N2797A
Extreme Temperature Single-Ended Active Probe

User's Guide

Agilent Technologies

Notices

Manual Part Number

N2797–97000

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Oscilloscope Products Division

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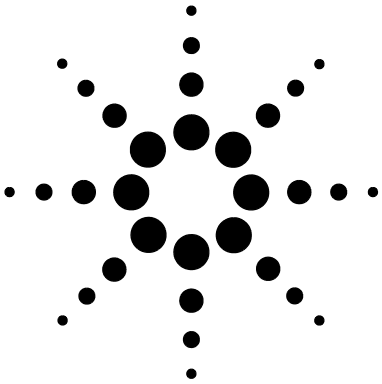
Contents

Contents



1 Using the Probe

The N2797A single-ended active probe is designed to be used in extreme temperatures environments. With a 2 meter cable and ability to operate in temperatures from –40°C to +85°C, the N2797A probe is ideal for environmental labs. The probe's bandwidth is 1.5 GHz.

The N2797A integrates many of the characteristics needed for today's general-purpose, high-speed probing, especially in digital system design, component design/characterization, and educational research applications. Its 1 MΩ input resistance and extremely low input capacitance (1 pF) provide ultra low loading of the device under test. This, accompanied with superior signal fidelity, makes this probe useful for most of today's digital logic voltages. With a wide ±8V dynamic range and ±12V offset range, this probe can be used in a wide variety of applications.

For high signal integrity probing, the N2797A 1.5 GHz active probe is a perfect complements to Agilent's 500 MHz – 600 MHz and 1 GHz bandwidth scopes.

The probe is powered directly by the InfiniiVision and Infiniium AutoProbe interface, eliminating the need for an additional power supply. The probe also come with a number of accessories that allow for easy connections to the circuit under test. Refer to "Supplied Accessories" on page 8.

WARNING **Handle the probe with care to avoid injury, especially when it is fitted with the sharp spring or rigid tip.**

CAUTION This probe is an ESD sensitive devices, particularly at the probe tips. Follow standard ESD precautions when handling. Remove tip accessories when storing the probe.

CAUTION Before using the probe, refer to "Safety Information" on page 24.

CAUTION Handle the probe cable carefully to avoid damaging it through excessive bending or pulling. Avoid any mechanical shocks to the probe in order to guarantee accurate performance and protection.

Probe Features

Oscilloscope Compatibility

The N2797A probe is compatible with the Agilent oscilloscopes shown in Table 1. Up to four probes can be connected to the oscilloscope. The table also lists the minimum required firmware version for the oscilloscope.

NOTE The N2797A probe is designed for oscilloscopes with 1 MΩ AutoProbe-interface channel inputs.

Is Your Oscilloscope Software Up-to-Date?

Agilent periodically releases software updates to support your probe, fix known defects, and incorporate product enhancements. To download the latest firmware, go to www.agilent.com and search for your oscilloscope's topic. Click on the "Drivers, Firmware & Software" tab.

Table 1 Compatible Oscilloscopes and Support

Oscilloscope	Adapter Required
Infiniium Oscilloscopes ***(firmware version ≥3.50 or above)***	
90000 Q-Series	N5442A
90000 X-Series	N5442A
90000A	—
9000 H-Series	—
9000A-Series	—
InfiniiVision Oscilloscopes ***(firmware version ≥2.11 or above)***	
4000 X-Series	—
3000 X-Series	—

Probe Headlight

The probe is equipped with a white LED headlights to illuminate the area around the probe tip. This headlight has a fixed intensity and is turned on and off by pressing the button that is located on the probe's body.

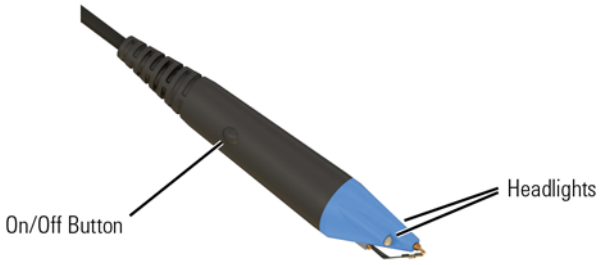


Figure 1 Headlights and Button

Channel-Identification Rings

When multiple probes are connected to the oscilloscope, the channel identification rings (yellow, green, blue, and purple) allow you to quickly determine which channel input is associated with each probe. On the probe, place one colored ring near the probe's channel connector and place an identical color ring near the probe head.

Supplied Accessories

The probe comes with the accessories shown in Figure 2.

CAUTION

All of the supplied accessories can be used at the probe's specified extreme temperature range of –40°C to +85°C (–40°F to +185°F) except the flex nose clip and pico hook tips. These adapters have a slightly reduced temperature range of –20°C to +80°C (–4°F to +176°F).

