

# Keysight N2804/5A Differential Probes

User's Guide

# Notices

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## Safety Notices

### 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.

### 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.

# Contents

Introduction	/ 5
Inspecting the Probe	/ 6
Handling the Probe	/ 7
Oscilloscope Compatibility	/ 8
Channel Identification Rings	/ 9
To Clean the Probe	/ 9
N2804A Probe and Accessories	/ 10
N2805A Probe and Accessories	/ 12
Attaching Probe Accessories	/ 14
Probe Offset Adjustment	/ 15
Safety Information	/ 17
Specifications and Characteristics	/ 20
N2804A Performance Plots	/ 23
N2805A Performance Plots	/ 27
Performance Verification	/ 31
Performance Tests	/ 32
Performance Test Record	/ 34
IEC Measurement Category Definitions	/ 35
Measurement Category I (CAT I)	/ 35
Measurement Category II (CAT II)	/ 35
Measurement Category III (CAT III)	/ 35
Measurement Category IV (CAT IV)	/ 35
Returning the Probe for Service	/ 36
Contacting Keysight Technologies	/ 37

Contents

Index

# Keysight N2804/5A Differential Probes User's Guide

## Introduction

The N2804A and N2805A differential probes provide superior general-purpose differential signal measurements that are required for high-speed power measurements, vehicle bus measurements, and high-speed digital system designs. Both probes are powered by the oscilloscope's AutoProbe interface. Both probes are designed for Measurement Category II (CAT II) as described in **"IEC Measurement Category Definitions"** on page 35.

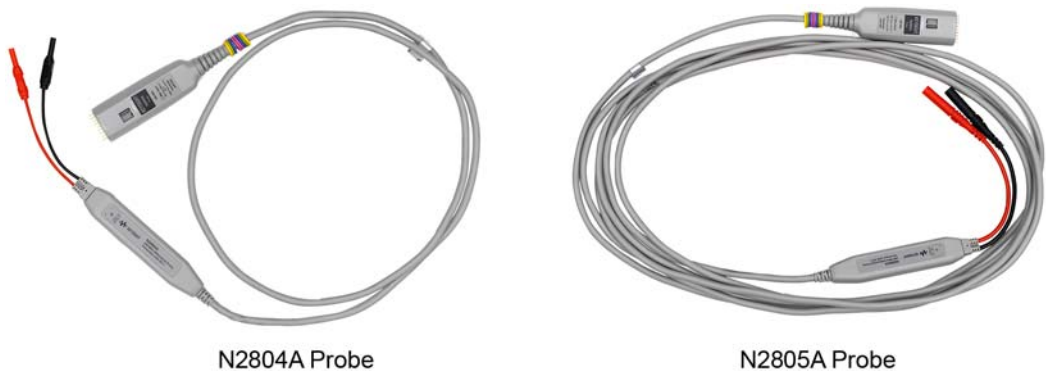
The N2804A 300 MHz differential probe offers 100:1 attenuation ratio, allowing it to be used for high voltage signal measurements. The differential probe has an differential input resistance of 4 M $\Omega$  and low input capacitance of 4 pF to minimize circuit loading. The probe comes with a pair of extension leads (30 cm long) with a damping resistor built in to damp out the in-band resonance and provide flat frequency response even with the extension leads and the probe tip accessories used.

The N2805A 200 MHz differential probe is designed to provide superior differential signal measurements especially in environments where extended cable length is required. This is due to the probe's 5m long cable length.

**Table 1** Quick Probe Comparison\*

	N2804A	N2805A
Band width	300 MHz	200 MHz
Attenuation Ratio	100:1	50:1
Differential Input Loading	4 M $\Omega$    4 pF	4 M $\Omega$    4 pF
Maximum Differential Input	$\pm 300V$ (DC + peak AC) and $\pm 200 V_{rms}$	$\pm 100V$ (DC + peak AC) and $\pm 100 V_{rms}$
Probe Cable Length	1.2 m	5 m

\* Refer to **"Specifications and Characteristics"** on page 20 for the complete specifications.



**Figure 1** Probes (Accessories Not Shown)

## Inspecting the Probe

- Inspect the shipping container for damage. Keep the damaged shipping container or cushioning material until the contents of the shipment have been checked for completeness and the probe has been checked mechanically and electrically.
- Check the accessories.
- If the contents are incomplete or damaged, notify your Keysight Technologies Sales Office.
- Inspect the probe. If there is mechanical damage or defect, or if the probe does not operate properly or pass calibration tests, notify your Keysight Technologies Sales Office.

If the shipping container is damaged, or the cushioning materials show signs of stress, notify the carrier as well as your Keysight Technologies Sales Office. Keep the shipping materials for the carrier's inspection. The Keysight Technologies office will arrange for repair or replacement at Keysight Technologies' option without waiting for claim settlement.

## Handling the Probe

Handle the probe with care and refer to the safety notices in this manual. The probe cable is a sensitive part of the probe and, therefore, you should be careful not to damage it through excessive bending or pulling. You should also avoid any mechanical shocks to this product in order to guarantee accurate performance and protection.

### CAUTION

Always wear an ESD wrist strap when working with active probes. Not doing so can result in the probe becoming permanently damaged.

### CAUTION

Observe all of the product limits noted on the products labels and listed in **“Safety Information”** on page 17 and **“Specifications and Characteristics”** on page 20.

