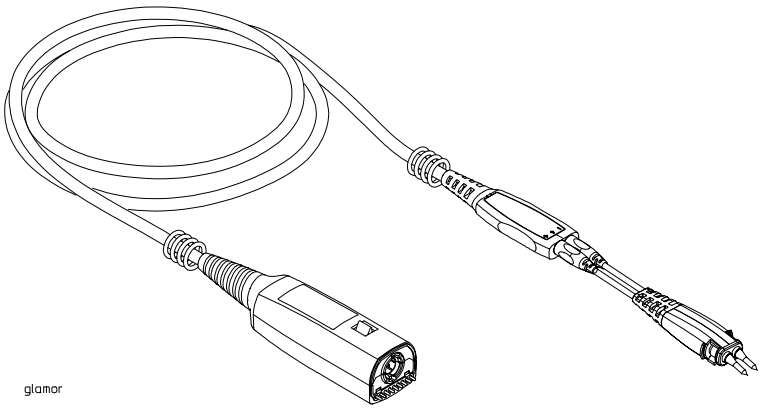
Agilent Technologies

User's Quick Start Guide

Publication number 01169-97002
November 2004



For Safety information and Regulatory information, see the pages at the back of this guide.

1168A 10 GHz and 1169A 12 GHz InfiniiMax Active Probes

In This Book

This guide provides user and service information for the 1168A and 1169A InfiniiMax Active Probes.

Chapter 1 gives you general information such as inspection, cleaning, accessories supplied, and specifications and characteristics of the probe. Shows the recommended probe configurations for the different probe accessories.

Contents

General Information

1

General Information

1168A 10 GHz and 1169A 12 GHz InfiniiMax Active Probes

The 1168A and 1169A InfiniiMax Active Probes are probe solutions for high-frequency applications. The probes are compatible with the DSO81304A, DSO81204A, DSO81004A, 54855A, and 54854A Infiniium AutoProbe Interface which completely configures the Infiniium series of oscilloscopes for the probes.

These probes are also compatible with the N1022A probe adaptor for use with the Infiniium 86100A Digital Communication Analyzer or for use with the 1143A external power supply.

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 instrument has been checked mechanically and electrically.

❑ Check the accessories.

Accessories supplied with the probe are listed in "Accessories Supplied" in Table 1-1.

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

❑ Inspect the probe.

- 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.

InfiniiMax Accessories Supplied

A complete probing solution consists of an amplifier and a probe head.

Figure 1-1

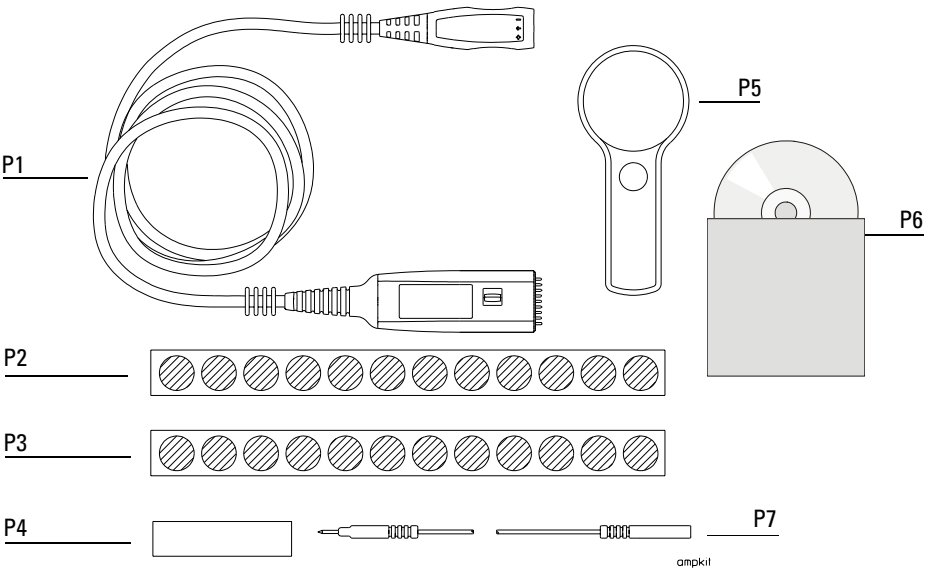
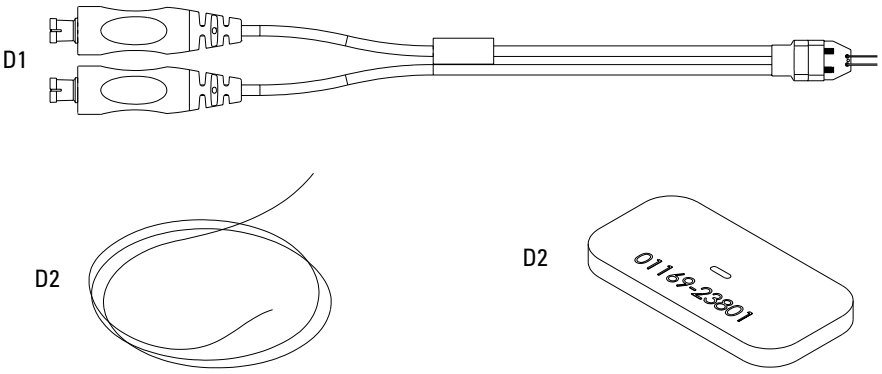


Table 1-1

Item	Description	Qty Supplied	Part Supplied
P1	Probe amplifier 1168A - 10 GHz 1169A - 12 GHz	1	 1168A 1169A
P2	Velcro dots strip, hooks	1	
P3	Velcro dots strip, loops	1	
P4	Velcro strip	1	
P5	Magnifying glass	1	
P6	CD-ROM containing Adobe Acrobat files with more in-depth information on probe performance, performance verification, and service.	1	
P7	Probe amplifier ground wire	1	01131-21301

N5381A 12 GHz Solder-in Differential Probe Head

Figure 1-2



Some parts have been enlarged to show more detail.

N5381A 12 GHz Solder-in Differential Probe Accessories Supplied

Item	Description	Qty Supplied	Part Supplied
	Solder-in differential probe head kit consists of the following		N5381A
D1	Solder-in differential probe head	1	
D2	0.007 inch tin-plated nickel wire	1	01169-81301
D2	Trim gauge (comes as part of the wire package)	1	

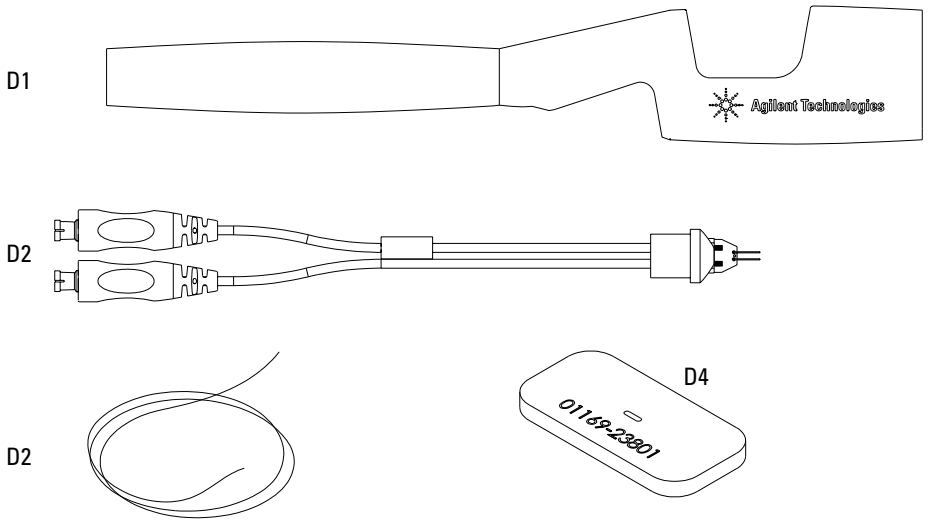
Cut wire

Before using the wire, the two wires must be cut to the correct dimensions by using the trim gauge. See instructions for "Replacing the Wires on N5381A and N5382A Probe Heads" on page 32.

Optional 0.005 inch tin-plated nickel wire is available for smaller geometry connections. See "Replaceable Parts for the N5380A, N5381A, N5382A, and Probe Amps" on page 13 for more information.

N5382A 12 GHz Differential Browser Probe Head

Figure 1-3



Some parts have been enlarged to show more detail.

N5381A 12 GHz Solder-in Differential Probe Accessories Supplied

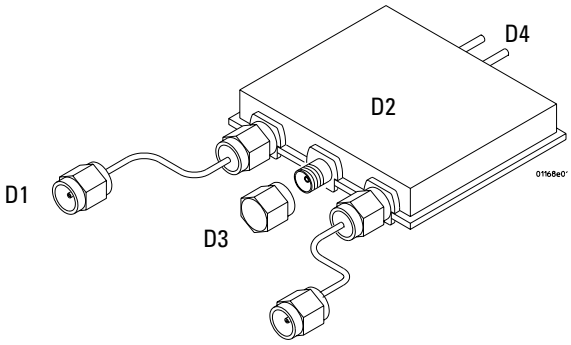
Item	Description	Qty Supplied	Part Supplied
	Solder-in differential probe head kit consists of the following		N5382A
D1	Ergonomic handle	1	01130-43202
D2	Solder-in differential probe head	1	
D3	0.005 inch tin-plated steel wire	1	01169-21304
D4	Trim gauge (comes as part of the wire package)	1	

Cut wire

Before using the wire, the two wires must be cut to the correct dimensions by using the trim gauge. See instructions for “Wire Dimensions” on page 25.

