

# 2011 Distribution Sales Guide

As your knowledge grows, so will your sales

For Employees of Agilent Authorized Distributors Only – Not for Customers or End Users



**Agilent Technologies**

# Welcome to the Distribution Sales Guide

## Dear Sales Partner,

**Welcome to the Agilent team.** We're excited to have you sell our products. Agilent Technologies is the world's leading provider of test and measurement solutions. Our product line-up covers everything from general-purpose to specialized instruments with the solid performance and reliability Agilent always delivers. So your customers get the capabilities they want and the value they demand.

**We created this guide to help you satisfy customers and *earn more money*.** We want to make selling Agilent instruments easy and profitable for you.

**Add to your sales with Accessories and Options.** Pay special attention to accessories and options, because these add-ons can mean more satisfied customers and more money for you.

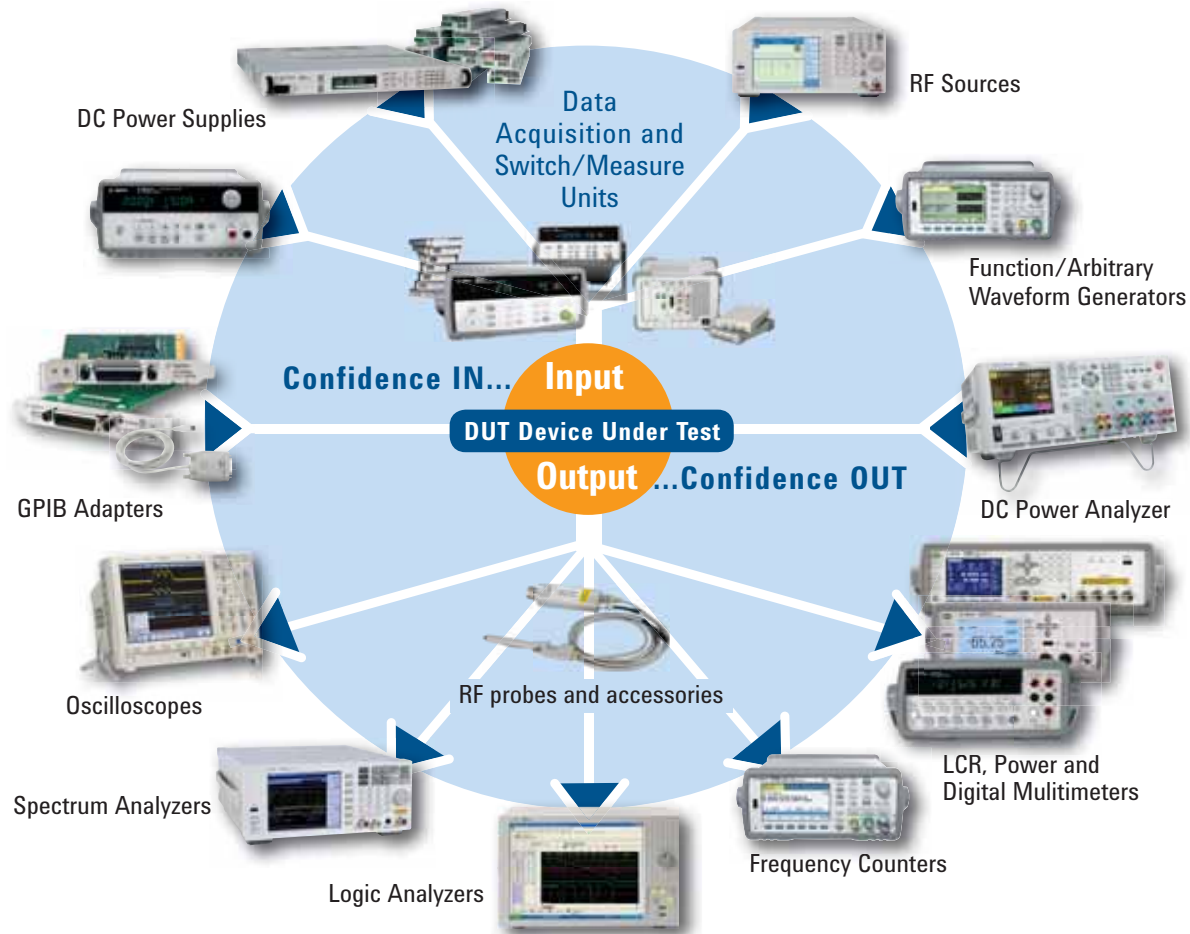
**Also focus on the revenue potential in the Cross-sell list.** These are instruments that customers often use with the main product and that work well with it. You can see the potential for selling additional instruments when you consider the typical test-and-measurement bench setup shown on page 3.

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US prices are subject to change without notice.

# Agilent's Complete Device Under Test — Solutions







# RF and Universal Frequency Counters/Timers

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# RF and Universal Frequency Counters/Timers

## What is a counter?

**Measurement/function:** Provide the most accurate and lowest cost way to measure frequency. They offer better resolution, speed and accuracy at a lower cost for frequency or timing measurements than scopes, spectrum analyzers or other instruments.

## Customer application and needs

R&D and calibration/metrology	Design validation	Manufacturing
<ul style="list-style-type: none"><li>• Check frequency and timing accuracy to ensure they are within design spec or tolerance</li><li>• Calibrate instruments that create or measure a signal (such as spectrum analyzers and function generators)</li></ul>	<ul style="list-style-type: none"><li>• Check frequency or timing accuracy and stability in various operating and environmental conditions</li></ul>	<ul style="list-style-type: none"><li>• Make frequency or system timing measurements to ensure no component defects or problems in the manufacturing process</li></ul>
User needs:	User needs:	User needs:
<ul style="list-style-type: none"><li>• High accuracy and resolution</li><li>• Ease-of-use and reliability</li><li>• Measurement information</li><li>• Statistical and trending capabilities</li></ul>	<ul style="list-style-type: none"><li>• High accuracy and resolution</li><li>• Statistical and trending capabilities</li></ul>	<ul style="list-style-type: none"><li>• High speed</li><li>• Best accuracy possible at a low cost</li></ul>

## Competitive cross reference


Agilent	53181A	53210A	53131A	53132A	53220A	53230A	53140/50 Series
Pendulum Tektronix Fluke				Pendulum CNT 90 Tek FCA 3000 Fluke PM6690		Pendulum CNT 91 Tek FCA 3100	



## Questions for your customer

Use the answers to choose the most suitable model from the table below.

<b>Speed of signal</b>	<b>What frequency do you need to measure?</b>
<b>For frequencies up to 15 GHz</b>	<b>53210A, 53220A and 53230A</b> all have options that handle frequencies to 15 GHz.
<b>For frequencies up to 46 GHz</b>	Choose the <b>5314x</b> or the <b>5315x</b> microwave frequency counters.
<b>Number of channels</b>	<b>Will you need to make time interval measurements?</b>
Two channels are required to make time interval measurements, select <b>53220A</b> or <b>53230A</b> .	
<b>Resolution and accuracy</b>	<b>How precise do your measurements need to be?</b>
<b>10 digits/s</b>	<b>53210A</b> offers 10 digits/s frequency resolution.
<b>12 digits/s</b>	<b>53220A</b> and <b>53230A</b> both provide 12 digits/s frequency resolution.
<b>Highest resolution and accuracy</b>	Single-shot timing resolution affects the accuracy of both frequency and timing measurements. Select the <b>53230A</b> if highest accuracy measurements are important (20 ps).

Model number	Why buy? 1-minute sell	Inputs and resolution	Frequency range (optional)	Measurements	Starting price USD
<b>53210A</b>	<ul style="list-style-type: none"> <li>Frequency measurements like 53181A, higher performance</li> <li>Large color graphical display with built-in analysis</li> </ul>	RF frequency counter (1 channel), 10 digits/s	Optional microwave channel up to 15 GHz	<ul style="list-style-type: none"> <li>Frequency, period, frequency ratio, level</li> </ul>	\$1,963
<b>53220A</b> 	<ul style="list-style-type: none"> <li>Adds a second channel for timing measurements</li> <li>Large color graphical display with built-in analysis</li> <li>Leading price/performance value for universal counter</li> </ul>	Universal counter/timer (2 channels), 12 digit/s, 100 ps time interval	DC to 350 MHz (6, 15 GHz)	<ul style="list-style-type: none"> <li>Frequency, period, frequency ratio, level, time interval, single period, rise/fall time, pulse width, duty cycle, phase, totalize</li> </ul>	\$2,273
<b>53230A</b>	<ul style="list-style-type: none"> <li>Highest performing model available</li> <li>Industry-leading 20 ps timing resolution</li> <li>Optional pulse/burst microwave</li> <li>Continuous/gap-free and timestamp measurements for basic modulation domain analysis</li> </ul>	Universal counter/timer (2 channels), 12 digits/s, 20 ps time interval	DC to 350 MHz (6, 15 GHz)	<ul style="list-style-type: none"> <li>Frequency, period, frequency ratio, level, time interval, single period, rise/fall time, pulse width, duty cycle, phase, totalize continuous/gap-free timestamp (MDA), optional pulse microwave</li> </ul>	\$3,552
<b>53181A*</b>	<ul style="list-style-type: none"> <li>Replaced by 53210A</li> </ul>	RF frequency counter (1 channel), 10 digits/s	DC to 225 MHz (1.5, 3, 5 or 12.4 GHz)	<ul style="list-style-type: none"> <li>Frequency, period, frequency ratio, level</li> </ul>	\$1,984
<b>53131A*</b>	<ul style="list-style-type: none"> <li>Replaced by 53220A</li> </ul>	Universal frequency counter (2 channels), 10 digits/s, 500 ps time interval	DC to 225 MHz (3, 5 or 12.4 GHz)	<ul style="list-style-type: none"> <li>Frequency, period, frequency ratio, level, time interval, rise/fall time, pulse width, duty cycle, phase, totalize</li> </ul>	\$2,289
<b>53132A*</b>	<ul style="list-style-type: none"> <li>Replaced by 53230A</li> </ul>	Universal frequency counter (2 channels), 12 digits/s, 150 ps time interval	DC to 225 MHz (3, 5 or 12.4 GHz)	<ul style="list-style-type: none"> <li>Frequency, frequency ratio, time interval, period, rise/fall time, pulse width, duty cycle, phase, totalize, peak voltage, time interval average.</li> </ul>	\$3,568

