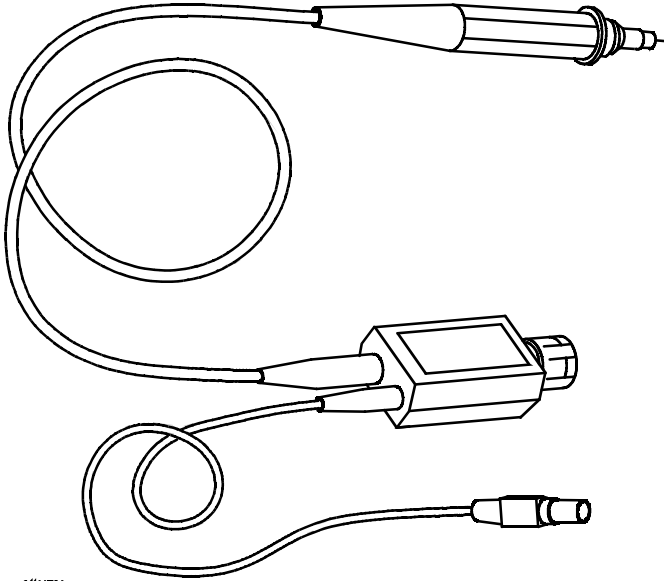

User and Service Guide

Publication number 01144-97001
September 2002



01144-97001

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1144A Active Probe

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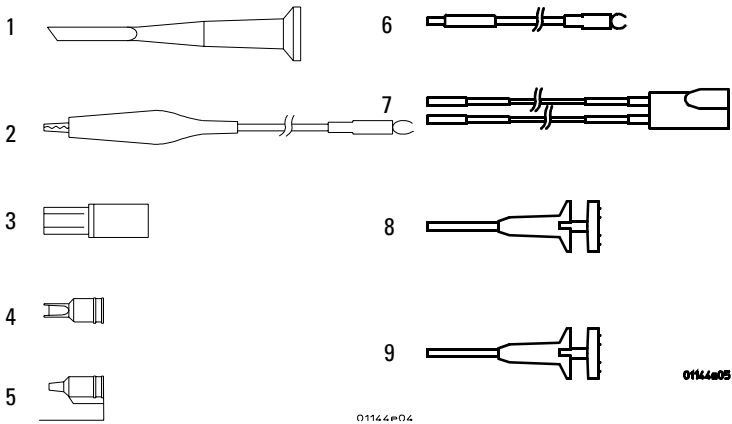
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1144A Active Probe

The 1144A Active Probe is a 10:1 probe with an 800 MHz bandwidth. An FET at the input allows a high input resistance and low input capacitance which minimizes the loading of the circuit under test. The output impedance of the probe is 50 Ω which allows the probe cable to be extended with a 50 Ω coaxial cable. The probe can be powered by the probe power outputs of the 54520A, 54522A, 54540A, or 54542A oscilloscopes. To use the probe with other instruments you can use the 1142A power supply.

Accessories Supplied

The following accessories are supplied with the 1144A probe.



- | | | | |
|---|----------------------------|---|--------------------------|
| 1 | Retractable pincher tip | 6 | Ground lead |
| 2 | Alligator clip ground lead | 7 | Dual lead adapter |
| 3 | BNC adapter | 8 | Mini-pincher tip (black) |
| 4 | IC tip | 9 | Mini-pincher tip (red) |
| 5 | Ground bayonet | | |

You can order a kit of accessory parts from Agilent Technologies, part number 01144-68702.

Specifications**Accessories Available**

The following accessories are available and can be ordered separately.

- Fan-out adapter, Agilent Technologies part number 01144-61604, to operate two probes from one supply connector.

Specifications

The following specifications apply to the 1144A.

Bandwidth¹ ≥ 800 MHz

Rise Time^{1,2} ≤ 440 ps

Attenuation³ 10:1 $\pm 2\%$

Input Resistance 1 M Ω , $\pm 5\%$

Maximum Input Voltage ± 40 V (dc + peak ac)

1. Above 35 °C, bandwidth and risetime degrade approximately 1/2%/°C
2. Rise time figure calculated from $t_r = 0.35/\text{Bandwidth}$.
3. When connected to an instrument input of 50 Ω , $\pm 0.5\%$

Characteristics

The following are characteristics of the 1144A.

