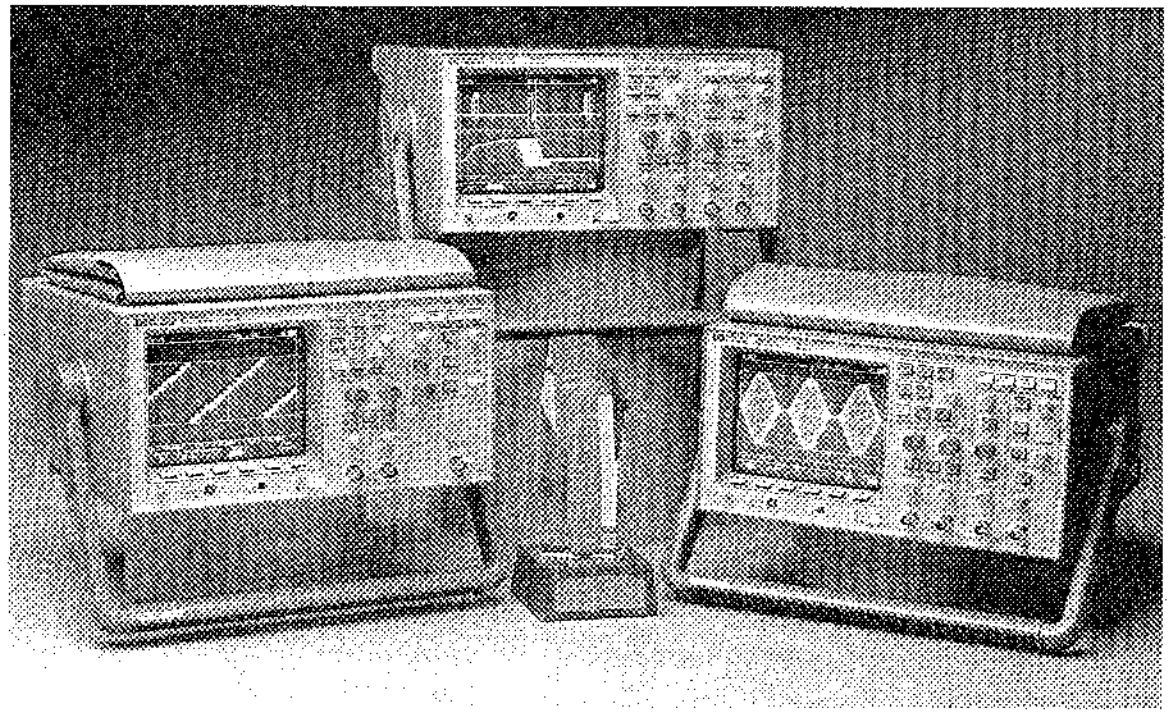
OSCILLOSCOPES

General Purpose and Troubleshooting

HP 54600 Series

- Up to 150-MHz bandwidth
- Analog look and feel
- Automatic and cursor-based measurements of frequency, time, and voltage
- Waveform storage
- Plug-in modules for hard copy, remote programming, and enhanced testing
- 3-year warranty with optional 2-year extension



HP 54600A 2-Channel and HP 54601A and 54602A 4-Channel Oscilloscopes

The HP 54600 family of oscilloscopes offers you the comfortable feel of analog scopes and the measurement power of digital scopes, all at a price you can afford. This family of oscilloscopes gives you the ability to view waveforms you can't see with your analog scope, and they provide the familiar controls and interactive displays you've grown accustomed to. To solve your most difficult test problems, the scope provides powerful digital features, such as pre-trigger viewing, waveform storage, and measurement automation.

This combination of analog feel and digital power enhances your troubleshooting ability. You can expect bright, crisp displays of your most demanding signals at all sweep speeds and delayed sweep magnifications. Storage for glitch and transient analysis is as simple as pressing a button. Pre-trigger viewing lets you view events that an analog scope would miss.

This new class of oscilloscopes, made possible through HP's advanced integrated circuit technology, presents this power in a small, lightweight package and at a price that fits your budget. The oscilloscopes' unique three-processor architecture helps re-create the feel of analog scopes while still giving you access to advanced measurement capabilities. The display update rate of over one million points per second provides a display with unprecedented interactivity. For example, AM-modulated waveforms and other rapidly changing signals are shown onscreen with the detail and fidelity you expect.

Three Models: One is Right for You

The two-channel, 100-MHz HP 54600A is ideally suited for production, field service, and educational applications, where its simple controls let you quickly find your problems. The four-channel, 100-MHz HP 54601A fits well into research and development labs and applications where complex digital circuits are designed and tested. The four-channel HP 54602A provides 150-MHz bandwidth on channels 1 and 2, and 250-MHz bandwidth on limited-attenuation channels 3 and 4. This additional bandwidth lets you look at signals that tax 100-MHz scopes. You can even look at and trigger on fast digital signals with rise times down to 1.4 ns, helping you find glitches and other unwanted signal components.