N5380A SMA Probe Head

Figure 1-4



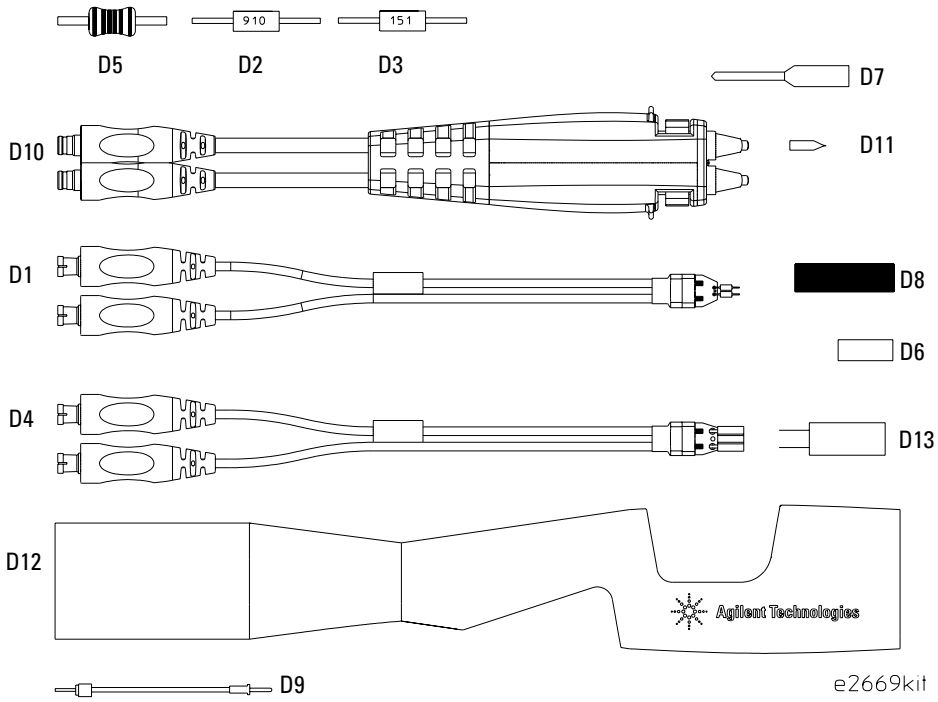
Some parts have been enlarged to show more detail.

N5380A 12 GHz SMA Probe Head Accessories Supplied

Item	Description	Qty Supplied	Part Supplied
	SMA probe head consists of the following		N5380A
D1	SMA-M to SMA-M cables	2	E2695-61601
D2	Probe Head PC Board	1	
D3	SMA shorting cap	1	
D4	GPO-F to GPO-F adaptor	2	

E2669A Differential Connectivity Kit

Figure 1-5



Some parts have been enlarged to show more detail.

E2669A Differential Connectivity Kit Accessories Supplied

Item	Description	Qty Supplied	Part Supplied
	Solder-in differential probe head kit consists of the following		E2677A
D1	Solder-in differential probe head	4	01131-62103
D2	Resistor for solder-in differential probe head full bandwidth, 91 Ω)	80	01131-81510
D3	Resistor for solder-in differential probe head medium bandwidth, 150 Ω)	40	01131-81506

Item	Description	Qty Supplied	Part Supplied
	91 Ω resistor template	1	01131-94311
	150 Ω resistor template	1	01131-94308
	Socketed differential probe head kit consists of the following		E2678A
D4	Socketed differential probe head	2	01131-62105
D5	Resistor for socketed differential probe head full bandwidth, 82 Ω)	96	01130-81506
D6	Socket for 25 mil (25/1000 inch) square pins, female on both ends	8	01131-85201
D7	25 mil female socket w/20 mil round male pin on other end	8	01131-85202
D8	Heatshrink socket accessory	8	01130-41101
D9	160 Ω Damped wire accessory	12	01130-21302
D13	Header adapter	4	01130-63201
	82 Ω resistor template	1	01131-94309
	Differential browser kit consists of the following		E2675A
D10	Differential browser	1	01131-60002
D11	Resistive tip for differential browser (blue)	20	01131-62102
D12	Ergonomic handle	1	01131-43201

Cut resistors

Before using the resistors, the resistor wires must be cut to the correct dimensions. For the correct dimensions see “Resistor Dimensions” on page 26

Replaceable Parts for the N5380A, N5381A, N5382A, and Probe Amps

Table 1-2

Agilent Replaceable Parts				
Agilent Part Number	**Consists of**	**Orderable?**	**Description**	**Qty**
1169A		Yes	12 GHz InfiniiMax Amp Kit	1
1168A		Yes	10 GHz InfiniiMax Amp Kit	1
01169-21304		Yes	0.005 steel wire and trim gauge (N5382A)	1
01169-81301		Yes	0.007 tin-plated nickel wire and trim gauge (N5381A)	1
01169-21306		Yes	0.005 tin-plated nickel wire and trim gauge (N5381A)	1
N5380A		Yes	SMA probe head	1

Table 1-3

N5380A Replaceable Parts			
Vendor	**Part Number**	**Description**	**Qty**
Corning Gilbert Rosenberger	#A1A1-0001-03 #19K 109-K00 E4	GPO-F to GPO-F adaptor	2
Agilent	E2695-61601	SMA-M to SMA-M cables	2

Replaceable Parts and Additional Accessories for the E2669A

Table 1-4

Connectivity Kit				
Agilent Part Number	**Consists of**	**Orderable?**	**Description**	**Qty**
E2669A		Yes	Differential Connectivity Kit consists of	1
	E2675A	Yes	Differential browser kit	1
	E2677A	Yes	Solder-in differential probe head kit	4
	E2678A	Yes	Socketed differential probe head kit	2

Probe Head Kits				
Agilent Part Number	**Consists of**	**Orderable?**	**Description**	**Qty**
E2675A		Yes	Differential browser kit	1
	01131-60002	No (Order E2658A accessory kit)	Differential browser	1
	01131-62102		Resistive tip for browser (blue)	20
	01131-43201		Ergonomic handle for browser	1
E2677A		Yes	Solder-in differential probe head kit	1
	01131-62103	No (Order E2670A accessory kit)	Solder-in differential probe head	1
	01131-81510		Resistor 91 Ω full bandwidth	20
	01131-81506		Resistor 150 Ω medium bandwidth	10
	01131-94311		91 Ω resistor template	1
	01131-94308		150 Ω resistor template	1
E2678A		Yes	Socketed differential probe head kit	1
	01131-62105	No (Order E2671A accessory kit)	Socketed differential probe head	1
	01130-63201		Header adapter	2
	01130-81506		Resistor 82 Ω full bandwidth	48
	01130-21302		160 Ω damped wire accessory	6
	01131-85201		Socket for 25 mil (25/1000 inch) square pins, female on both ends	4
	01131-85202		25 mil female socket w/20 mil round male pin on other end	4
	01130-41101		Heatshrink socket accessory	4
	01131-94309		82 Ω resistor template	1

Probe Heads				
Agilent Part Number	**Consists of**	**Orderable?**	**Description**	**Qty**
01131-60002		Yes	Differential browser	1
01131-62103		Yes	Solder-in differential probe head	1
01131-62105		Yes	Socketed differential probe head	1

Accessory Kits				
Agilent Part Number	**Consists of**	**Orderable?**	**Description**	**Qty**
E2658A		Yes	Replacement accessories for E2675A	1
	01131-62102	No	Resistive tip for browser (blue)	20
	01131-43201	No	Ergonomic handle for browser	1
E2670A		Yes	Replacement accessories for E2677A	1
	01131-81510	No	Resistor 91 Ω full bandwidth	20
	01131-81506	No	Resistor 150 Ω medium bandwidth	10
	01131-94311	No	91 Ω resistor template	1
	01131-94308	No	150 Ω resistor template	1
E2671A		Yes	Replacement accessories for E2678A	1
	01130-81506	No	Resistor 82 Ω full bandwidth	48
	01130-21302	No	160 Ω damped wire accessory	6
	01131-85201	No	Socket for 25 mil (25/1000 inch) square pins, female on both ends	4
	01131-85202	No	25 mil female socket w/20 mil round male pin on other end	4
	01130-41101	No	Heatshrink socket accessory	4
	01131-94309	No	82 Ω resistor template	1

Resistors

The Agilent number below is provided as a reference (not orderable) for you to order from the manufacturer.

