OSCILLOSCOPES & WAVEFORM ANALYZERS
Digitizing Oscilloscopes

HP 54502A 400 MHz, 400 MSa/s Digitizing Oscilloscope

The HP 54502A is a 400 MHz, 400 MSa/s sample rate, 2-channel digitizing oscilloscope designed for both repetitive and single-shot signals. In repetitive mode, the HP 54502A has 400 MHz bandwidth. In real-time mode, its 400 MSa/s sample rate provides a single-shot bandwidth of 100 MHz. Like other members of the HP 54500 family, the HP 54502A has all of the digitizing advantages of oscilloscopes that are much higher in price. Its high repetitive/single-shot bandwidth, ease of use, HP-IB programmability, and HP 54500 family general-purpose features make it a powerful tool for both manual and automated test applications.

HP 54502A Specifications and Characteristics

	Real-time	Repetitive
Bandwidth: (-3 dB) dc-coupled	dc to 100 MHz	dc to 400 MHz[1,2]
Switchable bandwidth limits	ac-coupled lower -3 dB freq.: 90 Hz LF reject lower -3 dB freq.: 450 Hz Bandwidth limit: dc to 30 MHz	
Rise time[2]	3.5 ns	875 ps
Number of channels	2 (simultaneous)	
Vertical sensitivity range	2 mV/div to 5 V/div	
Vertical gain accuracy (dc)[3,4]	±2.0% of full scale	
Vertical resolution[4]	±1.6% of full scale (6 bit A/D) ±0.4% of full scale (8 bits with ≥8 averages)	
Maximum sample rate	400 MSa/s	25 MSa/s
Waveform record length[6]	normal: 501 points extended: 2001 points	time/div — Rec length 5 ns - 5 s/div — 501 pts 2 ns/div — 401 pts 1 ns/div — 201 pts
Input R (selectable)	1 MΩ ±1% or 50Ω ±1%	
Input C	7 pF nominal	
Input coupling	ac, dc	
Maximum input voltage	1 MΩ: ±250 V [dc + peak ac (< 10 kHz)] 50 Ω: 5 V rms	
Offset range	vertical sensitivity — available offset 2 mV - 50 mV/div — ±2 V >50 mV - 250 mV/div — ±10 V >250 mV - 1.25 V/div — ±50 V >1.25 V - 5 V/div — ±250 V	
Offset accuracy[4]	±(2 mV+2% of ch. offset+2.5% of full scale)	
Dynamic range	±1.5 x full scale from center of screen	
Channel-to-channel isolation	40 dB: dc to 50 MHz 30 dB: 50 to 100 MHz (with channels at equal sensitivity)	40 dB: dc to 50 MHz 30 dB: 50 to 400 MHz
Voltage measurement accuracy (dc)[3,4]		
Dual cursor	±(2.0% of full scale + 0.032 x V/div)	
Single cursor	±(2.0% of full scale + offset accuracy +0.016 x V/div)	
Time base range	1 ns/div to 5 s/div	
Time base reference accuracy	0.01%	
Maximum time base resolution	50 ps (maximum)	
Delta-t accuracy	±(2% x screen diameter + 0.01% x delta t + 500 ps)	±(2% x screen diameter + 0.01% x delta t + 250 ps)
Delay range (post-trigger)	Time/div setting — Available delay 50 ms - 5 s/div — 40 x (s/div) 100 µs - 20 ms/div — 1 s 1 ns - 50 µs/div — 10 000 x (s/div)	

	Real-time	Repetitive
Delay range (pre-trigger)	All time/div settings: 40 x (s/div)	Time/div setting — Available delay 1 µs-5 s/div — -40x(s/div) 10 ns-500 ns/div — -80 µs 1 ns-5 ns/div — -10 000x(s/div)
Triggering		
Trigger sensitivity[4]		
Internal		
dc to 100 MHz	0.5 div	0.5 div
100 MHz to 400 MHz	N/A	1 div
External		
dc - 250 MHz	100 mVp-p into 50 Ω	
Trigger pulse width (minimum)		
Internal	7.0 ns	1.75 ns
External	2.8 ns	2.8 ns
Trigger level range	Internal: ±1.5 x full scale from center of screen External: ± 2V	

Voltage: 115/230 V ac, -25% to +15%
350 VA maximum

Weight: Net: approximately 10 kg (22 lb). Shipping: approximately 20 kg (44 lb).
Size: 194.3H x 422.3W x 355.6mmD (7.65" x 16.62" x 14")
Does not include front panel protrusions

Specifications valid for temperature range ±10°C from software calibration temperature with eight or more averages selected.

[1]Upper bandwidth reduces by 2.5 MHz for each °C above +35°C.
[2]Rise times are calculated from:

$$t_r = \frac{0.35}{\text{bandwidth}}$$

[3]Vertical gain accuracy decreases 0.08% per °C from software calibration temperature.
[4]Expansion is used below 7 mV/div range so vertical resolution and accuracies are correspondingly reduced. Below 7mV/div full scale is defined as 56 mV.
[5]On time/div settings 1µs/div and slower, bandwidth in repetitive mode is 100 MHz
[6]Available over HP-IB waveform record length is:

Real-time -normal: 500 points, extended: 2000 points
Repetitive 10 ns - 5 s/div: 1024 pts
5 ns/div: 1000 pts
2 ns/div: 400 pts
1 ns/div: 200 pts

HP 54502A Telecommunications Mask Template Test Option

Make telecom mask template measurements to ANSI, CCITT, and ISDN standards without using Mylar overlays. HP 54502A option 001 automates many of the mask measurements that are time consuming with analog oscilloscopes. Pass-fail accuracy and repeatability are improved through use of automatic measurements eliminating human error.

HP 54502A Option 001 Features

- 15 standard telecom signal mask templates stored in ROM
- Positive and negative templates
- Automatic triggering on positive "isolated ones"[1] in live traffic for many standard telecom signals
- Automatic best-fit of test signals to positive mask templates
- Automatic pass-fail comparison of mask templates with corresponding input signals
- Automatic storage, printing or plotting of failed signals
- User-defined pass-fail tolerance
- Memory protection for user mask templates, waveforms and front panel setups

For more information on this option and a technical data sheet, contact your local HP Sales Office (see page 737).

[1]For the HP 54502A Opt. 001, the term "isolated ones" is defined as a pulse sequence of at least two zeros followed by a one followed by at least two zeros.

Ordering Information

The HP 54502A digitizing oscilloscope comes complete with two HP 10430A 10:1 10 MΩ probes, a front panel manual, a programming manual, a service manual, a miniature probe to BNC male adapter, a power cord, and three-year warranty.

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Opt 001 telecommunications mask template test option
Opt 908 rackmount kit (5061-6175)
Opt 910 additional front-panel, programming and service manual
Opt 090 delete probes