IEEE-488 *

**The 2232 and 2221A oscilloscopes comply with IEEE Standard 488.1-1987 with Option 10, RS-232-C with Option 12, and Tektronix Standard Codes and Formats.*

2232/*NEW* 2221A OSCILLOSCOPES

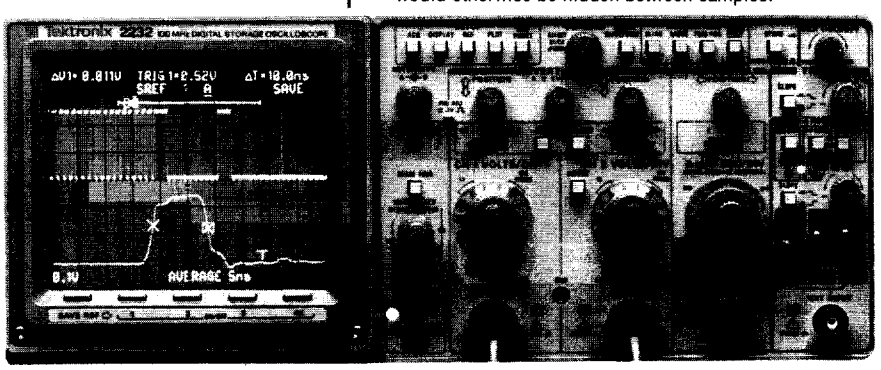
UNMATCHED VERSATILITY

The 2232 and 2221A deliver high-end performance at the lowest price in their class. These 100 MHz oscilloscopes have advanced capabilities not found in comparable scopes. For single-shot and low repetition-rate signals, they offer simultaneous 100 MS/s sampling on each channel, 10 ns glitch capture, 1 K and 4 K record length, and battery-backed memory. When your signal is best viewed in real-time, a single push of a button makes each operate as familiar analog oscilloscope. This dual performance capability assures you the right solution is always at your fingertips.

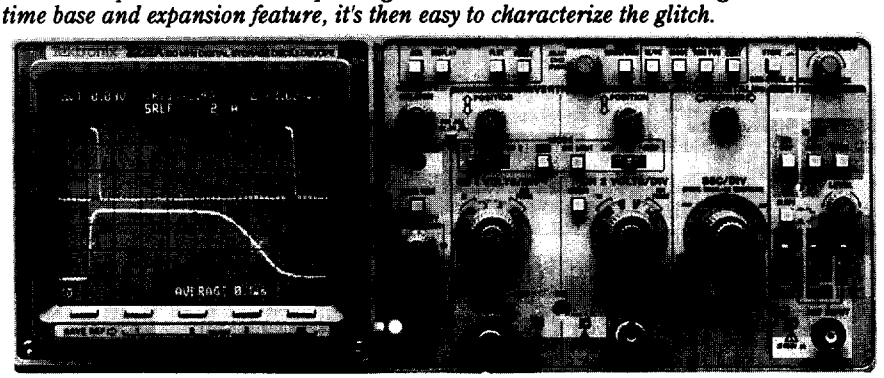
The 2221A is an improved version of our popular 2221, offering the same digitizing performance as the 2232 in a single time base oscilloscope. The fast sample rate and long 4 K record length provide plenty of signal capturing capability; its horizontal and vertical expansion of stopped waveforms facilitate the signal analysis.

HIGH-SPEED GLITCH CAPTURE

With innovative sampling technologies, these oscilloscopes are capable of catching random signal variations that are often missed with other digitizing oscilloscopes. In *Peak Detect* sampling mode, these scopes always sample at 100 MS/s, continuously observing your signal every 10 ns, regardless of sweep speed. This "glitch-finding" capability helps you quickly isolate problems such as power line spikes or false clock pulses that would otherwise be hidden between samples.



The 2232's peak detect mode captures glitches as narrow as 10 ns. Using the second time base and expansion feature, it's then easy to characterize the glitch.



