

[United States Home](#) > ... > [Oscilloscopes](#) > [U1600A Series handheld oscilloscopes \(2 models\)](#) >

U1602A Handheld Oscilloscopes, 20 MHz

Product Status: Currently Orderable | Currently Supported



Key Specifications

20-MHz Bandwidth

- 2 channels
- 200 MSa/s Sampling Rate
- 125 KB Memory Depth
- Color Display - 4.5 inch

Features

- Waveform Zoom and Math Functions
- 6000 count Digital Multimeter
- Data Logger Capability

Connectivity

- Connectivity Standard: USB 2.0 Full Speed IO Interface

Optional Connectivity

- USB Host Capability with Option 001 - Allows you to connect to a USB Memory Device and download waveforms instantaneously.

Note that this option has to be specified when placing an order as it cannot be retrofitted on completed or shipped units.

Description

The NEW Agilent U1602A handheld digital oscilloscope is a full-featured oscilloscope that offers maximum versatility for current and future needs. The Agilent U1602A model is a dual-channel, 20-MHz oscilloscope that has built-in DMM and recorder functions.

Features

- **Three-in-one solution: Dual channel oscilloscope, True RMS DMM, and Real-Time Data Logger**
- **Large 4.5" color LCD display**
- **Up to 40 MHz bandwidth with advanced triggering**
- **Up to 200 MSa/s sampling rate**
- **125 kilobytes of waveform memory depth**
- **22 automatic scope measurement functions available**
- **6,000-count DMM resolution with built-in measurement functions including voltmeter, ohmmeter, and auxiliary meter**
- **Zoom and Dual Waveform Math functions (additional FFT function with four windowing techniques available in U1604A)**
- **Full remote control and data transfer via PC Link application software**
- **USB 2.0 full-speed interface connectivity**
- **Multi-language Quick Help support**

Introduction

The U1600A Series handheld digital oscilloscope has a 4.5-inch LCD color display, which helps to clearly distinguish waveforms between two channels. This U1600A Series provides a high performance troubleshooting and quality assurance tool for technical professionals in the installation, maintenance, service, and automotive industries. The U1600A Series consists of two models: U1602A – 20 MHz oscilloscope and U1604A – 40 MHz oscilloscope. Each model has a real-time sampling rate of up to 200 MSa/s. Users can use the Dual Waveform Math (DWM) and Fast Fourier Transform (FFT) functions (in the U1604A model) to perform quick waveform analyses in both time and frequency domains. The built-in 6000 resolution count true RMS digital multimeter (DMM) comes with an auto-range feature that gives users the flexibility to perform quick and accurate meter measurements including voltage, resistance, and auxiliary measurements. In addition,

the standard versions of the U1600A Series models also contain a data logger function.

A scope, true RMS DMM, a real-time data logger in one instrument

The U1600A Series is a robust, high performance and reliable handheld waveform and meter measurement tool for today's challenging industrial environments. Not only do these instruments provide fully featured oscilloscope functions, but also a 6,000-count true RMS DMM with real-time data logger. The DMM measurement functions include a voltmeter (for DC voltage, AC voltage and true RMS AC + DC voltage measurements), an ohmmeter (for 2-wire resistance, capacitance, diode and continuity tests), and an auxiliary meter (for temperature, ampere measurement).

U1600A Series Features

Oscilloscope Mode

The U1600A Series handheld digital oscilloscope offers the following standard and advanced features to make your analysis and troubleshooting tasks easier and faster.

Deep memory

The U1600A Series has 125 kilobytes of memory depth.

Autoscale

Autoscale enables the instruments to quickly display any active signals, and automatically adjust the vertical and horizontal settings with trigger control for best-possible signal display.

Dual Waveform Math (DWM) and Fast Fourier Transform (FFT)

The U1600A Series offers analysis functions including addition and subtraction for DWM, as well as FFT with four windowing techniques (Rectangular, Hanning, Hamming and Blackman-Harris). The FFT function is only available on the U1604A model.

Cursor measurement

You can use the cursor function to manually place the readout of the waveform's voltage at any desired vertical or horizontal point.

22 automatic measurements

Up to 22 automatic measurements are available. You can carry out and display four different measurements simultaneously.

Advanced triggering

Advanced triggering includes edge, pulse width, pattern, and video functionality to help you isolate the signal you want to see.

Easy connectivity

The PC Link application software is bundled with the purchase of any U1600A Series handheld digital oscilloscope. This software provides flexibility for data collection, storage and documentation needs via USB connectivity.

Save and recall waveform and setup memories

Up to 10 waveforms and configuration setups can be stored in the instrument and recalled at any time for future use and reference.

Logger Mode

The U1600A Series allows you to customize your data logging for any DMM measurement. This sophisticated function allows you to record and consolidate a sequence of data points for data plotting purposes.

Digital Multimeter (DMM) Mode

Auto-range

All meter measurements come in auto-range mode – the instruments automatically select the most appropriate measurement range.