**\* In all cases, the 53210A, 53220A and 53230A will outperform the previous-generation 53181A, 53131A and 53132A. Sell the older models in a repeat purchase for manufacturing or test system setup.**

# 53210A 350 MHz RF Frequency Counter

LXI



*Build on speed and accuracy with more information and connectivity.*

Starting price: **\$1,963**

*For bandwidth needs above 20 GHz, recommend Agilent microwave counters*

## Key features

- 350 MHz, 10-digit frequency resolution and optional 6 GHz or 15 GHz microwave channels
- Large color graphical display with built-in analysis capabilities: math, statistics, histogram, trend/stripchart and datalogging
- Measurements: frequency, period, frequency ratio, voltage level
- Connectivity LXI Class-C compliant with LAN, USB and GPIB (optional)

## Qualify

- **Need two channels (timing measurements)?** If yes, sell 53220A or 53230A; otherwise, sell 53210A.
- **Need higher frequency?** Buy a third channel (Option 106 or 115).
- **Need a high stability timebase?** Buy Option 010. Also consider Option 300 (battery) for keeping timebase warm.

## Options

Option 010*	Ultra-high-stability OCXO timebase
Option 106*	6 GHz microwave input
Option 115*	15 GHz microwave input
Option 201*	Add rear panel parallel inputs for baseband channels
Option 203*	Microwave input—rear panel SMA (f) connector
Option 300*	Add internal lithium ion smart battery and charger
Option 400*	Add GPIB interface

\* Order 53200U-xxx to retrofit your counter with one of these options.

## Optional accessories

1250-1476	Adapter, Type-N (m) to BND (f), DC to 4 GHz
N2870A	Passive probe, 1:1, 35 MHz, 1.3 m
N2873A	Passive probe, 10:1, 500 MHz, 1.3 m
N2874A	Passive probe, 10:1, 1.5 GHz, 1.3 m
34131A	Transit case
34190A	Rackmount kit (mounting single instrument)
34191A	2U dual flange kit (mounting two 2U instruments side-by-side)
34194A	Dual lock link kit (for side-by-side instrument mounting)

## Cross-sell

- 34401A DMM
- 33521A/33522A function/arbitrary waveform generator
- E3600 Series of bench power supplies
- 3000 X-Series oscilloscopes



# 53220A/53230A 350 MHz Universal Frequency Counter/Timers



*Build on speed and accuracy with more information, connectivity and measurement capabilities.*

Starting price: **\$2,273**

## Competitive advantage

<b>Agilent 53220A Series</b>	<ul style="list-style-type: none"> <li>Single-shot time-interval resolution of 20 ps</li> <li>USB (I/O and Memory), LXI-C/LAN, GPIB</li> <li>Full-color graphical display</li> <li>Built-in math, graphs and analysis</li> </ul>
<b>Pendulum CNT 90/91</b>	<ul style="list-style-type: none"> <li>3.5 M reading memory (vs. Agilent's 1 M)</li> </ul>
<b>Tek FCA 3000/3100</b>	<ul style="list-style-type: none"> <li>Higher capability timebase standards available</li> <li>Frequency options up to 20 GHz</li> </ul>

**Other competition:** Picotest U6200A, Stanford SR 620

*For bandwidth needs above 20 GHz, recommend Agilent microwave counters.*

## Key features

- 350 MHz, 12-digit frequency resolution, 100/20 ps single-shot timing resolution
- Optional 6 GHz or 15 GHz microwave channels
- Large color graphical display with built-in analysis: math, statistics, histogram, trend/stripchart, and datalogging
- Measurements: frequency, period, frequency ratio, voltage level, time interval, single period, pulse width, rise/fall time, duty, phase totalize
- Connectivity LXI Class-C compliant with LAN, USB and GPIB (optional)
- 53230A only: continuous/gap-free measurements and timestamps for modulation domain analysis, optional pulse/burst microwave measurements

## Qualify

- Need the highest performance single-shot timing?** Sell 53230A (20 ps); otherwise sell 53220A (100 ps).
- Need measurements for modulation domain analysis or pulse microwave?** Sell 53230A with Option 106/115 and Option 150 for pulse/burst microwave.
- Need higher frequency?** Buy a third channel (Option 106 or 115).
- Need a high stability timebase?** Buy Option 010. Also consider Option 300 (battery) for keeping timebase warm.

## Options

Option 010*	Ultra-high-stability OCXO timebase
Option 106*	6 GHz microwave input
Option 115*	15 GHz microwave input
Option 201*	Add rear panel parallel inputs for baseband channels
Option 203*	Microwave input—rear panel SMA (f) connector
Option 300*	Add internal lithium ion smart battery and charger
Option 400*	Add GPIB interface

\*Order 53200U-xxx to retrofit your counter with one of these options.

## Optional accessories

1250-1476	Adapter, Type-N (m) to BND (f), DC to 4 GHz
N2870A	Passive probe, 1:1, 35 MHz, 1.3 m
N2873A	Passive probe, 10:1, 500 MHz, 1.3 m
N2874A	Passive probe, 10:1, 1.5 GHz, 1.3 m
34131A	Transit case
34190A	Rackmount kit (mounting single instrument)
34191A	2U dual flange kit (mounting two 2U instruments side-by-side)
34194A	Dual lock link kit (for side-by-side instrument mounting)

## Cross-sell

- 34401A DMM
- 33521A/33522A function/arbitrary waveform generator
- E3600 Series of bench power supplies
- 3000 X-Series oscilloscopes

# 53181A/53131A/53132A 225 MHz RF/Universal Frequency Counters



Industry-standard family for fast, accurate frequency and time measurements

Starting price: **\$1,845**

## Competitive advantage

Agilent 53181A, 53131A, 53132A	<i>The 53200 series will outperform the previous-generation 531xx series in all cases. Repeat purchase for manufacturing or test system setup only.</i>
Agilent 53200 Series	<ul style="list-style-type: none"> <li>• More connectivity options</li> <li>• Color graphical display</li> <li>• Higher frequency bandwidth</li> <li>• Lower price</li> </ul>
Pendulum CNT 90/91 Tek FCA 3000/3100	<ul style="list-style-type: none"> <li>• Time-interval resolution: 50 ps</li> <li>• Higher capability timebase options</li> <li>• Built-in graphing capabilities</li> </ul>

**Other competition:** Picotest U6200A, Stanford SR 620

**In all cases, the 53210A, 53220A and 53230A will outperform the previous-generation 53181A, 53131A and 53132A.** Sell the older models in a repeat purchase for manufacturing or test system setup.

## Key features

- 225 MHz, 10- or 12-digit frequency resolution and optional 1.5 GHz (53181A), 3 GHz, 5 GHz or 12.4 GHz microwave channels
- Measurements (all models): frequency, frequency ratio, period, peak voltage
- Time-interval measurements (53131A, 53132A): time interval, rise/fall time, pulse width, duty cycle, phase, totalize, time interval average
- GPIB and RS-232, plus IntuLink software for connectivity

## Qualify

- **Need to make a repeat purchase for a manufacturing or test system setup?** Sell 53181A, 53131A or 53132A. Otherwise, sell 53210A, 53220A or 53230A.

## Options

Option 001	Medium-stability timebase
Option 010	High-stability timebase
Option 112	Ultra-high-stability timebase (53132A only)
Option 115	1.5 GHz RF input (53181A only)
Option 030	3 GHz RF channel 2 input
Option 050	5 GHz RF channel 2 input
Option 124	12.4 GHz RF channel 2 input

## Optional accessories

Connectivity	(one of the following)
82350B	PCI high-performance GPIB card
82351A	PCIe™-GPIB interface card
82357B	GPIB/USB interface
E5810A	LAN/GPIB gateway
10833A/B/C/D/E/G	GPIB cable
34190A	Rackmount kit (mounting single instrument)
34191A	2U dual flange kit (mounting two 2U instruments side-by-side)
34194A	Dual lock link kit (for side-by-side instrument mounting)

## Cross-sell

- 34401A DMM
- 33521A/33522A function/arbitrary waveform generator
- E3600 Series of bench power supplies
- 3000 X-Series oscilloscopes



# Data Acquisition and Switching

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# Data Acquisition and Switching

## What are data acquisition (DAQ) and switching?

### Measurement/function:

**Data acquisition** (DAQ, DAC) measures electrical and physical properties over time to generate data that can be manipulated using a computer. A sensor or transducer is used to convert data for physical properties to electrical signals. The DAQ system measures the electrical signal, processes the data and reports the measurement in appropriate units.