Input Capacitance 2 pF (typical)

Overshoot and Ringing 1 $\pm 10\%$ for the first 6 ns, $\pm 4\%$ from 6 ns to 20 ns, $\pm 1.5\%$ thereafter

Output Voltage Offset $< \pm 15$ mV

Input Dynamic Range² 0 to ± 7.0 V

Output Load Requirement 50 Ω $\pm 0.5\%$

1. When used with a 3 GHz oscilloscope (oscilloscope characteristics excluded).
2. When connected to an instrument input of 50 Ω , $\pm 0.5\%$

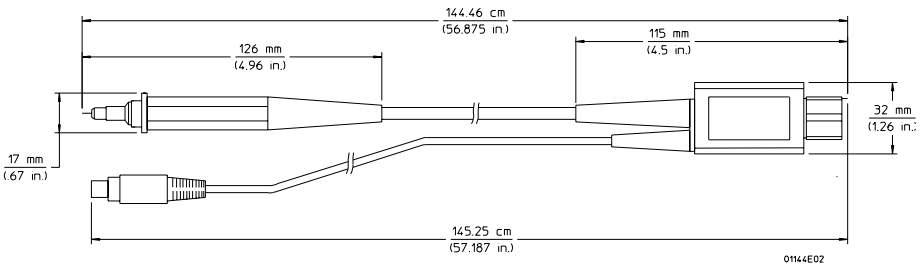
General Characteristics

The 1144A Active Probe has the following general characteristics.

Environmental Conditions	Operating	Non-operating
Temperature	0 °C to +55 °C (32 °F to +131 °F)	-40 °C to +70 °C (-40 °F to +158 °F)
Humidity	up to 95% relative humidity (non-condensing) at +40 °C (+104 °F)	up to 90% relative humidity at +65 °C (+149 °F)
Altitude	up to 4,600 meters (15,000 ft)	up to 15,300 meters (50,000 ft)
Vibration	Random vibration 5 to 500 Hz, 10 minutes per axis, 0.3g _{rms} .	Random vibration 5 to 500 Hz, 10 min. per axis, 2.41 g _{rms} . Resonant search 5 to 500 Hz swept sine, 1 octave/min. sweep rate, (0.75g), 5 min. resonant dwell at 4 resonances per axis.



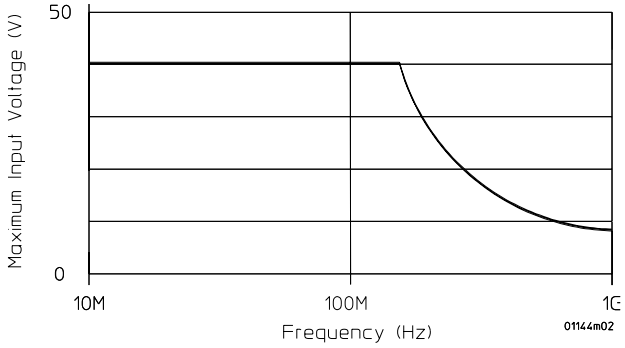
Power Requirements	dc ±12 V to ±15 V ±5% (at approximately 75 mA each supply)
Weight	Net: approximately 180 g (~6.5 oz), probe body 35 g (~1.25 oz) Shipping: approximately 0.8 kg (1.75 lb)
Dimensions	Refer to the outline drawing below.



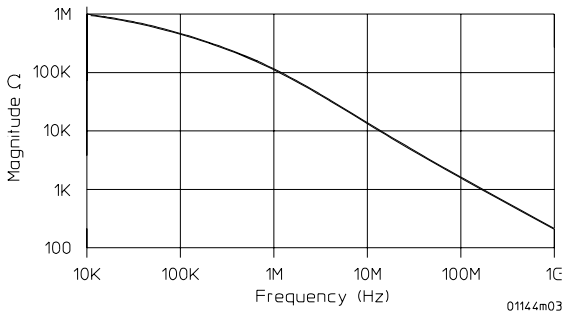
1144A Dimensions.