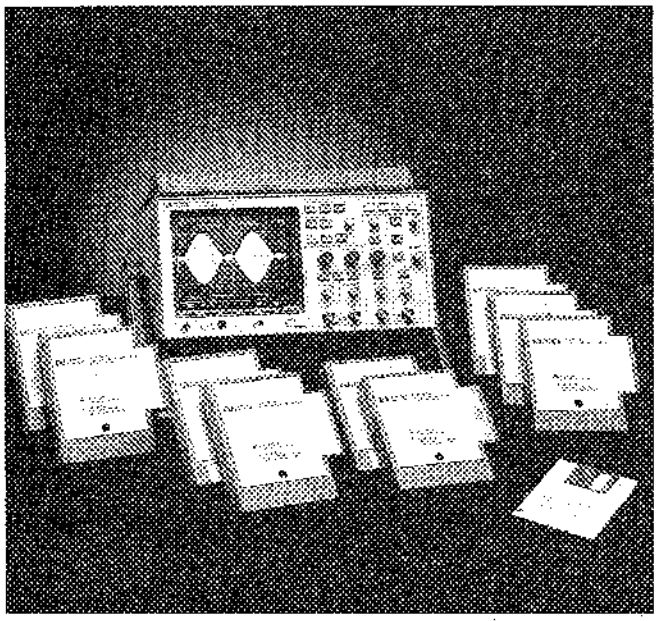
A Full Family of Benchtop Automation Products

The HP 54600 Series oscilloscopes are only part of a comprehensive line of test products. You'll find the answer to your general-purpose test and troubleshooting needs among the solutions offered in the family of test solution products. Optional plug-on modules add remote programming (HP-IB and RS-232 versions) and hard-copy output; for more complete measurement solutions, try:

- HP 54655A and 54656A Test Automation Modules. Design your test boundaries and create a test sequence—at your bench!
- HP 54657A and 54658A Measurement/Storage Modules. Add measurements, mask testing, and up to 100 waveform memory locations with this module.
- HP 54653A ScopeLink software. This easy-to-use package lets you use your PC to view waveforms, store scope and module setups, and much more.

For more information an any of these products in the HP 54600 family, see the modules and accessories sections on the following pages.

- Hard-copy output to printer or plotter
- Remote instrument control
- Enhanced automatic measurements
- Extended waveform storage and math operations
- Custom test-sequence creation and operation



HP 54600 Series Oscilloscopes

The HP 54600 Series scopes use a complete range of optional interface modules for hard-copy output, remote programmability, and, perhaps most importantly, custom test functionality. These modules plug onto the back of any HP 54600 Series scope and turn a great manual scope into a benchtop automation tool. You can create a true measurement solution for your specific test and measurement needs. No other scope in its class can offer these capabilities—and the price is right!

HP 54650A HP-IB Interface Module

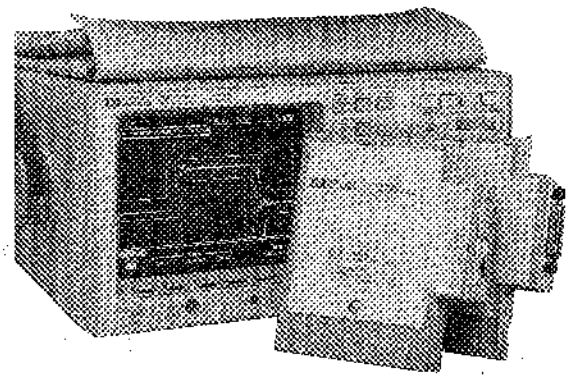
This module provides full remote control and hard-copy output to HP-IB printers and plotters. Programming is in accordance with IEEE 488.2. An operating and programming manual and disk with programming examples are included.

HP 54651A RS-232 Interface Module

This module provides full remote control and hard-copy output to RS-232 printers and plotters. The module supports printers that are Epson FX-80 or HP-PCL compatible. An operating and programming manual and disk with programming examples are included.

HP 54652A Parallel Interface Module

This module provides the lowest-cost hard-copy solution in the HP 54600 family. Printers supported include those that are Epson FX-80 or HP-PCL compatible. An operating note is included.



HP 54655A and 54656A Test Automation Modules

The HP 54655A (HP-IB) and 54656A (RS-232) Test Automation Modules provide you with an automated test station that can sit on your bench. The Test Automation Modules add built-in pass/fail testing with conditional branching and operator prompts to any oscilloscope in the HP 54600 family. With these modules, an unskilled operator can perform exacting measurements by simply following the instructions listed on the scope's display. All of these abilities add up to a powerful benchtop test solution—and it can all be created without a computer!

