Agilent Technologies

# User's Guide

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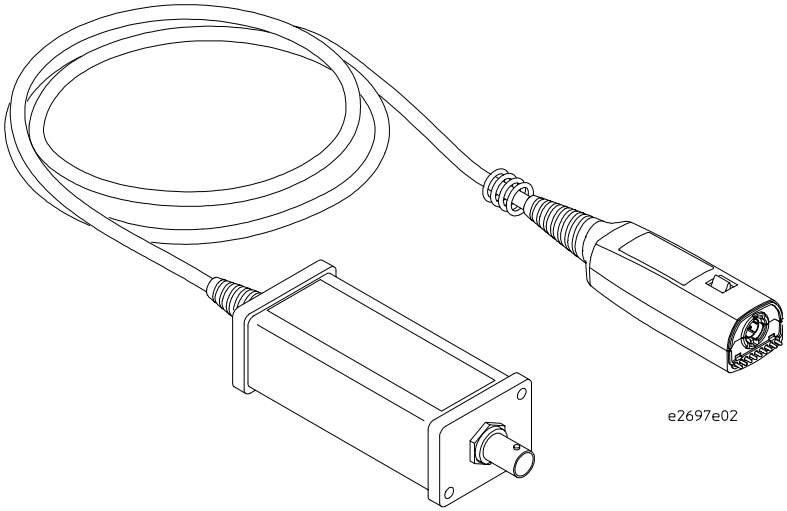





# E2697A 1 MΩ Impedance Adapter

# In This Book

This guide provides user and service information for the E2697A 1 MΩ Impedance Adapter.

**Chapter 1** gives you general information such as inspection, cleaning, accessories supplied, and specifications and characteristics of the probe.

**Chapter 2** provides service information.

# Contents

1

# General Information

# E2697A 1 MΩ Impedance Adapter

The E2697A provides the 1 MΩ impedance input required by some oscilloscope probes for use with the 5485xA series Infiniium oscilloscopes. In addition, the E2697A has a build-in coupling control which allows you to switch from dc to ac coupling and a built-in attenuation control which allows you to switch from 10:1 to 1:1 attenuation.

## To inspect the adapter

❑ **Inspect the shipping container for damage.**

Keep a damaged shipping container or cushioning material until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically.

❑ **Check the accessories.**

Accessories supplied with the instrument are listed in "Accessories Supplied" in table 1-1 later in this chapter.

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

❑ **Inspect the adapter.**

- If there is mechanical damage or defect, or if the adapter does not operate properly or pass performance tests, notify your Agilent Technologies Sales Office.
- If the shipping container is damaged, or the cushioning materials show signs of stress, notify the carrier as well as your Agilent Technologies Sales Office. Keep the shipping materials for the carrier's inspection. The Agilent Technologies Office will arrange for repair or replacement at Agilent Technologies' option without waiting for claim settlement.

# Accessories Supplied

The following figure and table show the accessories supplied with the E2697A 1 MΩ Impedance Adapter.

