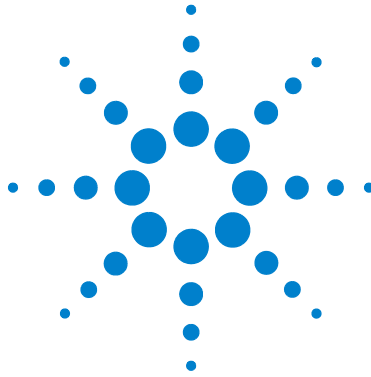


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# **Agilent U2701A/U2702A USB Modular Oscilloscope**

## **Service Guide**



**Agilent Technologies**

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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.

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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.

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## Safety Symbols

The following symbols on the instrument and in the documentation indicate precautions which must be taken to maintain safe operation of the instrument.

	Direct current (DC)		Off (supply)
	Alternating current (AC)		On (supply)
	Both direct and alternating current		Caution, risk of electric shock.
	Three-phase alternating current		Caution, risk of danger (refer to this manual for specific Warning or Caution information).
	Earth (ground) terminal		Caution, hot surface.
	Protective conductor terminal		Out position of a bi-stable push control.
	Frame or chassis terminal		In position of a bi-stable push control.
	Equipotentiality	<b>CAT I</b>	Category I Overvoltage Protection
	Equipment protected throughout by double insulation or reinforced insulation.		

## General Safety Information

The following general safety precautions must be observed during all phases of operation, service and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture and intended use of the instrument. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

### WARNING

- Observe all markings on the equipment before connecting any wiring to the equipment.
- This equipment is under CAT1 measurement category, do not connect the test probe to MAIN.



CAT1

Maximum Working Voltage: 30 Vrms or 42 Vpeak or 60 Vdc

- Do not measure more than rated voltage (as marked on the equipment).
- Inspect the test probe for damaged insulation or expose metal and check for continuity. Do not use test probe if found damaged.
- Do not operate the equipment in an explosive atmosphere or in the presence of flammable gases or fumes.
- Do not use the equipment if it does not operate properly. Have the equipment inspected by qualified service personal. If necessary, return the equipment to Agilent for service and repair to ensure that safety features are maintained.

### CAUTION

- Always disconnect the probes from the measuring circuit before disconnecting the adapter.
- Do not measure voltage above 30 Vrms, 42 Vpeak by using 10:1 test probe under standalone use.
- Use the device with the cables provided.
- Repair or service that is not covered in this manual should only be performed by qualified personnels.
- Applying excessive voltage or overloading the device will cause irreversible damage to the circuitry.

## Environment Conditions

This instrument is designed for indoor use only. Table 1 shows general environmental requirements for this instrument.

**Table 1** Environment Requirements





<b>Environmental Conditions</b>	<b>Requirements</b>
Operating Temperature	0 °C to 50 °C
Storage Temperature	-20 °C to 70 °C
Operating Humidity	20 to 85% RH (non-condensing)
Storage Humidity	5 to 90% RH (non-condensing)

### CAUTION

The Agilent U2701A/U2702A are safety-certified in compliance with the following safety and EMC requirements:

- IEC 61010-1: 2001/EN 61010-1: 2001 (2nd edition)
- CAN/CSA-C22.2 No. 61010-1-04
- IEC 61326-2002/EN 61326: 1997+A1: 1998+A2: 2001+A3: 2003
- ICES-001: 2004
- AS/NZS CISPR11: 2004
- USA: ANSI/UL 61010-1:2004

## Regulatory Markings

	<p>The CE mark is a registered trademark of the European Community. This CE mark shows that the product complies with all the relevant European Legal Directives.</p>		<p>The C-tick mark is a registered trademark of the Spectrum Management Agency of Australia. This signifies compliance with the Australia EMC Framework regulations under the terms of the Radio Communication Act of 1992.</p>
<p><b>ICES/NMB-001</b></p>	<p>ICES/NMB-001 indicates that this ISM device complies with Canadian ICES-001.</p> <p>Cet appareil ISM est conforme à la norme NMB-001 du Canada.</p>		<p>This instrument complies with the WEEE Directive (2002/96/EC) marking requirement. This affixed product label indicates that you must not discard this electrical/electronic product in domestic household waste.</p>
	<p>The CSA mark is a registered trademark of the Canadian Standards Association.</p>		

## Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC

This instrument complies with the WEEE Directive (2002/96/EC) marking requirement. This affixed product 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 1, this instrument is classified as a “Monitoring and Control Instrument” product. The affixed product label is shown as below:



### **Do not dispose in domestic household waste**

To return this unwanted instrument, contact your nearest Agilent office, or visit:

[www.agilent.com/environment/product](http://www.agilent.com/environment/product)

for more information.

## In This Guide...

### **1 Characteristics and Specifications 1**

This chapter specifies the product characteristics and specifications of the U2701A and U2702A USB modular oscilloscopes.

### **2 Calibration 11**

This chapter describes the step-by-step calibration procedures that cover self-calibration and performance verification procedures.

### **3 Dismantle Procedures 27**

This chapter shows the step-by-step disassembly procedures and list the available replacement parts together with its part number for the U2701A and U2702A USB modular oscilloscopes.

