



Advanced Test Equipment Rentals

www.atecorp.com 800-404-ATEC (2832)

TEK 100 MHz
DUAL TRACE OSCILLOSCOPES

2200
SERIES

2235

Dc to 100 MHz Bandwidth
Lightweight, Easy to Use
2 mV Sensitivity
5 ns/Div Sweep Rate
Advanced Trigger System
Trigger View
Delayed Sweep Measurements
Large, Bright CRT
10X Probes Included
Three Year Warranty—Five Year Option

TYPICAL APPLICATIONS

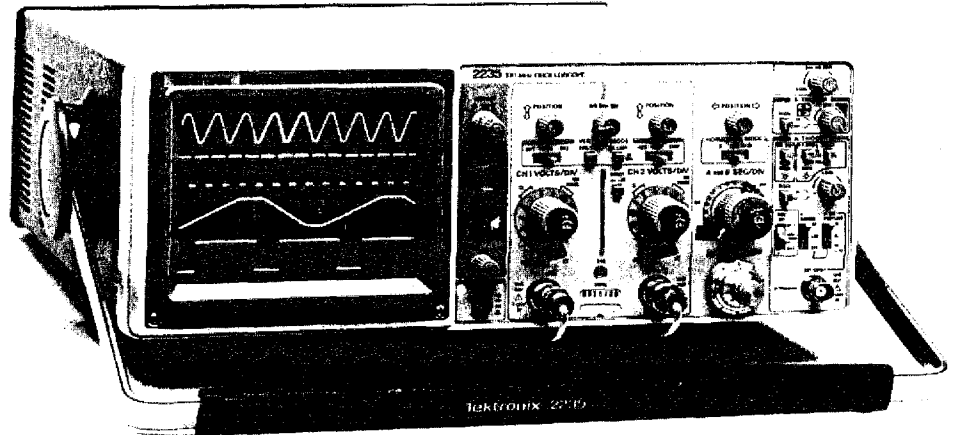
Field Service
Design
Component Testing

See page 277 for available Application Notes.

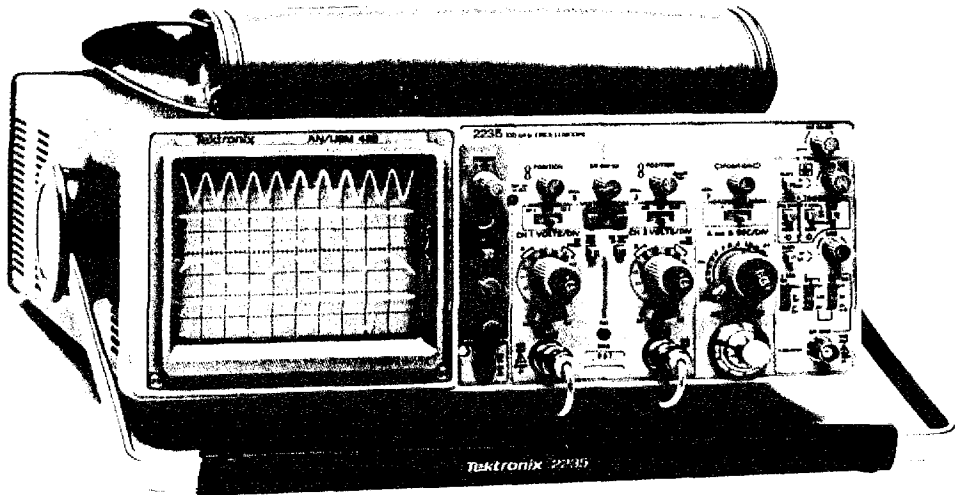
The 100 MHz 2235 offers high value and high performance. The low price is made possible by the 2200 Series innovative architecture. Yet it has the needed features, operational simplicity and—not least—solid reliability. All backed by a three year warranty on all parts and labor, including the CRT, excluding probes.

The 2235 ensures measurement quality and reliability while reducing instrument cost. Tek started with the innovative architecture of the 2200 Series: fewer boards, fewer mechanical parts, less cabling and electrical connectors. This approach, plus advanced circuit design and a focus on essential features, has led to a scope that's more accurate, more reliable, lighter and more serviceable—and simpler to use—than any other 100 MHz scope.

