Keysight Technologies

U2761A USB Modular Function/ Arbitrary Waveform Generator

Data Sheet

KEYSIGHT TECHNOLOGIES

Introduction

The Keysight Technologies, Inc. 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 together with the U2781A USB modular product 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 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

Features

- 20 MHz Sine and Square waveforms
- Sine, Square, Ramp, Triangle, Pulse and DC waveforms
- 14-bit, 50MSa/s, 64 k-points Arbitrary waveforms [1]
- Optional arbitrary waveform generation upgrade (2 MHz)
- AM, FM, PM, ASK, FSK, and PSK modulation types
- 40 mVpp to 5 Vpp amplitude range (into 50 Ω load)
- Pulse generation
- Easy-to-use bundled software
- Arbitrary waveform editor
- Command logger function
- USB 2.0 and USBTMC-USB488 standards

Direct digital waveform

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

Pulse generation

The U2761A is able to generate pulses from 500 µHz to 5 MHz. Designed with variable period, pulse width and amplitude parameters, the U2761A is ideal for a wide range of applications demanding flexible pulse width signals.

Internal modulation

With internal AM, FM, PM, ASK, FSK and PSK modulation it is easy to modulate waveforms without the need for a separate modulation source. Built in linear and logarithmic sweeps is available with selectable sweep rates from 1 ms to 500 s.

Arbitrary waveform editor

The innovative U2761A is bundled with easy-to-use application software, the Keysight Measurement Manager. This application allows customization of waveforms generation.

1. [1] Maximum at 16 k points for Arbitrary waveforms when using bundled software, Keysight Measurement Manager (KMM) and 64 k points when programmed in compatible application development environments like Keysight VEE, NI LabVIEW, and Microsoft Visual Studio.

Product characteristics and general specifications

Remote Interface

- Hi-Speed USB 2.0
- USBTMC-USB488[1]

Power Consumption

- +12 VDC, 2 A
- Isolated ELV power source

Operating Environment

- Operating temperature from 0 °C to +50 °C
- Operating humidity at 20% to 85% RH (non-condensing)
- Altitude up to 2000 meters
- Pollution Degree 2
- For indoor use only

Storage Compliance

- Storage temperature from –20 °C to 70 °C
- Storage humidity at 5% to 90% RH (non-condensing)

Safety Compliance

Certified with:

- IEC 61010-1:2001/EN 61010-1:2001 (2nd Edition)
- USA: UL61010-1: 2004
- Canada: CSA C22.2 No.61010-1:2004

EMC Compliance

- IEC 61326-1:2002/EN 61326-1:1998+A2:2001+A3:2003
- Canada: ICES-001:2004
- Australia/New Zealand: AS/NZS CISPR 11:2004

Shock and Vibration

Tested to IEC/EN 60068-2

IO Connector

BNC connector

Dimension (W × D × H)

- > 60 dB at 50/60 Hz ±0.1%
- > 0 dB at 50/60 Hz ±0.1%

SHOCK AND VIBRATION

Tested to IEC/EN 60068-2

IO CONNECTOR

Four banana socket terminals

Dimension (W × D × H)

Module dimension:

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

Weight

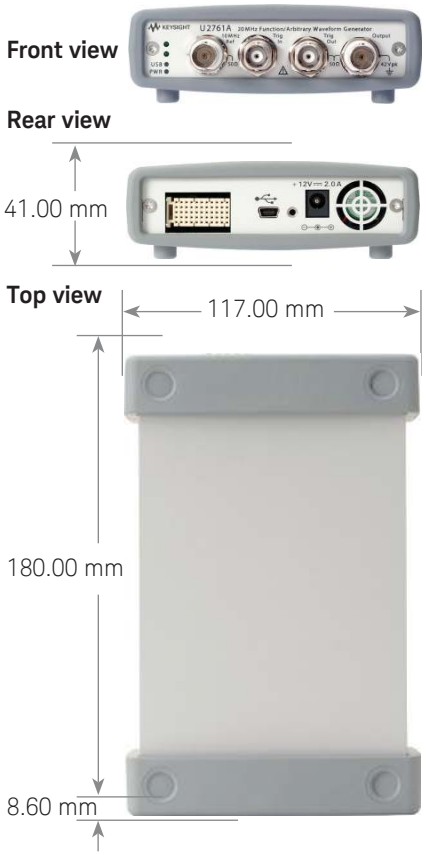
- 528 g (with bumpers)
- 476 g (without bumpers)

Warranty

One year for U2761A
Three months for standard shipped accessories

1. Compatible with Microsoft Windows operating systems only. Requires a direct USB connection to the PC so the appropriate driver can be installed in the USB modular instrument.