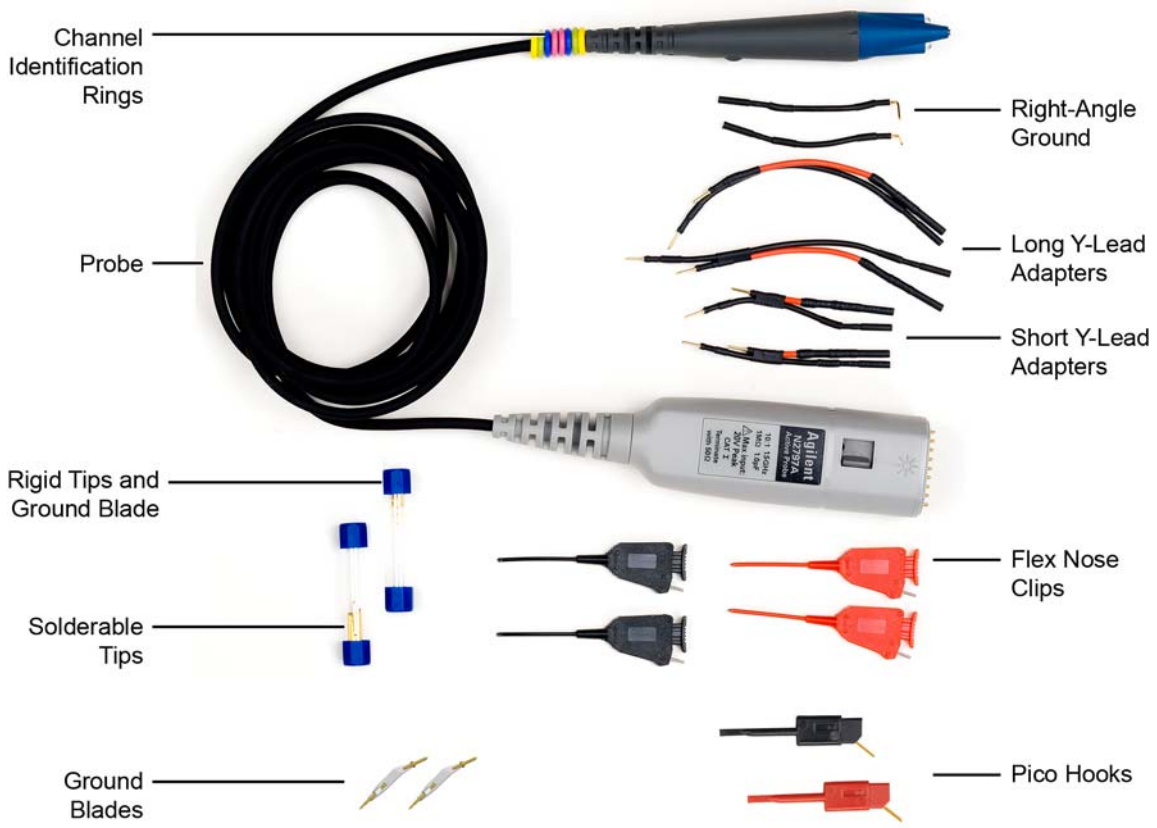


Figure 2 Accessories Supplied With the Probe (Not to Scale)

Table 2 Supplied Accessories

Accessory	Ambient Operating Temperature	Quantity
Flex Nose Clip (red)	–20°C to +80°C (–4°F to +176°F)	2
Flex Nose Clip (black)		2
Pico Hook (red)		1
Pico Hook (black)		1
Rigid Probe Tip	Same as probe –20°C to +85°C (–4°F to +185°F)	5
Solderable Tip (0.97 mm square)		10
Ground Blade		2
Y-Lead Adapter, long with damping resistor (9 cm)		2
Y-Lead Adapter, short with damping resistor (6 cm)		2
Right-Angle Ground (5 cm)		2

Available Accessories

Table 3 shows the replacement accessories available in the N2798A replacement accessory kit. The table lists the ambient operating temperatures for each accessory. Those accessories that have the same temperature range as the probe are marked "*extreme temp*".

Table 4 shows additional accessories that work with the probe, but are not provided with the probe. Notice that most of these accessories can not be used at extreme temperature range of the probe.

Table 3 Replacement Accessory Kit (N2798A)

Item	Description	Ambient Operating Temperature	Qty	Kit Part Number
	Solderable Tip, *extreme temp*	Same as probe –40°C to +85°C (–40°F to +185°F)	10	5061-7385
	Ground Blade, *extreme temp*		2	5061-7393
	Rigid Probe Tip, *extreme temp*		5	5061-7389
	Flex Nose Clips This adapter has a *slightly reduced* temperature range compared to the probe.	–20°C to +80°C (–4°F to +176°F)	2 (red) 2 (black)	5061-7390 (red) 5061-7391 (black)
	Pico Hook Nose Clips This adapter has a *slightly reduced* temperature range compared to the probe.	–20°C to +80°C (–4°F to +176°F)	1 (red) 1 (black)	—
	Long Y-Lead Adapter with damping resistor (10 cm), *extreme temp*	Same as probe –20°C to +85°C (–4°F to +185°F)	2	5061-7386
	Short Y-Lead Adapter with damping resistor (5 cm), *extreme temp*		2	5061-7387
	Right Angle Ground (5 cm), *extreme temp*	Same as probe –40°C to +85°C (–40°F to +185°F)	2	5061-7384

Table 4 Additional Available Accessories

Item	Description	Ambient Operating Temperature	Qty	Kit Part Number
	Spring Probe Tip, *extreme temp*		2	5061-7388
	Long Y-Lead Adapter(10 cm)	0°C to 50°C (32°F to 122°F)	1	5061-7392
	Right Angle Ground (10 cm)	0°C to 50°C (32°F to 122°F)	2	5061-7400
	Right Angle Ground (5 cm)		2	5061-7399
	Ground Lead (6 cm)	0°C to 50°C (32°F to 122°F)	2	5061-7395
	Ground Lead (12 cm)		2	5061-7396
	Offset Ground	0°C to 50°C (32°F to 122°F)	2	5061-7394
	N2787A 3D Probe Positioner	Not Specified	—	—

Attaching Probe Accessories

It's easy to change the probe tip and ground accessories. Figure 3 on page 13 shows locations for inserting the tip and the ground accessory. To change an accessory, gently pull it straight out of its contact socket along the axis of the probe. Once the accessory is removed, insert the new accessory until it is seated in the contact socket. In order to insert the probe tip completely into the housing, carefully press the probe tip against a hard surface.

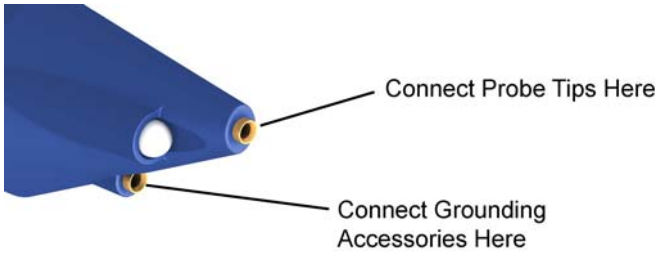


Figure 3 Tip and Grounding Connections

Using the Accessory Tips and Grounds

This section presents the various probe accessory configurations listed in order of available bandwidth for your measurements. Select the configuration to match your measurement needs, including ease of use.

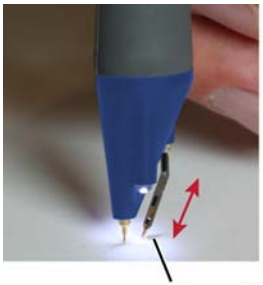
Table 5 Probe Configuration in Order of Decreasing Bandwidth

Recommended Order of Use	Probe Configuration Topic	Typical Bandwidth
1	 "Rigid or Solderable Tip with Ground Blade" on page 15	1.5 GHz
2	 "9 cm Y-Leads with 0.1" Headers" on page 18	1.0 GHz
3	 "Solderable Tip with Right-Angle Ground" on page 17	800 MHz
4	 "9 cm Y-Leads with 0.1" Headers" on page 18	800 MHz
5	 "Y-Lead with Flexible Nose Clips and Pico Hooks" on page 19	500 MHz

1 Rigid or Solderable Tip *with* Ground Blade

Bandwidth 1.5 GHz

The combination of rigid or solderable tip and ground blade provide the highest bandwidth of any combination of accessory tips and grounds. Use this configuration at room temperatures where hand probing is possible or at extreme temperatures when using a probe positioner that can withstand the required temperature.



WARNING **Handle the probe with care to avoid injury, especially when it is fitted with the sharp rigid or spring tip.**

When inserting the tip, insert the end with the ridge into the probe head as shown in Figure 4.

