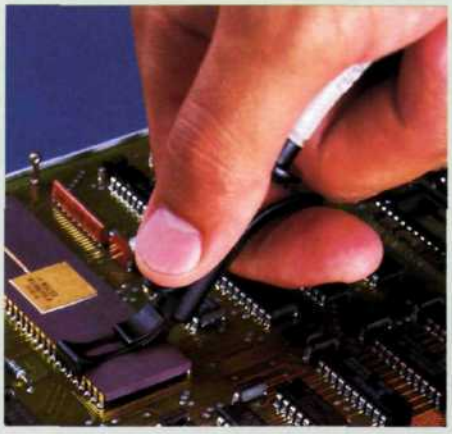


Selecting the right probe for your particular measurement involves many choices. This section will give you some ideas on how to go about making the best decision.

When an oscilloscope measurement is made, the circuit under test is disturbed since energy must be transferred from the circuit to the oscilloscope input. Effectively, this means that what is being measured is not just the circuit under test, but the combination of the probe, oscilloscope *and* the circuit under test. The idea then, is to select a probe that will affect the test circuit the least and still have the necessary characteristics to make the measurement of choice with accuracy.

Below is a list of probe parameters to be considered when selecting the proper probe for a given measurement:

- ☐ Attenuation
- ☐ Bandwidth (BW)
- ☐ Pulse response
- ☐ Input resistance (Rin)
- ☐ Input capacitance (Cin)
- ☐ Form factor
- ☐ Compensation range
- ☐ Maximum input voltage (Vmax)
- ☐ Cable length
- ☐ Serviceability

Probe Compensation Range

You will note that many probes have a specification that lists the oscilloscope input capacitance range over which they can be used. When choosing a probe, be sure that it can be compensated for the amount of input capacitance that your oscilloscope has.

Most oscilloscopes have 1 megohm input resistance. This input resistance is in parallel with shunt capacitance that results from the oscilloscope's input components. Probes that have attenuation factors (other than 1:1) designed for these high-impedance inputs must have "compensation" networks that adjust the probe's circuitry to give equal attenuation to all frequencies within their application bandwidth. Operating instructions provided with the probe explain how to adjust the compensation network to obtain best test signal fidelity.

Types of Probes

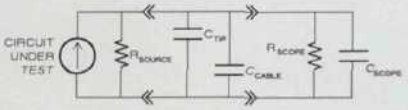
The most common oscilloscope probe is the "passive probe." It is called this because it has no "active" components and has only resistive, capacitive, and inductive circuit elements.

The most frequent trade-offs made in passive probes are between attenuation, circuit loading, and bandwidth. For instance, when the attenuation factor is increased, it is possible to reduce circuit loading and increase system bandwidth. For example, a divide by 10 (10:1) probe can have hundreds of MHz bandwidth while a 1:1 (no attenuation) probe is limited to tens of MHz bandwidth.

The 1:1 passive probe

The 1:1 probe is essentially a length of low capacitance coaxial cable with a BNC connector on one end and a probe tip on the other. This probe has no attenuation, is shielded, and yields the same input resistance that the scope has.

The 1:1 probe should be used when small signals are being examined and no attenuation can be tolerated. It has high input capacitance so it is normally used only in low-frequency applications where limited bandwidth will not cause measurement errors.



$$\text{Gain} = 1$$
$$R_{IN} = R_{SCOPE} = 1\ M\Omega$$
$$C_{IN} = C_{TIP} + C_{CABLE} + C_{SCOPE}$$

$$\text{Bandwidth} \cong \frac{1}{2\pi \left(\frac{R_{IN} R_{SOURCE}}{R_{IN} + R_{SOURCE}} \right) C_{IN}}$$

For: $C_{IN} = 60pF$, $R_{SCOPE} = 1\ M\Omega$

Input bandwidth of probe:
$\cong 2.6$ KHz, $R_S \rightarrow \infty$
$\cong 2.6$ MHz, $R_S = 1\ K\Omega$
$\cong 2.6$ MHz, $R_S = 100\ \Omega$

Figure 1. Equivalent circuit of a 1:1 probe

As you might interpret from figure 1, it is usually a poor choice to probe a high-frequency high-impedance source with a 1:1 probe since the probe's bandwidth is low for high-impedance sources.

The 1:1 50Ω Probe

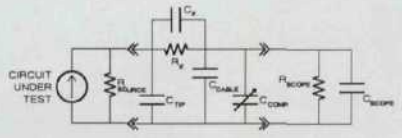
There are two types of 1:1 probes. Some are designed for high-impedance oscilloscope inputs, others are designed for 50Ω inputs. In general, they differ only in the cable that is used between the tip and scope connector. 50Ω 1:1 probes use 50Ω transmission line coaxial cable and are meant to be used with terminated 50Ω inputs. High impedance 1:1 probes use low-capacitance cable specially designed to give best pulse response with high impedance (usually 1 megohm) oscilloscope inputs.

When a 50Ω probe is used to probe source impedances close to 50Ω, there is little loading of the circuit under test. As the source impedance increases, the 50Ω probe will increasingly load the test circuit, causing errors in the voltage amplitude measured.