Agilent Part Number	Order From Vendor	Orderable Part Number	Description	Qty
01131-81504	AVX Components	HR01000J	Resistor for solder-in single-ended probe head (full bandwidth, 0 Ω)	1
	BREL International	RMB16-000-J		

01131-81510	AVX Components	HR01910J	Resistor for solder-in single-ended probe head (high bandwidth, 91 Ω)	1
	BREL International	RMB16-910-J		
01130-81506	BC Components	2312 903 08209	Resistor for socketed differential probe head (high bandwidth, 82 Ω)	1
	Vishay	SMA0204HF/ MK1HF5082R 1% A		

Other Accessories

Vendor	Part Number	Description	Qty
Cascade® Microtech	E2654A	EZ-Probe® positioner	1
Agilent	E2655B	Probe deskew and performance verification kit	1
Agilent	E5381-82103	160 Ω damped wire accessory (01130-21302 34 each)	1
Agilent	01131-68703	Header adapter kit for socketed differential probe head (01130-63201 10 each)	1
Inmet	#8037	SMA coaxial dc block	1
Inmet	#18AH-6	SMA 6 dB coaxial attenuator	1
Inmet	#18AH-12	SMA 12 dB coaxial attenuator	1
ATM Microwave	#P1907	SMA adjustable delay	1

Specifications

All specifications are warranted. Measured using the probe amp and N5381A solder-in differential probe head.

Table 1-5

Specifications		
Bandwidth (-3 dB)		
1168A	> 10 GHz	
1169A	> 12 GHz (13 GHz typical)	
Input Resistance	50 kΩ ±2%	Differential mode resistance
	25 kΩ ±2%	Single-ended mode resistance each side to ground

Characteristics

All characteristics are the typical performance values of the InfiniiMax probes using the probe amp and N5381A solder-in differential probe head and are not warranted. Footnotes are located on page 19.

Typical Performance	
Oscilloscope and Probe System Bandwidth (-3 dB)	
1168A with DSO81004A	10 GHz
1169A with DSO81204A	12 GHz
1169A with DSO81304A	13 GHz
Rise and Fall Time (10% to 90%)	
1168A	44 ps
1169A	40 ps
Rise and Fall Time (20% to 80%)	
1168A	30 ps
1169A	28 ps
Rise and Fall Time (10% to 90%) (Phase corrected on DSO80000 Series Oscilloscope)	
1168A	40 ps
1169A	33 ps
Rise and Fall Time (20% to 80%) (Phase corrected on DSO80000 Series Oscilloscope)	
1168A	28 ps
1169A	23 ps

Input Capacitance		
Cm	0.09 pF	Model for input C is Cm is between tips and Cg is to ground for each tip
Cg	0.26 pF	
Cdiff	0.21 pF	Differential mode capacitance (capacitance when probing a differential signal = Cm + Cg/2)
Cse	0.35 pF	Single-ended mode capacitance (capacitance when probing a single-ended signal = Cm + Cg)
Input Dynamic Range	±1.65 V	Differential or single-ended
Input Common Mode Range	8 V peak-to-peak	dc to 100 Hz
	1.25 V peak-to-peak	> 100 Hz
Maximum Signal Slew Rate (SRmax)[1]	25 V/ns	When probing a single-ended signal
	40 V/ns	When probing a differential signal
DC Attenuation	≅ 3.45:1 [2]	
Zero offset error referred to input	< 2 mV x DC Attenuation [2]	
Offset Range	±16.0 V	When probing single-ended
Offset Accuracy	< 3% [2]	
Noise referred to input	2.5 mVrms	
Propagation Delay	≅ 6 ns	
Maximum Input Voltage	30 V Peak, CAT I	Maximum non-destructive voltage on each input ground
ESD Tolerance	> 8 kV from 100 pF, 300 Ω HBM	

1 Srmax of a sine wave = Amp x 2 x π x frequency or SRmax of a step ≅ Amp x 0.6 / trise (20 to 80%) for more information see Table 1-7 on page 24.
2 When calibrated on the oscilloscope, these characteristics are determined by the oscilloscope characteristics.

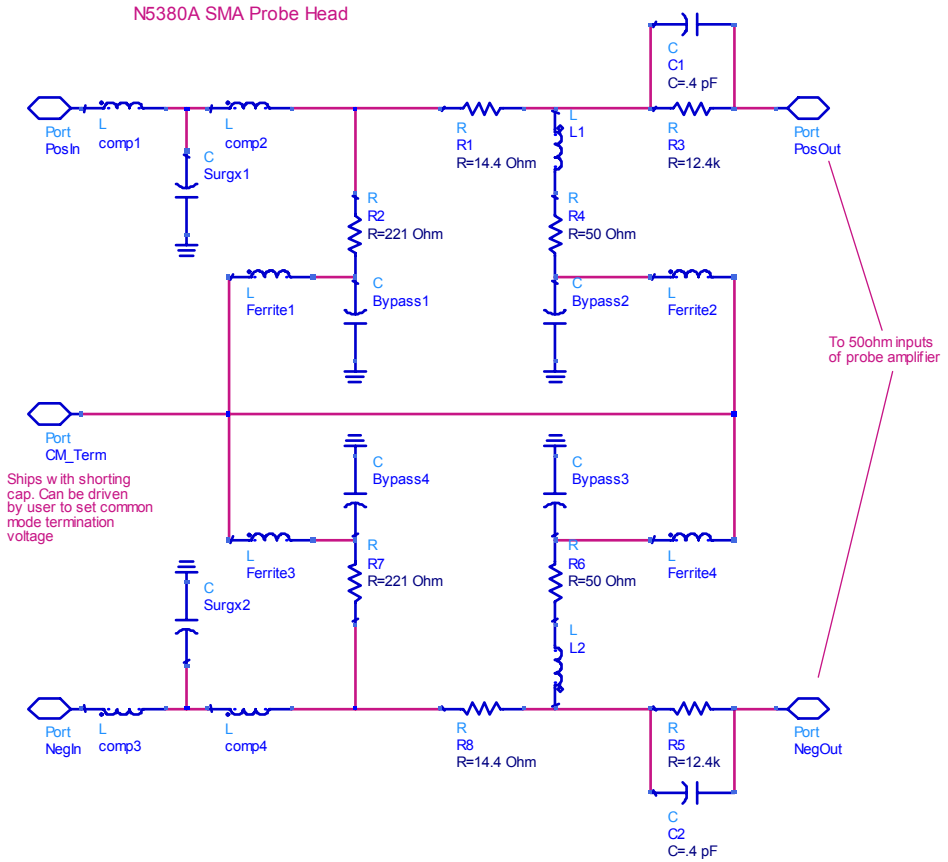
InfiniiMax II Series Performance Characteristics with N5380A SMA Probe Head

All characteristics are the typical performance values of the InfiniiMax probes using the probe amp and N5380A SMA probe head and are not warranted. Footnotes are located on page 21

Bandwidth	1169A: >12GHz	1168A: > 10GHz
Probe only rise and fall times	1169A: 27.5 ps (20% to 80%) 40 ps (10% to 90%)	1168A: 27.5 ps (20% to 80%) 40 ps (10% to 90%)
System rise and fall times[1]	1169A with DSO81304A: 23 ps (20% to 80%) 34 ps (10% to 90%) 1169A with DSO81204A 25 ps (20% to 80%) 36 ps (10% to 90%)	1168A with DSO81004A: 30 ps (20% to 80%) 42 ps (10% to 90%)
System bandwidth (-3 dB)	1169A with DSO81304A: 12.5 GHz 1169A with DSO81204A: 12 GHz	1168A with DSO81004A: 10 GHz
Input Resistance	50 Ω ± 2%	
Input dynamic range	± 1.1 V Differential or Single-Ended	
Maximum input[4]	2.28 Vrms	
(Vin-Vcm_term)		
Input common mode range	± (4.3 V - Vcm_term × 0.67) ± 0.8 V	dc to 100 Hz > 100 Hz
Maximum Signal Slew Rate[2]	25 V/ns	Differential Input
(SMA attenuator can extend range. See footnote 3.)		
DC attenuation	~2.2:1 (-6.9db)	
Zero offset error referred to input	< 2 mV	
Noise referred to input	1.6 mVrms (~ 14 nV/rtHz using noise BW of 12.5 GHz)	
Propagation delay	~6.15 ns	

1. Decreased rise and fall times mainly due to phase correction performed in the DSO80000 series, not due to DSP boosting (except in DSO81304A).
2. SR max of sine wave = amplitude x 2 x pi x frequency OR SR max of a step approximately equal to the amplitude x 0.6/trise (20-80%).
3. Use of X:1 SMA coaxial attenuators in front of SMA probe Head will:
   a. Increase by X the max input signal slew rate, dynamic range, offset range, common mode range, noise referred to the input, DC attenuation, and maximum input voltage.
   b. Most likely improve return loss or input TDR if attenuators are high quality
   c. Not affect bandwidth and rise time if attenuators are high quality.
4. Vcm_term is the voltage supplied to the common mode termination port of the N5380A. If shorting cap in place, this voltage is zero.

Figure 1-6



SMA Probe Head Schematic

CAT I: Secondary Circuits

Do not use the probe for measurements within measurement categories II, III and IV.

The RATED transient overvoltage is 80 volts peak.

General Characteristics

The following general characteristics apply to the active probe.

Table 1-6

General Characteristics

Environmental Conditions

	Operating	Non-operating
Temperature	5 °C to +40 °C	–40 °C to +70 °C
Humidity	up to 95% relative humidity (non-condensing) at +40 °C	up to 90% relative humidity at +65 °C
Altitude	Up to 4,600 meters	Up to 15,300 meters
Power Requirements	Voltages supplied by the Agilent oscilloscope AutoProbe interface.	
Weight	approximately 0.69 kg	
Dimensions	Refer to the outline in figure 1-11.	
Pollution degree 2	Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.	
Indoor use only		

Slew Rate Requirements for Different Technologies

The following table shows the slew rates for several different technologies. The maximum allowed input slew rate is 25 V/ns for single-ended signals and 40 V/ns for differential signals. Table 1-7 shows that the maximum required slew rate for the different technologies is much less that of the probe.

