NEW 2246/2245

Bright, Crisp Display With High Writing Rate
Four Independent Channels
100 MHz Bandwidth With 2 ns/Div Time Base
On-Screen Scale Factor Readouts
Flexible Triggering
  Auto Level and Auto HF, LF, Noise Reject, TV Line and TV Field
Delayed Sweep
Control Status Lights
2% Vertical and Horizontal Accuracy
2 mV/Div Vertical Sensitivity at Full Bandwidth
New Specially Designed Probe
  Improved, Rugged Tip
  Hybrid Circuitry for Improved Performance
  Simple, Rugged Construction
New Labeled Volts Cursors With Ground-Referenced Readings and On-Screen Readouts

New Hands-Off Voltmeter Measurements
  Peak and -Peak
  Peak-to-Peak
  Gated Peaks
  Gated Peak-to-Peak
  Dc
New SmartCursors™
  Track Voltmeter Measurements
  Visually Indicate Trigger Level and Ground
  Time Measurements With Cursors or Alternate Delayed Sweep ATime
Three Year Warranty—Five Year Option

TYPICAL APPLICATIONS
  Logic Design and Repair
  Communications
  Power Supply Design

Higher Performance, Lower Price
The performance/price ratio for portable oscilloscopes has been substantially upgraded. No other portable scope can offer the range of productivity enhancing features and performance characteristics at a comparably low price than the Tektronix NEW 2245 and 2246.

Features That Promote Productivity
Four independent channels speed troubleshooting and design tasks by allowing simultaneous observation of multiple test points. Front panel set-ups are simplified by pushbutton activated functions and on-screen scale factor readouts. And with buttons that light up, settings can be verified at a glance.
More Triggering Flexibility

Hands-free triggering, made possible by the Auto-level mode, automatically places a stable display of almost any waveform on screen. The LF, HF, and Noise Reject modes, together with a 10-to-1 holdoff range, deliver stable triggering on complex waveforms. The built-in TV Line and TV Field triggering capability extends measurements to most video-related applications.

Performance Plus

The NEW 2245 and 2246 oscilloscopes have low noise vertical systems that produce sharp, bright traces. Their 2 ns time base and 100 MHz bandwidth bring out the details on high speed signals and render measurements with good timing resolution.

Low level signal measurements are easily managed by the 2 mV/div vertical sensitivity that extends to 0.25 div at 50 MHz (0.5 div at 100 MHz).

Voltage Measurements With the Push of a Button

A pushbutton activated measurement system on the 2246 enhances productivity even more. This scope turns out virtually hands-off measurements quickly of +peak, -peak, peak-to-peak, dc, and gated volts, all with convenient on-screen readout of values.

If more visual indication is desired, the unique cursor system can provide feedback showing exactly where on the waveform an automatic measurement is being made. These feedback cursors, when selected, even show ground and trigger level locations.

There is also the ability to use cursors in the conventional manual mode for making point-to-point time and voltage measurements, including time interval measurements between a point on the reference waveform and a point on any of four other displayed waveforms.

Three Year Warranty

As with all of our high quality 2000 Series Oscilloscopes, the 2245 and 2246 (including the CRT) are covered by the Tektronix three year warranty, making ownership more cost effective than ever.

CHARACTERISTICS

 Characteristics are common to both instruments, except where indicated.

VERTICAL SYSTEM

Display Modes — CH1, CH2, CH3, CH 4, Add (CH 1 + CH 2), Invert (CH 2), Alternate and Chopped display switching for all channels, and 20 MHz bandwidth limiting.

CHANNEL 1 AND CHANNEL 2

Frequency Response (~3dB Bandwidth) — 100 MHz for temperatures from 0°C to +35°C. 90 MHz for temperatures from +35°C to +50°C.

Ac Coupled Lower — 3dB Frequency — 10 Hz or less with 1X probe. 1 Hz or less with standard accessory 10X probe.

Step Response — ≤3.5 μs for temperatures from 0°C to +35°C. ≤3.9 μs for temperatures from +35°C to +50°C. Rise times calculated from t=0.35BW.

Deflection Factor Range — 2 mV/div to 5 V/div in a 1-2-5 sequence of 11 steps.

Maximum Error — ±2% for temperatures from +15°C to +35°C. ±1% for temperatures from 0°C to +15°C and from +35°C to +50°C.

Variable Range — Continuously variable between VOLTS/DIV step settings. Increases step setting by at least 2.5 V/div.

Uncalibrated Indicators — A > symbol appears on-screen when deflection factor is between calibrated VOLTS/DIV step settings.