**Switching** enables signals to be routed through a test system.

## Customer application and needs

R&D	Manufacturing	Other
<ul style="list-style-type: none"> <li>Characterize the functionality of a design</li> </ul>	<ul style="list-style-type: none"> <li>Route signals through different test points of products as part of functional test</li> </ul>	<ul style="list-style-type: none"> <li>Perform data logging and monitoring measurements with many points</li> </ul>
User needs:	User needs:	User needs:
<ul style="list-style-type: none"> <li>Flexibility to test on bench or in environmental chamber</li> <li>Easy-to-use front panel</li> <li>Easy to control remotely</li> <li>Seamless integration with other instruments</li> <li>Low number of channels</li> </ul>	<ul style="list-style-type: none"> <li>Complete remote control</li> <li>Storage of small log files</li> <li>Flexibility to work with many kinds of instruments</li> </ul>	<ul style="list-style-type: none"> <li>Portability to use in the field or in multiple locations</li> <li>Capability to automate with other instruments</li> <li>Storage of very large log files</li> <li>Flexibility that allows access to few or many switches</li> </ul>

## Competitive cross reference

Agilent	34970A	34972A	34980A
Keithley	2700	2701, 2750	3700
Fluke	2640/45	Hydra	
Discontinued Agilent models	HP 3488, HP 3497A, HP3852A		



## Questions for your customer


Use the answers to choose the most suitable model from the table below.

Number of channels	How many signals will you view at one time?
<b>60 2-wire</b>	View 120 single-wire signals with <b>34072A</b> .
<b>1024 2-wire</b>	View 1024 signals with <b>34980A</b> .
Measurement/input types	What types of measurements will you need?
<b>Temperature</b>	All models perform the temperature measurements common in data logging applications. Thermocouples are the most common and lowest cost but also the least accurate; RTDs and thermistors are more expensive but more accurate.  Other common data acquisition measurements include voltage, current, resistance, frequency and counter.
Switching capabilities	What kind of card configuration will you need?
<b>Multiplexer</b>	A multiplexer configuration is used for signal switching to a single measuring instrument. One signal is connected at a time to the measuring device, and the input is disconnected before a new input is connected.
<b>Matrix</b>	A matrix configuration offers more switching flexibility by connecting multiple inputs, such as signal sources, to multiple outputs, such as test inputs.
<b>Multifunction</b>	Multifunction cards provide a mix of digital and analog input and output.



Agilent also offers USB modular instruments that can provide data acquisition and switching capabilities in a computer-hosted form factor.

[See Modular Instruments on page 121.](#)

Model number	Why buy? 1-minute sell	Measurement/input types	Switching capabilities	Starting price USD
<b>34970A</b>	<ul style="list-style-type: none"> <li>Low cost and high performance</li> <li>Measures up to 120 single-wire channels</li> </ul>	<ul style="list-style-type: none"> <li>2- and 4-wire resistance,</li> <li>DC and AC volts</li> <li>Temperature: 8 thermocouple types, RTDs and thermistors</li> <li>Frequency, period to 300 kHz</li> <li>DCI, ACI (using 34901A module only)</li> </ul>	<ul style="list-style-type: none"> <li>General purpose, multiplexer, matrix, RF and multifunction</li> </ul>	\$1,597
<b>34972A</b> 	<ul style="list-style-type: none"> <li>Same functionality as 34970A with LAN and USB interfaces plus USB memory port</li> </ul>	<ul style="list-style-type: none"> <li>2- and 4-wire resistance</li> <li>Temperature (RTDs, thermocouples, thermistors)</li> <li>AC/DC volts and current</li> <li>Frequency/period</li> </ul>	<ul style="list-style-type: none"> <li>General purpose, multiplexer, matrix, RF and multifunction</li> </ul>	\$1,845
<b>34980A</b>	<ul style="list-style-type: none"> <li>Compact, high-performance platform with more than 20 modules</li> <li>Higher channel count, more switching possibilities and greater connectivity for system applications than 34970A</li> </ul>	<ul style="list-style-type: none"> <li>2- and 4-wire resistance, DC and AC volts and current</li> <li>Temperature: 8 thermocouple types, RTDs and thermistors</li> <li>Frequency, period to 10 MHz</li> <li>Digital I/O with pattern capabilities, D/A converters, counter/totalizer</li> </ul>	<ul style="list-style-type: none"> <li>General-purpose and multifunction DC to 26 GHz, multiplexer, matrix, RF <math>\mu</math>W and <math>\mu</math>W relay driver</li> </ul>	\$2,521



# 34972A LXI Data Acquisition and Switch Unit

**LXI**



Same features as the popular 34970A but with new LAN and USB connectivity options.

Starting price: **\$1,845**

## Competitive advantage

<b>Agilent 34972A</b>	<ul style="list-style-type: none"> <li>• Three slots</li> <li>• 1 Gbit LAN and USB 2.0 interfaces</li> <li>• USB stick to access data without computer</li> <li>• Easy control via graphical web interface</li> </ul>
<b>Keithley 2701</b>	<ul style="list-style-type: none"> <li>• Two slots</li> <li>• LAN and RS-232 interfaces only</li> </ul>

**Other competition:** Fluke Hydra, HP 3852A, HP 3488A, HP 3497A, VXI, PXI

## Key features

- 3-slot LXI mainframe with 6½ digit DMM and built-in signal conditioning measures temperature (RTDs, thermocouples, thermistors), AC/DC voltage, 2-/4-wire resistance, frequency/period, AC/DC
- Accepts all 34970A switch and control plug-in modules
- 1 Gbit LAN and USB 2.0 standard on all units
- USB stick capability for data storage or transfer
- Web interface for easy set-up and control
- Free BenchLink data logger software to create tests without programming

## Qualify

- **Need direct LAN or USB connection to the PC?** Sell 34972A.
- **Need to log large amounts of data to a USB stick?** Sell 34972A.
- **Need higher sampling rate?** Sell U2xxx modular data acquisition or up-sell 34980A.
- **Need advanced data logging software?** Sell 34930A Data Logger Pro software.

## Included accessories

- Thermocouple
- BenchLink Data Logger Software
- Screwdriver
- Standard product manuals, calibration test report, and programming and reference CD-ROMs

## Plug-in modules

34901A	20-channel, general-purpose mux	34902A	16-channel, high-speed mux
34903A	20-channel actuator/general-purpose switch (form C)	34904A	4x8 matrix card
34905A	50 Ω RF mux	34906A	75 Ω RF mux
34907A	Multifunction module	34908A	40-channel single-ended mux

## Options

Option 001	Delete internal DMM (Order 34970-80010 to retrofit DMM at a later time.)
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## Optional accessories

34830A	Data Logger Pro software	34307A	10-pack of J-type thermocouples
34308A	5-pack of 10 kΩ thermistors	34131A	Hard carrying case
34191A	2U dual flange kit	34194A	Dual lock link kit
34905-60001	Kit of 10 SMB-to-BNC adapter cables, 50 Ω	34190A	Rackmount kit with filler panel
34906-60001	Kit of 10 SMB-to-BNC adapter cables, 75 Ω	34161A	Accessory pouch

## Cross-sell

- E3600 Series of bench power supplies
- 3000 X-Series oscilloscopes
- 33220A function/arbitrary waveform generator

# 34970A Data Acquisition and Switch Unit



60-channel count, 3-slot mainframe used for data acquisition with included 6½-digit DMM or switching without DMM.

Starting price: **\$1,597**

## Competitive advantage

<b>Agilent 34970A</b>	<ul style="list-style-type: none"><li>• Three slots, up to 120-channel count</li><li>• Value price and high reliability</li><li>• GPIB and RS-232 interfaces</li></ul>
<b>Keithley 2700/2701</b>	<ul style="list-style-type: none"><li>• Two slots</li><li>• More accurate DC resolution at 0.003% vs 0.004%</li></ul>

**Other competition:** Fluke Hydra, HP 3852A, HP 3488A, HP 3497A, VXI, PXI

## Key features

- 3-slot mainframe with 6 1/2 digit DMM, choose from 8 plug-in modules with up to 120 single-ended (60 2-wire) channels or 96 matrix crosspoints
- Unique capability to count every closure on every switch for easy, predictable relay maintenance
- 50 K readings of nonvolatile memory, auto timestamp
- Measurements include 2- and 4-wire resistance, DC and AC volts, temperature (8 thermocouple types, RTDs and thermistors), frequency, period to 300 kHz, DCI, ACI (using 34901A module only)

## Qualify

- **Need higher sampling rate?** Sell U2xxx modular data acquisition or up-sell 34980A.
- **Need more measurement types or a higher number of channels?** Up-sell 34980A.
- **Need data logging software?** Sell 34930A Data Logger Pro software.
- **Need direct LAN or USB connection to the PC or to log large amounts of data to a USB stick?** Sell 34972A.

