



2213/2215

Dc to 60 MHz Bandwidth

Lightweight

Easy to Use

2 mV Sensitivity

Advanced Trigger System

5 ns/div Sweep Rate

Delayed Sweep Measurements

Large, Bright CRT

New 10X Probes Included

Three Year Warranty—Five Year Option

Two 60 MHz, dual trace oscilloscopes from Tektronix offer unprecedented value in both initial and life cycle costs. They are ideal everywhere general purpose scopes are needed.

These oscilloscopes provide unexcelled performance in a small lightweight package; 6.1 kg (13.5 lb). With pouch and front cover, only 6.8 kg (15 lb).

X-Y operation is simple and easy to use. Both vertical input channels (CH 1 and CH 2) can be used through their full range of sensitivity settings. Vertical sensitivities range from 2 mV to 10 V/div. Sweep speeds range from 0.5 s/div to 50 ns/div. A 10X magnification provides 5 ns/div.

A pushbutton beamfinder allows easy scope setups. The scope bezel accepts a Tektronix C-5C Scope Camera with graticule illuminating flash (Option 04).

The advanced triggering system features true vertical mode alternate triggering; both the 2213 and 2215 will trigger alternately even with unrelat-

ed signals. Other features include variable trigger holdoff, TV line and TV field triggering at any sweep speed, and an enhanced auto mode. On the 2215, the dual time base operates in either run after A or trigger after A. The latter permits jitter-free B measurements.

The 2213's single time base delay provides the user with the performance of intensified and delayed sweep operations at a low price. Where dual time base performance is required, the 2215 delivers it with alternate sweep switching. The 2215 can display four traces; vertical channels 1 and 2 at the A sweep rate, and vertical channels 1 and 2, delayed, at the B sweep rate. Both scopes also incorporate new auto-intensity and auto-focus circuits that provide convenient operation over a wide range of sweep speeds.

Low life cycle cost is brought about by the inherent reliability of the new scopes. The parts count and cabling have been greatly reduced as compared to older designs. Even the traditional line transformer and line voltage selector switches have been eliminated, thanks to a new high-efficiency power supply. The advantages of these power supply improvements are that the 2213 and 2215 will operate from mains voltages of 90 to 250 V RMS at frequencies from 48 to 440 Hz. Additional reliability also results from superior mechanical design and packaging, soldered-in components, absolute minimum of connectors and very low power consumption.

In strong testimony of the incomparable reliability of the 2000 Family oscilloscopes, Tek offers the industry's first three year warranty: All labor and parts, including CRT, excluding probes. And then, beyond the "basic three years" of warranty coverage, Tek will extend your service coverage up to five years, offering you a choice of three practical service plans to meet your specific service needs.

CHARACTERISTICS

The following electrical characteristics are common to both instruments except where noted:

VERTICAL DEFLECTION (2 IDENTICAL CHANNELS)

Bandwidth*1 and Rise time*2

| 0°C to +40°C | +40°C to +50°C |
|---|---------------------------------------|
| Dc to 60 MHz, 20 mV/div to 10 V/div, 5.8 ns reduced | Dc to 50 MHz, 2 mV to 10 mV/div, 7 ns |
| Dc to 50 MHz, 2 mV to 10 mV/div, 7 ns | |

*1 Measured at -3 dB.

*2 At all deflection factors from 50 Ω terminated source.

Deflection Factor — 2 mV/div to 10 V/div ±3% (+20°C to +30°C) or ±4% (0°C to +50°C). 1-2-5 sequence. Uncalibrated, continuously variable between steps to at least 25 V/div.

Display Modes — CH 1, CH 2, CH 2 Add (normal and inverted), Alternate, Chopped: ≈250 kHz rate, electronically switched.

Common-Mode Rejection Ratio — At least 10:1 at 10 MHz for common-mode signals of 6 divisions or less.

Input R and C — 1 MΩ ±2% paralleled by ≈30 pF.

Maximum Input Voltage

| | |
|------------|---|
| Dc Coupled | 400 V (dc + peak ac) 800 V (p-p ac at 1 kHz or less) |
| Ac Coupled | 400 V (dc + peak ac) 800 V (p-p ac at 1 kHz or less) |

Delay Line — Permits viewing leading edge of displayed waveform.