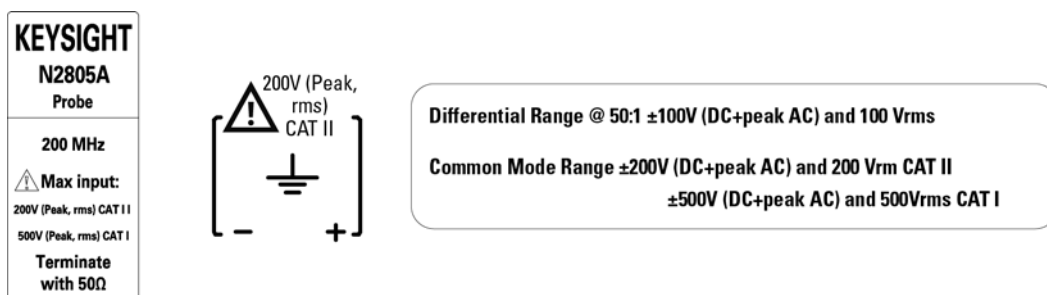


Figure 2 N2805A Product Labels

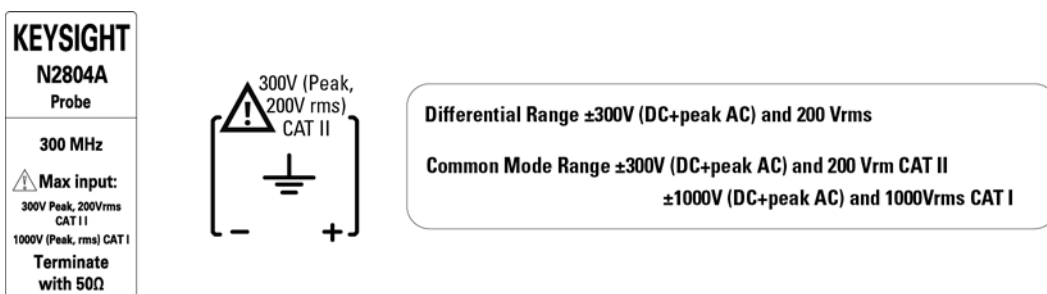


Figure 3 N2804A Product Labels

## Oscilloscope Compatibility

The N2804A and N2805A probes are compatible with the Keysight oscilloscopes shown in **Table 2**. Up to four probes can be connected to the oscilloscope at the same time. The table also lists the minimum required firmware version for the oscilloscope.

### NOTE

Is Your Oscilloscope Software Up-to-Date? Keysight periodically releases software updates to support your probe, fix known defects, and incorporate product enhancements. To download the latest firmware, go to [www.keysight.com](http://www.keysight.com), locate the Technical Support page, and search by your oscilloscope model number.

### NOTE

The N2804A and N2805A probes are designed for oscilloscopes with 50Ω AutoProbe-interface channel inputs. The AutoProbe interface provides the power to the probe.

**Table 2** Compatible Oscilloscopes and Support

Oscilloscope	Required Firmware Version	Adapter Required
<b>Infiniium Oscilloscopes</b>		
90000 Q-Series	≥ 5.20	N5442A
90000 X-Series	≥ 5.20	N5442A
90000A	≥ 5.20	–
9000A/H-Series	≥ 5.20	–
S-Series	≥ 5.20	–
<b>InfiniiVision Oscilloscopes</b>		
4000 X-Series	≥ 4.00	–
3000 X-Series	≥ 2.38	–



## Channel Identification Rings

When multiple probes are connected to the oscilloscope, use the channel identification rings to associate the channel inputs with each probe. Place one colored ring near the probe's channel connector and place an identical color ring near the probe head. The channel identifications rings are shown in **"N2804A in Case"** on page 10 and **"N2805A in Case"** on page 12.

## To Clean the Probe

Disconnect the probe from the oscilloscope and clean the probe with a soft cloth dampened with a mild soap and water solution. Make sure that the probe is completely dry before reconnecting it to an oscilloscope. Avoid using abrasive cleaners and chemicals containing benzene or similar solvents.

## N2804A Probe and Accessories

Figure 4 shows the N2804A probe with accessories in the product case. A description of each accessory is provided in Table 3 on page 11. These accessories are not compatible with N2805A probes. Replacements can be ordered with the N2816A replacement kit. The quantity for each accessory in the kit is the same as listed in the table and originally provided with the probe.

For IEC Category definitions, refer to "IEC Measurement Category Definitions" on page 35.

### WARNING





**The measurement category of a combination of a PROBE ASSEMBLY and an accessory is the lower of the measurement categories of the PROBE ASSEMBLY and of the accessory.**

---



Figure 4 N2804A in Case

**Table 3** N2804A Accessories Supplied With Probe (Order N2816A for Replacement Accessories)

Accessory	Description
	Alligator Clips (1 red and 1 black) Rating: 600V, 10A (CAT III) BW: 300 MHz
	Pincer Clips (1 red and 1 black) Rating: 300V, 1A (CAT II) BW: 300 MHz
	Extension Leads (1 red and 1 black) Approximately 30 cm length BW: 120 MHz
	Probe Offset Adjustment Tool (Qty. 1)

## N2805A Probe and Accessories

Figure 5 shows the N2805A probe with accessories in the product case. A description of each accessory is provided in Table 4 on page 13. These accessories are not compatible with N2804A probes. Replacements can be ordered with the N2817A replacement kit. The quantity for each accessory in the kit is the same as listed in the table and originally provided with the probe.

For IEC Category definitions, refer to “IEC Measurement Category Definitions” on page 35.

### WARNING






The measurement category of a combination of a PROBE ASSEMBLY and an accessory is the lower of the measurement categories of the PROBE ASSEMBLY and of the accessory.

---



Figure 5 N2805A in Case

**Table 4** N2805A Accessories Supplied With Probe (Order N2817A for Replacement Accessories)

Accessory	Description
	Alligator Clips (1 red and 1 black) Rating: 300V, 10A (CAT II) BW: 200 MHz
	Hook Clips (1 red and 1 black) Rating: 1000V, 3A (CAT III) BW: 200 MHz
	Pincer Clips (1 red and 1 black) Rating: 1000V, 5A (CAT III) BW: 100 MHz
	Browser Leads (1 red and 1 black) Rating: 1000V, 10A (CAT III) BW: 200 MHz
	Probe Offset Adjustment Tool (Qty. 1)

## Attaching Probe Accessories

Before you can use the probe, gently push one of the supplied accessory tips onto the probe leads as shown in **Figure 6**. For N2804A probes, extension leads can be inserted between the tip and probe leads.