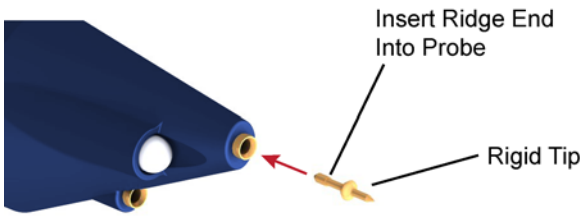


Figure 4 Inserting the Rigid Tip

2

6 cm Y-Leads *with* 0.1″ Headers

Bandwidth 1.0 GHz

The short 6 cm long Y-leads offer a convenient and reliable method to connect both the probe signal and ground to probe points on the board via or the solderable pins that are provided with each probe. The sockets accept 0.56 to 0.86 mm round and 0.64 mm square (0.022 to 0.034 inch round and 0.025 inch square) diameter pins. The maximum insertion depth is 7.5 mm (0.295 inch) and the outer insulation of the socket is less than 2.54 mm. You can use it for 2.54 mm pitch (0.1 inch) terminals.

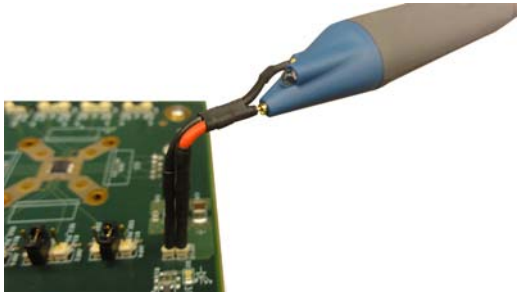


Figure 5 Probe with Y-Leads Attached

3 Solderable Tip *with* Right-Angle Ground

The solderable pin and right-angle ground provide hands free probing at extreme temperatures. Solder the tip on the printed-circuit board as shown in Figure 6 and then slip the probe onto the free end of the solderable pin.

Bandwidth 800 MHz

NOTE

The longer right-angle ground lead introduces increased inductance in the ground path. Therefore, keep the right-angle ground lead as straight as possible for maximum measurement bandwidth. Loops and bends in the ground lead, as shown in this picture, can reduce the measurement bandwidth.

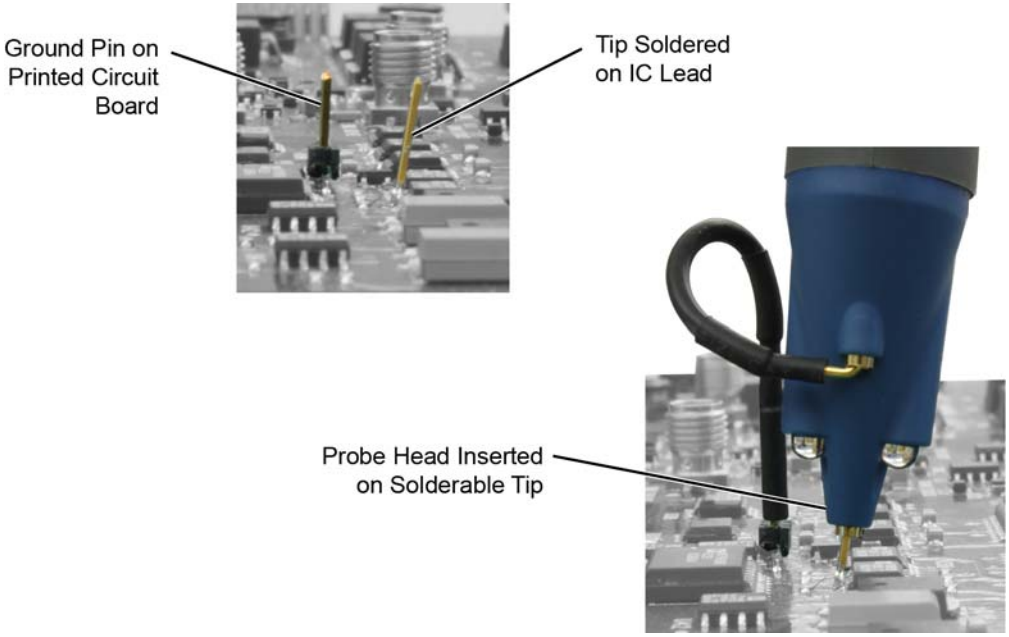


Figure 6 Placing the Probe Onto the Solderable Tip

4 9 cm Y-Leads *with* 0.1″ Headers

Like the 6 cm Y-leads, the 9 cm Y-leads offer a convenient and reliable method to connect both the probe signal and ground to probe points on the board via or the solderable pins that are provided with each probe. The added convenience of the longer leads results in a slightly reduced bandwidth.

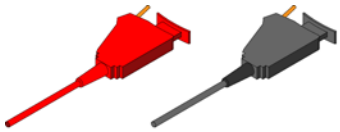
Bandwidth 800 MHz

The sockets accept 0.56 to 0.86 mm round and 0.64 mm square (0.022 to 0.034 inch round and 0.025 inch square) diameter pins. The maximum insertion depth is 7.5 mm (0.295 inch) and the outer insulation of the socket is less than 2.54 mm. You can use it for 2.54 mm pitch (0.1 inch) terminals.

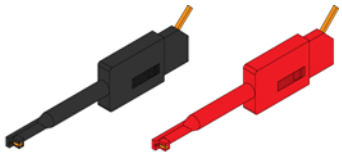
Figure 7 Probe with Y-Leads Attached

5 Y-Lead *with* Flexible Nose Clips and Pico Hooks

You can use flexible nose clips and Pico hook clips to make connections to components or wires with leads that are 1.01 mm (0.04 inches) in diameter or smaller. With today's miniature IC- and component-packaging techniques, these clips can make probing challenging devices much easier.



Flexible Nose Clips



Pico Hook Clips

Most users prefer to attach the clips to the probe via the Y-lead adapter as shown in the picture below. Press the back of the clip to extend the grasping hook and then release to tighten the hook around the component you are testing.

CAUTION

The clips have an ambient operating temperature range of –20°C to +80°C (–4°F to +176°F). This is a slightly reduced range compared to the probe.

