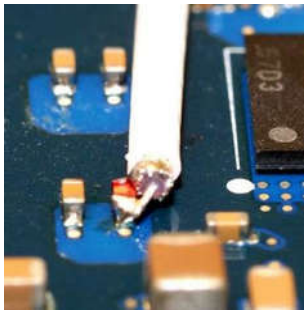
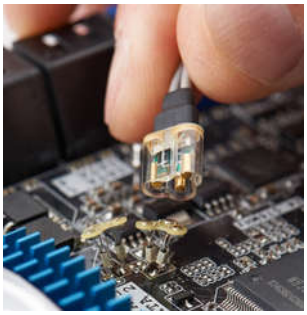
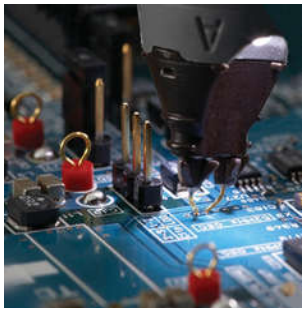


TECHNICAL OVERVIEW

Oscilloscope Probes and Accessories

Introduction

To get the most out of your oscilloscope, you need the right probes and accessories for your particular applications. Whether you need the high bandwidth and low loading of an active probe, an easy way to connect to surface mount ICs or a passive probe to measure high voltages, there are a wide selection of high-quality probes and accessories for your Keysight Technologies, Inc. oscilloscope.



KEYSIGHT TECHNOLOGIES

How To Select A Probe

Selecting the correct probe for your oscilloscope measurement should not be difficult. This brochure provides suggestions on how to make the best decision. Following is a list of probe parameters you need to consider when you select a probe for a given measurement.

Attenuation

Choose the attenuation ratio of the probe (1:1, 10:1, 100:1, 1000:1) to match the test signal amplitude to the oscilloscope's vertical sensitivity range. Higher attenuation probe allows the measurement range of a scope to be extended, and lower attenuation probe allows for lower noise measurement.

Bandwidth (BW)

The probe's rated bandwidth should match the oscilloscope's and be adequate for the test signal. However, at higher frequencies, grounded lead inductance and input capacitance often influence system performance more than probe bandwidth.

Input resistance (Rin)

Input impedance is used to describe the loading effects of a probe. At DC and low frequency ranges, the probe's resistive component is the main factor that loads down the circuit under test. However, as the frequency goes up, the capacitance of the probe tip, in parallel with the DC resistance, starts to reduce the input impedance of the probe, resulting in greater loading and a more adverse effect to the target.

Input capacitance (Cin)

Excessive input capacitance (sometimes called tip capacitance) slows down the system's pulse response. Usually the least input capacitance possible is best.

Maximum input voltage (Vmax)

To ensure user safety, help protect the oscilloscope input from destructive voltage, and avoid damage to the probe, select a probe that is rated for a higher voltage than the signal you intend to test.

Probe compensation range

Most passive probes have a specification that lists the oscilloscope input capacitance range over which they can be used. When choosing a passive probe, be sure that the oscilloscope's input capacitance lies within the probe's compensation range or you will not be able to adjust the probe to achieve a correctly compensated square wave signal.

Probe output termination

Most oscilloscopes have 1-MΩ and/or 50 Ω input resistance. For proper signal transfer and optimum signal integrity, it's important that the probe's R and C match the R and C of the oscilloscope it is to be used with. For example, 50 Ω terminated probes should be used with 50 Ω scope inputs. Similarly, 1 MΩ terminated probes should be used on scopes with a 1 MΩ input resistance.

Probe interface

Most Keysight oscilloscope probes offer either a BNC type of probe interface or the AutoProbe interface. The AutoProbe interface is an intelligent communication and power link between compatible probes and the Infiniium or InfiniiVision Series oscilloscopes. The AutoProbe identifies the type of probe attached and sets up the proper input impedance, attenuation ratio, probe power, and offset range as needed.

Probe tip form factor

Your probe must make a reliable connection to the test point, and you may want it to grab the test point. Generally, this requires a small and light probe and a tip or grabber that is compatible with the test point. SMT and fine-pitch geometries make this issue especially critical.

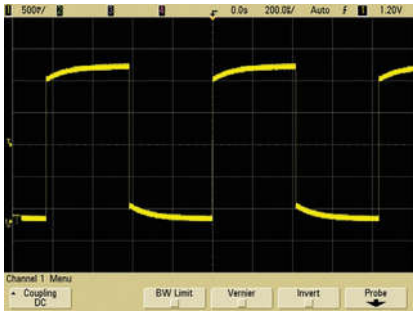
Single-ended, Differential or InfiniiMode Probe

Two most common voltage probe types are single-ended and differential probe.

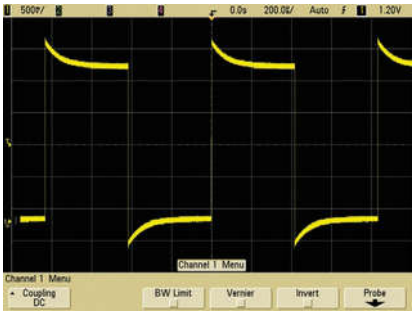
Differential probes measure the voltage difference between any two input points in contrast to a single-ended probe, which measures input voltage relative to ground. Differential probes are especially popular for measuring high-frequency signals or signals where neither are referenced to ground. Differential probes use a differential amplifier to convert the difference between two signals into a voltage that can be sent to a typical single-ended scope input.

A differential probe can be used to make single-ended measurements by using its negative input as a ground reference contact and there are several advantages to using a differential probe to make single-ended measurement. New InfiniiMode probes offer multiple modes that can measure single-ended, differential, and common-mode characteristics of a differential signal with a signal connection.