Table 1-7

Slew Rate Requirements

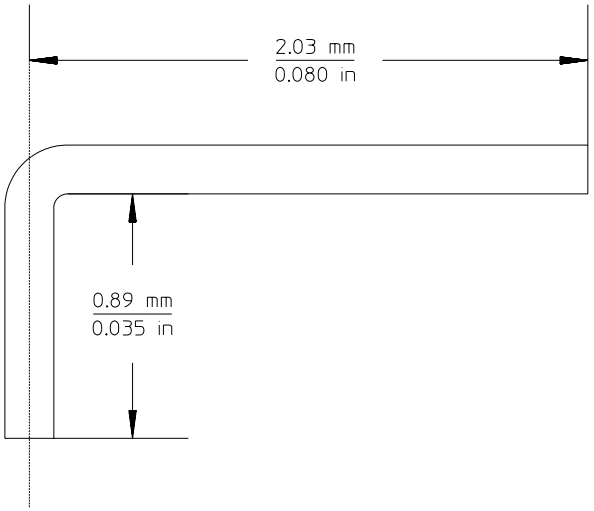
Name of Technology	Differential Signal	Max Single-Ended Slew Rate [1] (V/ns)	Max Differential Slew Rate [2] (V/ns)	Driver Min Edge Rate (20%-80% ps)	Max Transmitter Level (Diff V)
PCI Express (3GIO)	YES	9.6	19.2	50	1.6
RapidIO Serial 3.125Gb	YES	8.0	16.0	60	1.6
10GbE XAUI (4x3.125Gb)	YES	8.0	16.0	60	1.6
1394b	YES	8.0	16.0	60	1.6
Fibre Channel 2125	YES	8.0	16.0	75	1
Gigabit Ethernet 1000Base-CX	YES	7.8	15.5	85	2.2
RapidIO 8/16 2Gb	YES	7.2	14.4	50	1.2
Infiniband 2.5Gb	YES	4.8	9.6	100	1.6
HyperTransport 1.6Gb	YES	4.0	8.0	113	1.5
SATA (1.5Gb)	YES	1.3	2.7	134	0.6
USB 2.0	YES	0.9	1.8	375	1.1
DDR 200/266/333	NO	7.2	n/a	300	3.6
PCI	NO	4.3	n/a	500	3.6
AGP-8X	NO	3.1	n/a	137	0.7

1 The probe specification is 25 V/ns
2 The probe specification is 40 V/ns

Wire Dimensions

In order to make measurements with proper fidelity using the N5381A 12 GHz solder-in differential probe head or the N5382A 12 GHz differential browser probe head, the wire leads must be trimmed to a specified length as shown in figure 1-7. The procedure for trimming the wires is found in the section “Replacing the Wires on N5381A and N5382A Probe Heads” on page 32

Figure 1-7



Resistor Dimensions

In order to make measurements with proper fidelity, the resistor leads must be trimmed to a specified length and one end bent 90 degrees as shown in figure 1-8 and figure 1-9. The resistor in figure 1-10 needs to be trimmed but does not require any bending.

Solder-in 91 Ohm and 0 Ohm Full Bandwidth Resistors

The following part number resistors must be trimmed and bent as shown in figure 1-8.

- 01131-81510 (91 Ohm)
- 01131-81504 (0 Ohm)

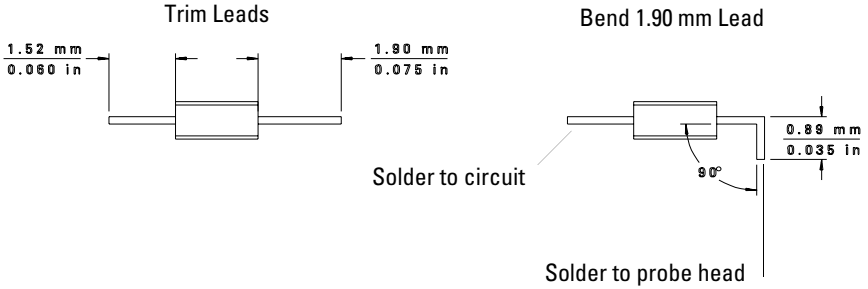
The equipment required is:

- Exacto knife
- Agilent supplied template included with resistors
- Magnifying device
- Tweezers (2)

The instructions for trimming and bending the resistor are:

1. Using tweezers, place resistor body inside the rectangle of the trim template.
2. Using the Exacto knife, trim the leads even with the trim lines.
3. Place resistor body inside the rectangle of the bend template.
4. Using another pair of tweezers, bend the 1.90 mm (0.075 in) lead 90 degrees.

Figure 1-8



Solder-in 150 Ohm and 0 Ohm Medium Bandwidth Resistors

The following part number resistors must be trimmed and bent as shown in figure 1-9.

- 01131-81506 (150 Ohm)
- 01131-81504 (0 Ohm)

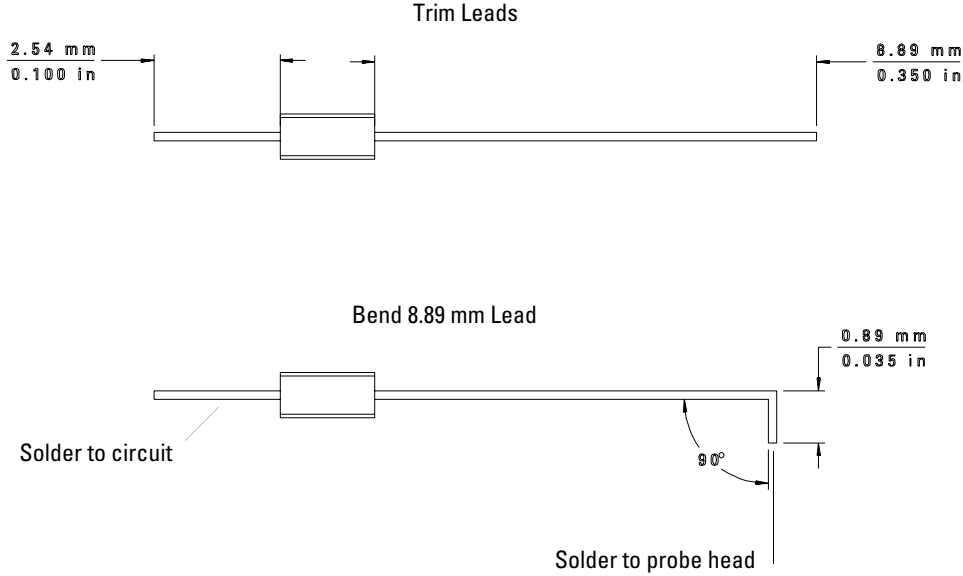
The equipment required is:

- Exacto knife
- Agilent supplied template included with resistors
- Magnifying device
- Tweezers (2)

The instructions for trimming and bending the resistor are:

1. Using tweezers, place resistor body inside the rectangle of the trim template.
2. Using the Exacto knife, trim the leads even with the trim lines.
3. Place resistor body inside the rectangle of the bend template.
4. Using another pair of tweezers, bend the 8.89 mm (0.360 in) lead 90 degrees.

Figure 1-9



82 Ohm Resistor

The following part number resistors must be trimmed as shown in figure 1-10.

- 01130-81506

The equipment required is:

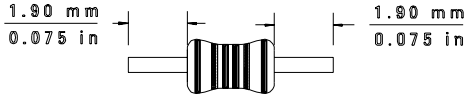
- diagonal cutters
- Agilent supplied template included with resistors
- Magnifying device
- Tweezers

The instructions for trimming the resistor are:

