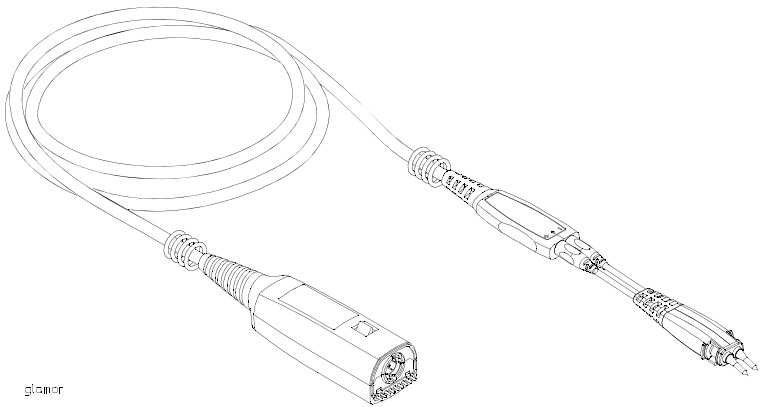

User's Quick Start Guide

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1130A 1.5 GHz, 1131A 3.5 GHz, 1132A 5 GHz, and 1134A 7 GHz InfiniiMax Active Probes

In This Book

This guide provides user and service information for the 1130A, 1131A, 1132A, and 1134A 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.

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General Information

1130A 1.5 GHz, 1131A 3.5 GHz, 1132A 5 GHz, and 1134A 7 GHz InfiniiMax Active Probes

The 1130A, 1131A, 1132A, and 1134A InfiniiMax Active Probes are probe solutions for high-frequency applications. The probes are compatible with the 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 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 instrument are listed in "Accessories Supplied" in Table later in this chapter.

- 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

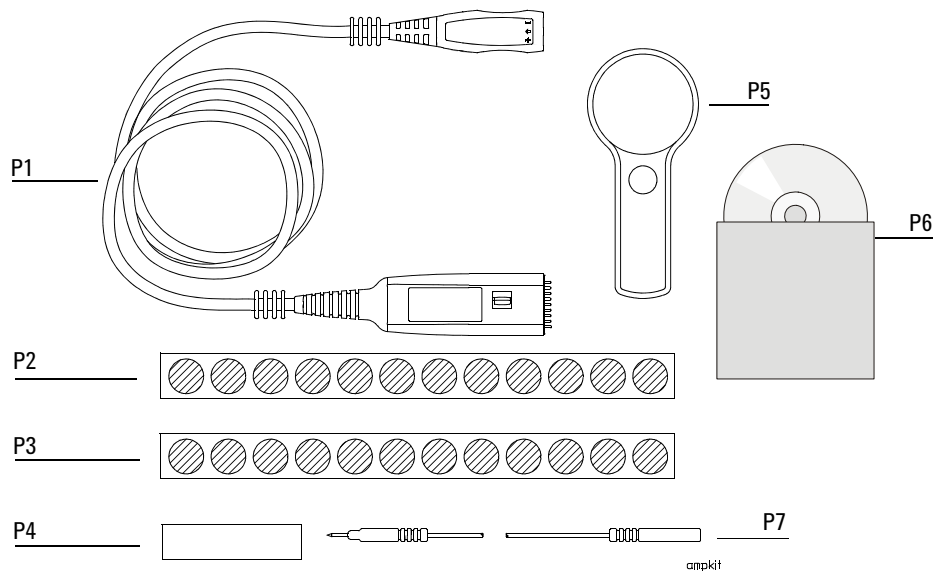
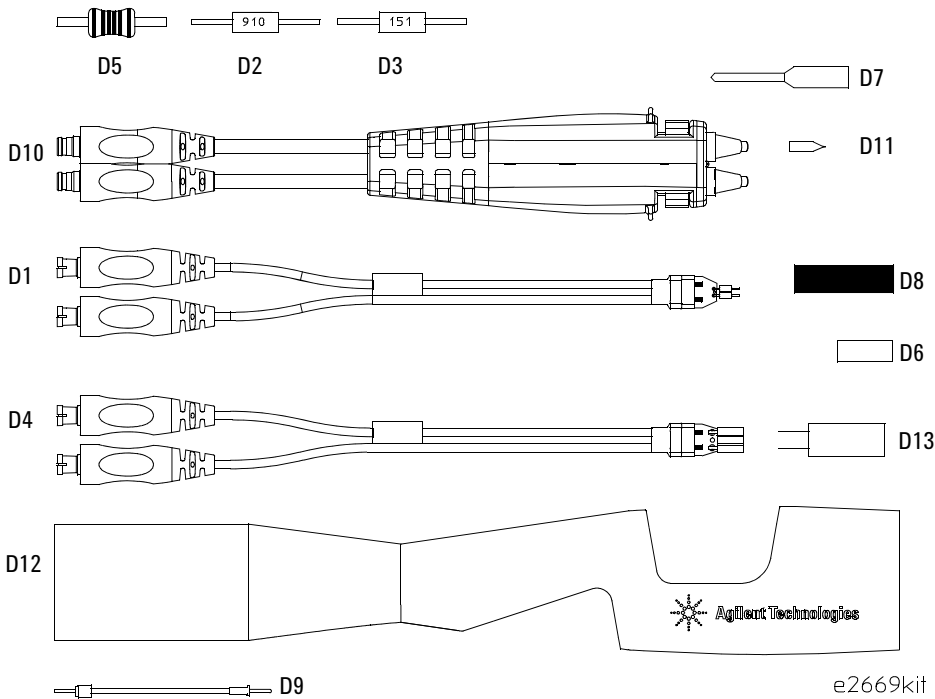