The 2221A offers the same powerful digitizing capabilities in a single time base scope, making it an attractive lower cost alternative for many troubleshooting needs.

EXCELLENT WAVEFORM RESOLUTION

Both oscilloscopes acquire 1 K or 4 K records with 8-bit vertical resolution. They can display between 100 and 4096 points on-screen for precise analysis. Events as slow as 20 seconds (and slower with external clocking) or as fast as several nanoseconds can be captured and analyzed with confidence.

The 2232 adds a powerful dual time base system, allowing you to zoom in on any portion of your waveform and acquire a full record of information. A period of delay from the initial (A) trigger is set scrolling a "B-delay" intensified window to the point of interest. The 2232 can then immediately start acquiring samples at the new sweep speed, or await a trigger event to lock onto the point of interest.

WAVEFORM STORAGE AND ANALYSIS

Digital storage provides the opportunity to freeze events on-screen for analysis. But unlike many digital oscilloscopes, the 2232 and 2221A allow you to expand, compress, reposition, and measure a waveform after it has been captured. These capabilities apply to any stored waveform with the 2232, including non-volatile reference memories. The 2232 also adds an additional 26 K of extended memory for waveform storage on-board. Thus, a reference library of up to 26 known-good waveform sets can be recalled at any time for performance verification. Or unknown signals can be captured and recalled later for analysis.

TIME-SAVING FEATURES

Bezel buttons, measurement cursors and on-screen readouts reduce analysis time and measurement error. Conveniently located bezel buttons let you easily select advanced menu functions. These functions include adjusting average weighting and sweep limits, point-selectable trigger position, and display modes.

Measurement cursors further simplify scope operation by calculating and displaying delta time and voltage. The cursors are tied to a selected waveform and can be positioned anywhere in a record (including off-screen over greater than 10 divisions) for detailed timing analysis. Scale factors automatically track the selected waveform.

INTERFACING ALTERNATIVES

The 2232 and 2221A offer a choice of interfaces: GPIB and RS-232-C. Both allow you to transmit and receive waveform data, query front-panel settings, control menu functions, and reset single-sweep trigger. In addition, you can connect the oscilloscope directly to a compatible printer or plotter for hardcopy output at the push of a button.

Tektronix makes interfacing with your personal computer easy. For example, Tek's "WaveSaver" package makes easy work of waveform transfer, documentation, and data archiving on your pc. For remote data transfer over commercial telephone lines, "TeleServicing" software adds modem control capabilities for a turn-key field service and remote-monitoring solution. See the T&M Software section of this catalog for more information on these and other software solutions.

To order, call your local Tektronix Sales Office, or call Tek's National Marketing Center. Toll free: 1-800-426-2200, Ext. 99.

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100 MHz, 100 MS/s DIGITAL STORAGE PLUS ANALOG OSCILLOSCOPES

2232/2221A NEW

CHARACTERISTICS

Characteristics are common to the 2232 and 2221A except where noted.

DIGITAL STORAGE SYSTEM

Sample Rate – 100 MS/s per channel. Effective sample rates up to 2 GS/s in repetitive storage mode (0.5 µs/div and faster in single-channel mode, 0.2 µs/div and faster dual-channel).

Resolution – Vertical: 8 bits (25 levels per div.), up to 12 bits in average mode. Horizontal: 10 bits (100 points per div.), 9 bits per channel in dual channel mode.

Record Length – 4 K or 1 K selectable. 2 K or 512 per channel in dual channel mode.

Pre/Post Trigger – 1/8, 1/2, or 7/8 trigger position selectable, selectable to any point in record via menu.

Acquisition Modes – Peak Detect (10 ns glitch capture at all available sweep speeds); Accumulated Peak Detect; Average (weight-selectable from 1/1 to 1/256); and Sample.

Save Reference Memory – One 4 K or three 1 K acquisitions battery-backed. 2232: adds 26 K of extended memory (store up to 26 waveform sets). Battery-backed memory stores waveforms for up to 3 years.

