Agilent
U2701A and U2702A USB Modular Oscilloscope

Data Sheet

Agilent Technologies

Features

- **100 MHz and 200 MHz bandwidths**
- **Up to 1GSa/s maximum sample rate**
- **32 Mpts of waveform memory**
- **Compact and portable size — 117.00 mm x 180.00 mm x 41.00 mm (with rubber bumpers)**
- **Advanced triggering, including edge, pulse width, and TV**
- **Compatibility with Hi-Speed USB 2.0, USBTMC 488.2 standards**
- **Four math functions, including FFTs standard**
- **DUAL-PLAY — standalone and modular capability**
- **Compatibility with wide range of application development environments**

Figure 1 The U2701A and U2702A USB modullar oscilloscopes

Highest performance, lowest cost for today and tomorrow

Agilent's U2701A and U2702A USB modular oscilloscopes combine a set of essential features that are ideal for analyzing designs in an affordable way. The U2701A and U2702A come in two bandwidths: 100 MHz and 200 MHz respectively. These devices are uniquely designed to accommodate your needs for flexibility with the dual-play function. Dual-play functionality allows you to use the oscilloscope as a standalone or to scale up the test system in a cardcage with additional scopes or with Agilent's other USB modular product offerings, thus providing a complete solution for system development.

The U2701A and U2702A give you the debugging power you need. Each modular oscilloscopes comes standard with features such as advanced triggering, automatic measurements, math functions including FFTs, and much more.

The user-friendly Agilent Modular Instrument Measurement Manager software bundled with the U2701A and U2702A offers a simple interface for quick setup, configuration, and measurement control.

Why Do You Need Deep Memory and a High Sampling Rate?

To see more time
When you are able to store more samples that you have obtained in the memory, you can view the signal at a longer time. This will be the best way to understand the use of deep memory.

A longer capture time gives you a better visibility into cause-effect relationships in your designs, which significantly simplify your root-cause debugging. It also allows you to capture start-up events in a single acquisition.

The need to stitch together multiple acquisitions or set precise triggering conditions are no longer necessary. You can spend less time finding events, and more time analyzing them.

To see even more details
The relationship between memory depth and acquisition rate is not as obvious. All scopes have a "banner" maximum sample rate specification, but many can only sustain these rates at a few time base settings.

Higher sampling rate
By offering sampling rate more than twice the acquired signal bandwidth, aliasing can be prevented. With more sampling data captured, higher accuracy of your test and analysis results can be achieved.

Ease of Use

The U2701A and U2702A USB modular oscilloscopes are equipped with Hi-Speed USB 2.0 interface for easy setup and plug-and-play. Hence, this ease-of-use makes the oscilloscopes ideal for the education, design validation, and manufacturing environment.

Figure 2 The dual-play capability allows U2701A and U2702A USB modular oscilloscopes to be used as standalone units or fitted into a cardcage.

Compatible with a Wide Range of Application Development Environments

The Agilent U2701A and U2702A USB modular oscilloscopes are compatible with a wide range of application development environments. This minimizes the time that R&D and manufacturing engineers need to use the devices in different software environments.

Listed below are the popular development environments and tools with which the USB modular oscilloscope is compatible:
- Agilent VEE and Agilent T&M Toolkit
- Microsoft Visual Studio.NET, C/C++ and Visual Basic 6
- LabVIEW
- Microsoft .NET Framework

Figure 3 The accessories offered for the U2701A and U2702A USB modular oscilloscopes.

Features you need

The U2701A and U2702A include the following standard features that you need to do your job done quickly and easily:

Hi-Speed USB Interface
The U2701A and U2702A connect to the computer through Hi-Speed USB 2.0 connectivity.

Autoscale
Autoscale lets you display any active signals, automatically setting the vertical, horizontal, and trigger controls for the best signal display within the shortest time.

Advanced triggering
Edge, pulse width, and TV are the triggering modes included to help you isolate the signals you want to see.

Large memory
With memory depth up to 32 Mpts, you can capture even more data. Larger memory allows you to capture data over a longer time frame.

Fast Fourier Transfer (FFT) and Waveform Math
The U2701A and U2702A offer analysis functions such as addition, subtraction, multiplication, division, and Fast Fourier Transform (FFT). FFT allows you to manipulate the waveform using five types of windows such as Hanning, Hamming, Blackman-Harris, Flattop, and rectangular.

High sampling rate
Sampling rate up to 500 MSa/s/ch enables more details of the signal to be seen and analyzed. When two channels are interleaved, the sampling rate can be up to 1 GSa/s. This fast-sampling capability allows you to perform intermittent detection easily.

Pulse triggering
Pulse triggering allows you to trigger on pulse events.

Portability
The U2701A and U2702A's compact size makes them portable and easy to be carried to your working field.

One-year warranty
Every U2701A and U2702A comes with one year warranty.