Table 1-1

Item	Description	Qty Supplied	Part Supplied
P1	Probe amplifier 1134A - 7 GHz 1132A - 5 GHz 1131A - 3.5 GHz 1130A - 1.5 GHz	1	1NB7-8517 1NB7-8526 1NB7-8516 1NB7-8535
P2	Velcro dots strip, hooks	1	none
P3	Velcro dots strip, loops	1	none
P4	Velcro strip	1	none
P5	Magnifying glass	1	none
P6	CD-ROM containing Adobe Acrobat files with more in-depth information on probe performance, performance verification, and service.	1	none
P7	Probe amplifier ground wire	1	01131-21301

E2669A Differential Connectivity Kit

Figure 1-2



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

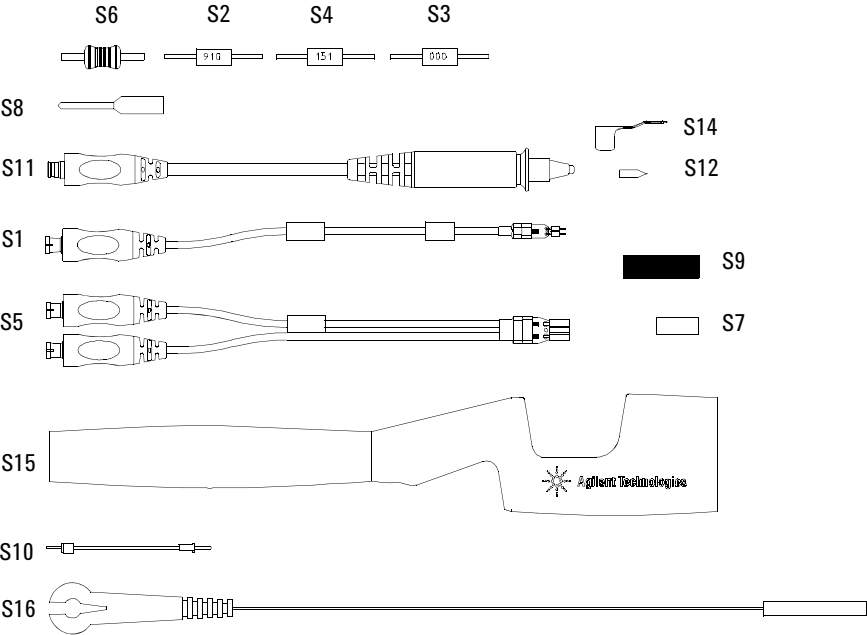
Before using the resistors, the resistor wires must be cut to the correct dimensions. For the correct dimensions see "Resistor Dimensions" on page 1-21

Resistor performance

The S2 resistors were changed from 100 Ω to 91 Ω for slightly better performance. Either value produces a response that is well within specifications. If you have some of the older 100 Ω resistors, ensure that you use either two 100 Ω or two 91 Ω resistors. Do not mix them.

E2668A Single-ended Connectivity Kit

Figure 1-3



e2668kit

Some parts have been enlarged to show more detail.

E2668A Single-ended Connectivity Accessories Supplied

Item	Description	Qty Supplied	Part Supplied
	Solder-in single-ended probe head kit consists of the following		E2679A
S1	Solder-in single-ended probe head	1	01130-62101
S2	Resistor for solder-in single-ended probe head (full bandwidth, 91 Ω)	16	01131-81510
S3	Resistor for solder-in single-ended probe head (full and medium bandwidth, 0 Ω)	24	01131-81504

Item	Description	Qty Supplied	Part Supplied
S4	Resistor for solder-in single-ended probe head (medium bandwidth, 150 Ω)	8	01131-81506
	91 Ω resistor template	2	01131-94311
	150 Ω resistor template	2	01131-94308
	Socketed differential probe head kit consists of		E2678A
S5	Socketed differential probe head	1	01131-62105
S6	Resistor for socketed differential probe head full bandwidth, 82 Ω)	48	01130-81506
S7	Socket for 25 mil (25/1000 inch) square pins, female on both ends	4	01131-85201
S8	25 mil female socket w/20 mil round male pin on other end	4	01131-85202
S9	Heatshrink tubing for square pin socket accessories	4	01130-41101
S10	160 Ω damped wire accessory	6	01130-21302
	82 Ω resistor template	1	01131-94309
	Single-ended browser kit consists of		E2676A
S11	Single-ended browser	1	01130-60007
S12	Resistive tip for single-ended browser (blue)	10	01131-62102
S14	Ground collar assembly for single-ended browser	2	01130-60005
S15	Ergonomic handle	1	01130-43202
S16	Socketed ground lead 6 inches	1	5063-2120

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 1-21.