**Figure 1-1**

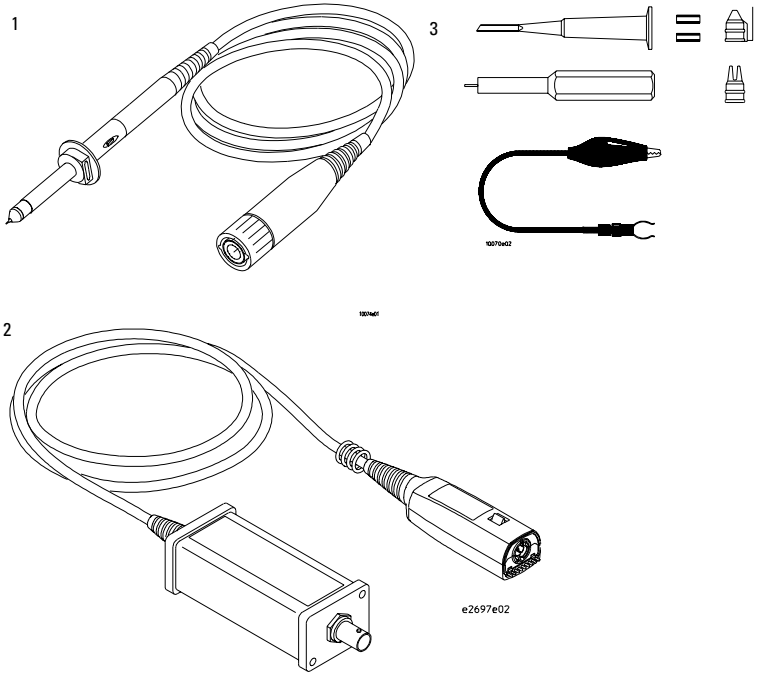



**Table 1-1**

**Accessories Supplied**

| Item | Description | Qty | Agilent Part Number |
|---|---|---|---|
| 1 | 500 MHz, 10:1 Passive Probe | 1 | 10073C |
| 2 | 1 MΩ Impedance Adapter | 1 | |
| 3 | 10073C Probe Accessories | 1 | |

# Characteristics and Specifications

The following characteristics are typical for the active probe.

**Table 1-2**

| Characteristics | |
|---|---|
| **Bandwidth[1] (-3 dB)** | 500 MHz (with 10073C probe) |
| **Rise and Fall Time (10% to 90%)** | 700 ps calculated from $t_r = \frac{0.35}{\text{Bandwidth}}$ |
| **Input Impedance[1]** | 1 MΩ ±1% (~ 12 pF) |
| **Input Dynamic Range** | ±0.8 V (internal attenuator at 1:1)<br>± 8.0 V ( internal attenuator at 10:1) |
| **Input Dynamic Range (with 10073C 10:1 probe)** | ±8.0 V (internal attenuator at 1:1)<br>± 80 V ( internal attenuator at 10:1) |
| **Input Coupling** | dc, ac (7 Hz) |
| **DC Attenuation[1]** | 1.16:1 (internal attenuator at 1:1)[2]<br>11.6:1 (internal attenuator at 10:1)[3] |
| **Offset Range** | ±5.0 V (internal attenuator at 1:1)<br>± 50 V (internal attenuator at 10:1) |
| **Offset Accuracy[1]** | ± (1.5 % of channel offset + 1.5% of full scale)[4] |
| **Maximum Input Voltage** | ±100 V (dc + ac)(ac < 100 kHz), CAT I |
| **DC Gain Accuracy[1]** | ± 1.5% of full scale[4] |

1 Denotes Warranted Specifications, all others are typical. Specifications are valid after a warm-up period and with-in ± 5 °C of the calibration temperature.

2 At scale settings > 200 mV/div signal size limited by input dynamic range.

3 At scale settings > 2 V/div signal size limited by input dynamic range.

4 Full scale is defined as 8 vertical divisions.

# General Characteristics

The following general characteristics apply to the active probe.

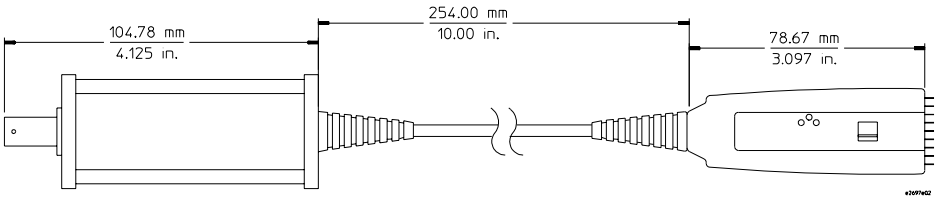
**Table 1-3**

**General Characteristics**

## Environmental Conditions

| | Operating | Non-operating |
|---|---|---|
| **Temperature** | 0 °C to +40 °C | –40 °C to +70 °C |
| **Humidity** | up to 95% relative humidity (non-condensing) at +40 °C | up to 90% relative humidity at +65 °C |
| **Power Requirements** | +12 Vdc @ 1.9 mA typical<br>+5 Vdc @ 51 mA typical<br>-5 Vdc @ 26 mA typical<br>-12 Vdc @ 1.9 mA typical<br>0.43 W | (voltages supplied by AutoProbe Interface) |
| **Weight** | approximately 0.69 kg | |
| **Dimensions** | Refer to the outline in figure 1-2. | |
| **Pollution degree 2** | Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected. | |
| **Indoor use** | | |

**Figure 1-2**




**E2697A 1 MΩ Impedance Adapter Dimensions**

## To use the adapter

The Infiniium family of oscilloscopes provides both power and offset control to the E2697A 1 MΩ impedance adapter through the front panel connector. Probe offset is changed by adjusting the vertical offset control on the Infiniium oscilloscope. The control should be adjusted to center your waveform within the dynamic range of the probe.