### **4 Troubleshooting 33**

This chapter includes the information on general troubleshooting hints for the U2701A and U2702A USB modular oscilloscopes.



## Contents

<b>1</b>	<b>Characteristics and Specifications</b>	<b>1</b>
	Specifications	2
	Characteristics	3
	Product Characteristics and General Specifications	7
	Measurement Category	9
<b>2</b>	<b>Calibration</b>	<b>11</b>
	Introduction	12
	Self-Calibration	13
	Performance Test	15
	Modular Oscilloscope Performance Verification Tests	17
<b>3</b>	<b>Dismantle Procedures</b>	<b>27</b>
	General Disassemble	28
	Replacement Parts	31
<b>4</b>	<b>Troubleshooting</b>	<b>33</b>
	Troubleshooting	34

## List of Figures

[Figure 2-1 Soft front panel display](#) 19

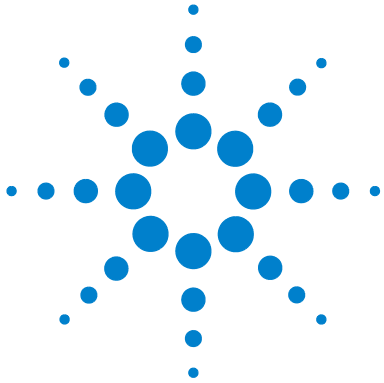
[Figure 2-2 Voltage measurement accuracy verification test setup](#) 20

## List of Tables

[Table 2-1 List of recommended test equipment](#) 12

[Table 2-2 Voltage measurement accuracy verification settings](#) 18

[Table 3-3 List of replacement parts](#) 31



# 1 Characteristics and Specifications

Specifications	2
Characteristics	3
Product Characteristics and General Specifications	7
Measurement Category	9

This chapter specifies the characteristics and specifications of the U2701A and U2702A USB modular oscilloscopes.



## 1 Characteristics and Specifications

# Specifications

All specification are warranted. Specifications are valid after a 30-minute warm-up period and within  $\pm 10^{\circ}\text{C}$  from firmware calibration temperature.

### Vertical System: oscilloscope channels

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Bandwidth (-3 dB)	U2701A: DC to 100 MHz U2702A: DC to 200 MHz
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### Scope channel triggering

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Trigger sensitivity	<10 mV/div: greater of 1 div or 5 mV; $\geq 10$ mV/div: 0.6 div
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## Characteristics

All characteristics are typical performance values and are not warranted. Characteristics are valid after a 30-minute warm-up period and within  $\pm 10^{\circ}\text{C}$  from firmware calibration temperature.

### Acquisition: oscilloscope channels

Real time sample rate	
2 channels interleaved	1 GSa/s
Each channel	500 MSa/s
Standard memory depth	
2 channels interleaved	32 Mpts
Each channel	16 Mpts
Vertical resolution	8 bits
Peak detection	Yes
Averaging	Any number from 1 to 999
Filter	Sin(x)/x interpolation for time base 1 ns to 100 ns
Sweep modes	Auto, normal, single

### Vertical system: oscilloscope channels

Scope channels	U2701A/U2702A: Ch 1 and 2
AC coupled	U2701A: 3.5 Hz to 100 MHz U2702A: 3.5 Hz to 200 MHz
Calculated rise time (= 0.35/bandwidth)	U2701A: 3.5 ns U2702A: 1.75 ns
Single-shot bandwidth	U2701A: 100 MHz U2702A: 200 MHz
Range	2 mV/div to 5 V/div (1 M $\Omega$ )
Maximum input	CAT I 30 Vrms, 42 Vpk
Offset range	$\pm 4$ div

**1 Characteristics and Specifications****Vertical system: oscilloscope channels (continued)**

Dynamic range	±4 div
Input impedance	1 MΩ: ≈ 16 pF
Coupling	AC, DC, Ground
BW limit	≈ 25 MHz
Standard probes	10:1 Passive Probe 150 MHz 1.2 m 10:1 Passive Probe 300 MHz 1.2 m
ESD tolerance	±2 kV
Noise peak-to-peak	3 mVpp
DC vertical offset accuracy	≤ 200 mV/div: ±0.1 div ±2.0 mV ±0.5% offset value; > 200 mV/div: ±0.1 div ±2.0 mV ±1.5% offset value
DC vertical gain accuracy	±4.0% of Full Scale
Single cursor accuracy	±{DC vertical gain accuracy + DC vertical offset accuracy + 0.2% full scale (~1/2 LSB)}
Dual cursor accuracy	±{DC vertical gain accuracy + 0.4% full scale (~1 LSB)}
<b>Horizontal</b>	
Range	1 ns/div to 50 s/div
Time base accuracy	20 ppm
Delay range	Pre-trigger: -100% Post-trigger: +100%
Modes	Main, roll, XY
XY	Yes
Reference position	Center
<b>Trigger system</b>	
Sources	Ch 1, Ch 2, Ext (not applicable for TV trigger)
Modes	Normal, single, auto trigger
Holdoff time	60 ns