Resistor performance

The S2 resistors were changed from 100 Ω to 91 Ω for slightly better performance. Either value produces a response that is well within specifications.

Replaceable Parts and Additional Accessories

A complete probing solution consists of an amplifier, a probe head, and accessories. Amplifiers are available in kits that include velcro, a magnifying glass, and a CD-ROM with information on probe performance, verification and service. Probe heads are available in connectivity kits, probe head kits, or individually. Accessories are available in connectivity kits, probe head kits, or accessory kits.

Table 1-2

Connectivity Kits				
Agilent Part Number	Consists of	Orderable?	Description	Qty
E2668A		Yes	Single-ended Connectivity Kit consists of	1
	E2676A	Yes	Single-ended browser kit	1
	E2679A	Yes	Solder-in single-ended probe head kit	1
	E2678A	Yes	Socketed differential probe head kit	1
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	Differential browser	1
	01131-62102	No (Order E2658A accessory kit)	Resistive tip for browser (blue)	20
	01131-43201		Ergonomic handle for browser	1
E2676A		Yes	Single-ended browser kit	1
	01130-60007	No	Single-ended browser	1
	01130-60005	No (Order E2663A accessory kit)	Ground collar assembly	2
	01131-62102		Resistive tip for browser (blue)	10
	01130-43202		Ergonomic handle for browser	1
	5063-2120		Socketed ground lead	1

Probe Head Kits (continued)

Agilent Part Number	Consists of	Orderable?	Description	Qty
E2677A		Yes	Solder-in differential probe head kit	1
	01131-62103	No	Solder-in differential probe head	1
	01131-81510	No (Order E2670A accessory kit)	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	Socketed differential probe head	1
	01130-63201	No (Order E2671A accessory kit)	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
E2679A		Yes	Solder-in single-ended probe head kit	1
	01130-62101	No	Solder-in single-ended probe head	1
	01131-81510	No (Order E2672A accessory kit)	Resistor 91 Ω full bandwidth	16
	01131-81506		Resistor 150 Ω medium bandwidth	8
	01131-81504		Resistor 0 Ω ground resistor	24
	01131-94311		91 Ω resistor template	2
	01131-94308		150 Ω resistor template	2

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

General Information
Replaceable Parts and Additional Accessories

Accessory Kits (continued)

Agilent Part Number	Consists of	Orderable?	Description	Qty
E2663A		Yes	Replacement accessories for E2676A	1
	01130-60005	No	Ground collar assembly	2
	01131-62102	No	Resistive tip for browser (blue)	10
	01130-43202	No	Ergonomic handle for browser	1
	5063-2120	No	Socketed ground lead 6 inches	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
	01130-63201	No	91 Ω header adapter	2
	01131-94309	No	82 Ω resistor template	1
E2672A		Yes	Replacement accessories for E2679A	1
	01131-81510	No	Resistor 91 Ω full bandwidth	16
	01131-81506	No	Resistor 150 Ω medium bandwidth	8
	01131-81504	No	Resistor 0 Ω ground resistor	24
	01131-94311	No	91 Ω resistor template	2
	01131-94308	No	150 Ω resistor template	2

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 and medium bandwidth, 0 Ω)	1
	BREL International	RMB16-000-J		
01131-81510	AVX Components	HR01910J	Resistor for solder-in single-ended probe head (full bandwidth, 91 Ω)	1
	BREL International	RMB16-910-J		
01131-81506	AVX Components	HR01151J	Resistor for solder-in differential probe head (medium bandwidth, 150 Ω)	1
	BREL International	RMB16-151-J		
01130-81506	BC Components	2312 903 08209	Resistor for socketed differential probe head (full bandwidth, 82 Ω)	1
	Vishay	SMA0204HF/ MK1HF5082R 1% A		

Other Accessories

Vendor	Part Number	Description	Qty
Cascade® Microtech	E2654A	EZ-Probe® positioner	1
Agilent	E2655A	Probe deskew and performance verification kit	1
Agilent	01131-68703	Header adapter kit for socketed differential probe head (01130-63201 10 each)	1

Characteristics and Specifications

All warranted specifications are denoted by a ¹ footnote reference number. Footnotes are located on page 18. All other characteristics are typical values.