1 Using tweezers, place resistor body inside the rectangle of the trim template.

2 Using the diagonal cutters, trim the leads even with the trim lines.

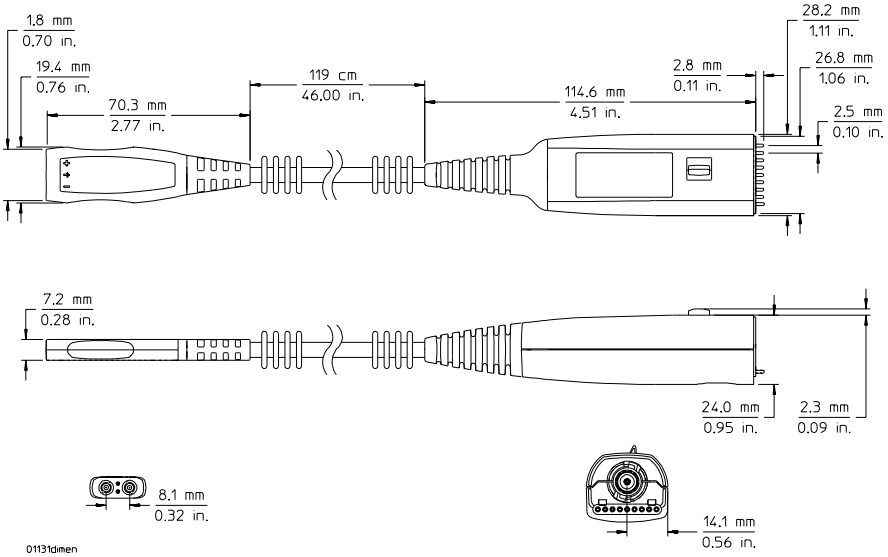
Figure 1-10



Probe and Probe Head Dimensions

Probe Amp Dimensions

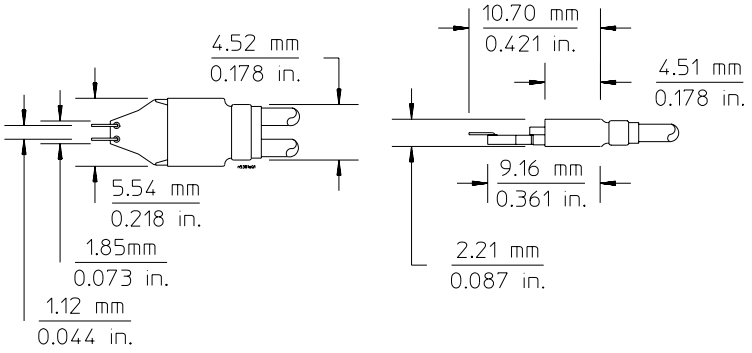
Figure 1-11



1168A and 1169A Active Probe Dimensions

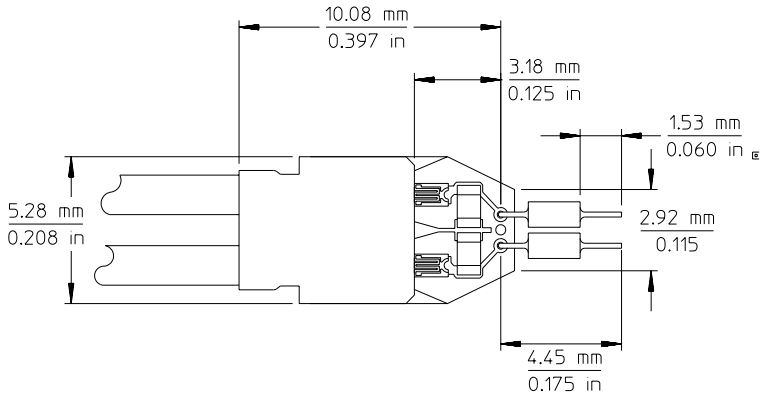
N5381A and N5382A Probe Head Dimensions

Figure 1-12



01131-62103 Solder-in Differential Probe Head Dimensions

Figure 1-13



Calibrating the probe

The Infiniium family of oscilloscopes provides both power and offset control to the 1168A and 1169A active probes through the front panel connector. Probe offset is changed by adjusting the vertical offset control on the Infiniium oscilloscope. The control should be adjusted to center your signal within the 5 volt peak-to-peak (12 volts peak-to-peak for slow signals) dynamic range of the probe.

Before using the 1168A or 1169A probes, a calibration and deskew should be performed.

1. Connect the probe output to the oscilloscope input.
2. Calibrate the oscilloscope and probe combination using the Infiniium probe calibration routine.

   When the probe has been calibrated, the dc gain, offset zero, and offset gain will be calibrated. The degree of accuracy specified at the probe tip is dependent on the oscilloscope system specifications.

Probe handling considerations

This probe has been designed to withstand a moderate amount of physical and electrical stress. However, with an active probe, the technologies necessary to achieve high performance do not allow the probe to be unbreakable. You should treat the probe with care. It can be damaged if excessive force is applied to the probe tip. This damage is considered to be abuse and will void the warranty when verified by Agilent Technologies service professionals.

- Exercise care to prevent the probe end from receiving mechanical shock.
- Store the probe in a shock-resistant case such as the foam-lined shipping case which came with the probe.

Cleaning the probe

If the probe requires cleaning, disconnect it from the oscilloscope 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 the oscilloscope.

Replacing the Wires on N5381A and N5382A Probe Heads

When the wire leads of the N5381A and N5382A probe heads become damaged or break off due to use, the wires can be replaced. Use the appropriate wire for each probe head as follows:

- The N5381A uses the 0.007 inch tin-plated nickel wire. (01169-81301)
- The N5382A uses the 0.005 inch tin-plated steel wire. (01169-21304)
- Optional 0.005 inch tin-plated nickel wire (used with N5381A). (01169-21306)

The recommended equipment and procedure for replacing the wires is outlined below.

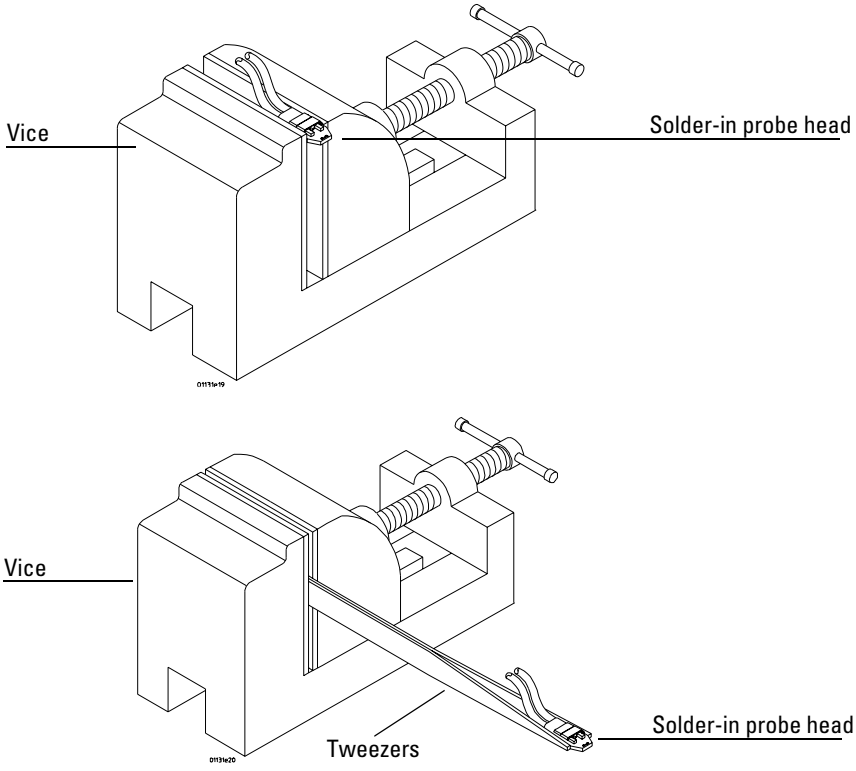
Table 1-8

Equipment
Vice or clamp for holding tip
Metcal STTC-022 (600 °C) or STTC-122(700 °C) tip soldering iron or equivalent. The 600 °C tip will help limit burning of the FR4 tip PC board.
0.381 mm (0.015 in) diameter RMA flux standard tin/lead solder wire
Fine stainless steel tweezers
Rosin flux pencil, RMA type (Kester #186 or equivalent)
Flush cutting wire cutters
Magnifier or low power microscope
Agilent supplied trim gauge (01169-23801)
Ruler

1 Use the vice or clamp to position the tip an inch or so off the work surface for easy access. If using a vice, grip the tip on the sides with light force. If using a tweezers clamp, grip the tip either on the sides or top and bottom. See figure 1-14.

CAUTION When tightening the vice, use light force to avoid damaging the solder-in probe head.

Figure 1-14



2 Make sure soldering iron tip is free of excess solder. Grab each wire lead with tweezers and pull very gently up. Touch the soldering iron to solder joint just long enough for the wire to come free of the probe head tip. Do not keep the soldering iron in contact with the tip any longer than necessary in order to limit burning and damage to the pc board. This solder joint has very low thermal mass so it should not take very long for the joint to melt and release.

3 Prepare the mounting hole(s) for new wire(s) by insuring that the holes are filled with solder. If they are not, use the soldering iron and solder to fill the holes. Again, do not leave the iron in contact with the tip any longer than necessary. When the hole(s) are filled with solder use the flux pencil to coat the solder joint area with flux.