**Trigger system (continued)**

Selections	Edge, pulse width, TV
Edge	Triggers on a rising or falling edge, alternating or either edge of any source
Pulse Width	Triggers on a pulse width greater than, equal to, or less than a specified time limit, with time limits ranging from 16 ns to 10 s. Minimum lowerlimit: 8 ns Minimum upperlimit: 16 ns Maximum pulse width setting: 10 s
TV	Triggers on one of three standard television waveforms: NTSC, PAL, SECAM TV trigger sensitivity: 0.6 division of sync signal. Modes supported include Field 1, Field 2, all fields, or any line within a field.
AutoScale	Single button automatic setup of all channels

**Oscilloscope channel triggering**

Range (internal)	$\pm 4$ div from center screen
Coupling	AC (< 15 Hz) LF reject (~ 35 kHz) HF reject (~ 35 kHz)

**External (EXT) triggering**

Input impedance	1 M $\Omega$ : $\approx$ 16 pF
Maximum input	CAT I 30 Vrms, 42 Vpk
Range	DC coupling: trigger level $\pm 1.25$ V and $\pm 2.5$ V
EXT trigger pulse width	> 2.5 ns
Trigger Level Sensitivity	For $\pm 1.25$ V range setting: DC to 100 MHz: 100 mV > 100 MHz: 200 mV  For $\pm 2.5$ V range setting: DC to 100 MHz: 250 mV > 100 MHz: 500 mV

**1 Characteristics and Specifications****Display**

Interpolation	Sin(x)/x
Display types	Dots and vectors
Persistence	Off, infinite
Format	XY, roll

**Measurement features**

Automatic measurements	Measurements are continuously updated. Cursors track last selected measurement.
Voltage	Peak-to-peak, maximum, minimum, average, amplitude, top, base, Vrms, overshoot, preshoot, crest, standard deviation, cycle RMS, RMS AC
Time	Frequency, period, +width, –width, +duty cycle, –duty cycle, rise time, fall time, delay, phase
Frequency	Maximum Peak
Cursors	Modes: Manual Type: Time, voltage and frequency (FFT) Measurements: $\Delta T$ , $\Delta V$ , frequency, Peak Scan (FFT), $\Delta Peak$
Math functions	Add, subtract, multiply, FFT, divide

**FFT**

Points	1250 points (for 500 ns and above)
Source of FFT	Source channels 1 or 2
Window	Hanning, Hamming, Blackman-Harris, rectangular, Flattop
Noise floor	–50 to –90 dB depending on averaging
Amplitude	Display in dBV
Maximum frequency	250 MHz



## Product Characteristics and General Specifications

### Remote Interface

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- Hi-Speed USB 2.0
- USBTMC Class Device <sup>[1]</sup>

### Power Consumption

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- +12 V DC, 2 A
- Isolated ELV supply source

### Measurement Category

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- CAT I 30 Vrms

### Operating Environment

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- Operating temperature from 0 °C to 50 °C
- Operating humidity at 20 ~ 85% R.H. (Non-condensing)
- Altitude up to 2000 meters (Operating and non-operating)
- Pollution degree 2
- For indoor use only

### Storage Compliance

---

- Storage temperature from -20 °C to 70 °C
- Storage humidity at 5 ~ 90% R.H. (Non-condensing)

### Safety Compliance

---

- IEC 61010-1: 2001/EN 61010-1: 2001 (2nd edition)
- Canada: CAN/CSA-C22.2 No. 61010-1-04
- USA: ANSI/UL 61010-1:2004

### EMC Compliance

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- IEC 61326-2002/EN 61326:1997+A1: 1998+A2: 2001+A3: 2003
- Canada: ICES-001: 2004
- Australia/New Zealand: AS/NZS CISPR11: 2004

### Shock & Vibration

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- Tested to IEC/EN 60068-2

### IO Connector

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- BNC connector

## 1 Characteristics and Specifications

### **Dimension**

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- 117.00 mm x 180.00 mm x 41.00 mm (with rubber bumpers)
- 105.00 mm x 175.00 mm x 25.00 mm (without rubber bumpers)

### **Weight**

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- 534 g (with rubber bumpers)
- 482 g (without rubber bumpers)

### **Warranty**

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- 3 years

[1] Requires a direct USB connection to the PC so the appropriate driver can be installed in the USB modular instrument or USB DAQ module.

## Measurement Category

The U2701A and U2702A USB modular oscilloscopes are intended to be used for measurement in Measurement Category I, 30 V for scope measurement.

### Measurement Category Definition

Measurement CAT I is for measurements performed on circuits not directly connected to MAINS. Examples are measurements on circuits not derived from MAINS, and specially protected (internal) mains-derived circuits.

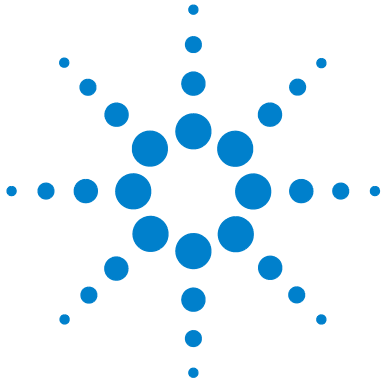
Measurement CAT II are measurements performed on circuits directly connected to the low voltage installation. Examples are measurements on household appliances, portable tools, and similar equipment.