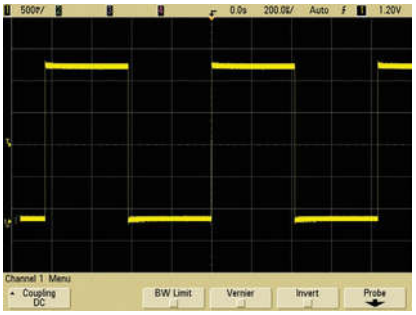
The effects of passive probe compensation:



Under-compensated



Over-compensated



Properly compensated

Types of Probes

Passive probes

The most widely used type of oscilloscope probe is the “passive probe.” Passive probes are also the most rugged and economical. There are no active components such as transistors or amplifiers in the probe, and therefore passive probes do not need to be powered.



Passive probes classifications

	1:1 high Z passive probe	10:1 or 20:1 high Z passive probe	100:1 high Z passive probe	Resistive divider passive probe
Features	A low capacitance coax cable with a BNC connector on one end and a probe on the other	• The most widely used scope probe type; provided standard with most < 1-GHz oscilloscopes • Gives lower input capacitance and higher bandwidth than the 1:1 probe	• Additional attenuation for use with higher- amplitude signals • Large attenuation requires a high-gain amplifier on the scope	• Highest-bandwidth passive probe for measuring high-frequency, low- impedance circuit • Must be used with an oscilloscope’s 50-Ω input
When to use	For viewing small signals (< 1 V)	For viewing up to ~300 V	For viewing up to 4 kV high voltage	High-frequency, low-impedance (< 50 Ω) digital circuit, transmission line
When not to use	For probing high-frequency signal	For achieving > 700 MHz system bandwidth	For making floating (ungrounded) measurement	For probing high-amplitude, high-impedance signal
Typical bandwidth	Up to 35 MHz	Up to 600 MHz	Up to 500 MHz	Up to 1.5 GHz
Keysight models	N2870A,10070D, N2889A, N2140A/42A (1:1/10:1)	N2871/2/3/5A, 10073D, 10074D, 1165A, N2862B/63B/89A/90A, N2840A/41A/42A/43A/53A N2894A, N7007A	10076C	N2874/6A



Low-inductive ground connection for N287xA probes keeps the probe loading low to achieve high signal integrity measurements



The replaceable probe tip on the N287xA probes saves you money

Passive probes characteristics

Model	Cable length	Attenuation	Typical probe bandwidth	Compensates oscilloscope input	Max input voltage	Recommended oscilloscopes
10070D	1.5 m	1:1	20 MHz	1 MΩ	400 V CAT II	1000, 3000, 2000 X, 3000 X, 4000 X, 6000 X, 5000, 6000, 7000, 9000, S-Series
N2870A	1.3 m	1:1	35 MHz	1 MΩ	55 V CAT II	1000, 3000, 2000 X, 3000 X, 4000 X, 6000 X, 5000, 6000, 7000, 8000, 9000, S-Series
N2142A	1.2 m	1:1/10:1	75 MHz	1 MΩ, 15-40 p	300 V at 10:1, 150 V at 1:1 CAT II	1000 X
N2140A	1.2 m	1:1/10:1	200 MHz	1 MΩ, 15-40 p	300 V at 10:1, 150 V at 1:1 CAT II	1000 X
N2889A	1.3 m	1:1,10:1	350 MHz	1 MΩ, 5-30 pF	300 V CAT II	1000, 3000, 2000 X, 3000 X, 4000 X, 6000 X, 5000, 6000, 7000, 8000, 9000, S-Series
10073D	1.5 m	10:1	500 MHz	1 MΩ, 6-15 pF	400 V CAT II	5000 Series (500 MHz) 6000 (300 MHz to 1 GHz), 7000, 5464x, 54830, 8000 Series
10074C	1.5 m	10:1	150 MHz	1 MΩ, 9-17 pF	400 V CAT II	6000 Series (100 MHz), 5462x
N2862B / N2841A	1.2 m	10:1	150 MHz	1 MΩ, 5-30 pF	300 V CAT II	1000, 3000, 2000 X, 3000 X-Series
N2863B / N2842A	1.2 m	10:1	300 MHz	1 MΩ, 5-30 pF	300 V CAT II	1000, 3000, 2000 X, 3000 X, 5000 Series (100, 300 MHz)
N2871A	1.3 m	10:1	200 MHz	1 MΩ, 10-25 pF	300 V CAT II	2000 X, 3000 X, 4000 X, 6000 X, 5000, 6000, 7000, 8000, 9000, 54600, S-Series
N2872A	1.3 m	10:1	350 MHz	1 MΩ, 10-25 pF	300 V CAT II	2000 X, 3000 X, 4000 X, 6000 X, 5000, 6000, 7000, 8000, 9000, 54600, S-Series
N7007A	2 m	10:1	400 MHz	1 MΩ, 8-16 pF	1 kV CAT II, 600 V CAT III	2000 X, 3000 X, 4000 X, 6000 X, 5000, 6000, 7000, 8000, 9000, 54600, S-Series
N2873A	1.3 m	10:1	500 MHz	1 MΩ, 10-25 pF	300 V CAT II	2000 X, 3000 X, 4000 X, 6000 X, 5000, 6000, 7000, 8000, 9000, 54600, S-Series
N2890A / N2843A	1.3 m	10:1	500 MHz	1 MΩ, 5-30 pF	300 V CAT II	1000, 3000, 2000 X, 3000 X, 4000 X, 6000 X, 5000, 6000, 7000, 8000, 9000, S-Series
1165A	1.5 m	10:1	600 MHz	1 MΩ, 12-14 pF	300 V CAT II	54830, 6000, 7000, 8000, 9000 Series
N2894A [1]	1.3 m	10:1	700 MHz	1 MΩ, 10-25 pF	300 V CAT II	4000 X and 6000 X
N2874A	1.3 m	10:1	1.5 GHz	50 Ω	8.5 V CAT I	4000 X, 6000 X and all Infiniium Series
N2875A	1.3 m	20:1	500 MHz	1 MΩ, 7-20 pF	300 V CAT II	1000, 3000, 2000 X, 3000 X, 4000 X, 6000 X, 5000, 6000, 7000, 8000, 9000, 54600 Series
N2876A	1.3 m	100:1	1.5 GHz	50 Ω	21 V mains isolated	4000 X, 6000 X, and all Infiniium Series
54006A	1.2 m	10:1 (500 Ω) or 20:1 (1 kΩ)	6 GHz	50 Ω	20 Vpk	S-Series, 80000, 90000, 5484x, 5485x, 90000X/Q with N5442A
10076C	1.5 m	100:1	500 MHz	1 MΩ, 7-20 pF	3.7 kV pk mains isolated, 1 kV pk CAT II	1000, 3000, 1000 X, 2000 X, 3000 X, 4000 X, 6000 X, 5000, 6000, 7000, 8000, 9000, S-Series

