

**Agilent**

## U2761A USB Modular Function/Arbitrary Waveform Generator

Data Sheet



**Agilent Technologies**

## Features

- **20 MHz Sine and Square waveforms**
- **Sine, Square, Ramp, Triangle, Pulse and DC waveforms**
- **14-bit, 50 MSa/s, 64 k-points Arbitrary waveforms**
- **AM, FM, PM, ASK, FSK, and PSK modulation types**
- **40 mVpp to 5 Vpp amplitude range (into 50 ohm load)**
- **Pulse generation**
- **Easy-to-use bundled software**
- **Arbitrary waveform editor**
- **Command logger function**
- **Hi-Speed 2.0, USBTMC 488.2 standards**

## Overview

The Agilent U2761A is a 20 MHz USB modular function generator with Arbitrary waveform and pulse generation capability. It can operate as a standalone or modular unit when used with the U2781A USB modular instrument chassis.

### Various features of the U2761A

- Latest DDS technology adoption for more stable and accurate output signal
- Easy-to-use arbitrary waveform editor for easy customization of waveform generation
- Built-in modulation capability eliminates the need for a separate modulation source
- Pulse generation up to 5 MHz with variable period, pulse width, and amplitude that are ideal for wide variety of applications
- Wide range of Application Development Environment (ADE) compatibility
- Low start-up cost with standalone capability
- Flexibility in expanding your application when using it as modular unit with the U2761A
- Command logger function offered in the bundled software allows easy command conversion into VEE programs



### Direct digital waveform

The U2761A adopts the latest direct digital synthesis (DDS) technology that digitally creates arbitrary waveforms and frequencies from a single and fixed frequency source. DDS offers the precision of digitally controlled logic—reducing the complexity of the generator while increasing the stability. Thus, allowing you to have a stable, accurate output signal for clean, low distortion sine waves and square waves with fast rise and fall time up to 20 MHz and linear ramp waves up to 200 kHz.

### Arbitrary waveform editor

With every purchase of the U2761A, it is bundled with an easy-to-use application software, the Agilent Measurement Manager. This application allows customization of waveforms generation.

### Pulse generation

The U2761A can generate pulses from 500  $\mu$ Hz to 5 MHz. With variable period, pulse width, and amplitude parameters, the U2761A is ideally suited to a wide variety of applications requiring flexible pulse width signals.

### Internal modulation

Internal AM, FM, PM, ASK, FSK, and PSK modulation makes it easy to modulate waveforms without the need for a separate modulation source. Linear and logarithmic sweeps are also built in, with sweep rates selectable from 1 ms to 500 s.

### Quick and easy to begin with

The USB 2.0 interface provides easy connectivity and setup that allows automatic detection of the U2761A. With quick and easy USB connectivity, the U2761A is ideal for academic and testing environment. The USBTMC 488.2 standard makes the U2761A compatible with any system that comes with USB ports.

### Flexible standalone or modular capability

The U2761A is uniquely designed with flexibility to function standalone or as a modular unit. The standalone PC-based unit allows you to have low start-up cost.

### ADE compatibility

The U2761A is compatible with a wide range of ADEs. This minimizes development time because developers can program directly using the SCPI commands.

Listed below are the popular development environments and tools that the U2761A is compatible with:

- Agilent VEE and Agilent T&M Toolkit
- Microsoft® Visual Studio .NET, C/C++ and Visual Basic 6
- LabView®
- MATLAB®

### Easy-to-use AMM offers command logger function

Better yet, Agilent Measurement Manager application software provides a quick and easy means to configure and control the device. This enhances productivity because it allows users to start performing measurement promptly without needing to write any programming codes.

The Agilent Measurement Manager also comes with a command logger function that lets you capture commands that can be easily converted to VEE programs for VEE users.

