Table 6-1
2465A/2455A/2445A Electrical Characteristics

Characteristics	Performance Requirements
VERTICAL DEFLECTION SYSTEM—CHANNEL 1 AND CHANNEL 2	
Deflection Factor	
Range	2 mV/division to 5 V/division in a 1-2-5 sequence of 11 steps.
Accuracy	1 MΩ input, noninverted.
+15°C to +35°C	
On-Graticule Accuracy	Within ±2% at any VOLTS/DIV setting for a four or five-division signal centered on the screen.
ΔV Accuracy (using cursors over entire graticule area)	±(1.25% of reading +0.03 div + signal aberrations).
−15°C to +15°C and +35°C to +55°C	Add ±2% of reading.
50 Ω Coupling	Add ±1% of reading.
CH 2 Inverted	Add ±1% of reading.
ΔV Range	±8 × VOLTS/DIV setting.
V/DIV VARiable, noninverted	Continuously variable between VOLTS/DIV settings. Extends deflection factor to >12.5 V/division.
Frequency Response	Bandwidth is measured with a leveled, low distortion, 50-Ω source, sine-wave generator, terminated in 50 Ω. The reference signal amplitude is set at the lesser of 6 divisions or the maximum leveled amplitude. Bandwidth with probe is checked using a probe-tip-to-GR (017-0520-00) termination adapter. Bandwidth with external termination is checked using a BNC 50-Ω feed through terminator (011-0049-01).

Table 6-1 (cont)
2465A/2455A/2445A Electrical Characteristics

Characteristics	Performance Requirements
−3 dB Bandwidth	Using standard accessory probe or internal 50-Ω termination.
2465A	
+15°C to +35°C	Dc to 350 MHz.
−15°C to +15°C and +35°C to +55°C	Dc to 300 MHz.
2455A	
+15°C to +35°C	Dc to 250 MHz.
−15°C to +15°C and +35°C to +55°C	Dc to 200 MHz.
2445A	Dc to 150 MHz.
−4.7 dB Bandwidth	Using 50-Ω external termination on 1-MΩ input.
2465A	
−15°C to +35°C	Dc to 350 MHz.
+35°C to +55°C	Dc to 300 MHz.
2455A	
−15°C to +35°C	Dc to 250 MHz.
+35°C to +55°C	Dc to 200 MHz.
2445A	Dc to 150 MHz.
AC Coupled, Lower −3 dB Frequency	10 Hz or less.
With Standard Accessory Probe	1 Hz or less.
Step Response Rise Time	Calculated from $T_r = 0.35/BW$.
2465A	≤1 ns.
2455A	≤1.4 ns.
2445A	≤2.33 ns.
Channel Isolation	≥100:1 attenuation of deselected channel at 100 MHz; ≥50:1 at 350 MHz, for an eight-division input signal from 2 mV per division to 500 mV per division, with equal VOLTS/DIV settings on both channels.

Table 6-1 (cont)
2465A/2455A/2445A Electrical Characteristics

Characteristics	Performance Requirements
Displayed Channel 2 Signal Delay with Respect to Channel 1 Signal	Adjustable through a range of at least −500 ps to +500 ps.
Input R and C (1 MΩ)	
Resistance	1 MΩ ±0.5%.
Capacitance	15 pF ±2 pF.
Maximum Input Voltage ⚠	
DC, AC, or GND Coupled	400 V (dc + peak ac). 800 V p-p ac at 10 kHz or less.
Input R (50 Ω)	
Resistance	50 Ω ±1%.
VSWR	
2465A	
Dc to 300 MHz	≤1.3:1.
300 to 350 MHz	≤1.5:1.
2455A, 2445A	≤1:3:1 for dc to Nominal Bandwidth.
Maximum Input Voltage ⚠	5 V rms, averaged for 1 second; ±50 V peak.
Cascaded Operation	Channel 2 Vertical Signal Output into Channel 1 input; DC coupled using a 50-Ω RG-58C/U coaxial, with 1 MΩ DC or 1 MΩ AC Channel 1 input coupling; with Channel 1 and Channel 2 VOLTS/DIV set at 2 mV and 20 MHz bandwidth limit on.
Deflection Factor	200 μV per division ±10%.
CMRR (ADD Mode with Channel 2 inverted)	At least 20:1 at 50 MHz for common-mode signals of eight divisions or less, with VAR VOLTS/DIV control adjusted for best CMRR at 50 kHz, at any VOLTS/DIV setting.