1. The N2894A provides 700 MHz system bandwidth with the 4000X and 6000X Series 1 GHz or higher bandwidth models only.

Single-ended active probes

Active probes contain a small, active amplifier built into the probe body near the probe tip. This arrangement makes it possible to keep the probe input capacitance very low, usually less than 2 pF. This low capacitance results in high input impedance on high frequencies. It has the best overall combination of resistive and capacitive loading. With such low loading, active probes can be used on high-impedance circuits that would be seriously loaded by passive probes. Active probes are the least intrusive of all the probes.



Single-ended active probe characteristics

Model	Attenuation	Probe bandwidth	Input dynamic range	Applications and use	Oscilloscope compatibility
N2795A	10:1	1 GHz	0 to ± 8 V	General-purpose, high-speed probing in digital and analog system design	50-Ω AutoProbe interface input
N2796A	10:1	2 GHz	0 to ± 8 V		
N2797A	10:1	1.5 GHz	0 to ± 8 V	Extreme temperature probing at –40 to +85 °C	
N7020A	1.1:1	2 GHz	0 to ± 850 mV	General purpose power integrity measurement of DC power rails	3000T/4000X/6000X/S-Series/9000
N7024A	1.3:1	6 GHz	0 to ± 600 mV	Power integrity measurement in high speed systems using Infiniium	S, 90000X, V, Z and Q Series (requires N5442A with AutoProbe II interface scopes)

Single-ended active probe advantages	Limitations
Timing and voltage measurements are more accurate at high bandwidths	Active probes are more expensive than general-purpose passive probes
Active probes are the least intrusive to circuits under test	Active probes have lower dynamic range, lower maximum voltage and are less rugged than passive probes



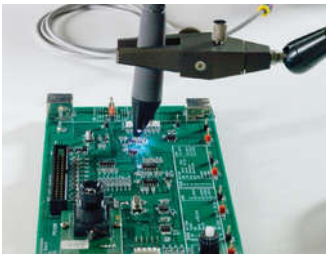
N7020A 2 GHz power rail probe



N7024A 6 GHz power rail probe



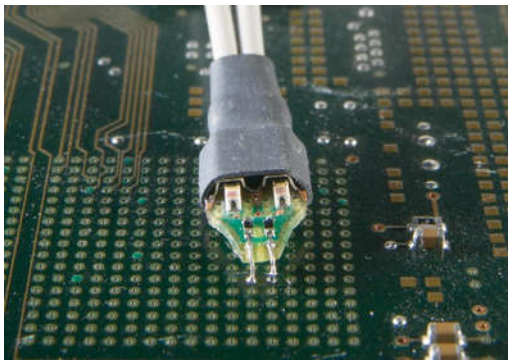
N2795A/N2796A 1/2-GHz active probe with AutoProbe interface, head light, and 1 MΩ input Z



N2795A/96A comes with a headlight for better visibility while probing

Differential active probes

A “differential” probe is an active probe that has two inputs, one positive and one negative, as well as a separate ground lead. It drives a single-terminated 50-Ω cable to transmit its output to one oscilloscope channel. The output signal is proportional to the difference between the voltages appearing at the two inputs. A differential probe is used to look at signals that are referenced to each other instead of earth ground and to look at small signals in the presence of large DC offsets or other common mode signals such as power line noise.



Differential active probe characteristics

Model	Attenuation	Probe bandwidth	Input dynamic range	Applications and use	Oscilloscope compatibility
N2791A	10:1 or 100:1	25 MHz	± 700 V at 100:1 (diff or common)	Power supply design, motor control, electronic ballast	• Any oscilloscope with 1-MΩ BNC input • Order N7013A extension cable kit for extreme temperature testing (–40 to +85 °C)
N2891A	100:1 or 1000:1	70 MHz	± 7,000 V at 1000:1 (diff or common)	High voltage power or surge measurement	Any oscilloscope with 1-MΩ BNC input
N2790A	50:1 or 500:1	100 MHz	± 1400 V (diff), ± 1,000 V(common)	Power supply design, motor control, electronic ballast	• AutoProbe 1-MΩ interface InfiniiVision • 5000, 6000 (except 100 MHz), 7000, 3000X/T, 4000X, 6000X and Infiniium 54830, 8000, 9000, and S-Series • Order N7013A extension cable kit for extreme temperature testing (–40 to +85 °C)
N2792A	10:1	200 MHz	± 20 V (diff), ± 60 V (common)	High-speed power measurements, automotive serial buses (CAN, LIN), digital differential buses	• Any oscilloscope with 50-Ω BNC input • Order N7013A extension cable kit for extreme temperature testing (–40 to +85 °C)
N2818A	10:1	200 MHz	± 20 V (diff), ± 60 V (common)	High-speed power measurements, automotive serial buses (CAN, LIN), digital differential buses	• AutoProbe 50-Ω, 3000X/4000X/6000X/9000/S-Series/90000A, 90000X/Q (with N5442A) • Order N7013A extension cable kit for extreme temperature testing (–40 to +85 °C)
N2805A	50:1	200 MHz	± 100 V (diff), ± 500 V (common)	Differential signal measurements that need long cable connection (5 m)	AutoProbe 50-Ω, 3000T/4000X/6000X/9000/S-Series
N2804A	100:1	300 MHz	± 300 V (diff), ± 1000 V (common)	High-speed power device measurements	AutoProbe 50-Ω, 3000T/4000X/6000X/9000/S-Series
DP0001A	50:1, 100:1, 250:1, 500:1	400 MHz	± 2 kV (diff), ± 2 kV (common)	WBG power devices, power converters or motor drives	Infiniium MXR, S, 9000A and 90000X, Z, UXR <=33 GHz (with N5442A)
N2793A	10:1	800 MHz	± 15 V (diff), ± 30 V (common)	High-speed power measurements, automotive serial buses (CAN, LIN, Flexray), digital differential buses	Any oscilloscope with 50-Ω BNC input
N2819A	10:1	800 MHz	± 15 V (diff), ± 30 V (common)	High-speed power measurements, automotive serial buses (CAN, LIN, FlexRay, MOST), digital differential buses	AutoProbe 50-Ω, 3000X/4000X/6000X/9000/S-Series/90000A, 90000X/Q (with N5442A)