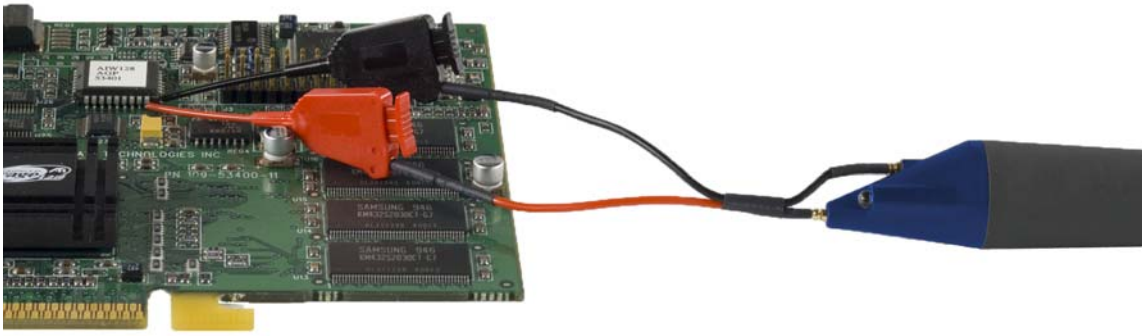


Figure 8 Probe with Flexible Nose Clips Attached

Dynamic Range and Offset Voltage Limitations

With the $16V_{pp}$ (±8V) of dynamic range and ±12V of offset range, the probes have a wide measuring range of ±20V, which allows them to be used for a wide variety of applications. For example, if you wanted to measure small AC noise riding on top of a +10V DC signal, you could use DC offset to position the signal at the center of the screen to keep the probe within its dynamic range. You could then zoom in to see the detail at a higher resolution. Trying to measure a signal out of the dynamic range may result in a clipped or distorted waveform.

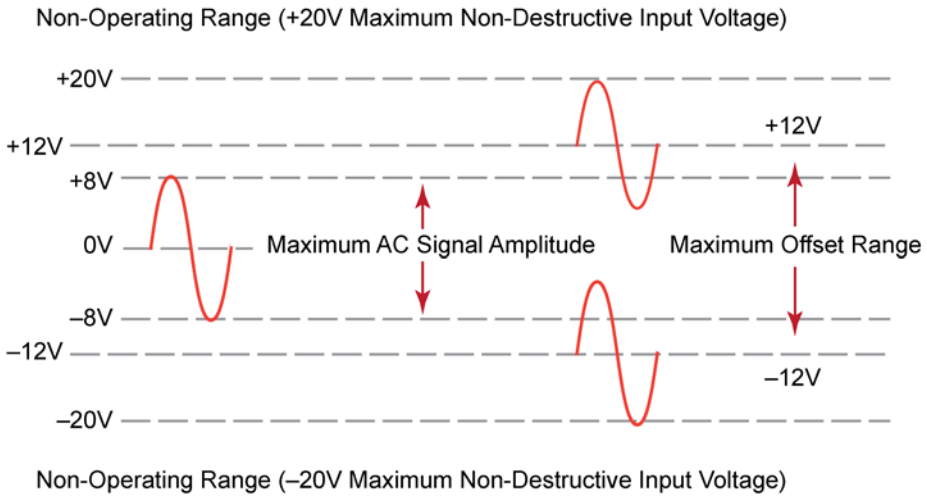


Figure 9 Dynamic Range and Offset Limits

Functional Test

Use the following generic measurement procedure to ensure that your probe is functioning properly.

1. Connect the probe to an oscilloscope channel input and ensure the input impedance of the oscilloscope matches the output impedance of the probe (50Ω).
2. Connect a grounding accessory to the probe and connect the ground to the ground terminal on the oscilloscope.
3. Connect the probe tip to the oscilloscope's probe compensation output.
4. Enable autoscale on the oscilloscope.
5. A square wave should now be displayed on the oscilloscope, if the probe is functioning properly.

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 Agilent 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 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.

Cleaning 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 the probe is completely dry before reconnecting it to an oscilloscope.

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 Agilent 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, N2797A)
   - ❏ Product Serial Number (for example, MYXXXXXXXX)
   - ❏ Description of failure or service required

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

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.

Contacting Agilent Technologies

For technical assistance, contact your local Agilent Call Center.

- In the Americas, call 1 (800) 829-4444
- In other regions, visit http://www.agilent.com/find/assist

Before returning an instrument for service, you must first call the Call Center at 1 (800) 829-4444.

Safety Information

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 **Handle the probe with care to avoid injury, especially when it is fitted with the sharp spring or rigid tip.**

WARNING **Handle Probe Tips and Accessories Carefully.**
Some of the probe tips and accessories are very sharp (the browser tips, for example). You should handle these with care to avoid personal injury.

WARNING **Use Only Grounded Instruments.**
Do not connect the probe's ground lead to a potential other than earth ground. Always make sure the probe and the oscilloscope are grounded properly.

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.

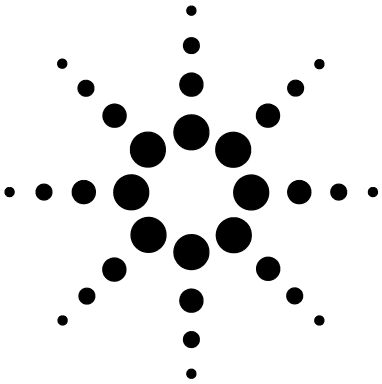
WARNING **Observe Probe Ratings.**
Do not apply any electrical potential to the probe input which exceeds the maximum rating of the probe. Make sure to comply with the voltage versus frequency derating curve found in this manual.

WARNING **Keep Away From Live Circuits.**
Avoid open circuitry. Do not touch connections or components when power is present.

WARNING **Indoor Use Only.**
Do not operate in wet/damp environments. Keep product surfaces dry and clean.

WARNING **Do Not Operate With Suspected Failures.**
Refer to qualified service personnel.

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.



2
Probe Calibration

Always calibrate the probe before making any critical measurements. A probe calibration removes attenuation errors, offset errors, and timing delays that are introduced by the probe. This chapter contains basic calibration procedures for both Infiniium and InfiniiVision oscilloscopes. For additional information on the probe calibration refer to the oscilloscope's user documentation.

CAUTION

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

Calibrating the Probe on Infiniium Oscilloscopes

Probe calibrations vary slightly between series 9000, 90000, and 90000 X oscilloscopes. For 9000 series oscilloscopes, the following calibrations are used:

- Skew Calibration
- Attenuation/Offset Calibration

For 90000 series oscilloscopes, the following calibrations are used:

- DC Attenuation/Offset Calibration
- Skew Calibration

When performing a the skew calibration, the E2655B Performance Verification (PV) and deskew fixture is used. The PV fixture is included with the Deskew Kit which is shipped with Infiniium oscilloscopes. The fixture is also used in the performance verification procedure that is documented in Chapter 5, “Performance Verification”.

An optional N2787A 3D Probe Positioner or equivalent can be used to hold the probe during the calibration.

Procedure

1. Turn on the oscilloscope. Allow the oscilloscope and probe to warm up for 20 minutes before performing the probe calibrations.
2. If the oscilloscope needs calibration, perform a user calibration before the probe calibration. On the oscilloscope, click **Utilities > Calibration**.
3. On the oscilloscope, click **Setup > Probes**.
4. In the Probe Calibration dialog box, select the tab representing the channel that has the probe attached.