Mask Template Testing

The Test Automation Module's test abilities are based on waveform mask templates, waveform envelopes that define a test area. The module lets you build up to 40 masks and up to 100 test-sequence steps that you define to create your custom test. Each step consists of a scope configuration, test mask, custom branching instructions, and custom labels and messages. The combination of sequencing and branching based on test results allows you to re-create your test flowchart with the scope and module combination. You end up with a reliable and repeatable path to automated testing, and you create that test in the comfortable environment of your test bench.

Mask Template Generation and Editing

The Test Automation Modules can automatically generate your test masks. Two methods make mask generation simple:

- Automask with tolerance limit. This method uses your known good waveform and applies a user-defined voltage tolerance to the waveform, generating a mask with the tolerance built-in.
- Automask with Autostore. You can use Autostore, the HP 54600 family's infinite persistence mode, to create an envelope from your waveform. Automask then creates the mask template from the Autostore data.

The built-in mask editor lets you refine your Automask template, or you can use the editor to create your own precision mask.

Once the test sequence has been defined, it remains safely stored in the module's nonvolatile RAM. You can use HP ScopeLink software to copy sequences to other scopes, for constructing multiple-test stations, or for storage of multiple sequences.

Two Interface Versions

The HP 54655A Test Automation Module provides an HP-IB interface, and is well suited for applications involving controllers. The module performs many tasks previously left to the computer, speeding throughput and improving productivity.

The HP 54656A RS-232 version of the Test Automation Module provides you with additional features for external I/O. External switches can be connected to the module to allow remote switching through a test sequence. In addition, the HP 54656A has five user-definable output lines that can be uniquely configured for each step. Use these lines to drive buzzers, indicator lights, or even switches in your test fixture.

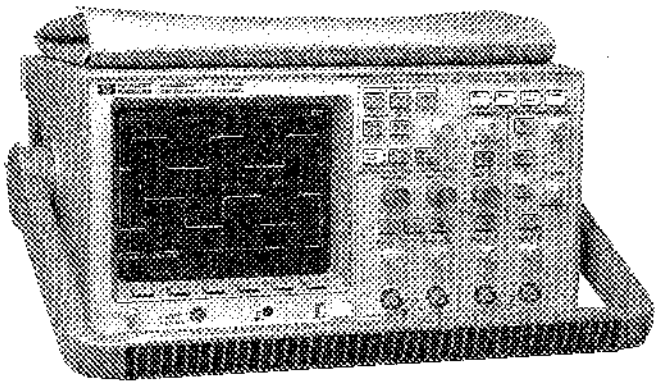
Even with all this test power, each module gives you the full functionality and programmability of the standard HP-IB and RS-232 interface modules.

The HP 54655A and 54656A are both supplied with an operating and programming manual, user's guide, and a disk with programming examples. In addition, the HP 54656A RS-232 version includes a 9- to 25-pin adapter cable and an RJ-45 connector with 10 ft (about 3 m) of cable for use with the I/O lines.

OSCILLOSCOPES

General Purpose and Troubleshooting (cont'd)

HP 54600 Series Test and Interface Modules



HP 54657A HP-IB and 54658A RS-232 Measurement/Storage Modules

The HP 54657A and 54658A Measurement/Storage Modules bring enhanced measurement and storage power to your HP 54600 scope. You can even create and monitor a mask-based test by using the modules' new mask template test capabilities. A list of the added features includes:

- Up to 100 nonvolatile trace memories
- New automatic measurements with user-defined levels
- New channel-to-channel delay and phase measurements
- Real-time clock for time- and date-tagging of hard copy and stored traces
- Unattended pass/fail signal monitoring

New Automatic Measurements and Waveform Math

The Measurement/Storage Module adds such new measurement capabilities as:

- Amplitude, pulse overshoot and preshoot, delay, and phase angle
- 10/90%, 20/80%, and user-defined voltage thresholds for rise time and fall time measurements
- New measurement formats of percentage and phase angle
- Waveform multiplication, differentiation, and integration

Now you can make your measurement in the format you desire. No more manual calculations!

More Trace Storage

The module adds 3 nonvolatile trace storage locations and 64 K of trace memory to the HP 54600 scope. The module uses a data compression technique for storage in that 64 K, allowing storage for up to 96 additional waveforms.

