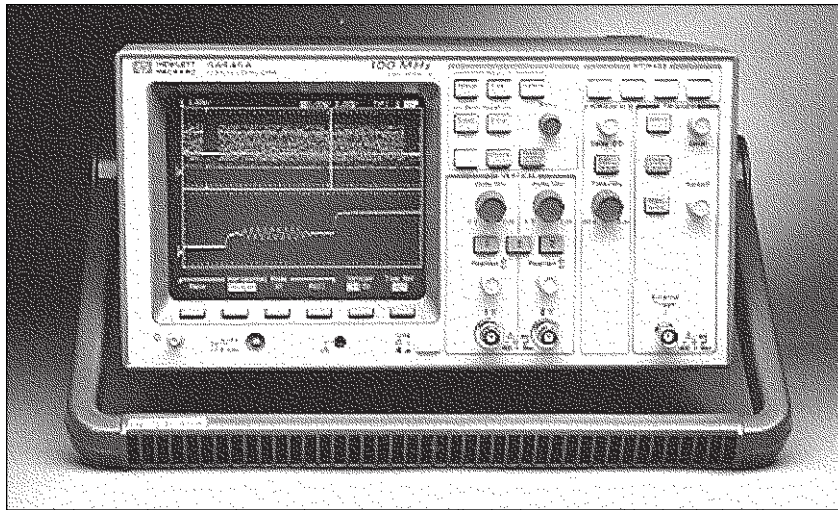


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# HP 54645A Oscilloscope

## Product Overview

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- Dual-channel 100-MHz scope with 200 MSa/s
- 1 MB of memory per channel
- HP MegaZoom technology allows deep memory capture and a responsive display
- Simple, easy-to-use controls
- Glitch triggering

### Testing power

With the addition of the new HP 54645A Oscilloscope to your lab, you will be able to view easily the full range of signals in your circuit, from its highest speed digital operation to its slowest analog transducer input. The HP 54645A's 100-MHz bandwidth, 2ns/div sweep speed and 200 MSa/s acquisition, coupled with its unique high-speed display, give you the view of your critical digital control signals needed to ensure proper circuit operation. In addition, the HP 54645A's very deep memory and 50-second/div sweep speed allow you to capture transducer and analog signals at a higher sampling speed at long timebase settings.

### HP MegaZoom technology

Often in mixed-signal systems the events of interest either take place over a long time span or they are widely separated from the trigger event. With 1 million samples per channel, HP's MegaZoom technology captures long time spans with a high sampling speed, allowing you to see the fine detail needed to solve elusive mixed-signal problems.

Before the introduction of the HP 54645A scope, deep-memory oscilloscopes were considered specialized tools because of their complex and non-responsive operation. These scopes had excessive display dead time. These problems have been overcome with the development of HP's MegaZoom technology, which uses multiple processors

optimized for the task of waveform acquisition, storage and display. Now, using HP MegaZoom technology, we've built an oscilloscope that has the ability to capture long records without sacrificing front-panel or display responsiveness.

### Simple controls simplify testing

The HP 54645A is based on HP's popular 54600 series of award-winning oscilloscopes. These scopes are known for their simple and easy-to-use front panels. Direct access knobs are provided for the most common controls. Soft keys and menus are used for the controls that are typically set-up and then left alone. The HP 54645A scope follows in

this tradition by offering front-panel controls that you can operate without studying manuals or display blocking messages. HP's MegaZoom technology gives the HP 54645A Oscilloscope the instantaneous responsiveness of an analog scope. With direct analog-like controls and instant response you'll never be distracted from your circuit analysis problems by the instrument.

### **Do more in less time with digital power**

One of the major advantages of a digital oscilloscope is the simplified and automated operation of the scope. Simply press the Autoscale button to set-up the HP 54645A scope for a new measurement. At a press of this button, the HP 54645A Oscilloscope will turn on and scale active channels to obtain the best display. The HP 54645A scope sets up triggering to obtain a stable display, even if you have used the External trigger input!

Delayed sweep and a combination of cursor and automatic measurements give you accurate characterization of your circuit with very little effort.

### **Simple yet powerful triggering**

The HP 54645A Oscilloscope provides the triggering power you expect in your general purpose bench scope. If you are familiar with the triggering operation of most lab-quality analog scopes, you will be familiar with the operation of the HP 54645A Oscilloscope. The glitch mode gives you the choice of having the HP 54645A search for a glitch that is less than a specified width on either of its channels. In addition you can search for a pulse that is

more than a specified width or within upper and lower limits.

TV mode triggering may be specified as field 1, field 2, vertical interval or line of a composite TV waveform.