The 2235 delivers 2% vertical and horizontal accuracy in normal operation. Accuracy of 3% or better is maintained across a wide range of environmental extremes. Trace noise, chop noise, vertical aberrations and sweep interference have been reduced to a minimum. Delay jitter of 1:20,000 ensures excellent timing measurement resolution. Triggering is sensitive to 0.3 div at 10 MHz. There's a trigger view for simplifying set-ups; single sweep for photographing transients; bandwidth limit for noisy environments; and a bright, high resolution 14 kV dome mesh CRT.



Features like rugged design, lightweight and an easy-to-learn front panel make the 2235 an ideal service scope. In both service and design, it offers the sensitivity for low level measurements and sweep rates for fast logic families, plus 10:1 variable holdoff range for complex word triggering. And at the bottom line, it offers the price and reliability to significantly lower the cost of owning a quality scope.



2235 Option 01 (AN/USM-488)

Fully Provisioned Through the U.S.
Army System

Meets or Exceeds MIL-T-28800C and
MIL-STD-461B Part 4 for EMC/EMI

Dc to 100 MHz Bandwidth

Accepted and Specified by the U.S. Army

The 2235 Option 01 is accepted and specified by the U.S. Army. If you're involved in designing and specifying systems for the U.S. Army, here is a 100 MHz oscilloscope that should top your support equipment lists.

Comparable in performance to the standard 2235, the 2235 Option 01 version has impressive features. It meets the rigid environmental requirements of MIL-T-28800C for Class 5 instruments. Electromagnetic interference is improved over the standard 2235, and meets MIL-STD-461B part 4 requirements. It has adjustable graticule illumination as well as uncalibrated indicator lights for both the horizontal time base and the vertical channels. HF REJ and LF REJ filtering expand flexibility for trigger coupling.

For your convenience we've also included a protective front-panel cover, accessory pouch, P6101A 1X 2-meter probe, binocular viewing hood, BNC-T connector, BNC male-to-binding post, two IC grabber tips and a service manual.

CHARACTERISTICS

The following electrical characteristics are common to the 2236, 2235, and 2235 Option 01 except where noted.

VERTICAL SYSTEM (TWO IDENTICAL CHANNELS)

Bandwidth (-3dB) and Rise Time — 100 MHz and 3.5 ns, derated to 90 MHz at 2 mV/div and outside 0°C to +35°C. Bandwidth Limit: 20 MHz ± 10%.

Deflection Factor — 2 mV to 5 V/div at ±2%. Accuracy derated ±3% outside +15°C to +35°C (+10°C to +35°C, 2235 Option 01). Continuously variable between steps by at least 2.5:1.

Step Response Aberrations — 2235 and 2235 Option 01: +4%, -4%, 4% p-p (2 mV to 0.5 V/div). 2236: +4%, -4%, 4% p-p (5 mV to 0.5 V/div), +5%, -5%, 5% p-p (2 mV/div).

Display Modes — CH 1, CH 2, CH 2 Invert, Add, Alternate, Chop (500 kHz).

Common-Mode Rejection Ratio — At least 10:1 at 50 MHz for signals of 6 div or less (10:1 at 80 MHz 2235 Option 01).

Input R and C — 2235 and 2235 Option 01: 1 MΩ, 20 pF. 2236: 1 MΩ, 22 pF.

Maximum Input Voltage (Ac and Dc Coupled) — 400 V (dc + peak ac) or 800 V (p-p to 10 kHz).

Channel 1/Channel 2 Isolation — 100:1 at 50 MHz.

HORIZONTAL SYSTEM

Sweep Rate — A Time Base: 0.05 μs to 0.5 s/div in 1-2-5 sequence. 10X Mag: 5 ns/div. B Time Base: 0.05 μs to 50 ms/div in 1-2-5 sequence. 10X Mag: 5 ns/div.

Sweep Linearity — ±5% over any two of center eight divisions.