The 10:1 Passive Probe

10:1 probes are most frequently furnished with oscilloscopes when shipped from the factory. This probe adds attenuation circuitry to its tip and a compensation chassis at its other end. The compensation adjustment allows faithful waveform transfer when used with different oscilloscopes having different input capacitance specifications. The 10:1 probe's higher attenuation factor allows lower input capacitance and higher bandwidth than the 1:1 probe for the same signal source resistance.

The 10:1 attenuation factor also increases the oscilloscope's viewable maximum input voltage by a factor of 10. Many oscilloscopes have maximum input settings of 5 volts per division, so this probe allows viewing several hundred volts up to the maximum limit of the probe itself.



When correctly compensated

$$C_x R_x = R_{SCOPE}(C_{CABLE} + C_{COMP} + C_{SCOPE})$$

For a 10 MΩ probe to be used with a 1 MΩ input scope:

$$C_x = 1/9\,(C_{CABLE} + C_{COMP} + C_{SCOPE})$$

$$C_{IN} = + C_{TIP} + \frac{1}{\frac{1}{C_x} + \frac{1}{C_{CABLE} + C_{COMP} + C_{SCOPE}}} \cong C_x + C_{TIP}$$

TYPICAL:
Gain = 0.1
R_{IN} = 10 MΩ
C_{IN} = 7 - 20 pF Depending upon scope and cable length.

$$\text{Probe Bandwidth} \cong \frac{1}{2\pi\left(\frac{R_{IN} R_{SOURCE}}{R_{IN} + R_{SOURCE}}\right) C_{IN}}$$

Figure 2. Equivalent circuit for a 10:1 passive divider probe.

100:1 Passive Probes

The lower input capacitance of the 10:1 probe is further increased by the 100:1 passive probe. This probe should be used for fairly high level signals where the oscilloscope/probe combination has sufficient sensitivity to properly display the test signal.

Input capacitances of approximately 2 pF are not uncommon for this type of probe. For that reason, in applications where high frequencies are present and driving impedances are high, this probe will load the circuit under test less than the 10:1 probe. An example: probing the final stage of a z axis amplifier that drives the control grid (brightness) of a cathode ray tube.

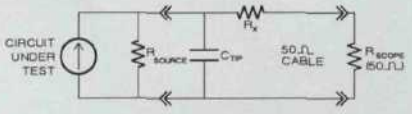
Resistive Divider Passive Probes

The highest bandwidth passive probe is the resistive divider probe. It uses a 50Ω transmission line for its cable and must be used with an oscilloscope that has a 50Ω input. High impedance inputs can be used if they are fitted with a 50Ω feed-thru termination like the HP 10100C.

The 50Ω transmission line eliminates effects of capacitance in the cable, however, probe input resistance is low (50Ω times the attenuation factor of the probe). Input capacitance is low and consists only of the stray capacitance at the probe tip. Typical input capacitance is approximately 1 pF.

Resistive divider probes have excellent system bandwidth and are useful in high frequency applications where impedances are typically low so that the low input resistance of the probe has minimum effect on the circuit under test.

Low input resistance does limit the maximum amplitude of signals that can be probed. Care must be taken not to overheat the probe's voltage division resistor or the resistor that terminates the 50Ω cable.



Gain = 1 to 0.01 (R_x = 1 to 4950 Ω)

For Gain = 0.1, R_x = 450 Ω
R_{IN} = 500 Ω
C_{IN} = $C_{TIP} \simeq$ 1pF

For R_{SOURCE} = 50 Ω

$$\text{Bandwidth of the probe} \cong \frac{1}{2\pi\,(50)\,(1pF)} \approx 3.2\ GHz$$

Figure 3. Equivalent circuit for a resistive divider passive probe.

Active Probes

One version of an active probe contains an amplifier in the probe tip to provide a high input R and low C. The output of this amplifier is connected to the oscilloscope through a 50Ω transmission line cable.

Since an amplifier is located in the tip, this type of probe is larger, more expensive and more easily damaged. It has high input impedance, high bandwidth and lacks the attenuation of resistive divider probes. For this reason, within its limitations, it is a good general purpose probe.

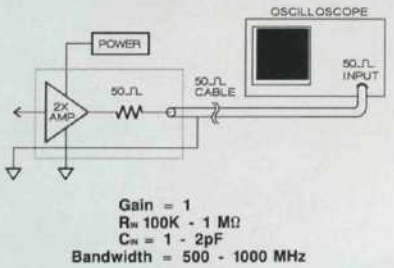


Figure 4. One version of an active probe.

Another variation of the active probe follows the principal of the resistive divider probe, but the tip series resistor value is made larger to increase the probe's input resistance. As with the resistive divider probe, the attenuated test signal is transmitted down a 50Ω cable but instead of being directly connected to the oscilloscope, it is amplified and compensated at the end of the cable in a probe pod assembly connected to the oscilloscope input. The pod makes up for the increased attenuation caused by the higher valued tip resistor and compensates response so that it is flat with frequency.