Voltmeter

Voltmeter measurements include DC voltage, AC voltage, and AC + DC voltage with auto-measurement of minimum, maximum, and average values.

Ohmmeter

Ohmmeter measurements include resistance, capacitance, diode test, and continuity test. The auto-measurement of minimum, maximum, and average values applies only to resistance test.

Auxiliary meter

The auxiliary meter carries out temperature and ampere measurements. The auto-measurement of minimum, maximum, and average values are also available in this mode.

SCOPE SPECIFICATIONS^[1]

Vertical System: Scope Channels

Bandwidth (–3 dB)	U1602A: DC to 20 MHz U1604A: DC to 40 MHz
DC vertical gain accuracy	5 mV/div to 20 mV/div: ± 5% full scale 50 mV/div to 100 V/div: ± 3% full scale

Scope Channel Triggering

Trigger sensitivity	DC to 5 MHz: 0.8 divisions U1602A: 5 MHz to 20 MHz – 1 division U1604A: 5 MHz to 40 MHz – 1 division
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SCOPE CHARACTERISTICS^[2]

Acquisition: Scope Channels

Maximum sample rate	U1602A: 200 MSa/s interleaved, 100 MSa/s each channel (50 s/div to 125 ns/div) U1604A: 200 MSa/s interleaved, 100 MSa/s each channel (50 s/div to 250 ns/div)
Equivalent sample rate	U1604A: 2.5 GSa/s (125 ns/div to 10 ns/div)
Vertical resolution	8 bits
Maximum memory depth	125 kilobytes
Peak detection	5 ns
Average	Selectable in average number of 2, 4, 8, 16, 32, 64, 128, 256

Vertical System: Scope Channels

Analog channels	Channel 1 and Channel 2 simultaneous acquisition
Bandwidth (–3 dB)	U1602A: DC to 20 MHz U1604A: DC to 40 MHz
AC coupled	< 10 Hz without probe < 1 Hz with 10 M Ω 10:1 probe
Rise time	U1602A: < 17.5 ns U1604A: < 8.8 ns
Single shot bandwidth	U1602A: 20 MHz U1604A: 40 MHz
Vertical sensitivity	5 mV/div to 100 V/div (1:1 scope probe) 50 mV/div to 1 kV/div (10:1 scope probe) 500 mV/div to 10 kV/div (100:1 scope probe)
Maximum input	CAT III 300 Vrms (up to 400 Hz) from terminal to ground
Offset/Dynamic range	± 5 div
Input impedance	1 M Ω < 20 pF
Coupling	AC, DC, GND
Probes	U1560-60001: 1:1 passive probe U1561-60001: 10:1 passive probe U1562-60001: 100:1 passive probe
Probe attenuation factors	1x, 10x, 100x
Coupling	3 Vp-p, ~ 1 kHz
Maximum probe input	1x CAT III 300 VAC 10 x, 100x CAT III 600 VAC

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

[2] All characteristics are typical performance values and are not warranted. Characteristics are valid after a 30-minute warm-up period and within a range of ± 10 °C from firmware calibration temperature.

Noise peak-to-peak	3% of full scale or 5 mV, whichever is greater
DC vertical offset accuracy	$\pm 0.1\%$ div ± 2 mV $\pm 0.5\%$ offset value
Single cursor accuracy	4% full scale
Dual cursor accuracy	4% full scale

Horizontal System

Range	U1602A: 50 ns to 50 s/div U1604A: 10 ns to 50 s/div
Resolution	U1602A: 2 ns U1604A: 400 ps
Reference position	Left, center, right
Delay range (pre-trigger)	15 divisions
Delay range (post-trigger)	1000 divisions
Analog Δt accuracy	$\pm 3\%$ reading $\pm 0.4\%$ screen
Modes	Main, XY, Roll
RMS Jitter	5% of horizontal scale or 5 ns, whichever is higher

Trigger System

Source	Channel 1 and Channel 2
Modes	Auto, normal, single
Selections	Edge, pulse width, pattern, video
Edge	Trigger on a rising or falling edge of any source
Pattern	Trigger at the beginning of a pattern of high, low levels and rising or falling edge established conditions of AND, OR, NOR and NAND between the channels.
Pulse Width	200 ns to 10 s. Trigger when a positive or negative pulse width of any source larger than, less than, equal to or not equal to duration.
Video	Video trigger sensitivity: 0.7 division trigger level. Available to both Channel 1 and Channel 2. Analog progressive and interlaced video standards including NTSC, PAL and SECAM. Positive or negative sync pulse polarity. Modes – all fields, even fields, odd fields or line 5 – 263 within a field.
Range	± 4 divisions from center screen
Level accuracy	± 0.5 divisions
Trigger sensitivity	DC to 5 MHz: 0.8 divisions U1602A: 5 MHz to 20 MHz – 1 division U1604A: 5 MHz to 40 MHz – 1 division
Coupling	DC, AC (< 1 Hz), HF reject (> 50 kHz), LF reject (< 30 kHz), Noise reject

Measurement System

Autoscale	Finds and displays all active scope channels, sets edge trigger mode on highest numbered channel, sets vertical sensitivity on scope channel. Requires voltage > 20 mVp-p, 0.5% duty cycle and frequency > 100 Hz.
Automatic measurement	Measurements continuously updated.
Voltage	Peak-to-peak, maximum, minimum, amplitude, top, base, +overshoot, –overshoot, preshoot, RMS, mean and one cycle mean.
Time	Frequency, period, +width, –width, and +duty cycle and –duty cycle on any channel. rise time, fall time, delay and phase shift.