HORIZONTAL DEFLECTION

Time Base A (2213 and 2215) — 0.05 μs/div to 0.5 s/div (1-2-5 sequence). 10X magnifier extends max sweep rate to 5 ns/div.

Time Base B (2215 Only) — 0.05 μs/div to 50 ms/div (1-2-5 sequence). 10X magnifier extends max sweep rate to 5 ns/div.

Variable Time Control (2213 and 2215) — Time Base A provides continuously variable uncalibrated sweep rates between steps to at least 1.25 s/div.

Time Base A (2213 and 2215) and B (2215 only) Accuracy*1

| | +20°C to +30°C | 0°C to +50°C |
|-------------|----------------|--------------|
| Unmagnified | ±3% | ±4% |
| Magnified | ±5% | ±6% |

*1 Center 8 divisions.

Horizontal Display Modes (2213) — A, A intensified after delay, delayed.

Horizontal Display Modes (2215) — A, alternate (A intensified by B and B), B. Electronic switching between intensified and delayed sweep.

2213 SWEEP DELAY

Delay Times — <0.5 μs, 10 μs, and 0.2 ms.

Multiplier — Increases delay time by 20 to 1 or more.

Jitter — 5000 to 1 (0.02%) of maximum available delay time.



2215 SWEEP DELAY

Delay Times — Continuously variable by means of a 10 to 1 vernier control. Delayed (B) portion is intensified on the main (A) trace.

Delay Position Range — <0.5 div +300 ns to more than 10 div.

Delay Dial Accuracy — $\pm 1.5\%$ of reading past 1 div.

A/B Sweep Separation — Control permits main and delayed sweep to be separated by at least 3.5 div.

Jitter — 10,000 to 1 (0.01%) of maximum available delay time.

TRIGGERING

2213 and 2215 A Time Base Trigger Modes — Normal (sweep runs when triggered), automatic (sweep runs in the absence of a triggering signal and triggers automatically for signals down to 20 Hz), and TV field (with slope set for negative going transitions, and trigger level adjusted close to blanking level, sweep starts at first line of video; use Normal for TV line display). LED indicates when sweep is triggered.

A Trigger Holdoff — Adjustable control permits a stable presentation of repetitive complex waveforms.

Sensitivity — Auto and Normal internal: Below 2 MHz, signal must be at least 0.4 div amplitude; requirements increase above 2 MHz; at 60 MHz, signal must be at least 1.5 div amplitude.

Auto and Normal External — Up to 2 MHz, trigger signal must be at least 50 mV p-p; requirements increase up to 60 MHz, where signal must be at least 250 mV p-p.

TV Field — Composite video must be at least 2 div amplitude.

Level and Slope (Norm Mode) — Internal: Trigger level can be adjusted over the range of amplitudes displayed on the CRT. External, Dc Coupled: Level can be adjusted over a range of at least ± 2 V, or 4 V p-p. External, Dc Coupled and Attenuated ($\div 10$): Level can be adjusted over a range of at least ± 20 V, or 40 V p-p.

External Inputs — R and C ≈ 1 M Ω paralleled by ≈ 30 pF. 400 V (dc + peak ac) or 800 V ac p-p at 1 kHz or less.

2215 DELAYED (B) TIMEBASE

Level and Slope — Separate slope and level controls for triggering B sweep.

Sensitivity — Up to 2 MHz, signal must be at least 0.4 div in vertical amplitude; requirements increase up to 60 MHz, where signal must be at least 2 div in amplitude.

X-Y OPERATION

Full Sensitivity X-Y (CH 1 Horizontal, CH 2 Vertical) — 2 mV/div to 10 V/div, accurate $\pm 5\%$. Bandwidth is dc to at least 2 MHz. Phase difference between amplifiers is 3° or less from dc to 50 kHz.

DISPLAY

CRT — 8 x 10 cm display. Horizontal and vertical center lines further marked in 0.2 cm increments. GH (P31) Phosphor standard. 10 kV accelerating potential, mesh grid, halo suppressed.

Graticule — Internal, non-parallax, not illuminated; markings for measurement of risetime.

Beam Finder — Compresses trace to within graticule area for ease in locating an off-screen signal. A preset intensity level provides a constant brightness.