The HP 54100, HP 54110 oscilloscopes and the HP 54300A probe multiplexer use this type of active probe. An example is the HP 54001A probe which has a gain of 1, a bandwidth of 1 GHz, and an input R of 10 kΩ shunted by approximately 2 pF. Since there are no active components in the probe tip, the tip is much smaller than those of active probes described in the first case above.

The HP 54001A, for mechanical reasons, is limited to use with the oscilloscopes and probe multiplexer mentioned above.

The HP 10400 Family of Mini-Probes

- ☐ Modular Construction
- ☐ Improved Electrical Performance
- ☐ New Accessories

The HP 10400A Miniature Probe Family offers modular construction, improved reliability and superior electrical performance over our previous mini-probes. Modular construction allows individual replacement of probe tips, cables, and chassis assemblies reducing probe replacement and repair costs.

Improved cable and strain relief design increase reliability. Electrical performance is also improved by superior grounding accessories and increased input resistance (10 MΩ) in many probes.

Oscilloscope/Miniature Probe Compatibility and Probe Characteristics

HP Oscilloscope/ Logic Analyzer	HP Probe Model No.	*Approx Overall* Length in Metres (ft)	Division Ratio	Input R	*Approx* Shunt Capacitance	Typical *Oscilloscope* Maximum Bandwidth	*Compensates* Oscilloscope Input	Max[1] dc Volts
Same as 10431A but without probe indent	**10430A**	1m (3.3)	10:1	1MΩ	6.5 pF	500 MHz	1MΩ 6-9 pF	450
54111D, 54112D	**10431A**[2]	1m (3.3)	10:1	1MΩ	6.5 pF	500 MHz	1MΩ 6-9 pF	450
1631A/D, 1715/22/25/26/27, 5185, 1805/09, 54200/201[3], 54501A	**10432A**	1m (3.3)	10:1	10MΩ	7.5 pF	300 MHz	1MΩ 10-16 pF	450
1631A/D, 16530/31, 5185, 54200/201[3], 54501A	**10433A**	2m (6.6)	10:1	10MΩ	10 pF	300 MHz	1MΩ 10-16 pF	450
1740/41/42/43/44/45/46	**10434A**	1m (3.3)	10:1	10MΩ	8.5 pF	100 MHz	1MΩ 18-22 pF	450
1631A/D, 1715/22/25/26/27, 1805/09, 54200/201, 5185, 54003A, 54501A	**10435A**	1m (3.3)	10:1	1MΩ	7.5 pF	300 MHz	1MΩ 10-16 pF	450
1740/41/42/43/44/45/46	**10436A**	2m (6.6)	10:1	10MΩ	11 pF	100 MHz	1MΩ 18-22 pF	450
For oscilloscopes with 50Ω inputs	**10437A**	2m (6.6)	1:1	50Ω	—	—	—	—
All scopes with high Z inputs (may reduce bandwidth)	**10438A**	1m (3.3)	1:1	—	40 pF	—	—	450
	10439A	2m (6.6)	1:1	—	64 pF	—	—	450
1631A/D, 1715/22/25/26/27, 1805/09, 1950A, 54003A, 54111D[3,4], 54112D[3], 54200/201[3]	**10440A**	2m (6.6)	100:1	10MΩ	2.5 pF	300 MHz	1MΩ 6-14 pF	450

(1) Maximum input voltage may be limited by scope input maximum voltage.
(2) Has probe identification pin.
(3) For application with vertical inputs only. External trigger inputs require probes with 1 MΩ input R.
(4) System bandwidth is reduced.

HP 10400A Family Replacements For Older HP Probes

How to use this table.
The table below lists older HP probes that have been obsoleted together with their **CLOSEST HP 10400A family replacement (bold type).** *COMPARE SPECIFICATIONS TO CHECK THE NEW PROBE'S COMPATIBILITY WITH YOUR APPLICATION.*