Measurement CAT III are measurements performed in the building installation. Examples are 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, and some other equipment including stationary motors with permanent connection to the fixed installation.

Measurement CAT IV are measurements performed at the source of the low-voltage installation. Examples are electricity meters and measurements on primary over current protection devices and ripple control units.

**1 Characteristics and Specifications**

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## 2 Calibration

Introduction	12
Self-Calibration	13
Performance Test	15
Modular Oscilloscope Performance Verification Tests	17

This chapter includes the equipment required for the U2701A and U2702A USB modular oscilloscopes calibration procedure, self-calibration procedure, and performance verification procedure.



## 2 Calibration

### Introduction

Prior to checking the performance of the instrument, ensure that you have all the equipment listed in the following to perform the verification procedure for analog input and analog output.

**Table 2-1** List of recommended test equipment

Equipment	Critical Specification	Recommended Model
Oscilloscope Calibrator	<ul style="list-style-type: none"> <li>• &gt; 200 MHz leveled sine wave</li> <li>• DC offset voltage of 5.5 V to 35.5 V</li> <li>• 0.1 V resolution</li> <li>• 300 MHz leveled sine wave</li> </ul>	Fluke 5820A
Power Supply	<ul style="list-style-type: none"> <li>• &gt; 12 V, 2 A</li> </ul>	Agilent E3648A
BNC Cables	<ul style="list-style-type: none"> <li>• Quantity: 2</li> </ul>	Agilent 10503A
Feedthrough	<ul style="list-style-type: none"> <li>• 50 <math>\Omega</math> BNC (f) to BNC (m)</li> </ul>	Agilent 0960-0301
Digital Multimeter	<ul style="list-style-type: none"> <li>• 0.1 mV resolution</li> <li>• 0.005% accuracy</li> </ul>	Agilent 34401A
Adapter	<ul style="list-style-type: none"> <li>• BNC tee (m) (f) (f)</li> </ul>	Agilent 1250-0781
Cable	<ul style="list-style-type: none"> <li>• Type N (m) 609.6 mm (24 inch)</li> </ul>	Agilent 11500B
Adapter	<ul style="list-style-type: none"> <li>• Type N (m) to BNC (m)</li> </ul>	Agilent 1250-0082 or Pomona 3288 with Pomona 3533

## Self-Calibration

The self-calibration performs an internal self-alignment routine to optimize the signal path that affects channel sensitivity, offset, and trigger parameters. It is advisable for you to run self-calibration for the following situation:

- every 12 months or after 2000 hours of operation
- if the ambient temperature is higher than 10°C from the calibration temperature
- to maximize the measurement accuracy
- when you experience abnormal operation
- to verify proper operation after repair

**WARNING**

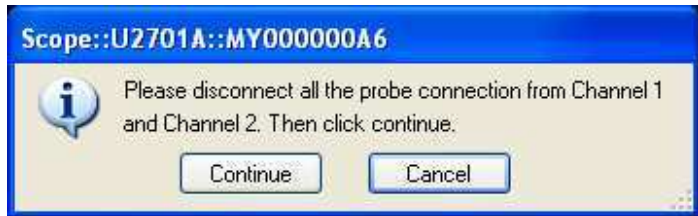
**Disconnect all probe and meter connections to the input terminal of the instrument. Allow the instrument to warm up for at least 30 minutes before performing self-calibration.**

---

## 2 Calibration

To start self-calibration, perform the following:

- 1 Click **Tools > Oscilloscopes > Perform Self-Calibration**.
- 2 Click on **Continue** when the message is shown.



- 3 Wait for a few minutes for the self-calibration process to be completed
- 4 Click on OK when the self-calibration is completed.





## Performance Test

### Performance Test Interval

The performance tests described in this section may be performed for incoming inspection. It is advisable to perform the performance tests periodically to verify that the modular oscilloscope is operating within the specifications. The recommended test interval is once per year or after 2000 hours of operation. Performance should also be tested after repairs or major upgrades.

### Performance Test Record

A test record is provided in Agilent U2701A/2702A Modular Oscilloscopes Performance Test Record. This record lists out the performance tests, test limits, and columns to record test result.

### Warming Up Before Testing

For accurate test results, allow the instrument and test equipment to warm up for at least 30 minutes before testing.

**NOTE**

Perform self-calibration before performing any performance verification test for better accuracy. If the performance tests remain failing after self-calibration, send the instrument to your nearest Agilent Technologies Service Centre for servicing.

---

## Current Check

Equipment: Power supply

- 1 Connect the power connector to power supply.
- 2 Set the voltage to 12 V.
- 3 Perform a check on the current load at power supply (maximum current = 1.8 A, typical current = 1.4 A). If the current is within the limit, you can proceed to conduct the performance verification tests.

## Modular Oscilloscope Performance Verification Tests

The performance tests verify the channel's measurement accuracy and acquisition system to provide confidence in functionality and accuracy of the instrument's specification as listed in the chapter “[Characteristics and Specifications](#)”.