Table 6-1 (cont)
2465A/2455A/2445A Electrical Characteristics

Characteristics	Performance Requirements
VERTICAL DEFLECTION SYSTEM—CHANNEL 3 AND CHANNEL 4	
Deflection Factors	
Values	100 mV and 500 mV per division.
Accuracy	Within ±10%.
Frequency Response	Bandwidth is measured with a leveled, low distortion, 50-Ω source, sine-wave generator, terminated in 50 Ω. The reference signal amplitude is set at the lesser of 6 divisions or the maximum leveled amplitude. Bandwidth with external termination is checked with a 4 division reference signal amplitude. Bandwidth with probe is checked using a probe-tip-to-GR (017-0520-00) termination adapter. Bandwidth with external termination is checked using a BNC 50-Ω feed through terminator (011-0049-01).
— 3 dB Bandwidth	Using standard accessory probe.
2465A	
+15°C to +35°C	Dc to 350 MHz.
−15°C to +15°C and +35°C to +55°C	Dc to 300 MHz.
2455A	
+15°C to +35°C	Dc to 250 MHz.
−15°C to +15°C and +35°C to +55°C	Dc to 200 MHz.
2445A	Dc to 150 MHz.

Table 6-1 (cont)
2465A/2455A/2445A Electrical Characteristics

Characteristics	Performance Requirements
−4.7 dB Bandwidth	Using 50-Ω external termination.
2465A	
+15°C to +35°C	Dc to 350 MHz.
−15°C to +15°C and +35°C to +55°C	Dc to 300 MHz.
2455A	
+15°C to +35°C	Dc to 250 MHz.
−15°C to +15°C and +35°C to +55°C	Dc to 200 MHz.
2445A	Dc to 150 MHz.
Step Response Rise Time	Calculated from $T_r = 0.35/BW$.
2465A	≤1 ns.
2455A	≤1.4 ns.
2445A	≤2.33 ns.
Channel Isolation	≥50:1 attenuation of deselected channel at 100 MHz with an 8-division input signal.
Signal Delay Between Channel 1 and Either Channel 3 or Channel 4	Within ±1.0 ns, measured at the 50% points.
Input Resistance	1 MΩ ±1%.
Input Capacitance	15 pF ±3 pF.
Maximum Input Voltage ⚠	400 V (dc + peak ac). 800 V p-p ac at 10 kHz or less.
VERTICAL DEFLECTION SYSTEM—ALL CHANNELS	
Low-frequency Linearity	0.1 division or less compression or expansion of a two-division, center-screen signal when positioned anywhere within the graticule area.
Bandwidth Limiter	Reduces upper 3 dB bandpass to a limit of 13 MHz to 24 MHz.