For best accuracy, you should calibrate the oscilloscope, adapter, and probe combination using the Infiniium probe calibration routine before using the 1 MΩ impedance adapter assemby. When the probe has been calibrated, the dc gain, offset zero, and offset gain will be calibrated.

## Cleaning the probe

If the probe requires cleaning, disconnect it from the oscilloscope and clean it with a soft cloth dampened with a mild soap and water solution. Make sure the probe is completely dry before reconnecting it to the oscilloscope.

2

# Service

# Introduction

This chapter provides service information for the E2695A 1 MΩ Impedance Adapter. The following sections are included in this chapter:

- Service strategy
- Returning to Agilent Technologies for service
- Troubleshooting and failure symptoms

## Service Strategy

If the 1 MΩ impedance adapter is under warranty, normal warranty services apply. If the 1 MΩ impedance adapter is not under warranty, a failed adapter can be exchanged for a reconditioned one at a nominal cost.

## To return the probe to Agilent Technologies for service

Before shipping the 1 MΩ impedance adapter to Agilent Technologies, contact your nearest Agilent Technologies Sales Office for additional details.

1. **Write the following information on a tag and attach it to the** 1 MΩ impedance adapter.
   - Name and address of owner
   - 1 MΩ impedance adapter model number
   - 1 MΩ impedance adapter serial number
   - Description of the service required or failure indications
2. **Remove all accessories from the** 1 MΩ impedance adapter.
   Accessories include all cables. Do not include accessories unless they are associated with the failure symptoms.
3. **Protect the probe by wrapping it in plastic or heavy paper.**
4. **Pack the probe in foam or other shock absorbing material and place it in a strong shipping container.**
   You can use the original shipping materials or order materials from an Agilent Technologies Sales Office. If neither are available, place 3 to 4 inches of shock absorbing material around the probe and place it in a box that does not allow movement during shipping.
5. **Seal the shipping container securely.**
6. **Mark the shipping container as FRAGILE.**
   In any correspondence, refer to 1 MΩ impedance adapter by model number and full serial number.

## Troubleshooting

- If your 1 MΩ impedance adapter is under warranty and requires repair, return it to Agilent Technologies. Contact your nearest Agilent Technologies Service Center.
- If the failed 1 MΩ impedance adapter is not under warranty, you may exchange it for a reconditioned 1 MΩ impedance adapter. See "To Prepare the 1 MΩ Impedance Adapter for Exchange" in this chapter.

## Failure Symptoms

The following symptoms may indicate a problem with the 1 MΩ impedance adapter or the way it is used. Possible remedies and repair strategies are included.

The most important troubleshooting technique is to try different combinations of equipment so you can isolate the problem to a specific 1 MΩ impedance adapter.

### Probe Calibration Fails

Probe calibration failure with an oscilloscope is usually caused by improper setup. If the calibration will not pass, check the following:

- Check that the 1 MΩ impedance adapter passes a waveform with the correct amplitude.
- If the 1 MΩ impedance adapter is powered by the oscilloscope, check that the offset is approximately correct. The 1 MΩ impedance adapter calibration cannot correct major failures.
- Be sure the oscilloscope passes calibration without the 1 MΩ impedance adapter.

### Incorrect Frequency Response

Incorrect frequency response may be caused by a defective 1 MΩ impedance adapter, oscilloscope, or an improper use such as poor connections or grounding. See chapter 2, in this guide. If the 1 MΩ impedance adapter use is correct, try the 1 MΩ impedance adapter with another oscilloscope.

If the probe fails to meet the bandwidth specification, factory repair is necessary. Also read "Incorrect Pulse Response" below.

# Verifying the E2697A adapter input impedance

Specification: 1 MΩ ±1%

**Equipment Required**

| Equipment | Critical Specification | Recommended Model/Part |
|---|---|---|
| Oscilloscope | For the E2697A power. | 5483xA/B/D or 5485xA series oscilloscopes |
| Digital Multimeter (DMM) | Resistance ±1% | 34401A |

1. From the Control Menu of the oscilloscope, Select Factory Default.
2. Plug the E2697A into Channel 1.
3. From the Setup menu of the oscilloscope, select Channel 1.
4. Click the Probes button.
5. In the Probe Setup dialog box set the E2697A Atten control to 1:1 and set the Coupling control to DC.
6. Set the DMM to measure a 2-wire resistance.
7. Connect the DMM to the E2697A input using a BNC cable.
8. Record the reading on the DMM as R1.