## I. Voltage Measurement Accuracy Verification Test

Equipment: Power supply, oscilloscope calibrator, BNC tee, digital multimeter, BNC cables

This test verifies the accuracy of the analog channel voltage measurement for each channel (DC Vertical Gain Accuracy and Dual Cursor Accuracy specifications). In this test, you will measure the DC voltage output of an oscilloscope calibrator using dual cursors on the oscilloscope, and compare the results with the digital multimeter's reading.

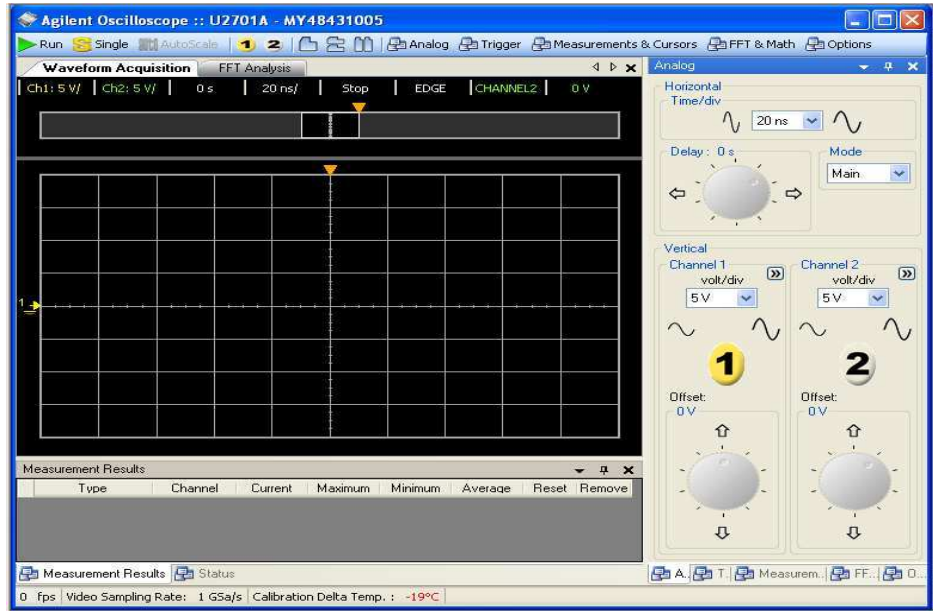
*Test Limit:  $\pm 4.0\%$  of full scale  $\pm 1$  LSB \* (\* 1 LSB = 0.4% of full scale)*

Full scale on all ranges is defined as 8 divisions times the Volts/Div setting.

**Table 2-2** Voltage measurement accuracy verification settings

Volts/Div Setting	Oscilloscope Calibrator Setting	Low Test Limits	High Test Limits
5 V/Div	35 V	33.24 V	36.76 V
2 V/Div	14 V	13.296 V	14.704 V
1 V/Div	7 V	6.648 V	7.352 V
500 mV/Div	3.5 V	3.324 V	3.676 V
200 mV/Div	1.4 V	1.3296 V	1.4704 V
100 mV/Div	700 mV	664.8 mV	735.2 mV
50 mV/Div	350 mV	332.4 mV	367.6 mV
20 mV/Div	140 mV	132.96 mV	147.04 mV
10 mV/Div	70 mV	66.48 mV	73.52 mV
5 mV/Div	35 mV	33.24 mV	36.76 mV
2 mV/Div	14 mV	13.296 mV	14.704 mV

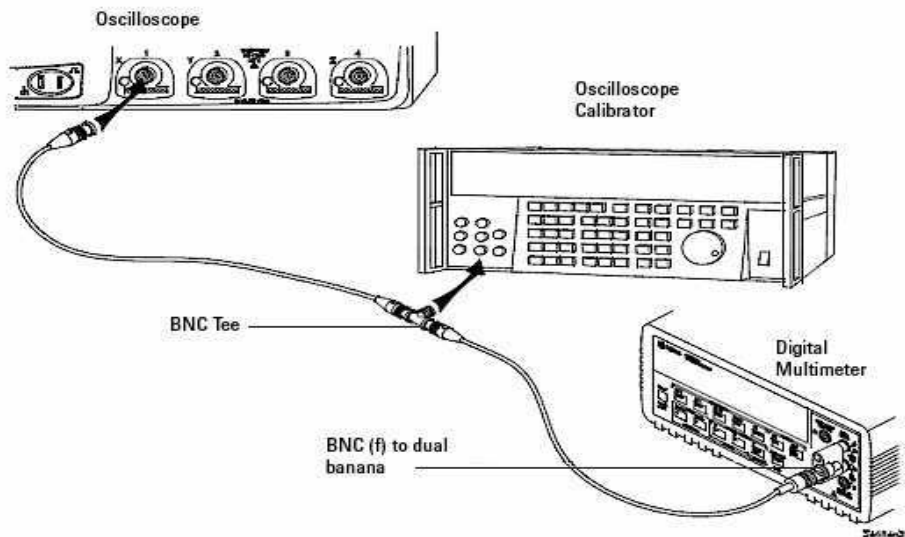
- 1 On the modular oscilloscope, set the offset to 0.5 major divisions from the bottom of the display as shown in Figure 2-1.