Accuracy

	+15°C to +35°C*	0°C to +50°C
Unmagnified	±2%	±3%
Magnified	±3%	±4%

*1 +10°C to +35°C for 2235 Option 01.

Display Modes — A, Alternate (A Intensified and B Delayed) and B.

CALIBRATED SWEEP DELAY

Delay Time Range — Continuously variable with 10-turn control from <0.5 +300 ns to >10 div.

Differential Delay Time Accuracy — (2235 and 2235 Option 01) ±1% (+15°C to +35°C); ±2% (0°C to +50°C).

ΔTime Measurement Accuracy — (2236) Max accuracy equal to time base accuracy ±50 ps. Time Base Accuracy With Standard Oscillator: 10 ppm (0.001%); with Option 14 TCXO (Temperature-Compensated Crystal Oscillator): 0.5 ppm (0.00005%).

Delay Jitter — 2236: 10,000:1 (0.01%). 2235 and 2235 Option 01: 20,000:1 (0.005%).

TRIGGERING

A Trigger Sensitivity

2235 & 2235 Opt 01	Internal	External (p-p volts)
10 MHz	0.3 div**	35 mV
60 MHz	1.0 div	120 mV
100 MHz (2235)	1.5 div	200 mV
100 MHz (2235 Opt 01)	1.5 div	150 mV

2236

10 MHz	0.35 div	40 mV
60 MHz	1.2 div	150 mV
100 MHz	1.5 div	250 mV

2236 CTM

10 MHz	0.5 div	50 mV
60 MHz	1.5 div	160 mV
100 MHz	2.0 div	300 mV

B Trigger (Internal Only) Sensitivity

	10 MHz	60 MHz	100 MHz
2235 & 2235 Opt 01	0.35 div	1.0 div	1.5 div
2236	0.4 div	1.2 div	1.5 div
2236 CTM	0.5 div	1.5 div	2.0 div

** 0.35 for 2235 Option 01.

TV Trigger Sensitivity — TV Field: 1.0 div of composite sync. TV Line: 0.3 div (2235); 0.35 div (2236 and 2235 Option 01).

Bandwidth Limiting — 20 MHz when bandwidth limit switch depressed.

High Frequency Reject — (2235 Option 01 only) Attenuates signals above 40 kHz.

Low Frequency Reject — (2235 Option 01 only) Attenuates signals below 40 kHz.

Trigger System Operating Modes — Normal, p-p automatic, TV line, TV field, and single sweep.

Trigger View System — Same deflection factors as vertical channels with internal sources; 100 mV/div with ac and dc external, and 1 V/div with dc ÷ 10 external. Accuracy is ±20%. Delay difference between trigger view (EXT input) and either vertical channel is <2.0 ns.

External Trigger Input — Coupling: Ac, dc, or dc ÷ 10.

Variable Holdoff Control — Increases A sweep holdoff time at least 10:1.

X-Y OPERATION

Deflection Factors — Same as scope's vertical system with the V/div switch in calibrated detent.

Accuracy

	Y-Axis	X-Axis
+15°C to +35°C	±2%	±3%
0°C to +50°C	±3%	±4%

Bandwidth — Y-Axis: same as scope's vertical system. X-Axis: 2.5 MHz.

Phase Difference Between X-Axis and Y-Axis Amplifiers — ±3° from dc to 150 kHz with dc coupled inputs.

CRT AND DISPLAY FEATURES

CRT — 8 cm x 10 cm display; internal unilluminated graticule (2235 Option 01 is illuminated). Accelerating potential is 14 kV. GH (P31) phosphor standard.

Controls — Beam Finder, Focus, Separate A and B Sweep Intensity, Trace Rotation. 2235 Option 01 also has Variable Scale Illumination.

Z-Axis Input — Dc coupled, positive-going signal decreases intensity; 5 V p-p signal causes noticeable modulation; dc to 20 MHz.

OTHER CHARACTERISTICS

Probe Adjust Signal — (2235/2236) Squarewave, 0.5 V ±5%, 1 kHz ±20%.

Amplitude Calibrator — (2235 Option 01 only) Squarewave, 0.5 V ±2%, 1 kHz ±20%.

