

Keysight Technologies

U2761A USB Modular Function/Arbitrary Waveform Generator

[Data Sheet](#)



Features

- Sine, Square, Ramp, Triangle and Pulse waveforms as well as DC signal
- 14-bit, 50 MSa/s Arbitrary Waveforms customizable through the arbitrary waveform editor
- Built-in modulation: AM, FM, PM, ASK, FSK and PSK
- Pulse generation up to 5 MHz with variable period, pulse width and amplitude parameters
- Hi-Speed USB 2.0 connectivity
- Dual-play operation: standalone and modular capability
- Bundled with easy-to-use Keysight Measurement Manager (KMM) software
- NEW! Control, automate and simplify with Keysight BenchVue software
- Compatible with a wide range of Keysight Development Environments (KDEs)

Put a Bench in Your Bag

The next time you're called out to solve tough problems in electronic products or processes, leave the bulky transit cases behind. With Keysight Technologies, Inc.'s USB modular instrument (MI) family, you can easily carry powerful test gear in your bag along with your laptop PC.

Our line of MIs includes two oscilloscopes, a DMM, a function generator with arbitrary waveform capability, a source/measure unit and a 4x8 switch matrix. All provide USB 2.0 connectivity (with USBTMC-USB488) standard and plug-and-play simplicity for easy use on the go or on the bench.



Keysight U2761A USB Modular Function/Arbitrary Waveform Generator

The U2761A is a 20 MHz function/arbitrary waveform generator the size of a typical novel, and flexibly operates as a standalone unit or as a modular unit in the U2781A USB modular product chassis.



U2761A used as a standalone instrument



U2761A used as a modular instrument



Keysight U2700A series USB Modular Instruments won Design News' Golden Mousetrap Award in the 2009 Best Products Category. Design News' Awards Program highlights engineering innovation and product design creativity, and honors the best designs of the past year.

Control, Automate and Simplify with BenchVue – No Programming Needed

Keysight BenchVue software for the PC eliminates many of the issues around bench testing. By making it simple to connect, control instruments, and automate test sequences, you can quickly move past the test development phase and access results faster than ever before with just a few clicks. Dedicated instrument apps allow you to quickly configure the most commonly used measurements and setups for each instrument family. Rapidly build custom test sequences with the integrated Test Flow app to automate and visualize test results without the need for instrument programming. BenchVue supports hundreds of Keysight instrument types and models all from one easy to use application. Control, Automate, Simplify with BenchVue.

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

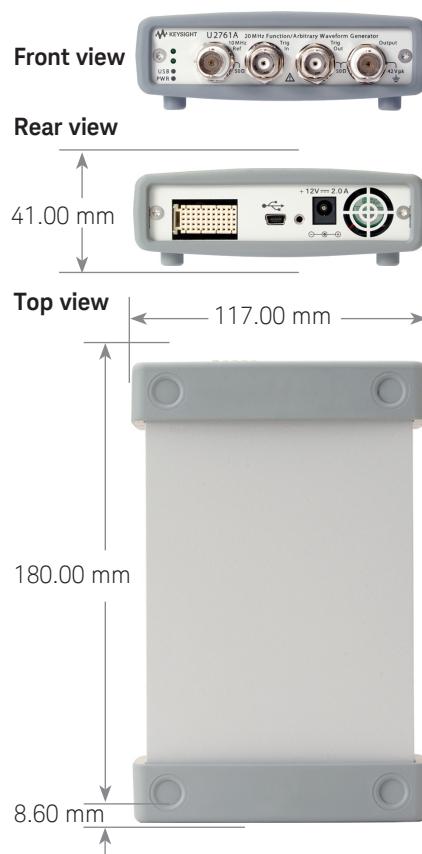
- 528 g (with bumpers)
- 476 g (without bumpers)

Warranty

One year for U2761A

Three months for standard shipped accessories

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

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 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 μ Hz to 20 MHz (1 μ Hz 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	\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 ^[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 μ Hz to 20 MHz (1 μ Hz 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		
	\leq 50 kHz = 10 ns + 100 ppm of period		
Ramp, Triangle			
Frequency range	1 μ Hz to 200 kHz (1 μ Hz resolution)		
Linearity	< 0.2% of peak output		
Programmable symmetry	0% to 100%		
Pulse			
Frequency range	500 μ Hz to 5 MHz (1 μ 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		