Channel Isolation — 50 dB or more attenuation of deselected channel at 10 MHz. 34 dB or more at 100 MHz. Measured with an eight div input signal and equal VOLTS/DIV settings on both channels from 2 mV/div to 0.5 V/div.

Channel 2 Signal Delay With Respect to Channel 1 — <100 ps difference.

Input Characteristics — 1 MΩ ±0.1% shunted by 20 pF ±0.5 pF. Maximum Input Voltage: 400 V (dc + peak ac); 800 V peak ac at 10 kHz or less.

Common Mode Rejection Ratio (ADD Mode With Channel 2 Inverted) — At least 10:1 at 50 MHz. For common-mode signals of eight div or less and with VAR VOLTS/DIV control adjusted for best CMRR at 50 kHz at any VOLTS/DIV setting.

Trace Drift — Between VOLTS/DIV Step Settings: 0.2 div or less. With VAR VOLTS/DIV Rotated Between Extremes: 1 div or less. Inverting Channel 2: 1 div or less. Between GND and DC Input Coupling: <0.5 mV for temperatures from 0°C to +35°C. <2 mV for temperatures from +35°C to +50°C.

Position Range — At least 11 div from graticule center.

CHANNEL 3 AND CHANNEL 4

Frequency Response — Same as Channel 1 and Channel 2.

Step Response — Same as Channel 1 and Channel 2.

Deflection Factor — Settings: 0.1 V/div and 0.5 V/div.

Maximum Error — Same as Channel 1 and Channel 2.

Channel Isolation — 34 dB or more attenuation of deselected channel at 100 MHz. Measured with an eight div input signal.

Channel 4 Signal Delay With Respect to Channel 3 — <100 ps difference.

Input Characteristics — 1 MΩ ±1% shunted by 2 pF ±0.5 pF. Maximum Input Voltage: 400 V (dc + peak ac); 800 V peak ac at 10 kHz or less.

Trace Shift — Between VOLTS/DIV Settings: 1 div or less.

Position Range — Same as Channel 1 and Channel 2.

HORIZONTAL SYSTEM

Display Modes — A (main sweep), A ALTernate with B (delayed sweep), and B. In X-Y mode, Channel 1 provides X-axis (horizontal) deflection.

A Sweep Time Base Range — 0.5 s/div to 20 ns/div in a 1-2-5 sequence of 24 steps. X10 magnification extends fastest sweep rate to 2 ps/div.

B Sweep Time Base Range — 5 s/div to 20 ns/div in a 1-2-5 sequence of 24 steps. X10 magnification extends fastest sweep rate to 2 ps/div.

Variable Timing Range — Continuously variable between SEC/DIV calibrated step settings. Extends slowest A sweep and B sweep speeds by a factor of at least 2.5 times. Affects the A SEC/DIV setting with the A display mode; affects the B SEC/DIV setting with the ALT and B modes.

A Sweep Timing Accuracy — Applies over the center eight div. Excludes the first 0.25 div of the magnified sweep and sweep beyond the 10th magnified div.

<table>
<thead>
<tr>
<th>Range</th>
<th>Unmagnified</th>
<th>Magnified</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Hz to +35°C</td>
<td>±2%</td>
<td>±3%</td>
</tr>
<tr>
<td>+35°C to +50°C</td>
<td>±3%</td>
<td>±4%</td>
</tr>
</tbody>
</table>

Linearity — ±5% over any two of the center eight div, or both unmagnified and magnified displays.

Delay Time — Range: <0.1 div to >9.8 div of the A sweep. Maximum value does not exceed end of the A sweep. Jitter: 1:20,000 p-p (0.05%) viewed over two seconds.

TRIGGERING

Trigger Sensitivity from CH 1, CH 2, CH 3, CH 2 Source.

DC Coupled — 0.35 div or greater triggers from dc to 50 MHz, increasing to 1 div at 150 MHz.

Noise Reject Coupled — 0.8 div or more triggers; 0.5 div or less does not trigger.

HF Reject Coupled — 0.35 div or greater triggers from dc to 50 kHz; 0.25 div or less does not trigger above 500 kHz.

LF Reject Coupled — 0.35 div or greater triggers from 100 kHz to 50 MHz; 0.35 div or greater does not trigger from dc to 10 kHz.

Ac Coupled — 0.35 div or greater triggers from 50 Hz and 50 MHz; 0.35 div or less does not trigger from dc to 5 Hz.

For dc, LF Reject, and ac coupling above 50 MHz, triggering signal requirement increases to 1.0 div at 150 MHz.
Trigger Sensitivity From TV Line or TV Field Source — 0.5 div or less of composite sync achieves stable display.

Lowest Usable Frequency With Auto Level Function — 10 Hz.