Unattended Signal Monitoring

The Measurement/Storage Module simplifies circuit analysis and debugging by comparing your live signal to a test template you create. If the scope detects a failure, it can perform one of three tasks:

- Store the failing trace to memory, along with the time and date of the failure
- Print the trace (with time and date) on a printer
- Note the failure and maintain pass/fail statistics while continuing the test

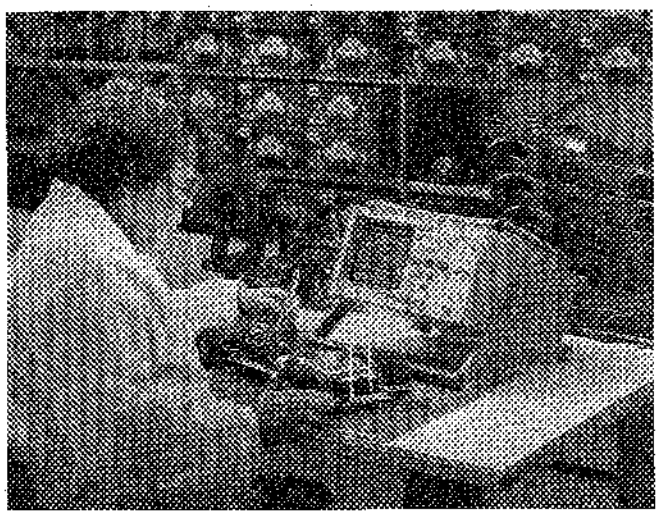
Built-in mask generation and editing software make creating your test template simple. Once your mask and test are created, you can leave it in the module's nonvolatile memory or store it to a PC with HP ScopeLink software. This new capability lets you easily run tests to characterize your circuits, whether for a short time or overnight. You can even use the Measurement/Storage Module in conjunction with a PC for enhanced throughput and to take advantage of the new measurements.

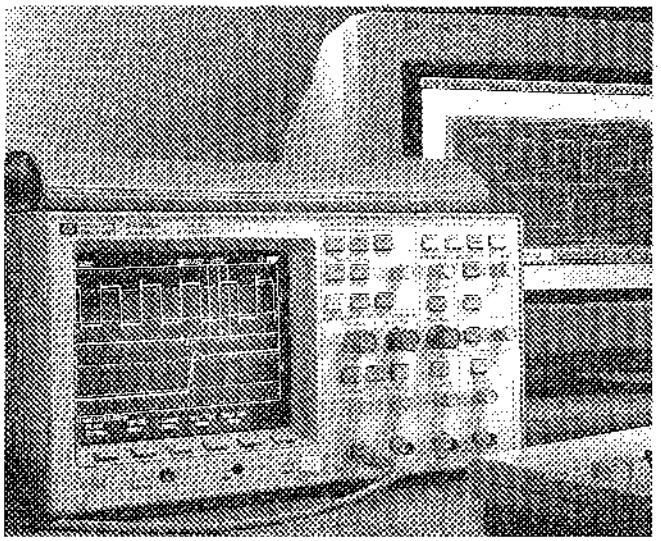
FFT—A New Measurement Dimension

The Measurement/Storage Module now has the ability to give you frequency information for your input waveforms. Fast Fourier Transform (FFT) capability now allows you to find and identify unusual waveform frequency components. FFT also allows you to check the fidelity of your signal or compare it to other similar-looking waveforms.

The Measurement/Storage Module's FFT capability includes frequency and amplitude cursors (with both dBm and dBv scaling), which let you make quick, accurate measurements. You can choose between Hanning, flattop, exponential, and rectangular windows, and you can select the number of points to include in the FFT calculation.

The HP 54657A and the HP 54658A include an operating and programming manual and a disk with programming examples.





HP 54653A ScopeLink Software

The HP 54653A ScopeLink software package provides a simple communications link between your personal computer and the HP 54600 family of oscilloscopes. ScopeLink lets you transfer scope screen images, waveform data, front-panel setups, and even custom test information via an HP-IB or RS-232C interface. All you need is a PC-compatible computer, interface cable, and your HP 54600 Series scope to transfer information such as:

- **Screen images.** Screen images can be transferred to a PC for storage, viewing, and printing. HP ScopeLink software can even convert the image to TIFF or PCX formats for annotation and placement in many popular word processing and desktop publishing applications.
- **Waveform data.** Data about the waveform can be transferred in time and voltage pairs to a PC and saved in ASCII format for general usage. HP ScopeLink software can also save in formats compatible with Lotus® 1-2-3® and DADiSP, allowing you to perform additional data analysis.
- **Instrument setups.** Scope setups can be transferred to your PC for storage and recalled later. You can store setups for several different tests or configure multiple scopes with the setup created on a master unit.
- **Test automation sequences.** HP ScopeLink software has the capability to send and receive complete sequences from the Test Automation Module. Build your test with one scope and module, save the sequence with ScopeLink, and duplicate the test in other scopes—it's easy! HP ScopeLink software also allows you to write-protect your sequence after you send it to the scope.
- **Telecom test templates.** HP ScopeLink software comes with a series of 21 templates for testing to CCITT, ANSI, and DS-1 standards. Waveforms with rates up to 8 Mb/s can be tested.