1. Add 1/10th of output amplitude and offset specification per $^{\circ}$ C for operation outside the range of 18 $^{\circ}$ C to 28 $^{\circ}$ 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 μ Hz to 200 kHz (1 μ Hz 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)	$\pm 1\%$ 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)	$\pm 2\%$ of offset setting $\pm 1\%$ 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 k Ω , DC coupled
Latency	< 500 ns
Jitter (RMS)	6 ns (3.5 ns for pulse)
Trigger output	
Output Level	TTL compatible into ≥ 1 k Ω
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

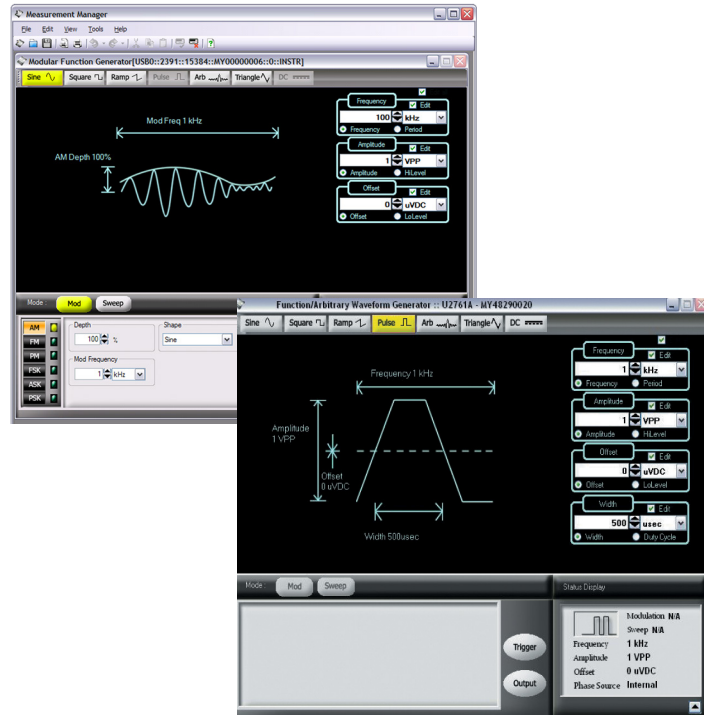
Keysight Measurement Manager

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 with the modular instruments.

Supported features found in the U2761A USB Modular Function/Arbitrary Waveform Generator:

- Command Logger and Code Converter
- 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

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 above¹

Keysight T&M Toolkit Runtime version 2.1²

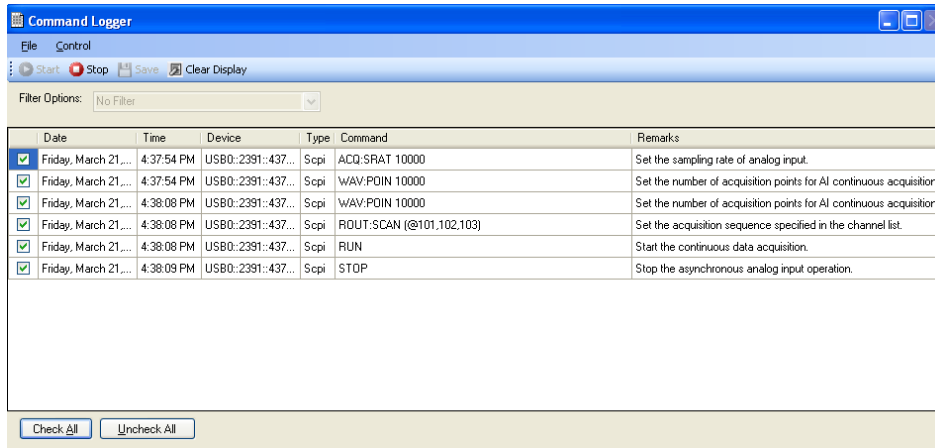
Keysight T&M Toolkit Redistributable Package 2.1 patch²