## Product Outlook and Dimensions

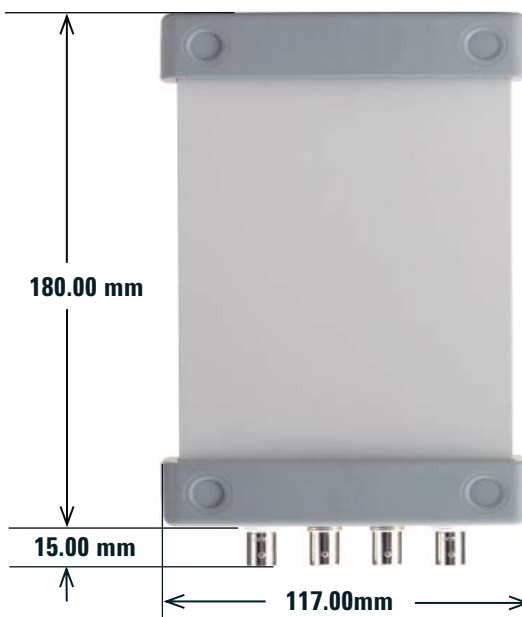
Front View



Rear View



Top View



## Standard Shipped Item

- 12 V, 2 A AC/DC Adaptor
- Power Cord
- USB Standard-A to Mini-B Interface Cable
- 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 Measurement Manager Quick Reference Card
- Certificate of Calibration

## Optional Accessories

- 1.5 m BNC Coax Cable
- USB Secure Cable

## System Requirements

<p><b>PROCESSOR</b> 1.6 GHz Pentium® IV or higher</p>
<p><b>OPERATING SYSTEM</b></p> <ul style="list-style-type: none"> <li>• Windows® XP Professional or Home Edition (Service Pack 1 or later), or</li> <li>• Windows 2000 Professional (Service Pack 4 or later)</li> </ul>
<p><b>BROWSER</b> Microsoft® Internet Explorer 5.01 or higher</p>
<p><b>AVAILABLE RAM</b> 512 MB or higher recommended</p>
<p><b>HARD DISK SPACE</b> 1 GB</p>
<p><b>VIDEO</b> Super VGA 800×600 (1024×768 recommended)</p>
<p><b>PREREQUISITES</b></p> <ul style="list-style-type: none"> <li>• Agilent IO Libraries 14.2 or higher (version 15.0<sup>1</sup> recommended)</li> <li>• Agilent T&amp;M Toolkit 2.1 Runtime version 2.1<sup>2</sup></li> <li>• Agilent T&amp;M Toolkit Redistributable Package 2.1 patch<sup>2</sup></li> <li>• Microsoft .NET Framework version 1.1 and 2.0<sup>2</sup></li> </ul>

1 Available in Agilent Automation-Ready CD.

2 Bundled with Agilent Measurement Manager application software installer.

## Product Characteristics and General Specification

<p><b>REMOTE INTERFACE</b></p> <ul style="list-style-type: none"> <li>• Hi-Speed USB 2.0</li> <li>• USBTMC 488.2 Class Device</li> </ul>
<p><b>POWER CONSUMPTION</b></p> <ul style="list-style-type: none"> <li>• +12 VDC, 2 A</li> <li>• Isolated ELV power source</li> </ul>
<p><b>OPERATING ENVIRONMENT</b></p> <ul style="list-style-type: none"> <li>• Operating temperature from 0 °C to 50 °C</li> <li>• Operating humidity at 20% to 85% RH (non-condensing)</li> <li>• Altitude up to 2,000 meters</li> <li>• Pollution degree 2</li> <li>• For indoor use only</li> </ul>
<p><b>STORAGE COMPLIANCE</b></p> <ul style="list-style-type: none"> <li>• Storage temperature from –20 °C to 70 °C</li> <li>• Storage humidity at 5% to 90% RH (non-condensing)</li> </ul>
<p><b>SAFETY COMPLIANCE</b> Certified with:</p> <ul style="list-style-type: none"> <li>• IEC 61010-1:2001/ EN61010-1:2001 (2nd Edition)</li> <li>• Canada : CAN/CSA-C22.2 No. 61010-1-04</li> <li>• USA: ANSI/UL 61010-1:2004</li> </ul>
<p><b>EMC COMPLIANCE</b></p> <ul style="list-style-type: none"> <li>• IEC 61326-2002/ EN 61326:1997+A1:1998+A2:2001+A3:2003</li> <li>• Canada : ICES-001:2004</li> <li>• Australia/New Zealand: AS/NZS CISPR11:2004</li> </ul>
<p><b>SHOCK &amp; VIBRATION</b> Tested to IEC/EN 60068-2</p>
<p><b>IO CONNECTOR</b> BNC Connector</p>
<p><b>DIMENSION (WxDxH)</b></p> <ul style="list-style-type: none"> <li>• 117.00 mm x 180.00 mm x 41.00 mm (with bumpers)</li> <li>• 105.00 mm x 175.00 mm x 25.00 mm (without bumpers )</li> </ul>
<p><b>WEIGHT</b></p> <ul style="list-style-type: none"> <li>• 528 g (with bumpers)</li> <li>• 476 g (without bumpers)</li> </ul>
<p><b>WARRANTY</b> One year</p>