### WARNING

**Must be Grounded. Before making connections to the input leads of this probe, ensure that the probe's output connector is attached to the channel input of the oscilloscope and the oscilloscope is properly grounded.**

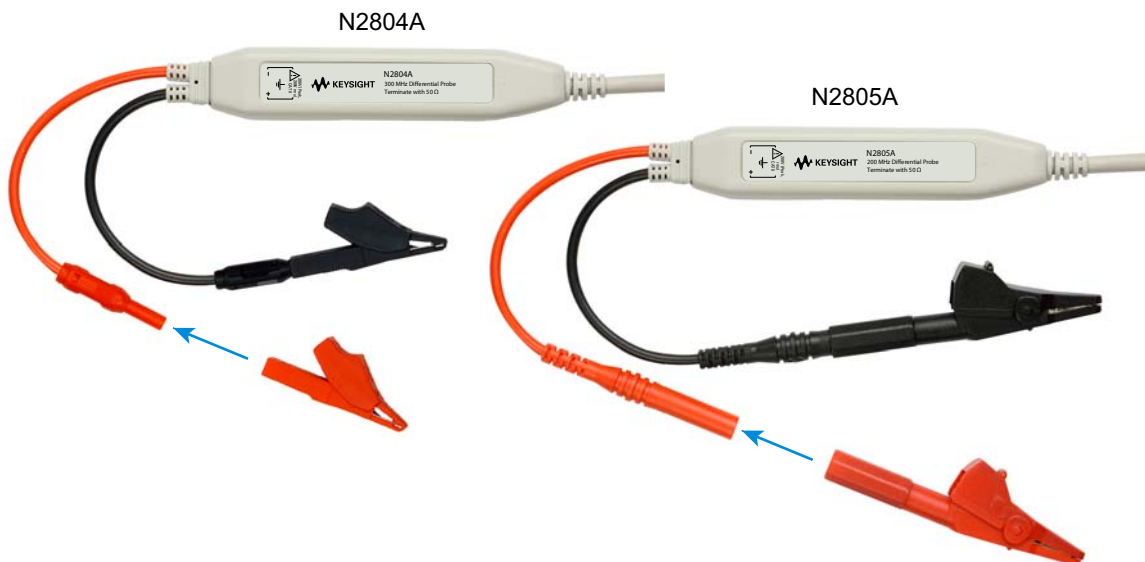


### CAUTION

To protect against electrical shock, use only the accessories supplied with this probe or in the accessory kit.

### CAUTION

This probe is to carry out differential measurements between two points on the circuit under test. This probe is not for electrically insulating the circuit under test and the measuring instrument.



**Figure 6** Attaching an Accessory Tip

## Probe Offset Adjustment

The N2804A/N2805A differential probes can be adjusted for zeroing out the probe's offset voltage using the trimmer tool supplied with the probe. Follow the procedure shown below to perform the offset zero calibration.

### NOTE

Allow the oscilloscope and probe to warm up for 20 minutes before performing the adjustment.

- 1 Connect the probe to an oscilloscope channel input. Turn on the oscilloscope and wait 20 minutes to allow the oscilloscope and probe to warm up.
- 2 If the oscilloscope needs calibration, perform a user calibration before the probe calibration.
- 3 Using the probe's hook tips, short the + and - probe inputs together as shown in [Figure 7](#).



**Figure 7** Adjusting the Offset Using the Supplied Tool

- 4 Press **Default** setup and **AutoScale** of the oscilloscope.
- 5 Press the channel button for the probe, and set the oscilloscope channel to DC coupled mode.

## Probe Offset Adjustment

- 6** Set the oscilloscope to **Averaging** mode (x8 or higher) to reduce oscilloscope noise.
- 7** Set the vertical scale of the oscilloscope to 100 mV/div (for N2804A) and 50 mV/div (for N2805A).
- 8** Using the offset adjustment tool that comes with the probe, adjust the probe offset voltage to zero volts.



## Safety Information



This manual provides information and warnings essential for operating this probe in a safe manner and for maintaining it in safe operating condition. Before using this equipment and to ensure safe operation and to obtain maximum performance from the probe, carefully read and observe the following warnings, cautions, and notes.

This product has been designed and tested in accordance with accepted industry standards, and has been supplied in a safe condition. The documentation contains information and warnings that must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

Note the external markings on the probe that are described in this document.

### WARNING

**To avoid personal injury and to prevent fire or damage to this product or products connected to it, review and comply with the following safety precautions. Be aware that if you use this probe assembly in a manner not specified, the protection this product provides may be impaired.**

---

### WARNING

**Observe Maximum Working Voltage. To avoid injury, do not use the N2804A probe above  $\pm 300V$  between each input lead and earth or  $\pm 300V$  between the two input leads. Refer to “Specifications and Characteristics” on page 20 for more information.**

---

### WARNING

**Observe Maximum Working Voltage. To avoid injury, do not use the N2805A probe above  $\pm 500V$  between each input lead and earth or  $\pm 100V$  between the two input leads. Refer to “Specifications and Characteristics” on page 20 for more information.**

---

### WARNING

**Must be Grounded. Before making connections to the input leads of this probe, ensure that the probe is connected to the oscilloscope’s channel input and the oscilloscope is properly grounded.**

---

### WARNING

**The measurement category of a combination of a PROBE ASSEMBLY and an accessory is the lower of the measurement categories of the PROBE ASSEMBLY and of the accessory.**

---

### WARNING

**Do Not Operate Without Covers. To avoid electrical shock or fire hazard, do not operate this probe with the covers removed.**

---

**WARNING**

**Do Not Operate in Wet / Damp Conditions.** To avoid electrical shock, do not operate this probe in wet or damp conditions.

---

**WARNING**

**Do Not Operate in an Explosive Atmosphere.** To avoid injury or fire hazard, do not operate this probe in an explosive atmosphere.

---

**WARNING**

**Avoid Exposed Circuit.** To avoid injury, remove jewelry such as rings, watches, and other metallic objects. Do not touch exposed connections and components when power is present.