Level Control Range — ±20 div referenced to the selected source.

Level Readout Accuracy — ±0.3% of reading ±0.1 div.

Variable Holdoff Range — Increases the A sweep holdoff time by at least a factor of 10.

**X-Y OPERATION**

Deflection Factors — Same as Vertical System, with VAR VOLTS/DIV in calibrated deflect.

Maximum Error

<table>
<thead>
<tr>
<th>Range</th>
<th>Y-Axis</th>
<th>X-Axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>0°C to +15°C</td>
<td>±2%</td>
<td>±3%</td>
</tr>
<tr>
<td>+15°C to +50°C</td>
<td>±2%</td>
<td>±3%</td>
</tr>
<tr>
<td>+35°C to +90°C</td>
<td>±2%</td>
<td>±3%</td>
</tr>
</tbody>
</table>

X-Axis — 3dB Bandwidth — 3 MHz or more.

Phase Difference Between X and Y — <3°

CURSOR AND FRONT PANEL DISPLAY

Controls — Separate A Intensity, B Intensity, Readout Intensity, Focus, Beam Finder, Trace Rotation, and Scale Illumination.

CRT — 8 x 10 cm internal graticule. Markings: 8 major div vertically and 10 major div horizontally, with auxiliary markings.

Standard Phosphor — GH (P31).

Y-Axis Orthogonality — ±0.1 div over eight vertical div; no adjustment.

Cursor Functions — (2246)

<table>
<thead>
<tr>
<th>Function</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEC, 1/SEC, PHASE, ΔTIME, ΔY/ΔX, PHASE</td>
<td>±0.5% of reading +0.02 horizontal div</td>
</tr>
<tr>
<td>VOLTS, GND VOLTS</td>
<td>±0.5% of reading +0.02 vertical div + 0.02 div + HF display errors</td>
</tr>
</tbody>
</table>

**PHYSICAL CHARACTERISTICS**

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>mm</th>
<th>in</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width, With handle</td>
<td>361</td>
<td>14.2</td>
</tr>
<tr>
<td>Height</td>
<td>177</td>
<td>7.0</td>
</tr>
<tr>
<td>With feet and pouch</td>
<td>164</td>
<td>6.4</td>
</tr>
<tr>
<td>Without pouch</td>
<td>145</td>
<td>5.7</td>
</tr>
<tr>
<td>Depth</td>
<td>175</td>
<td>6.9</td>
</tr>
<tr>
<td>With front cover</td>
<td>159</td>
<td>6.3</td>
</tr>
<tr>
<td>With handle extended</td>
<td>20.4</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>kg</td>
<td>lb</td>
</tr>
</tbody>
</table>

| Net With accessories and pouch | 8 | 1.9 |
| Without accessories and pouch | 7 | 1.7 |

**EXTERNAL Z-AXIS INPUT**

Active Region Lower Threshold — <1.8 V.

Signal Required to Blank Swept-Related Trace — >3.8 V.

Input Resistance to Ground — 10 kΩ ± 10%.

Maximum Input Voltage — 30 V (dc + peak ac) or <30 V ac p-p at 1 kHz.

**CALIBRATOR OUTPUT**

Voltage Into 1 MD Load — 0.5 V ± 2%.

Repetition Range — 1 kHz ± 10%.

Overshoot — <0.1%.

**POWER REQUIREMENTS**

Line Voltage Range — 90 V to 250 V.

Line Frequency — 48 Hz to 445 Hz.


Maximum Power Consumption — 80 W (110 V ac).

**ENVIRONMENTAL**

Environmental requirements qualify the electrical and mechanical specifications. When not rack-mounted, the instrument meets the environmental requirements of MIL-T-28800C for Type III, Class 5, Style D equipment.

Ambient Temperature — Operating: 0°C to +50°C. Nonoperating: −50°C to −75°C.

Altitude — Operating: To 1500 m (50,000 ft). Nonoperating: To 1500 m (50,000 ft).

Vibration — Operating: 15 minutes along each of three axes, 0.015 inch p-p displacement. 10 Hz to 55 Hz in one minute sweeps. 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-2880C, Paragraph 4.5.5.1.2.2 for Type III, Class 5.

Shock — Operating and Nonoperating: 30 g, half sine, 11 ms duration; three shocks on each face, for a total of 18 shocks.

**Bench Handling Test** — 4 inch drop per Tektronix Standard 062-2868-00.

Transportation Drop and Vibration — Meets the limits of Tektronix Standard 062-2868-00.

**WARRANTY-PLUS SERVICE PLANS**

**OPTIONAL ACCESSORIES**

**RECOMMENDED PROBES**

See Probe Section for additional probes, page 464.