HP ScopeLink software also provides imaging, data transfer, and setup transfer for the HP 54500 Series oscilloscopes, and its imaging capability will work with the HP 1650 Series logic analyzers and the HP 16500A logic analysis system.

HP ScopeLink software is supplied on both 3½- and 5¼-in disks, and a user's guide is included.

Other HP 54600 Series Oscilloscope Accessories

HP 54654A Operator's Training Kit (Opt 103 to HP 54600 Series Scopes)

The operator's training kit consists of a training signal board and lab workbook. The signal board provides 12 signals that show various operating modes and features of an HP 54600 Series oscilloscope. After completing the labs, the user can operate the scope and make measurements with no extra training. This kit is ideal for the educational environment and can also be an excellent tool for training new employees. The operator's training kit comes with signal board, manual, and 9 V battery, all contained in an attractive case.

HP 10098A Pouch and Front Panel Cover (Opt 101 to HP 54600 Series scopes)

The pouch provides probe and accessory storage on top of the scope and is easily removable for rackmounting. The front panel cover provides sturdy protection of the front panel display and knobs when transporting the scope.

HP 10079A Oscilloscope Camera

The HP 10079A camera is designed for use with any HP 54600 Series oscilloscope. When a printer or plotter is unavailable or undesirable, or when your HP 54600 Series scope has no interface module, this camera offers a simple means of waveform recording. The HP 10079A camera uses Polaroid Type 667 film and includes an operating manual.

HP 5041-9409 Carrying Case (Opt 104 to HP 54600 Series Scopes)

The HP 5041-9409 carrying case makes transporting and shipping your HP 54600 Series oscilloscope safe and simple. A scope, optional module, and other accessories fit neatly inside the padded shell of hard plastic, and the case is lockable for shipment.

HP 85901A Portable ac Power Source

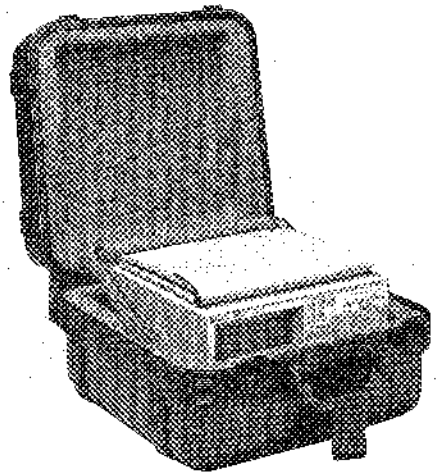
This portable power source includes a battery and power inverter. The source will power an HP 54600 Series scope for at least 2 hours, and its inverter may be used in cases where 12-Vdc power is available externally.

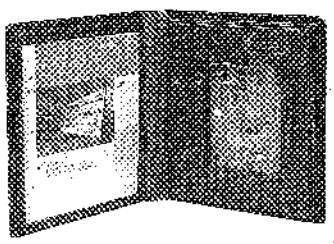
Two-Year Warranty Extension (Opt W50)

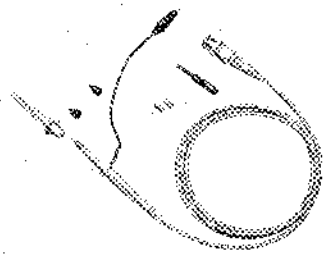
Option W50 for HP 54600 Series scopes extends the normal three-year warranty for an additional two years, giving you five years of worry-free operation.

HP Journal, February 1991

The *HP Journal* is a bimonthly publication recognizing technical contributions made by HP employees. The February 1991 issue discusses the development process and technical structure of the HP 54600 Series scope. To receive a copy, contact your local HP sales office.







OSCILLOSCOPES
General-Purpose and Troubleshooting
HP 54600 Series

Performance Characteristics

Vertical system

Channels 1 and 2	2 mV/div to 5 V/div
Accuracy[1]	±1.5%
Vernier accuracy[1]	Fully calibrated; ±3%
Bandwidth (−3dB), ac-coupled	dc to 100/150 MHz[5] 10 Hz to 100/150 MHz[3]
Rise time	<3.5/2.33 ns[5] (calculated)
Coupling	dc, ac, and ground
Channels 3 and 4	0.1 and 0.5 V/div
Accuracy[1]	+1.5%
Bandwidth (−3dB)	dc to 100/250 MHz[2]
Rise time	<3.5/1.4 ns[5] (calculated)
Coupling	dc and ground
Math functions	CH 1 ±CH 2
Cursor accuracy[1,2]	
Single cursor	Vertical accuracy ±1.2% of full scale +0.5% of position value
Dual cursor	Vertical accuracy ±0.4% of full scale
Bandwidth limit (channels 1 and 2)	≃20 MHz
Inversion	CH 1 and CH 2
CMRR	≃20 dB at 50 MHz
Dynamic range	±8 div from center screen
Input R&C	1 MΩ, ≃13 pf
Maximum input	400 V (dc + peak ac)