---

**WARNING**

**For Indoor Use Only.** Only use this probe indoors.

---

**WARNING**

**Do Not Operate With Suspected Failures.** If you suspect there is damage to this probe, have it inspected by a qualified service personnel.

---

**WARNING**

**Connect and Disconnect Properly.** Connect the probe to the oscilloscope and connect the ground lead to earth ground before connecting the probe to the circuit under test. Disconnect the probe input and the probe ground lead from the circuit under test before disconnecting the probe from the oscilloscope.

---

**WARNING**

**Do not use a probe which is cracked, damaged or has defective leads.**

---

**WARNING**

**Do not install substitute parts or perform any unauthorized modification to the probe.**

---

**WARNING**

**Do not use the probe or oscilloscope in a manner not specified by the manufacturer.**

---

**CAUTION**

The probe cable is a sensitive part of the probe and, therefore, you should be careful not to damage it through excessive bending or pulling. Avoid any mechanical shocks to this product in order to guarantee accurate performance and protection.

---

## Concerning the Oscilloscope or Voltage Measuring Instrument to Which the Probe is Connected

**WARNING**

Whenever it is likely that the ground protection is impaired, you must make the instrument inoperative and secure it against any unintended operation.

---

**WARNING**

If you energize the instrument by an auto transformer (for voltage reduction or mains isolation), the ground pin of the input connector terminal must be connected to the earth terminal of the power source.

---

**WARNING**

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.

---

**WARNING**

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 fuse holders. To do so could cause a shock or fire hazard.

---

**WARNING**




Capacitors inside the instrument may retain a charge even if the instrument is disconnected from its source of supply.

---

## Specifications and Characteristics

The following tables list the characteristics for the N2804A and N2805A differential probes. Bandwidth and DC gain accuracy are the only warranted specifications. Connect the probe to a powered-on oscilloscope for at least 20 minutes before any testing to allow the probe to warm up. Ensure that the environmental conditions do not exceed the probe's specified limits.

**Table 5** N2804/5A Safety and Regulatory Information

Description	
CEI/IEC 61010-031 CAT II	
	This symbol indicates the Environmental Protection Use Period (EPUP) for the product's toxic substances for the China RoHS requirements.
	The CE mark is a registered trademark of the European Community. ISM GRP 1-A denotes the instrument is an Industrial Scientific and Medical Group 1 Class A product. ICES/NMB-001 indicates product compliance with the Canadian Interference-Causing Equipment Standard.
	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. To return unwanted products, contact your local Agilent office, or refer to <a href="http://www.agilent.com">www.agilent.com</a> for more information.

**Table 6** Environmental Specifications

Description	Specification
Temperature	Operating: -10 °C to +40 °C Non-operating: -30 °C to +70 °C
Altitude	Operating: 3,000 m (9,842 feet) Non-operating: 15,300 m (50,196 feet)
Humidity	Operating: 25 – 85% room humidity Non-operating: 25 – 85% room humidity
Pollution Degree	Pollution Degree 2

**Table 7** Electrical Specifications and Characteristics

Description*	N2804A	N2805A
Band width <sup>†</sup> ‡ (-3 dB)	300 MHz (without extension leads) 120 MHz (with extension leads)	200 MHz
DC Gain Accuracy <sup>†</sup>	±1%	±1%
Rise Time (10% - 90%)	1.167 ns	1.75 ns
Attenuation	100:1	50:1
Input Impedance		
Each Side to Ground:	2 MΩ    8 pF	2 MΩ    8 pF
Between Inputs:	4 MΩ    4 pF	4 MΩ    4 pF
Maximum Differential Input Voltage	±300V (DC + peak AC) and ±200 V <sub>rms</sub>	±100V (DC + peak AC) and ±100 V <sub>rms</sub>
Maximum Common Mode Input Voltage	±300V (DC + peak AC) and 200 V <sub>rms</sub> CATII ±1000V (DC + peak AC) and 1000 V <sub>rms</sub> CATI	±200V (DC + peak AC) and 200 V <sub>rms</sub> CATII ±500V (DC + peak AC) and 500 V <sub>rms</sub> CATI
Absolute Maximum voltage (each side to ground)	±300V (DC + peak AC) and 200 V <sub>rms</sub> CATII ±1000V (DC + peak AC) and 1000 V <sub>rms</sub> CATI	±300V (DC + peak AC) and 200 V <sub>rms</sub> CATII ±500V (DC + peak AC) and 500 V <sub>rms</sub> CATI
Output Termination	50Ω AutoProbe interface	50Ω AutoProbe interface
Output Offset	< ±2 mV (adjustable)	< ±2 mV (adjustable)
Offset Adjustable Range	-80 mV to +80 mV or larger	-80 mV to +80 mV or larger
CMRR	-80 dB at 60 Hz -50 dB at 10 MHz	-80 dB at 60 Hz -50 dB at 10 MHz
Noise Referenced to Probe Input	90 mV <sub>rms</sub>	30 mV <sub>rms</sub>
Power Requirements	AutoProbe Interface	AutoProbe Interface

\* All entries are typical unless otherwise noted.