HP Model No.	Division Ratio	Compensation Range	Max DC Volts	Input C	Input R	Usage BW*	Length	Style**
10001A	10:1	15-55 pF	600	10 pF	10 MΩ	30 MHz	1.5 m	S1
10436A	10:1	18-22 pF	450	11 pF	10 MΩ	100 MHz	2 m	MP
10003A	10:1	15-55 pF	600	10 pF	10 MΩ	45 MHz	1.2 m	S1
10434A	10:1	18-22 pF	450	8.5 pF	10 MΩ	100 MHz	1 m	MP
10004D	10:1	20-30 pF	500	10 pF	10 MΩ	100 MHz	1.1 m	S2
10434A	10:1	18-22 pF	450	8.5 pF	10 MΩ	100 MHz	1 m	MP
10005D	10:1	20-30 pF	500	17 pF	10 MΩ	100MHz	3 m	S2
10436A	10:1	18-22 pF	450	11 pF	10 MΩ	100 MHz	2 m	MP
10006D	10:1	20-30 pF	500	14 pF	10 MΩ	100 MHz	1.8 m	S2
10436A	10:1	18-22 pF	450	11 pF	10 MΩ	100 MHz	2 m	MP
10007B	1:1	—	500	40 pF	1 MΩ	system	1.1 m	S2
10438A	1:1	—	450	40 pF	1 MΩ	system	1 m	MP
10008B	1:1	—	500	60 pF	1 MΩ	system	1.8 m	S2
10439A	1:1	—	450	64 pF	1 MΩ	system	2 m	MP
10014A	10:1	9-13 pF	500	10 pF	10 MΩ	300 MHz	1.1 m	S2
10432A	10:1	10-16 pF	450	7.5 pF	10 MΩ	300 MHz	1 m	MP
10016B	10:1	9-13 pF	500	14 pF	10 MΩ	300 MHz	1.8 m	S2
10433A	10:1	10-16 pF	450	10 pF	10 MΩ	300 MHz	2 m	MP
10017A	10:1	9-14 pF	300	8 pF	1 MΩ	300 MHz	1 m	MPO
10435A	10:1	10-16 pF	450	7.5 pF	1 MΩ	300 MHz	1 m	MP
10018A	10:1	9-14 pF	300	10 pF	1 MΩ	300 MHz	2 m	MPO
10433A	10:1	10-16 pF	450	10 pF	10 MΩ	300 MHz	2 m	MP
10021A	1:1	—	300	36 pF	1 MΩ	system	1 m	MPO
10438A	1:1	—	450	40 pF	1 MΩ	system	1 m	MP
10022A	1:1	—	300	62 pF	1 MΩ	system	2 m	MPO
10439A	1:1	—	450	64 pF	1 MΩ	system	2 m	MP
10026A	1:1	—	scope(1)	—	50Ω	scope(1)	1 m	MPO
10437A	1:1	—	scope(1)	—	50Ω	scope(1)	2 m	MP
10027A	1:1	—	scope(1)	—	50Ω	scope(1)	2 m	MPO
10437A	1:1	—	scope(1)	—	50Ω	scope(1)	2 m	MP
10032A	100:1	9-14 pF	300	3 pF	3 MΩ	300 MHz	1.1 m	MPO
10440A	100:1	6-14 pF	450	2.5 pF	10 MΩ	300 MHz	2 m	MP
10033A	10:1	4-12 pF	200	8 pF	1 MΩ	500 MHz	1 m	MPO
10431A	10:1	6-9 pF	450	6.5 pF	1 MΩ	500 MHz	1 m	MP
10040A	10:1	20-30 pF	300	9 pF	1 MΩ	100 MHz	1 m	MPO
10434A	10:1	18-22 pF	450	8.5 pF	10 MΩ	100 MHz	1 m	MP
10041A	10:1	20-26 pF	300	12 pF	1 MΩ	100 MHz	2 m	MPO
10436A	10:1	18-22 pF	450	11 pF	10 MΩ	100 MHz	2 m	MP
10042A	10:1	20-24 pF	300	15 pF	1 MΩ	100 MHz	3 m	MPO
10436A	10:1	18-22 pF	450	11 pF	10 MΩ	100 MHz	2 m	MP

***Usage Bandwidth:** This column describes the maximum bandwidth of the oscilloscope with which this probe is typically used.

****Style:** This column describes the physical configuration of the probe described:

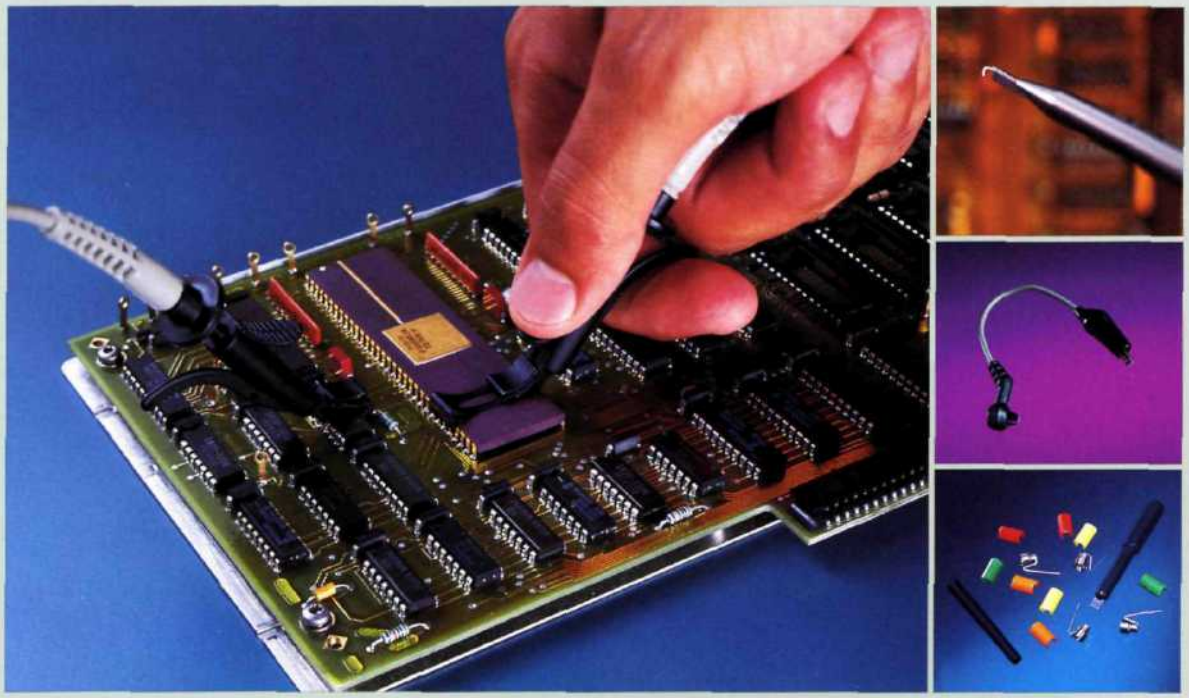
MP: Miniature probe, a member of the new HP 10400 family of mini-probes. These probes replace other styles in most cases. See photograph on opposite page.