   R1 Input Impedance _____.

   The input impedance should be 1 MΩ ±1%.
9. In the Probe Setup dialog box set the Atten control to 10:1.
10. Record the reading on the DMM as R2.

    R2 Input Impedance _____.

    The input impedance should be 1 MΩ ±1%.

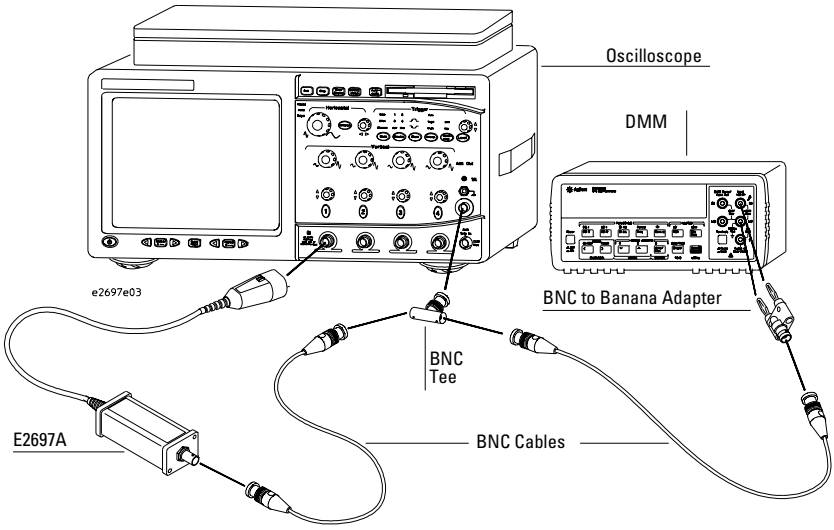
# To test dc gain accuracy

Specification = ±1.5%

| Equipment | Critical Specification | Agilent Part Number |
|---|---|---|
| DMM | Better than 0.1% accuracy | 34401A |
| Cables (2 each) | BNC | 10503A |
| Adapter | BNC (f) to Banana (m) | 1251-2277 |
| Adapter | BNC tee (m)(f)(f) | 1250-0781 |
| Oscilloscope | For the E2697A Power and Measurements | 5485xA series oscilloscopes. |

1. From the Control Menu of the oscilloscope, select Factory Default.
2. Plug E2697A into Channel 1.
3. Connect the E2697A input to the Aux Out of the oscilloscope using a BNC cable.
4. From the Setup menu of the oscilloscope, select Channel 1.
5. Click on the Probes button.
6. Set the E2697A Atten control to 1:1.
7. Select the Configure Probing System button and deselect any selected probe in the pull-down list.
8. Click on the Calibrate Probe button.
9. In the Probe Calibration dialog box, select the Calibrate Atten/Offset radio button.
10. Click on the Start Atten/Offset Calibration button and follow the on-screen instructions.
11. Close the Probe Calibration dialog box.
12. Close the Probe Setup dialog box.
13. Disconnect the BNC cable from the Aux Out of the oscilloscope.
14. In the Channel Setup dialog box, set the Scale to 500 mV.
15. Close the Channel Setup dialog box.
16. From the Setup menu, select Acquisition.
17. Enable averaging with the number of averages set to 16.
18. Close the Acquisition Setup dialog box.
19. From the Utilities menu, select Calibration.
20. Set the Aux Output to DC and the Level to 800 mV
21. Close the Calibration dialog box.
22. Connect the equipment as shown in figure 2-1.

**Figure 2-1**




**23** Select the Vavg measurement from the measurement tool bar.
**24** Press the Clear Display button on the front panel.
**25** Once 16 averages have occured, record the Vavg mean value as V0.
**26** Record the dc voltage shown on the DMM as V1.
**27** From the Utilities menu, select Calibration.
**28** Change the Level control to -800 mV.
**29** Close the Calibration dialog box.
**30** Press the Clear Display button on the front panel.
**31** Once 16 averages have occured, record the Vavg mean value as V2.
**32** Record the dc voltage shown on the DMM as V3.
**33** Calculate the dc gain error using the following equation:

$$\text{dc gain error } \% = \left| \frac{V0 - V2}{V1 - V3} - 1 \right| \times 100$$

**34** The dc gain error should be less than 1.5%.
**35** From the Setup menu of the oscilloscope, select Channel 1.
**36** Click on the Probes button.
**37** Set the E2697A Atten control to 10:1.
**38** Close the Probe Setup dialog box.
**39** Set the Scale control to 1.00 V/div.
**40** Close the Channel Setup dialog box.
**41** From the Utilities menu, select Calibration.
**42** Set the Aux Output to DC and the Level to 2.4 V
**43** Close the Calibration dialog box.
**44** Press the Clear Display button on the front panel.