Microsoft .NET Framework version 2.0²

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

Command logger

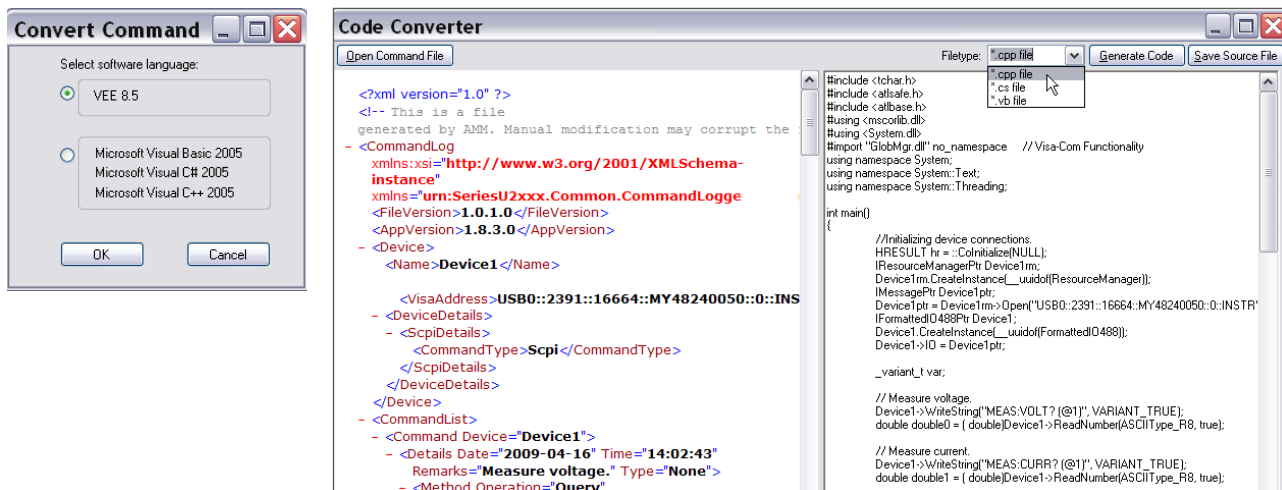
The Command Logger function allows users to log SCPI or IVI-COM command sequences used to control your Keysight USB modular product. The function also captures the time each command is executed. Review the configuration commands at your own pace, or convert the commands to other programming languages with the KMM's Code Converter.



Date	Time	Device	Type	Command	Remarks
Friday, March 21...	4:37:54 PM	USB0::2391::437...	Scpi	ACQ:SRAT 10000	Set the sampling rate of analog input.
Friday, March 21...	4:37:54 PM	USB0::2391::437...	Scpi	WAV:POIN 10000	Set the number of acquisition points for AI continuous acquisition.
Friday, March 21...	4:38:08 PM	USB0::2391::437...	Scpi	WAV:POIN 10000	Set the number of acquisition points for AI continuous acquisition.
Friday, March 21...	4:38:08 PM	USB0::2391::437...	Scpi	ROUT-SCAN (@101,102,103)	Set the acquisition sequence specified in the channel list.
Friday, March 21...	4:38:08 PM	USB0::2391::437...	Scpi	RUN	Start the continuous data acquisition.
Friday, March 21...	4:38:09 PM	USB0::2391::437...	Scpi	STOP	Stop the asynchronous analog input operation.

Code converter

KMM Code Converter comes with two converters: the Keysight VEE Code Converter, and the Microsoft C#/C++/VB Code Converter, allowing you to convert logged SCPI/IVI-COM commands to snippets of VEE Pro, Visual Basic, C++ and C# codes. You can now convert SCPI commands without needing advanced programming skills, helping you program with ease and allowing you to integrate your programs seamlessly for automated tests.



Convert Command

Select software language:

VEE 8.5

Microsoft Visual Basic 2005

Microsoft Visual C# 2005

Microsoft Visual C++ 2005

OK Cancel

Code Converter

Open Command File

Filetype: .cpp file, .cs file, .vb file

Generate Code Save Source File

```
<?xml version="1.0" ?>
<!-- This is a file
generated by AMM. Manual modification may corrupt the
- <CommandLog
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance"
  xmlns="urn:SeriesU2xxx.Common.CommandLogge
">
  <FileVersion>1.0.1.0</FileVersion>
  <AppVersion>1.8.3.0</AppVersion>
  - <Device>
    <Name>Device1</Name>
    <VisaAddress>USB0::2391::16664::MY48240050::0::INS
    - <DeviceDetails>
      - <ScpiDetails>
        <CommandType>Scpi</CommandType>
        </ScpiDetails>
      </DeviceDetails>
    </Device>
  - <CommandList>
    - <Command Device="Device1">
      - <Details Date="2009-04-16" Time="14:02:43"
        Remarks="Measure voltage." Type="None">
        - <Method Operation="Query"
```

```
#include <char.h>
#include <calstate.h>
#include <calbase.h>
#include <mscscorb.dll>
#include <System.dll>
#include "GlobMgr.dll" no_namespace // Visa-Com Functionality
using namespace System;
using namespace System::Text;
using namespace System::Threading;

int main()
{
    //Initializing device connections
    HRESULT hr = ::CoInitialize(NULL);
    IResourceManagerPtr Device1rm;
    Device1rm.CreateInstance(__uuidof(ResourceManager));
    IMessagePtr Device1ptr;
    Device1ptr = Device1rm->Open("USB0::2391::16664::MY48240050::0::INSTR");
    IFormattedIO488Ptr Device1;
    Device1.CreateInstance(__uuidof(FormattedIO488));
    Device1->IO = Device1ptr;

    _variant_t var;

    // Measure voltage
    Device1->WriteString("MEAS:VOLT? (@1)", VARIANT_TRUE);
    double double0 = (double)Device1->ReadNumber(ASCIIType_R8, true);

    // Measure current
    Device1->WriteString("MEAS:CURR? (@1)", VARIANT_TRUE);
    double double1 = (double)Device1->ReadNumber(ASCIIType_R8, true);
```


