

# User's Guide

Publication number 01170-92002  
March 2002



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## 1170 Series Low-Mass, Miniature Passive Oscilloscope Probes

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## Inspect the probe

### Inspect the shipping container for damage.

Keep a damaged shipping container or cushioning material until the contents of the shipment have been checked for completeness and the probe has been checked mechanically and electrically.

### Check the accessories.

Any accessories that were supplied with the probe are listed in "Available accessories" in this manual.

- If the contents are incomplete or damaged, notify your Agilent Technologies Sales Office.

### Inspect the instrument.

- If there is mechanical damage or defect, or if the probe does not operate properly or pass performance tests, notify your Agilent Technologies Sales Office.
- If the shipping container is damaged, or the cushioning materials show signs of stress, notify the carrier as well as your Agilent Technologies Sales Office. Keep the shipping materials for the carrier's inspection. The Agilent Technologies office will arrange for repair or replacement at Agilent Technologies' option without waiting for claim settlement.

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# 1170 Series Low-Mass, Miniature Passive Oscilloscope Probes

The 1170 Series Low-Mass, Miniature Passive Oscilloscope Probes are designed to work with the Wedge Probe Adapter and generally available logic analyzer accessories. The 1170 Series Probes have an ultra-small probe tip and an ultra-thin flexible cable. The 1170 Series Probes are high-performance probes that have low tip capacity and weigh less than one gram.

A range of accessories is available for you to optimize interfacing with surface mount devices. The 1170 Series Probes will fit directly onto standard board headers and IC clips. The Wedge Probe Adapter makes convenient connections to TQFP/PQFP package leads.

The 1170 series probes are compatible with the Infiniium oscilloscope AutoProbe Interface which completely configures the Infiniium oscilloscope for the probe.

## **Other key features**

- Narrow, sharp, replaceable probe tip.
- Browser attachment with ultra-sharp crown point. Use this attachment when probing about the circuit in debug mode. The crown point will not easily slip off of the lead you are probing. The pogo pin allows hand movement without losing contact.
- Snap-on BNC connector makes it easier to attach the probe to the oscilloscope.
- An assortment of long and short ground leads for connecting to a wide variety of points. Also includes a 0.65-mm wedge adapter for signal or ground connections.
- Flexible, light-weight cable with kevlar strengthener.
- Probe comes in a convenient storage box, with labeled information on how to reorder parts.
- Automatic Probe Identification Pin.

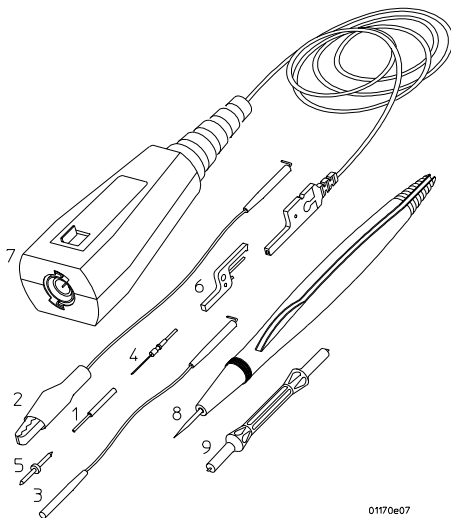
**Probe parts supplied**

**Probe parts supplied**

The following diagram and table show the parts supplied with the 1170 Series Probes.

**To order replaceable parts**

To order a replaceable part, in the United States call our toll-free hotline at 1-800-452-4844, or call your local Agilent Technologies Sales Office.



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**Parts of the 1170 Series Probes**

**1170 Series Probes Parts Supplied**

Item	Description	Item	Description
1	Pin - pogo	6	Ground extender
2	Ground lead - alligator	7	Probe
3	Ground lead - socketed	8	Browser
4	Walking stick ground	9	Screwdriver
5	Pin - probe		

**E2642A — 1170 Series Probes Accessory Kit**

<b>Item</b>	<b>Description</b>	<b>Quantity</b>
1	Pin - pogo	2
2	Ground lead - alligator	2
3	Ground lead - socketed	2
4	Walking stick ground	1
5	Pin - probe	4
6	Ground extender	2
7	SMD clip	2
8	Browser pogo pin	1

You can order additional quantities of these parts. See the ordering information in this manual.

The following table shows replaceable parts that you can order directly from Agilent Technologies.