5 In the dialog box, select the probe head and the type of calibration. Click **Start** and follow the instructions shown on the oscilloscope.

6 When performing the skew calibration, you will be instructed to use the PV fixture. Observe these points:

- ❏ Connect the PV fixture's input to the oscilloscope's calibration output. Connect a 50 ohm terminator to the PV's output.

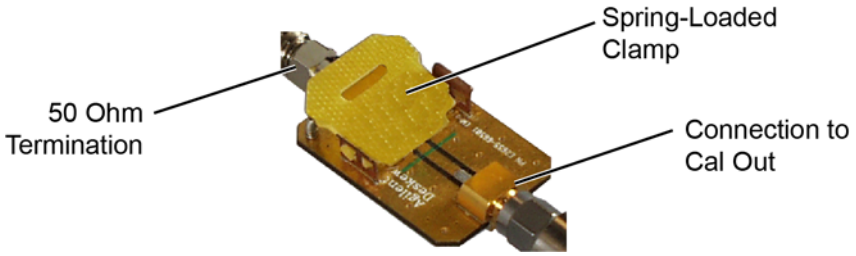


Figure 10 E2655B PV Fixture with 50 Ohm Termination

- ❏ Position the probe so that the signal lead touches the PV fixture's center conductor next to the dialectric area. The ground lead should touch the PV fixture's ground plane. On 90000 X-series oscilloscopes, use an N5442A adapter when instructed to connect the probe to one of the oscilloscope's channel inputs.

CAUTION To avoid damaging the oscilloscope's **Cal Out** connector, do not apply force to the PV fixture. Light probe contact is all that is needed for the calibration.

CAUTION NEVER solder a probe tip to the thick-film gold. The gold will immediately dissolve into the solder and disappear.

NOTE If you are using the browser tip, it is recommended that you use the N2787A 3D Probe Positioner to hold the probe in place.

NOTE You can check that the probe leads are correctly connected by pressing the front panel autoscale button. A stable step should be shown on the screen. Pressing autoscale will close the Probe Calibration dialog box.

Calibrating the Probe on InfiniiVision Oscilloscopes

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

Procedure

1 Connect the probe to one of the oscilloscope channels.

NOTE When you connect the probe, the **Calibrate Probe** softkey in the Channel Probe Menu becomes active.

2 Connect the probe to the calibration terminals. On 3000 X-series oscilloscopes, connect the probe's signal tip to the front-panel **Demo 2 / Probe Comp** terminal and the ground tip to the ground terminal.

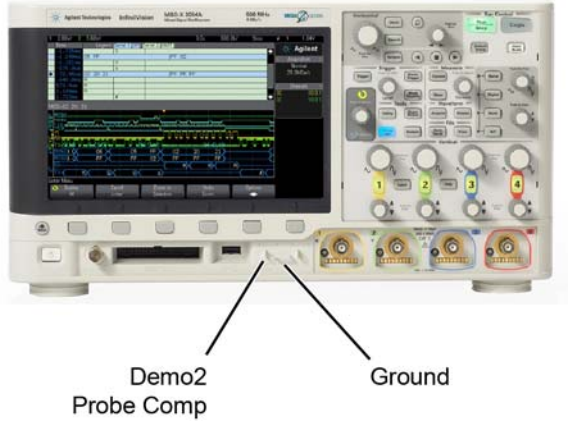


Figure 11 Probe Calibration Terminals on 3000 X-Series Oscilloscope

3 Press the Channel on/off key to turn the channel on (if the channel is off).

4 In the Channel Menu, press the **Probe** softkey.

5 Press the **Calibrate Probe** softkey and follow the instructions on the display.

3 Characteristics and Specifications

This chapter provides the characteristics and specifications for the N2797A active probe. The probe and oscilloscope should be warmed up for at least 20 minutes before any testing and the environmental conditions should not exceed the probe's specified limits.

Table 6 Mechanical Characteristics

Parameter	Characteristic
Probe Weight	108g (approximate)
Cable Length	2m

Table 7 Environmental Specifications

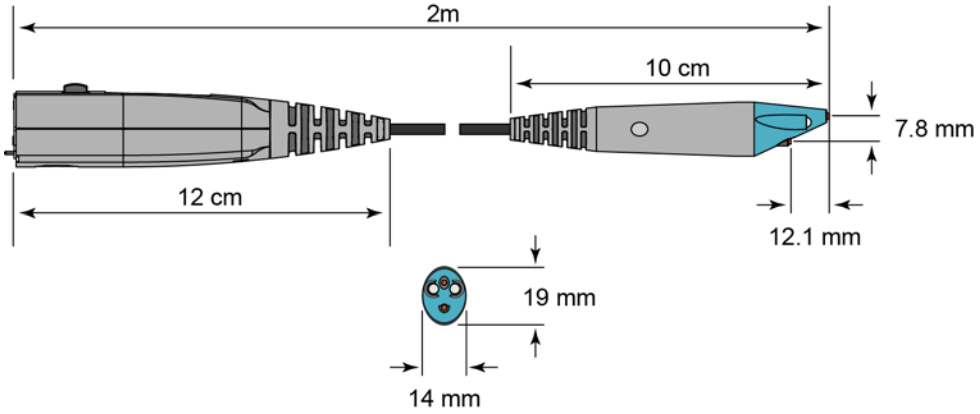
Parameter	Characteristic
Ambient Operating Temperature	–40°C to +85°C (–40°F to +185°F)
Ambient Non-Operating Temperature	–40°C to +85°C (–40°F to +185°F)
Operating Humidity	95% RH at +40°C
Non-Operating Humidity	95% RH at +65°C
Operating Altitude	4,000m (13,000 ft)
ESD	8 kV HBM

Table 8 Electrical Characteristics and Specifications

Parameter	Characteristic or Specification *(where indicated)*
Bandwidth (–3 dB)[a]	1.5 GHz *(specification)*
Rise Time (10% – 90%, calculated)	233 ps
System Bandwidth (with Agilent oscilloscope)	1 GHz (with Agilent's 1 GHz InfiniiVision or Infiniium oscilloscope)
Attenuation Ratio (at DC)	10:1 ± 0.5%
Input Dynamic Range	–8V to +8V (DC or Peak AC)
Non-Destructive Maximum Input Voltage	–20V to +20V
Offset Range	±12V
DC Offset Error (Output Zero)	< ±1 mV
Flatness (at 25° C)	Typical 0.3 dB (10 Hz – 100 MHz) Typical 0.8 dB (100 MHz – 1 GHz) Typical 2.0 dB (1 GHz – 1.5 GHz)
Flatness Over Temperature (–40° C to +85° C)	Typical 0.3 dB (10 Hz – 100 kHz) Typical 0.6 dB (100 kHz – 100 MHz) Typical 0.8 dB (100 MHz – 500 MHz) Typical 2.0 dB (500 MHz – 1 GHz) Typical 2.5 dB (1 GHz – 1.5 GHz)
Input Resistance [a]	1 MΩ ± 3% *(specification)*
Input Capacitance	1 pF
Probe Noise	< 2.5 mV_{rms} (referred to input)
Output Impedance	50Ω
Internal Power	Agilent AutoProbe interface from oscilloscope (InfiniiVision and Infiniium)

a Denotes warranted electrical specification at 25 °C room temperature after 20 minute warm-up. All others are typical.