VERTICAL SYSTEM (2 Identical Channels)

Bandwidth (–3 dB) and Rise Time – 100 MHz and 3.5 ns (0°C to +35°C); 80 MHz and 4.4 ns (2 mV/div or +35°C to +50°C).

Deflection Factor and Accuracy – 2 mV/div to 5 V/div ±2% (+15°C to +35°C); ±3% (0°C to +50°C).

Vertical Operating Modes – CH 1, CH 2, CH 2 INVERT, ADD, ALT, CHOP (500 kHz), and XY.

CMRR – At least 10:1 at 50 MHz.

Input R and C – 1 MΩ, 20 pF.

Max Input Voltage – 400 V (dc + peak ac), 800 V p-p.

Channel Isolation – 100:1 at 50 MHz.

HORIZONTAL SYSTEM

Sweep Speeds – A sweep: 0.5 s/div to 0.05 µs/div, extended to 5 ns/div with X10 magnification. Store mode: 5 s/div to 0.05 µs/div (5 ns/div with X10 MAG).
2232: B sweep: 50 ms/div to 0.05 µs/div.

Accuracy – Nonstore Mode: X1: ±2%; X10: ±3% (+15°C to +35°C). X1: ±3%; X10: ±4% (0°C to +50°C). Store Mode: ±0.1% over full 10.24 divisions.

Horizontal Operating Modes – 2232: Nonstore Mode: A, ALT (A intensified by B and B), B. Store Mode: A, A intensified by B, B, 4 K COMPRESS. 2221A: A; 4 K COMPRESS in store mode.

Delay Jitter – 5000:1 (2232).

Delay Time Accuracy – ±1% (+15°C to +35°C).

TRIGGER SYSTEM

Trigger Sensitivity (A and B) – Internal: 0.35 div at 10 MHz, 1.5 div at 100 MHz. External: 40 mV at 10 MHz, 150 mV at 100 MHz (A trigger only).

Trigger Operating Modes – A-Mode: Peak-Peak AUTO (also for TV LINE), NORM, TV FIELD, SGL SWP. 2232 B-Mode: Runs-After-Delay, Triggered-After-Delay.

Trigger Source – A Trigger: VERT MODE, CH 1, CH 2, LINE, EXT. 2232 B Trigger: VERT MODE, CH 1, CH 2.

Trigger Coupling – With Internal Source: ac with P-P AUTO, TV LINE, or TV FIELD mode; dc with NORM or SGL SWP mode. With External Source: ac, dc, or DC/10. With Either Source: HF REJECT (attenuates above 40 kHz), LF REJECT (attenuates below 40 kHz).

Variable Holdoff – At least 10:1.

X-Y OPERATION

Deflection Factors – Same as vertical system.

Bandwidth – X-Axis: Nonstore mode 2.5 MHz; Store mode same as vertical system. Y-Axis: same as vertical system.

Phase Difference – ±3° from dc to 150 kHz.

ADVANCED FUNCTIONS

Cursor Function and Accuracy – ΔVolts: ±3% of reading. ΔTime: ±1 display interval (5 s/div to 1 µs/div); ±2 display intervals + 500 ps (0.5 µs/div to 0.05 µs/div).

X-Y Plotter Output – Plots all displayed waveforms, crt readout, and graticule (selectable).

External Clock Input – Dc to 1 kHz (roll mode), dc to 100 kHz (record mode).

CRT SYSTEM

Display – 8 cm x 10 cm, 14 kV nominal voltage.

Controls – A INTENSITY, B INTENSITY, TRACE ROTATION, BEAM FIND, FOCUS, STORAGE/READOUT INTENSITY, GRATICULE ILLUMINATION.

Z-Axis – 5 V causes modulation. Usable to 20 MHz.

POWER REQUIREMENTS

Line Voltage Range – 90 VAC to 250 VAC.