**45** Once 16 averages have occured, record the Vavg mean value as V0.
**46** Record the dc voltage shown on the DMM as V1.
**47** From the Utilities menu, select Calibration.
**48** Change the Level control to -2.4 V.
**49** Close the Calibration dialog box.
**50** Press the Clear Display button on the front panel.
**51** Once 16 averages have occured, record the Vavg mean value as V2.
**52** Record the dc voltage shown on the DMM as V3.
**53** Calculate the dc gain error using the following equation:

$$\text{dc gain error } \% = \left| \frac{V0 - V2}{V1 - V3} - 1 \right| \times 100$$

**54** The dc gain error should be less than 1.5%.

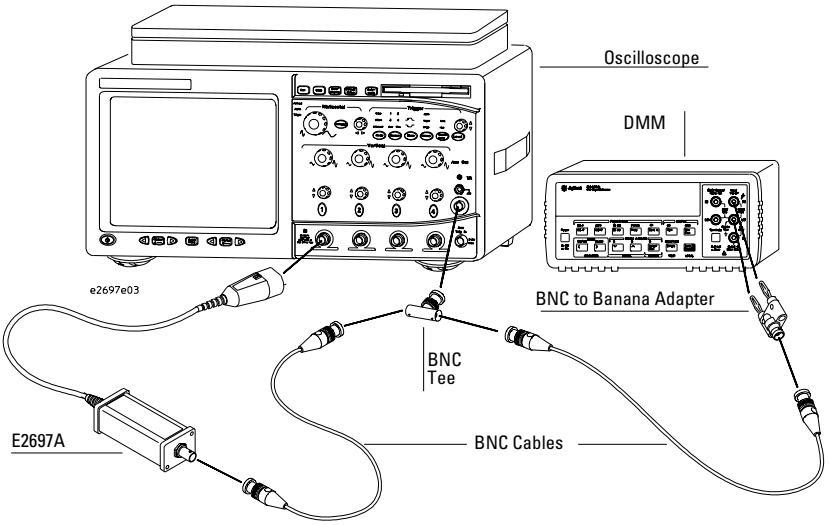
# To test offset accuracy

Specification = ±1.5%

| Equipment | Critical Specification | Agilent Part Number |
|---|---|---|
| DMM | Better than 0.1% accuracy | 34401A |
| Cables (2 each) | BNC | 10503A |
| Adapter | BNC (f) to Banana (m) | 1251-2277 |
| Adapter | BNC tee (m)(f)(f) | 1250-0781 |
| Oscilloscope | For the E2697A Power and Measurements | 5485xA series oscilloscopes. |

1. From the Control Menu of the oscilloscope, select Factory Default.
2. Plug E2697A into Channel 1.
3. Connect the E2697A input to the Aux Out of the oscilloscope using a BNC cable.
4. From the Setup menu of the oscilloscope, select Channel 1.
5. Click on the Probes button.
6. Set the E2697A Atten control to 1:1.
7. Select the Configure Probing System button and deselect any selected probe in the pull-down list.
8. Click on the Calibrate Probe button.
9. In the Probe Calibration dialog box, select the Calibrate Atten/Offset radio button.
10. Click on the Start Atten/Offset Calibration button and follow the on-screen instructions.
11. Close the Probe Calibration dialog box.
12. Close the Probe Setup dialog box.
13. Disconnect the BNC cable from the Aux Out of the oscilloscope.
14. In the Channel Setup dialog box, set the Offset control to 2.4 V.
15. Set the Scale control to 10 mV/div
16. Close the Channel Setup dialog box.
17. From the Setup menu, select Acquisition.
18. Enable averaging with the number of averages set to 16.
19. Close the Acquisition Setup dialog box.
20. From the Utilities menu, select Calibration.
21. Set the Aux Output to DC and the Level to 2.4 V.
22. Close the Calibration dialog box.
23. Connect the equipment as shown in figure 2-2.