Dimensions



4
Performance Data Plots

Figure 12 shows the frequency response for the spring or rigid probe tip and an offset ground or ground blade.

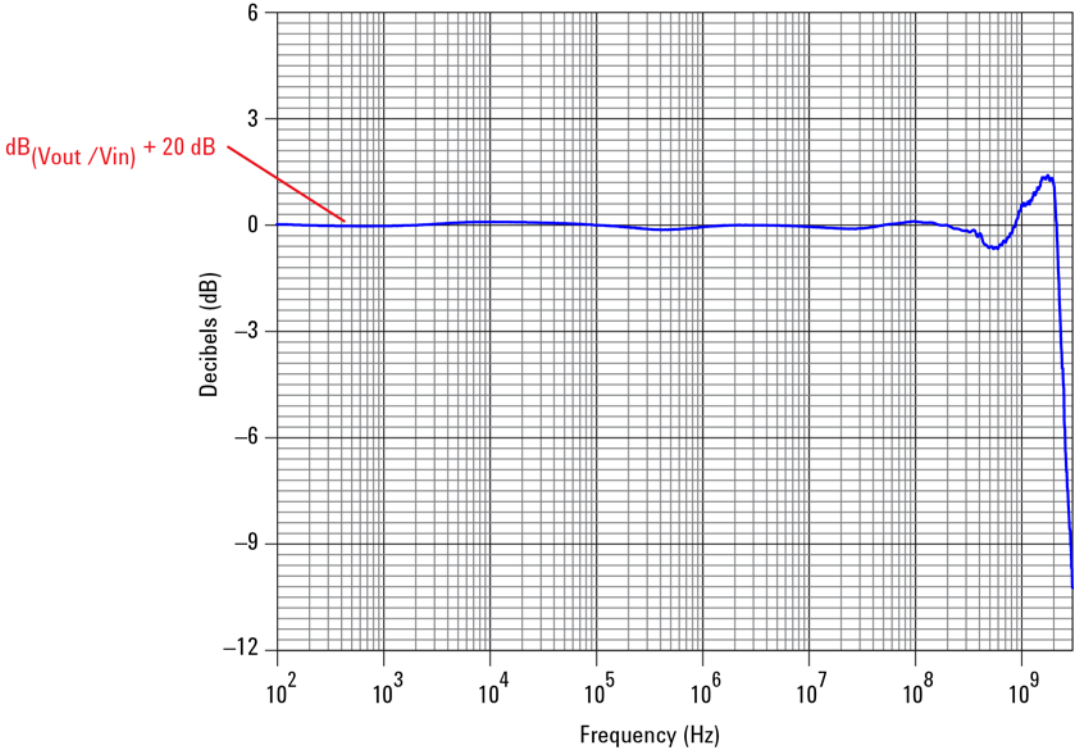


Figure 12 Frequency Response (Vout/Vin)

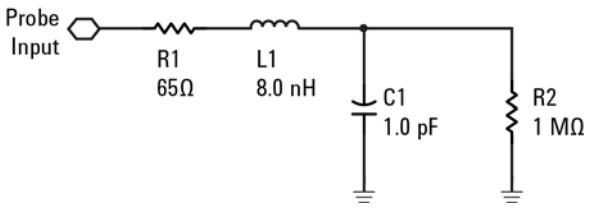


Figure 13 Input Impedance Equivalent Model

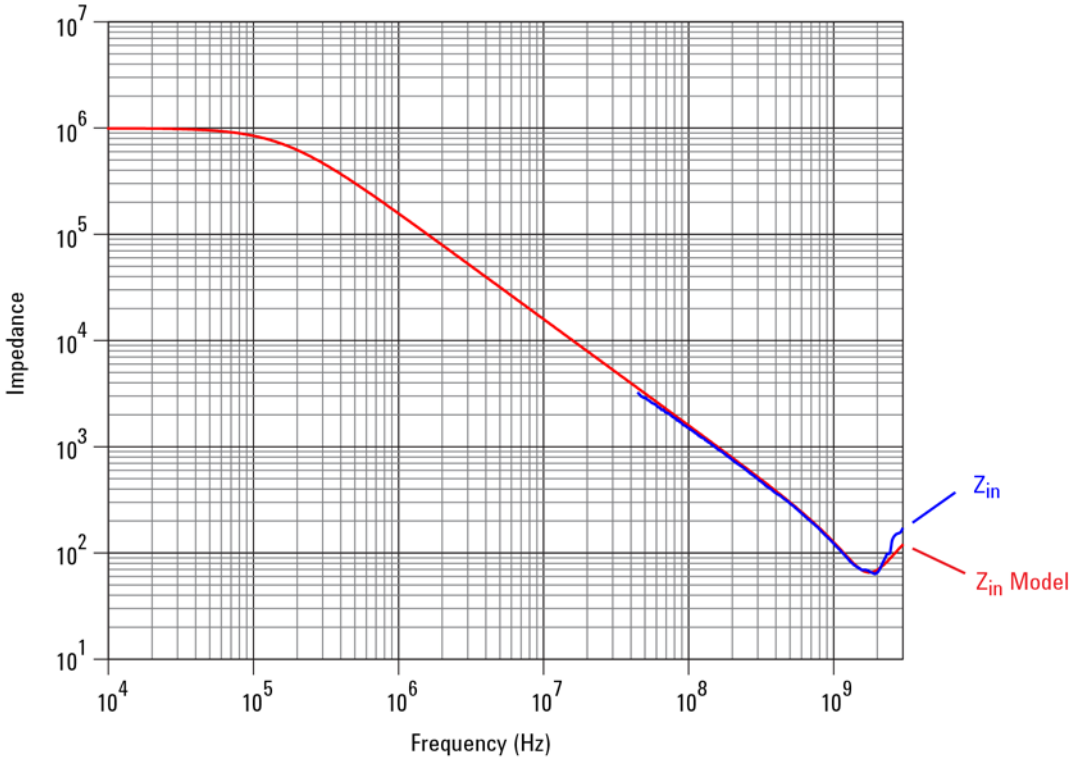
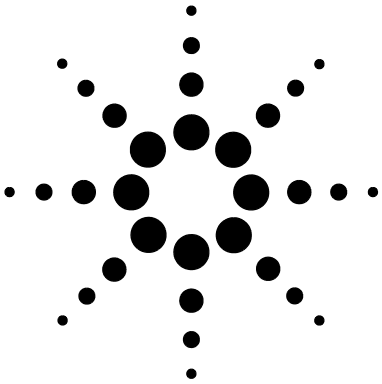


Figure 14 Typical Input Impedance Plot



5 Performance Verification

These procedures are used to test the warranted specifications for the N2797A. The recommended calibration test interval is once a year or as required. Use the equipment listed in Table 9 on page 40.