Line Frequency – 48 Hz to 440 Hz.

Max. Power Consumption – 85 W (150 VA).

ENVIRONMENTAL CHARACTERISTICS

See page 108.

OTHER CHARACTERISTICS

Safety – UL 1244 listed, CSA certification.

Warranty – 3 years.

INSTRUMENT OPTIONS

ANSI/IEEE-488.1 GPIB Interface (Option 10) – Function Subsets Implemented: SH1, AH1, T5, L3, SR1, RL2, PP0, DC1, DT0, C0, E2. Plotter Devices: HPGL (single-color), Epson FX-Series, HP ThinkJet. Data Transfer Rate: approximately 1 kilobyte/s.

EIA Std RS-232-C Interface (Option 12) – Baud Rate: 50 to 2400 for interactive use, up to 4800 for driving plotters. Plotter Devices: HPGL (single-color), Epson FX-Series, HP ThinkJet. Connectors: DCE (female), DTE (male).

QuickStart Training Package (Option 2F) – Includes QuickStart training manual and multiple signal source board with battery.

Rackmount Kit (Option 3R) – Provides rackmount kit for 5.25" rack height.

ORDERING INFORMATION

2232 100 MHz Dual Time Base, Digital + Analog Oscilloscope ☎ **$4,995**
Includes:
Two 10X Voltage Probes (P6109)
Opt. 01, Operator's Manual (070-7066-00), User's Ref. Guide (070-7068-00),
Front Panel Cover (200-2520-00),
Accessory Pouch (016-0677-02),
3 Year Warranty, Power Cord.

2221A 100 MHz Single Time Base Digital + Analog Oscilloscope ☎ **$3,995**
Includes: same as above except:
Operator's Manual (070-8156-00),
User's Ref. Guide (070-8158-00)

INSTRUMENT OPTIONS

Opt. 10 – GPIB Interface	**+$300**
Opt. 12 – RS-232-C Interface (with pc/plotter cable)	**+$300**
Opt. 2F – QuickStart Package[1]	**+$199**
Opt. 3R – Rackmount Kit	**+$250**

ACCESSORY OPTIONS

Opt. 1C – C-9 Camera	**+$580**
Opt. 1K – K212 Instrument Cart	**+$385**
Opt. 1P – HC100 Plotter w/GPIB cable (requires Opt. 10)	**+$1050**
Opt. 3P – HC100 Plotter w/RS-232-C Cable (req. Opt.12)	**+$950**
Opt. 1T – Transit Carrying Case	**+$345**
Opt. 17 – P6408 Logic Probe	**+$375**
Opt. 33 – Travel Line Package	**+$295**

INTERNATIONAL POWER PLUG OPTIONS

Opt. A1- A5 – Available **NC**
See page 108 for descriptions.

WARRANTY-PLUS SERVICE PLANS

2232:	
Opt. M2 – +2 yrs service	**+$335**
Opt. M8 – +4 calibrations	**+$530**
2221A:	
Opt. M2 – +2 yrs service	**+$318**
Opt. M8 – +4 calibrations	**+$495**

RECOMMENDED ACCESSORIES/ FIELD KITS

Service Manual –	
2232: (070-7067-00)	**$85**
2221A: (070-8157-00)	**$35**
2232F10 – GPIB Field Upgrade Kit	**$300**
2232F12 – RS-232-C Upgrade Kit	**$300**
Rackmount Kit – (016-0833-01)	**$250**
QuickStart Training Package – (020-1812-04)	**$199**

(See page 108 for more accessories.)

PHYSICAL CHARACTERISTICS

Dimensions	mm	in.
Width	360	14.
Height	137	5.4
Depth	440	17.3
Weight	**kg**	**lbs.**
Net	8.2	18.0

[1]*See page 274 in Education section for information on Quick Start Packages.*

☎ Product available within 24 hours through Tek Direct. Call 1-800-426-2200.

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