Table 6-1 (cont)
2465A/2455A/2445A Electrical Characteristics

Characteristics	Performance Requirements
Vertical Signal Delay	At least 30 ns of the sweep is displayed before the triggering event is displayed at any SEC/DIV ≥10 ns/div. At 5 ns/div, at least 10 ns of the sweep is displayed before the triggering event.
Chopped Mode Switching Rate	With displayed SEC/DIV in the 20 μs to 2 μs/div range, the switching rate is 2.5 MHz ±0.2%. Otherwise, the switching rate is 1 MHz ±0.2%. The display cycle rate equals the chop switching rate divided by the number of channels displayed. The chop switching rate is modulated slightly to minimize waveform breaks with repetitive signals.
TRIGGERING	
Minimum P-P Signal Amplitude for Stable Triggering from Channel 1 or Channel 2 Source	
2465A and 2455A	
DC Coupled	0.35 division from dc to 50 MHz; increasing to 1.0 division at 300 MHz and 1.5 divisions at 500 MHz.
NOISE REJ Coupled	≤1.2 divisions from dc to 50 MHz; increasing to 3 divisions at 300 MHz and 4.5 divisions at 500 MHz.
AC Coupled	0.35 division from 60 Hz to 50 MHz; increasing to 1.0 division at 300 MHz and 1.5 divisions at 500 MHz. Attenuates signals below 60 Hz.
HF REJ Coupled	0.5 division from dc to 30 kHz.
LF REJ Coupled	0.5 division from 80 kHz to 50 MHz; increasing to 1.0 division at 300 MHz and 1.5 divisions at 500 MHz.
2445A	
DC Coupled	0.35 division from dc to 50 MHz; increasing to 1.5 divisions at 250 MHz.
NOISE REJ Coupled	≤1.2 divisions from dc to 50 MHz; increasing to 4.5 divisions at 250 MHz.

Table 6-1 (cont)
2465A/2455A/2445A Electrical Characteristics

Characteristics	Performance Requirements
AC Coupled	0.35 division from 60 Hz to 50 MHz; increasing to 1.5 divisions at 250 MHz. Attenuates signals below 60 Hz.
HF REJ Coupled	0.5 division from dc to 30 kHz.
LF REJ Coupled	0.50 division from 80 kHz to 50 MHz; increasing to 1.5 divisions at 250 MHz.
Minimum P-P Signal Amplitude for Stable Triggering from ADD Source	Add 0.5 division to CH 1 or CH 2 requirement at 300 MHz and 500 MHz for 2465A and 2455A.
Minimum P-P Signal Amplitude for Stable Triggering from CH 3 or CH 4 Source	0.5 × CH 1 or CH 2 requirement.
Minimum P-P Signal Amplitude for Stable Triggering from Composite, Multiple Channel Source, ALT Vertical Mode	Add 1 division to the single-channel source specification. Checked at 50 mV per division.
Maximum P-P Signal Rejected by NOISE REJ COUPLING Signals Within the Vertical Bandwidth	
CH 1 or CH 2 SOURCE	⩾0.4 division for VOLTS/DIV settings of 10 mV/div and higher. Maximum noise amplitude rejected is reduced at 2 mV/div and 5 mV/div.
CH 3 or CH 4 SOURCE	⩾0.2 division.
Jitter	
2465A	⩽50 ps with 5 divisions of 300 MHz at 500 ps/division.
2455A	⩽50 ps with 5 divisions of 250 MHz at 1 ns/division.
2445A	⩽100 ps with 5 divisions of 150 MHz at 1 ns/division.
LEVEL Control Range	
CH I or CH 2 SOURCE	±18 × VOLTS/DIV setting.
CH 3 or CH 4 SOURCE	±9 × VOLTS/DIV setting.

Table 6-1 (cont)
2465A/2455A/2445A Electrical Characteristics

Characteristics	Performance Requirements
LEVEL Readout Accuracy	For triggering signals with transition times greater than 20 ns.
CH 1 or CH 2 SOURCE	
+15°C to +35°C	Within ±[3% of reading + 3% of p-p signal + 0.2 division + 0.5 mV + (0.5 mV × probe attenuation factor)] with Vertical Input at 1 MΩ DC, CH 2 Source Not Inverted, and Trigger DC Coupled.
−15°C to +35°C and +35°C to +55°C	Add 1.5 mV × probe attenuation to +15°C to +35°C specification.
50 Ω Input	Add ±1% to 1 MΩ input specification.
CH 2 Inverted	Add ±1% of reading to non-inverted specification.
NOISE REJ Coupled	Add ±0.6 division to DC Coupled specifications.
CH 3 or CH 4 SOURCE	Within ±[3% of reading + 4% of p-p signal + 0.1 division + (0.5 mV × probe attenuation factor)] and Trigger DC Coupled.
NOISE REJ Coupled	Add ±0.3 division to the DC Coupled specification.
AUTO LVL Mode Maximum Triggering Signal Period	
A SEC/DIV Setting	
<10 ms	At least 20 ms.
10 ms to 50 ms	At least four times the A-SEC/DIV setting.
>50 ms	At least 200 ms.
AUTO Mode Maximum Triggering Signal Period	
A-SEC/DIV Setting	
<10 ms	At least 80 ms.
10 ms to 50 ms	At least 16 times the A-SEC/DIV setting.
>50 ms	At least 800 ms.