CAUTION

Electrostatic discharge (ESD) can quickly and imperceptibly damage or destroy high performance probes, resulting in costly repairs. Always wear a wrist strap when handling probe components and insure that cables are discharged before being connected.

Table 9 Required Test Equipment

Test Equipment	Critical Specification	Model Number
Digital Multimeter (DMM)	Resistance ±1%	Agilent 34401A
Vector Network Analyzer (VNA)	13 GHz sweep range full 2 port cal Option 1D5	Agilent 8720ES 
Calibration Standards	No Substitute	Agilent 85052D
External Power Supply	No Substitute	Agilent 1143A 
AutoProbe Interface Adapter	No Substitute	Agilent N1022A/B 
Outside thread 3.5 mm (male) to 3.5 mm (female) adapter	No Substitute	Agilent 5062-1247
Cable (2)	3.5 mil; SMA; High Quality	Agilent 8120-4948
Cable	1.5 mil Probe Power Extension No Substitute	Agilent 01143-61602
PV/DS Test Board	No Substitute (In E2655B Kit)	Agilent E2655-66503 

Test 1. DC Input Resistance

Procedure

1. Connect the DMM probes between the probe tip and ground at the tip of the probe.
2. Set up the DMM to measure resistance. The resistance should read 1 MΩ ± 3%.
3. Record the resistance in Table 10 on page 49.

Test 2. Bandwidth

NOTE Allow the probe to warm up for at least 20 minutes.

Using the 8720ES VNA successfully

Observe these simple guidelines when working with the 8720ES VNA during this procedure.

- Sometimes it may take a few seconds for the waveforms to settle completely. Allow time for waveforms to settle before continuing.
- Make sure all connections are tight and secure. If needed, use a vise to hold the cables and test board stable while making measurements.
- Be careful not to cross thread or force any connectors. This could be a very costly error to correct.

Procedure

Initial Setup

1. Turn on the 8720ES VNA and let warm up for 20 minutes.
2. Press the green **[Preset]** key on the 8720ES VNA.
3. On the VNA, press the **[Power]** key and set the power to 0 dBm.
4. On the VNA, press the **[AVG]** key and then select the **Averaging Factor** screen key. Set averaging to 4.
5. On the VNA, press the **[Sweep Setup]** key and then press the **sweep type menu** screen key. Select the **log freq** screen key.
6. Connect the probe under test to the AutoProbe Adapter and power the probe using the 1143A power supply as shown in Figure 15 on page 43. Install the outside thread adapter to the AutoProbe Adapter.

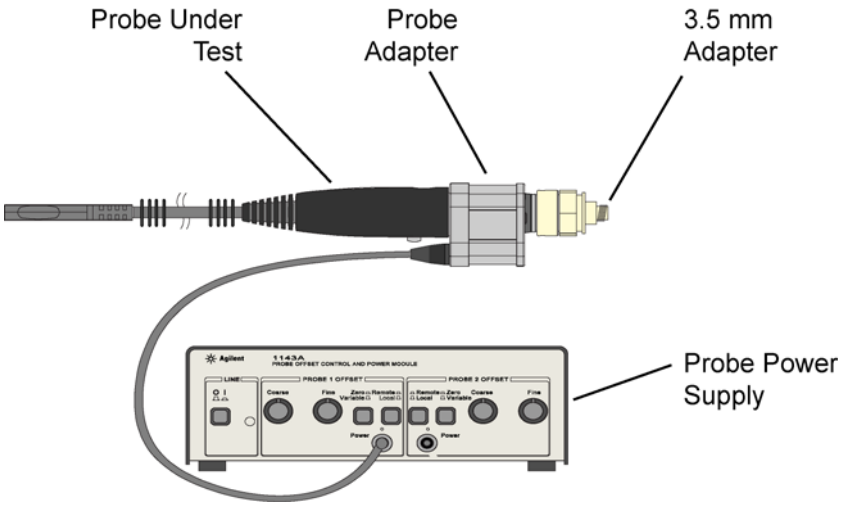


Figure 15 Probe Connected to Probe Adapter (*not to scale*)

Calibrating a Reference Plane

To get a reliable measurement from the VNA you must calibrate a reference plane so that the VNA knows where the probe under test is located along the transmission line.

7 On the VNA, press the **[Cal]** key.

8 Press the **cal menu** screen key.

9 Press the **full 2 port** screen key.

10 Connect the PV fixture to the **Port 1** on the VNA using a high quality SMA cables. Connect the cable to the pincher side of PV fixture as shown in Figure 16 on page 44.

11 The calibration reference plane is at the other end of PV fixture.

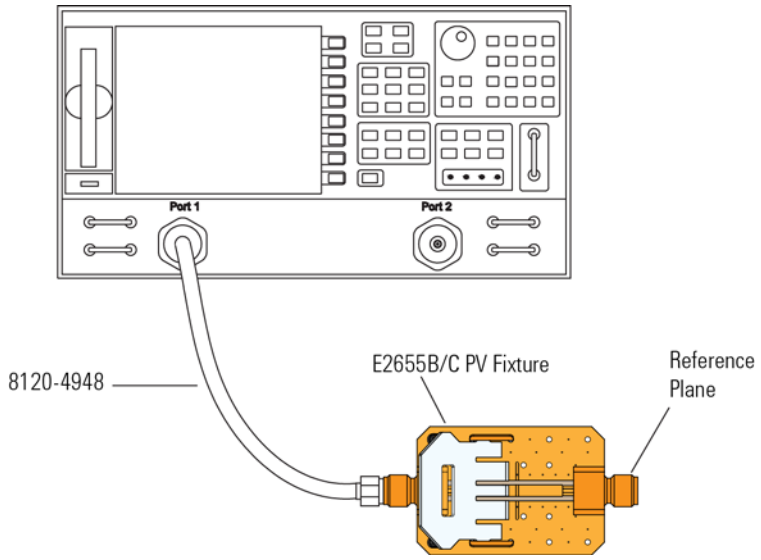


Figure 16 PV Fixture Connected to VNA

12 Perform a Calibration for the **PORT 1** side of the Reference plane.

- **a** Press the **reflection** screen key.
- **b** Connect the open end of 85052D Calibration Standard to the non-pincher side of the PV/DS test board.
- **c** Select the **open** screen key under the **Forward** group.
- **d** Wait until the VNA beeps indicating that it has completed the task.
- **e** Connect short end of Calibration Standard to the non-pincher side of the PV/DS test board.
- **f** Select **short** screen key under the **Forward** group.
- **g** Wait until the VNA beeps indicating that it has completed the task.
- **h** Connect load end of Calibration Standard to the non-pincher side of the PV/DS test board.
- **i** Select the **loads** screen key under the **Forward** group.

j Press **broadband** screen key selection.

k Wait until the VNA beeps indicating that it has completed the task.

l Press the **done loads** screen key.

m You have just calibrated one side of the reference plane.