## Included accessories

- RS-232 cable
- BenchLink Data Logger Software
- Standard product manuals, calibration test report, and programming and reference CD-ROMs
- Thermocouple
- Screwdriver

## Plug-in modules

34901A	20-channel, general-purpose mux	34902A	16-channel, high-speed mux
34903A	20-channel actuator/general-purpose switch (form C)	34904A	4x8 matrix card
34905A	50 $\Omega$ RF mux	34906A	75 $\Omega$ RF mux
34907A	Multifunction module	34908A	40-channel single-ended mux

## Options

Option 001	Delete internal DMM (Order 34970-80010 to retrofit DMM at a later time.)
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## Optional accessories

34830A	Data Logger Pro software	34161A	Accessory pouch
34308A	5-pack of 10 k $\Omega$ thermistors	34131A	Hard carrying case
34191A	2U dual flange kit	34194A	Dual lock link kit
82350B	PCI high-performance GPIB card	82351A	PCI <sup>™</sup> -GPIB interface card
82357B	GPIB/USB interface	E5810A	GPIB/LAN gateway
34307A	10-pack of J-type thermocouples	10833A/B/C/D/E/G	GPIB cable
34905-60001	Kit of 10 SMB-to-BNC adapter cables, 50 $\Omega$	34190A	Rackmount kit with filler panel
34906-60001	Kit of 10 SMB-to-BNC adapter cables, 75 $\Omega$		

# 34980A Data Acquisition and Switch Unit



8-slot switch/measure mainframe with internal DMM switching up to 560 channels.

Starting price: **\$2,521**

## Competitive advantage

<b>Agilent 34980A</b>	<ul style="list-style-type: none"> <li>• 8 slots</li> <li>• Greater selection of modules: 21 modules including RF/<math>\mu</math>W</li> <li>• Higher switch scanning speed</li> <li>• Higher density</li> <li>• Lower cost</li> </ul>
<b>Keithley 3700</b>	<ul style="list-style-type: none"> <li>• 6 slots</li> <li>• Higher resolution with 7½ digit DMM</li> <li>• USB memory port</li> <li>• Smaller 2U size</li> </ul>

**Other competition:** Keithley 2700, Fluke Hydra, HP 3852A, HP 3488A, HP 3497A, VXI, PXI

## Key features

- 8 slots for the 21 available modules with up to 560 2-wire multiplexer channels or 4098 2-wire matrix crosspoints
- Switching from DC to 26 GHz, multiplexer, matrix, RF  $\mu$ W and  $\mu$ W relay driver, digital I/O and analog output
- Built-in 6½-digit DMM supports 11 measurements with over 3000 readings/sec, including 2- and 4- wire resistance, DC and AC voltage and current, temperature (8 thermocouple types, RTDs and thermistors), frequency to 10 MHz, period, digital I/O with pattern capabilities, D/A converter, counter/totalizer

## Qualify

- **Need ATE switching?** Sell matrix, mux, RF or GP plug-ins.
- **Need digital I/O or analog output?** Sell 34950A (digital I/O) or 34952A (both digital I/O and analog output).
- **Need advanced data logging software?** Sell 34832A Data Logger Pro software.

## Included accessories

- BenchLink Data Logger software
- Standard product manuals, calibration test report, and programming and reference CD-ROMs

## Plug-in modules

34921A	40-channel armature multiplexer w/temp	34922A	70-channel armature multiplexer
34923A	40/80-channel reed multiplexer	34924A	70-channel reed multiplexer
34925A	40/80-channel isolated FET multiplexer	34931A	Dual 4x8 armature matrix
34932A	Dual 4x16 armature matrix	34933A	Dual/quad 4x8 reed matrix
34934A	High-density 512 crosspoint matrix	34937A	32-channel form C/form A GP switch
34938A	20-channel 5A form A switch	34939A	64-channel high-density form A switch
34941A	Quad 1x4 50 $\Omega$ 3 GHz multiplexer	34942A	Quad 1x4 75 $\Omega$ 1.5 GHz multiplexer
34945A	Microwave switch/attenuator driver	34946A	Dual 1x2 SPDT term switch (4 or 20 GHz)
34947A	Triple 1x2 SPDT unterminated microwave switch	34950A	64-bit digital I/O w/memory and counter
34951A	4-channel isolated D/A converter	34959A	Breadboard module \$709
34952A	Multifunction module w/digital I/O, D/A, totalizer		

## Options

Option 001	Delete internal DMM
------------	---------------------

## Optional accessories

Many types of connectors and cables available – see [www.agilent.com/find/34980A](http://www.agilent.com/find/34980A).

34832A	Data Logger Pro software	34307A	10-pack of J-type thermocouples
34308A	5-pack of 10 k $\Omega$ thermistors	10833A/B/C/D/E/G	GPIO cable
82350B	PCI high-performance GPIO card	82351A	PCIe™-GPIO interface card

## Cross-sell

- 7000 Series oscilloscopes
- 33220A function/arbitrary waveform generator

An abstract graphic on the left side of the slide. It features several parallel, slightly curved lines that appear to be made of a glowing, golden-yellow material. These lines are set against a dark background and are overlaid with binary code (0s and 1s) in a similar golden-yellow color. The lines and text have a soft glow, giving them a three-dimensional appearance.

# Digital Multimeters

For Employees of Agilent Authorized Distributors Only – Not for Customers or End Users

# Digital Multimeters

## What is a DMM?

**Measurement/function:** Measures DC and AC signals to characterize the design of an electronic device. Measurements include voltage, current, resistance, and capacitance and frequency.

## Customer application and needs

R&D and calibration/metrology	Design validation	Manufacturing
<ul style="list-style-type: none"><li>Complement the function generator and oscilloscope on an engineer's bench</li><li>Provide several measurement functions to fully test component and sub-assembly designs</li></ul>	<ul style="list-style-type: none"><li>Verify design intent before proceeding to manufacturing</li></ul>	<ul style="list-style-type: none"><li>Verify functional operation of devices, ensure DUT meets design specification</li><li>Often DMMs will be built into a manufacturing system that is controlled via computer</li></ul>
User needs:	User needs:	User needs:
<ul style="list-style-type: none"><li>High DC accuracy</li><li>Speed</li><li>Data logging</li><li>Temperature measurements</li></ul>	<ul style="list-style-type: none"><li>High DC accuracy</li><li>Speed</li><li>Data logging</li><li>Temperature measurements</li></ul>	<ul style="list-style-type: none"><li>High DC accuracy</li><li>Remote capability</li><li>High speed</li><li>Best accuracy possible at a low cost</li></ul>

## Competitive cross reference

	Economy	Mid-range			Performance	Specialty
Agilent	34405A	34401A	34410A	34411A	3458A	34420A
Fluke/Keithley	8808A/DMM4020 8845/DMM4040 8846/4050				8508/Fluke only	





## Questions for your customer

Use the answers to choose the most suitable model from the table below.

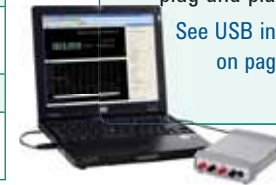
Configuration	Where and how will you use the unit?
<b>Handheld</b>	Handheld models work best for faultfinding and field work.
<b>Benchtop</b>	Benchtop models provide greater accuracy and additional features.
Digits of resolution	How accurate do your measurements need to be?
<b>4½ to 8½</b>	The higher the digits of resolution, the more precise and accurate your measurements will be.
<b>8½</b>	The <b>34458A</b> is Agilent's most accurate DMM.
Measurement types	What types of measurements do you need to make?
<b>See column below</b>	Higher-performance units provide greater accuracy, including the more accurate 4-wire resistance measurement.
Reading speed	How fast do you need to make measurements?
<b>Reading/sec for system use</b>	This speed indicates how fast you can transfer data to a computer. The <b>34411A</b> provides 50,000 readings/sec.


DMMs are also available in a portable and reliable handheld form

See handheld on page 38

Compact DMM available with plug-and-play simplicity

See USB instruments on page 122



Model number	Why buy? 1-minute sell	Digits of resolution	Measurement types/functions	Reading speed	Starting price USD
<b>U3401/2A</b>	<ul style="list-style-type: none"> <li>Basic capabilities</li> <li>Good performance, affordable</li> </ul>	4½ or 5½	DC+AC voltage and current, selectable 2- or 4-wire resistance, frequency, diode and continuity	N/A*	\$449
<b>U3606A</b>	<ul style="list-style-type: none"> <li>DMM and power supply in a single box</li> <li>Compact, affordable</li> </ul>	5½	4-wire mΩ resistance, 30 W dual-range power supply with OVP and OCP load protection, auto scan and ramp, square-wave generator	Up to 37 readings/sec	\$1,199
<b>34405A</b>	<ul style="list-style-type: none"> <li>Slightly lower performance and price than 34401A</li> <li>Ideal for low-cost manufacturing and education</li> </ul>	5½	DC & AC voltage, DC & AC current, 2-wire resistance, frequency, continuity, diode test, capacitance, temperature	Up to 19 readings/sec	\$750
<b>34401A</b> 	<ul style="list-style-type: none"> <li>Industry standard for accuracy, speed, ease and versatility</li> </ul>	6½	DC & AC voltage, DC & AC current, 2- and 4-wire resistance, frequency and period, continuity, diode test	1,000 readings/sec	\$1,072
<b>34410A</b>	<ul style="list-style-type: none"> <li>More measurements, faster readings over the bus than 34401A</li> </ul>	6½	DC & AC voltage, DC & AC current, 2- and 4-wire resistance, frequency and period, continuity, diode test, capacitance, temperature	10,000 readings/sec	\$1,298
<b>34411A</b>	<ul style="list-style-type: none"> <li>Highest throughput of benchtop DMMs</li> <li>Best choice for system use</li> </ul>	6½	DC & AC voltage, DC & AC current, 2- and 4-wire resistance, frequency and period, continuity, diode test, capacitance, temperature	50,000 readings/sec	\$2,067
<b>34420A</b>	<ul style="list-style-type: none"> <li>Very accurate, low-level measurements</li> </ul>	7½	DC voltage and current, 2- and 4-wire resistance (with low power), 2-channel scanning, temperature	250 readings/sec	\$3,942
<b>3458A</b>	<ul style="list-style-type: none"> <li>Highest resolution and accuracy</li> <li>Recognized worldwide as the standard for high-performance DMMs</li> </ul>	8½	DC & AC voltage, DC & AC current, 2- and 4-wire resistance, frequency and period	100,000 readings/sec	\$8,260

\* No computer connectivity, so no remote reading speed.