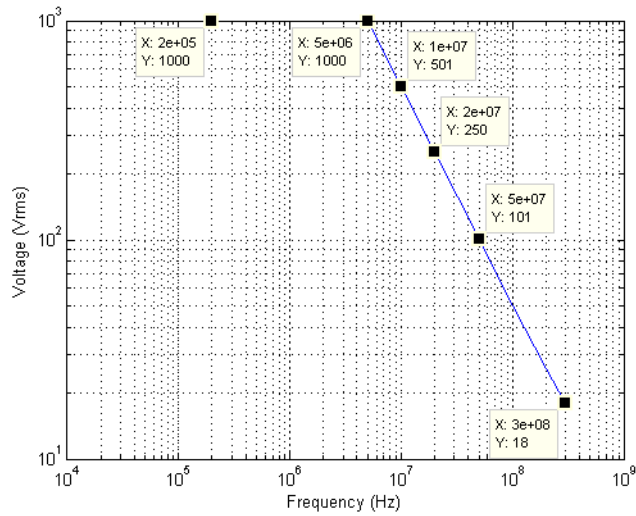
† Warranted specification

‡ Calculated 0.35/Tr

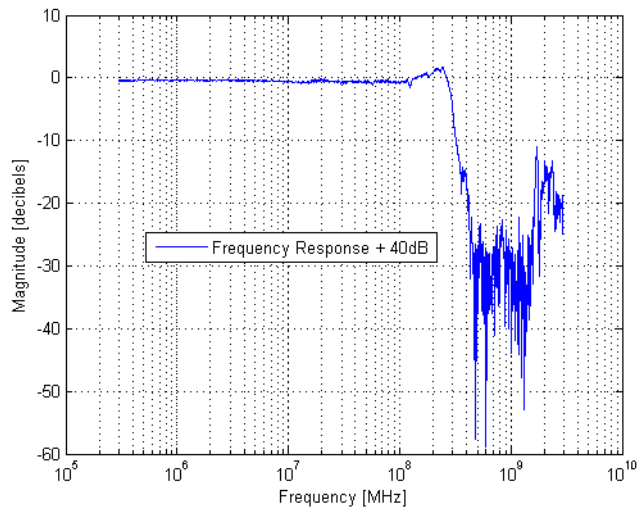
**Table 8** Mechanical Characteristics

Description	N2804A	N2805A
<b>Approximate Weight</b>		
Not Including Accessories	170g (6 oz)	160g (5.64 oz)
Including Accessories	1.01 kg (35.6 oz)	1.83 kg (64.6 oz)
BNC Cable Length	1.2 m (47 inches)	5 m (197 inches)
Length of Input Leads	39 cm (15.4 inches) with extension leads 12 cm (4.7 inches) without extension leads	16.5 cm (6.5 inches)
Housing Dimensions (L x W x H)	350 mm x 270 mm x 80 mm (13.8 in x 10.6 in x 3.15 in)	410 mm x 365 mm x 65 mm (16.1 in x 14.4 in x 2.56 in)