USB Modular Function Generator App within BenchVue

BenchVue software for the PC makes it simple to connect, control, capture and view multiple Keysight instruments simultaneously with no additional programming. You can derive answers faster than ever by easily viewing, logging and exporting measurement data and screen images with a few clicks from a single environment.

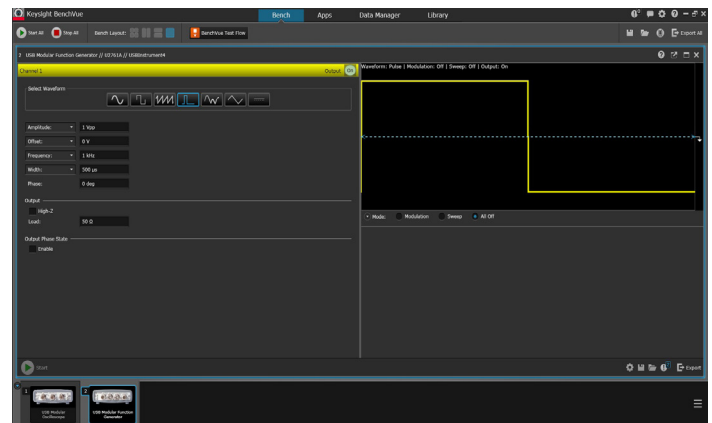
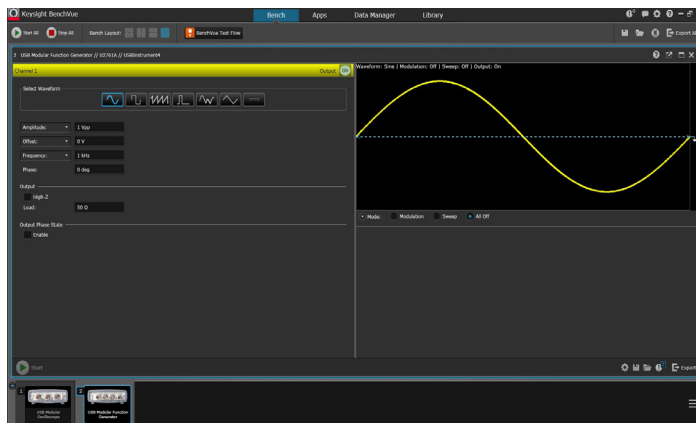
- Visualize multiple measurements simultaneously
- Easily log data, screen shots and system state
- Rapidly prototype custom test sequences
- Recall past states of your USB Modular to replicate results
- Export measurement data in the desired format fast
- Quickly access manuals, drivers, FAQs and videos

The USB Modular Function Generator App within BenchVue allows you to easily configure the U2761A Function/Arbitrary Waveform Generator, set waveform properties and load custom arbitrary waveforms – either from files or simply drag and drop a measured trace from an oscilloscope. Upgrading to the Pro version (BV0022A) will provide you with advanced custom waveform creation capabilities by linking BenchVue to the Keysight Waveform Builder Pro Software.



View measurements across USB DAQ, modular and bench instruments all on one BenchVue interface.

Get started with BenchVue, downloadable at no cost at www.keysight.com/find/benchvue.



Controlling your function generator is as easy as point and click, or drag and drop.

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

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

Evolving

Our unique combination of hardware, software, support, and people can help you reach your next breakthrough. **We are unlocking the future of technology.**



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Three-Year Warranty

www.keysight.com/find/ThreeYearWarranty

Keysight's committed to superior product quality and lower total cost of ownership. Keysight is the only test and measurement company with three-year warranty standard on all instruments, worldwide. And, we provide a one-year warranty on many accessories, calibration devices, systems and custom products.



Keysight Assurance Plans

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Up to ten years of protection and no budgetary surprises to ensure your instruments are operating to specification, so you can rely on accurate measurements.

Keysight Channel Partners

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Get the best of both worlds: Keysight's measurement expertise and product breadth, combined with channel partner convenience.

www.keysight.com/find/U2761A

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