

User's Guide

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Agilent 1160 Series Miniature Passive Oscilloscope Probes

Introduction

The Agilent 1160-series family of miniature passive probes offers modular construction and improved reliability. Modular construction allows individual replacement of probe tips. Improved cable and strain relief design increase reliability.

The Agilent 1160-series probes are compatible with the AutoProbe Interface, which completely configures the Infiniium oscilloscope for the probe. The snap-on BNC connector makes it easy to attach the probe to the oscilloscope.

Agilent Technologies miniature probes significantly reduce the problem of probing densely populated integrated circuit components or the characteristically minute conductors on printed circuit boards. These small, lightweight probes allow measurements that were previously very difficult, while reducing the hazard of shorting. The probe body fits in the hand as comfortably as a pencil.

The probe includes a browser tip that won't slip off the test point being probed and short to some adjacent point. The browser uses a crown point that "digs in" to solder, and won't slip.

These probes include a variety of ground leads for attaching to many different grounding points.

Probe packaging provides convenient storage and ordering information for replacement parts.

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To 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.**

Accessories supplied with the probe are listed in "Accessories Supplied" in the front of 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's option without waiting for claim settlement.

Features

- Narrow, sharp, replaceable probe tip
- Browser attachment with ultra sharp crown point. Use this attachment when probing about the circuit in de-bug mode. The crown point will not easily slip off 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 scope
- An assortment of long and short ground leads for connecting to a wide variety of points. Also includes 0.050-inch SMD clips for signal and ground connections
- Handle unscrews and pulls back to reduce the size of the probe
- General purpose retractable hook tip constructed of strong, durable music wire
- Flexible, light weight cable with kevlar strengthener
- Multi-position barrel insulator exposes as much or as little probe ground as desired at the probe tip.
- Probes come in a convenient storage box, well labeled with information on how to reorder parts.
- Automatic Probe Identification Pin

Probe parts supplied

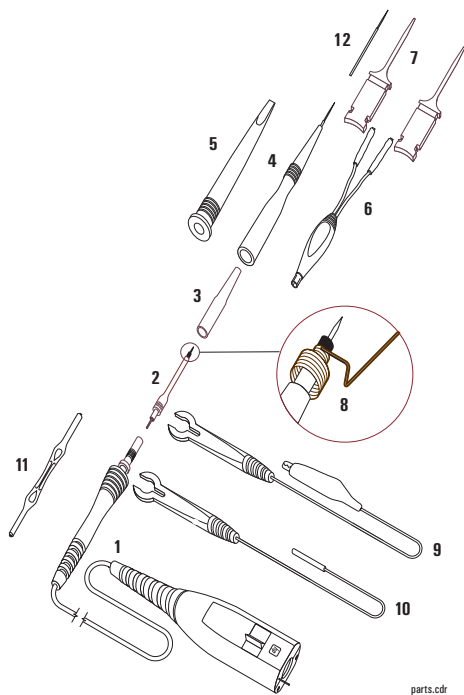
The following figure and table show the parts supplied with the Agilent 1160 series probe. The replaceable parts table shows replacement parts that can be ordered from Agilent Technologies.

Ordering replacement parts

To order a replacement part, in the United States please call our toll-free hotline at 1-877-447-7278, or call you local Agilent Technologies Sales Office.

Agilent 1160 Series Miniature Passive Oscilloscope Probes

Probe parts supplied



parts.cdr

Probe Parts Supplied

Item #	Description	Qty Supplied
1	Probe	1
2	Probe tip	2
3	Barrel insulator	2
4	Browser	1
5	General purpose retractable hook tip	1
6	Dual-lead adapter	1
7	SMD clip	2
8	Spring ground	4
9	Alligator ground lead	1
10	Socketed ground lead	1
11	Screwdriver	1
12	Browser pogo pin (spare)	1

