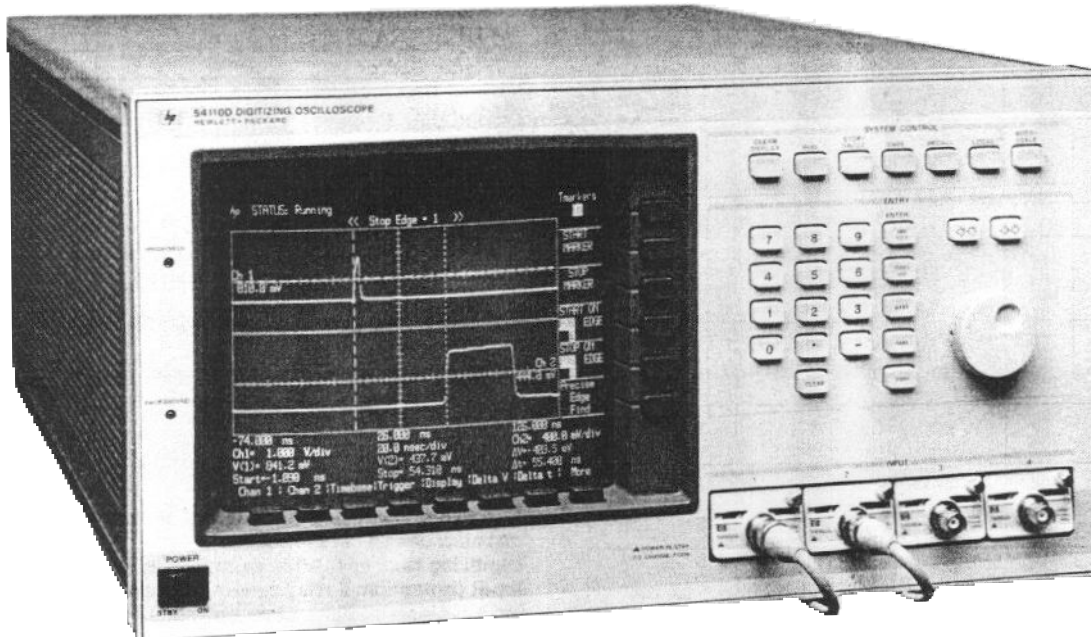


- 1 GHz bandwidth
- Auto pulse parameter and time interval measurements
- Digital storage
- Available with color or monochrome display
- Pre-trigger viewing
- Logic triggering capability



HP 54110D



HP 54100A/D and HP 54110D

As the speeds of analog and digital logic continue to increase, board and system designers need to pay even closer attention to high-frequency and transmission-line characteristics of their circuits. Design requirements are rigorous. Subnanosecond technology creates narrow and elusive pulses.

High Bandwidth

The HP 54100/110 unite a powerful 1 GHz bandwidth with a random repetitive sampling technique for viewing rarely occurring narrow waveforms. With a 40 megasample/second single-shot digitizing rate and an effective digitizing rate of 100 gigasamples/second, these oscilloscopes yield 0.002% time base accuracy, 50 ps aperture jitter, and 10 ps resolution for confident measurements of critical timing parameters in high-speed circuitry.

With random repetitive sampling, you can capture waveforms that occur thousands of screen diameters before the trigger event. This gives an effective memory depth of millions of bytes for finding causes of failures that occur long before the trigger.

High Resolution

Analyze perturbations within a waveform with high resolution. With vertical magnification and waveform averaging, small signal details can be viewed and measured with 10 bits of effective resolution.

Flexible Analysis

Only the HP 54100A/D and HP 54110D allow the display of either vertical channel versus the other. The 1 GHz bandwidth makes this feature valuable in measuring high-speed I-V device characteristics and transfer functions high-speed converters.

The HP 54100A/D

When a monochrome display is preferred, for example in a totally automatic test application, choose the HP 54100A or HP 54100D

oscilloscope. These units require less rack height (7") than the HP 54110D (8.75") and have all of the same measurement features and specifications. The HP 54100A has one external trigger input, while the HP 54100D and HP 54110D have two.

The HP 54100M

In non-commercial applications when compatibility with the U.S. Air Force MATE (Modular Automatic Test Equipment) program is needed, contact Hewlett-Packard for information concerning the HP 54100M oscilloscope. The HP 54100M implements automatic test features of the HP 54100A through an internal TMA (Test Module Adapter). The HP 54100M is CILL (Control Interface Intermediate Language) compatible and includes most of the same features as the HP 54100A.

A Choice of Input Pods and Probes

The HP 54100/110 inputs are configured with removable pods that can be chosen according to the application. Pods can be changed quickly and easily, and they occupy a minimum of storage space.

- 50 ohm inputs and probes for a wide variety of environments, without the expense of amplifier plug-ins.
- 1 GHz miniature active probes for densely packed, high-speed logic circuits.
- 1 Mohm probes for circuits sensitive to resistive loading.
- 50 ohm BNC inputs for measurements where terminated lines are important.
- 100:1 probes for extended dynamic range.

For more information on the HP 54100/110's probing system, please refer to page 75.

OSCILLOSCOPES & WAVEFORM ANALYZERS

Digitizing Oscilloscopes (cont'd) Models 54100A/D,

Specifications - HP 54100A/D, HP 54110D

Inputs

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

HP 54100A

HP 54100D

HP 54110D color display

Input Pods And Probes

HP 54001A 1 GHz miniature active probe pod

HP 54002A 50 ohm BNC input pod

HP 54003A 1-megohm, 10:1 probe pod