Figure 4 The U2701A and U2702A connect to the computer or laptop with a USB cable, enabling fast data transfer.

Product Characteristics and General Specifications

Remote interface	Hi-Speed USB 2.0 USBTMC Class Device
Power consumption	+12 V DC, 2 A Installation Category III
Operating environment	Operating Temperature: 0 °C to 50 °C Storage Temperature: –20 °C to 70 °C Operating Humidity: 20 ~ 85% R.H. Non-condensing Storage Humidity: 5 ~ 90% R.H. Non-condensing Altitude: Up to 2,000 m (Operating and non-operating) Pollution Degree: 2
Storage compliance	–20 °C to 70 °C
Safety compliance	Certified with: IEC 61010-1:2001/ EN61010-1:2001 (2nd Edition) Canada : CAN/CSA-C22.2 No. 61010-1-04 USA: ANSI/UL 61010-1:2004
EMC compliance	IEC 61326-2002/ EN 61326:1997+A1:1998+A2:2001+A3:2003 Canada : ICES-001:2004 Australia/New Zealand: AS/NZS CISPR11:2004
Shock and vibration	Tested to IEC/EN 60068-2
IO connector	BNC connector
Dimension (W x D x H)	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	534 g (with rubber bumpers) 482 g (without rubber bumpers)
Warranty	One year

System Requirements

Processor	1.6 GHz Pentium IV or higher
Operating system	One of the following Microsoft® Windows® versions: Windows XP Professional or Home Edition (Service Pack 1 or later) Windows 2000 Professional (Service Pack 4 or later)
Browser	Microsoft Internet Explorer 5.01 or higher
Available RAM	512 MB or higher recommended
Hard disk space	1 GB
Prerequisites	Agilent IO Libraries Suite 14.2[1] or higher Agilent T&M Toolkit 2.1 Runtime version[2] Microsoft .NET Framework version 1.1 and 2.0[2]

[1] Available in Agilent Automation-Ready CD
[2] Bundled with Agilent Measurement Manager software application installer

Standard Shipped Items

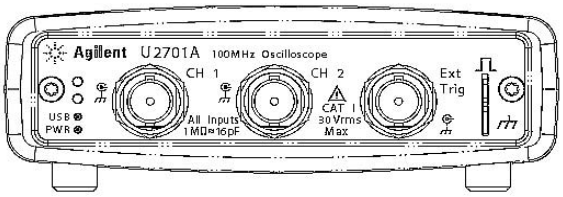
- 12 V, 2 A AC/DC Power Adapter
- Power Cord
- USB Standard A to Mini-B Interface Cable
- 10:1 Passive Probe 150 MHz 1.2m, N2862A (only applicable for U2701A)
- 10:1 Passive Probe 300 MHz 1.2m, N2863A (only applicable for U2702A)
- L-Mount Kit (used with modular instrument chassis)
- Agilent Automation-Ready CD (contains the Agilent IO Libraries Suite)
- Agilent USB Modular Products Quick Start Guide
- Agilent USB Modular Products Reference CD-ROM
- Agilent USB Modular Products Quick Reference Card
- Certificate of Calibration

Optional Accessories

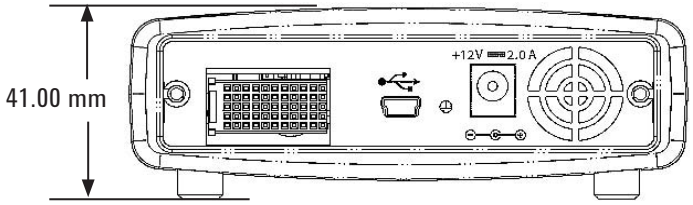
- BNC Cable, U2921A-100
- USB Secure Cable, U2921A-101
- 1:1 Passive Probe 20 MHz, 1.5 m, 10070C (Order no.: U2701A-200)
- 10:1 Passive Probe 150 MHz 1.2m, N2862A (only applicable for U2701A) (Order no.: U2701-201)
- 10:1 Passive Probe 300 MHz 1.2m, N2863A (only applicable for U2702A) (Order no.: U2702-201)