Replacement Parts

Item #	Replacement part	Agilent Part Number
1	Probe (for replacement, order entire probe assembly)	1160A, 1161A, 1162A, 1163A, 1164A, or 1165A
2	1160A probe tip (qty 5) — Red	5063-2136
2	1161A probe tip (qty 5) — Brown	5063-2137
2	1162A probe tip (qty 5) — Black	5063-2138
2	1163A probe tip (qty 5) — Grey	5063-2139
2	1164A probe tip (qty 5) — Orange	5063-2151
2	1165A probe tip (qty 5) — Brown	5063-2137
3	Barrel insulator (qty 4)	*
4	Browser (qty 1)	5063-2115
5	General purpose retractable hook tip (qty 2)	5063-2135
6	Dual-lead adapter (qty 1)	5063-2147; See ** below
7	SMD clip (qty 5)	5063-2149
8	Spring ground (qty 4)	*
9	Alligator ground lead (qty 2)	5063-2140
10	Socketed ground lead (qty 1)	5063-2120
11	Screwdriver	*
12	Browser pogo pin (qty 4)	*
—	Accessory kit*	01160-68701

* Accessory kit includes 4 spring grounds, 4 browser pogo pins, 4 barrel insulators, and 1 screw driver.

** Provides interface with the Agilent Wedges.

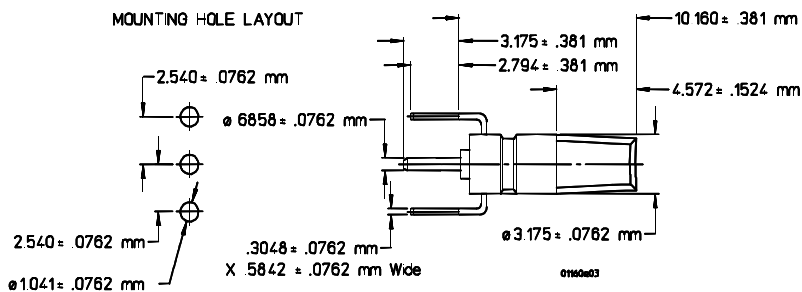
- Agilent 10467-68701 SMD microclips for connection to SMT parts with lead spacings of 0.5mm (0.020 inch) to 0.8mm (0.032 inch)
- Agilent 5063-2143 probe tip-to-BNC adapter.
- Agilent 10100C BNC(m)-to-BNC(f) 50Ω feedthrough terminator.
- Agilent N2844A flexible tip jack adapter



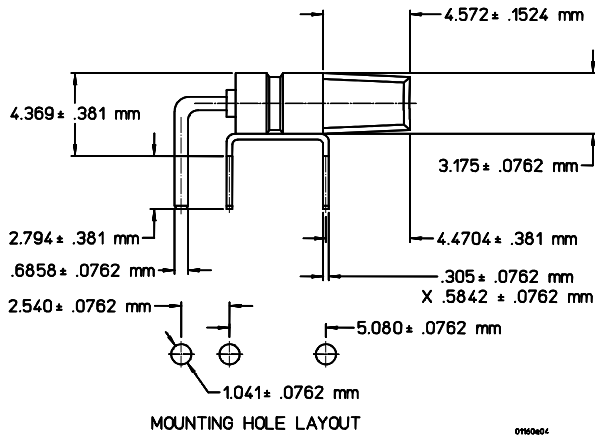
- Agilent E9639A 5 mm socket adapter.



- Agilent N2767A (Qty 5) or Agilent N2768A (Qty 25) vertical mini-probe socket.



- Agilent N2765A (Qty 5) or Agilent N2766A (Qty 25) horizontal mini-probe socket.



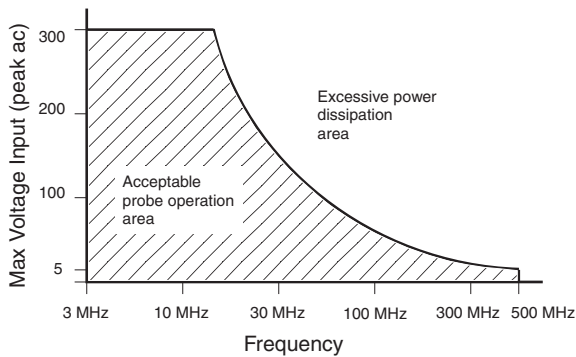
Characteristics

Operating and environmental characteristics are shown below.

Operating Characteristics

Approximate propagation delay 1160A, 1161A, 1162A, 1163A and 1165A	6.7 ns
Approximate propagation delay (1164A)	8.8 ns
Safety	Meets IEC1010-2-31
Pull strength (BNC to probe tip)	≤12 lb static pull
Maximum input voltage	300 V (dc + peak ac), CAT II

Voltage vs Frequency Rating Curve



Environmental Characteristics

Temperature (operating)	0 C to +55 C
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	



This symbol indicates that the Agilent 1160A Series Probes are in compliance with European product regulations, including the EMC Directive and the Low Voltage Directive.