**Replaceable Parts for 1170 Series Probes**

<b>Replaceable Part</b>	<b>Agilent Part Number</b>
1170 Series Probe (For replacement, order the entire probe assembly.)	1170, 1171, 1172, 1173
Browser (quantity 1)	5063-2122
Screwdriver	Included in accessory kit
BNC-to-Probe Tip Adapter	E9638A

**Probe parts supplied****Available accessories**

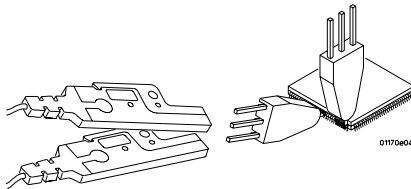
- 10467-68701 surface-mount device (SMD) microclips for connection to surface-mount technology (SMT) parts with lead spacings of 0.5 mm (0.020 inch) to 0.8 mm (0.032 inch).
- 10100C BNC(m)-to-BNC(f) 50- $\Omega$  feedthrough terminator.
- Wedges

<b>Agilent Wedge Model</b>	<b>Description</b>
E2613A	One 0.5 mm x 3-signal Wedge Probe Adapter
E2613B	Two 0.5 mm x 3-signal Wedge Probe Adapters
E2614A	One 0.5 mm x 8-signal Wedge Probe Adapter
E2615A	One 0.65 mm x 3-signal Wedge Probe Adapter
E2615B	Two 0.65 mm x 3-signal Wedge Probe Adapters
E2616A	One 0.65 mm x 8-signal Wedge Probe Adapter

Check your Wedge Probe Adapter User's Guide to verify the latest Wedge models.

**Using the Wedge Probe Adapter**

The Wedge Probe Adapter probing solution provides accurate and mechanically non-invasive contact to the TQFP/PQFP package leads. Follow the guidelines in the Wedge Probe Adapter User's Guide for problem-free probing.

**Connecting the Probe to the Wedge Adapter**

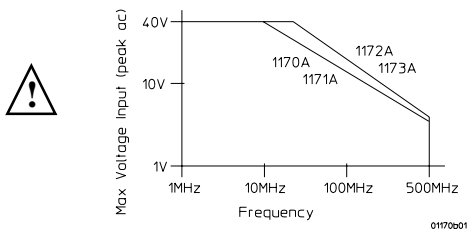
## Probe characteristics

Operating and environmental characteristics of the 1170 Series Probes are shown below.

### 1170 Series Probes Operating Characteristics

1170	7 ns approximate propagation delay
1171	6.5 ns approximate propagation delay
1172	6 ns approximate propagation delay
1173	5.5 ns approximate propagation delay
Maximum input voltage	40 V (dc + peak ac), CAT I
Safety	Meets IEC1010-2-31
Pull strength (BNC to probe tip)	≤12 lb static pull
Pollution degree 2	Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.

Installation category (overvoltage category) I: Signal level, special equipment or parts of equipment, telecommunication, electronic etc., with smaller transient overvoltages than installation category (overvoltage category) II.



### Voltage versus Frequency Rating Curve

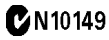
### Environmental Characteristics

<b>Temperature (operating)</b>	0 °C to +55 °C
<b>Humidity (operating)</b>	Up to 95% relative humidity at 40 °C
<b>Altitude (operating)</b>	Up to 4,600 meters (15,000 ft)
<b>Shock</b>	50 g (400 g tip only)
<b>Weight</b>	2.6 oz
<b>Indoor Use</b>	

**Probe characteristics**



This symbol indicates that the 1170 Series Probes are in compliance with European product regulations, including the EMC Directive and the Low Voltage Directive.



This symbol indicates that the 1170 Series Probes are in compliance with Australian product regulations.

**CAT I and CAT II Definitions**

Installation category (overvoltage category) I: Signal level, special equipment or parts of equipment, telecommunication, electronic etc., with smaller transient overvoltages than installation category (overvoltage category) II.

Installation category (overvoltage category) II: Local level, appliances, portable equipment etc., with smaller transient overvoltages than installation category (overvoltage category) III.



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## Bandwidth considerations

The dominant probe limitation to system bandwidth is its input capacitance, assuming that the high-frequency compensation adjustments have been made. The displayed bandwidth of any measurement system using an oscilloscope and probe is determined by four factors: probe input capacitance, source impedance, source bandwidth, and oscilloscope bandwidth.