Horizontal system

Sweep speeds, main and delayed	5 s/div to 2 ns/div
Accuracy	±0.01%
Resolution	100 ps
Vernier accuracy	±0.05%
Cursory accuracy (t and 1/t)[3]	±0.01% ±0.2% of full scale ±200 ps
Delay jitter	10 ppm
Pre-trigger delay (negative time)	10 div
Post-trigger delay (trigger to start of sweep)	At least 2560 div or 50 ms. Not to exceed 100 s.

Delayed sweep

Main sweep	Delayed sweep
5 s/div to 10 ms/div	Up to 200 × main
5 ms/div and faster	Up to 2 ns/div

Trigger system

Sensitivity all channels	dc to 25 MHz, 0.35 div or 3.5 mV
Channels 1 and 2	dc to 100/150 MHz[5], 1 div or 10 mV
Channels 3 and 4	dc to 100/250 MHz[2], 1 div or 10 mV
Sources	HP 54601A and 54602A: Channels 1, 2, 3, 4, or line. HP 54600A: Channels 1, 2, line, and external.
Coupling	ac, dc, LF reject, HF reject, and noise reject. LF & HF: 3db at 50 kHz.
Modes	Auto, Autolevel, Normal, Single, and TV
TV triggering	TV line and field. Requires 0.5 div of composite sync for stable display (Channels 1 and 2).
Holdoff	Adjustable from 200 ns to 13 s

External trigger (HP 54600A only)

Range sensitivity	±18 V dc to 25 MHz: 50 mV dc to 100 MHz: 100 mV
Coupling	dc, HF reject and noise reject
Input R&C	1 MΩ, ≃ 13 pF
Maximum input	400 V (dc + peak ac)

X-Y operation

Z-blanking	TTL high-blanks trace
Bandwidth	X and Y same as vertical system
Phase difference	±3° at 100 kHz

Display system

Display	7-in raster CRT
Resolution	255 vertical × 500 horizontal points
Controls	Front-panel intensity control
Graticule	8 × 10 grid or frame
Autostore	Saves previous sweeps in half-bright display and the most recent sweep in full-bright display

Acquisition system

Max sample rate	20 MSa/s
Resolution	8 bits
Simultaneous channels	Channels 1 and 2 or channels 3 and 4
Record length	4,000 points (2,000 points single shot)
Max update rate	1,000,000 points/s
Single shot Bandwidth	2 MHz, single channel 1 MHz, dual channel
Peak detect	50-ns glitch capture (100-ns dual channel) at sweep speeds of 50 μs/div and greater
Average	Number of averages selectable from 8, 64, 256

Advanced functions

Automatic measurements	Continuously updated
Voltage	Vavg, Vrms, Vpp, Vtop, Vbase, Vmin, and Vmax
Time	Frequency, period, +width, −width, duty cycle, rise time, and fall time
Cursors	Manually or automatically placed
Setup functions	
Autoscale	Sets the vertical and horizontal deflection and the trigger level
Save/recall	16 front-panel setups
Trace memory	2 volatile pixel memories
TV functions	
Line counting	Delay time calibrated in NTSC and PAL line numbers
HP 54602A only: All-field trigger (both fields selected)	Oscilloscope triggers on the vertical sync pulse in both fields, allowing use with noninterlaced video

General

Power requirements	
Line voltage range	100 Vac to 240 Vac
Line voltage selection	Automatic
Line frequency	45 Hz to 440 Hz
Max power consumption	220 VA
Environmental characteristics	Meets the requirements of MIL-T-28800D for type III, class 3, style D equipment as described later in this table
Ambient temperature	
Operating	−10° C to +55° C
Nonoperating	−51° C to +71° C
Humidity[4]	
Operating	95% RH at 40° C for 24 h
Nonoperating	90% RH at 65° C for 24 h
Altitude	
Operating	To 4,500 m (15,000 ft)
Nonoperating	To 15,000 m (50,000 ft)
EMI (Commercial) **EMI (MIL-T-28800D)**	Meets FTZ 1046 class B
CE01, CE03, CE07	Full limits
CS01, CS02, CS06	Full limits
RE01	15 dB relaxtion to 20 kHz; exceptioned from 20 kHz to 50 kHz
RE02 With Opt 002 installed	Full limits of class A1c and A1f
Without Opt 002 installed	10-dB relaxation from 14 kHz to 100 kHz
RS02	Exceptioned
RS03 With Opt 001 installed	Slight trace shift from 80 MHz to 200 MHz
Vibration	Operating 15 min along each of the 3 major axes; 0.025-in peak-to-peak displacement, 10 Hz to 55 Hz in 1-min cycles. Held for 10 min at 55 Hz (4 g at 55 Hz).
Shock	Operating 30 g, 1/2 sine, 11-ms duration, 3 shocks/axis along major axis. Total of 18 shocks.
Size (excluding handle)	
Width	322 mm (12.7 in)
Height	172 mm (6.8 in)
Depth	317 mm (12.5 in)
Weight	6.2 kg (14 lbs)
Safety	CSA certification, IEC 348