InfiniiMax single-ended and differential probes characteristics

Model	Bandwidth	Input Range	Diff input impedance	Attenuation ratio	Probe-to-scope interface
Gen I					
1130B	1.5 GHz	±2.5 V	50 kΩ/0.27 pF, RC	10:1	AutoProbe1
1131B	3.5 GHz	±2.5 V	50 kΩ/0.27 pF, RC	10:1	AutoProbe1
1132B	6 GHz	±2.5 V	50 kΩ/0.27 pF, RC	10:1	AutoProbe1
1134B	7 GHz	±2.5 V	50 kΩ/0.27 pF, RC	10:1	AutoProbe1
1130B	1.5 GHz	±2.5 V	50 kΩ/0.27 pF, RC	10:1	AutoProbe1
Gen II					
1168B	10 GHz	±1.65 V	50 kΩ/0.17 pF, RC	3.45:1	AutoProbe1
1169B	13 GHz	±1.65 V	50 kΩ/0.17 pF, RC	3.45:1	AutoProbe1
Gen III					
N2801A	20 GHz	±1.25 V	100 kΩ/0.32 pF, RCRC	6:1	AutoProbe2
N2802A	25 GHz	±1.25 V	100 kΩ/0.32 pF, RCRC	6:1	AutoProbe2
N2803A	30 GHz	±1.25 V	100 kΩ/0.32 pF, RCRC	6:1	AutoProbe2
Gen III+					
N2830A	4 GHz	±2.5 V	100 kΩ/0.32 pF, RCRC	5:1/10:1	AutoProbe1
N2831A	8 GHz	±2.5 V	100 kΩ/0.32 pF, RCRC	5:1/10:1	AutoProbe1
N2832A	13 GHz	±2.5 V	100 kΩ/0.32 pF, RCRC	5:1/10:1	AutoProbe1
N7000A	8 GHz	±2.5 V	100 kΩ/0.32 pF, RCRC	5:1/10:1	AutoProbe2
N7001A	13 GHz	±2.5 V	100 kΩ/0.32 pF, RCRC	5:1/10:1	AutoProbe2
N7002A	16 GHz	±2.5 V	100 kΩ/0.32 pF, RCRC	5:1/10:1	AutoProbe2
N7003A	20 GHz	±2.5 V	100 kΩ/0.32 pF, RCRC	5:1/10:1	AutoProbe2
Gen RC					
MX0023A	25 GHz	±1.25 V	50 kΩ/0.17 pF, RC	1:1/4:1	AutoProbe2
Gen Ultra					
MX0020A	10 GHz	±2.5 V	50 kΩ/0.17 pF, RC	1:1/4:1/8:1	AutoProbe2
MX0021A	13 GHz	±2.5 V	50 kΩ/0.17 pF, RC	1:1/4:1/8:1	AutoProbe2
MX0022A	16 GHz	±2.5 V	50 kΩ/0.17 pF, RC	1:1/4:1/8:1	AutoProbe2
MX0024A	20 GHz	±2.5 V	50 kΩ/0.17 pF, RC	1:1/4:1/8:1	AutoProbe2
MX0025A	25 GHz	±2.5 V	50 kΩ/0.17 pF, RC	1:1/4:1/8:1	AutoProbe2

1. AutoProbe1 is compatible with: InfiniiVision 3000A, 3000T, 4000, and 6000 X-Series (except N2830A and N2831A), Infiniium EXR, MXR, S-Series, 9000, and 90000A Series, Infiniium UXR (3.5 mm models), V, Z, Q, and 90000X Series with the use of the N5442A adapter.
2. AutoProbe2 is compatible with: Infiniium UXR (3.5 mm models), V, Z, Q, and 90000X Series, Infiniium UXR (1 mm & 1.85 mm models) with the use of the N2852A adapter, Infiniium N1000A and 86100D DCA-X with the use of the N5477A adapter (only for N2801A/02A/03A).

InfiniiMax probe heads and accessories

Keysight's InfiniiMax probing system supports a wide variety of high-speed probing applications with an extensive line-up of probe heads and accessories. Most InfiniiMax probe heads and accessories are split up into 2 groups based on input impedance architecture: RC architecture (Gen I, II, RC, and Ultra) and RCRC architecture (Gen III and III+). RC probe heads are only compatible with RC probe amplifiers; likewise, RCRC probe heads are only compatible with RCRC probe amplifiers.

InfiniiMax RC architecture probe heads and accessories

The following table lists all compatible RC probe heads and accessories. These are compatible with InfiniiMax Gen I/II/RC/Ultra probe amplifiers except where noted.