**Figure 2-1** Soft front panel display

- 2 Set the Volts/Div according to the Volts/Div Setting column in Table 2-2.
- 3 Set the acquisition mode to average, waveform number to 64.
- 4 Select the Y cursor and place the Y1 cursor on the offset line.
- 5 Use the BNC tee and cables to connect the oscilloscope calibrator or power supply to both the modular oscilloscope and digital multimeter (see Figure 2-2).

## 2 Calibration



**Figure 2-2** Voltage measurement accuracy verification test setup

- 6 Adjust the oscilloscope calibrator output so that the digital multimeter reading displays the first Volts/Div oscilloscope calibrator setting value in [Table 2-2](#). Wait for a few seconds to allow the measurement to settle.
- 7 Set the Y2 cursor to the center of the voltage trace.
- 8 The measurement reading is displayed on **Measurements & Cursors > Voltage > Average**. Ensure that the correct channel is selected. Reset the reading to get the newest reflected value. The  $\Delta Y$  value shown on the soft front panel display should be within the test limits of [Table 2-2](#).
- 9 Continue to check on the voltage measurement accuracy with the remaining Volts/Div setting values in [Table 2-2](#).
- 10 When you have finished checking all the voltage values, disconnect the oscilloscope calibrator from the modular oscilloscope.
- 11 Repeat this procedure for channel 2.

## II. Bandwidth Verification Test

Equipment: Oscilloscope calibrator, feedthrough

This purpose of this test is to verify the bandwidth of the modular oscilloscope. In this test, you will use the oscilloscope calibrator with a level sine wave output.

You will use the RMS voltage both at 1 MHz and at bandwidth frequency to verify the bandwidth response of the oscilloscope.

### **U2701A USB Modular Oscilloscope (100 MHz)**

Test limits at 2 mV/div to 5 V/div:

- All channels (–3 dB)
- DC to 100 MHz
- AC coupled 10 Hz to 100 MHz

### **U2702A USB Modular Oscilloscope (200 MHz)**

Test limits at 2 mV/div to 5 V/div:

- All channels (–3 dB)
- DC to 200 MHz
- AC coupled 10 Hz to 200 MHz

- 1** Connect the oscilloscope calibrator output through a 50  $\Omega$  feedthrough to the channel 1 input of the modular oscilloscope.
- 2** Set up the modular oscilloscope with the settings as follows:
  - Set the time base to 500 ns/div.
  - Set the Volts/Div for channel 1 to 200 mV/div.
  - Set the acquisition mode to Normal.
- 3** Set the oscilloscope calibrator to "Level Sine" and OPR/STBY to "OPR".

## 2 Calibration

- 4 Set the oscilloscope calibrator for 1 MHz and six divisions of amplitude, which is 1.2 Vpp.
- 5 Click on the AutoScale button.
- 6 Click on Measurement, select Vrms for channel 1.
- 7 Wait for a few seconds to allow the measurement to settle. View the RMS reading at the bottom of the display.

Record the reading: Vrms= \_\_\_\_\_ V

- 8 Change the frequency of the oscilloscope calibrator to 100MHz or 200MHz (according to product's bandwidth).
- 9 Change the time base to 5 ns/div.
  - a Wait a few seconds to allow the measurement to settle.
  - b View the RMS reading at the bottom of the display.
  - c Record the reading: Vrms= \_\_\_\_\_ mV
- 10 Calculate the response using this formula:

**$20\log_{10} \cdot \frac{\text{Results from Step 9}}{\text{Results from Step 7}}$**

**Results from Step 7**

- 11 Repeat the step 1 to step 10 for channel 2.



### III. Trigger Sensitivity Verification Test

#### Internal Trigger Sensitivity Test

Equipment: Oscilloscope calibrator, feedthrough

This purpose of this test is to verify the internal trigger sensitivity of the modular oscilloscope. In this test, you will apply a sine wave to the modular oscilloscope at the upper bandwidth limit. You will then decrease the amplitude of the signal to the specified levels, and check to see if the modular oscilloscope is still triggered.

Test Limits:

- For internal trigger:
  - <10 mV/div: greater of 1 div or 5 mVpp
  - ≥10 mV/div: 0.6 div

- 1 Use a 50  $\Omega$  feedthrough termination to connect the oscilloscope calibrator output to the modular oscilloscope channel 1 input.
- 2 To verify the trigger sensitivity at maximum bandwidth (100 MHz or 200 MHz):
  - a Select level sine in the oscilloscope calibrator.
  - b Set the output frequency of the oscilloscope calibrator to the maximum bandwidth of the modular oscilloscope and set the amplitude to 10 mVpp.
- 3 Set trigger mode to normal and trigger source to channel 1.
- 4 Set the time base to 10 ns/div.
- 5 Set channel 1 to 5 mV/div.
- 6 Decrease the amplitude from the oscilloscope calibrator until one vertical division of the signal is displayed. The trigger is stable when the displayed waveform is stable.

## 2 Calibration

- 7** If the trigger is unstable, try to adjust the trigger level. If the displayed waveform is stable after the adjustment, the test is considered passed.
- 8** Repeat step **2** to **5** for vertical settings of 10mV/Div, 20mV/div, and 50 mV/div. For these settings, the amplitude in step **6** is to be decreased until 0.6 div, which are:
  - 6 mVpp for 10 mV
  - 12 mVpp for 20 mV
  - 30 mVpp for 50 mV.
- 9** Repeat all the steps for channel 2.
- 10** Record the result as Pass/Fail in the performance test record provided.