Table 1-3

Characteristics and Specifications³		
Bandwidth¹ (-3 dB)		
1134A		> 7 GHz
1132A		> 5 GHz
1131A		> 3.5 GHz
1130A		> 1.5 GHz
Rise and Fall Time (10% to 90%)		
1134A		60 ps
1132A		86 ps
1131A		100 ps
1130A		233 ps
Oscilloscope and Probe System		
Bandwidth (-3 dB)		
1134A with 54855		6 GHz
1132A with 54854		4 GHz
1131A with 54853		2.5 GHz
1131A with 54852		2 GHz
1130A with 54833		1 GHz
1130A with 54832		1 GHz

Characteristics and Specifications (continued)

Input Capacitance

C_m	0.10 pF	Model for input C is C _m is between tips and C _g is to ground for each tip
C_g	0.34 pF	

C_{diff}	0.27 pF	Differential mode capacitance (capacitance when probing a differential signal = C _m + C _g /2)
-------------------------	---------	---

C_{se}	0.44 pF	Single-ended mode capacitance (capacitance when probing a single-ended signal = C _m + C _g)
-----------------------	---------	---

Input Resistance	50 k Ω $\pm$ 2%	Differential mode resistance
	25 k Ω $\pm$ 2%	Single-ended mode resistance each side to ground

Input Dynamic Range	$\pm$ 2.5 V	Differential or single-ended
----------------------------	-------------	------------------------------

Input Common Mode Range	$\pm$ 6.75 V	dc to 100 Hz
	$\pm$ 1.25 V	> 100 Hz

Maximum Signal Slew Rate (SR_{max})²	18 V/ns	When probing a single-ended signal
	30 V/ns	When probing a differential signal



DC Attenuation	10:1 $\pm$ 3% before calibration on oscilloscope	
	10:1 $\pm$ 1% after calibration on oscilloscope	

Zero offset error referred to input	< 30 mV before calibration on oscilloscope	
	< 5 mV after calibration on oscilloscope	

Offset Range	$\pm$ 12.0 V	When probing single-ended
---------------------	--------------	---------------------------

Offset Accuracy	< 3% of setting before calibration on oscilloscope	
	< 1% of setting after calibration on oscilloscope	

Noise referred to input	3.0 mVrms	
--------------------------------	-----------	--

Propagation Delay	6 ns	
--------------------------	------	--

General Information

Characteristics and Specifications

Characteristics and Specifications (continued)

Maximum Input Voltage	30 V Peak, CAT I ³	Maximum non-destructive voltage on each input ground
ESD Tolerance	> 8 kV from 100 pF, 300 Ω HBM	

1 Denotes Warranted Specifications, all others are typical. Measured using the probe amp and solder-in differential probe head with full bandwidth resistor.

2 S_{max} of a sine wave = $Amp \times 2 \times \pi \times frequency$ or SR_{max} of a step $\cong Amp \times 0.6 / trise$ (20 to 80%) for more information see Table 1-5 on page 20.

3 Values shown are for the probe amp and solder-in differential probe head with full bandwidth resistor.

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.

WEEE Compliance



This product complies with the WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as a "Monitoring and Control Instrumentation" product.

Do not dispose in domestic household waste.

To return unwanted products, contact your local Agilent office, or see www.agilent.com for more information.

General Characteristics

The following general characteristics apply to the active probe.

Table 1-4

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	+12 Vdc @ 11 mA -12 Vdc @ 5 mA +5 Vdc @ 28 mA -5 Vdc @ 92 mA 0.84 W	(voltages supplied by AutoProbe Interface)
Weight	approximately 0.69 kg	
Dimensions	Refer to the outline in figure 1-7.	
Pollution degree 2	Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.	
Indoor use only		

General Information

Slew Rate Requirements for Different Technologies

Slew Rate Requirements for Different Technologies

The following table shows the slew rates for several different technologies. The maximum allowed input slew rate is 18 V/ns for single-ended signals and 30 V/ns for differential signals. Table 1-5 shows that the maximum required slew rate for the different technologies is much less than that of the probe.

Table 1-5

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 XAU1 (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 18 V/ns

² The probe specification is 30 V/ns

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 1-4 and figure 1-5. The resistor in figure 1-6 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 1-4.

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

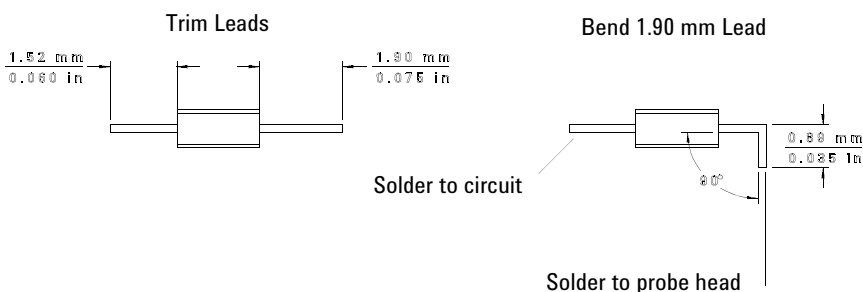
The equipment required is:

- 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 1-4



General Information

Resistor Dimensions

Solder-in 150 Ohm and 0 Ohm Medium Bandwidth Resistors

The following part number resistors must be trimmed and bent as shown in figure 1-5.