POWER REQUIREMENTS

Line Voltage Range — 90 V ac to 250 V ac. (No line switches or fuse changes needed.)

Line Frequency — 48 Hz to 440 Hz.

Maximum Power Consumption — 2235: 40 W, 70 VA. 2236: 60 W, 110 VA.

Dc Operation — 12 V to 30 V available with 1105, 1106, and 1107.

ENVIRONMENTAL

Ambient Temperature — Operating: 0°C to +50°C (except 2236 CTM ac RMSV, DCV, and Ω Modes: 0°C to +40°C). Nonoperating: -55°C to +75°C.

Altitude — Operating: To 4600 m (15,000 ft). Maximum operating temperature decreased 1°C/1,000 ft (5,000 ft to 15,000 ft). Nonoperating: To 15,000 m (50,000 ft).

Vibration — Operating: 15 minutes along each of the major axes. 0.015 in p-p displacement 10 Hz to 55 Hz to 10 Hz in one minute cycles. Held for 10 minutes at 55 Hz (2.4 g's at 55 Hz).

Humidity — Operating and Nonoperating: 95%, five cycles (120 hours) referenced to MIL-T-28800C, Paragraph 4.5.5.1.2.2.

Shock — Operating: 30 g's, ½ sine, 11 ms duration, 3 shocks per axis along each major axis. Total of 18 shocks.

EMC — Meets Class B requirements per VDE 0871B for radiated and conducted emission. 2235 Option 01 AN/USM 488 Only: Meets requirements of MIL-STD-461B Part 4, CE03, CS01, CS02, CS06, RE02 (to 1 GHz), and RS03 (1 V/meter to 1 GHz).

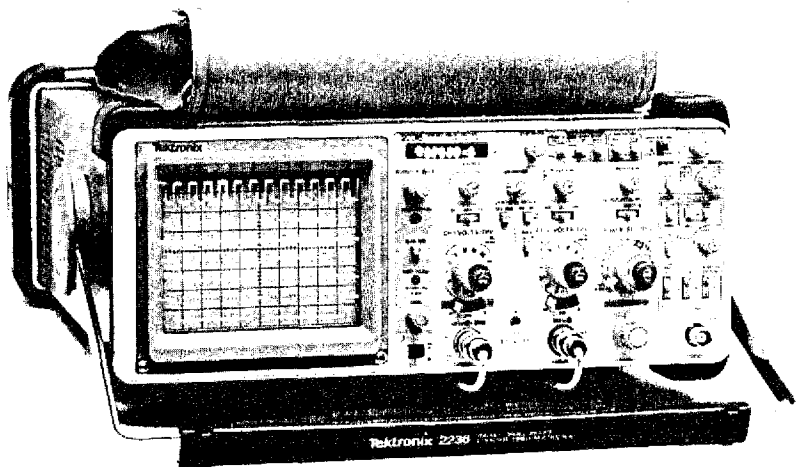
PHYSICAL CHARACTERISTICS

Dimensions	2235 and 2235 Opt 01		2236	
	mm	in	mm	in
Width*1	328	12.9	328	12.9
Height*2	137	5.4	137	5.4
Depth*2	440	17.3	440	17.3
Weights≈	kg	lb	kg	lb
Net	6.1	13.5	7.3	16.2

*1 Without handle.

*2 Without front cover.

≈ 2235 Option 01 height with pouch is 150 mm (5.9 in).



2236 Counter/Timer/Multimeter

CHARACTERISTICS

The following characteristics are unique to the 2236.

Time Base Accuracy — Standard: 10 ppm (0.001%). With Option 14 TCXO: 0.5 ppm (0.00005%).