This symbol indicates that the Agilent 1160A 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.

Bandwidth considerations

Bandwidth considerations

The Agilent 1160-series probes span three bandwidths.

- The 1160A, 1161A, 1164A, and 1165A are designed for use with oscilloscopes having bandwidths up to 500 MHz.
- The 1162A is designed for use in measurements demanding maximum sensitivity and bandwidth up to 25 MHz.

The dominant probe limitation to system bandwidth is its input capacitance, assuming the high-frequency compensation adjustments have been made. 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.

- The system bandwidth when using the 1163A (500 Ω probe) with a 50 Ω test source is generally the bandwidth of the oscilloscope.

Agilent 1160 family selection guide

Model Number	Type of probe	Bandwidth scope/probe system	Division ratio	Input R	Input C	Scope Input R	Comp Range	Length
1160A	High impedance, passive	500 MHz	10:1	10 M Ω	9 pF	1 M Ω	6–9 pF	1.5 m
1161A	High impedance, passive	500 MHz	10:1	10 M Ω	10 pF	1 M Ω	12–14 pF	1.5 m
1162A	High impedance, passive	25 MHz	1:1	1 M Ω	50 pF + scope capacitance	1 M Ω	n/a	1.5 m
1163A	500 Ω resistive divider	>1.5 GHz with 54845A	10:1	500 Ω	1.5 pF	50 Ω	n/a	1.5 m
1164A	High impedance, passive	500 MHz	10:1	10 M Ω	10.5 pF	1 M Ω	6–9 pF	2.0 m
1165A	High impedance, passive	500 MHz	10:1	10 M Ω	10 pF	1 M Ω	12–14 pF	1.5 m

Probe compatibility

Infiniium Oscilloscope	Use this Agilent probe
54810A	1160A, 1162A, 1163A, 1164A
54815A	1160A, 1162A, 1163A, 1164A
54820A	1160A, 1162A, 1163A, 1164A
54825A	1160A, 1162A, 1163A, 1164A
54830B	1162A, 1163A, 1165A
54831B	1162A, 1163A, 1165A
54832B	1162A, 1163A, 1165A
54835A	1161A, 1162A, 1163A
54845A/B	1161A, 1162A, 1163A

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.)

To clean the probe

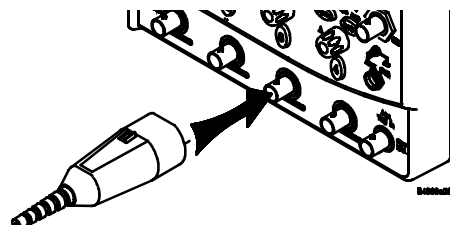
If this probe requires cleaning, disconnect it from all power sources and clean with soft cloth dampened with a mild soap and water solution. Make sure the probe is completely dry before reconnecting it to a power source.

To connect oscilloscope probes

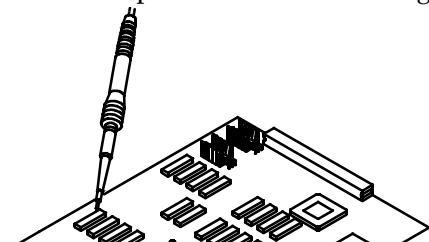
To connect oscilloscope probes

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

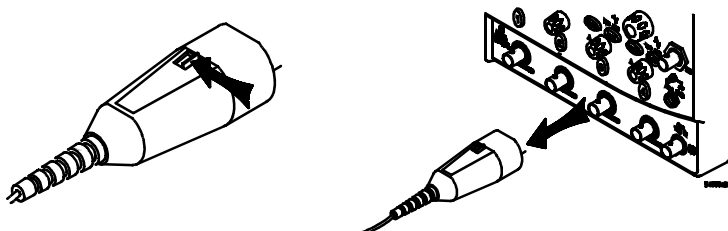
The Agilent 1160 series probes are not compatible with the Aux Trig In or Aux Out connectors on the Infiniium oscilloscope. Use standard BNC cables on these connectors.



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



- 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.



CAUTION

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.