### **Computer and hardcopy I/O**

For connection to your PC, printer, or workstation, the HP 54645A scope is fully compatible with the full line of HP 546XX interface modules. Simply select the module that best fits your needs and you are ready to either print the screen or interface to your PC or workstation. With the addition of the HP 54657A or HP 54659B Measurement/Storage module, you will have both of the interface capabilities described above, as well as additional measurements such as FFT.

### **Software for enhanced connectivity**

With the addition of HP BenchLink Scope software for Microsoft® Windows™, you have the ability to easily interface this powerful instrument to your PC. This versatile software, which is compatible with Windows 3.1 or Windows 95, makes the movement of waveform data or trace images fast and easy. With this software product you may transfer the full deep-memory record of the HP 54654A scope with no more effort than a click of your mouse.

### **Built to last**

The HP 54645A Oscilloscope is designed and built to the rugged requirements of MIL-T-28800. This means that this powerful product is built to withstand the rigors of daily use as you test and debug your circuits. This rugged design is backed up with a three-year warranty.

With its small size and light weight, as well as its rugged design, the HP 54645A Oscilloscope will serve as a valuable member of your test team today and for years to come.

## Specifications

### Vertical system

#### Scope channels: CH 1 & 2

Bandwidth (3dB)	dc to 100 MHz @ $\geq 10$ mV/div ( $> 75$ Mhz @ $< 10$ mV/div)
ac coupled	1.5 Hz to 100 MHz
Risetime (calculated)	$\sim 3.5$ ns @ $> 10$ mV/div, ( $< 4.6$ ns @ $< 10$ mV/div)
Dynamic input range	$\pm 32$ V or $\pm 8$ div whichever is less
Math Functions	Channel 1+ or - channel 2
Input resistance	1 M $\Omega$
Input capacitance	$\sim 13$ pF
Maximum input	400V (dc + peak ac)
Range	1mV/div to 5V/div
Accuracy	$\pm 1.5\%$ FS
Vernier	Fully calibrated, accuracy $\pm 3\%$ FS
Single Cursor Accuracy	Vertical gain accuracy $\pm 1.2\%$ full scale $\pm 0.5\%$ of position value
Dual Cursor Accuracy	Vertical gain $\pm 0.4\%$ of full scale
BW limit	Approx. 20 MHz
Coupling	ac, dc, GND
Channel isolation	dc to 20 MHz $> 40$ dB (with channels at same v/div) 20 MHz to 100 MHz $> 30$ dB
Inversion	Channel 1 and channel 2

### Horizontal system

Sweep speeds	50s/div to 2 ns/div main and delayed
Accuracy	$\pm 0.01\%$
Vernier	Accuracy = $\pm 0.05\%$
Horizontal resolution	40 ps

### Cursor accuracy

Single channel	Horizontal accuracy $\pm 0.2\%$ of screen width $\pm 40$ ps
Dual channel	Horizontal accuracy $\pm 0.2\%$ of screen width $\pm 80$ ps
Delay jitter	$< 10$ ppm

### Delay range

Pre-trigger (negative delay) At least 1 screen width or 2.5 msec

Post-trigger (from trigger point to end of sweep): 500 seconds

### Delayed sweep

Delayed Sweep expansion: Delayed timebase can be as fast as 2 nsec/div but must be at least 2X the main timebase. Delayed sweep display is an expansion of the same data acquisition as the main.

HP MegaZoom technology (Post acquisition Pan and Zoom): The time/div and delay controls allow any part of the acquired waveform display to be expanded to the full extent of the memory available.

### Trigger system

Source	CH1, CH2, Line External
Slope	Rising or falling
Modes	Auto, Autolevel, & Normal
Holdoff	$\sim 200$ ns to $\sim 25$ seconds
Glitch	Less than, greater than, or within specified range
Source Polarity	CH 1, CH 2 or External Rising or falling
Minimum setting pulse width	8 ns
TV	Ch1 or CH 2only
TV line and field	0.5 divisions of composite synch required for stable display

### Sensitivity

dc to 25 MHz  
 $> 10$  mV/div  $\leq .35$  div or 3.5 mV  
 $< 10$  mV/div  $\leq 1$  div or 2 mV

25MHz to 100 MHz  
 $> 10$  mV/div  $\leq 1$  div or 10 mV  
 $< 10$  mV/div  $\leq 1.5$  div or 3 mV

Coupling  
dc, ac, HF reject, LF reject, noise reject  
HF reject and LF reject  $-3$ dB @ 50 kHz.

