

OSCILLOSCOPES

& WAVEFORM ANALYZERS

Digitizing Oscilloscopes

HP 54111D

- 2 Gigasample/second, one channel when used with HP 54114A
- 500 MHz repetitive bandwidth

- 8k memory depth
- HP PaintJet printer color output

HP 54111D: High-speed General-Purpose Scope

The HP 54111D can be configured as a 2 gigasample/second (2 GSa/s), one channel oscilloscope or as a two channel 1 gigasample/second oscilloscope with a memory depth of 8k samples per channel. The HP 54111D retains all of the key features and user friendliness of the HP 54100/110 oscilloscopes, such as automatic measurements, autoscaling, cursors, and a color display. Plus, the HP 54111D adds features necessary for controlling and managing the added memory depth, such as scroll, zoom, and memory bar.

Key Contribution.

- 2 gigasamples/second digitizing rate (maximum)
- 500 MHz bandwidth
- 8k memory per channel
- Up to eight bits of vertical resolution with bandwidth limits
- Two channels of simultaneous capture at up to 1 GSa/s
- Pre-trigger information
- Automatic measurements
- Fully HP-ID programmable
- Advanced logic triggering capabilities
- Instant hard-copy output

Memory Bar Simplifies Data Viewing

The HP 54111D provides 8k samples of memory per channel. This results in a minimum of 16 screens of waveform information in single-shot acquisitions. To simplify management of all this data, the HP 54111D displays a memory bar. The memory bar is displayed along the top edge of the graticule and shows the portion of memory being viewed relative to the entire memory record. In addition, the trigger point is also shown along the memory bar.

General-purpose to Special Applications

With a 2 gigasample/second digitizing rate, the HP 54111D gives you the fastest sampling rate available in a general-purpose digitizing oscilloscope. However, the HP 54111D is much more than an instrument for capturing fast single-shot transients. With random repetitive sampling, this instrument provides a bandwidth of 500 MHz for high-speed circuit design and test.

In addition to its single-shot and repetitive capabilities, the HP 54111D provides flexible input coupling with a wide dynamic range for viewing and analyzing a variety of signals. Use this scope for just about any general-purpose application from very slow to very high-speed repetitive or non-repetitive waveforms.

Ultra high digitizing rate

No longer do you need a manual analog storage oscilloscope to capture high-speed single-shot phenomena found in:

- high-speed pulse analysis
- nuclear test studies
- plasma discharge
- high voltage arcing
- high frequency bursts

All these single-shot events can be captured easily at 2 GSa/s, with 4 JLS of data stored for review and analysis. (8 JLS over HPID).

High-speed ECL design

Non-repetitive glitches appearing on the clock signal can be captured easily with the 500 MHz single-shot performance of the HP 54111D with the HP 54114A two-gigasample/second test set. Four JLS of pre-trigger data is invaluable for determining the cause of the glitch.

High-speed semiconductor design

Single-shot performance of 500 MHz permits you to measure the outputs from latches (one-time events for multiple clock periods in ECL circuits).

Laser and high-energy research

Photo detector pulses can be measured with single-shot capture using the 2 GHz sampling rate and built-in automatic measurements. Infinite persistence can also be used to show and measure maximum variations of the waveform to the 500 MHz bandwidth.

The HP 54111D's two simultaneous 1 gigasample/second channels give you the single-shot performance of the most advanced analog storage oscilloscopes, but with all the advantages and ease of use of a digitizing oscilloscope. And with a staggered over-sampling technique, the HP 54111D provides this single-shot performance with up to eight bits of non-blooming vertical resolution.



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With a 1 gigasample/second digitizing rate, the HP 541110 captured this laser pulse single-shot.

Data communication.

Combine 2 gigasample/second (Gsa/s) digitizing rate with eight kbytes of memory depth per channel, for an invaluable tool for analyzing high-speed serial waveforms such as data communications or radar testing.

High bandwidth application.

Not only is the HP 54111D digitizing oscilloscope useful for single-shot phenomena, but it also samples repetitively, giving you 500 MHz bandwidth with high signal fidelity. Use this oscilloscope for general-purpose applications, from very slow to very high-speed repetitive or non-repetitive waveforms.

Computer-aided test.

The HP 54111D has many features that make it an excellent tool in computer-aided test. Its repetitive bandwidth and digitizing rate allow it to cover a wide range of automatic measurement applications. In addition, this instrument has many features that enhance test throughput time, such as built-in automatic measurements, fast acquisition cycles, and deep memory.

Input range and conditioning

The HP 54111D has the widest input dynamic range and coupling capabilities of any HP digitizing oscilloscopes. The input sensitivity can be set from 1 mV/div to 5 V/div. All input coupling is internal and programmable. The selections include: ac, dc, 1 MO, 500, and ground. These input signal conditioning features make the HP 54111D more general-purpose for the circuit designer and test engineer.

HP 54111 D Specification.

Vertical (volts/div)	Single-shot		Repetitive
	2 channel	1 channel with HP 54114A	
Channel			
Bandwidth	250 MHz	500 MHz	500 MHz
Transition time	1.4 ns	700 ps	700 ps
Vertical resolution	8 bits/25 MHz, 7 bits/100 MHz 6 bits/250 MHz	8 bits/50 MHz 7 bits/200 MHz 6 bits/500 MHz	6 bits, 8 bits with averaging

Input coupling:	ac/dc/de-500/ground
Input Impedance:	1 MΩ at 6.5 pF or 50 Ω (dc)
Maximum input voltage	IMO: ± 40V lde + peakael 500: sVrms
Horizontal (time)	
Digitizing rate	1 Gsa/sto 50 Sa/s
Deflection factor	s00ps/divto 1 s/div
Memory depth per channel	8k (Sps at 1Gsa/s), single shot only
Delay range (pre-trigger)	-8jia s0jS/divand less, increasinglo -160s all s/div
Delay range (post-trigger)	0.16s at 0.sjS/divand less, increasinglo 10,000sal 1 s/div

Time measurement accuracy

single channel	single-shot .300ps.0.03% of reading	repetitive .100ps .0.03% of reading
dual channel	.600ps.0.03% of reading	.200ps .0.03% of reading

Triggering	Internal	External
Source	channels, 2	inputs, 3, 4
Sensitivity		
dc to 200MHz	0.1 X full scale ¹	1mV (1:1)
200MHz to 500MHz	0.2 X full scale ¹	45mV (1:1)
Trigger level range	.3 X full scale	.1V (1:1)
Input resistance	not applicable	1 MΩ Maximum
Input voltage	not applicable	.10V lde + peakael Input
Operating range	not applicable	.1V (1:1) ldc + peakael

¹Raw Data

²When calibrated to probe tip using front panel calibration source. Applies to major ranges (5 mV/div, 10 mV/div, 20 mV/div, 50 mV/div, 100 mV/div, 200 mV/div, 500 mV/div, 1 V/div, and 2 V/div). All continuous settings between the ranges are 3% of full-scale.

³Applies to settings 5 mV/div and above.

Vertical gain $\pm 2\%$ of full-scale

accuracy
dc offset accuracy $\pm 1.5\%$ of setting

Measurement accuracy
single data point $\pm \text{gain accuracy} \pm \text{offset accuracy} \pm \text{resolution}$
between data points on the same waveform $\pm \text{gain accuracy} \pm 2 \times \text{resolution}$

dc offset range: ± 200 mV (1 mV/div to 4.9 mV/div)
 ± 1 V (5 mV/div to 49 mV/div)
 ± 10 V (50 mV/div to 0.49 V/div)
 ± 100 V (0.5 V/div to 5 V/div)