Product outlook and dimensions



Standard shipped accessories

- 12 V, 2 A AC/DC Power adapter
- Power cord
- USB Standard A to Mini-B interface cable
- L-Mount kit (used with modular product chassis)
- Keysight Automation-Ready CD-ROM (contains the Keysight IO Libraries Suite)
- Keysight USB Modular Products Quick Start Guide
- Keysight USB Modular Products Reference CD-ROM
- Keysight USB Modular Products Quick Reference Card
- Certificate of Calibration

Optional accessories

- 1.5 m BNC coax cable
- USB Secure 2-m cable

Product specifications and measurement characteristics

Waveforms			
Standard	Sine, Square, Ramp, Triangle, Pulse, DC		
Built-in arbitrary	Exponential Rise, Exponential Fall, Negative Ramp		
Waveform characteristics			
Sine			
Frequency range	1 µHz to 20 MHz (1 µHz resolution)		
Amplitude flatness[1] (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[2]	Frequency range	< 1 Vpp	≥ 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[2]	DC to 20 kHz	0.10%	
Spurious (Non-harmonic) output[3]	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)		
Square			
Frequency range	1 µHz to 20 MHz (1 µHz resolution)		
Rise/Fall time	< 18 ns, 10 to 90% terminated load (50 W)		
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 ≤ 50 kHz = 10 ns + 100 ppm of period		
Ramp, Triangle			
Frequency range	1 µHz to 200 kHz (1 µHz resolution)		
Linearity	< 0.2% of peak output		
Programmable symmetry	0% to 100%		
Pulse			
Frequency range	500 µHz to 5 MHz (1 µHz resolution)		
Pulse width (period ≤ 10 s)	40 ns minimum, 10 ns resolution		
Overshoot	< 3%		
Jitter (RMS)	300 ps + 0.1 ppm of period		

1. Add 1/10th 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.

Waveform characteristics (continued)	
Arbitrary	
Frequency range	1 µHz to 200 kHz (1 µHz resolution)
Waveform memory depth	64 kSa[1]
Amplitude resolution	14 bits/sample (including sign)
Sampling rate	50 MSa/s
Minimum rise/fall time	36 ns (Typical)
Linearity	< 0.2% of peak output
Settling Time	< 250 ns to 0.5% of final value
Jitter (RMS)	10 ns + 30 ppm
Common characteristics	
Amplitude	
Range	40 mVpp to 5 Vpp (Into 50 Ω load) 80 mVpp to 10 Vpp (Into open circuit)
Accuracy[2] (across 50 Ω load at 1 kHz)	±1% of setting ± 5 mV (±10 mV @ Hi-Z)
Units	Vpp, Vrms, dBm
Resolution	4 digits
DC offset	
Range (peak AC + DC)	±2.5 V (Into 50 Ω load)
	±5 V (Into open circuit)
Accuracy[2] (across 50 Ω load)	±2% of offset setting ±1% of amplitude ±5 mV (±10 mV @Hi-Z)
Amplitude Limit	Amplitude + Offset limit to within ±2.5 V range across 50 Ω load or ±5 V across open circuit
Main output	
Impedance	50 Ω load (Typical)
Isolation	At least 42 Vpk to earth
Protection	Short-circuit protected, overload automatically disables main output
Internal frequency reference	
Accuracy[3]	±8 ppm in 1 year
External frequency reference	
Input	
Lock range	10 MHz ±170 Hz
Amplitude level	500 mVpp to 5 Vpp
Impedance	50 Ω 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° to –360°
Resolution	0.01°
Accuracy	20 ns

1. Maximum at 16 k points for Arbitrary waveforms when using bundled software, Keysight Measurement Manager (KMM) and 64 k points when programmed in compatible application development environments like Keysight VEE, NI LabVIEW, and Microsoft Visual Studio.
2. Add 1/10th of output amplitude and offset specification per °C for operation outside the range of 18 °C to 28 °C.
3. Add 1 ppm/°C (average) for operation outside the range of 18 °C to 28 °C.