### External trigger

Range	$\pm 18$ V
Sensitivity	dc to 25 MHz 50 mV dc to 100 MHz 100mV
Coupling	dc HF reject, and noise reject
Input resistance	1 Mohm
Input capacitance	Approx. 13 fp
Maximum input voltage	400V (dc+peak ac)

### XYZ

Bandwidth	100 MHz,
Phase error @ 1 MHz	1.8 degrees
Z input	TTL high blanks

### Acquisition system

Maximum sample rate	200 MSa/s on each channel
Vertical resolution	8 bits
Single shot bandwidth	20 MHz
Simultaneous capture on both channels	

Maximum memory depth	1 Meg samples per channel
Peak detection	Will capture and display a pulse at least 5 nsec wide at any timebase setting
Maximum display rate	3 million samples per second with sufficient trigger rate, and vectors off. 60 full screens per second, vectors on.
Average	Selectable as smoothing, 4, 8, 16, 32, 64, 128, and 256 averages.
Roll mode	At sweep speeds of 200 ms/div and slower, waveform data moves across the display from right to left with no dead time.
<b>Display system</b>	
Display	7 inch raster monochrome CRT
Resolution	255 vertical by 500 horizontal points.
Controls	Front-panel intensity
Vectors	Selectable on/off
Graticle	8 X10 grid, frame, & none

### Advanced features

Automatic measurements	(measurements are continuously updated, markers indicate measurement)
Voltage	$V_{AVG}$ (dc), $V_{RMS}$ $V_{PP}$ , $V_{MIN}$ , & $V_{MAX}$
Time	Frequency, Period, + Pulse Width, - Pulse Width, Duty Cycle, Rise Time & Fall Time.
Cursors	Manually or automatically placed Read out of time, 1/time, voltage

### Setup functions

Autoscale	Finds and displays all active channels, sets trigger to highest numbered channel, sets vertical sensitivity on active channels, time base to display 1.8 periods
Save/recall (non-volatile)	10 set-ups can be saved and recalled from non-volatile memory
Trace Trace (pixel) memory	2 volatile

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<b>General</b>		Size	35.26 x 17.27 x 31.75cm 12.7W x 6.8H x 12.5D in. (excluding handle)
Calibrator Output:		Weight	6.35 Kgs (~ 14 lbs)
Frequency	~ 1.2 kHz	Power usage	~90 W
Amplitude	5V	Voltage	88-250 VAC
<b>EMI</b>		Line voltage selection	Automatic
Commercial	Meets FTZ 1046 class B	Frequency	45-440 Hz
Mil-T-28800D	Meets requirements in accordance with paragraph 3.8.3 EMI Type III, and MIL-STD-461C as modified by table XII		
CE01,CE03	yes	<b>Environmental characteristics</b>	
CS01,CS02,CS06	yes	This instrument meets the requirements of MIL-T-28800D for Type III, Class 3 Style D equipment as described below	
RE01v	15 dB relaxation to 20 kHz; exceptioned from 20 kHz to 50 kHz	<b>Shock:</b> HP class B1 and MIL-T-28800 style D, class 3 operating: 30g, 1/2 sine, 11 ms duration, 3 shocks per axis along major axis. Total of 18 shocks.	
RE02 (with Opt 002)	Full limits of class A1c and A1f	<b>Vibration operation:</b> 15 minutes along each of 3 major axes: 0.64 mm (0.025 inch) p-p displacement, 10 Hz to 55 Hz in one-minute cycles. Held for 10 minutes at 55 Hz (4 g at 55 Hz).	
RE02 (without Opt 002)	10 dB relaxation from 14 kHz to 100 kHz	<b>Altitude:</b> operating to 4500 M (15,000 ft), non-operating to 15,000 M (50,000 ft)	
RS02	Exceptioned	<b>Humidity:</b> operating 95% RH at 40° C for 24 hrs Non-operating 90% RH at 65° C, 24 hrs	
RS03 (with Opt 001)	Slight trace shift from 80 Mhz to 200 mHz	Ambient temperature: operating -10° C to 55° C, non-operating -51° C to +71° C	
		<b>Safety:</b> CSA Certification , IEC 348	

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## Ordering Information

### HP54645A Oscilloscope

Accessories supplied: Two each HP10074A 10:1 divider probes with readout  
User's Guide and Service Manual  
Power cord

### Accessories and options available

**HP 10098A** Front panel cover & pouch kit  
**HP 34810B** BenchLink Scope software  
**HP 5062-7345** Rack mount kit  
**HP 10074A** 10X probe with readout  
**HP 10070A** 1X probe

### Modules fully supported:

\* 54650A, HP-IB I/O  
54651A, RS-232 I/O  
\* 54652A Parallel I/O  
\* 54652B - RS-232 & Centronics I/O  
\* 54657A - HPIB Measurement/storage  
54658A RS-232 Measurement/storage  
\* 54659B - RS-232 & Centronics Measurement/storage  
54655A & 54656A Test Automation Modules, I/O support only  
\*Recommended module

### Supported printers

HP-PCL & Epson FX80  
Plotter dump HP-GL (RS-232 & HP-IB)

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***Within Budget, Without Compromise***