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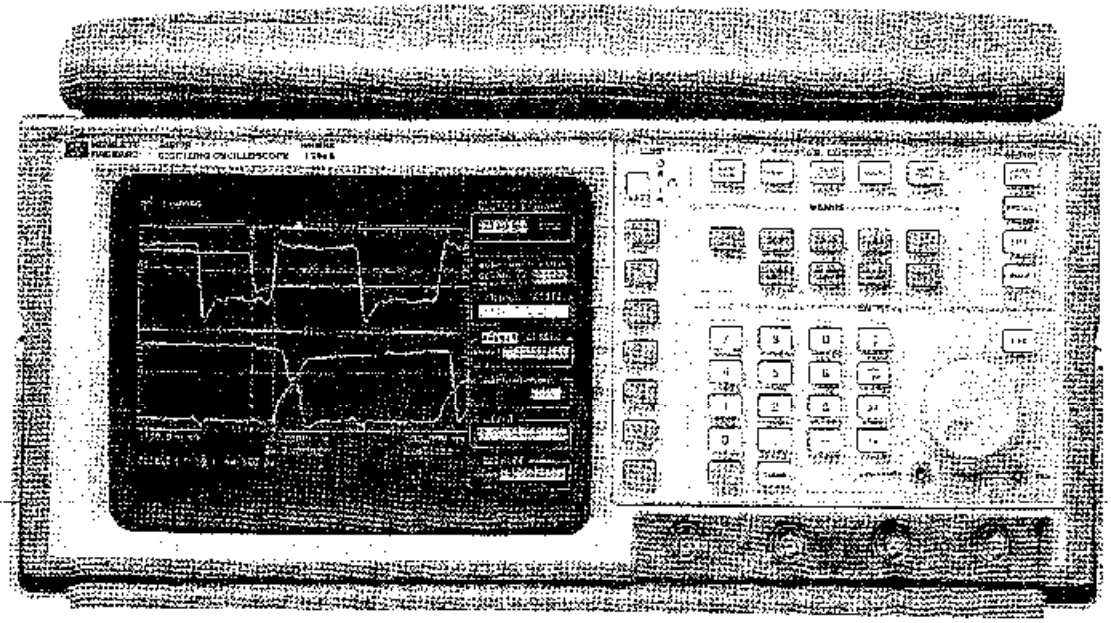
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OSCILLOSCOPES

General-Purpose Oscilloscopes

HP 54501A, 54503A, 54504A, 54505B, 54506B, 54510B, 54512B



HP 54501A, 54503A, 54504A, 54505B, 54506B, 54510B, 54512B

NEW

DESIGNED FOR HP-IB SYSTEMS

HP 54500 Family of Digitizing Oscilloscopes

The HP 54500 Series of digitizing oscilloscopes offers you the performance you need at a price you can afford. The HP 54500 Series has features and functions that were previously available only in considerably higher-priced instruments. Like HP's other digitizing oscilloscopes, the HP 54500 Series offers features such as autoscale, pushbutton hard copy, automatic measurements, nonvolatile setup and waveform memories, and full HP-IB programmability. In addition, the new HP 54505B, 54506B, 54510B, and 54512B add features to help you get your job done quickly.

Reduce Hardware Design and Troubleshooting Time with HP 54500 Series Oscilloscopes

These powerful oscilloscopes speed hardware design and debugging with performance to match your needs. HP's advanced logic triggering is a standard feature in the HP 54500 family. Use it to trigger on a wide variety of user-specified conditions. Trigger on edge, pattern, state, or trigger after delay to capture such elusive events as timing violations or transient bus phenomena. Some of the products within the HP 54500 family (see the table below) also offer glitch triggering to isolate and trigger on a glitch as narrow as 1.75 ns. To pinpoint infrequent events and determine their cause, use HP's advanced logic triggering in conjunction with up to four channels to quickly isolate anomalies. Triggering on an anomaly will allow you to probe other points within the system during the failure condition to understand the cause of the problem quickly.