Trigger characteristics	
Trigger input	
Input Level	TTL compatible
Slope	Rising and Falling, Selectable
Pulse width	> 100 ns
Input impedance	> 10 kΩ, DC coupled
Latency	< 500 ns
Jitter (RMS)	6 ns (3.5 ns for pulse)
Trigger output	
Output Level	TTL compatible into ≥1 kΩ
Pulse width	> 400 ns
Output impedance	50 Ω (Typical)
Fanout	4 TTL
Rise time	≤ 20 ns
Modulation	
Modulation scheme	Internal, AM, FM, PM, FSK, PSK, ASK
AM	
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%
FM	
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
PM	
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°
FSK	
Carrier waveforms	Sine, Square, Ramp, Arbitrary
Source	Internal
Internal modulation	50% duty cycle square (2 mHz to 100 kHz)
PSK	
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°
ASK	
Carrier waveforms	Sine, Square, Ramp, Arbitrary
Source	Internal
Internal modulation	50% duty cycle square (2 mHz to 100 kHz)
Sweep Characteristics	
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

Keysight Measurement Manager

The Keysight Measurement Manager (KMM) is an application data viewer software that comes with the standard purchase of the U2700A Series USB modular instruments. This software is designed to help you perform quick device configuration, data logging and data acquisition using the products.

Supported features found in the U2761A USB modular function/ arbitrary waveform generator:

- Command logger
- Self-test
- Self-calibration
- Option to save the current instrument configuration to a file
- Data logging and export feature to CSV, HTML and text only format files that can be printed
- Trigger settings between modules in the instrument chases with Star trigger and Master/Slave trigger

Keysight Measurement Manager prerequisites

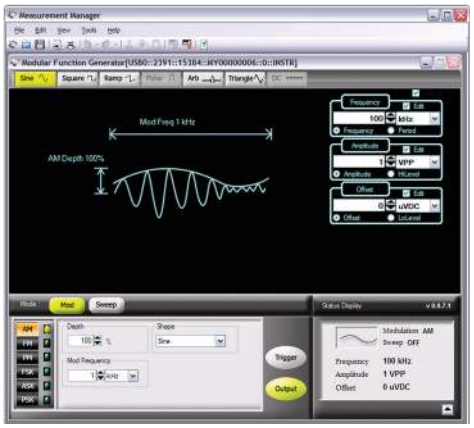
Prior to installing the Keysight Measurement Manager software, ensure that your PC meets the following minimum system requirements for installation and operation.

Requirement	Windows XP operating systems	Windows Vista operating systems	Windows 7 operating systems
Operating system	Windows XP Service Pack 3 (or later)[1]	Windows Vista (32-bit) Service Pack 1 and 2[2]	Windows 7 (32-bit and 64-bit)[3, 4]
Processor speed	600 MHz or higher required, 800 MHz recommended	1 GHz 32-bit (x86)	3 GHz 32-bit (x86)
Memory	256 MB minimum (1 GB or greater recommended)	1 GB minimum	2 GB minimum
Hard-disk space	1.5 GB minimum	1.5 GB minimum	1.5 GB minimum
Video	Super VGA (800 × 600) 256 colors or more	Support for DirectX 9 graphics with 128 MB graphics memory recommended[5]	Support for DirectX 9 graphics with 128 MB graphics memory recommended[5]
CD-ROM drive or DVD-ROM drive[6]	Required	Required	Required
Browser	Microsoft Internet Explorer 5.01 or greater	Microsoft Internet Explorer 7 or greater	Microsoft Internet Explorer 7 or greater

1. Supported Windows XP editions — Home or Professional
2. Supported Windows Vista (32-bit) editions — Home Basic, Home Premium, Business, or Ultimate
3. Supported Windows 7 (32-bit and 64-bit) editions — Home Basic, Home Premium, Professional, Enterprise, or Ultimate
4. Keysight Measurement Manger for Windows 7 64-bit support is a 32-bit application running on a WOW64 (Windows-on-Windows 64-bit) emulator.
5. Super VGA graphics is supported for Windows Vista and Windows 7.
6. The type of media provided with the product determines whether a CD-ROM drive or DVD-ROM drive is required.