[1] Temperature is ±10° C from calibration.
[2] Use full scale of 80 mV for 2 mV/div and 5 mV/div ranges.
[3] Use full scale of 50 ns for 2 ns/div.
[4] Tested to Hewlett-Packard environmental specification section 75B for class B-1 products.
[5] Second number is characteristic for the HP 54602A only.

HP 54655A and 54656A Test Automation Modules Operating Characteristics

The characteristics that follow apply to HP 54600 Series oscilloscopes with the module installed.

Trace memories	2, nonvolatile

Step sequencing

Number of steps	100, nonvolatile
Instrument setup	Entire front-panel setup. When mask template testing is used, automatic measurements will not be displayed.
Messages	Label (60 characters); pass, fail min, and fail max messages (30 characters each)
Branching	Branch based on the test result of pass, fail min, or fail max.
Operator-access permission	None: Mode allows use of only soft keys for sequencing. Adjust: Mode allows use of soft keys, V/div knobs, position knobs, delay knob, and time/div knob. All: Mode allows use of all keys and knobs.
Sequencing control	3 soft keys control the sequencing: Next, Previous, and Reset.
Editing	Copy a single step or mask template to a destination step.

Mask template testing

Number of mask templates	40, nonvolatile
Mask template generation	Automask generates mask templates from Autostore data with variable tolerance; mask editor allows pixel-by-pixel editing and line-drawing editing; smooth mask function performs a running average of 3 pixels.
Test region	Pixel-by-pixel selectable
Adjust mode	Adjustment mode is optimized for fastest screen update; some of the displayed data may not be tested.
Fail region	Inside: Signal fails if it falls inside the region bounded by the max and min limit line. Outside: Signal fails if it falls outside the region bounded by the max and min limit lines.
Failure indication	Failure-zone indicator shows where the signal fails the mask template.

Hard-copy output

Printer/plotter supported	HP ThinkJet, HP QuietJet, HP PaintJet, or HP LaserJet printer; HP-GL–compatible plotter. HP 54656A only: Epson FX-80 or compatible printer.

RS-232 configurations

Connector type	With adapter cable connected, the end of the cable is a 25-pin DTE port. A printer cable is required to connect to either hard-copy devices or computer.
Protocols	XON/XOFF, hard wire
Data bits	8
Stop bits	1
Parity	None
Baud rates	1200, 2400, 9600, 19200

Programmability

All instrument settings and operating modes may be remotely programmed via RS-232 or HP-IB (IEEE 488).

Input/output (HP 54656A only)

Input lines	2 lines for remote control of the Next, Previous, and Reset functions during sequencing.
Output lines	5 output lines definable in each step. Selections are on, off, pulse at start of step, pulse at end of step, pass, fail, fail min, and fail max. Output level is 0–5 V; output resistance is 120 Ω max. Output current is ≃24 mA.

HP 54657A and 54658A Measurement/Storage Modules Operating Characteristics

The characteristics that follow apply to HP 54600 Series oscilloscopes with the module installed.

Automatic measurements

Voltage	Vamp, Vavg, Vrms, Vpp, Vpre, Vovr, Vtop, Vbase, Vmin, and Vmax
Time	Delay, duty cycle, frequency, period, phase angle, rise time, fall time, +width, and −width
Thresholds	User selectable among 10%/90%, 20%/80%, or absolute voltage levels
Measurement formats	Voltage, time, percentage, and phase angle
Waveform math functions	Addition, subtraction, multiplication, differentiation, integration, and FFT.

Mask template testing

Number of mask templates	2, nonvolatile
Mask generation	Automask generates mask template from displayed data with variable tolerance. Mask editor allows pixel-by-pixel editing.
Test region	Pixel-by-pixel resolution
Fail region	Inside: Signal fails if it falls inside the region bounded by the max and min limit lines. Outside: Signal fails if it falls outside the region bounded by the limit lines.
Failure indication	Failure-zone indicator shows where the signal fails the mask template.