### External Trigger Level Sensitivity Test

Equipment: Power supply, oscilloscope calibrator, feedthrough

This purpose of this test is to verify the external trigger level sensitivity of the modular oscilloscope. In this test, you will apply a sine wave with  $V_{peak}$  of 100 mV, with frequency of 100 MHz or 200 MHz to the modular oscilloscope. You will then check to see if the oscilloscope is still triggered.

Test Limits:

- For external trigger:
  - DC to 100 MHz, 100 mV
  - >100 MHz bandwidth, 200 mV (for  $\pm 1.25$  V range)
  - DC to 100 MHz, 250 mV

- 1** To verify the trigger sensitivity at maximum bandwidth (100 MHz or 200 MHz):
  - a** Select level sine in the oscilloscope calibrator.
  - b** Set the output frequency of the oscilloscope calibrator to the maximum bandwidth of the modular oscilloscope and set the amplitude to 200 mVpp (for U2701A) or 400 mVpp (for U2702A).
- 2** On the oscilloscope, set the trigger source to external. Set the trigger level to 0.
- 3** Click on channel 1 and channel 2. Set the time base to 100  $\mu$ s/Div and vertical scale to 1 V/Div.
- 4** On the oscilloscope calibrator, put the operation to **STBY**, you should find that the trigger indicator is blinking.
- 5** Change the operation to **OPR**, you should find that the trigger indicator is solid on.
- 6** Record the result as **Pass/Fail** in performance test record provided.

2 Calibration

**Agilent U2701A/2702A Oscilloscopes Performance Test Record**

Serial No. \_\_\_\_\_ Test By \_\_\_\_\_  
 Test Interval \_\_\_\_\_ Work Order No. \_\_\_\_\_  
 Recommended Next Testing \_\_\_\_\_ Temperature \_\_\_\_\_

**Voltage Measurement Accuracy**

Range	Power Supply Setting	Test Limits	Channel 1	Channel 2
5 V/Div	35 V	33.24 V to 36.76 V	_____	_____
2 V/Div	14 V	13.296 V to 14.704 V	_____	_____
1 V/Div	7 V	6.648 V to 7.352 V	_____	_____
500 mV/Div	3.5 V	3.324 V to 3.676 V	_____	_____
200 mV/Div	1.4 V	1.3296 V to 1.4704 V	_____	_____
100 mV/Div	700 mV	664.8 mV to 735.2 mV	_____	_____
50 mV/Div	350 mV	332.4 mV to 367.6 mV	_____	_____
20 mV/Div	140 mV	132.96 mV to 147.04 mV	_____	_____
10 mV/Div	70 mV	66.48 mV to 73.52 mV	_____	_____
5 mV/Div	35 mV	33.24 mV to 36.76 mV	_____	_____
2 mV/Div	14 mV	13.296 mV to 14.704 mV	_____	_____

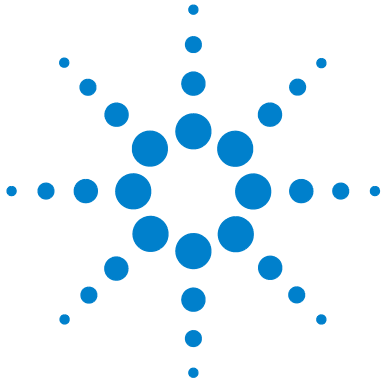
Bandwidth	Model	Test Limits	Channel 1	Channel 2
	U2701A	0 to -3 dB	_____	_____
	U2702A	0 to -3 dB	_____	_____

**Trigger Sensitivity (Internal Trigger)**

	Range	Test Limits	Channel 1	Channel 2
U2701A	5 mV/Div	1 division	_____	_____
	10 mV/Div	0.6 division	_____	_____
	20 mV/Div	0.6 division	_____	_____
U2702A	50 mV/Div	0.6 division	_____	_____
	5 mV/Div	1 division	_____	_____
	10 mV/Div	0.6 division	_____	_____
	20 mV/Div	0.6 division	_____	_____
	50 mV/Div	0.6 division	_____	_____

**Trigger Sensitivity (External Trigger)**

		Result
U2701A	100 MHz at 200 mVpp	_____
U2702A	200 MHz at 200 mVpp	_____



## 3 Dismantle Procedures

General Disassemble 28

Replacement Parts 31

This chapter describes the step-by-step disassemble procedures and list the available replacement parts for the U2701A and U2702A USB modular oscilloscopes,



## General Disassemble

This chapter provides the step-by-step guides on how to dismantle the module and install the replacement assembly. To reassemble the module, follow the instructions in reverse order.

### NOTE

The parts shown in the following figures are representative and may differ from what you have in your module.

---

The removable assemblies include:

- Metal casing
- Rear metal casing
- Front metal casing, which is attached to the carrier board and measurement board
- Front and rear rubber bumper

## Mechanical Disassembly

Follow the instructions in this section for the instrument disassembly process.