**Figure 2-2**




**24** Select the Vavg measurement from the measurement tool bar.
**25** Press the Clear Display button on the front panel.
**26** Once 16 averages have occured, record the Vavg mean value as V0.
**27** Record the dc voltage shown on the DMM as V1.
**28** From the Utilities menu, select Calibration.
**29** Change the Level control to -2.4 V. You will hear a beep indicating that an overload condition occured that can be ignored.
**30** Close the Calibration dialog box.
**31** From the Setup menu of the oscilloscope, select Channel 1.
**32** In the Channel Setup dialog box, set the Offset control to -2.4 V.
**33** Set the Scale control to 10 mV/div.
**34** Close the Channel Setup dialog box.
**35** Press the Clear Display button on the front panel.
**36** Once 16 averages have occured, record the Vavg mean value as V2.
**37** Record the dc voltage shown on the DMM as V3.
**38** Calculate the offset error using the following equation:

$$\text{offset error } \% \;=\; \left| \frac{V0 - V2}{V1 - V3} - 1 \right| \times 100$$

**39** The offset error should be less than 1.5%.
**40** From the Setup menu of the oscilloscope, select Channel 1.
**41** Click on the Probes button.
**42** Set the E2697A Atten control to 10:1.
**43** Close the Probe Setup dialog box.

**44** In the Channel Setup dialog box, set the Offset control to 2.4 V.
**45** Set the Scale control to 100 mV/div.
**46** Close the Channel Setup dialog box.
**47** From the Utilities menu, select Calibration.
**48** Set the Aux Output to DC and the Level to 2.4 V
**49** Close the Calibration dialog box.
**50** Press the Clear Display button on the front panel.
**51** Once 16 averages have occured, record the Vavg mean value as V0.
**52** Record the dc voltage shown on the DMM as V1.
**53** From the Setup menu of the oscilloscope, select Channel 1.
**54** In the Channel Setup dialog box, set the Offset control to -2.4 V.
**55** Close the Channel Setup dialog box.
**56** From the Utilities menu, select Calibration.
**57** Change the Level control to -2.4 V.
**58** Close the Calibration dialog box.
**59** Press the Clear Display button on the front panel.
**60** Once 16 averages have occured, record the Vavg mean value as V2.
**61** Record the dc voltage shown on the DMM as V3.
**62** Calculate the offset error using the following equation:

$$\text{offset error } \% = \left| \frac{V0 - V2}{V1 - V3} - 1 \right| \times 100$$

**63** The offset error should be less than 1.5%.

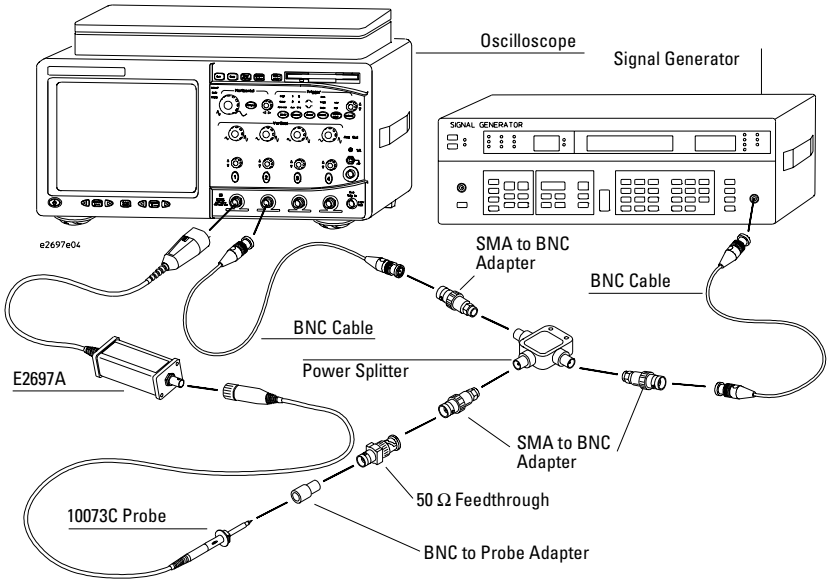
# To test the bandwidth

Specification = > -3 dB at 500 MHz with 10073C probe

| Equipment | Critical Specification | Agilent Part Number |
|---|---|---|
| Power Splitter | 50 Ω two way power splitter | 11667B |
| Signal Generator | 250 kHz to 1.0 GHz sinewave at 1 V | E4400B |
| Cables (2 each) | BNC | 10503A |
| Adapter | 50 Ω feedthrough (m) | 10100C |
| Adapter (3 each) | SMA (m) to BNC (f) | |
| Adapter | BNC to probe tip adapter | 5081-7705 |
| Adapter | BNC to probe adapter | 5081-7705 |
| Probe | No substitute | 10073C |
| Oscilloscope | For the E2697A Power and Measurements | 5485xA series oscilloscopes. |