Software requirements
Keysight IO Libraries Suite 15.1 and above[1]
Keysight T&M Toolkit Runtime version 2.1[2]
Keysight T&M Toolkit Redistributable Package 2.1 patch[2]
Microsoft .NET Framework version 2.0[2]

1. Available on the Keysight Automation-Ready CD-ROM
2. Bundled with Keysight Measurement Manager software application installer



Other products in the Keysight USB Modular Test Instruments Family

U2722A /U2723A USB Modular Source Measure Unit

Features:

- Three-channel SMU with four-quadrant source/measure operation
- High measurement sensitivity of 100 pA with 16-bit resolution for all voltage and current ranges
- 0.1% basic accuracy
- Embedded test scripts (for U2723A)

For more information: www.keysight.com/find/U2722A
www.keysight.com/find/U2723A

U2741A USB Modular Digital Multimeter (DMM)

Features:

- Fast reading speed (up to 100 Sa/s)
- Wide range of basic measurement functions, including frequency and temperature measurements

For more information: www.keysight.com/find/U2741A

U2701A/U2702A USB Modular Oscilloscope

Features:

- High sampling rate up to 500 MSa/s, enabling accurate measurement analysis
- Up to 32 MB large memory
- Fast fourier transfer (FFT) and waveform math functions enables easy waveform calculation

For more information: www.keysight.com/find/usbscope

U2751A USB Modular Switch Matrix

Features:

- Minimal cross-talk of –30 dB at 45 MHz wide bandwidth
- High bandwidth at 45 MHz without terminal block
- Capability to test up to four devices-under-test (DUTs)
- Works with other Keysight instruments for multi-point testing

For more information: www.keysight.com/find/U2751A

U2781A USB Modular Product Chassis

Features:

- Expansion of channels for each modular product
- Multiple instrument synchronization
- Internal and external 10 MHz reference clock
- High-speed USB 2.0
- SSI/Star trigger bus synchronization between external trigger source and modules

For more information: www.keysight.com/find/U2781A

Ordering information

Model	Description
U2761A	USB modular function/arbitrary waveform generator

Optional accessories

Model	Description
U2921A-100	BNC cable
U2921A-101	USB secure cable 2 m
U2010A	Arbitrary waveform generation upgrade to 2 MHz
U2010A-1FP	Arbitrary waveform generation upgrade bundle purchase with U2761A

myKeysight

myKeysight

www.keysight.com/find/mykeysight
A personalized view into the information most relevant to you.

www.axiestandard.org
AdvancedTCA® Extensions for Instrumentation and Test (AXIe) is an open standard that extends the AdvancedTCA for general purpose and semiconductor test. Keysight is a founding member of the AXIe consortium. ATCA®, AdvancedTCA®, and the ATCA logo are registered US trademarks of the PCI Industrial Computer Manufacturers Group.

www.lxistandard.org
LAN eXtensions for Instruments puts the power of Ethernet and the Web inside your test systems. Keysight is a founding member of the LXI consortium.

www.pxisa.org
PCI eXtensions for Instrumentation (PXI) modular instrumentation delivers a rugged, PC-based high-performance measurement and automation system.

Three-Year Warranty
www.keysight.com/find/ThreeYearWarranty
Keysight's commitment to superior product quality and lower total cost of ownership. The only test and measurement company with three-year warranty standard on all instruments, worldwide.

Keysight Assurance Plans
www.keysight.com/find/AssurancePlans
Up to five years of protection and no budgetary surprises to ensure your instruments are operating to specification so you can rely on accurate measurements.

www.keysight.com/quality
Keysight Technologies, Inc.
DEKRA Certified ISO 9001:2008
Quality Management System

Keysight Channel Partners
www.keysight.com/find/channelpartners
Get the best of both worlds: Keysight's measurement expertise and product breadth, combined with channel partner convenience.

www.keysight.com/find/U2761A

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at:
www.keysight.com/find/contactus

Americas

Canada	(877) 894 4414
Brazil	55 11 3351 7010
Mexico	001 800 254 2440
United States	(800) 829 4444

Asia Pacific

Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 112 929
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Other AP Countries	(65) 6375 8100

Europe & Middle East

Austria	0800 001122
Belgium	0800 58580
Finland	0800 523252
France	0805 980333
Germany	0800 6270999
Ireland	1800 832700
Israel	1 809 343051
Italy	800 599100
Luxembourg	+32 800 58580
Netherlands	0800 0233200
Russia	8800 5009286
Spain	0800 000154
Sweden	0200 882255
Switzerland	0800 805353 Opt. 1 (DE) Opt. 2 (FR) Opt. 3 (IT)
United Kingdom	0800 0260637

For other unlisted countries:
www.keysight.com/find/contactus
(BP-07-10-14)

KEYSIGHT TECHNOLOGIES

Published in USA, August 3, 2014
5991-0413EN
www.keysight.com