# 3401/2A Digital Multimeter, 4½ and 5½ Digit



*Affordable DMM with basic functions and good measurement accuracy.*

Starting price: **\$450**

## Competitive advantage

<b>Agilent U3401A/U3402A</b>	<ul style="list-style-type: none"><li>• Agilent reliability</li><li>• DC+AC voltage and current readings</li><li>• Lower overall price</li><li>• One more measurement function</li></ul>
<b>Instek GDM- 8245/8246/8251A</b>	<ul style="list-style-type: none"><li>• Comes with computer interface</li><li>• Lower starting price</li></ul>

## Key features

- Accuracy 0.012% DCV 3402A (0.02% DCV 3401A)
- Kensington lock slot security
- 11 measurements including DC+AC voltage and current, selectable 2- or 4-wire resistance, frequency, diode and continuity
- 6 built-in math functions: dBm, min/max, relative, compare and hold

## Qualify

- **Need a DMM with computer interface?** Up-sell 34401A.
- **Need DMM and power supply?** Sell U3606A.

## Options

U3400A-1CM	Rackmount kit
U3400A-1CN	Lock link kit

## Included accessories

34138A	Test lead kit
34133A	Precision electronic test leads

## Optional accessories

34138A	Test lead kit
34133A	Precision electronic test leads
U1161A	Extended test lead kit
11059A	Kelvin probe set
34330A	Current shunt

## Cross-sell

- U8000 Series DC power supplies
- 33210A function/arbitrary waveform generator
- 3000 X-Series oscilloscopes

# U3606A Multimeter/DC Power Supply



*Combines 5½ digit DMM and a 30 W dual-range power supply in one convenient, efficient instrument.*

Starting price: **\$1,201**

## Competitive advantage

There are no competitive products on the market.

## Key features

- Full-featured DMM with 0.025% DCV accuracy and 30 W dual-range DC supply, 0.01%+3 mV, OVP/OCV protection with simultaneous and independent operation
- Value-add capabilities such as autoramp and scan for multilevel DC bias testing, up to 4.8 kHz square wave output, remote sense and 4-wire m $\Omega$  measurement
- USB-TMC488.2 and GPIB connectivity with SCPI compliance

## Qualify

- **Only need a DMM?** Sell the 34405A or the higher resolution 34401A, 6½ digit.
- **Need more power?** See Power Supply on pages 81-92.

## Options

U3606A-1CN	Rackmount kit
U3606A-1CN	Lock link kit
U3606A-0BN	Printed English manual

## Included accessories

- U8201A combo test lead kit
- USB 2.0 high-speed Type-A-to-Type-B cable
- Quick start guide, calibration test report, and programming and reference CD-ROMs

## Optional accessories

U8201A	Combo test lead kit
U8202A	Electronic test lead kit
E3600A-100	Test lead kit

## Cross-sell

- E3600 Series DC power supplies
- 33210A function/arbitrary waveform generator
- 3000 X-Series oscilloscopes

# 34405A Digital Multimeter, 5½ Digit



Low-cost, general-purpose DMM with accuracy, speed and versatility.

Starting price: \$449

### Competitive advantage

<b>Agilent 34405A</b>	<ul style="list-style-type: none"><li>• Access to temperature and capacitance functions</li><li>• USB 2.0 connection</li><li>• Standard communication software</li></ul>
<b>Fluke F8808A</b>	<ul style="list-style-type: none"><li>• More accurate DCV at 0.015%</li><li>• RS-232 connection</li><li>• Fluke 45 emulation</li></ul>

### Key features

- Accuracy 0.025% DC, 0.2% AC
- True RMS AC voltage and current plus capacitance and temperature
- Total of 11 measurements for a low price
- Agilent I/O Libraries and Intuilink, USB connectivity with IVI-COM and LabView drivers for quick PC connection

### Qualify

- **Need 4-wire resistance?** Up-sell 34401A/10A/11A; otherwise sell 34405A.
- **Need USB?** If GPIB or LAN, up-sell 34401A/10A/11A; otherwise sell 34405A.

### Included accessories

- Test lead kit
- USB interface cable
- Quick start guide, calibration test report, and programming and reference CD-ROMs

### Optional accessories

E2308A	Thermistor probe
34330A	30 A current shunt
U1161A	Extension test lead kit

### Cross-sell

- E3600 Series of bench power supplies
- 33210A function/arbitrary waveform generator
- 3000 X-Series oscilloscopes

# 34401A Digital Multimeter, 6½ Digit



*Industry-standard, general-purpose DMM for accuracy, speed, measurement ease and versatility.*

Starting price: **\$1,072**

## Competitive advantage

<b>Agilent 34401A</b>	<ul style="list-style-type: none"> <li>Higher speed</li> <li>Proven reliability</li> <li>Top seller for 15+ years</li> </ul>
<b>Fluke F8845</b>	<ul style="list-style-type: none"> <li>None</li> </ul>

**Other competition:** Keithley 2000/2100, Advantest AD7641A

## Key features

- Intuitive front panel for quick benchtop use
- 0.0035% DC accuracy, 0.06% AC accuracy
- IntuiLink PC connectivity software included, GPIB and RS-232 standard, USB with adapter, SCPI commands for easy system use
- Measurements include DC and AC voltage, DC and AC current, 2- and 4-wire resistance, frequency and period, continuity, diode test

## Qualify

- **Need 4-wire resistance?** Sell 34401A; otherwise sell 34405A.
- **Need more than 1,000 readings per second?** Up-sell 34410A/11A; otherwise sell 34401A.

## Included accessories

- Test lead kit with probe
- Alligator and grabber attachments
- Standard product manuals, calibration test report, and programming and reference CD-ROMs

## Optional accessories

34161A	Accessory pouch		
34330A	30 A current shunt		
34161A	Input terminal short		
34330A	Kelvin probe set		
11062A	Kelvin clip set		
E2308A	5 KΩ thermistor probe		
34137A	Deluxe test lead kit		
34171B	Input terminal connector		
34190A	Rackmount kit with filler panel		
11060A	Surface mount device (SMD) test probes		
34131A	Hard transit case		
10833A/B/C/D/E/G	GPIB cable		
Connectivity (one of the following):			
82350B	PCI high-performance GPIB card	82351A	PCIe™-GPIB interface card
82357B	GPIB/USB interface	E5810A	GPIB/LAN gateway

## Cross-sell

- E3600 Series of bench power supplies and/or N6700 Series system power supplies
- 33220A function/arbitrary waveform generator
- 3000 X-Series oscilloscopes



# 34410A/34411A Digital Multimeter, 6½ Digit

**LXI**



*High-accuracy DMM with high throughput over the bus.*

Starting price: **\$1,298**

## Competitive advantage

<b>Agilent 34410A/11A</b>	<ul style="list-style-type: none"> <li>Faster system capability (reading rates, function/range changes and data transfer rates)</li> <li>LXI Class-C compliant</li> </ul>
<b>Fluke F8846</b>	<ul style="list-style-type: none"> <li>Better DC accuracy at 0.0024%</li> <li>Histogram display</li> </ul>

**Other competition:** HP/Agilent 3478A, 3458A;  
Fluke 8845A/8846A, 45;  
Keithley 2100; Advantest AD7461A

## Key features

- 0.003% DC accuracy, 0.06% AC accuracy
- Fast reading rate with large memory (up to 1 million readings stored ) to capture higher-frequency signals and save test time
- Industry standard interfaces: LXI Class-C compliant with LAN and GPIB plus connectivity software for test-system use
- Measurements include DC & AC voltage, DC & AC current, 2- & 4-wire resistance, frequency, period, continuity, diode test, capacitance, temperature

## Qualify

- Need 10,000 readings/sec?** Sell 34410A; if more readings/sec needed, sell 34411A.
- Need more than 6½ digits resolution?** Up-sell 3458A; otherwise sell 34410A/11A.

## Included accessories

- Test lead kit with probe and SMT attachments
- USB interface cable
- Standard product manuals, calibration test report, and programming and reference CD-ROMs

## Optional accessories

34162A	Accessory pouch		
34330A	30 A current shunt		
34172B	Input terminal short		
11059A	Kelvin probe set		
11062A	Kelvin clip set		
E2308A	5 KΩ thermistor probe		
34137A	Deluxe test lead kit		
34171B	Input terminal connector		
34190A	Rackmount kit with filler panel		
11060A	Surface mount device (SMD) test probes		
34131A	Hard transit case		
10833A/B/C/D/E/G	GPIB cable		
Connectivity (one of the following):			
82350B	PCI high-performance GPIB card	82351A	PCIe™-GPIB interface card

## Cross-sell

- E3600 Series of bench power supplies and/or N6700 Series system power supplies
- 33220A function/arbitrary waveform generator
- 3000 X-Series oscilloscopes

# 34420A Digital Multimeter, 7½ Digit



High-sensitivity nanovolt and micro-ohm meter .