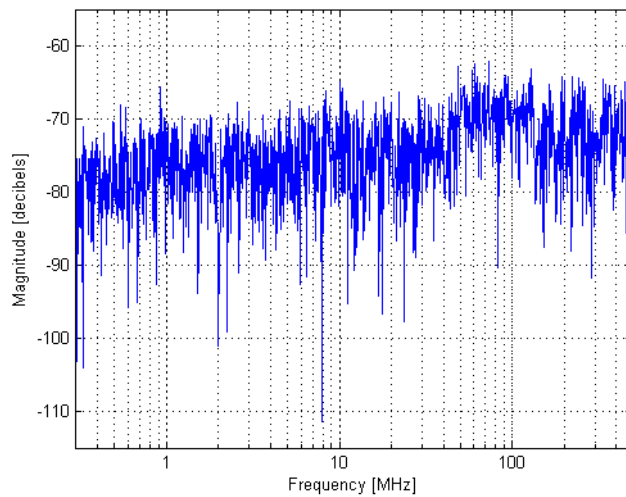
# N2804A Performance Plots



**Figure 8** N2804A Derating Curve

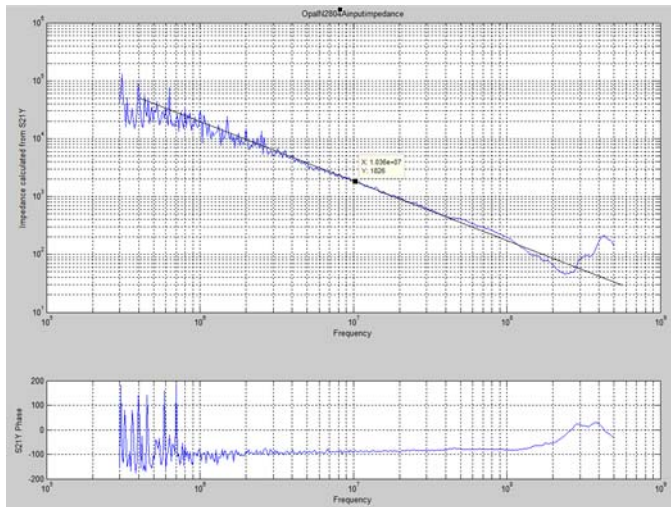


**Figure 9** N2804A Frequency Response

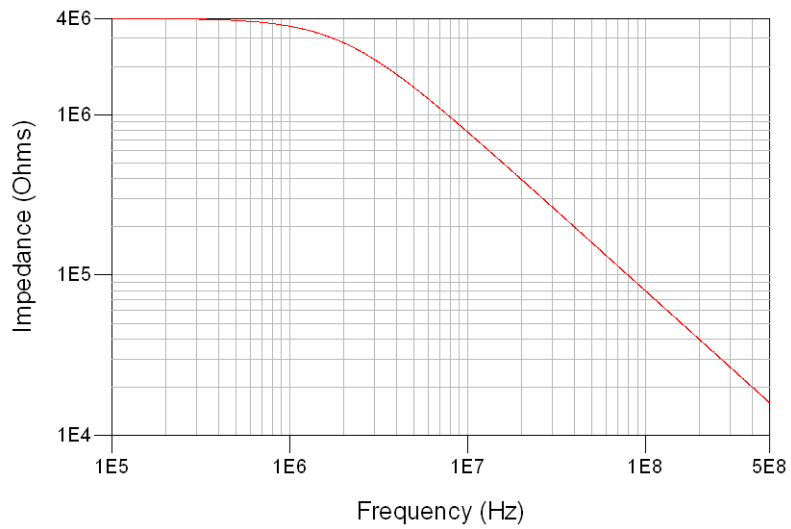


**Figure 10** N2804A Frequency Response when Inputs Driven in Common Mode (CMRR)

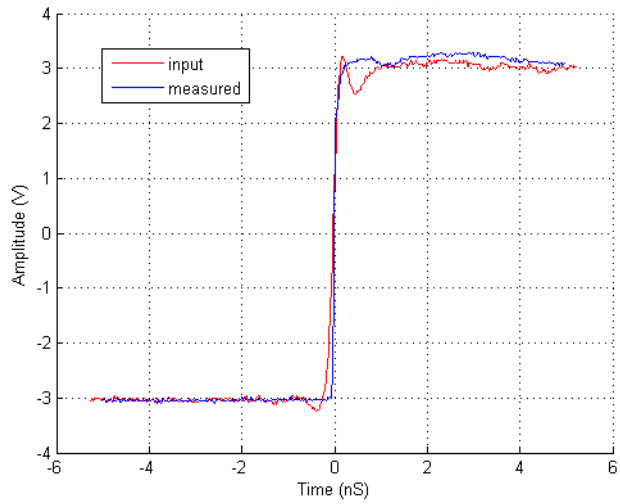




**Figure 11** N2804A Input Impedance (Between Inputs, Actual)

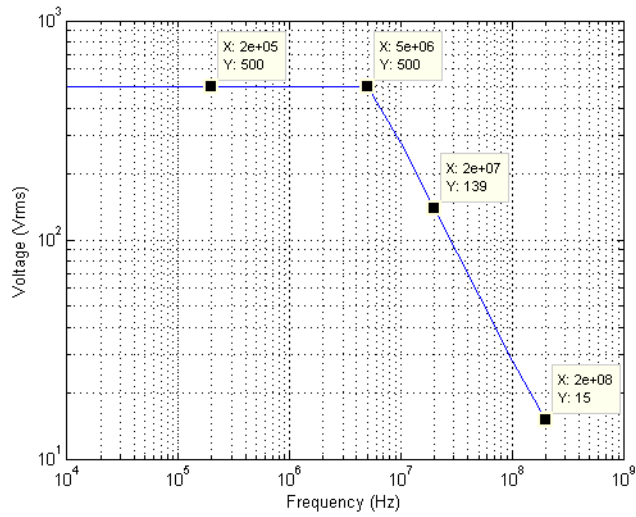


**Figure 12** N2804A Input Impedance (Between Inputs, Simulated)

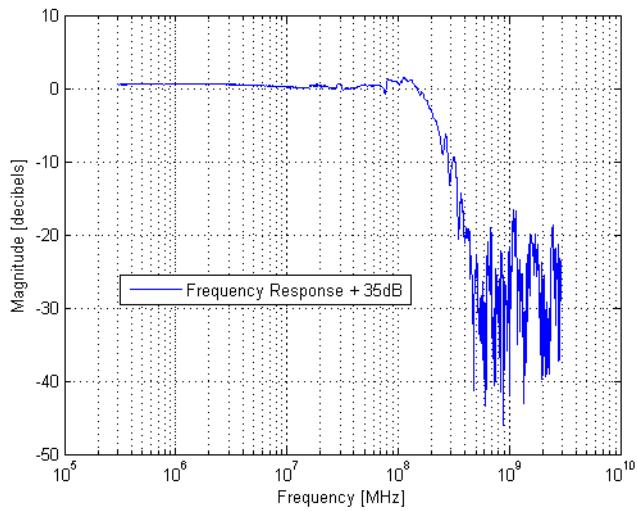


**Figure 13** N2804A Normalized Differential Step Response (50Ω)

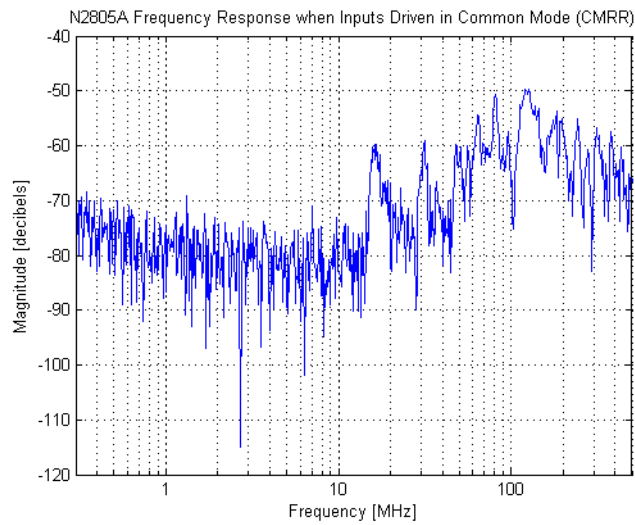
## N2805A Performance Plots



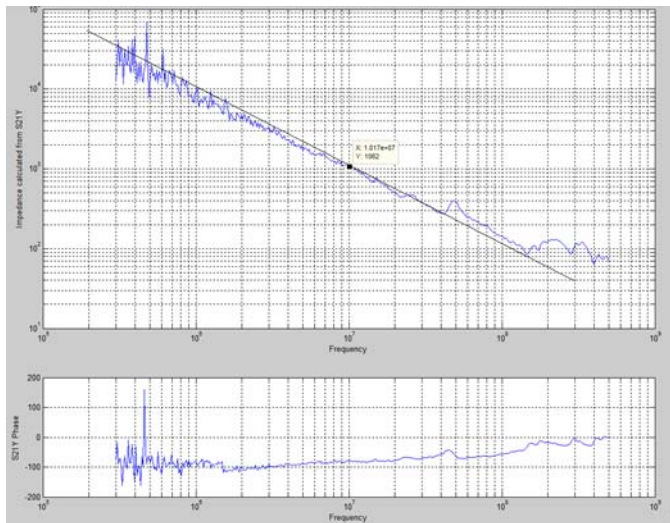
**Figure 14** N2805A Derating Curve



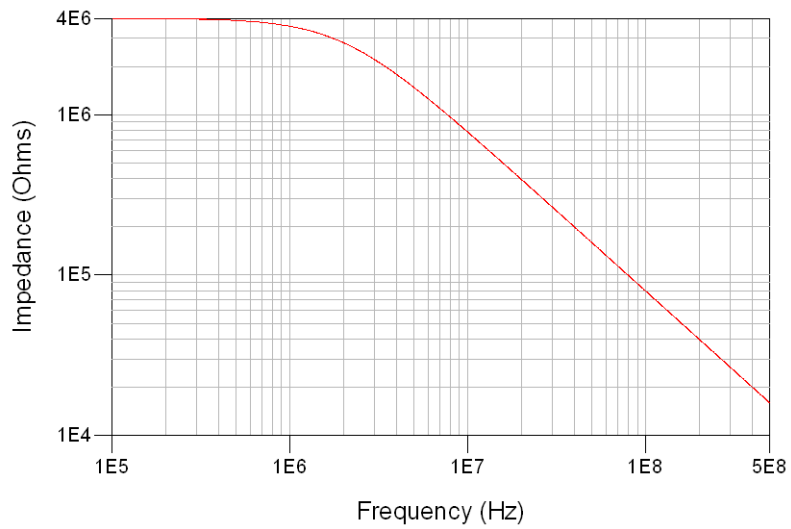
**Figure 15** N2805A Frequency Response



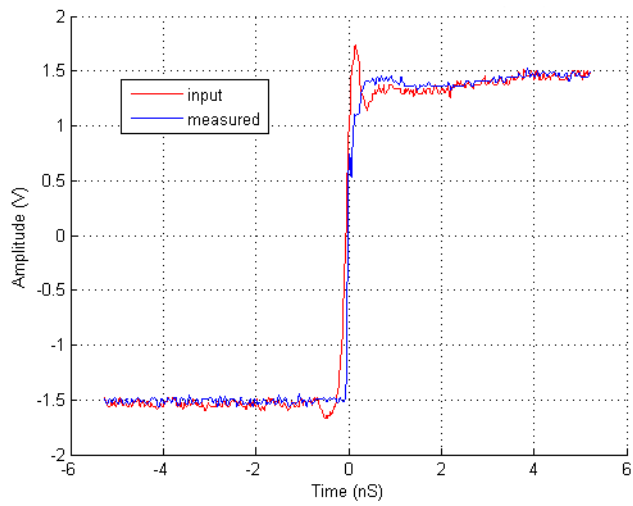
**Figure 16** N2805A Frequency Response when Inputs Driven in Common Mode (CMRR)



**Figure 17** N2805A Input Impedance (Between Inputs, Actual)



**Figure 18** N2805A Input Impedance (Between Inputs, Simulated)



**Figure 19** N2805A Normalized Differential Step Response (50Ω)

## Performance Verification

The following procedure can be used to test the N2804A or N2805A probe's DC differential gain accuracy and bandwidth, which are warranted specifications.

### NOTE

The recommended test interval is 1 year.

**Table 9** Required Test Equipment

Description	Critical Specifications	Recommended Model Part Number	Functions
Digitizing Oscilloscope	Band width: >200 MHz 1 M $\Omega$ /50 $\Omega$ selectable input	Keysight DSOS204A	Display probe output
Signal Generator Precision DC voltage source	Amplitude accuracy: less than or equal to 0.25% 1 M $\Omega$ / 50 $\Omega$ selectable load Sine wave greater than or equal to 200 MHz	Fluke 9500B High Performance Oscilloscope Calibrator or Keysight E8257D+1EU option	Signal source for DC gain and bandwidth
BNC Adapter	BNC (f) to Dual Banana (m) Adapter	Keysight 1251-2277	Interconnection between probe and generator