MPO: Member of the older family of HP mini-probes. Tips of MP probes have the same diameter as MPO probes. Most MPO probes have been obsoleted and are replaced by new HP 10400A series probes (MP probes).

S1: Older standard probes. See Oscilloscope Probe Accessory Tree for adapters that allow use of standard probe accessories on new HP 10400 series probes.

S2: Older probes also referred to as standard. See Oscilloscope Probe Accessory tree.

Note (1): 50Ω Probes: See section on How To Select A Probe for details. In general, the maximum input voltage of a 50Ω probe is dictated by the maximum input voltage of the oscilloscope that it is used with in the 50Ω input mode. The system bandwidth when using a 50Ω probe with a 50Ω test source is generally the bandwidth of the oscilloscope used.



HP 10400A Supplied Accessories

The HP 10400A mini-probe family also features new accessories including a ground lead fitted with a ferrite bead for reduced ringing on pulse tops, and an IC grabber that allows easy connection of a single probe to many IC packages without fear of shorting adjacent pins. The new IC grabber fits DIPs with 0.01 inch spacing (standard) and up to 0.9 inch package width.

Each 10400A family probe is shipped with one general-purpose Grabber, one IC grabber, one Ground Lead, and one Accessory Package which contains: 4 grounding spanners (for close grounds at the probe tip), 1 probe barrel insulator, an adjustment screwdriver, and 8 colored cable markers.

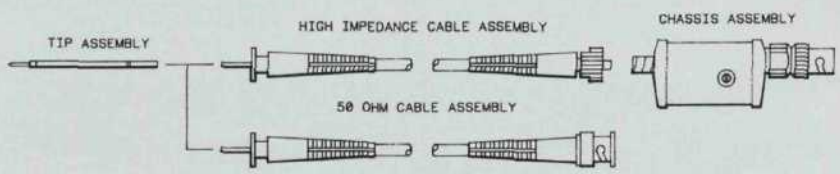
The accessories listed above may be purchased singly under the following numbers:.

5061-6160 General Purpose Grabber
5061-6161 IC Grabber
5061-6162 Ground lead
5061-6163 Accessory Packet

Replacement parts for HP 10400A Family Probes

Probe Model Number	Replacement Tip	Replacement Cable	Replacement Chassis
10430A	5061-6145	5061-6139	10430-60101
10431A	5061-6145	5061-6139	10431-60101
10432A	5061-6151	5061-6139	10432-60101
10433A	5061-6146	5061-6140	10433-60101
10434A	5061-6150	5061-6139	10434-60101
10435A	5061-6147	5061-6139	10435-60101
10436A	5061-6152	5061-6140	10436-60101
10437A	5061-6149	5061-6142	none
10438A	5061-6149	5061-6139	10438-60101
10439A	5061-6149	5061-6140	10439-60101
10440A	5061-6148	5061-6140	10440-60101

HP 10400-90901 HP 10400 Probe Family User Manual $5.00



Additional HP 10400 Family Accessories

HP 10024A *HP 10211A*

HP 10024A IC Test Clip

The HP 10024A IC Test Clip is useful when several IC pins must be probed. By removing the probe's insulating sleeve and inserting the mini-probe's tip into the IC Test Clip, you can monitor points on 14 and 16 pin DIP's without worrying about shorting adjacent pins.

The HP 10024A also includes 4 insulated circuit interface pins. These pins can be used to make low inductance connections between the IC's ground pin and the 10024A's probe ground contacts. By inserting the other end of the pin, IC pin connections can be brought out to the top of the IC clip for easy access.

HP 10024A IC Test Clip

HP 10024-69501 Interface Pin Kit for the HP 10024A: includes 12 interface pins.

HP 10211A DIP Clip

The HP 10211A DIP Clip is similar to the HP 10024A in operation but accesses 24 pin IC DIP's without the worry of shorting adjacent pins.

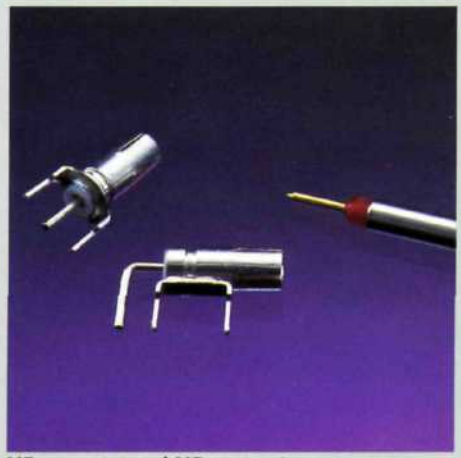
HP 12011A Dip Clip

HP 1250-1454 (two shown)

HP 1250-1454 BNC (m) to Mini-Probe Adapter

This device permits connection of 10400 family mini-probe tips to BNC connectors.