Trace memory (all nonvolatile)

Locations 1–3	High-speed storage without compression
Locations 4–100	Storage with compression; number of traces is a function of complexity. Storage time is approximately 7 s.
Real-time clock	24-h format with battery backup. Can be set from front panel.

Hard-copy output

Printer/plotter supported	HP ThinkJet, HP QuietJet, HP PaintJet, or HP LaserJet printer; HP-GL–compatible plotters. HP 54658A only: Epson FX-80 or compatible printer

Programmability

All instrument settings and operating modes may be remotely programmed via RS-232 or HP-IB (IEEE 488).

RS-232 configurations (HP 54658A only)

Connector type	25-pin DTE port; a printer cable is required to connect with hard-copy devices or with a computer.
Protocols	XON/XOFF, hard wire
Data bits	8
Stop bits	1
Parity	None
Baud rates	1200, 2400, 9600, 19200

OSCILLOSCOPES
General Purpose and Troubleshooting
HP 54600 Series

Ordering Information
HP 54600A Two-Channel, 100-MHz Oscilloscope
Includes two 1.5 m 10X probes (10071A), operating and service manual, and line cord.

HP 54601A Four-Channel, 100-MHz Oscilloscope
Includes two 1.5 m 10X probes (10071A), operating and service manual, and line cord.

HP 54602A Four-Channel, 150-MHz Oscilloscope
Includes two 1.5 m 10X probes (10071A), operating and service manual, and line cord.

Accessories
HP 54650A HP-IB Interface Module
HP 54651A RS-232 Interface Module
HP 54652A Parallel Interface Module
HP 54653A ScopeLink Software
HP 54654A Operator's Training Kit
HP 54655A Test Automation Module with HP-IB Interface
HP 54656A Test Automation Module with RS-232 Interface
HP 54657A Measurement/Storage Module with HP-IB Interface
HP 54658A Measurement/Storage Module with RS-232 Interface
HP 10079A CRT Trace Camera
HP 10070A 1.5 m 1X Probe
HP 85901A ac Power Source

Options
Opt 101 Accessory Pouch and Front-Panel Cover (HP 10098A)
Opt 102 Two Additional 10071A Probes (HP 54601A, 54602A only)
Opt 103 Operator's Training Kit (HP 54654A)
Consists of a training signal board and lab workbook. After completing these labs, an operator will be able to make measurements and operate the oscilloscope without any additional training.
Opt 104 Carrying Case (HP 5041-9409)
Designed to protect the oscilloscope for shipment or for checking as airline baggage.
Opt 105 ScopeLink Software (HP 54653A)
MS-DOS® software that interfaces the scope (with either HP-IB or RS-232 module installed) to a PC for storage, analysis, or easy integration of waveform data into desktop publishing software.
Opt 090 Delete Probes
Opt 908 Rackmount Kit (HP 5062-7345)
7-in EIA standard rack
Opt W50 Additional Two-Year Warranty (for a total of five years)
HP 54600A
HP 54601A
HP 54602A

MS-DOS® is a U.S. registered trademark of Microsoft Corporation.

For the Educators
These oscilloscopes are ideally suited for classroom use. Contact your local Hewlett-Packard sales office for details on specific education discount programs.

For the most current prices and product information, contact your local Hewlett-Packard sales office. see page 665.

HP 54600 Interfacing and Hard Copy Output Information

Compatibility Chart
The following table describes the devices supported by the HP 54600 Series oscilloscopes

	HP-IB modules	RS-232 modules	Parallel modules
HP-PCL Printers	Yes	Yes	Yes
HP-GL Plotters	Yes	Yes	N/A
Epson Printers (FX-80 or Compatible)	Yes	Yes	Yes
Computers	Yes	Yes	N/A

Ordering Information
HP Printers and Plotters
HP 2225A ThinkJet Printer
HP 2227A QuietJet Printer
HP 33481A LaserJet IIIP Printer
HP 7440A Color Pro Plotter
HP 7475A Plotter

HP-IB Cables
HP 10833A 1 m Cable
HP 10833B 2 m Cable
HP 10833C 4 m Cable
HP 10833D 0.5 m Cable

RS-232 Cables
For connection to printers and plotters:
HP 13242G 5 m, 25 Pin (M) to 25 Pin (M)
HP 17255M 1.5 m, 25 Pin (M) to 25 Pin (M)
For connection to IBM PC/XT computers:
HP 17255D 1.5 m, 25 Pin (M) to 25 Pin (F)
HP 92219J 5 m, 25 Pin (M) to 25 Pin (F)
For connection to HP Vectra computers:
HP 24542G 3 m, 25 Pin (M) to 9 Pin (F)

Parallel Cable
HP 92284A Cable