50 $\Omega$ BNC Feed Through Adapter	50 $\Omega$ precision feed through terminator	Keysight 0960-0301	Termination between probe and calibrator for bandwidth verification

## Performance Tests

- 1 Configure the oscilloscope to the following settings:
  - Amplitude Scale (Channel 1): . . . . . 20 mV/div
  - Amplitude Scale (Channel 2): . . . . . 500 mV/div
  - Time Scale: . . . . . 200  $\mu$ s/div
  - Acquisition mode: . . . . . 32 averages
  - Input impedance: . . . . . 50 $\Omega$ .
  - Trigger: . . . . . Channel 2
- 2 On the 9500B calibrator, configure **CH2** to the following settings:
  - Type: . . . . . TRIGGER
  - Load: . . . . . 50 $\Omega$
- 3 On the 9500B, connect the **CH2** active head to channel 2 on the oscilloscope.  
Connect the **CH1** active head to channel 1 on the oscilloscope
- 4 On the 9500B, set **CH1** to the following settings and enable the output:
  - Waveform: . . . . . square wave
  - Load: . . . . . 1 M $\Omega$
  - Amplitude: . . . . . 0.1V pk-pk
  - Frequency: . . . . . 1 kHz
- 5 On the oscilloscope, select the amplitude measurement and record the square wave's DC amplitude (approximately 100 mV):
  - $V_{cal}$ : . . . . . \_\_\_\_\_ mV

### DC Differential Gain

- 6 Disable the 9500B's output and disconnect the active head from channel 1 of the oscilloscope.
- 7 Connect the probe's output to channel 1 of the oscilloscope.
- 8 Attach the BNC adapter to the 9500B's **CH1** active head.
- 9 Attach the differential probe input leads by clipping the alligator clamp to the BNC adapter banana post.
- 10 On the 9500B, change the **CH1** amplitude setting to:
  - N2804A: . . . . . 10V pk-pk
  - N2805A: . . . . . 5V pk-pk
- 11 Enable the output of the calibrator.



- 12** On the oscilloscope, note the measured DC amplitude for the square wave input to the probe. For N2804A probes, divide this value by 100 and record the voltage below as the probe's output ( $V_{\text{probe out}}$ ). For N2805A probes, divide the measured value by 50.