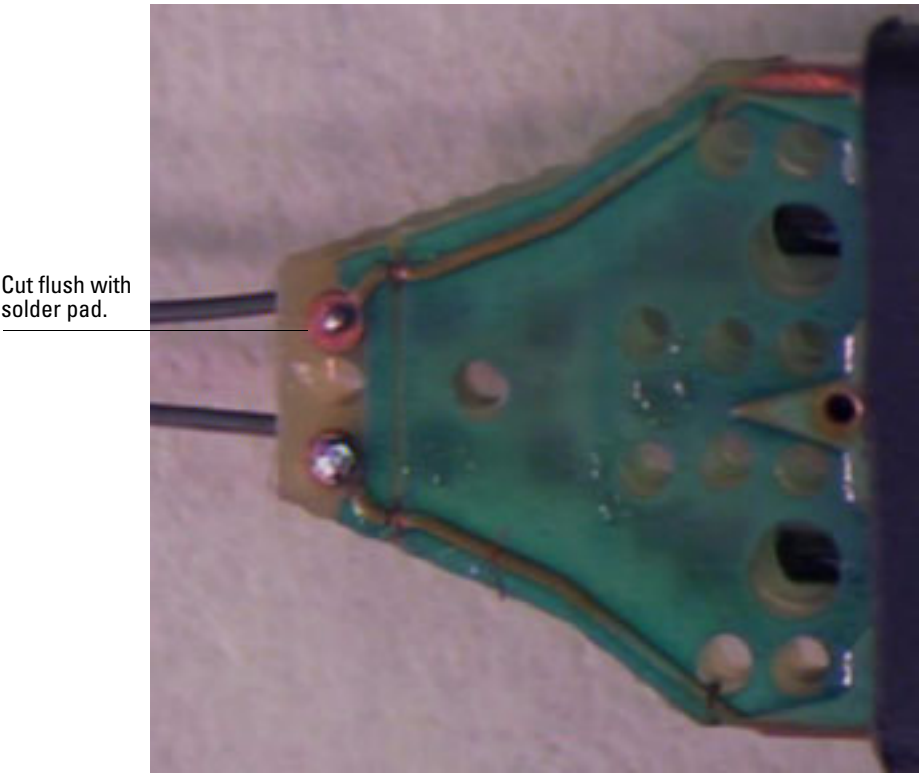
4 Cut two wires to a length of about 12.7 mm (0.5 inches).

5 Using tweezers, put a 90 degree bend at approximately 6 mm (0.25 inches) from the one end of the wire.

6 Holding the wire in one hand and the soldering iron in the other hand, position the end of the wire lead over the solder filled hole. Touch the soldering iron to the side of the hole. When the solder in the hole melts, the wire lead will fall into the hole. Remove soldering iron as soon as lead falls into the hole. Again, the thermal mass of the joint is very small so extra dwell time is not needed with the soldering iron to insure a good joint.

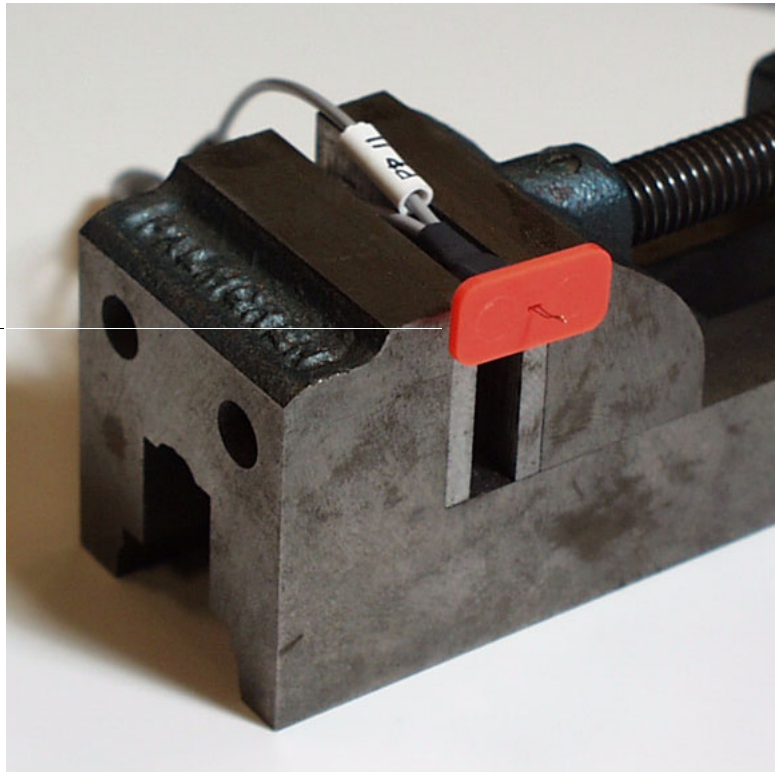
7 Cut the wires that protrude on the bottom side of the probe head board even with the solder pad.

Figure 1-15



8 Place the wires through the hole in the trim gauge with the probe head perpendicular to the trim gauge.

Figure 1-16



9 Cut the wires even with the trim gauge on the side opposite of the probe head.

Figure 1-17

Tips for Using Solder-In Probe Heads

- When soldering in leads to DUT always use plenty of flux. The flux will insure a good, strong solder joint without having to use an excessive amount of solder.
- Strain relieve the micro coax leading away from the solder-in tips using hook-and-loop fasteners or adhesive tape to protect delicate connections.
- Note that for the differential solder-in probe head, the + and - connection can be determined when the probe head is plugged into the probe amplifier, therefore, it does not matter which way the tip is soldered.

Replacing the Mini-axial Lead Resistors on Solder-In Tips

When the leads of the mini-axial resistors become damaged or break off due to use, the resistors can be replaced. The recommended equipment and procedure for replacing the resistors is outlined below.

Table 1-9

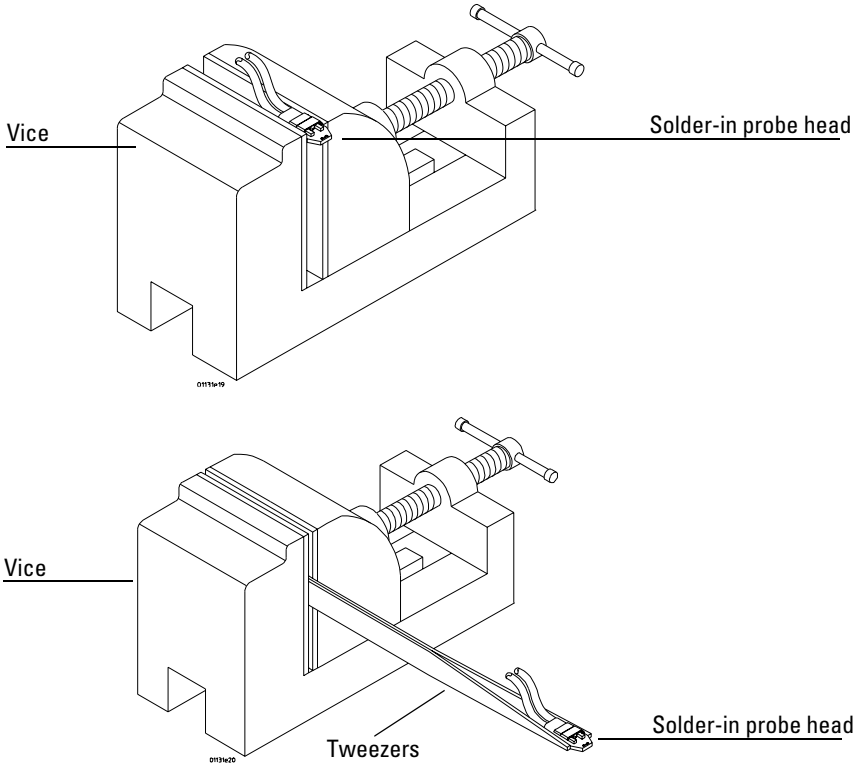
Equipment
Vice or clamp for holding tip
Metcal STTC-022 (600 °C) or STTC-122(700 °C) tip soldering iron or equivalent. The 600 °C tip will help limit burning of the FR4 tip PC board.
0.381 mm (0.015 in) diameter RMA flux standard tin/lead solder wire
Fine stainless steel tweezers
Rosin flux pencil, RMA type (Kester #186 or equivalent)
Diagonal cutters
Magnifier or low power microscope
Ruler

Replacement Procedure

1 Use the vice or clamp to position the tip an inch or so off the work surface for easy access. If using a vice, grip the tip on the sides with light force. If using a tweezers clamp, grip the tip either on the sides or top and bottom. See figure 1-18.

CAUTION When tightening the vice, use light force to avoid damaging the solder-in probe head.

Figure 1-18



2 Make sure soldering iron tip is free of excess solder. Grab each resistor lead or body with tweezers and pull very gently up. Touch the soldering iron to solder joint just long enough for the resistor to come free of the probe head tip. Do not keep the soldering iron in contact with the tip any longer than necessary in order to limit burning and damage to the pc board. This solder joint has very low thermal mass so it should not take very long for the joint to melt and release.

3 Prepare the mounting hole(s) for new resistors or wires by insuring that the holes are filled with solder. If they are not, use the soldering iron and solder to fill the holes. Again, do not leave the iron in contact with the tip any longer than necessary. When the hole(s) are filled with solder use the flux pencil to coat the solder joint area with flux.

4 Prepare the mini-axial lead resistor for attachment to tip pc board. See "Resistor Dimensions" on page 26 for dimensions and directions on preparing resistor leads. Lead to be attached to tip pc board will have a 90 degree bend to go into through hole in the tip pc board.

5 Holding the resistor lead or wire in one hand and soldering iron in the other, position the end of the resistor lead (after the 90 degree bend) over the solder filled hole. Touch the soldering iron to the side of the hole. When the solder in the hole melts, the resistor lead will fall into the hole. Remove soldering iron as soon as lead falls into the hole. Again, the thermal mass of the joint is very small so extra dwell time is not needed with the soldering iron to insure a good joint.