Product Outlook and Dimensions

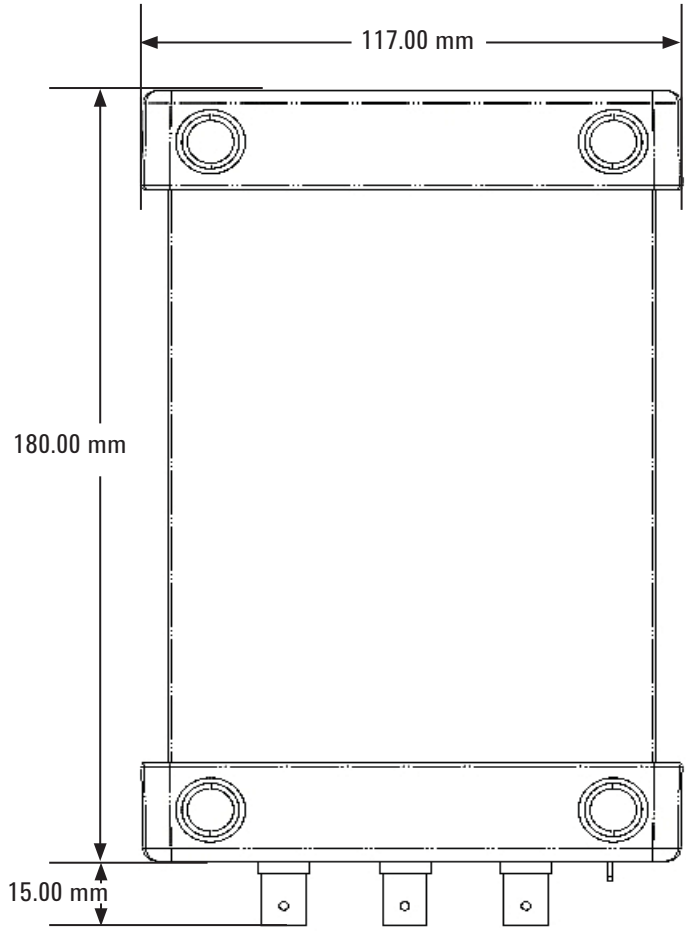
Front View



Rear View



Top View



Performance Specifications[1]

Vertical system: oscilloscope channels	
Bandwidth (–3 dB)	U2701A: DC to 100 MHz U2702A: DC to 200 MHz

Scope channel triggering	
Trigger sensitivity	<10 mV/div: greater of 1 div or 5mV; ≥10 mV/div: 0.6 div

1 All specifications are warranted. Specifications are valid after a 30-minute warm-up period and within ±10°C of last calibration temperature.

Performance Characteristics[1]

Acquisition: oscilloscope channels		
Real time sample rate		
2 channels interleaved	1 GSa/s	
Each channel	500 MSa/s	
Standard memory depth	Normal	Single-shot
2 channels interleaved	32 Mpts	64 Mpts
Each channel	16 Mpts	32 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 simultaneous acquisition
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 MΩ)
Maximum input[2]	CAT I 30 Vrms, 42 Vpk
Offset range	±4 div Example: ±8 mV on 2 mV/div; ±20 V on 5 V/div
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

1 All characteristics are typical performance values and are not warranted. Characteristics are valid after a 30-minute warm-up period and within ±10°C of last calibration temperature.

2 Under standalone use, users are only allowed to measure up to CAT1 30 Vrms. For high-voltage measurement up to CAT1 300 Vrms, users must install the L-mount kit on the U2701A/U2702A before plugging into the instrument chassis. Ensure that the L-Mount kit installed on your modular oscilloscope is screwed to the instrument chassis to ensure chassis grounding. It is required to use the provided 10:1 probes (N2862A/N2863A) for high-voltage measurements

Performance Characteristics (continued)

Vertical system: oscilloscope channels (continued)

Single-cursor accuracy	±{DC vertical gain accuracy + DC vertical offset accuracy + 0.2% full scale (~1/2 LSB)} Example: for 50 mV signal, scope set to 10 mV/div (80 mV full scale), 5 mV offset, accuracy = ±{4.0% (80 mV) + 0.1(10 mV) + 2.0 mV + 0.5% (5 mV) + 0.2% (80 mV)} = ±6.385 mV
Dual-cursor accuracy	±{DC vertical gain accuracy + 0.4% full scale (~1 LSB)} Example: for 50 mV signal, scope set to 10 mV/div (80 mV full scale), 5 mV offset, accuracy = ±{4.0% (80 mV) + 0.4% (80 mV)} = ±3.52 mV

Horizontal

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

Trigger system

Sources		Ch 1, Ch 2, Ext (not applicable for TV trigger)
Modes		Normal, single, auto trigger
Holdoff time		60 ns
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 lower limit: 8 ns Minimum upper limit: 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)	±4 div from center screen
Coupling	AC (< 15 Hz) LF reject (~ 35 kHz) HF reject (~ 35 kHz)

External (EXT) triggering

Input impedance	1 MΩ: ≈ 16 pF
Maximum input	CAT I 30 Vrms, 42 Vpk
Range	DC coupling: trigger level ±1.25 V and ±2.5 V
EXT trigger pulse width	> 2.5 ns

Performance Characteristics (continued)

External (EXT) triggering (continued)	
Trigger level sensitivity	For ±1.25 V range setting: DC to 100 MHz: 100 µV > 100 MHz: 200 µV For ±2.5 V range setting: DC to 100 MHz: 250 µV > 100 MHz: 500 µV

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: ΔT, ΔV, frequency, Peak Scan (FFT), ΔPeak
Math functions	Add, substract, 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