HP 1250-1454



HP 1250-1918 and HP 1250-1737

HP 1250-1737 PC board mini-probe socket

The HP 1250-1737 PC board mini-probe socket is ideal for circuit applications where it is desirable to make a reliable circuit connection between the mini-probe tip and a test circuit (Soldering the tip itself into place is not recommended.) The HP 1250-1737 is useful in production PC board applications as an oscilloscope test point. The probe plugs into its socket parallel to the PC board.

HP 1250-1737

HP 1250-1918 PC board vertical mini-probe socket.

The HP 1250-1918 is similar to the 1250-1737 (above) except that it is designed for attaching the probe vertically to the board rather than horizontally.

HP 1250-1918

HP 10020A

HP 10020A Resistive Divider Probe Kit

The HP 10020A Resistive Divider Kit is a signal probing system for measuring fast-transition-time signals in high-impedance systems. It is designed for use with 50Ω input oscilloscopes, but may be used with other than 50Ω systems if a 50Ω feedthrough termination, such as the Model 10100C, is used. The extremely low input RC of the 10020A provides high-fidelity probing of fast-transition signals.

Several accessories, supplied with the Model 10020A, provide greater probing versatility. The Model 10218A BNC Adapter allows the resistive divider to be connected to a BNC connector. The Model 10240B Blocking Capacitor provides ac-coupling at the divider output. A spanner tip provides a very short ground lead, which reduces ringing in high-frequency probing. A special probe handle fits over the short vinyl tip for convenient use.

Specifications

Probe Tip: pin (see accessories supplied for other tips)

Output Connector: BNC

Length (overall): Approx 1.2 m (4 ft.)

Weight: NET, 0.45 KG (1 lb.)

Accessories Supplied: Blocking Capacitor, HP 10240B; BNC Adapter Tip, HP 10218A; Adapter Tip 6-32, 5060-0449; Alligator Tip 6-32, 2 ea, 5061-1258; Probe Handle, 5040-5968; Cable Assy. 5.1 cm (6 in.) Ground 6-32, 10020-61602; Cable Assy 15.2 cm (6 in.), Ground 6-32, 10020-61603; Tip, Spanner Ground, 5060-0549; Cap, insulating (clear plastic) 2 ea, 10020-45401; Cap, insulating (grey plastic) 2 ea, 10004-45402; Sleeve, color coding, red 2 ea, 5040-0477

HP 10020A Resistive Divider Probe Kit

HP 10229A Slip-on Hook Tip (Recommended Accessory)

HP 10240B Blocking Capacitor

Model 10240B Blocking Capacitor is a probing accessory that provides ac coupling while maintaining a 50Ω system. This capacitor is designed for use with the model 10020A Resistive Divider Kit, but may be used with any probe that must be terminated in 50Ω.

(Note: Model 10240B is included in the model 10020A Resistive Divider Kit.)

Characteristics

Capacitance: 0.18 μF
Maximum Voltage: ±200Vdc.
Reflection: <12% when driven by a 150 ps rise time step in a 50Ω system.
Sag: Approximately 10% per μs (1% in 100 ns).
Connectors: BNC

HP 10240B

High Frequency Resistive Dividers (Supplied in the HP 10020A Resistive Divider Probe Kit.)

Part No.	Division Ratio	Input R ohms[1]	Division Accuracy	Max V rms[2]	Input C pF	Probe Rise Time ns[3]	Bandwidth MHz
10020-67701	1:1	50	—	6	—	<0.5	700
10020-67702	5:1	250	± 3%	9	<0.7	<0.5	700
10020-67703	10:1	500	± 3%	12	<0.7	<0.5	700
10020-67704	20:1	1000	± 3%	15	<0.7	<0.5	700
10020-67705	50:1	2500	± 3%	25	<0.7	<0.5	700
10020-67706	100:1	5000	± 3%	35	<0.7	<0.5	700

[1] When terminated in 50Ω
[2] Limited by power dissipation of the resistive element.
[3] Rise time with or without 10240B blocking capacitor

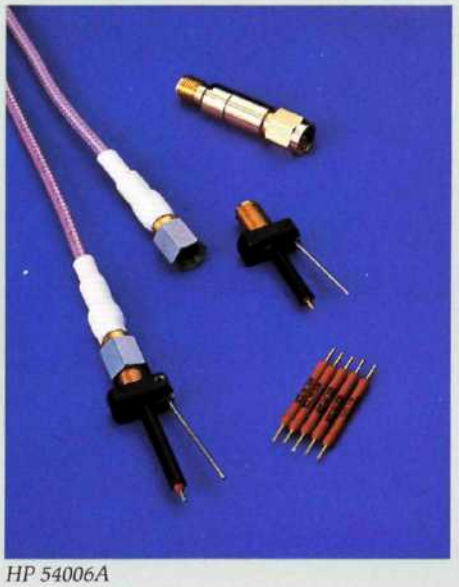
HP 10002A

HP 10002A 1000V 50:1 Voltage Divider Probe.