- 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:

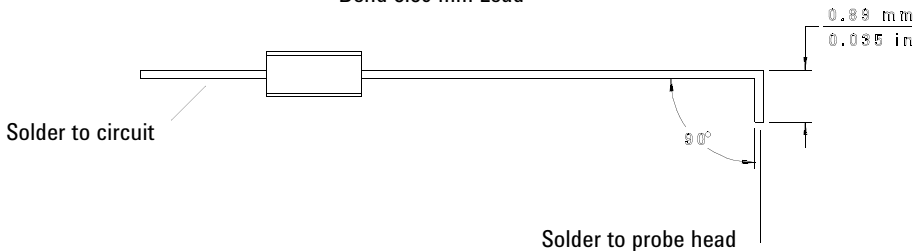
- 1 Using tweezers, place resistor body inside the rectangle of the trim template.
- 2 Using the Exacto knife, trim the leads even with the trim lines.
- 3 Place resistor body inside the rectangle of the bend template.
- 4 Using another pair of tweezers, bend the 8.89 mm (0.360 in) lead 90 degrees.

Figure 1-5

Trim Leads



Bend 8.89 mm Lead



82 Ohm Resistor

The following part number resistors must be trimmed as shown in figure 1-6.

- 01130-81506

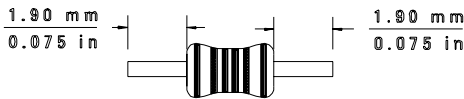
The equipment required is:

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

The instructions for trimming the resistor are:

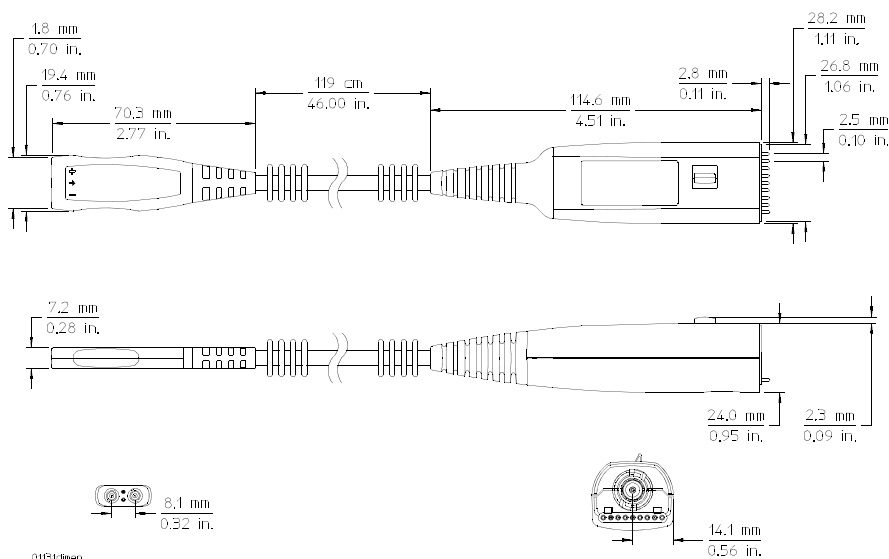
- 1 Using tweezers, place resistor body inside the rectangle of the trim template.
- 2 Using the diagonal cutters, trim the leads even with the trim lines.

Figure 1-6



Probe Dimensions

Figure 1-7



1130A, 1131A, 1132A, and 1134A Active Probe Dimensions

Calibrating the probe

The Infiniium family of oscilloscopes provides both power and offset control to the 1130A, 1131A, 1132A, and 1134A 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 1130A, 1131A, 1132A, or 1134A 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.

Understanding and Using Offset in InfiniiMax Active Probes

It is important to understand how the 113xA probes behave with respect to offset when different probe head / signal combinations are used.

The purpose of offset in active probes or oscilloscope front ends is to allow the subtraction of most or all of the dc component of the input signal so the signal can better utilize the dynamic range of the input. When using an InfiniiMax probe with an Infiniium oscilloscope, you can select the case (see the three cases described below) that applies for your measurement by selecting the "Probes" button under the channel setup menu. This allows you to select which type of probe head is being used and, if it is a differential probe head, allows you to select whether you are probing a differential or single-ended signal. With these inputs, the oscilloscope will use the proper type of offset for your measurement case. The specifics for each case are discussed below.

As an important side note, whenever adjusting the offset for a particular probe head, make sure to have a triggered signal.

Case 1 - A single-ended probe head probing a single-ended signal:

For this case, the offset control on the oscilloscope controls the probe offset and the channel offset is set to zero. This allows the offset voltage to be subtracted from the input signal before the signal gets to the differential amplifier. Since this subtraction is done before any active circuits, the offset range is large (+/- 12 V for the 113X amplifiers and 25-k Ω probe heads). Note that the minus probe tip is not present when using a single-ended probe head which means nothing is plugged into the "-" input of the probe amp. This is normal and causes no problems.

Case 2 - A differential probe head probing a single-ended signal:

For this case, the offset control on the oscilloscope controls the probe offset and the channel offset is set to zero. This allows the offset voltage to be subtracted from the input signal before the signal gets to the differential amplifier. Since this subtraction is done before any active circuits, the offset range is large (+/- 12 V for the 113X amplifiers and 25-k Ω probe heads). A differential probe can make higher bandwidth and more accurate measurements on single-ended signals than a single-ended probe and this method of applying offset to only the plus side of a differential probe means there is no sacrificing of offset range.