1. From the Control Menu of the oscilloscope, select Factory Default.
2. Plug E2697A into Channel 1.
3. Connect the 10073C probe to the E2697A.
4. Connect the 10073A probe tip to the probe calibration output of the oscilloscope.
5. From the Setup menu of the oscilloscope, select Channel 1.
6. Click on the Probes button.
7. Click on the Calibrate Probe button.
8. In the Probe Calibration dialog box, select the Calibrate Atten/Offset radio button.
9. Click on the Start Atten/Offset Calibration button and follow the on-screen instructions.
10. Close the Probe Calibration dialog box.
11. Close the Probe Setup dialog box.
12. Connect the equipment as shown in figure 2-3.

**Figure 2-3**




**13** Set the signal generator to 1 V and 50 MHz.
**14** Press the front Autoscale button of the oscilloscope.
**15** Select from the Measure menu Voltage and from the list of voltage measurement select the Vrms measurement.
**16** In the Enter Measurement Info dialog box select Channel1 as the Source, select Single Cycle as the Measurement Area and AC as the RMS Type.
**17** Click the OK button.
**18** Select from the Measure menu Voltage and from the list of voltage measurement select the Vrms measurement.
**19** In the Enter Measurement Info dialog box select Channel2 as the Source, select Single Cycle as the Measurement Area and AC as the RMS Type.
**20** Click the OK button.
**21** Press the front panel Clear Display button.
**22** Record the ACVrms mean value of channel 1 as Vout.
**23** Record the ACVrms mean value of channel 2 as Vin.
**24** Calculate the 50 MHz response using the following equation

$$50\ \text{MHz response in dBs} = 20\log\frac{\text{Vout}}{\text{Vin}}$$

**25** The response should be > -3dB.
**26** Set the signal generator to 500 MHz.
**27** Press the front panel Clear Display button.
**28** Record the ACVrms mean value of channel 1 as Vout.

**29** Record the ACVrms mean value of channel 2 as Vin.
**30** Calculate the 500 MHz response using the following equation

$$500\ \text{MHz response in dBs} = 20\log\frac{\text{Vout}}{\text{Vin}}$$

**31** The response should be > -3 dB.
**32** From the Setup menu of the oscilloscope, select Channel 1.
**33** Click on the Probes button.
**34** Set the E2697A Atten control to 10:1.
**35** Close the Probe Setup dialog box.
**36** Close the Channel Setup dialog box.
**37** Press the front panel Clear Display button.
**38** Record the ACVrms mean value of channel 1 as Vout.
**39** Record the ACVrms mean value of channel 2 as Vin.
**40** Calculate the 50 MHz response using the following equation

$$50\ \text{MHz response in dBs} = 20\log\frac{\text{Vout}}{\text{Vin}}$$

**41** The response should be > -3dB.
**42** Set the signal generator to 500 MHz.
**43** Press the front panel Clear Display button.
**44** Record the ACVrms mean value of channel 1 as Vout.
**45** Record the ACVrms mean value of channel 2 as Vin.
**46** Calculate the 500 MHz response using the following equation

$$500\ \text{MHz response in dBs} = 20\log\frac{\text{Vout}}{\text{Vin}}$$

**47** The response should be > -3 dB.

# DECLARATION OF CONFORMITY

according to ISO/IEC Guide 22 and EN 45014

**Manufacturer's Name:** Agilent Technologies (Malaysia) Sdn. Bhd.

**Manufacturer's Address:** Penang Instrument Manufacturing Operation
Bayan Lepas Free Industrial Zone
11900 Penang, Malaysia