Tips for Using Solder-In Probe Heads

- Don't solder in resistors leads with a big ball of solder right next to the resistor body. Normally the nickel lead will limit the heat transfer to the resistor body and protect the resistor, but if a ball of solder is right next to the resistor body on the lead, the resistor may come apart internally and ruin the resistor.
- When soldering in leads to DUT always use plenty of flux. The flux will insure a good, strong solder joint without having to use an excessive amount of solder.
- Don't use the wrong value of resistor at the wrong length. See "Resistor Dimensions" on page 26 for dimensions and directions on preparing resistor leads.
- Make sure the zero ohm resistor is used for ground leads on the single-ended probe head.
- Strain relieve the micro coax leading away from the solder-in tips using hook-and-loop fasteners or adhesive tape to protect delicate connections.
- Note that for the differential solder-in probe head, the + and - connection can be determined when the probe head is plugged into the probe amplifier, so which way the tip is soldered in is not important.

Using Probe Accessories

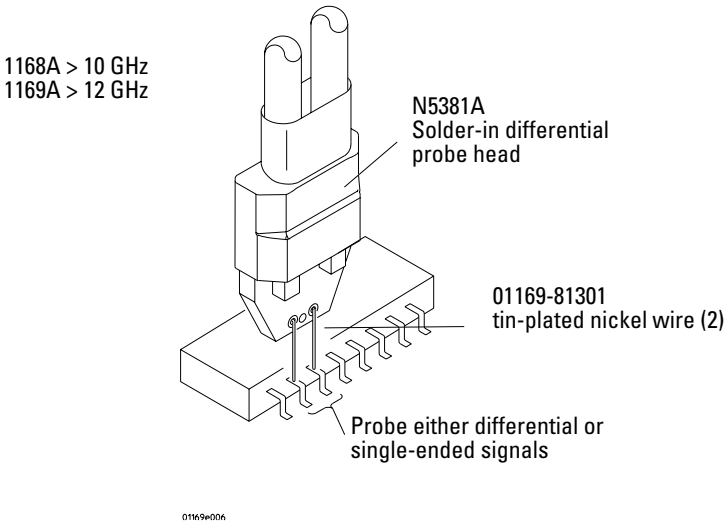
The 1168A and 1169A active probes come with a CD-ROM which contains more in-depth information about connecting the probe to your circuit.

The probe configurations shown in this section are the ones recommended for the best performance for different probing situations.

Solder-in Differential Probe Head (Full Bandwidth)

This probe configuration provides the full bandwidth signals and the lowest capacitive loading for measuring both single-ended and differential signals. The probe head wires must be soldered to the circuit that you are measuring. Because of the small size of the wire leads, it is easy to solder them to very small geometry circuits.

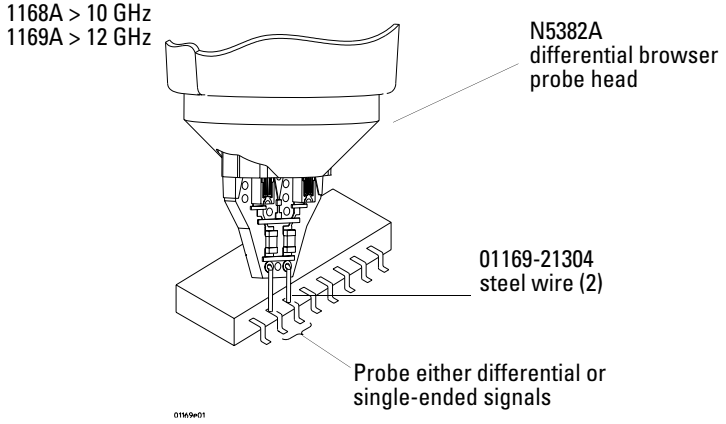
Figure 1-19



Differential Browser (Full Bandwidth)

The differential browser configuration is the best choice for general purpose troubleshooting of a circuit board for full bandwidth signals.

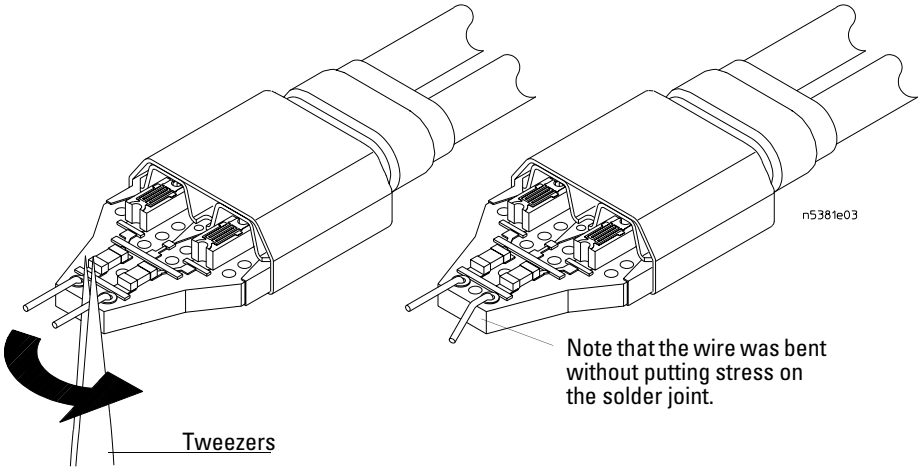
Figure 1-20



Adjusting the Spacing of the Differential Browser Wires

The best way to adjust the spacing of the differential browser wires is by using a pair of tweezers. By using a twisting motion rather than moving the wires around and putting stress at the solder joint, the wires will last much longer with multiple adjustments. See figure 1-21.

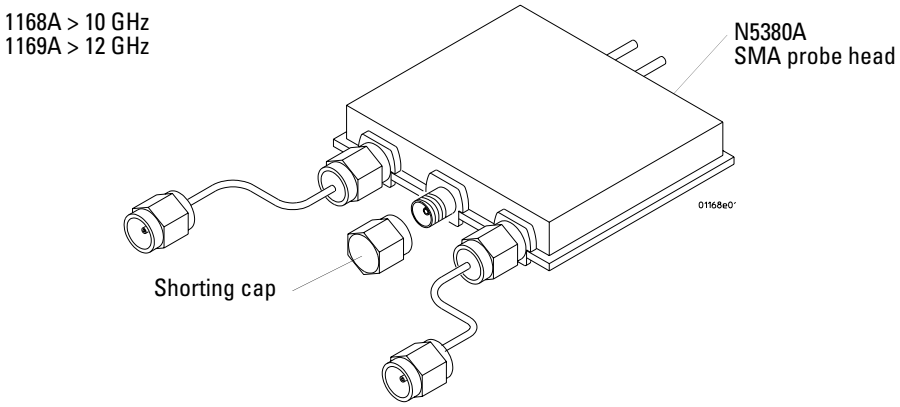
Figure 1-21



N5380A SMA Probe Head (Full Bandwidth)

This probe head provides the highest bandwidth for connecting to SMA connectors.

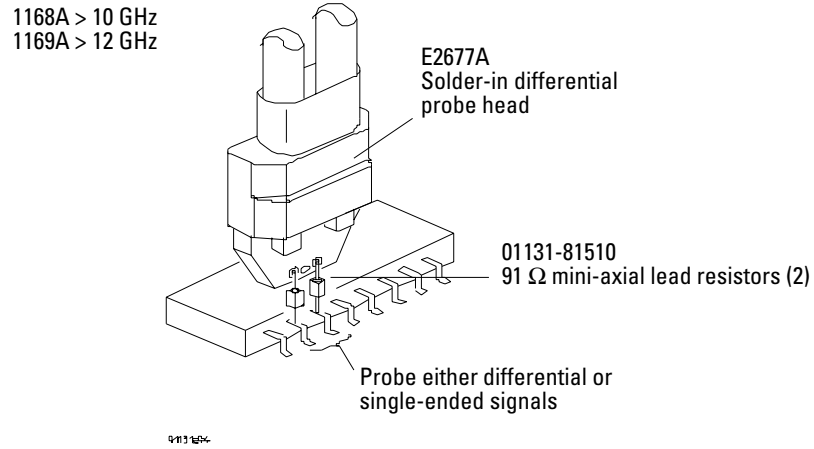
Figure 1-22



Solder-in Differential Probe Head (High Bandwidth)

This probe configuration provides the high bandwidth signals and the lowest capacitive loading for measuring both single-ended and differential signals. The probe head resistors must be soldered to the circuit that you are measuring. Because of the small size of the resistor leads, it is easy to solder them to very small geometry circuits.

Figure 1-23



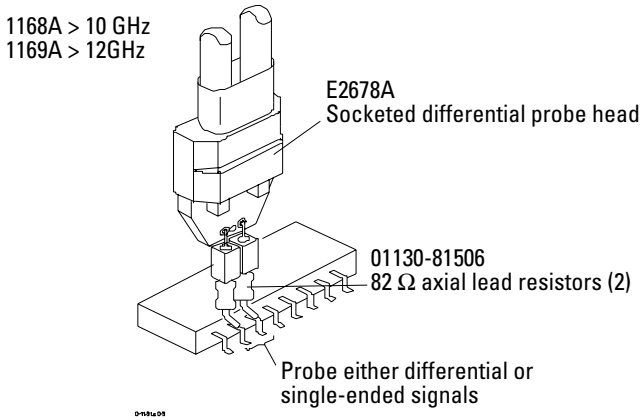
Solder-in Differential Probe Head (High Bandwidth)

Socketed Differential Probe Head (High Bandwidth)

This probe configuration provides the high bandwidth signals and minimal capacitive loading for measuring both single-ended and differential signals. The 82 Ω axial lead resistors are soldered to the circuit that you are measuring. The socketed differential probe head is plugged on to the resistors. This makes it easier to move the probe from one location to another. Because of the larger size of the resistor leads, the target for soldering must be larger than the solder-in probe heads.