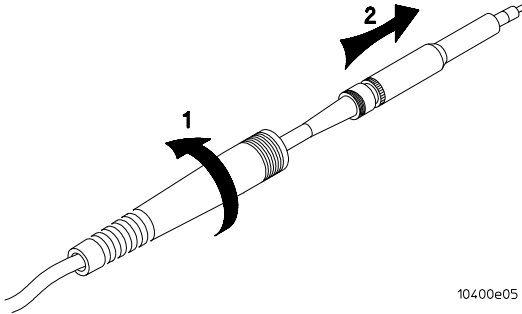
To operate the probe

CAUTION Do not solder probe tip to any surface. Solder will damage the probe tip.

CAUTION If using the probe without any accessories, the probe could cause a short if dropped within the circuit.

To attach the probe to the circuit under test

The probe tip may be used without any accessories for probing in hard- to-get places.



10400e05

The cable strain relief may be unscrewed from the probe and slid back on the cable when using two or more probes in close proximity. When using the probe without the browser or retractable hook tip, the barrel insulator (supplied accessory) should be used to cover the tip ground shield to prevent the hazard of shorting when probing the circuit. The barrel insulator, may be unscrewed and removed to accommodate tight probing situations.

The barrel insulator can be screwed to multiple positions:

- With the barrel insulator screwed all the way on, a spring ground (supplied accessory) may be added to the probe tip to provide ground contact.
- With the barrel insulator screwed most of the way out, the barrel insulator covers the ground shield by the probe tip.

To operate the probe

Probe tip with ground

Ground the probe by attaching either the alligator ground, socket ground, or spring ground. Any of these ground accessories provides reference for a ground point. To avoid possible shorting of other circuitry, use the barrel insulator in conjunction with any of the grounding accessories.

Probe tip with browser

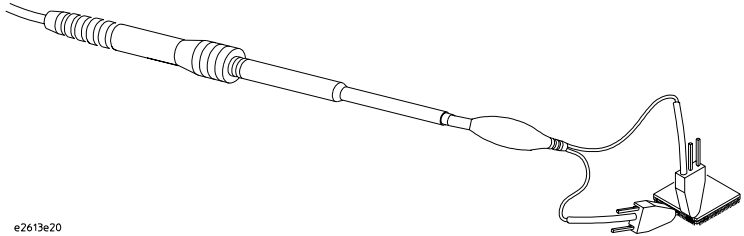
The browser tip has a crown point that digs into solder and won't slip. Attach a ground lead to the probe, then the barrel insulator, and then the browser. The spring-loaded pogo pin allows hand movement without losing contact.

Probe tip with general purpose retractable hook tip

The retractable hook tip is used for most typical in-circuit probing and ICs. Attach a ground lead to the probe, then the barrel insulator, and then the retractable hook tip. Attach the hook tip to a probing point by pressing the retractable hook tip body towards the probe body, placing the hook tip around the probing point, and then release the retractable hook tip body.

The Agilent Wedge Probe Adapter

The Agilent Wedge Probe Adapter makes contact with legs of the IC under test when the Agilent Wedge Probe Adapter conductors are inserted into the space between the legs of the IC. If you are using the Agilent Wedge Probe Adapter, refer to the supplied Agilent Wedge Probe Adapter User's Guide.



Connecting the Probe to an Agilent Wedge Adapter

Agilent Wedge Probe Adapters

Agilent Model Number	Description
E2613A	One 0.5 mm x 3-signal wedge
E2613B	Two 0.5 mm x 3-signal wedge
E2614A	One 0.5 mm x 8-signal wedge
E2615A	One 0.65 mm x 3-signal wedge
E2615B	Two 0.65 mm x 3-signal wedge
E2616A	One 0.65 mm x 8-signal wedge
E2643A*	One 0.5 mm x 16-signal wedge
E2644A*	One 0.65 mm x 16-signal wedge

* 16-signal Agilent Wedge Probe Adapters include 3 removable jumpers
(Agilent part number 1258-0141 for quantity of 1 jumper)

Compensation adjustments

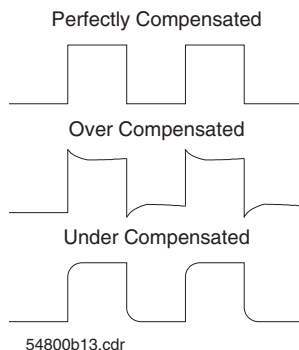
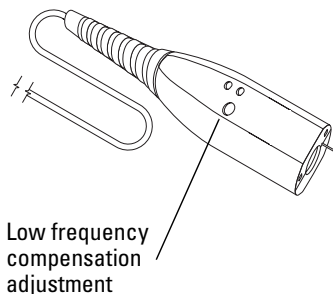
The probes can be adjusted for low-frequency compensation and for high-frequency compensation. Low-frequency compensation is an operating adjustment and high-frequency compensation should be performed periodically according to maintenance schedules.