Starting price: \$3,942

### Competitive advantage

<b>Agilent 34420A</b>	<ul style="list-style-type: none"><li>• Greater accuracy</li><li>• More measurements including <math>\mu\Omega</math>s</li><li>• Calibration lab standard</li></ul>
<b>Keithley 2182</b>	<ul style="list-style-type: none"><li>• Less expensive</li><li>• Fewer features – not a <math>\mu\Omega</math> meter</li></ul>

### Key features

- High sensitivity DCV measurements (100 pV ) and 1.3 nV rms noise
- High sensitivity resistance measurements (100 n $\Omega$ )
- Temperature measurements with 0.003 °C accuracy using SPRT probes
- Measurements include DC voltage, 2- and 4-wire resistance (with low power), 2-channel scanning and temperature
- SCPI and Keithly 181 compatible modes

### Qualify

- **Need low-power 4-wire resistance?** Sell 34420A; otherwise sell 34401A.
- **Need more than 250 readings per second?** Up-sell 3458A; otherwise sell 34410A or 34411A.

### Included accessories

- Test lead kit with with probe and SMT attachments
- Alligator and grabber attachments
- Standard product manuals, calibration test report, and programming and reference CD-ROMs

### Optional accessories

34102A	Low thermal input cable		
34104A	Low thermal input connector		
34190A	Rackmount kit with filler panel		
34103A	Low thermal shorting plug		
34161A	Accessory pouch		
10833A/B/C/D/E/G	GPIB cable		
Connectivity (one of the following):			
82350B	PCI high-performance GPIB card	82351A	PCIe™-GPIB interface card
82357B	GPIB/USB interface	E5810A	GPIB/LAN gateway

### Cross-sell

- E3600 Series of bench power supplies and/or N6700 Series system power supplies
- 33250A function/arbitrary waveform generator
- 9000 Series oscilloscopes

# 3458A Digital Multimeter, 8½ Digit



High-sensitivity nanovolt and micro-ohm meter.

Starting price: **\$3,942**

## Competitive advantage

<b>Agilent 3458A</b>	<ul style="list-style-type: none"> <li>Faster reading speed</li> <li>More memory</li> <li>Calibration lab standard</li> </ul>
<b>Fluke 8508</b>	<ul style="list-style-type: none"> <li>Greater accuracy both AC and DC</li> <li>Fewer features – not a <math>\mu\Omega</math> meter</li> </ul>

## Key features

- 8½ digit resolution with 0.05 ppm transfer accuracy
- Performance leader with max reading rate of 100,000 readings/sec
- Measurements include DC & AC voltage, DC & AC current, 2- and 4-wire resistance, frequency and period

## Included accessories

- Test lead kit with probe
- Alligator and grabber attachments
- Standard product manuals, calibration test report, and programming and reference CD-ROMs

## Options

3458A-001	Extended reading memory (expands total to 148 kbytes)
3458A-002	High stability (4 ppm/year)
3458A-A6J	ANSI Z540-compliant calibration
3458A-907	Front handle kit
3458A-908	Rackmount kit
3458A-909	Rackmount kit with handles

## Optional accessories

34137A	Deluxe test leads		
34330A	30 A current shunt		
34308A	Thermistor kit		
11053A	Low thermal test lead pair, spade lug to spade lug, 0.9 m		
11174A	Low thermal test lead pair, spade lug to banana lug, 0.9 m		
11058A	Low thermal test lead pair, banana lug to banana lug, 0.9 m		
11058A	Kelvin probe set (4-wire, 1 m)		
11062A	Kelvin clip set		
E2308A	5 K $\Omega$ thermistor temperature probe		
10833A/B/C/D/E/G	GPIB cable		
Connectivity (one of the following):			
82350B	PCI high-performance GPIB card	82351A	PCIe™-GPIB interface card
82357B	GPIB/USB interface	E5810A	GPIB/LAN gateway

## Cross-sell

- E3600 Series of bench power supplies and/or N6700 Series system power supplies
- 33250A function/arbitrary waveform generator
- 9000 Series oscilloscopes



# Function, Arbitrary, Pulse or Pattern Generators

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# Function, Arbitrary, Pulse or Pattern Generators

## What is a function, arbitrary, pulse or pattern generator?

**Measurement/function:** Generates basic and arbitrary analog and digital signals used as a stimulus to characterize the design of an electronic device.

### Function generator: Customer application and needs

R&D	Design validation	Manufacturing
<ul style="list-style-type: none"> <li>Complement the DMM and oscilloscope</li> <li>Provide basic and arbitrary signals to test components and sub-assemblies</li> </ul>	<ul style="list-style-type: none"> <li>Provide a clock signal for synchronization of instruments in the test system</li> <li>Provide several signals to fully verify design before proceeding to manufacturing</li> </ul>	<ul style="list-style-type: none"> <li>Provide a clock signal for synchronization of instruments in the test system</li> <li>Provide stimulus signals to verify functional operation of devices</li> </ul>
User needs:	User needs:	User needs:
<ul style="list-style-type: none"> <li>High accuracy and resolution, including amplitude flatness, low jitter and low distortion</li> </ul>	<ul style="list-style-type: none"> <li>High accuracy and resolution, including amplitude flatness, low jitter and low distortion</li> </ul>	<ul style="list-style-type: none"> <li>Capability to duplicate signals used in R&amp;D to verify designs in manufacturing</li> </ul>

### Pulse generator: Customer application and needs

R&D	Design validation	Manufacturing
<ul style="list-style-type: none"> <li>Verify that the product can handle ideal and real-world signals during the design process</li> </ul>	<ul style="list-style-type: none"> <li>Test product durability, accuracy and stability in various operating and environmental conditions</li> </ul>	<ul style="list-style-type: none"> <li>Perform stress tests under defined conditions to ensure the DUT fulfills the specification</li> </ul>
User needs:	User needs:	User needs:
<ul style="list-style-type: none"> <li>High accuracy and resolution</li> <li>Ease of use</li> <li>Reliability</li> <li>Real-world signal simulation</li> </ul>	<ul style="list-style-type: none"> <li>Pulses, square waves, PRBS and user-defined patterns with defined distortions added to the signals</li> </ul>	<ul style="list-style-type: none"> <li>Pulses, square waves, PRBS and user-defined patterns with defined distortions added to the signals</li> </ul>

### Competitive cross reference


	Economy	Mid-range	Performance
Agilent	33210A	33220A	33521A, 33522A
BK Precision	4084AWG		33250A
Tektronix		AFG3021, AFG3022	81150A/81160A
			AFG3101, AFG3120, Tek AFG 3251/2A



## Questions for your customer

Use the answers to choose the most suitable model from the table below.

Bandwidth	What frequency do you need to measure?
10 MHz, 20 MHz, 30 MHz or 80 MHz	Choose <b>33210A</b> , <b>33220A</b> , <b>33521A</b> , <b>33522A</b> or <b>33250A</b> , respectively.
240 MHz or 500 MHz	The <b>81150A</b> bandwidth of 240 MHz supports sine-wave generation. The 81160A handles up to 500 MHz.
660 MHz	The <b>81100A</b> family provides a bandwidth of 660 MHz and capabilities for specialty or digital applications.
Type of waveform or pulse generated	What kind of stimulus will you need to provide to your device under test (DUT)?
Sine, square, ramp, modulation, noise and pulse waveforms	Choose either general-purpose or higher-performance signal generators.
Additional real-world and distorted signals	For greater flexibility, the <b>81150A</b> and <b>81160A</b> offer a two-channel version with channel coupling and adding.
Highly accurate and detailed pulses and patterns	The 81100A family offers the most detailed and accurate pulses and patterns.

Model number	Why buy? 1-minute sell	Frequency range	Waveforms and modes of operation	Starting price USD
<b>33210A</b>	<ul style="list-style-type: none"> <li>Cost-effective</li> <li>Low-distortion, highly accurate signals</li> </ul>	10 MHz	Sine, square, ramp, pulse, noise and optional arbitrary waveforms	\$1,197
<b>33220A</b>	<ul style="list-style-type: none"> <li>Low-cost and full-featured</li> <li>Arbitrary waveforms at no extra cost</li> </ul>	20 MHz	Sine, square, ramp/triangle, pulse, noise, sin(x)/x, cardiac, exponential rise and fall, sweep, modulation, burst and arbitrary waveforms	\$2,273
<b>33521A</b> 	<ul style="list-style-type: none"> <li>Highest signal fidelity</li> <li>Flexible pulses with edge time</li> <li>Point-by-point arbitrary waveforms, sequencing</li> </ul>	30 MHz	Standard waveforms, pulses, arbitrary, sequencing, noise, burst, sweep, frequency list, modulation and dual-tone	\$1,930
<b>33522A</b>	<ul style="list-style-type: none"> <li>2-channel version of 33521A</li> <li>Dual-channel frequency and amplitude coupling</li> <li>Differential outputs</li> </ul>	30 MHz	Standard waveforms, pulses, arbitrary, sequencing, noise, burst, sweep, frequency list, modulation, dual-tone and dual-channel coupling	\$2,950
<b>33250A</b>	<ul style="list-style-type: none"> <li>Competitively priced 80 MHz unit</li> <li>Higher frequency than the 33220A</li> </ul>	80 MHz	Sine, square, ramp/triangle, pulse, noise, sin(x)/x, cardiac, exponential rise and fall, sweep, modulation, burst and arbitrary waveforms	\$4,579
<b>81150A</b>	<ul style="list-style-type: none"> <li>Four instruments in one — pulse, function/arbitrary and noise generator plus optional pattern generator</li> <li>Big brother to the 33250A, with pulse capabilities, higher bandwidth, 13 standard functions and over 80 measurements available</li> </ul>	240 MHz	120 MHz pulse, 240 MHz sine, 14-bit, 2 Gsa/s arbitrary, square, triangle, sin(x)/x, ramp, modulation, noise and arbitrary waveforms  Pattern generator includes PRBS	\$10,055
<b>81160A</b>	<ul style="list-style-type: none"> <li>Four instruments in one: pulse, function/arbitrary and noise generator plus optional pattern generator</li> <li>High-end function generator</li> </ul>	1 µHz to 500 MHz	330 MHz pulse, 500 MHz sine, 14-bit, 2.5 Gsa/s arbitrary, square, triangle, sin(x)/x, ramp, modulation, noise and arbitrary waveforms  Optional pattern generator includes PRBS to 660 MBit/s	\$17,404
<b>81100A family</b>	<ul style="list-style-type: none"> <li>Family for CMOS &lt; TTL, LVDS, ECL testing and more</li> <li>Ideal for generating fast digital signals</li> </ul>	1 µHz to 660 MHz	Pulse, pattern, data, PRBS, depending on the model	\$9,824