Characterize Your Signals Accurately

Speed your characterization by using the automatic measuring capabilities offered by the HP 54500 family of oscilloscopes. You have a choice of 17 measurements based on standard or user-definable thresholds. Use measurement statistics to continuously display the maximum, minimum, and mean value for each measurement. Also available for characterization are the automask generator and waveform compare mode (see the table below). Put a reference waveform onscreen and have the scope build a pass-fail mask around it, with a test tolerance that you specify. Use the compare mode to test incoming waveforms against the mask. If the signal fails, the scope will store the failed waveform, with a time-date stamp, to either internal memory or an external printer or plotter. The fast Fourier transforms (FFTs) available on the new HP 54505B, 54506B, 54510B, and 54512B oscilloscopes are also useful tools for characterizing signals. With the high sample rate of these oscilloscopes, you can now analyze your signal by using a single-shot FFT.

If you are characterizing several events separated in time, the sequential single-shot capability allows you to capture the pulses without dead time in between. You can then analyze the pulses individually or all together in normal, averaged, or envelope mode.

The HP 54500 Series of Digitizing Oscilloscopes

	HP 54501A	HP 54503A	HP 54504A	HP 54505B/HP 54506B	HP 54510B/HP 54512B
Bandwidth					
Repetitive	100 MHz	500 MHz	400 MHz	300 MHz	300 MHz
Single shot	1 MHz	2 MHz	50 MHz	125 MHz	250 MHz
Sample rate	10 MSa/s	20 MSa/s	200 MSa/s	500 MSa/s	1 GSa/s
No. of channels	4 (2+2)	4	2	2/4	2/4
Memory/channel	501 samples	501 samples	2001 samples	8001 samples	8001 samples
Dual timebase window	Yes	Yes	Yes	No	No
Pan and zoom	No	No	No	Yes	Yes
Advanced logic trigger	Yes	Yes	Yes	Yes	Yes
Glitch trigger	No	No	No	Yes	Yes
Measurement limit test	Yes	Yes	Yes	Yes	Yes
Mask generator	No	No	No	Yes	Yes
Waveform compare	No	No	No	Yes	Yes
Sequential single shot	No	No	No	Yes	Yes
Automatic hard copy	Yes	Yes	Yes	Yes	Yes
See page no.	141	141	140	139	139

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HP 54505B, 54506B, 54510B, and 54512B Oscilloscopes

The HP 54510B and HP 54512B digitizing oscilloscopes have two and four channels, respectively, sampling all channels simultaneously at a maximum rate of 1 GSa/s with 8000 samples of memory depth per channel. The HP 54505B and HP 54506B have two and four channels, respectively, sampling all channels simultaneously at a maximum rate of 500 MSa/s with 8000 samples of memory depth per channel. These scopes retain all the key features and user friendliness of the other HP 54500 Series oscilloscopes. Many new features are included: FFTs, sequential single shot, glitch trigger, automatic mask generation, and waveform compare. These digitizing oscilloscopes are affordable, high-performance oscilloscopes for applications such as advanced hardware design and troubleshooting, high-energy research, and manufacturing test.

HP 54505B, 54506B, 54510B, and 54512B Specifications and Characteristics

Acquisition System

Maximum sample rate	HP 54510B, 54512B: 1 GSa/s on all channels HP 54505B, 54506B: 500 MSa/s on all channels
Record length	8001 points (real time) 501 points (repetitive)
Real-time bandwidth	HP 54510B, 54512B: 250 MHz HP 54505B, 54506B: 125 MHz
Resolution	8 bits (10 bits via HP-IB with averaging)

Vertical (Voltage)

Repetitive bandwidth	300 MHz
Number of channels (simultaneous acquisition)	HP 54506B, 54512B: 4 HP 54505B, 54510B: 2
Sensitivity[1]	1 mV/div to 5 V/div
dc gain accuracy	±1.25% of full scale
Input R (selectable)	1 MΩ ±1% or 50 Ω ±1%
Input C	7 pF nominal
Input coupling	ac, dc
Maximum input	1 MΩ: ±250 V (dc + peak ac (< 10 kHz)) 50 Ω: 5 V rms
Switchable bandwidth	ac-coupled lower: ≤10 Hz
Limits (−3 dB frequency)	LF reject: lower: 400 Hz Bandwidth: limit: 30 MHz
Channel to channel isolation (channels at equal sensitivity)	dc to 50 MHz: 40 dB 50 MHz to 300 MHz: 30 dB