Low-frequency compensation is adjusted when the probe is first connected to the oscilloscope. Probe compensation will usually hold over all the attenuator ranges when used with a Agilent Technologies oscilloscope. If the input capacitance of the oscilloscope changes as ranges are switched, compensation must be adjusted each time a new range is selected.

Low-frequency compensation

Before you can have a flat frequency response when using a compensated passive divider probe, the probe's cable capacitance and scope input capacitance must be compensated 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. To compensate a probe, follow these steps.

- 1 Connect the probe from the appropriate oscilloscope channel to the front-panel probe adjust signal terminal [] on the oscilloscope. The probe can be attached 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 (see figures below.)



High-frequency compensation

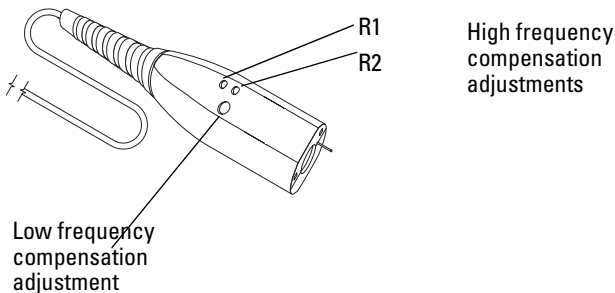
Perform the following procedure to compensate for cable loss in your probe.

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

Equipment required

Equipment	Specification	Agilent Part Number
50 Ω feedthrough	50 Ω , BNC(m) and (f)	10100C
Adapter	BNC-to-probe tip	5063-2143

- 1 Connect a 50 Ω feedthrough to Infiniium oscilloscope Aux Out connector.
- 2 Connect BNC-to-probe tip adapter to 50 Ω feedthrough.
- 3 Remove any probing aid and the barrel insulator from the probe tip.
- 4 Connect the probe tip to the BNC-to-probe tip adapter.
- 5 Connect the probe BNC to oscilloscope channel 1. The probe can be attached with the holes in the probe body facing up to allow adjustment.
- 6 Set the Infiniium oscilloscope Aux Out to Probe Comp (set under Utilities...Calibration...Aux Output on the Infiniium oscilloscope.)
- 7 Press Autoscale, then set the time base to 5 ns/div.
- 8 Set sample mode to equivalent time, # of averages to 4 (set under Setup...Acquisition... on the Infiniium oscilloscope.)
- 9 Using the narrow end of the supplied screwdriver tool, rotate high-frequency compensation resistors R1 and R2 fully clockwise.
- 10 Adjust R1 and R2 alternately in small increments until the displayed waveform has the flattest top.



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charges to Agilent
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shipping charges to return
the product to the Buyer.
However, the Buyer shall
pay all shipping charges,
duties, and taxes for
products returned to
Agilent Technologies from
another country.

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and firmware designated by
Agilent Technologies for
use with an instrument will
execute its programming
instructions when properly
installed on that
instrument. Agilent
Technologies does not
warrant that the operation
of the instrument software,
or firmware will be
uninterrupted or error free.

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The foregoing warranty
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resulting from improper or
inadequate maintenance by
the Buyer, Buyer-supplied
software or interfacing,
unauthorized modification
or misuse, operation outside
of the environmental
specifications for the
product, or improper site
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maintenance.

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agreements and other
customer assistance
agreements are available for
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Certification

Agilent Technologies
Company certifies that this
product met its published
specifications at the time of
shipment from the factory.
Agilent Technologies
further certifies that its
calibration measurements
are traceable to the United
States National Institute of
Standards and Technology,
to the extent allowed by the
Institute's calibration
facility, and to the
calibration facilities of other
International Standards
Organization members.

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.

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.

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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