# 33210A/33220A/33250A Function/Arbitrary Waveform Generators

## Qualify:

- Need an external clock reference? Sell Option 001 or sell 33250A.
- Need pulse-width modulation? Sell 33220A or up-sell 81150A.
- Need higher performance or more accurate pulse capabilities? Up-sell 81150A.

LXI



### 33210A

*General-purpose function/arbitrary waveform generator for signals under 10 MHz*

Starting price: **\$1,221**

## Key features

- Easy-to-use graphical display, softkeys, number pad and knob
- Built-in modulation, sweep and burst modes
- High fidelity waveforms including: sine, square, pulse, noise, ramp
- Optional 8 Kpoint arbitrary waveform memory

## Competitive advantage

<b>Agilent 33210A</b>	<ul style="list-style-type: none"> <li>• More standard functions</li> <li>• Slightly less accuracy for lower price</li> </ul>
<b>BK Precision 4084AWG</b>	<ul style="list-style-type: none"> <li>• More features</li> <li>• Better accuracy for \$100 more</li> </ul>

LXI



### 33220A

*General-purpose function/arbitrary waveform generator for signals under 20 MHz*

Starting price: **\$1,957**

## Key features

- Easy-to-use graphical display, softkeys, number pad and knob
- Built-in modulation, sweep and burst modes
- High-fidelity waveforms including: sine, square, pulse, noise, ramp
- Built-in 64 Kpoint arbitrary waveform memory

## Competitive advantage

<b>Agilent 33220A</b>	<ul style="list-style-type: none"> <li>• Better distortion specs</li> <li>• Smaller footprint</li> <li>• LAN interface based on LXI standard</li> </ul>
<b>Tektronix AFG3021</b>	<ul style="list-style-type: none"> <li>• Competitive product priced the same</li> </ul>



### 33250A

*General-purpose function/arbitrary waveform generator for signals under 80 MHz*

Starting price: **\$4,579**

## Key features

- Easy-to-use graphical display, softkeys, number pad and knob
- Built-in modulation, sweep and burst modes
- High fidelity waveforms including: sine, square, pulse, noise, ramp
- Optional 8 Kpoint arbitrary waveform memory

## Competitive advantage

<b>Agilent 33250A</b>	<ul style="list-style-type: none"> <li>• More memory for arb (64 Kpts)</li> <li>• 80 MHz frequency for square waves</li> <li>• Easy-to-use front panel at the same price</li> </ul>
<b>Tektronix AFG3101/02</b>	<ul style="list-style-type: none"> <li>• Higher maximum frequency (100 MHz) for sine waves</li> <li>• Sample rates of 250 Msa/s or 1 Gsa/s</li> <li>• 50 MHz square wave</li> </ul>

## Model comparison

Model	33210A	33220A	33250A
Frequency	10 MHz	20 MHz	80 MHz
Arbitrary waveform	Option 002 8 Kpoints 50 Msa/s, 14 bits	64 Kpoints 50 Msa/s, 14 bits	64 Kpoints 200 Msa/s, 12 bits
Modulation	AM, FM, PWM sweep and burst	AM, FM, PM, FSK, PWM sweep and burst	AM, FM, FSK AM, FM, PWM sweep and burst
Connectivity	LXI Class-C compliant with standard GPIB, USB and LAN	LXI Class-C compliant with standard GPIB, USB and LAN	GPIB and RS-232
External timebase reference	Option 001	Option 001	Standard

Included accessories	33210A	33220A	33250A
	IntuiLink waveform editor software		
	USB cable		
	Standard product manuals, calibration test report and programming and reference CD-ROMs		

Options	33210A	33220A	33250A
Option 1CM	Rackmount kit (also sold as Agilent 34190A)		
Option 001	External timebase reference ♦		N/A
Option 002	8 Kpoints arbitrary waveforms ♦		N/A

Optional accessories	33210A	33220A	33250A
34131A	Transit case		
34131A	Rackmount kit with filler panel		
34162A	Standard product manuals, calibration test report and programming and reference CD-ROMs		
10833A/B/C/D/E/G	GPIB cable		
Connectivity (one of the following)			
82350B	PCI high-performance GPIB card		
82351A	PCIe™-GPIB interface card		
82357A	N/A		GPIB/USB interface
E5810A	N/A		LAN/GPIB gateway

♦ Options may be purchased either initially or as upgrades later.

# 33521A, 33522A Function/Arbitrary Waveform Generator



*Revolutionary signal generation delivers the highest signal fidelity in its class, full-bandwidth pulses, and real point-by-point arbitrary waveforms.*

Starting price: **\$1,930**

## Competitive advantage

<b>Agilent 33521A, 33522A</b>	<ul style="list-style-type: none"> <li>Higher signal bandwidth: 30 MHz sine, square and pulse</li> <li>Higher amplitude resolution: 16 bits</li> <li>Wider output range: 1 mVpp to 10 Vpp</li> <li>Dual-channel coupling and tracking</li> </ul>
<b>Tektronix AFG3021/3022</b>	<ul style="list-style-type: none"> <li>3-year standard warranty</li> </ul>
<b>Tabor WW5061/62</b>	<ul style="list-style-type: none"> <li>5-year standard warranty</li> <li>Ramped FSK modulation</li> </ul>

## Key features

- Full-bandwidth pulses with selectable leading and trailing edge times
- Capability to sum any two signals with either the 1- or 2-channel version
- Pseudo-random binary sequences (PRBS) with standard sequence numbers
- True point-by-point arbitrary waveforms with sequencing
- Dual-channel frequency and amplitude coupling, differential, and combined channels

<b>Frequency</b>	1 $\mu$ Hz to 30 MHz
<b>Arb resolution &amp; sample rate</b>	16-bit, 250 MSa/s, 1 MSa/channel memory
<b>Modulation type</b>	AM, FM, PM, FSK, BPSK, PWM, Sum (carrier + modulation)
<b>Operating modes</b>	Continuous, modulate, frequency sweep, burst output gate
<b>Total harmonic distortion &amp; jitter</b>	< 0.04% THD and < 40 ps jitter

## Qualify

- Need up to 30 MHz pulses?** Sell the 33521A or 33522A. If higher, sell the 81150A.
- Need arbitrary waveform generation?** Sell the 33521A or 33522A. If not, sell the 33210A.
- Need two channels?** Sell the 33522A. If not, sell the 33521A or 33250A.

## Options

Option 002	Increases arbitrary waveform memory to 16 MSa/channel
Option 010	OCXO timebase for ultra-high stability
Option 400	GPIB interface (USB and LAN standard)

## Included accessories

- Built-in waveform editor on the front panel — no PC needed
- Standard product manuals, calibration test report, and programming and reference CD-ROMs

## Optional accessories

33503A	Benchlink Waveform Builder Pro
34131A	Transit case
34190A	Rackmount kit with filler panel
82351A	PCI <sup>™</sup> -GPIB interface card

34162A	Accessory pouch
10833A/B/C/D/E/G	GPIB cable
82350B	PCI high-performance GPIB card

## Cross-sell:

- 34410A, 34411A DMMs
- 3000 X-Series oscilloscopes
- E3600 Series of bench power supplies

# 81150A, 81160A Pulse, Function/Arbitrary Waveform and Noise Generator



*Single instrument with pulse, function and arbitrary waveform saves money, time and space.*

Starting price: **\$10,055**

## 81150A Competitive advantage

<b>Agilent 81150A</b>	<ul style="list-style-type: none"> <li>Higher performance for all specs</li> <li>Value and convenience of four instruments in one</li> <li>Additional features, such as channel coupling and pattern generation</li> </ul>
<b>Tektronix AFG 3251/2A</b>	<ul style="list-style-type: none"> <li>Lower performance for all specs</li> <li>Lower price</li> <li>Bigger display</li> </ul>



Starting price: **\$17,404**

## 81160A Competitive advantage

<b>Agilent 81160A</b>	<ul style="list-style-type: none"> <li>Higher performance for all specs</li> <li>Channel coupling, pattern generation with arbitrary bit-shaped pattern</li> <li>Differential output</li> <li>Glitch-free parameter changes</li> <li>Trigger and strobe output</li> </ul>
<b>Keithley 3401/3402</b> AKA Picosecond Pulse Lab 1200	<ul style="list-style-type: none"> <li>None</li> </ul>

## Key features

	<b>81150A</b>	<b>81160A</b>
Pulse generation with variable rise/fall times	1 $\mu$ – 120 MHz	1 $\mu$ – 330 MHz
Sine waveform output	1 $\mu$ – 240 MHz	1 $\mu$ – 500 MHz
Arbitrary waveforms		
Modulation AM, FM, PM, PWM, FSK and sweep		
Pattern generation		
Low intrinsic jitter to create precise clock and source		
Glitch-free parameter changes to ease transition for sensitive DUTs		
LXI Class-C compliant with standard GPIB, USB and LAN		
Triggerable and repeatable noise with selectable crest factor to test DUT continually against same condition		
Differential output, channel adding or coupling (2-channel version only)		

## Qualify

- **Need 120 MHz pulse?** If lower, sell 33250A; if higher, up-sell the 81110A.
- **Need pattern capabilities?** If yes, add option PAT for 81150A or 81160A.
- **Need higher bandwidth than 240 MHz?** Sell 81160A.