**Declares, that the product**

**Product Name:** 1 MΩ Impedance Adapter

**Model Number(s):** E2697A

**Product Option(s):** This declaration covers all options of the above product

**Conforms to the following product standards:**

| | **Standard** | **Limit** |
|---|---|---|
| **EMC** | IEC 61326-1:1997+A1:1998+A2:2000/EN 61326-1:1997+A1:1998+A2:2000 | |
| | CISPR 11:1997+A1:1999 / EN 55011:1998+A1:1999 | Group 1, Class A[1] |
| | IEC 61000-4-2:1995+A1:1998/EN 61000-4-2:1995 | 4kV CD, 8kV AD |
| | IEC 61000-4-3:1995/EN 61000-4-3:1996 | 3V/m, 80-1000 MHz |
| | IEC 61000-4-4:1995/EN 61000-4-4:1995 | 0.5kV signal lines, 1kV power lines |
| | IEC 61000-4-5:1995/EN 61000-4-5:1995 | 3V, 0.15-80 MHz |
| | IEC 61000-4-11:1994/EN61000-4-11-1994 | 1 cycle, 100% |
| | Canada: ICES-001:1998 | |
| | Australia/New Zealand: AS/NZS 2064.1 | |
| **Safety** | IEC 61010-1:2001/EN 61010-1:2001 | |
| | Canada: CSA-C22.2 No. 1010.1:1992 | |

**Conformity/Supplemental Information:**

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC (including 93/68/EEC) and carries the CE-marking accordingly (European Union).

[1]This product was tested in a typical configuration with Agilent Technologies test systems.

Date: 08/15/2003

Tan, Boon Juan / Quality Manager

For further information, please contact your local Agilent Technologies sales office, agent, or distributor.

## Product Regulations

**EMC**

| | Performance Criteria[1] |
|---|---|
| IEC 61326-1:1997+A1:1998+A2:2000/EN 61326-1:1997+A1:1998+A2:2000 | |
| CISPR 11:1997+A1:1999 / EN 55011:1998+A1:1999 | B |
| IEC 61000-4-2:1995+A1:1998/EN 61000-4-2:1995 | A |
| IEC 61000-4-3:1995/EN 61000-4-3:1996 | B |
| IEC 61000-4-4:1995/EN 61000-4-4:1995 | B |
| IEC 61000-4-5:1995/EN 61000-4-5:1995 | B |
| IEC 61000-4-11:1994/EN61000-4-11-1994 | B |

Canada: ICES-001:1998
Australia/New Zealand: AS/NZS 2064.1

**Regulatory Information for Canada**

### ICES/NMB-001:1998

This ISM device complies with Canadian ICES-001.
Cet appareil ISM est confomre à la norme NMB-001 du Canada.

**Regulatory Information for Australia/New Zealand**

This ISM device complies with Australian/New Zealand AS/NZS 2064.1

N10149

**[1] Performance Criteria:**

A Pass - Normal operation, no effect.
B Pass - Temporary degradation, self recoverable.
C Pass - Temporary degradation, operator intervention required.
D Fail - Not recoverable, component damage.

**Safety** IEC 61010-1:2001/EN 61010-1:2001
Canada: CSA-C22.2 No. 1010.1:1992

**Additional Information:**

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC (including 93/68/EEC) and carries the CE-marking accordingly (European Union).

**Sound Pressure Level** N/A

CE
ISM 1-A

# Safety Notices

This apparatus has been designed and tested in accordance with IEC Publication 1010, Safety Requirements for Measuring Apparatus, and has been supplied in a safe condition. This is a Safety Class I instrument (provided with terminal for protective earthing). Before applying power, verify that the correct safety precautions are taken (see the following warnings). In addition, note the external markings on the instrument that are described under "Safety Symbols."

**Warnings**

• Before turning on the instrument, you must connect the protective earth terminal of the instrument to the protective conductor of the (mains) power cord. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. You must not negate the protective action by using an extension cord (power cable) without a protective conductor (grounding). Grounding one conductor of a two-conductor outlet is not sufficient protection.

• Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired fuses or short-circuited fuseholders. To do so could cause a shock or fire hazard.

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

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

• Service instructions are for trained service personnel. To avoid dangerous electric shock, do not perform any service unless qualified to do so. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

• Do not install substitute parts or perform any unauthorized modification to the instrument.

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

• Do not operate the instrument in the presence of flammable gasses or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

• Do not use the instrument in a manner not specified by the manufacturer.

**To clean the instrument**

If the instrument requires cleaning: (1) Remove power from the instrument. (2) Clean the external surfaces of the instrument with a soft cloth dampened with a mixture of mild detergent and water. (3) Make sure that the instrument is completely dry before reconnecting it to a power source.

**Safety Symbols**

Instruction manual symbol: the product is marked with this symbol when it is necessary for you to refer to the instruction manual in order to protect against damage to the product..

Hazardous voltage symbol.

Earth terminal symbol: Used to indicate a circuit common connected to grounded chassis.

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# Notices



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**WARNING**

**A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.**

**CAUTION**

A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

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