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# User's Guide

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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.

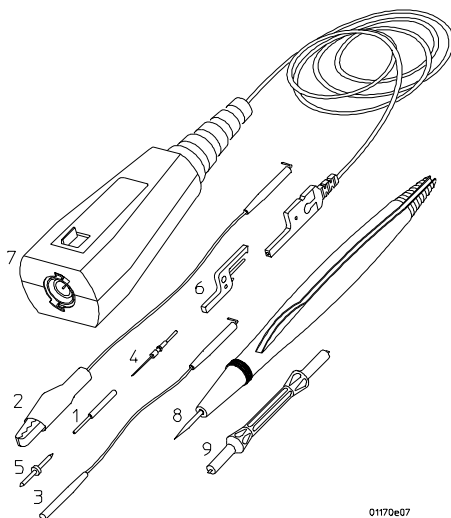
**Probe parts supplied**

**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		

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**E2642A — 1170 Series Probes Accessory Kit**

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<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.

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**Replaceable Parts for 1170 Series Probes**

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<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

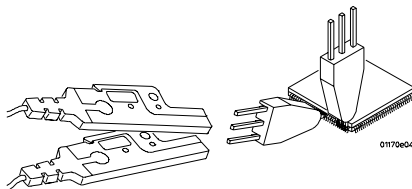
<b>Agilent Wedge Model</b>	<b>Description</b>
E2613A	One 0.5 mm x 3-signal Wedge Probe Adapter
E2613B	Two 0.5 mm x 3-signal Wedge Probe Adapters
E2614A	One 0.5 mm x 8-signal Wedge Probe Adapter
E2615A	One 0.65 mm x 3-signal Wedge Probe Adapter
E2615B	Two 0.65 mm x 3-signal Wedge Probe Adapters
E2616A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

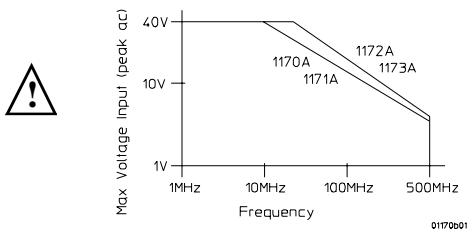
## Probe characteristics

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 vs Frequency Rating Curve

### Environmental Characteristics

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

### Indoor Use

**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.



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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:
54810A	1170A, 1172A
54815A	1170A, 1172A
54820A	1170A, 1172A
54825A	1170A, 1172A
54843A	1171A, 1173A
54845A	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.

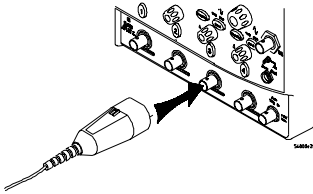
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## To connect oscilloscope probes

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

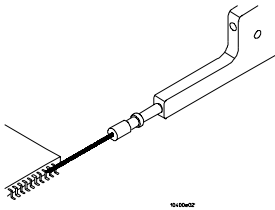
### Use Standard BNC Cables

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



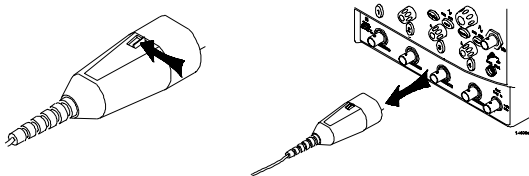
### Connecting the 1170 Series Probe to the Oscilloscope

- 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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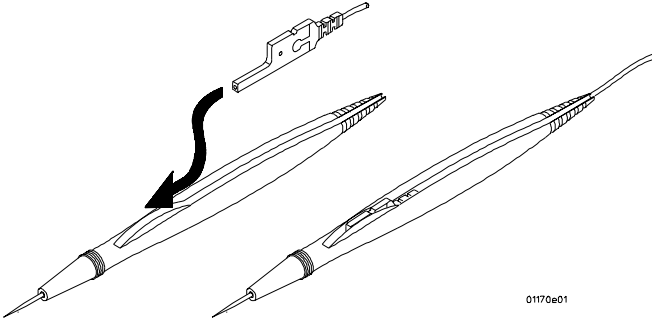
**CAUTION**

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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****Compensation adjustments**


You can adjust the probes for both low-frequency compensation and high-frequency compensation. Low-frequency compensation is an operating adjustment. High-frequency compensation should be performed periodically according to maintenance schedules.

**When to Adjust the Probe Compensation**

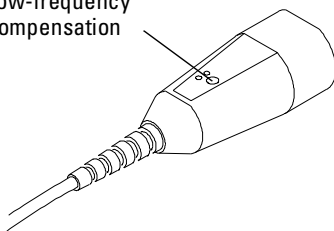
Low-frequency compensation is adjusted when you first connect the probe to the oscilloscope. Probe and channel-to-channel compensation will usually hold over all of the attenuator ranges when used with a Agilent Technologies Oscilloscope.

**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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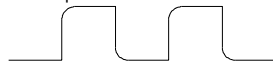
Perfectly Compensated



Over Compensated



Under Compensated

**Low-Frequency Adjustment and Waveforms**

### Adjusting high-frequency compensation

#### Do Low-Frequency Compensation First

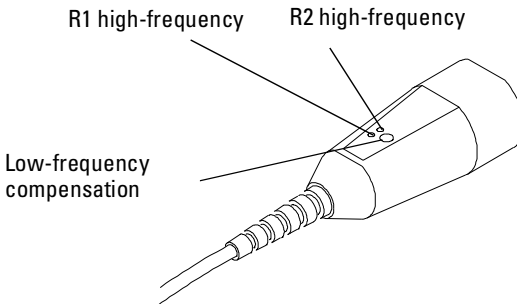
You must do the low-frequency compensation procedure described previously before doing this high-frequency compensation procedure.

To compensate for cable loss in your probe, you'll need this equipment:

#### Equipment Required

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



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#### High-Frequency Compensation Adjustments





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## Safety

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. To ensure safe operation and to keep the product safe, the information, cautions, and warnings in this operating manual must be heeded. In addition, note the external markings on the instrument that are described under "Safety Symbols."

### 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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## WARNING

The Warning sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a Warning sign until the indicated conditions are fully understood and met.

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## CAUTION

The Caution sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a Caution symbol until the indicated conditions are fully understood or met.

## About this edition

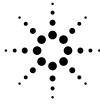
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New editions are complete revisions of the manual. Many product updates do not require manual changes; and, conversely, manual corrections may be done without accompanying product changes. Therefore, do not expect a one-to-one correspondence between product updates and manual updates.





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**User's Guide**

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