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### 1170 Series Probes Selection Guide

Agilent Model Number	Type of Probe	Bandwidth Scope/Probe System	Division Ratio	Input R	Input C	Scope Input R	Comp Range	Length
<b>1170A</b>	High-impedance, passive	500 MHz	10:1	10 M $\Omega$	9 pF	1 M $\Omega$	6-9 pF	1.5 M
<b>1171A</b>	High-impedance, passive	500 MHz	10:1	10 M $\Omega$	9 pF	1 M $\Omega$	12-14 pF	1.4 M
<b>1172A</b>	High-impedance, passive	500 MHz	20:1	10 M $\Omega$	4 pF	1 M $\Omega$	6-9 pF	1.3 M
<b>1173A</b>	High impedance passive	500 MHz	20:1	10 M $\Omega$	4 pF	1 M $\Omega$	12-14 pF	1.2 M

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### 1170 Series Probe and Infiniium Oscilloscope Compatibility

Infiniium Oscilloscope	You can use these probes:
54810	1170A, 1172A
54815	1170A, 1172A
54820	1170A, 1172A
54825	1170A, 1172A
54835	1171A, 1173A
54845	1171A, 1173A

**Safety considerations**

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**Safety considerations**

**WARNING SHOCK HAZARD!**

These probes are designed for use with oscilloscopes that have a common terminal at *GROUND POTENTIAL* (in accordance with OSHA requirements and the National Electric Code). Exposed metallic surfaces of the probe and the oscilloscope *MUST BE GROUNDED*. Failure to ground the common terminal during certain applications, such as those requiring the oscilloscope to be powered from an external battery, might expose the operator to an electrical shock hazard that could be lethal (depending on voltage and current conditions.)

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**Cleaning the probe**

If the 1170 Series Probe requires cleaning, disconnect it from all power sources and clean it with a soft cloth dampened with a mild soap and water solution. Make sure the probe is completely dry before reconnecting it to a power source.

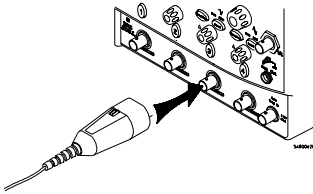
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## To connect oscilloscope probes

- 1 Attach the probe connector to the desired oscilloscope channel. Push it straight on until it latches into place.

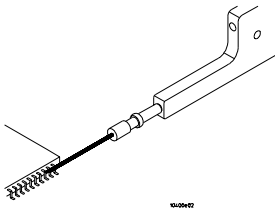
### Use Standard BNC Cables

1170 Series Probes are not compatible with Aux Trig In or Aux Out connectors on Infiniium Oscilloscopes. Use standard BNC cables on these connectors.



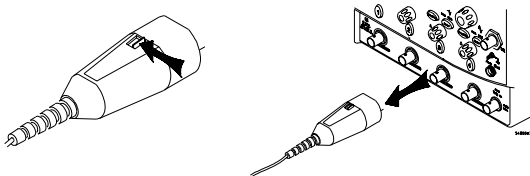
### Connecting the 1170 Series Probe to the Oscilloscope

- 2 Connect the probe to the circuit using any of the probing aids.



### Connecting the 1170 Series Probe to a Circuit

- 3 To disconnect the probe from the oscilloscope, push the small latch on top of the probe connector to the left, then pull the connector body away from the front panel of the oscilloscope without twisting the probe connector.



### Disconnect Latch on the 1170 Series Probe

**To connect oscilloscope probes**

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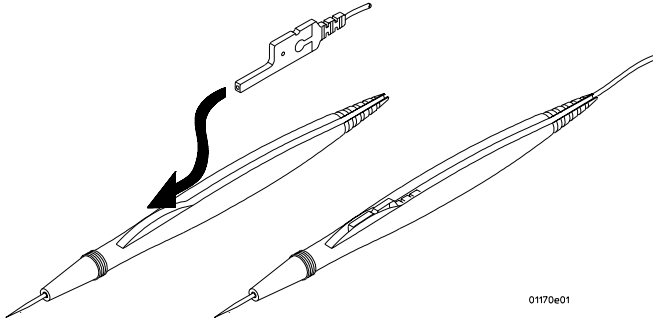
**CAUTION**

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Do not attempt to twist the snap-on probes on or off the oscilloscope's BNC connector. Twisting with excessive force will damage the probe.

**If you are using the browser**

Slide the probe tip into the browser as shown.



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**Sliding the Probe Tip into a Browser**

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## To operate the probe

When operating the 1170 Series Probes, these additional parts can help:

- Pin Probe
- SMD Clip

The SMD clip lets you connect the 1170 Series Probe to SMT parts. See “Available accessories” described earlier for more information.

- BNC-to-Probe Tip Adapter

This tip adapter lets you attach the 1170 Series Probe to a BNC cable.

- Walking Stick

The walking stick attaches to the probe to make ground contact with the circuit board, while letting you angle and maneuver the probe around an area.

### **1 Attach the probe to the circuit.**

You may use the probe tip pin without any other accessories for probing in places that are difficult to reach.