Offset range	**Vertical sensitivity**	**Available offset**
	1 mV to 50 mV per division	±2 V
	> 50 mV to 250 mV per division	±10 V
	> 250 mV to 1.25 V per division	±50 V
	> 1.25 V to 5 V per division	±250 V

Offset accuracy	±(1% of channel offset + 2% of full scale)
Voltage measurement accuracy (dc)[2]	
Dual cursor	±[(1.25%)(full scale) + (0.032)(V per division)]
Single cursor	±[(1.25%)(full scale) + (offset accuracy) + (0.016)(V per division)]

Horizontal (Time)

Time base range	1 ns/div to 5 s/div
Resolution	20 ps
Δ Time accuracy	
Repetitive:	±[(0.005%)(Δ Time) + (2E-8)(delay setting) + (100 ps)]
Real time:[3]	HP 54510B, 54512B: ±[(0.005%)(Δ Time) + (2E-8)(delay setting) + (150 ps)] HP 54505B, 54506B: ±[(0.005%)(Δ Time) + (2E-8)(delay setting) + (300 ps)]

Delay range		
Post-trigger	10,000 × (s per division)	
Pre-trigger	**Time per division**	**Available delay**
	1 ns to 50 ns per division	
	HP 54510B, 54512B	−8 μs
	HP 54505B, 54506B	−16 μs
	100 ns to 5 s per division	−160 × (s per division)

Trigger

Sensitivity	
Internal	dc to 100 MHz: 0.5 division 100 MHz to 300 MHz: 1.0 division
External	HP 54505B, 54510B: 100 mVpp into 50 Ω
Pulse width (minimum)	
Internal	1.75 ns
External	2.8 ns
Level range	
Internal	±1.5 × full scale from center screen
External	±2 V

FFTs	**Frequency Range**[4]	**Frequency Resolution**
HP 54510B, 54512B	dc to 500 MHz	1.22 mHz to 1.95 MHz (real-time acquisition)
HP 54505B, 54506B	dc to 250 MHz	1.22 mHz to 975 kHz (real-time acquisition)
Displayed frequency	Display is from dc to a selectable upper frequency in steps from 5 Hz to 500 MHz (real-time acquisition) for the HP 54510B and HP 54512B and from 5 Hz to 250 MHz (real-time acquisition) for the HP 54505B and HP 54506B.	
Frequency accuracy	[(sample frequency/2)(8192) − (0.0001)(signal frequency)]	
Signal to noise	55–65 dB. Noise floor can be reduced by averaging the time domain waveform or increasing the number of points in the time record.	

[1] Magnification is used below 7 mV per division range. Below 7 mV per division full scale is defined as 56 mV.
[2] For bandwidth limited signals, t$_r$ = 1.4 × sample interval.
[3] FFT amplitude readings are affected by input amplifier roll-off above 300 MHz.

Ordering Information

The HP 54505B and 54510B digitizing oscilloscopes come with two HP 10431A 10:1 probes (10 MΩ) and the HP 54506B and 54512B come with four HP 10431A 10:1 probes (10 MΩ). All of these oscilloscopes come with a front-panel manual, a programming manual, a service manual, a miniature probe to BNC male adapter, a power cord, and a three-year warranty.

HP 54505B 500 MSa/s, Two-Channel Oscilloscope
HP 54506B 500 MSa/s, Four-Channel Oscilloscope
HP 54510B 1 GSa/s, Two-Channel Oscilloscope
HP 54512B 1 GSa/s, Four-Channel Oscilloscope
Opt 908 Rack-Mount Kit (HP p/n 5061-6175)
Opt 910 Additional Front Panel, Programming and Service Manuals
Opt 090 Delete two Probes (HP 54505B, 54510B)
Opt 096 Delete four Probes (HP 54506B, 54512B)

For the most current prices and product information, contact your local Hewlett-Packard sales office—see page 252.

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