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

ENVIRONMENTAL CHARACTERISTICS

Ambient Temperature — Operating: 0°C to $+50^\circ\text{C}$. Nonoperating: -55°C to $+75^\circ\text{C}$.

Altitude — Operating: To 4600 m (15,000 ft); maximum allowable ambient temperature decreased by $1^\circ\text{C}/1000$ ft from 5000 to 15,000 ft. Nonoperating: 15,000 m (50,000 ft).

Vibration — Operating test samples were subjected to sinusoidal vibration in the X, Y, and Z axis with the frequency varied from 10 Hz to 55 Hz to 10 Hz in 1 minute sweeps for a duration of 15 minutes per axis and a dwell of 10 minutes at 55 Hz. Total displacement was 0.015 in p-p (2.4 g's at 55 Hz).

Humidity — Operating and Nonoperating: Test samples were subjected to 5 cycles (120 hours) of humidity testing.

Shock — Operating and Nonoperating: Test samples were subjected to 3 shocks, both directions along each axis for a total of 18 shocks. Peak accelerations of each $1/2$ -sine shock were 30 g's.

OTHER CHARACTERISTICS

Probe Adjust Signal — Squarewave, 0.5 V $\pm 20\%$, 1 kHz $\pm 20\%$.

Power Requirements — 90 to 250 V, 48 to 440 Hz without range switching, 50 W maximum at 115 V and 60 Hz.

PHYSICAL CHARACTERISTICS

| Cabinet Dimensions | mm | in |
|--|-----|------|
| Width (with handle) | 360 | 14.2 |
| Width (without handle) | 237 | 12.9 |
| Height (with feet and handle) | 137 | 5.4 |
| Depth (with front cover) | 445 | 17.5 |
| Depth (without front cover) | 440 | 17.3 |
| Depth (with handle extended) | 511 | 20.1 |
| Weights \approx | kg | lb |
| Net (with cover accessories, and pouch) | 7.6 | 16.8 |
| Net (without cover accessories, and pouch) | 6.1 | 13.5 |
| Shipping (domestic) | 8.2 | 18.0 |

INCLUDED ACCESSORIES

Two P6122 10X voltage probes (010-6122-01); operator's manual, service manual.

ORDERING INFORMATION

2213 Single Time Base Oscilloscope with Delayed Sweep \$1,200

2215 Delayed Alternate Time Base Oscilloscope \$1,450

Power Cords — Standard: 110 V ac North American plug.

INTERNATIONAL POWER CORDS & PLUG OPTIONS

Option A1 — Universal Euro 220 V/16 A, 50 Hz. Order 020-0859-00.

Option A2 — UK 240 V/13 A, 50 Hz. Order 020-0860-00.

Option A3 — Australian 240 V/10 A, 50 Hz. Order 020-0861-00.

Option A4 — North American 240 V/15 A, 60 Hz. Order 020-0862-00.

Option A5 — Switzerland 220 V/10 A, 50 Hz. Order 020-0863-00.

WARRANTY-PLUS SERVICE PLANS—Refer to page 41

M1 — (2213) 2 Calibrations +\$95

M1 — (2215) 2 Calibrations +\$100

M2 — (2213) +2 Years Service +\$75

M2 — (2215) +2 Years Service +\$80

M3 — (2213) 2 Years Service & 4 Calibrations +\$250

M3 — (2215) 2 Years Service & 4 Calibrations +\$270

OPTIONAL ACCESSORIES

Front Panel Cover — Order (200-2520-00) \$5.00

Accessory Pouch — Order (016-0677-00) \$42

Pouch and Cover — Order (020-0672-00) \$47

Viewing Hood — Order (016-0566-00) \$15

Carrying Strap — Order (346-0199-00) \$15

Carrying Case — Order (016-0694-00) \$340

CRT Light Filter — Clear. Order (337-2775-00) \$3.00

C-5C Option 04 — Scope Camera \$30

Model 200D or 200C SCOPE-MOBILE® Cart \$320

Rack Adaptor Kit — Order (016-0466-00) \$100

To order, call your local Tektronix Field Office, or call Tek's National Marketing Center, toll free: 1-800-426-2200, Ext 99. In Oregon call collect: (503) 627-9000, Ext 99.