Model	Bandwidth	Description
E2655C	13 GHz	Probe deskew and performance verification kit[3]
E2668B	N/A	InfiniiMax I connectivity kit for single-ended measurements (E2676B/77B/78B) [3]
E2669B	N/A	InfiniiMax I connectivity kit for diff/single-ended measurements (E2675B/77B/78B)
E2675B	6 GHz	differential browser head
E2676B	6 GHz	single-ended browser probe head[3]
E2677B	12 GHz	differential solder-in head
E2678B	12 GHz	differential/single-ended socketed probe head
E2679B	6 GHz	single-ended solder-in probe head[3]
MX0100A-001	25 GHz	micro probe head (set of 5), supports InfiniiMode
MX0100A-002	25 GHz	micro probe head (set of 25), supports InfiniiMode
MX0100A-003	25 GHz	micro probe head (set of 50), supports InfiniiMode
MX0102A	N/A	Soldering Tool Kit
MX0103A	25 GHz	Bullet adapter
MX0104A	40 GHz	Performance verification and deskew fixture[1,2]
MX0105A	20 GHz	SMA probe head, supports InfiniiMode
MX0106A	23 GHz	solder-in probe head, supports InfiniiMode
N2787A	N/A	3D probe positioner
N2823A	40 GHz	2.92 mm phase-matched cable pair (1m)
N2833A	N/A	InfiniiMax II differential connectivity kit (N2839A, N5381B, N5425B/26A, N2851A/49A) [1]
N2837A	21 GHz	browser head replace tip kit (set of 40) [1]
N2839A	21 GHz	browser head[1]
N2849A	13 GHz	QuickTip probe head tips[3]
N2851A	13 GHz	QuickTip probe head[3]
N2852A	N/A	AutoProbe II to AutoProbe III interface adapter (for use with UXR 1- & 1.85-mm models)
N2880A	N/A	Coaxial attenuator Kit (pairs of 6, 12, and 20 dB attenuators)
N2881A	N/A	DC blocking caps (set of 2 30-VDC block caps)
N2884A	12 GHz	ZIF fine wire tips for wafer probing
N2887B	4 GHz	Soft touch pro probe interface adapter[3]

Model	Bandwidth	Description
N2888A	4 GHz	soft touch half-channel probe interface adapter[3]
N5380B	12 GHz	SMA probe head
N5381B	12 GHz	solder-in probe head
N5425B	18 GHz	ZIF probe head
N5426A	18 GHz	ZIF tip (set of 10)
N5442A	N/A	AutoProbe I to AutoProbe II interface adapter (3.5 mm to precision BNC adapter)
N5448B	40 GHz	2.92 mm phase-matched cable pair (25cm)
N5450B	N/A	extreme temperature extension cable, 1m long
N5451A	5 & 9.9 GHz	long-wired ZIF tip kit (7 and 11 mm)

1. NOT compatible with Gen I
2. NOT compatible with Gen II
3. NOT compatible with Gen RC

InfiniiMax RCRC architecture probe heads and accessories

The following table lists compatible RCRC probe heads & accessories. These are compatible with InfiniiMax Gen III/III+ probe amplifiers except where noted.

Model	Bandwidth	Description
E2655C	13 GHz	Performance verification and deskew fixture
MX0104A	40 GHz	Performance verification and deskew fixture
MX0109A	26 GHz	extreme temperature solder-in head, supports InfiniiMode
N2787A	N/A	3D probe positioner
N2812A	N/A	high performance input cable, 2.92 mm connectors, 1 m length
N2823A	40 GHz	2.92 mm phase-matched cable pair (1m)
N2835A	N/A	InfiniiMax III/III+ differential connectivity kit (N5439A/45A, N2836A/38A/48A/49A)
N2838-68701	N/A	10x 130-ohm resistors for tip resistor replacement
N2838A	25 GHz	450-ohm PCB ZIF tips (set of five)
N2848A	16 GHz	QuickTip probe head, supports InfiniiMode
N2849A	16 GHz	QuickTip tips (set of 4)
N2852A	N/A	AutoProbe II to AutoProbe III interface adapter
N5381B	12 GHz	wire tips
N5439A	28 GHz	ZIF probe head
N5440A	28 GHz	450-ohm ceramic ZIF tip kit (set of five)
N5442A	N/A	3.5 mm to precision BNC adapter
N5444A	30 GHz	3.5/2.92 SMA probe head, supports InfiniiMode
N5445A	30 GHz	differential browser probe head
N5447A	28 GHz	200-ohm ceramic ZIF tip kit (set of five)
N5448B	40 GHz	2.92 mm phase-matched cable pair (25cm)
N5449A	N/A	High impedance probe adapter, include one N2878A 500 MHz 10:1 passive probe

Model	Bandwidth	Description
N5450B	N/A	extreme temperature extension cable, 1 m long
N5476A	30 GHz	browser tip replacement (set of 4)
N5477A	N/A	sampling scope adapter[1]

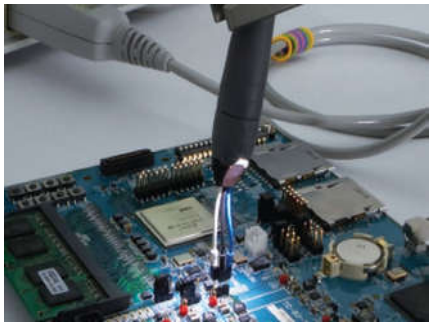
1. NOT compatible with Gen III+

InfiniiMode single-ended, differential and common-mode probes characteristics

Model	Attenuation	Probe bandwidth	Input dynamic range	Applications and use	Oscilloscope compatibility
N2750A	2:1 or 10:1	1.5 GHz	± 1 V Diff, 2 Vpp SE (at 2:1)/± 5 V Diff, 10 Vpp SE (at 10:1)	• Digital, analog design and power measurement • InfiniiMode probing for making differential, single-ended and common mode measurements with a single probe • Built-in quick action scope control for quick access to a variety of scope functions • Comes with solder-in, socketed and browser tip standard	InfiniiVision 3000 X/T, 4000 X, 6000 X, Infiniium 9000, S-Series
N2751A	2:1 or 10:1	3.5 GHz			6000 X, S-Series, 9000, 90000A
N2752A	2:1 or 10:1	6 GHz			6000 X, S-Series, 9000, 90000A



N2750A-02A InfiniiMode probe with standard accessories



InfiniiMode probe with either socketed tip or solder-in tip allows convenient measurements of differential, SE and CM signals with a single probe. Probe head light is built-in