**Step 1: Pull the rubber bumper out to unscrew the metal casing.**

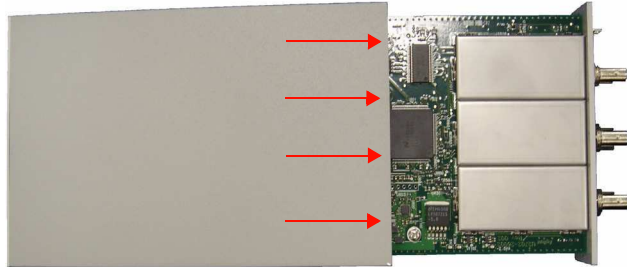


**Step 2: Unscrew all the following indicated screws from the metal casing.**

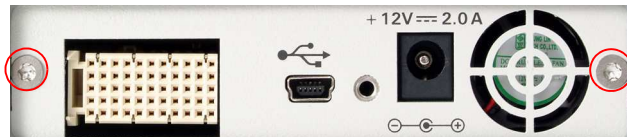


### 3 Dismantle Procedures

**Step 3: Gently pull the front metal piece out, which is attached to the carrier and measurement boards.**



**Step 4: Unscrew all the following indicated screws from the metal casing and remove the rear metal piece.**





## Replacement Parts

This section provides the information of the orderable replacement parts for U2701A and U2702A USB modular oscilloscopes. The parts available for replacement are listed in [Table 3-3](#) with the reference part numbers and the respective part names.

You can order the replacement parts from Agilent using the part number provided in the table below. To order replacement parts from Agilent, do the following:

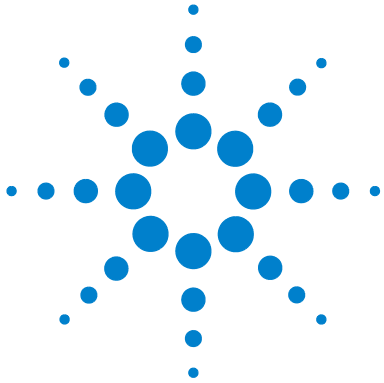
- 1 Identify the Agilent part number of the required parts as shown in the replacement parts list.
- 2 Contact your nearest Agilent Sales Office or Service Center.
- 3 Provide the instrument's model number and serial number.

**Table 3-3** List of replacement parts

Part Number	Part Name
U2702-68301	L-Bracket Assembly
U2702-40004	Rubber Bumper
U2702-60202	Rear Panel Assembly

**3 Dismantle Procedures**

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## 4 Troubleshooting

Troubleshooting 34

This chapter provides the information on general troubleshooting hints for the U2701A and U2702A USB modular oscilloscopes.





## Troubleshooting

This section provides hints and suggestions for solving general problems that you may encounter with the instrument. It guides you on what to check in the following situations:

- **If there is no display**


- 1 Check the LED on the front panel of the modular oscilloscope, it should lit up if the power is on.
- 2 Contact Agilent Technologies Service Centre to obtain technical assistance, if necessary.

- **If there is no trace display**

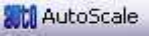
- 1 Click on the  button to start acquiring the waveform.
- 2 Check that the oscilloscope probe lead wires are securely inserted into the connector assembly and that the probe clips are making good contact with the probe lead wires.
- 3 Click on the  button to allow the instrument to automatically trigger the signal to the best display.
- 4 Contact Agilent Technologies Service Centre to obtain technical assistance, if necessary.

- **If the trace display is unusual or unexpected**

- 1 Check that the horizontal Time/div is correctly set for the expected frequency range of the input signals.
- 2 Check that all the oscilloscope probes are connected to the correct signals on the circuit under test, and ground lead is securely connected to ground of the circuit under test.
- 3 The trigger setup is the most important factor in capturing the signal you desire. Check that the trigger setup is correct.

- 4 Check that infinite persistence in the Display menu is turned off. Click on Clear Display to remove the waveforms from the display.
- 5 Click on the  button to allow the instrument to automatically trigger the signal to the best display.
- 6 Contact Agilent Technologies Service Centre to obtain technical assistance, if necessary.

• **If you cannot view a channel**

- 1 Check that the modular oscilloscope probe cable is securely connected to the input connector.
- 2 Check that the modular oscilloscope probe lead wires are securely inserted into the connector assembly and that the probe clips are making good contact with the probe lead wires.
- 3 Check that the circuit under test is powered on, probe clips are securely connected to test points in the circuit under test, and ground is connected.
- 4 Check that the respective scope channel is being turned on.
- 5 Click on the  button to allow the instrument to automatically set up all channels.
- 6 Contact Agilent Technologies Service Centre to obtain technical assistance, if necessary.

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**[www.agilent.com](http://www.agilent.com)**

### **Contact us**

To obtain service, warranty or technical support assistance, contact us at the following phone numbers:

United States:

(tel) 800 829 4444 (fax) 800 829 4433

Canada:

(tel) 877 894 4414 (fax) 800 746 4866

China:

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Europe:

(tel) 31 20 547 2111

Japan:

(tel) (81) 426 56 7832 (fax) (81) 426 56  
7840

Korea:

(tel) (080) 769 0800 (fax) (080) 769 0900

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[www.agilent.com/find/assist](http://www.agilent.com/find/assist)

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