

# OSCILLOSCOPES & WAVEFORM ANALYZERS

## Digitizing Oscilloscopes (cont'd)

Models 54100A/D, 54110D

### Specifications - HP 54100A/D, HP 54110D

#### Inputs

	HP 54002A	HP 54001A	HP 54003A
	50 $\Omega$ input	1 GHz miniature active probe	1 M $\Omega$ input, with 10:1 probe attached
<b>Maximum input voltage</b>	5 V rms	20 V peak	20 V peak
<b>Coupling</b>	dc	dc	dc
<b>Input capacitance (nominal)</b>	N/A	2 pF	8 pF
<b>Input resistance (nominal)</b>	50 $\Omega$	10 k $\Omega$	1 M $\Omega$
<b>Bandwidth (-3dB)</b>	dc to 1 GHz	dc to 1 GHz	dc to 300 MHz
<b>Transition time (10% to 90%)</b>	$\leq 350$ ps	$\leq 350$ ps	$\leq 1.2$ ns
<b>System bandwidth with HP 54100A/D, 54110D (-3 dB)</b>	dc to 1 GHz	dc to 700 MHz	dc to 300 MHz
<b>System transition time with HP 54100A/D, 54110D (10% to 90%)</b>	$\leq 350$ ps	$\leq 400$ ps	$\leq 1.2$ ns
<b>Division ratio</b>	1:1	10:1 $\pm 3\%$	10:1 $\pm 3\%$

#### Vertical (Voltage)

The following apply when the HP 54100A/D is used with the HP 54002A 50 ohm input pod.

**Bandwidth (-3 dB):** dc to 1 GHz; these specifications apply over ambient temperature range of +15° C to +35° C.

**Transition time (10% to 90%):**  $\leq 350$  ps

**Deflection factor (full-scale=8 divisions):** 10 mV/div to 1 V/div in 1-2-5 steps.

**DC accuracy, single voltage marker:**  $\pm 3\%$  of full-scale  $\pm 2\%$  of offset; when driven from a 50 ohm source.

**DC delta voltage accuracy using voltage markers on the same channel:**  $\pm 1\%$  of full-scale  $\pm 3\%$  of reading, when driven from a 50 ohm source.

#### DC Offset

**Range:**  $\pm 1.5 \times$  full-scale (referenced to center screen).

**Magnifier:** expands displayed signal vertically from 1 to 16 times; adjustable in 0.5% steps.

**Inputs:** two inputs, configurable with HP 54000-series pods.

#### Horizontal (Time)

**Deflection Factor (full-scale is 10 divisions):** 100 ps/div to 1 sec/div.

#### Delay (Time Offset)

**Pre-trigger range:** up to -200 ms or -10 divisions, whichever is greater.

**Post-trigger range:** up to +1 second or +10 divisions, whichever is greater.

#### Time Base Accuracy

**Single-channel:**  $(100 \text{ ps} \pm 2 \times 10^{-5} \times \text{delta T reading})$

**Channel-to-channel:**  $(200 \text{ ps} \pm 2 \times 10^{-5} \times \text{delta T reading})$

**RMS Jitter:**  $(50 \text{ ps} + 5 \times 10^{-7} \times \text{delay setting})$

#### Trigger

The following apply when the HP 54100A/D, 54100D is used with the HP 54002A 50 ohm input pod.

Trigger Source	Vertical Channel 1 or 2	Trigger Input 3 (HP 54100D, 54110D; Trig In 3 or 4)
<b>Trigger level range</b>	$\pm 2 \times$ full-scale	$\pm 2$ V
<b>Trigger sensitivity</b> dc to 100 MHz 100 to 500 MHz	0.12 $\times$ full-scale 0.24 $\times$ full-scale	40 mV 50 mV

**Trigger Source:** channel 1, channel 2, trigger 3 input (HP 54100D/54110D, trigger 4 input).

**Trigger 3 Input (HP 54100D, 54110D, trigger 4 input):** configurable with HP 54000-series pods.

#### Operating Characteristics

##### Digitizer

**Resolution:** 7 bits (1 part in 128).

Effective resolution can be extended up to approx 10 bits by using magnification and averaging.

**Digitizing rate:** up to 40 megasamples/s. Vertical

**input protection:** a relay opens when applied voltage exceeds rated input for input pod in use (see "Inputs").

##### Horizontal

**Delay between channels:** difference in delay between channels can be nulled out in 10 ps steps up to 10 ns to compensate for differences in input cables or probe length.

**Reference location:** the reference point can be located at the left edge, center, or right edge of the display. The reference point is that point where the time is offset from the trigger by the delay time.

##### Display

**Data display resolution:** 500 points horizontally by 256 points vertically.

##### Data display formats

Split screen: each channel display is four divisions high.

Full screen: the 2 channels are overlaid. Each channel display is eight div high.

##### Display modes

**Variable persistence:** the time that each data point is retained on the display can be varied from 200 ms to 10 seconds, or it can be displayed indefinitely.

**Averaging:** the number of averages can be varied from 1 to 2048 in powers of 2. On each acquisition,  $1/n$  times the new data is added to  $(n-1)/n$  of the previous value at each time coordinate. Averaging operates continuously; the average does not converge to a final value after  $n$  acquisitions.

**Graticules:** full grid, axes with tic marks, or frame with tic marks.

**Display colors (HP 54110D):** a default color selection is set up in the instrument. Different colors are used for display background, channel 1/ function 1, channel 2/ function 2, background and highlighted text, advisories, markers, and memories. If desired, the user may change the colors used from the front panel or over the HP-IB.

##### Ordering Information

	Price
HP 54100A	\$12,900
HP 54100D	\$17,600
HP 54110D color display	\$21,900

##### Input Pods And Probes

HP 54001A 1 GHz miniature active probe pod	\$765
HP 54002A 50 ohm BNC input pod	\$130
HP 54003A 1-megohm, 10:1 probe pod	\$665