Cursors	Manually place readout of horizontal (X, ΔX) and vertical (Y, ΔY).
Waveform math	CH1 + CH2, CH1 – CH2, CH2 – CH1
FFT⁽¹⁾	
Window	Rectangular, Hanning, Hamming, Blackman-Harris
Amplitude display	Selectable in amplitude displays of 1 dB, 2 dB, 5 dB, 10 dB

Digital Multimeter Specifications^[1] ± (% reading + % range)

Function	Range	Frequency, Test Current or Burden Voltage	1 year Tcal ± 5° C
DC Voltage	600.0 mV		0.3 + 0.08
	6.000 V		0.3 + 0.08
	60.00 V		0.3 + 0.08
	600.0 V		0.3 + 0.08
AC Voltage	600.0 mV – 600.0 V	50 Hz – 1 kHz	1.0 + 0.2
		1 kHz – 30 kHz	3.0 + 0.2
AC + DC Voltage	6.000 V – 600.0 V	50 Hz – 1 kHz	1.0 + 0.2
		1 kHz – 30 kHz	3.0 + 0.2
Resistance	600.0 Ω		0.5 + 0.2
	6.000 kΩ		0.5 + 0.2
	60.00 kΩ		0.5 + 0.2
	600.0 kΩ		0.5 + 0.2
	6.000 MΩ		0.5 + 0.2
	60.00 MΩ		1.0 + 0.2
Capacitance	60.00 nF		2.0 + 0.2
	600.0 nF		2.0 + 0.2
	6.000 μF		2.0 + 0.2
	60.00 μF		2.0 + 0.2
	300.0 μF		2.0 + 0.2
Diode	1.000 V	0.5 mA	2.0 + 0.08

Auxiliary Meter Specifications ± (% of reading + % of range)

Function	Range	Frequency	1 year Tcal ± 5° C
Temperature, °C	600.0 °C		0.3 + 0.08
	6000 °C		0.3 + 0.08
Temperature, °F	600.0 °F		0.3 + 0.08
	6000 °F		0.3 + 0.08
AC Current	60.00 A	50 Hz – 1 kHz	1.0 + 0.2
	600.0 A	50 Hz – 1 kHz	1.0 + 0.2
DC Current	60.00 A		1.0 + 0.08
	600.0 A		1.0 + 0.08

Measurement Characteristics

Full scale reading	6,000-count
DC voltage, True RMS AC voltage	Maximum input voltage, 600 Vrms CAT II, 300 Vrms CAT III DC coupled input coupling
Continuity	Beeper < 60 W in 600 W range

[1] For temperatures between 0 °C to 18 °C and 28 °C to 50 °C, add 0.1% of reading + 0.02% of range for every degree Celsius.

Data Logger

Source	Digital multimeter measurements
Range	10 divisions
Record size	Up to 8800 data points (with option 001)
Time span	Auto range 150 seconds to 20 days
Time reference	Time from start
Record method	Selectable minimum, maximum and average

Display System

Display	4.5-inch diagonal color CSTN LCD
Resolution	320 x 240 pixels
Control	Contrast control, infinite persistence on/off
Built-in help system	Functional help displayed by pressing help button
Real-time clock	Time and date (user-adjustable)

Storage

Save/Recall (non-volatile)	Up to 10 setups and traces
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GENERAL CHARACTERISTICS

Power Adapter

Line voltage range 50/60 Hz, 100 – 240 VAC
Output voltage 12 VDC

Battery

Ni-MH rechargeable battery pack 7.2 V, 4500 mAh
Operating time: 4 hours
Charging time: 5 hours, measurement unit off
Allow ambient temperature during charging: 10 °C to 40 °C

Operating Environment

Temperature	Operating full accuracy	0 °C to 50 °C
	Non-operating	-20 °C to 70 °C
Humidity	Operating full accuracy	to 80% RH at 40 °C
Altitude	Operating full accuracy	Up to 2000 m
	Non-operating	15000 m (50000 ft)
ESD tolerance		± 4 kV

Safety Compliance

IEC 61010-1: 2001/EN61010-1: 2001
CSA C22.2 No. 61010-1: 2004
UL 61010-1: 2004
Pollution degree 2
This instrument is rated for indoor use only.

Dimensions (HxWxD)

24.1 cm height x 13.8 cm width x 6.6 cm depth

Weight

1.5 kg

I/O

USB 2.0 full-speed client (standard)
USB 2.0 full-speed host (option 001)
Firmware upgrade through USB.

Warranty

3 years

DIMENSIONS