The HP 10002A voltage divider probe is a general purpose probe for use with instruments that have a bandwidth of less than 40 MHz with an input impedance of 1 MΩ shunted by approximately 15 to 55 pF. The probe is rated at 1000V peak.

Characteristics:
Input resistance: Approximately 9 MΩ. Shunt capacitance: Approximately 2.5 pF.
Length: 1.7 m (5.5 ft)

HP 10002A



HP 54006A

Probing Multi Gigahertz Systems

Probe multi-gigahertz systems with the HP 54006A, 10:1, 500Ω and 20:1, 1 kΩ resistive divider probes. These 6 GHz probes give access to circuit nodes that are not 50Ω or do not have 50Ω connectors allowing you to see signals at specific points such as the input to a gate. HP 54006A input capacitive loading is approximately 0.25 pF.

The HP 54006A probe system is useful with the HP 54120T oscilloscope as well as the HP 54100/54110A oscilloscopes fitted with HP 54002A input pods.

The HP 54006A 6 GHz Resistive Divider Probe Kit includes:
One 10:1, 500Ω probe body, six 450Ω resistors.

One 20:1, 1 kΩ probe body, six 950Ω resistors

One 36 inch, 50Ω coaxial cable, SMA (m-m)

One dc blocking cap, 10 GHz-26 GHz APC-3.5 (m-f)

HP 54006A
Extra resistors may be ordered separately:

Five 450Ω resistors.
HP 54006-68701

Five 950Ω resistors.
HP 54006-68702

HP1124A

HP 1124A 100 MHz Active Divider Probe

The HP 1124A Active Divider Probe provides high-voltage, general-purpose probing for instruments having 50Ω inputs without selectable high-impedance inputs. This 10 MΩ, 10 pF probe allows direct measurements of 100 volts, in the 100:1 division ratio mode, from dc to 100 MHz. In the 10:1 division ration mode, input voltage range is ± 10 volts. Power is supplied by instruments with probe power jacks or the 1122A probe power supply.

Specifications
(Measured with output connected to a 50Ω load.)

Bandwidth: (measured from a terminated 50Ω source)

DC-Coupled: dc to 100 MHz

AC-Coupled: 2 Hz to 100 MHz

Pulse Response (measured from a terminated 50Ω source)

Transition Time: <3.5 ns

Perturbations: 5% p-p. Measured with pulse transition time of >2.5 ns.

Attenuation Ratio: 10:1 ±5%; 100:1 ±5%

Dynamic Range
×10: ±10 V
×100: ±100 V

Input RC: 10 MΩ shunted by approx. 10 pF.

Maximum Safe Input
DC-Coupled
×10: ±300 V (dc + peak ac) ≤100 MHz
×100: ±500 V (dc + peak ac) ≤100 MHz

AC-Coupled
×10: ±300 V (dc + peak ac) ≤100 MHz
DC component must not exceed ±200 V

×100: ±500 V (dc + peak ac) ≤100 MHz
DC component must not exceed ±200 V

Accessories Supplied: One 20 cm (8 in.) ground lead with alligator clip (10004-61301), one retractable hook tip (10004-67604), and two probe tip insulating caps (10004-45402).

Power: −12.6 V and +15 V ±3% approx 30 mA from each supply. Use Model 1122A Probe Power Supply.

Weight: net 0.2 kg (5 oz); shipping 0.91 kg (2 lb)

Length: Approx 1.5 m (5 ft) overall

HP 1124A 100 MHz Active Divider Probe

HP 1122A

HP 1122A Power Supply

The HP 1122A Power Supply is a regulated power supply that provides power for operating the 1124A Active Probe. The power supply provides all power requirements for simultaneous operation of up to four active probes.

Specifications
Probe Driving Capability: Up to four 1124A active probes.

Power Output: −12.6 V and +15V ±3%

Power Input: 115V or 230V ±10%, 48 to 440 Hz, 40 W (with four probes)

Dimensions: 130 mm wide, 87 mm high, 305 mm long (5 1/8 in x 3 7/16 in x 12 in)

Weight: net 2.7 kg (6 lb); shipping 3.6 kg (8 lb)

Accessories Supplied: one 2.3 m (7.5 ft) power cord (8120-1378), four 0.9 m (36 in) extender cables (Model 10131B) The cables extend the probe power cable for added probing convenience.

HP 1122A Probe Power Supply

Replacement Price of HP 10131B Extender Cable

HP 1133A TV/Video Sync Pod

- ☐ **Clamped or Unclamped Video Output**
- ☐ **Trigger Output for Line and Frame**
- ☐ **For Most Standard Broadcast Composit Video Systems**
- ☐ **Compatible With Most Analog or Digitizing Oscilloscopes.**

The HP 1133A TV/Video Sync Pod provides users with TV sync triggering for most analog or digitizing oscilloscopes. It features clamped or unclamped video outputs that can be viewed on the oscilloscope's vertical channels and trigger outputs that can synchronize the oscilloscope to video frame and individual lines.