Case 3 - A differential probe head probing a differential signal:

For this case, the offset control on the oscilloscope controls the oscilloscope channel offset. The probe offset is not used and set to zero. Since the plus and minus sides of differential signals have the same dc component, it will be subtracted out and the output of the probe will by definition be centered around ground.

The channel offset allows the waveform seen on screen to be moved as desired. The allowable dc component in the plus and minus signals is determined by the common mode range of the probe which for the 113x probe amps and 25-k Ω probe heads is +/- 6.75 V.

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 1-6

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

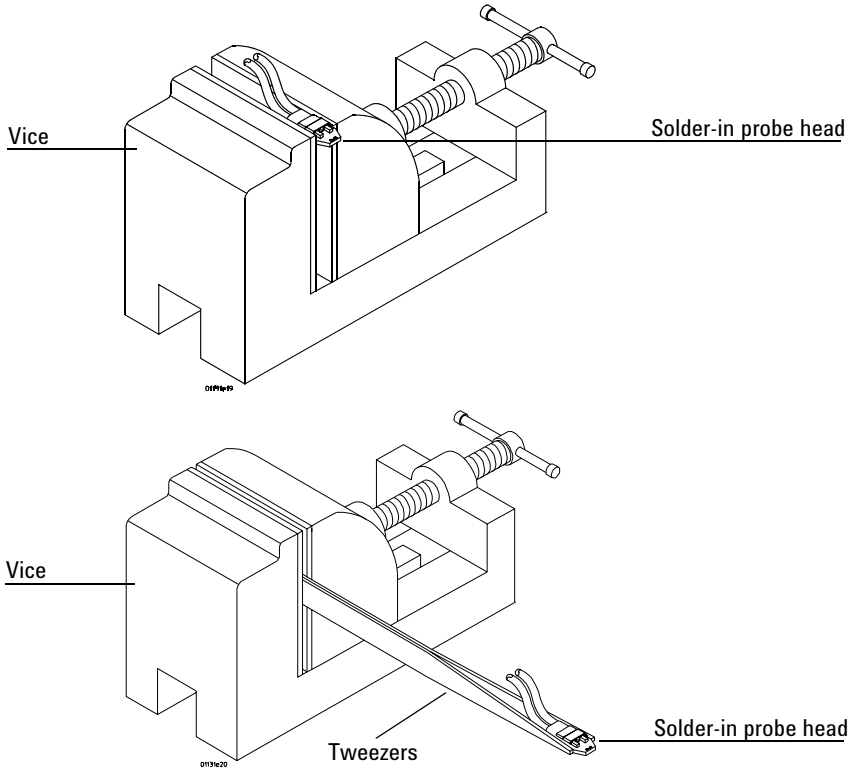
Ruler

Soldering 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 1-8.

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

Figure 1-8



- 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 tip pc board. 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 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 1-21 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 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 1-21 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

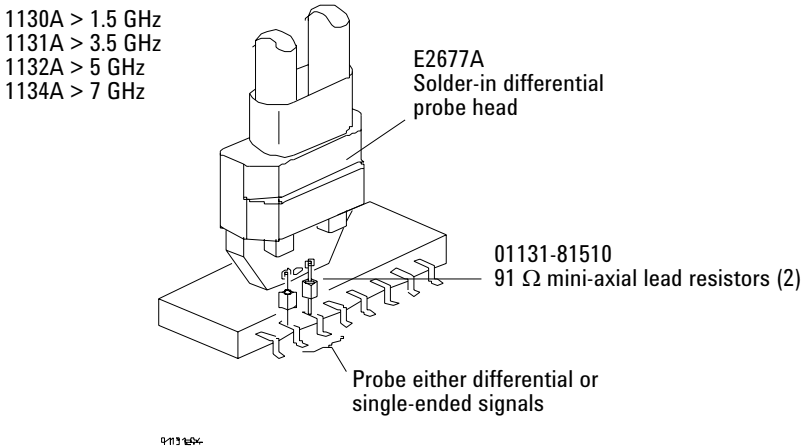
The 1130A, 1131A, 1132A, and 1134A active probes come with a CD-ROM which contains more in-depth information about connecting the probe to your circuit.

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 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 1-9



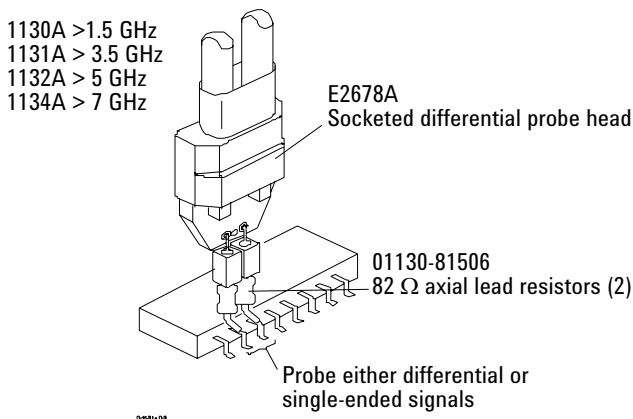
Solder-in Differential Probe Head (Full Bandwidth)