Operating the Probe

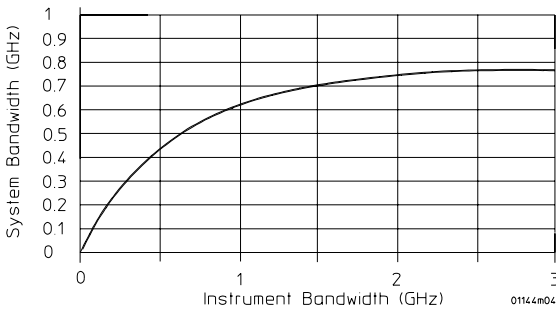
The following information will help you get the most out of your measurement when operating the probe.



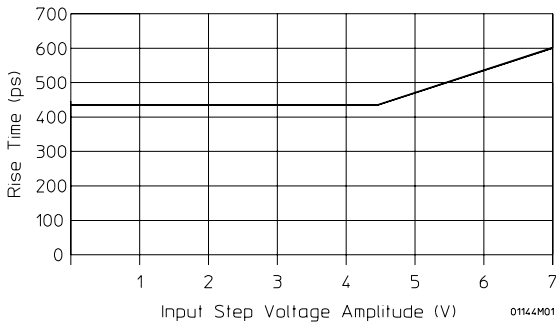
Operating Voltage Derating



Typical Input Impedance vs. Frequency



System Bandwidth



Typical Risetime vs. Input Voltage

CAUTION

Be sure to limit the input of this probe to voltages within the specified working voltage. Though the probe is designed with safeguards against static electricity and noise, the input is sensitive to and may be damaged by excessive voltage.

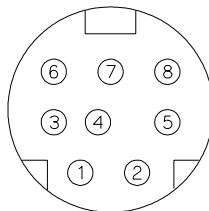
CAUTION

This probe is a sophisticated and delicate device. Please handle it with care. Dropping it or exposing it to strong vibration or shock can damage it and cause a malfunction.

Probe Power Connection

The following drawing shows the input power connections. The power requirements are given in the General Characteristics.

Pin 4, -15 V
Pin 6, +15 V
Pin 7, Ground
Shell, Cable Shield



01144E07

Cleaning the Probe

Do not use petroleum based solvents to clean the probe. Clean the probe with a neutral detergent in water and immediately wipe the probe with a dry cloth.

Service Strategy

Other than the accessories, there are no replaceable parts on the 1144A Active Probe. If your probe fails during warranty, normal warranty services apply. If the probe is not under warranty when it fails, it can be exchanged for a reconditioned probe at a nominal cost. The reconditioned probe is Agilent Technologies part number 01144-69701. Contact your Agilent Technologies representative for further information.

To return the probe for service

Before shipping the instrument to Agilent Technologies, contact your nearest Agilent Technologies sales office for additional details.

- 1 Write the following information on a tag and attach it to the instrument.**
 - Name and address of owner
 - Instrument model number
 - Description of the service required or failure indications
 - 2 Remove all accessories from the instrument.**

Accessories include all cables. Do not include accessories unless they are associated with the failure symptoms.
 - 3 Protect the instrument by wrapping it in plastic or heavy paper. Anti-static wrapping or packaging is strongly recommended.**
 - 4 Pack the instrument in foam or other shock absorbing material and place it in a strong shipping container.**

You can use the original shipping materials or order materials from an Agilent Technologies Sales Office. If neither are available, place 3 to 4 inches of shock-absorbing material around the instrument and place it in a box that does not allow movement during shipping.
 - 5 Seal the shipping container securely.**
 - 6 Mark the shipping container as FRAGILE.**

In any correspondence, refer to instrument by model number and full serial number.
-

Calibration Testing Procedures

These procedures are used to test the warranted specifications for the 1144A Active probe. Use the equipment listed in the “Test Equipment Required” section to complete the Testing Procedures.