### **2 Ground the probe tip.**

Ground the probe by attaching either the alligator ground, socket ground, or walking stick ground. Any of these ground accessories provide reference for a ground point.

### **The Browser**

The browser tip has a crown point that digs into solder and will not slip. The spring-loaded pogo pin allows hand movement without losing contact.

### **The Wedge Probe Adapter**

The Wedge Probe Adapter (described earlier) makes contact with legs of the IC under test when the Wedge Probe Adapter conductors are inserted into the space between the legs of the IC.

## Compensation adjustments


You can adjust the probes for both low-frequency compensation and high-frequency compensation. Low-frequency compensation is an operating adjustment.

### When to Adjust the Probe Compensation

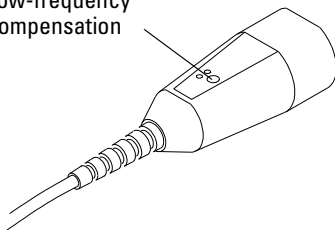
Low-frequency compensation is adjusted when you first connect the probe to the oscilloscope. Probe and channel-to-channel compensation will usually hold over all of the attenuator ranges when used with the recommended Agilent Technologies Oscilloscope. For more information, see "1170 Series Probe and Infiniium Oscilloscope Compatibility" on page 9

### Adjusting low-frequency compensation

Before you can have a flat frequency response when using a compensated passive divider probe, you must compensate the probe's cable capacitance and oscilloscope input capacitance to optimize the step response for flatness. You should compensate your probe to match its characteristics to the oscilloscope. A poorly compensated probe can introduce measurement errors.

- 1 Connect the probe from the appropriate oscilloscope channel to the front-panel probe adjust signal terminal [  ] on the oscilloscope. You can attach the probe with the holes in the probe body facing up to allow adjustment.
- 2 Press Autoscale.
- 3 Using the wide end of the supplied screwdriver tool, set the low-frequency compensation adjustment on the probe for the flattest pulse possible as shown below.

Low-frequency compensation



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Perfectly Compensated



Over Compensated



Under Compensated



### Low-Frequency Adjustment and Waveforms

### Adjusting high-frequency compensation

High-frequency compensation is not required if you are using the probe that is recommended for your oscilloscope. For more information, see “1170 Series Probe and Infiniium Oscilloscope Compatibility” on page 9.

The low-frequency compensation procedure must be performed before performing this procedure.

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#### Equipment Required

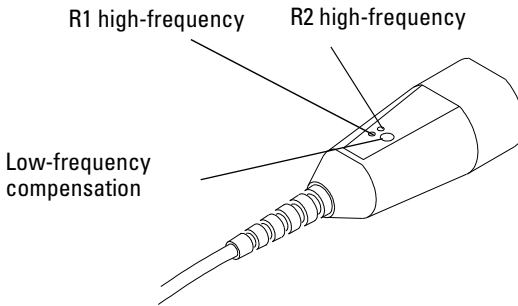
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Equipment	Specification	Agilent Part Number
50- $\Omega$ feedthrough	50- $\Omega$ BNC(m) and (f)	10100C
Adapter	BNC-to-probe tip	E9638A

- 1 Connect a 50- $\Omega$  feedthrough to the Infiniium Oscilloscope Aux Out connector.
- 2 Connect the BNC-to-probe tip adapter to the 50- $\Omega$  feedthrough.
- 3 Connect the probe tip to the BNC-to-probe tip adapter.
- 4 Connect the probe BNC to the appropriate channel on the oscilloscope.  
You can attach the probe with the holes in the probe body facing up to allow adjustment.
- 5 Set the Infiniium Oscilloscope Aux Out to 715 Hz (by selecting Utilities...Calibration...Aux Out on the Infiniium Oscilloscope).
- 6 Press Autoscale, then set the time base to 5 ns/div.
- 7 Set the sample mode to equivalent time, and the # of averages to 4 (by selecting Setup...Acquisition... on the Infiniium Oscilloscope) .
- 8 Using the narrow end of the supplied screwdriver tool, rotate the high-frequency compensation resistors R1 and R2 fully clockwise.

**Compensation adjustments**

- 9 Adjust R1 and R2 alternately in small increments until the displayed waveform has the flattest top.



01170e06

**High-Frequency Compensation Adjustments**



# 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 fuseholders. 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.

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**Manual Part Number**  
01170-92002, March 2002

**Print History**  
01170-92002, March 2002  
01170-92001, Jan. 2000  
01170-92000, Nov. 1998

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## CAUTION

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Agilent Technologies  
Printed in the USA

Manual Part Number  
01170-92002