Active differential probe advantages	Limitations
View small signals in the presence of DC or other common mode signals	• More expensive than general-purpose passive probes • Less dynamic range than using two passive probes
DP0001A/N2790A helps you make safe and accurate high-speed floating measurements. AutoProbe interface supplies probe power	400/100-MHz bandwidth, must be used with AutoProbe interface scope
N2791A/92A/93A and N2891A are low-cost differential probes that can be powered by USB port or by internal batteries	25-, 200-, 800-, 70-MHz bandwidth
N2818A/19A are the AutoProbe interface version of N2792A/93A	200-, 800-MHz bandwidth
1130B-34B, 1168B/69B and N2800A/01A/02A/03A InfiniiMax probe probes both single-ended and differential signals up to 30-GHz bandwidth	Lower dynamic range and maximum input voltage (but has ultra-low input capacitance)
N2750A/51A/52A InfiniiMode probes allow for making differential, single-ended and common mode measurements with a single probe.	Supports browser, solder-in and socketed tip use models only, bandwidth is limited with solder-in and socketed tip



1130B-34B, 1168B/69B InfiniiMax high-bandwidth differential probe and its probe head configurations



N2793A 800-MHz, 15-V differential probe with standard accessories



DP0001A 400 MHz, 2 kV differential probe with standard accessories



N2791A 25-MHz, 700-V differential probe with standard accessories



N2792A 200-MHz, 20-V differential probe with standard accessories

Current probes

Current probes sense the current flowing through a conductor and convert it to a voltage that can be viewed and measured on an oscilloscope. Keysight current probes use a hybrid technology that includes a Hall-effect sensor, which senses the DC current, and a current transformer, which senses the AC current. Using split core construction, the current probe easily clips on and off of a conductor, making it unnecessary to make an electrical connection to the circuit. Measurement bandwidths from DC to 150 MHz are available. The new N7040A/41A/42A is a family of Rogowski AC current probe for measuring large AC current conveniently. These probes have a flexible clip-around sensor coil that can easily be wrapped around current carrying test points for measurement and can measure large current without increase in transducer size.



Current probe characteristics

Model	Probe type	Probe bandwidth	Max input current	Applications and use	Oscilloscope compatibility [1]
1146B	AC/DC current, 0.1 V/A (0-10 A peak) or 0.01 V/A (0-100 A peak)	100 kHz	100 A peak	• AC line, motors, automotive current measurement • Requires 9-Vdc battery	High-impedance BNC input
N2780B [2]	AC/DC current, 0.01 V/A	2 MHz	500 Arms continuous, 700 A peak non-continuous	Motors, switching power supplies, line currents	High-impedance BNC input
N2820A	AC/DC current, 2 ch, 300 V/A (zoom in) and 2 V/A (zoom out)	3 MHz (zoom out), 500 kHz (zoom in)	Max 5 A, min 50 µA (with supplied accessories)	Capturing and analyzing low-level current flow in the DUT to characterize sub-circuits or measure current consumption of battery- powered devices or integrated circuits	InfiniiVision 3000 X-, 4000 X-, 6000 X- and Infiniium S-Series, 9000 Series only (high impedance AutoProbe input)
N2821A	AC/DC current, 1 ch, 300 V/A (zoom in) and 2 V/A (zoom out)	3 MHz (zoom out), 500 kHz (zoom in)	Max 5 A, min 50 µA (with supplied accessories)	Capturing and analyzing low-level current flow in the DUT to characterize sub-circuits or measure current consumption of battery- powered devices or integrated circuits	InfiniiVision 3000 X-, 4000 X-, 6000 X- and Infiniium 9000, S-Series only (high impedance AutoProbe input)
N2781B [2]	AC/DC current, 0.01 V/A	10 MHz	150 Arms continuous, 300 A peak non-continuous	Motors, switching power supplies, transformers	High-impedance BNC input
N7040A	Rogowski AC current, 2 mV/A	3 Hz-23 MHz	3,000 Apeak	Motor, switching power supplies, double pulse tester current measurements	High-impedance BNC input
N7041A	Rogowski AC current, 10 mV/A	12 Hz-30 MHz	600 Apeak	Motor, switching power supplies, double pulse tester current measurements	High-impedance BNC input
N7042A	Rogowski AC current, 20 mV/A	9.2 Hz-30 MHz	300 Apeak	Motor, switching power supplies, double pulse tester current measurements	High-impedance BNC input

Model	Probe type	Probe bandwidth	Max input current	Applications and use	Oscilloscope compatibility [1]
1147B [3]	AC/DC current, 0.1 V/A	50 MHz	15 A peak continuous, 30 A peak non-continuous	Motors, switching power supplies, magnetic-device current measurements	High-impedance AutoProbe input
N2782B [2]	AC/DC current, 0.1 V/A	50 MHz	30 Arms continuous, 50 A peak non-continuous	Switching power supplies, amplifiers, magnetic devices	High-impedance BNC input
N2783L [2]	AC/DC current, 0.1 V/A, 5 m cable	80 MHz	30 Arms continuous, 50 A peak non-continuous	Automotive device measurement	High-impedance BNC input
N2893A [3]	AC/DC current, 0.1 V/A	100 MHz	15 A peak continuous,30 A peak non-continuous	Motor, switching power supplies, magnetic device current measurements	High-impedance AutoProbe input
N2783B [2]	AC/DC current, 0.1 V/A	100 MHz	30 Arms continuous, 50 A peak non-continuous	Switching power supplies, low current measurements	High-impedance BNC input
N7026A	AC/DC current, 1 V/A (high sensitivity)	150 MHz	30 Arms continuous, 40 A peak non-continuous	Motor, switching power supplies, magnetic device current measurements, high sensitivity current measurement (1 mA/div)	High-impedance AutoProbe input

1. To use the 1146B or N2780B Series current probe with Infiniium 80000, 90000, or 5485xA Series scope, order E2697A 1-MΩ high-impedance adapter.
2. Requires N2779A 3-channel power supply.
3. Compatible with 3000X, 4000X, 6000X, 5000, 6000 (300 MHz to 1 GHz), 7000, 9000, S, V, 90000X/Q Series only. Use N5449A for use with 90000X/Q.