Testing Interval

The calibration test procedures may be performed for incoming inspection of the instrument and should be performed periodically thereafter to ensure and maintain peak performance. The recommended test interval is yearly or every 2,000 hours of operation. Amount of use, environmental conditions, and the user’s experience concerning need for testing will contribute to verification requirements.

Equipment Required

The equipment required for the calibration tests is listed at the test. Any equipment satisfying the critical specifications listed may be substituted for the recommended model.

CAUTION

Allow the probe to warm up for at least 15 minutes prior to beginning calibration tests. Failure to allow warm-up may cause the probe to fail tests.

Input Resistance

This test checks the input resistance of the active probe.

Specification 1.0 M Ω \pm 5%

Equipment Required

Equipment	Critical Specification	Recommended Model/Part
Digital Multimeter	Resistance \pm 1%	34401A

- 1 Connect the DMM between the probe tip and the ground shell at the front of the probe.
- 2 Set up the DMM to measure resistance.
 The resistance should read 1.0 M Ω \pm 50 k Ω .

Gain Accuracy

This test checks the gain accuracy of the probe

Specification 0.1 \pm 2% (into 50 Ω \pm 0.5%)

Equipment Required

Equipment	Critical Specification	Recommended Model/Part
Signal Generator	1 kHz and 1 Vrms	3312A
Digital Multimeter	Better than 0.1% accuracy at 1 kHz	34401A
Power Supply	Power for probe under test	Oscilloscope or 1142A
Blocking cap	0.18 mF (or 0.1 mF fixed capacitor)	10240B
Adapter	BNC(f)-to-probe (suppl'd with probe)	5081-7705
Adapter	N(f)-to-BNC(m)	1250-0077
Termination	BNC feed-through, 50 Ω \pm 0.5%	10100C (test to 0.5%)
Adapter	BNC (f) to banana (m)	1251-2277

- 1 Connect the power connector of the active probe to the oscilloscope or 1142A.
- 2 Connect the 50 Ω feedthrough to the output of the probe.
If your termination is not accurate to 0.5%, you will need to adjust your test results accordingly, about 0.05% for each 0.1% error in the load.
- 3 AC couple the voltmeter by connect the blocking capacitor in series with the voltmeter input.
This is to insure that there is no dc component in the signal measurement.
- 4 Set the signal generator for 1 kHz and 1.000 Vrms ±0.5% (±5.0mV). Use the DVM to measure the signal.
Generator voltage _____
- 5 Using the BNC-to-probe adapter, connect the probe input to the output of the signal generator.
- 6 Use the voltmeter to measure the signal at the output of the probe.
Connect the feedthrough termination to the blocking capacitor.
Probe output voltage _____
- 7 Calculate the ac gain.

$$\text{ac Gain} = \frac{\text{Probe output voltage}}{\text{Generator voltage}}$$

The ac gain should be between 0.098 and 0.102 (0.10 ±2.0%).

Bandwidth

This test checks the probe bandwidth.