Frequency — Range: ≤ 0.2 Hz to ≥ 100 MHz. Maximum Resolution: 0.00001 Hz. Maximum Accuracy: Equal to time base accuracy. Can be gated.*1*2

Period — Range: ≥ 5 s to ≤ 10 ns. Maximum Resolution: 10 ps. Maximum Accuracy: Equal to time base accuracy. Can be gated.*1*2

Width — Range: ≥ 5 s to ≤ 5 ns. Maximum Resolution: 10 ps. Maximum Accuracy: Equal to time base accuracy ± 10 ns. Can be gated.*1*2

Delay Time — Range: ≥ 2.5 s to ≤ 500 ns. Maximum Resolution: 10 ps. Maximum Accuracy: Equal to time base accuracy ± 20 ns.*2

Δ Time — Range: ≥ 2.5 s to ≤ 1 ns. Maximum Resolution: 10 ps. Maximum Accuracy: Equal to time base accuracy ± 50 ps.*2

Totalize — Over 8,000,000 events. Can be gated.

Dc Volts — Range: 0 V to 500 V. Maximum Resolution: 100 μ V. Accuracy: $\pm 0.1\%$. Input: Through side DMM leads.*2

RMS Ac Volts — Ac Coupled: True RMS with 20 Hz to 20 kHz frequency range. Range: 0 V to 350 V. Maximum Resolution: 100 μ V. Accuracy: $\pm 1.0\%$. Input: Through side DMM leads.*2

CH 1 Volts — Measures average dc voltage (with CH 1 dc coupling) or true RMS voltage (with CH 1 ac coupling); 1X/10X ranged by coded probes: Single Sweep button zeros display and permits relative dc and ac RMS measurements. Range, Dc and Ac Volts: 0 V to 50 V (500 V dc/350 V ac with P6121 10X Probe). Maximum Resolution, Dc and Ac Volts: 100 μ V (1 mV with P6121). Maximum Accuracy, Dc Volts (18°C to 28°C): $\pm 0.3\%$ with 1X probe, $\pm 0.5\%$ with 10X probe. Maximum Accuracy, Ac Volts with 1X probe (18°C to 28°C): $\pm 2\%$, 50 Hz to 100 Hz, $\pm 1\%$, 100 Hz to 20 kHz. Maximum Accuracy, Ac Volts with 10X Probe: $\pm 2\%$, 20 Hz to 20 kHz, with proper probe compensation.*2

Resistance — Range: 0 Ω to 1.99 G Ω . Maximum Resolution: 0.01 Ω . Accuracy: To 0.15%. Automatic

diode detection displays forward voltage drop to $\pm 1\%$; continuity mode activates tone if resistance is $< 5 \Omega$.*2

Temperature — Uses Optional Tektronix P6602 Temperature Probe. Temperatures in C or F selected with Freq/ Δ Time button. Range: -62°C to $+230^\circ\text{C}$ (-80°F to $+446^\circ\text{F}$). Resolution: To 0.1° (either range). Accuracy: To $\pm 2\%$ of reading $\pm 1.5^\circ\text{C}$; $\pm 2\%$ of reading $\pm 2.70^\circ\text{F}$.

Multimeter Inputs — Isolated from oscilloscope ground. Input Z: 10 M Ω . Maximum Input Voltage: 500 V (dc + peak ac), for all functions.

*1 Ranges, resolutions, and accuracies can be degraded due to gating errors and a smaller number of automatic averages made during a gated frequency, period, or width measurement. For complete formula specifications see operator's manual.

*2 For complete accuracy and resolution error formula specifications see operator's manual.

ORDERING INFORMATION

2236 Oscilloscope With Counter/Timer/Multimeter **\$2,650**
Includes: Two P6121 10X voltage probes; DMM leads; reference guide; operator manual (070-4205-00).

2235 Oscilloscope **\$1,575**
Includes: Two P6122 10X voltage probes; operator manual (070-4207-00).

2235 Option 01 Oscilloscope (AN/USM-488) Order 2235L **\$1,995**
Includes: Two P6122 10X Voltage Probes; P6101A 1X Voltage Probe; viewing hood (016-0566-00); BNC T-connector; BNC male to binding post; front panel cover; accessory pouch; two grabber tips; operator manual (070-4976-00); service manual (070-4977-00).