Current probe advantages	Limitations
• 1146B low-cost model measures AC and DC current to 100 Arms without breaking into the circuit • Probe power is provided by the battery, so there is no need for an external power supply	• 100 kHz bandwidth
• N2780B Series measures AC and DC current up to 500 A (N2780B) or 100 MHz (N2783B) • Compatible with any 1 MΩ BNC input	• Requires an external power supply (N2779A)
• 1147B measures AC and DC current up to 50 MHz • N2893A measures AC and DC current up to 100 MHz and provides auto-degaussing/offset elimination • N7026A measures AC and DC current up to 150 MHz with 1mA/div sensitivity and provides auto-degaussing/offset elimination • AutoProbe interface completely configures the oscilloscope for the probe	• Maximum 30 A peak (non-continuous)
• N2820A/21A high-sensitivity current probe supports high-sensitivity AC/DC current measurements from 50 µA to 5 A • Simultaneous high- and low-gain views of the current waveform for more precise wide-dynamic-range measurement	• Using high sense resistor value causes more burden voltage (IR drop) in the DUT • Probe bandwidth is limited to 5 MHz
• N7040A/41A/42A probes have a flexible clip-around sensor coil that can easily be wrapped around current carrying test points for measurement • The Rogowski coil current probe can measure large current without increase in transducer size	• For AC current measurement only



N2820A/21A high-sensitivity current probe (N2820A = 2 ch, N2821A = 1 ch)



1147B 50-MHz current probe with AutoProbe interface



N2893A 100-MHz current probe with AutoProbe interface



1146B 100-kHz current probe



N7040A 23 MHz, 3,000 Apk Rogowski coil AC current probe



N2780B Series current probes with N2779A power supply

Optical-to-electrical converter

Optical-to-electrical converter transduces optical signals into electrical signals for convenient analysis on oscilloscope. Keysight N7004A and N7005A optical-to-electrical converter is a high-sensitivity DC-coupled photodetector module designed for direct optical-to-electrical conversion of optical telecommunication or data communication signals into an Infiniium real-time oscilloscope. Each N7004A or N7005A adapter contains a measured S-parameter for an optimized correction filter, and this frequency response data is used to flatten the frequency response for a more accurate measurement.



N7004A 33 GHz optical-to-electrical converter



N7005A 60 GHz optical to electrical converter

N7004A characteristics

- DC to 33 GHz typical (-3 dBe, electrical)
- Single-mode and multimode inputs
- 50/125 µm, 750 nm to 1650 nm (covers main wavelengths: 850 nm, 1310 nm, and 1550 nm)
- Designed for reference receiver testing of industry optical standards or characterizing raw response of an optical transmitter
- Optical measurement features built into the Infiniium baseline software version 05.70 or higher
- Compatible with Infiniium UXR, V-Series, 90000 X-Series, Z-Series and discontinued 90000 Q-Series real-time oscilloscopes

N7005A characteristics

- DC to 60 GHz typical (-3 dBe, electrical)
- Single-mode input
- 9/125 µm, 1250 nm to 1600 nm (covers main wavelengths: 1310 nm, and 1550 nm)
- FlexDCA SW supports PAM4 measurement capabilities such as TDECQ for Infiniium UXR oscilloscopes and N7005A
- Optical measurement features built into the Infiniium UXR baseline software version
- 10.25 or higher
- Compatible with Infiniium UXR oscilloscope with ≥ 40 GHz bandwidth

Probing accessories

Probe positioners		
N2784A	One-arm probe positioner (for browsing)	Compatible with most scope probes
N2785A	Two-arm probe positioner (for browsing)	Compatible with most scope probes
N2786A	Two-leg probe positioner	Compatible with most scope passive probes
N2787A	3D probe positioner	Compatible with most Keysight probes including InfiniiMax browsers

Refer to the Probe Positioners - Data Sheet, publication number 5989-9131EN, for probe compatibility details.

Mixed signal oscilloscope logic probe		
N6459-60001	Logic probe with 1x8 flying leads (shipped with 2000 X-Series MSOs)	Compatible with 2000 X-Series MSOs
N6450-60001	Logic probe with 2x8 flying leads (shipped with 3000/4000 X-Series MSOs)	Compatible with 3000/4000 X-Series MSOs
N2756A	Logic probe with 16-channel flying leads (shipped with 6000 X-Series MSOs)	Compatible with 6000 X-Series MSOs
54620-68701	Logic probe with 2x8 flying leads (shipped with 6000/7000 Series MSOs)	Compatible with 6000/7000/54600 Series MSOs
10085-68701 [1]	40-pin logic probe and termination adapter	Compatible with 6000/7000/54600 Series MSOs
54826-68701	Logic probe kit for Infiniium MSOs (shipped with 8000 Series MSOs)	Compatible with 8000/54830 Series MSOs
E5396A	16-channel Soft Touch connectorless logic probe	Compatible with 6000/8000/54830 Series MSOs
54904-61615	Logic probe kit for Infiniium 9000 Series MSOs (shipped with 9000 Series MSOs)	Compatible with 9000 Series MSOs

1. With the addition of a 40-pin logic cable, the Keysight MSO accepts numerous logic analyzer accessories such as Mictor, Samtec, flying leads, or Soft touch connectorless probe.