## Product Specifications and Measurement Characteristics

WAVEFORMS	
Standard	Sine, Square, Ramp, Triangle, Pulse, DC
Built-in arbitrary	Exponential Rise, Exponential Fall, Negative Ramp

WAVEFORM CHARACTERISTICS			
<b>SINE</b>			
Frequency range	1 $\mu$ Hz to 20 MHz (1 $\mu$ Hz resolution)		
Amplitude flatness <sup>1</sup> (relative to 1 kHz)	<100 kHz	0.2 dB	
	100 kHz to 1 MHz	0.35 dB	
	1 MHz to 20 MHz	0.7 dB	
Harmonic distortion <sup>2</sup>	Frequency range	<1 Vpp	$\geq$ 1 Vpp
	DC to 20 kHz	-70 dBc	-60 dBc
	20 kHz to 100 kHz	-65 dBc	-60 dBc
	100 kHz to 1 MHz	-50 dBc	-45 dBc
	1 MHz to 20 MHz	-40 dBc	-35 dBc
Total harmonic distortion <sup>2</sup>	DC to 20 kHz	0.10%	
Spurious (Non-harmonic) output <sup>3</sup>	DC to 1 MHz	-65 dBc	
	1 MHz to 20 MHz	-65 dBc + 6 dB/octave	
Phase noise (10 kHz offset)	-115 dBc/Hz (Typical)		
<b>SQUARE</b>			
Frequency range	1 $\mu$ Hz to 20 MHz (1 $\mu$ Hz resolution)		
Rise/Fall time	<18 ns, 10 to 90% terminated load (50 $\Omega$ )		
Overshoot	<2%		
Variable duty cycle	20% to 80% (up to 10 MHz) 40% to 60% (up to 20 MHz)		
Asymmetry (@ 50% duty)	1% of period + 5 ns		
Jitter (RMS)	>50 kHz = 1 ns + 100 ppm of period $\leq$ 50 kHz = 10 ns + 100 ppm of period		
<b>RAMP, TRIANGLE</b>			
Frequency range	1 $\mu$ Hz to 200 kHz (1 $\mu$ Hz resolution)		
Linearity	<0.2% of peak output		
Programmable Symmetry	0% to 100%		
<b>PULSE</b>			
Frequency range	500 $\mu$ Hz to 5 MHz (1 $\mu$ Hz resolution)		
Pulse width (period $\leq$ 10 s)	40 ns minimum, 10 ns resolution		
Overshoot	<3%		
Jitter (RMS)	300 ps + 0.1 ppm of period		
<b>ARBITRARY</b>			
Frequency range	1 $\mu$ Hz to 200 kHz (1 $\mu$ Hz resolution)		
Waveform memory depth	64 kSa		
Amplitude resolution	14 bits/sample (including sign)		
Sampling rate	50 MSa/s		
Minimum rise/fall time	35 ns (Typical)		
Linearity	<0.2 % of peak output		
Settling Time	<250 ns to 0.5% of final value		
Jitter (RMS)	10 ns + 30 ppm		