Socketed Differential Probe Head (Full Bandwidth)

This probe configuration provides the full bandwidth signals and minimal capacitive loading for measuring both single-ended and differential signals. The $82\ \Omega$ 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 (0.635 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 1-10

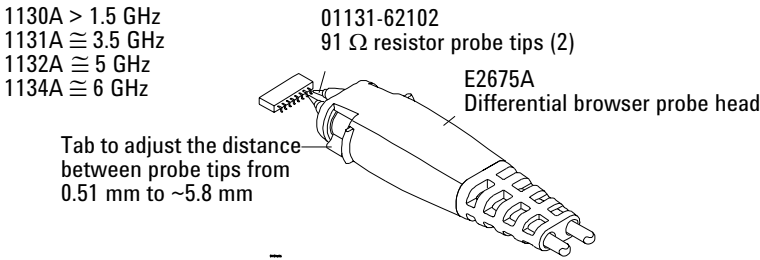


Socketed Differential Probe Head (Full Bandwidth)

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 1-11

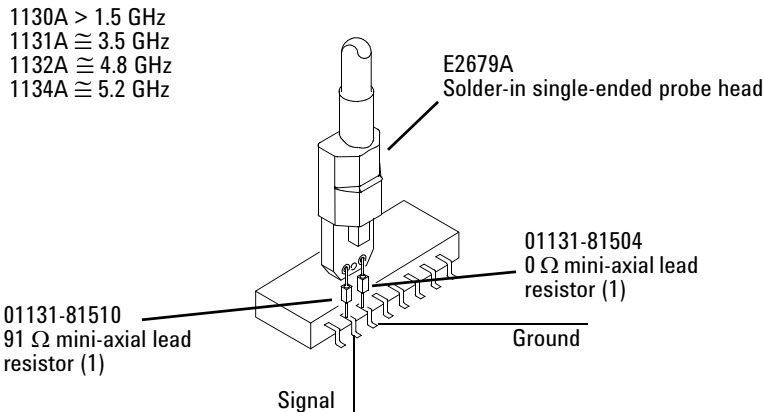


Differential Browser

Solder-in Single-ended Probe Head (Full 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 1-12



Solder-in Single-ended Probe Head

General Information

Using Probe Accessories

Single-ended Browser

The single-ended browser is a good choice for general purpose probing of single-ended signals when physical size is critical.

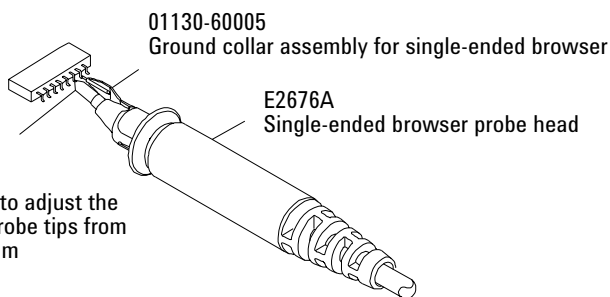
For wider span, non-performance critical browsing (rise times greater than ~0.5 ns), the 5063-2120 socketed ground lead can be used in place of the 01130-60005 ground collar.

Figure 1-13

1130A > 1.5 GHz
1131A $\cong$ 3.5 GHz
1132A $\cong$ 4.8 GHz
1134A $\cong$ 5.5 GHz

01131-62102
91 Ω resistor probe
tip

Twist ground collar to adjust the
distance between probe tips from
~0.25 mm to ~5.8 mm

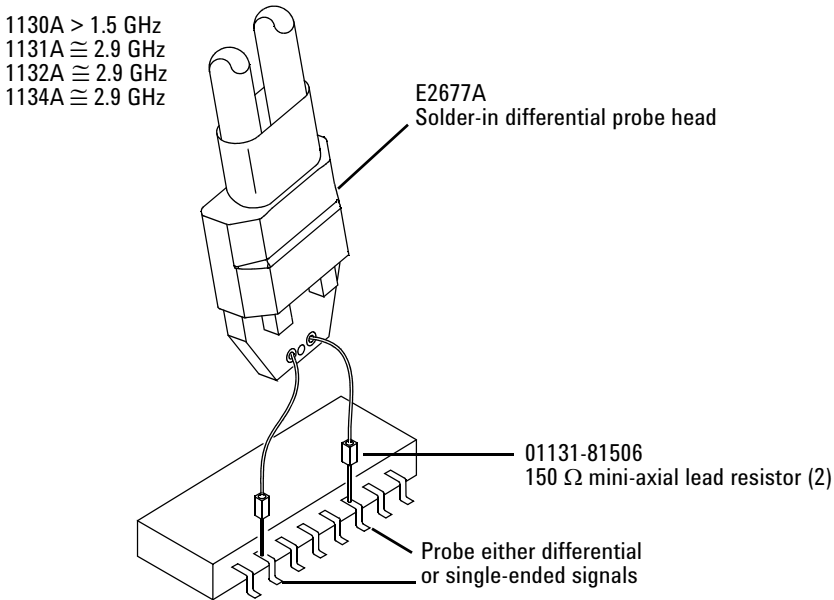


Single-ended Browser

Solder-in Differential Probe Head (Medium Bandwidth)

This probe configuration provides medium bandwidth measurements of differential or single-ended signals. The longer resistor length allows connection to widely spaced points or points in tight areas. 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. This configuration can probe circuit points that are farther apart than the full bandwidth configurations.