Specification down less than 3 dB, dc to 800 MHz

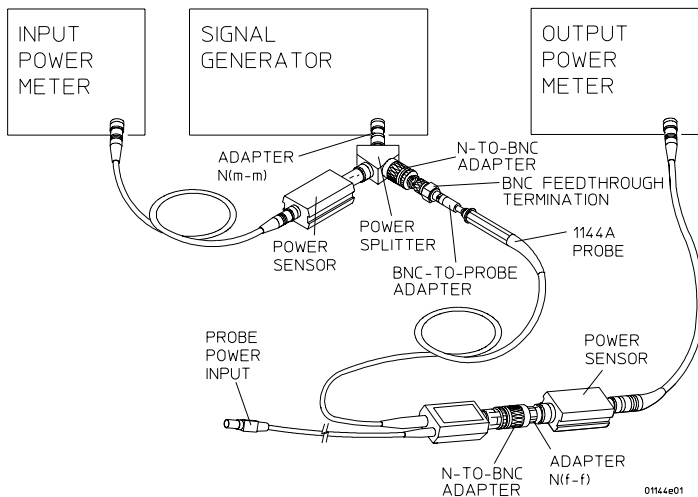
Equipment Required

Equipment	Critical Specification	Recommended Model/Part
Signal Generator	50 MHz to 800 MHz	8663A
Power Meters (2) or one Dual-Channel	50 MHz to 800 MHz, ±3% accuracy	436A (2), 437A (2), or 438A (1)
Power Sensor (2)	50 MHz to 800 MHz, 300 mW	8482A
Power Splitter	Type-N, dc to 800 MHz, ≤0.2 dB tracking	11667A
Power Supply	Power for probe under test	Oscilloscope or 1142A
Adapter (2)	Type N(m) to BNC(f), 50 Ω	1250-0780
Termination	BNC feedthrough, 50 Ω	10100C
Adapter	BNC(f)-to-probe (suppl'd with probe)	5081-7705

1144A Active Probe
Calibration Testing Procedures

Equipment	Critical Specification	Recommended Model/Part
Adapter	N(f-f), 50 Ω	1250-0772
Adapter	N(m-m), 50 Ω	1250-0778

- 1 Zero and calibrate the power meters with the power sensors.
- 2 Connect the equipment as in the drawing below.



- 3 Connect the probe power input to the oscilloscope or 1142A.
- 4 Set the signal generator for 50 MHz at 0.0 dBm.
- 5 Set the power meter calibration factors to the 50 MHz value on the power sensors.
- 6 Adjust the signal generator power output for exactly -6.0 dBm as read on the input power meter.
- 7 Note the power level reading on the output power meter. 50 MHz power level _____ dBm.

The output power level will be approximately -26 dBm. This corresponds to the 10:1 division ratio of the probe.

- 8 Change the signal generator frequency to 800 MHz.
- 9 Set the power meter calibration factors to the 800 MHz value on the power sensors.
- 10 Re-level the signal generator output power for a -6.0 dBm reading on the input power meter.
- 11 Note the power level reading on the output power meter. 800 MHz power level _____ dBm
- 12 Subtract the reading in step 7 from the reading in step 11.
The difference should be ≤ 3.0 dB

Calibration Test Record

Agilent Technologies Recommended Test Interval: 1 Year Recommended Date of Next Certification: _____ Certification Temperature: _____		1144A 800 MHz Differential Probe Serial No.: _____ Certification Date: _____ Tested By: _____ _____ _____
Test	Limits	Results
Input Resistance	1.0 M Ω \pm 5%	
Gain Accuracy	0.1 \pm 2% (into 50 Ω \pm 5%)	
Bandwidth	Down less than 3dB, dc to 800 MHz	

DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and CEN/CENELEC EN 45014

Manufacturer's Name: Agilent Technologies, Inc.

Manufacturer's Address: 1900 Garden of the Gods Road
Colorado Springs, CO
80907, U.S.A.

Declares, that the product

Product Name: Active Probe

Model Number(s): 1144A

Product Option(s): This declaration covers all options of the above product(s).

Conforms with the following product standards:

EMC:	Standard	Limit
	IEC 61326-1:1997+A1:1998 / EN 61326-1:1997+A1:1998	
	CISPR 11:1990 / EN 55011:1991	Group 1 Class A ^[1]
	IEC 61000-4-2:1995+A1:1998 / EN 61000-4-2:1995	4kV CD, 8kV AD
	IEC 61000-4-3:1995 / EN 61000-4-3:1995	3 V/m, 80-1000 MHz
	IEC 61000-4-4:1995 / EN 61000-4-4:1995	0.5kV signal lines, 1kV power lines
	IEC 61000-4-5:1995 / EN 61000-4-5:1995	0.5 kV line-line, 1 kV line-ground
	IEC 61000-4-6:1996 / EN 61000-4-6:1996	3V, 0.15-80 MHz
	IEC 61000-4-11:1994 / EN 61000-4-11:1994	1 cycle, 100%
	Canada: ICES-001:1998	
	Australia/New Zealand: AS/NZS 2064.1	
Safety:	IEC 61010-1:1990+A1:1992+A2:1995 / EN 61010-1:1993+A2:1995	
	Canada: CSA C22.2 No. 1010.1:1992	

Supplementary Information:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC (including 93/68/EEC, and carries the CE-marking accordingly (European Union).