$V_{\text{probe out}}$ : . . . . . \_\_\_\_\_ mV

- 13** Calculate the probe gain accuracy.  $V_{\text{cal}}$  was recorded in **step 5** and  $V_{\text{probe out}}$  was recorded in **step 12**.

$$\text{Probe Gain Accuracy (\%)} = \frac{V_{\text{probe out}} - V_{\text{cal}}}{V_{\text{cal}}} \times 100$$

- 14** Verify that the probe gain accuracy is  $\pm 1\%$  + scope gain accuracy. Record the test results as DC Differential Gain Accuracy in **Table 10** on page 34.

### Bandwidth

- 15** Disable the 9500B's output.
- 16** Connect the 50 $\Omega$  BNC feed through adapter to the N9500B's **CH1** active head.
- 17** Attach the BNC (f)-to-banana post adapter to the BNC feed through adapter.
- 18** Attach the differential probe input leads by clipping the alligator clamp to the BNC adapter banana post.
- 19** Enable the 9500B's output.
- 20** Configure the oscilloscope to the following settings:  
 Amplitude Scale (Channel 1): . . . . . 500 mV/div  
 Time Scale: . . . . . 2 ns/div  
 Acquisition mode: . . . . . Peak Detect
- 21** Center the trace on the oscilloscope.
- 22** On the 9500B, configure **CH1** to the following settings:  
 Waveform: . . . . . sine wave  
 Load: . . . . . 1 M $\Omega$   
 Amplitude: . . . . . .3V pk-pk  
 Frequency (N2804A): . . . . . .300 MHz  
 Frequency (N2805A): . . . . . .200 MHz

- 23** Measure the peak-to-peak amplitude on the oscilloscope. It should be greater than or equal to 210 mV – scope vertical accuracy. Record the test results as Bandwidth in **Table 10** on page 34.
- 24** Disable the 9500B's output and disconnect the probe input.

### Performance Test Record

Serial Number:  
 Certification Date:  
 Certification Temperature:  
 Tested By:

**Table 10** N2804A Performance Test Record

Test	Test Limits	Test Results
DC Differential Gain Accuracy	$\pm 1\%$ (99 mV – scope vertical accuracy to 101 mV + scope vertical accuracy)	
Bandwidth	$\geq$ (210 mV – scope vertical accuracy)	

## IEC Measurement Category Definitions

Definitions and Examples (Clause 6.5.2).

### Measurement Category I (CAT I)

Measurement category I is for measurements performed on circuits not directly connected to a mains supply. For example, measurements in circuits not derived from a mains supply and specially protected (internal) circuits derived from a mains supply. In the latter case, transient stresses are variable. For that reason, it is required that the transient withstand capability of the equipment is made known to the user.

### Measurement Category II (CAT II)

Measurement category II is for measurements performed on circuits directly connected to the low voltage installation. For example, household appliances, portable tools, and similar equipment.

### Measurement Category III (CAT III)

Measurement category III is for measurements performed in the building installation. For example, measurements on distribution boards, circuit breakers, wiring including cables, bus-bars, junction boxes, switches, socket-outlets in the fixed installation and equipment for industrial use like, for example, stationary motors with permanent connections to the fixed installation.

### Measurement Category IV (CAT IV)

Measurement category IV is for measurements performed at the source of the low-voltage installation. For example, electricity meters and measurements on primary over-current protection devices and ripple control units.

## Returning the Probe for Service

If the probe is found to be defective we recommend sending it to an authorized service center for all repair and calibration needs. Perform the following steps before shipping the probe back to Keysight Technologies for service.

- 1 Contact your nearest Agilent sales office for information on obtaining an RMA number and return address.
- 2 Write the following information on a tag and attach it to the malfunctioning equipment.
  - Name and address of owner
  - Product model number (for example, N2804A)
  - Product Serial Number (for example, MYXXXXXXXX)



**Figure 20** Location of Serial Number Label

- Description of failure or service required.

### NOTE

Include probing and browsing heads if you feel the probe is not meeting performance specifications or a yearly calibration is requested.

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- 3 Protect the probe by wrapping in plastic or heavy paper.
- 4 Pack the probe in the original carrying case or if not available use bubble wrap or packing peanuts.
- 5 Place securely in sealed shipping container and mark container as "FRAGILE".

### NOTE

If any correspondence is required, refer to the product by serial number and model number.

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## Contacting Keysight Technologies

For technical assistance, contact your local Keysight Call Center.

- In the Americas, call 1 (800) 829-4444
- In other regions, visit <http://www.keysight.com/find/assist>
- Before returning an instrument for service, you must first call the Call Center at 1 (800) 829-4444.

Returning the Probe for Service

# Index

## A

accessories  
    N2804A, 10  
    N2805A, 12  
alligator clips, 11, 13  
altitude, 20

## B

band width, 21  
browser leads, 13

## C

care, probe, 7  
CE mark, 20  
channel identification rings, 9  
characteristics, 20  
cleaning, 9  
compatible oscilloscopes, 8

## E

electrical specifications, 21  
Environmental, 20  
environmental specifications, 20  
ESD, 7  
extension leads, N2804A, 11

## G

grounding probe, 14

## H

hook clips, 13  
humidity, 20

## I

Infiniium oscilloscope, 8

InfiniiVision oscilloscope, 8  
input resistance, 21  
inspecting, 6

## K

Keysight Technologies, contacting, 37

## L

labels, 7

## M

measurement category, 10, 12, 20  
mechanical characteristics, 22

## O

Offset Adjust, 15  
oscilloscope  
    compatibility, 8  
    Infiniium, 8  
    InfiniiVision, 8

## P

performance plots  
    N2804A, 23  
    N2805A, 27  
performance verification, 31  
pincer clips, 11, 13  
probe  
    cable care, 7  
    cleaning, 9  
    grounding, 14  
    inspecting, 6  
    offset adjust, 15  
    service, 36  
product labels, 7

## R

repair, 36  
replacement kit  
    for N2804A, 10  
    for N2805A, 12  
returning for service, 36

## S

safety, 17  
Safety Considerations, 17  
safety specifications, 20  
safety warnings, 17  
service, 36

## T

temperature, 20  
test interval, recommended, 31

## W

WEEE Directive, 20