The pod is packaged in a case approximately 14x14x4.5 cm (5.5x5.5x1.75") and is powered by a separate a.c. power module. The pod features a loop-thru input (two female BNC) which can be driven from a 75Ω source, or for probing high impedance circuits, from a 1-10 MΩ probe. The loop-thru feature allows 75Ω signal to be looped through the TV/Video pod then connected to a video monitor or other device. Clamped or unclamped video outputs are designed to drive a high-impedance probe (1-10 MΩ) connected to the oscilloscope input.

The HP 1133A is compatible with broadcast standards M, N, C, B, G, H, I, D, K, K1, and L systems.

HP 1133A

Characteristics:
Video input: AC coupled with an RC of 1 MΩ shunted by approximately 10 pF.

Bandwidth: Approximately 10 MHz.

Maximum input voltage: 40 Volts (DC plus peak AC.)

Frame output is phase locked to the leading edge of the third field synchronizing pulse on field one, to the leading edge of the second pulse on field two. Frame output goes high on field one, and low on field two.

A switch is provided for positive or negative sync pulse polarity. A gain control is provided to adjust for signal amplitude at the BNC input. Gain from the input BNC to unclamped output is variable from approximately 2.5 to 50.

HP 1133A TV/Video Sync Pod

NOTE: THE 1133A MUST BE ORDERED WITH A POWER SUPPLY OPTION

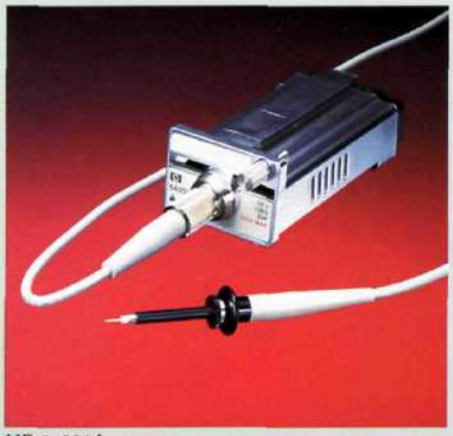
Opt. ABA Power supply for **U.S.A**, 120V nema 515P plug.

Opt. ABB Power supply for **Europe**, 220V CEE7-VII plug.

Opt. ABJ Power supply for **Japan**, 100V nema 515P plug.

Opt. ABU Power supply for **United Kingdom**, 240V BS1363 plug.

Input Pods for the HP 54100/54110 Oscilloscopes and the HP 54300A Probe Multiplexer.



HP 54001A

HP 54001A 1 GHz Miniature Active Probe Input Pod

Use the HP 54001A in applications such as high-speed logic measurements where high bandwidth is essential and capacitive probe loading dominates the probe's effect on the signal. A cable length of 1.5 metres provides access to hard to reach areas of a system rack or backplane. The probe's small tip diameter and size make it easy to get into crowded circuits. The combined system rise time with the HP 54100/54110 is less than 450 ps allowing measurements on sub-nanosecond logic.

Characteristics
Length: 1.5 m
Division Ratio 10:1 ±3%
Typical Circuit Loading
  Capacitive 2 pF
  Resistive 10 kΩ
System Response with HP 54100/54110 oscilloscopes:
  Rise time 400 ps
  Bandwidth 700 MHz
Usable Signal Range: ±20 V

For use with HP 54100/54110 oscilloscopes and the HP 54300A Probe multiplexer.
HP 54001A

HP 54002A

HP 54002A 50 Ohm BNC Input Pod

Use the HP 54002A with a terminated 50Ω system to preserve signal fidelity and to minimize measurement effects on the circuit under test. The HP 54002A can be used with the HP 10020A resistive divider probe kit. It may also be used with a variety of active oscilloscope probes that require 50Ω inputs.

Characteristics
System Response with the HP 54100/54110
  Risetime: 350 ps
  Bandwidth: 1 GHz

Maximum Input Voltage: 5 V rms.

For use with HP 54100/54110 oscilloscopes and with the HP 54300A Probe multiplexer.
HP 54002A

HP 54003A

HP 54003A 1 Megohm Probe Pod

Use the HP 54003A when resistive loading is critical, as in op-amp measurements. The supplied probe can be removed from the pod to provide a 1 MΩ, approximately 12 pF BNC input. This is useful when a coaxial connection is desired, in applications where bandwidth and capacitive load are not as critical as resistive loading (e.g., moderate bandwidth measurements in an ATE system).

The HP 54003A pod (with supplied probe removed) can also be used with the HP 10440A 100:1 probe for wide dynamic range measurements. (±200 Vdc. *See probe operating instructions for* voltage derating with frequency.)

Characteristics
Length: 1 m
Division Ratio 10:1
Typical Circuit Loading
  Capacitive: 7.5 pF
  Resistive: 1 MΩ
System Response with
The HP 54100/54110
  Risetime: 1.2 ns
  Bandwidth: 300 MHz
Usable signal range: ±20 V (with supplied probe)

For use with HP 54100/54110 oscilloscopes and with the HP 54300A Probe multiplexer.
HP 54003A