13 Connect the other high quality SMA cable to the VNA's **PORT 2** as shown in Figure 17.

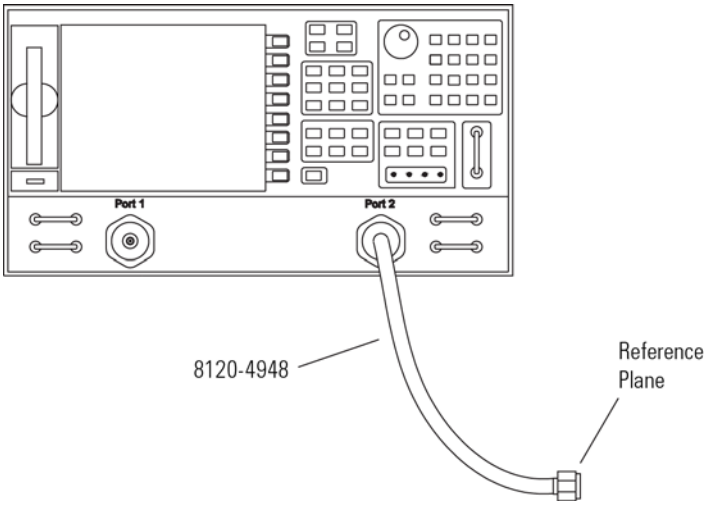


Figure 17 SMA Cable Connected to Port 2

14 Get the opposite sex of the Calibration Standards for the next step.

15 Perform Calibration for the **PORT 2** side of the Reference plane.

a Press the **reflection** screen key.

b Connect the open end of Calibration Standard to the available end of the **PORT 2** SMA cable.

c Select the **open** screen key under the **Reverse** group.

d Wait until the VNA beeps indicating that it has completed the task.

e Connect short end of Calibration Standard to the available end of the **PORT 2** SMA cable.

f Select **short** screen key the **Reverse** group.

g Wait until the VNA beeps indicating that it has completed the task.

h Connect load end of Calibration Standard to the available end of the **PORT 2** SMA cable.

i Select the **loads** screen key the **Reverse** group.

j Press **broadband** screen key selection.

k Wait until the VNA beeps indicating that it has completed the task.

l Press the **done loads** screen key.

m You have just calibrated the other side of the reference plane.

16 Press **standards done** key.

17 Connect the **PORT 2** SMA cable to the non-pincher side of PV fixture as shown in Figure 18.

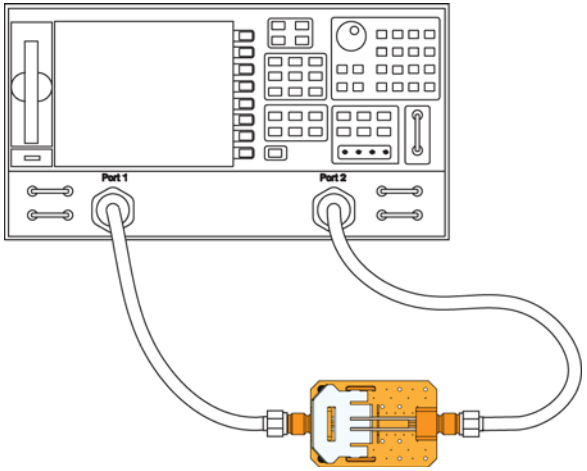


Figure 18 Forward and Reverse Setup

18 Press the **transmission** screen key.

19 Press the **do both fwd and reverse** screen key.

20 Wait until the VNA beeps four times indicating that it has completed the task.

21 Press the **isolation** screen key.

22 Press the **omit isolation** screen key.

23 Press **done 2 port cal** screen key.

24 Set the VNA's averaging to off.

25 Save the reference plane cal by pressing the **[save recall]** key then the **[save state]** key.

26 You may change name if you wish.

27 Press the **[scale reference]** key. Then set the scale to 1 dB per division and the reference position for 7 divisions.

28 Set reference value for 0 dB.

29 Press the **[measure]** key.

30 Press the **s21** screen key.

31 Ensure s21 response on screen is flat out to 1.5 GHz.

Measuring Vin Response

32 Position the probe conveniently to allow the probe tip to be normal to the PV/DS board.

33 Hold the probe in position, or use a positioner, so that the signal and ground are making contact and are perpendicular to the fixture.

34 Press the **[Sweep Setup]** key on the VNA. Then press the **trigger menu** screen key. Select the **continuous** screen key.

35 You should now have the V_{in} waveform on screen.

36 Select **[display]** key then **data->memory** screen key.

37 You have now saved Vin waveform into the VNA's memory for future use.

Measuring Vout Response

38 Disconnect the **PORT 2** cable from PV/DS test board and attach to probe output on the AutoProbe Adapter.

39 Connect the Calibration Standard load to PV/DS test board (non-pincher side).

40 Press **[scale reference]** key on the VNA.

41 Set reference value to –20 dB.

42 Hold probe in place as described previously.

43 The display on screen is V_{out}.

Displaying Vout/Vin Response on the VNA

44 Press the **[Display]** key.

45 Then select the **Data/Memory** screen key. You may need to adjust the **Reference Value**, located under the **Scale Ref** key, slightly to position the waveform at center screen.

46 Press marker key and position the marker to the first point that the signal is –3 dB below center screen.

47 Read the marker frequency measurement and record it in Table 10 on page 49.

48 The bandwidth test passes if the frequency measurement is greater than or equal to the probe's bandwidth limit, which is 1.5 GHz.

Performance Test Record

Table 10 Performance Test Record

Model #: N2797A	**Date:**	**Tested by:**	
Serial #:	**Recommended next test date:**		
Recommended Test Interval: 1 year / 2000 hours			
Probe Amplifier	**Test Limits**	**Result**	**Pass/Fail**
Test 1. DC Input Resistance	1 MΩ ± 3%		
Test 2. Bandwidth	≥ 1.5 GHz		

Index