OPTIONS

Option 02 — (2235, 2236 only) Front panel cover and accessory pouch. **+\$47**

Option 14 — (2236 only) TCXO Temperature-Compensated Crystal Oscillator, 0.5 ppm accuracy. **+\$295**

Option 33 — (2235, 2236 only) Travel Line Package. See page 305. **+\$200**

CONVERSION KITS

Rackmount Adaptor — See page 305
(2235) Order 016-0466-00 **\$115**
(2235 Option 01) Order 016-0833-00 **\$170**
(2236) Order 016-0015-00 **\$255**

Travel Line Package Retrofit Kit — See page 305.

TCXO Retrofit Kit — (2236 only) Temperature compensated crystal oscillator, 0.5 ppm accuracy. Order 040-1136-00 **\$365**

INTERNATIONAL POWER PLUG OPTIONS

Option A1 — Universal Euro 220 V, 50 Hz. Order 020-0859-00.

Option A2 — UK 240 V, 50 Hz. Order 020-0860-00.

Option A3 — Australian 240 V, 50 Hz. Order 020-0861-00.

Option A4 — North American 240 V, 60 Hz. Order 020-0862-00.

Option A5 — Switzerland 220 V, 50 Hz. Order 020-0863-00.

WARRANTY-PLUS SERVICE PLANS

SEE PAGE 497

M1 — (2235/2235 Option 01) 2 Calibrations.	+\$135
M1 — (2236) 2 Calibrations.	+\$160
M2 — (2235/2235 Option 01) + 2 Years Service.	+\$125
M2 — (2236) + 2 Years Service.	+\$150
M3 — (2235/2235 Option 01) 2 Years Service & 4 Calibrations.	+\$380
M3 — (2236) 2 Years Service & 4 Calibrations.	+\$450
M4 — (2235/2235 Option 01) 5 Calibrations.	+\$385
M4 — (2236) 5 Calibrations.	+\$425
M5 — (2235/2235 Option 01) 9 Calibrations + 2 Years Service.	+\$805
M5 — (2236) 9 Calibrations + 2 Years Service.	+\$900

OPTIONAL ACCESSORIES

Front Panel Cover and Accessory Pouch *1 — Order 020-0672-02	\$55
Front Panel Cover *1 — Order 200-2520-00	\$6.25
Accessory Pouch *1 — Order 016-0677-02	\$48
Viewing Hoods — (Collapsible) Order 016-0592-00	\$14
(Binocular) Order 016-0566-00*1	\$18.75
(Polarized) Order 016-0180-00	\$50
Carrying Strap — Order 346-0199-00	\$17
Carrying Case — Order 016-0792-01*2	\$355
Rackmount Adaptor Kits — (2235) Order 016-0466-00	\$115
(2235 Option 01) Order 016-0833-00	\$170
(2236) Order 016-0015-00	\$255
CRT Light Filter — (Clear*) Order 337-2775-01	\$1.95
(Blue) Order 337-2775-00	\$3.75
1107 Mounting Kit — Order 016-0785-00	\$50
1107 DC Inverter — See page 307.	\$525
1106 Battery Pack — See page 306.	\$1,265
1105 Power Supply — See page 306.	\$1,690

RECOMMENDED PROBES

See Probe Section for additional probes, page 464.

P6121 — 10X Probe.	\$100
P6122 — 10X Probe.	\$58
P6420 — DMM RF.	\$145
40 kV DMM — Order 010-0277-00	\$180
P6602 Temperature Probe — For use with 2236 CTM.	\$225
A6901 Ground Isolation Monitor — See page 478.	\$650
A6902B Voltage Isolator — See page 479.	\$1,795

RECOMMENDED CAMERAS

C-5C — See page 450. (2235 Option 01) C-5C Option 02	\$465
(2235, 2236) C-5C Option 04	\$495
C-7 — See page 448. (2235, 2236) C-7 Option 02	\$595
(2235 Option 01) Option 03	\$565
C-4 — (2235 Option 01) See page 446.	\$370

RECOMMENDED CART

K212 — For on-site mobility. See page 461. **\$330**

SERVICE MANUALS

(2235) Order 070-4206-00	\$25
(2236) Order 070-4204-00	\$25

*1 Standard with the 2235 Option 01 (AN/USM-488).

*2 Recommend use with front panel cover (200-2520-00).