Figure 1-14



Solder-in Differential Probe Head (Medium Bandwidth)

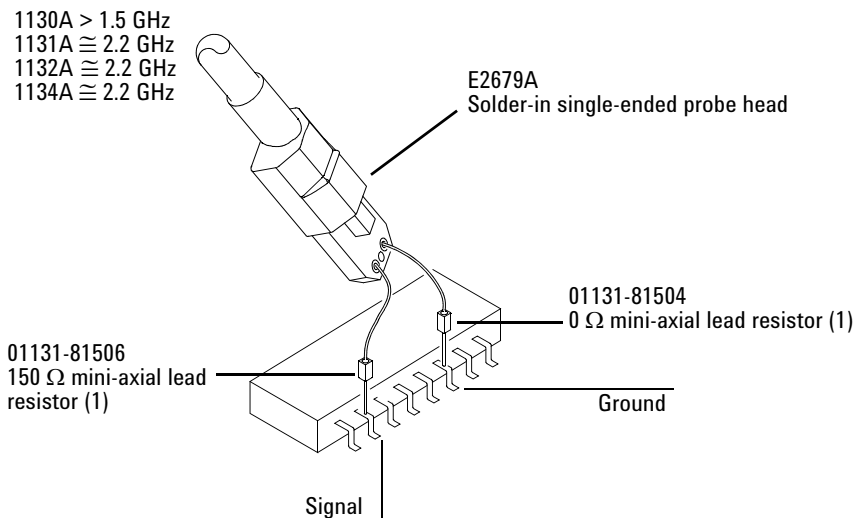
General Information

Using Probe Accessories

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

This probe configuration provides medium bandwidth measurements of single-ended signals. The longer resistor lead length allows connection to widely spaced points or points in tight areas. 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. This configuration can probe circuit points that are farther apart than the full bandwidth configurations.

Figure 1-15



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

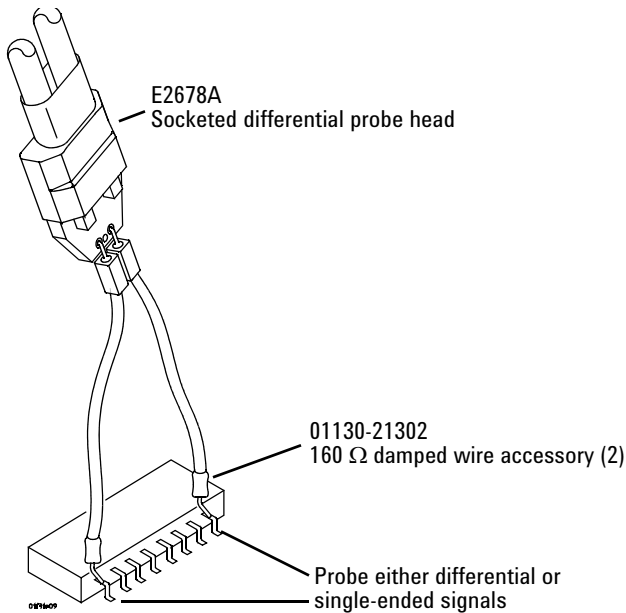
Socketed Differential Probe Head with Damped Wire Accessory

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 1-16

1130A $\cong$ 1 GHz
1131A $\cong$ 1.2 GHz
1132A $\cong$ 1.2 GHz
1134A $\cong$ 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. The header adapter is recommended for use with the 1130A and 1131A InfiniiMax probes. If the header adapter is used with higher bandwidth probe amps such as the 1132A (5 GHz) or the 1134A (7GHz), 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.

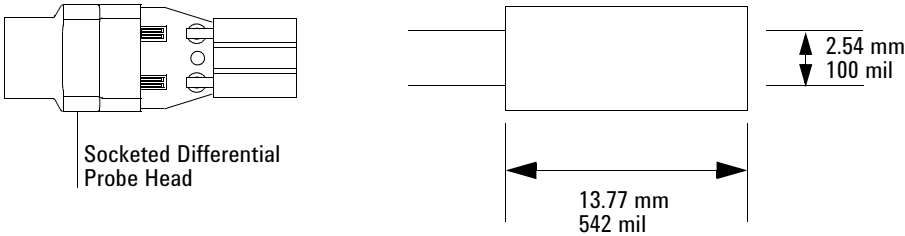
All of the specifications and characteristics of the header adapter are the same as those for the Socketed Differential Probe Head except for the input capacitance shown in the following table.

Table 1-7

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 1-17



Header Adapter Dimensions

Servicing the Probe

For information on servicing the 1130A, 1131A, 1132A, and 1134A probes and for verifying probe performance there are Adobe Acrobat files on the CD-ROM that comes with your probe.

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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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