The spacing for the socketed tip differential probe head is 0.100 inch (2.54 mm). If the resistors are to be soldered onto a PC board, the targets on the board should be two vias that can accept the 0.020 inch (0.508 mm) diameter resistor leads. A via of 0.025 inch (0.0635 mm) diameter is recommended. If soldering a resistor lead to a surface pad on your PC board, the resistor leads can be bent in an "L" shape and soldered down. A pad size of at least 0.030 x 0.030 inch (0.762 mm x 0.762 mm) is recommended.

Figure 1-24

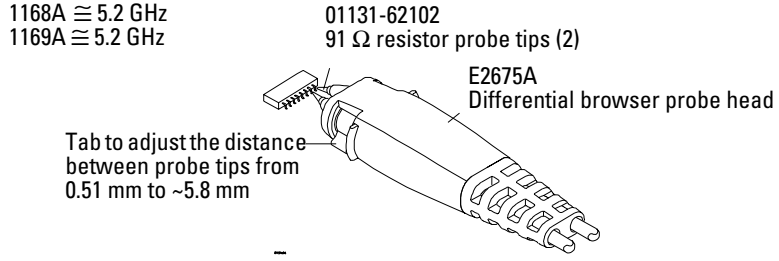


Socketed Differential Probe Head (Full Bandwidth)

Differential Browser

The differential browser configuration is the best choice for general purpose troubleshooting of a circuit board. The tab on the side of the probe allows the probe tips to be adjusted for different circuit geometries.

Figure 1-25

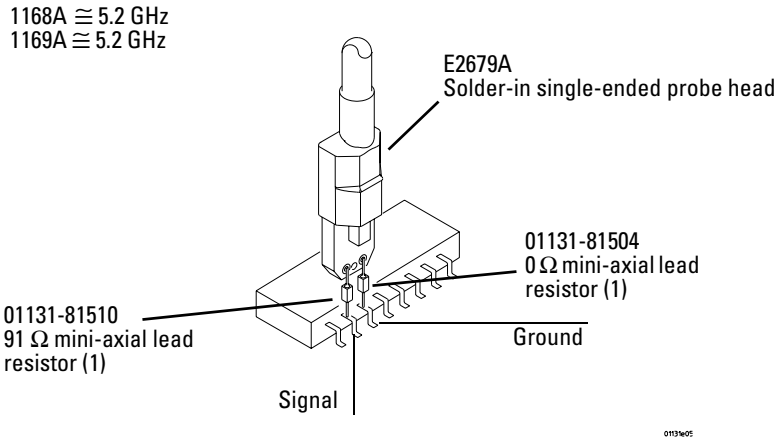


Differential Browser

Solder-in Single-ended Probe Head (High Bandwidth)

This probe configuration provides good bandwidth measurements of single-ended signals with a probe head that is physically very small. The probe head resistors must be soldered to the circuit that you are measuring. Because of the small size of the resistor leads, it is easy to solder them to very small geometry circuits.

Figure 1-26



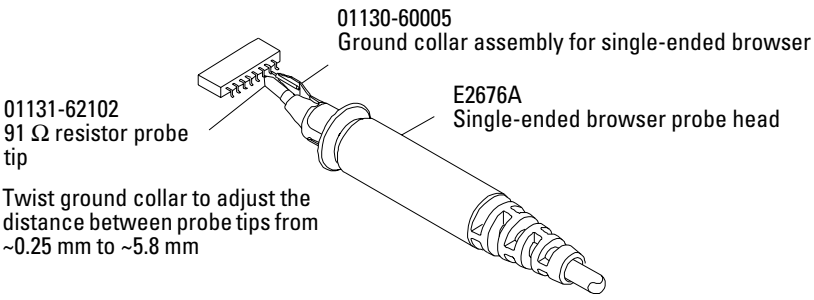
Solder-in Single-ended Probe Head

Single-ended Browser

The single-ended browser is a good choice for general purpose probing of single-ended signals when physical size is critical. Excessive peaking (+6 dB) can occur at about 9 GHz. Therefore, limit the bandwidth of the input signal.

For wider span, non-performance critical browsing (rise times greater than ~0.5 ns), the 5063-2120 socketed ground lead can be used in place of the 01130-60005 ground collar.

Figure 1-27



Single-ended Browser

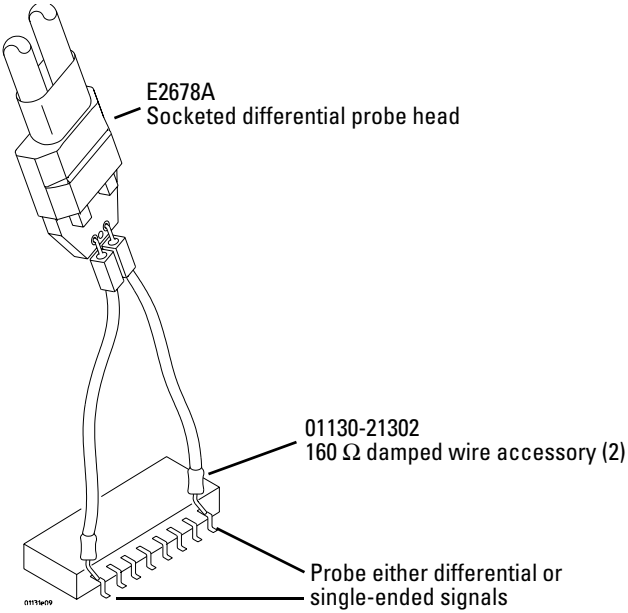
Socketed Differential Probe Head with Damped Wire Accessory

This probe configuration provides maximum connection reach and flexibility with good signal fidelity but lower bandwidth for measuring differential or single-ended signals. The damped wires must be soldered to the circuit that you are measuring. This configuration can probe circuit points that are farther apart than other configurations.

To adapt the 01130-21302 damped wire accessory from solder-in to plug-on, solder the tip into the 01131-85201 square pin socket and then slip the 01131-41101 heat-shrink sleeve over the solder joint and heat the heat-shrink tubing with a heat gun. This allows the damped wire accessories to be used to plug onto 25 mil square pins.

Figure 1-28

1168A ≅ 1.2 GHz
1169A ≅ 1.2 GHz



Socketed Differential Probe Head with Damped Wire Accessory

Socketed Differential Probe Head with Header Adapter

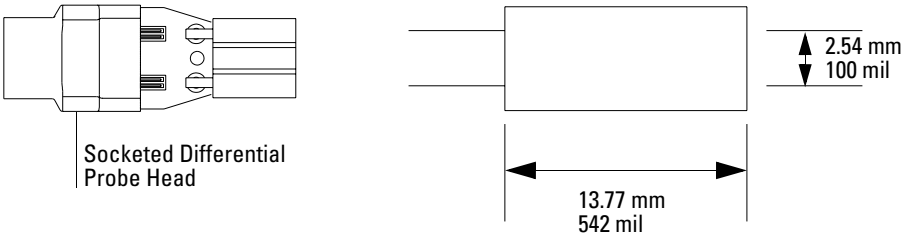
This probe configuration can be used to connect to 25 mil square pin headers with 100 mil spacing such as those used in USB testing. If the header adapter is used with the 1168A (10 GHz) or the 1169A (12 GHz), the rise time of the input signal should be slower than ~150 ps (10% to 90%) to limit the effects of resonances in the adapter.

All of the specifications and characteristics of the header adapter are the same as those for the Socketed Differential Probe Head except for the input capacitance shown in the following table.

Table 1-10

Characteristic	**Capacitance**	
Cm	0.43 pF	Model for input C is Cm between the tips and Cg to ground each tip
Cg	0.54 pF	
Cdiff	0.70 pF	Diff mode capacitance is Cm + Cg/2
Cse	0.97 pF	Se mode capacitance is Cm + Cg

Figure 1-29



Header Adapter Dimensions

Servicing the Probe

For information on servicing the 1168A and 1169A probes and for verifying probe performance there are Adobe Acrobat files on the CD-ROM that comes with your probe.

Index

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.

Agilent Technologies
P.O. Box 2197
1900 Garden of the Gods Road
Colorado Springs, CO 80901

Notices

Manual Part Number

01169-97002, Nov. 2004

Print History

01169-97002, Nov. 2004
01169-97001, October 2004

Agilent Technologies, Inc.
1601 California Street
Palo Alto, CA 94304 USA

Document Warranty

The material contained in this document is provided "as is," and is subject to being changed, without notice, in future editions. Further, to the maximum extent permitted by applicable law, Agilent disclaims all warranties, either express or implied, with regard to this manual and any information contained herein, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Agilent shall not be liable for errors or for incidental or consequential damages in connection with the furnishing, use, or performance of this document or of any information contained herein. Should Agilent and the user have a separate written agreement with warranty terms covering the material in this document that conflict with these terms, the warranty terms in the separate agreement shall control.

WARNING

A WARNING 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 personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

CAUTION

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

Agilent Technologies
Printed in Malaysia
Manual Part Number
01169-97002