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


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 modes, 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.

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 "WaveSave" 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 turn-key field service and remote-monitoring solutions. See the T&M Software section of this catalog for more information on these and other software solutions.

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

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 1/2 to 1256), 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 +50°C).

Deflection Factor – ±2 mV/div to 5 V/div ±1% (+15°C to +35°C), ±2% (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).

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.


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 – ±3% of reading. ATime: ±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 FOCUS, TRACE POSITION, 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.


ENVIRONMENTAL CHARACTERISTICS
See page 108.

OTHER CHARACTERISTICS
Safety – UL 1244 listed, CSA certification. Warranty – 3 years.

INSTRUMENT OPTIONS
AMS/IEEE-488.1 GPIB Interface (Option 10) – Function Subsets Implemented: SH1, AH1, T5, L3, SR1, RL2, PPO, DC1, D10, C0, E2. Plotter Devices: HPGL (single-color), Epson FX-Series, HP ThinkJet. Data Transfer Rate: approximately 1 kilobytes/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
070-7066-00
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 (070-8156-00)
INSTRUMENT OPTIONS
Opt. 10 – GPIB Interface $300
Opt. 12 – RS-232-C Interface (with coplottor cable) $300
Opt. 2F – QuickStart Package’ $199
Opt. 3R – Rackmount Kit $250
ACCESSORY OPTIONS
Opt. 1C – C-9 Camera $580
Opt. 1K – K212 Instrument Cart $385
Opt. 1P – HC100 Plotter $1850
w/GPIB cable (requires Opt. 10) $300
Opt. 3P – HC100 Plotter $850
w/RS-232-C Cable (req. Opt. 12) $35
Opt. 1T – Transit Carrying Case $345
Opt. 17 – PE408 Logic Probe $375
Opt. 33 – Travel Line Package $295

INTERNATIONAL POWER PLUG OPTIONS
Opt. A1–A5 – Available NC
See page 106 for descriptions.

WARRANTY PLUS SERVICE PLANS
2232:
Opt. M2 – 1 yr service +$335
Opt. M8 – 4 yr calibration +$330
2221A:
Opt. M2 – 1 yr service +$318
Opt. M8 – 4 yr calibration +$485

RECOMMENDED ACCESSORIES/ FIELD KITS
Service Manual – 2232: (070-7067-00) $85
221A (070-8157-00) $33
2221FB – GPIB Field Upgrade Kit $300
2222FS2 – RS-232-C Field Upgrade Kit $300
Rackmount Kit – (016-0853-01) $250
QuickStart Training Package – (020-1612-04) $109
(See page 106 for more accessories.)

PHYSICAL CHARACTERISTICS
Dimensions mm in.
Width 360 14
Height 137 5.4
Depth 440 17.3
Weight lb kg
NAT 8.2 3.67
1See page 274 in Education section for information on Quick Start Packages.

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