Table 6-1 (cont)
2465A/2455A/2445A Electrical Characteristics

Characteristics	Performance Requirements
AUTO LVL Mode Trigger Acquisition Time	Eight to 100 times the AUTO LVL Mode maximum triggering signal period, depending on the triggering signal period and waveform.
Trigger Holdoff	
Minimum	The greater of the A-SEC/DIV setting value or 2 μs, within +33% to −10%, except 1 μs at 5 ns/div.
Variable	Increases trigger holdoff time to 10 to 25 times the minimum holdoff.
SLOPE Selection	Conforms to trigger-source waveform or ac power-source waveform.
HORIZONTAL DEFLECTION SYSTEM	
A Sweep Time Base Range	
2465A	500 ms/div to 5 ns/div in a 1-2-5 sequence of 25 steps. X10 MAG extends maximum sweep rate to 500 ps/div.
2455A and 2445A	500 ms/div to 10 ns/div in a 1-2-5 sequence of 24 steps. X10 MAG extends maximum sweep rate to 1 ns/div.
B Sweep Time Base Range	
2465A	50 ms/div to 5 ns/div in a 1-2-5 sequence of 22 steps. X10 MAG extends maximum sweep rate to 500 ps/div.
2455A and 2445A	50 ms/div to 10 ns/div in a 1-2-5 sequence of 21 steps. X10 MAG extends maximum sweep rate to 1 ns/div.
Timing Accuracy	+15°C to +35°C, A-Sweep, with SEC/DIV at 100 ms/div or faster.
Sweep Accuracy Unmagnified	±(0.7% of time interval + 0.6% of full scale).
Δt Accuracy With Cursors, Unmagnified	±(0.5% of time interval + 0.3% of full scale).
Δt Accuracy with Sweep Delay	±(0.3% of time interval + 0.1% of full scale).
Delay Accuracy, A Sweep Trigger to Start of B Sweep	±(0.3% of delay setting + 0.6% of full scale) +0 to −25 ns.
B-Sweep Accuracy and Δt Accuracy with Cursors on B Sweep	Add ±0.3% of time interval to A-Sweep specifications.

Table 6-1 (cont)
2465A/2455A/2445A Electrical Characteristics

Characteristics	Performance Requirements
X10 MAG Accuracy	Add ±0.5% of time interval to unmagnified Sweep and Δt Cursors specifications. Exclude the first 0.5 division after the sweep starts (the first 0.5% of the full 100 division sweep).
500 ms or 200 ms/div Timing Accuracy (A Sweep only)	Add ±0.5% of interval to specifications for A SEC/DIV at 100 ms or faster.
SEC/DIV VAR Timing Accuracy	Add 2% of time interval to sweep accuracy specifications when VAR is out of detent.
Timing Accuracy (−15°C to +15°C and +35°C to +55°C)	Add ±0.2% of time interval to all Δt and delay specifications. Add ±0.5% of interval to sweep accuracy specification.
Δt Readout Resolution	
2465A	Greater of either 10 ps or 0.025% of full scale.
2455A, 2445A	Greater of either 20 ps or 0.25% of full scale.
Δt Range	±10 times A-SEC/DIV setting with Cursors, ±9.95 times A-SEC/DIV setting with Sweep Delay.
Sweep Delay Range	0 to 9.95 times the A SEC/DIV setting, from 500 ms to 10 ns with 2465A, or 500 ms to 20 ns with the 2455A and 2445A. A-Sweep triggering event is observable on B Sweep with zero delay setting for A SEC/DIV settings 50 μs or faster.
Delay Jitter	Within 0.004% (one part or less in 25,000) of the maximum available delay, plus 50 ps.
X10 MAG Registration	Within 0.5 division from graticule center at 1 ms SEC/DIV setting (X10 MAG on to X10 MAG off).
Horizontal POSITION Range	Start of 1 ms per division sweep can be positioned from right of graticule center to at least 10 divisions left of graticule center. Some portion of 1 ms per division sweep is always visible with X10 MAG off.