<b>COMMON CHARACTERISTICS</b>	
<b>AMPLITUDE</b>	
Range	40 mVpp to 5 Vpp (Into 50 $\Omega$ load) 80 mVpp to 10 Vpp (Into open circuit)
Accuracy <sup>1</sup> (across 50 $\Omega$ load at 1 kHz)	$\pm 1\%$ of setting $\pm 5$ mV ( $\pm 10$ mV @ Hi-Z)
Units	Vpp, Vrms, dBm
Resolution	4 digits
<b>DC OFFSET</b>	
Range (peak AC + DC)	$\pm 2.5$ V (Into 50 $\Omega$ load) $\pm 5$ V (Into open circuit)
Accuracy <sup>1</sup> (across 50 $\Omega$ load)	$\pm 2\%$ of offset setting $\pm 1\%$ of amplitude $\pm 5$ mV ( $\pm 10$ mV @Hi-Z)
Amplitude Limit	Amplitude + Offset limit to within $\pm 2.5$ V range across 50 $\Omega$ load or $\pm 5$ V across open circuit
<b>MAIN OUTPUT</b>	
Impedance	50 $\Omega$ load (Typical)
Isolation	At least 42 Vpk to earth
Protection	Short-circuit protected, overload automatically disables main output
<b>INTERNAL FREQUENCY REFERENCE</b>	
Accuracy <sup>4</sup>	$\pm 8$ ppm in 1 year
<b>EXTERNAL FREQUENCY REFERENCE</b>	
Input	
Lock range	10 MHz $\pm 170$ Hz
Amplitude level	500 mVpp to 5 Vpp
Impedance	50 $\Omega$ AC coupled
Lock time	<2 s
Output	
Frequency	10 MHz
Amplitude Level	632 mVpp (Typical)
Impedance	Return loss 10 dB (Typical) at 10 MHz
Phase Offset	
Range	+360 $^{\circ}$ to -360 $^{\circ}$
Resolution	0.01 $^{\circ}$
Accuracy	20 ns

<b>TRIGGER CHARACTERISTICS</b>	
<b>TRIGGER INPUT</b>	
Input Level	TTL compatible
Slope	Rising and Falling, Selectable
Pulse width	>100 ns
Input impedance	>10 k $\Omega$ , DC coupled
Latency	<500 ns
Jitter (RMS)	6 ns (3.5 ns for Pulse)
<b>TRIGGER OUTPUT</b>	
Output Level	TTL compatible into $\geq 1$ k $\Omega$
Pulse width	>400 ns
Output impedance	50 $\Omega$ (Typical)
Fanout	4 TTL
Rise time	$\leq 20$ ns

<b>MODULATION</b>	
Modulation scheme	Internal, AM, FM, PM, FSK, PSK, ASK
<b>AM</b>	
Carrier waveforms	Sine, Square, Ramp, Arbitrary
Source	Internal
Internal modulation	Sine, Square, Ramp, Arbitrary (2 mHz to 20 kHz)
Depth	0.0% to 100.0%
<b>FM</b>	
Carrier waveforms	Sine, Square, Ramp, Arbitrary
Source	Internal
Internal modulation	Sine, Square, Ramp, Arbitrary (2 mHz to 20 kHz)
Deviation	1 Hz to 500 kHz
<b>PM</b>	
Carrier waveforms	Sine, Square, Ramp, Arbitrary
Source	Internal
Internal modulation	Sine, Square, Ramp, Arbitrary (2 mHz to 20 kHz)
Deviation	0.0 ° to 360.0 °
<b>FSK</b>	
Carrier waveforms	Sine, Square, Ramp, Arbitrary
Source	Internal
Internal modulation	50% duty cycle square (2 mHz to 100 kHz)
<b>PSK</b>	
Carrier waveforms	Sine, Square, Ramp, Arbitrary
Source	Internal
Internal modulation	50% duty cycle square (2 mHz to 100 kHz)
Deviation	0.0 ° to 360.0 °
<b>ASK</b>	
Carrier waveforms	Sine, Square, Ramp, Arbitrary
Source	Internal
Internal modulation	50% duty cycle square (2 mHz to 100 kHz)

<b>SWEEP CHARACTERISTICS</b>	
Waveforms	Sine, Square, Ramp, Arbitrary
Type	Linear or Logarithmic
Direction	Up or Down
Sweep time	1 ms to 500 s
Trigger	Single, External, or Internal

- 1 Add 1/10<sup>th</sup> of output amplitude and offset specification per °C for operation outside the range of 18 °C to 28 °C.
- 2 DC offset set to 0 V.
- 3 Spurious output at low amplitude is -70 dBm, typical.
- 4 Add 1 ppm/°C (average) for operation outside the range of 18 °C to 28 °C.



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Revised: 11/08/06

Product specifications and descriptions in this document subject to change without notice.

© Agilent Technologies, Inc. 2008  
Printed in USA, May 22, 2008  
5989-7975EN



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