^[1]This product was tested in a typical configuration with Agilent Technologies test systems.

Date: 08/21/2000



Ken Wyatt / Product Regulations Manager

Product Regulations

Performance
Criteria

EMC	IEC 61326-1:1997+A1:1998 / EN 61326-1:1997+A1:1998	
	CISPR 11:1990 / EN 55011:1991	
	IEC 61000-4-2:1995+A1:1998 / EN 61000-4-2:1995	A
	IEC 61000-4-3:1995 / EN 61000-4-3:1995	B
	IEC 61000-4-4:1995 / EN 61000-4-4:1995	A
	IEC 61000-4-5:1995 / EN 61000-4-5:1995	A
	IEC 61000-4-6:1996 / EN 61000-4-6:1996	A
	IEC 61000-4-11:1994 / EN 61000-4-11:1994	A
Canada: ICES-001:1998		
Safety	IEC 61010-1:1990+A1:1992+A2:1995 / EN 61010-1:1993+A2:1995	
	Canada: CSA C22.2 No. 1010.1:1992	

Additional Information

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC (including 93/68/EEC) and carries the CE Marking accordingly (European Union).

¹Performance Codes:

A PASS - Normal operation, no effect.

B PASS - Temporary degradation, self recoverable.

C PASS - Temporary degradation, operator intervention required.

D FAIL - Not recoverable, component damage.

Notes:

Sound Pressure Level N/A

Regulatory Information for Canada

ICES/NMB-001

This ISM device complies with Canadian ICES-001.
Cet appareil ISM est conforme à la norme NMB-001 du Canada.

Regulatory Information for Australia/New Zealand

This ISM device complies with Australian/New Zealand AS/NZS 2064.1



Safety Notices

This apparatus has been designed and tested in accordance with IEC Publication 1010, Safety Requirements for Measuring Apparatus, and has been supplied in a safe condition. This is a Safety Class I instrument (provided with terminal for protective earthing). Before applying power, verify that the correct safety precautions are taken (see the following warnings). In addition, note the external markings on the instrument that are described under "Safety Symbols."

Warnings

- Before turning on the instrument, you must connect the protective earth terminal of the instrument to the protective conductor of the (mains) power cord. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. You must not negate the protective action by using an extension cord (power cable) without a protective conductor (grounding). Grounding one conductor of a two-conductor outlet is not sufficient protection.
- Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired fuses or short-circuited fuse-holders. To do so could cause a shock or fire hazard.
- If you energize this instrument by an auto transformer (for voltage reduction or mains isolation), the common terminal must be connected to the earth terminal of the power source.
- Whenever it is likely that the ground protection is impaired, you must make the instrument inoperative and secure it against any unintended operation.
- Service instructions are for trained service personnel. To avoid dangerous electric shock, do not perform any service unless qualified to do so. Do not attempt internal service or adjustment unless another person, capable of

rendering first aid and resuscitation, is present.

- Do not install substitute parts or perform any unauthorized modification to the instrument.
- Capacitors inside the instrument may retain a charge even if the instrument is disconnected from its source of supply.
- Do not operate the instrument in the presence of flammable gasses or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.
- Do not use the instrument in a manner not specified by the manufacturer.

To clean the instrument

If the instrument requires cleaning: (1) Remove power from the instrument. (2) Clean the external surfaces of the instrument with a soft cloth dampened with a mixture of mild detergent and water. (3) Make sure that the instrument is completely dry before reconnecting it to a power source.

Safety Symbols



Instruction manual symbol: the product is marked with this symbol when it is necessary for you to refer to the instruction manual in order to protect against damage to the product..



Hazardous voltage symbol.



Earth terminal symbol: Used to indicate a circuit common connected to grounded chassis.

Notices

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Colorado Springs, CO 80907
USA

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A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.



Agilent Technologies

User's Guide

Agilent Technologies

Printed in Malaysia

Part Number

01144-97001