Table 6-1 (cont)
2465A/2455A/2445A Electrical Characteristics

Characteristics	Performance Requirements
X-Y Operation	
X-Axis Deflection Factor Range, Variable, and Input Characteristics	Same as Channel 1.
Deflection Factor Accuracy	Same as Channel 1.
X-Axis Bandwidth	Dc to 3 MHz.
Phase Difference Between X and Y with BW Limit Off	≤1° from dc to 1 MHz; ≤3° from 1 MHz to 2 MHz.
X-Axis Low-frequency Linearity	0.1 division or less compression or expansion of a two-division, center-screen signal when positioned within the graticule area.
DISPLAY	
Cursor Position Range	
Delta Volts (ΔV)	At least the center 7.6 vertical divisions.
Delta Time (Δt)	At least the center 9.6 horizontal divisions.
Graticule	
Size	80 mm X 100 mm.
Markings	8 major divisions vertically and 10 major divisions horizontally, with auxiliary markings.
Trace Rotation Range	Adequate to align trace with the center horizontal graticule line.

Table 6-1 (cont)
2465A/2455A/2445A Electrical Characteristics

Characteristics	Performance Requirements
Z-AXIS INPUT	
Sensitivity	
Dc to 2 MHz	Positive voltage decreases intensity; +2 V blanks a maximum intensity trace.
2 MHz to 20 MHz	+2 V modulates a normal intensity trace.
Input Resistance	9 kΩ ±10%.
Maximum Input Voltage ⚠	±25 V peak; 25 V p-p ac at 10 kHz or less.
SIGNAL OUTPUTS	
CALIBRATOR	With A SEC/DIV set to 1 ms.
Output Voltage and Current	0.4 V ±1% into a 1-MΩ load, 0.2 V ±1.5% into a 50-Ω load, or 8 mA ±1.5% into a short circuit.
Repetition Period	Two times the A SEC/DIV setting for SEC/DIV from 100 ns to 100 ms.
Accuracy	±0.1%, during sweep time.
CH 2 SIGNAL OUT	
Output Voltage	20 mV/division ±10% into 1 MΩ, 10 mV/division ±10% into 50 Ω.
Offset	±20 mV into 1 MΩ, when dc balance has been performed within ±5°C of the operating temperature.
A GATE OUT and B GATE OUT	
Output Voltage	2.4 V to 5 V positive-going pulse, starting at 0 V to 400 mV.
Output Drive	Will supply 400 μA during HI state; will sink 2 mA during LO state.

Table 6-1 (cont)
2465A/2455A/2445A Electrical Characteristics

Characteristics	Performance Requirements
AC POWER SOURCE	
Source Voltage	
Nominal Ranges	
115 V	90 V to 132 V.
230 V	180 V to 250 V.
Source Frequency	48 Hz to 440 Hz.
Fuse Rating	2 A, 250 V, AGC/3AG, Fast blow; or 1.6 A, 250 V, 5 × 20 mm Quick-acting.
Maximum Power Consumption (fully optioned instrument)	120 watts (180 VA).
Primary Circuit Dielectric Voltage Withstand Test	1500 V rms, 60 Hz for 10 seconds without breakdown.
Primary Grounding	Type test to 0.1 Ω maximum. Routine test to check grounding continuity between chassis ground and protective earth ground.