Wedge probe adapter • Easy connection to 0.5 or 0.65 mm TQFP and PQFP packages • Reliable contact with little chance of shorting to adjacent pins • 3-, 8-, and 16-signal versions		
E2613A	IC pin spacing: 0.5 mm, 3-signal, qty 1	• Connects easily to most oscilloscopes or logic analyzers with appropriate accessories • Connects directly to 1145A/1155A active probes and the dual-lead adapter provided with the 1160A-65A passive probe family and N2877A/N2879A accessory kits for N2870A Series passive probes
E2614A	IC pin spacing: 0.5 mm, 8-signal, qty 1	
E2615A	IC pin spacing: 0.65 mm, 3-signal, qty 1	
E2616A	IC pin spacing: 0.65 mm, 8-signal, qty 1	
E2643A	IC pin spacing: 0.5 mm, 16-signal, qty 1	
E2644A	IC pin spacing: 0.65 mm, 16-signal, qty 1	



N2784A one-arm probe positioner



16-pin wedge adapter



E5396A half-size Soft Touch connectorless probe



N2786A 2-leg probe positioner and N2787A 3D probe positioner

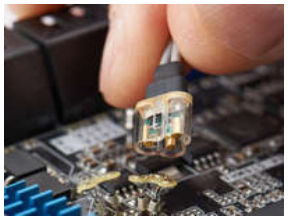
IC clip kit		
10075A	0.5 mm IC clip kit	For 10070 Series passive probes
Probe accessory kits		
10072A	SMT probe accessory kit	For 10070 Series passive probes
10077A	Accessory kit for 10076A/B/C high voltage probe	For 10076A/B/C
N2877A	Deluxe accessory kit	For N2870A Series passive probes
N2878A	General purpose accessory kit	For N2870A Series passive probes
N2879A	Fine-pitch accessory kit	For N2870A Series passive probes
PC board mini-probe sockets		
N2766A	Horizontal mini-probe socket, qty 25	Compatible with 1160A-65A and 104xxB passive probes
N2768A	Vertical mini-probe socket, qty 25	Compatible with 1160A-65A and 104xxB passive probes
N2885A	PCB adapter kit, qty 25	For N2870A Series passive probes
N4827A	PCB socket adapter	N2862B/63B/89A/90A passive probes
N4863A	Probe tip to PCB adapter, horizontal	N2870A-76A, N2894A
N4864A	Probe tip to PCB adapter, vertical	N2870A-76A, N2894A
Probe interface adapters		
E2697A	1-MΩ high-impedance adapter (includes one 10073C 500-MHz passive probe)	Compatible with Infiniium oscilloscope's 50-Ω input with AutoProbe I interface
N5449A	High impedance probe adapter (includes one N2873A 500-MHz passive probe)	For use with high impedance passive or active probes and Infiniium scope with AutoProbe II interface
N5442A	Precision BNC 50-Ω adapter	For use with InfiniiMax I, II, III+ (N2830A-32A), N2795A-97A, N2750A-52A active probes with AutoProbe I interface and with Infiniium with AutoProbe II interface
N1022B	Sampling oscilloscope adapter	For use with InfiniiMax I and II probes with Keysight 86100C DCA-j sampling oscilloscope
N5477A	Sampling oscilloscope adapter	For use with InfiniiMax III probe and Keysight 86100C DCA-J sampling oscilloscope
N2744A	T2A probe interface adapter	Enables TekProbe BNC probes to connect to Keysight's AutoProbe interface
BNC adapter		
N2882A	75 Ω (f) to 50 Ω (m) BNC adapter	Compatible with any oscilloscope's 50-Ω BNC input
Probe deskew fixtures		
E2655C	Probe deskew and performance verification kit for InfiniiMax I/II/III+ probes	
U1880A	Power measurement deskew fixture	
MX0104A	Probe deskew and performance verification fixture for InfiniiMax RC/III/III+ probes	



InfiniiMax probe with N5450B extreme temperature extension cable



N2880A InfiniiMax in-line attenuator (probe amplifier and head not included)



N2848A QuickTip head with N2849A QuickTip tips

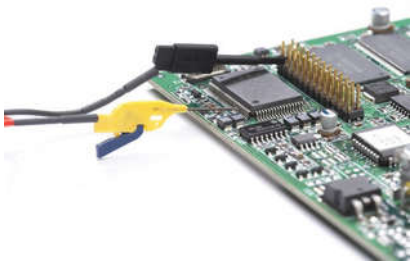
InfiniiMode N2750A/51A/52A differential probe accessories		
N2776A	Differential browser tips (qty 3)	For N2750A/51A/52A InfiniiMode probes
N2777A	InfiniiMode solder-in tips (qty 3)	For N2750A/51A/52A InfiniiMode probes
N2778A	InfiniiMode socketed tips (qty 3)	For N2750A/51A/52A InfiniiMode probes
N4822A	Socketed tip for USB/Ethernet application fixtures (qty 1)	For N2750A/51A/52A InfiniiMode probes
N2820A/21A high-sensitivity current probe accessories		
N2822A	20-mΩ resistor tips	For N2820A/21A current probe
N2824A	100-mΩ resistor tips	For N2820A/21A current probe
N2825A	User-defined resistor tips	For N2820A/21A current probe
N2826A	Replacement wires (15.5 cm, 22 AWG bare wires) (qty 5)	For N2820A/21A current probe
N2827A	Passive cable (for N2820A secondary channel)	For N2820A/21A current probe
N2828A	Replacement MBB (make-before-break) headers (qty 5)	For N2820A/21A current probe
N2829A	Replacement MBB (make-before-break) receptacles and 15.5 cm, AWG 22 socketed wires (qty 5 each)	For N2820A/21A current probe
N7020A/24A power rail probe accessories		
N7021A	Coaxial pigtail probe head (qty 3)	
N7022A	SMA cable, 48”	
N7023A	Browser kit	
N7032A	4 GHz browser for 0603 and 0805 SMD packages (inch code)	
N7033A	5 GHz browser for 0201 and 0402 packages (inch code)	



N2885A PCB adapter kit for N2870A Series passive probes (probe not included)



Use the N2744A T2A interface adapter to use Tektronix active probes with Keysight scopes



IC clips included in N2877A and N2878A accessory kits for N2870A Series passive probes

Related Literature

Publication title	Publication number
Infiniium Oscilloscope Probes and Accessories - Data Sheet	5968-7141EN
InfiniiVision Oscilloscope Probes and Accessories - Selection Guide	5968-8153EN
Probes and Accessories for Keysight Oscilloscopes - Selection Guide	5989-8433EN

Product Web Site

For the most up-to-date and complete application and product information, please visit our product Web site at:

www.keysight.com/find/probes



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