## Options

Option 001	One output channel
Option 002	Two output channels
Option PAT	Pattern generator license

## Included accessories

- USB cable
- Standard product manuals, calibration test report, and programming and reference CD-ROMs

## Cross-sell

- 7000 Series oscilloscope
- 34410/11A DMM





# Handhelds

For Employees of Agilent Authorized Distributors Only – Not for Customers or End Users



# Handheld Products

## What is a Handheld?

**Measurement/function:** Battery-powered test tools that handle a range of electronic, electrical and industrial measurements, including waveform, voltage (AC and DC), current (AC and DC), resistance, temperature, capacitance and inductance.

## Customer application and needs

Electrical	Electronics	Aerospace and Defense	Industrial
User needs:	User needs:	User needs:	User needs:
<ul style="list-style-type: none"> <li>• Portability</li> <li>• Range of measurement functions</li> <li>• Basic accuracy</li> <li>• Large and clear display</li> <li>• Ease of use</li> <li>• Reliability</li> <li>• Safety</li> </ul>	<ul style="list-style-type: none"> <li>• Range of measurement functions</li> <li>• High accuracy</li> <li>• Speed</li> <li>• Repeatability</li> <li>• Calibration ease</li> <li>• Reliability</li> </ul>	<ul style="list-style-type: none"> <li>• Range of measurement functions</li> <li>• High accuracy</li> <li>• Repeatability</li> <li>• Calibration ease</li> <li>• Safety</li> </ul>	<ul style="list-style-type: none"> <li>• Range of measurement functions</li> <li>• Unique features for specific applications</li> <li>• Ease of use</li> <li>• Durability</li> <li>• Safety</li> </ul>

## Competitive cross reference

	Handheld digital multimeter	Handheld oscilloscope	Handheld clamp meter	Handheld LCR meter
<b>Agilent</b>	U1241A/B, U1242A/B, U1251A/B, U1252AB, U1253A/B, U1271A/2A	U1600A/B	U1211A/2A/3A	U1731A/2A
<b>Fluke</b>	77, 175, 177, 179, 83-V, 87-V, 27-II, 28-II 287, 289	123, 124	336, 337	None
<b>BK Precision</b>	None	None	None	BK Precision 878, 879



## Questions for your customer

Typically customers will know which instrument they want. Each instrument's feature set is designed for a specific use.

Model number	Kind of instrument	Why buy? 1-minute sell	Measurement type/function	Starting price USD
<b>U1241A/B</b> <b>U1242A/B</b>	Digital multimeter	<ul style="list-style-type: none"> <li>Basic DMM measurements</li> <li>Ideal for field testing, walk-around with battery operation</li> </ul>	DC and AC voltage and current, resistance, frequency, capacitance, temperature, plus a switch counter	\$201
<b>U1251A/B</b> <b>U1252A/B</b> <b>U1253A/B</b>	Digital multimeter	<ul style="list-style-type: none"> <li>U1240 capabilities plus higher accuracy</li> <li>USB connectivity and many included accessories</li> <li>U1253A/B offers OLED screen</li> </ul>	DC and AC voltage and current, resistance, frequency, continuity with beeper, capacitance, temperature	\$382
<b>U1271A/2A</b>	Digital multimeter	<ul style="list-style-type: none"> <li>Ergonomic, rugged, water-and-dust-resistant for industrial environments</li> <li>Intelligent features: <math>Z_{LOW}</math> and backlight alert and backlight alert for noisy spaces</li> <li>Easy fuse replacement</li> <li>USB connectivity</li> </ul>	DC and AC voltage and current, resistance, frequency, continuity with beeper and backlight alert, capacitance, temperature, low pass filter, dual impedance mode	\$340
<b>U1602A/B</b> <b>U1604A/B</b>	Oscilloscope	<ul style="list-style-type: none"> <li>Full-featured</li> <li>Color screen</li> <li>High sampling rate, waveform memory</li> </ul>	2 analog channels, 200 MSa/s, dual waveform math, FFT, cursor, zoom and XY mode	\$1,358
<b>U1401A/B</b>	Multi-function calibrator	<ul style="list-style-type: none"> <li>2 instruments in one: DMM and source</li> <li>Designed for on-the-go service, calibration and validation</li> </ul>	DMM: AC/DC voltage and current, resistance, temperature, frequency, diode and continuity Source: voltage, current, square-wave and ramp	\$701
<b>U1701A/B</b>	Capacitance meter	<ul style="list-style-type: none"> <li>Low entry price for quality capacitance readings</li> </ul>	25 sets of high/low limit settings; measure from 0.1 pF to 199.99 mF	\$158
<b>U1731A/B</b> <b>U1732A/B</b>	LCR meter	<ul style="list-style-type: none"> <li>Quick and basic LCR measurements in a handheld tool</li> <li>Standard 3-year warranty</li> </ul>	Inductance: 0.1 $\mu$ H to 999.9 H Capacitance: 0.1 pF to 19.99 mF Resistance: 0.001 $\Omega$ to 9.999 M $\Omega$	\$289
<b>U1211/12/13A</b>	Clamp meter	<ul style="list-style-type: none"> <li>Large clamp opening of 2"</li> <li>Current measurement up to 1000 A</li> <li>Includes full-featured DMM functionality</li> <li>Large backlight dual display</li> </ul>	Current, resistance, frequency, temperature, voltage, continuity with beeper, diode test, capacitance	\$250

# Handheld DMM

## Qualify

- Need the brightest and clearest display? Sell U1253A/B.
- Need advanced accuracy and USB connectivity? Sell U1250.
- Need rugged DMM with USB connectivity? Sell U1270.
- Need a basic DMM? Sell U1240.



### U1241A/B and U1242A/B

*General-purpose, precise handheld DMMs*

Starting price: **\$201**

#### Key features

- 10,000 counts resolution
- Resistance up to 100 M $\Omega$
- Micro-amp current range
- Dual and differential temperature
- Runs on four AAA batteries
- U1242A also offers temperature measurements

#### Competitive advantage

<b>Agilent U1240 Series</b>	<ul style="list-style-type: none"> <li>• Calibration report</li> <li>• Better accuracy and resolution</li> <li>• Advanced troubleshooting features</li> </ul>
<b>Fluke 70 and 170</b>	<ul style="list-style-type: none"> <li>• None</li> </ul>

### U1271A/2A

*General-purpose, precise handheld DMMs*

Starting price: **\$340**

#### Key features

- 30,000 counts resolution
- Low impedance mode, Smart  $\Omega$ , LPF, Oik-V, visual and audible continuity indicator for noisy environments
- Ergonomic design with better grip, large knob and buttons
- Rugged, dust- and water-resistant casing (certified to IP 54)
- Easy fuse replacement via battery access

#### Competitive advantage

<b>Agilent U1270 Series</b>	<ul style="list-style-type: none"> <li>• Water-resistant</li> <li>• Low-impedance mode, data logging and easy fuse access</li> <li>• Ergonomic design</li> </ul>
<b>Fluke 87-V</b>	<ul style="list-style-type: none"> <li>• 400-hr battery life (vs Agilent U1270 300-hr battery life)</li> </ul>

### U1251A/B, U1252A/B, U1253A/B

*General-purpose, precise handheld DMMs*

Starting price: **\$382**

#### Key features

- 50,000 counts resolution
- True RMS readings for fast failure detection
- Certificate of calibration, additional 4 mm probes and alligator clips
- High contrast ratio 2000:1 and wide viewing angle 160° with U1253A/B OLED model

#### Competitive advantage

<b>Agilent U1250A/B Series</b>	<ul style="list-style-type: none"> <li>• OLED model</li> <li>• Lower price</li> </ul>
<b>Fluke 280</b>	<ul style="list-style-type: none"> <li>• Multi-language user interface</li> <li>• More data logging memory</li> </ul>

# Specifications and measurement comparison

Model number	U1241A/B	U1242A/B	U1251A/B	U1252A/B	U1253A/B	U1271A	U1272A
Display resolution (counts)	10,000	10,000	50,000	50,000	50,000	30,000	30,000
AC bandwidth	2 kHz	2 kHz	30 kHz	100 kHz	100 kHz	20 kHz	100 kHz
True RMS	AC	AC	AC	AC + DC	AC + DC	AC	AC + DC
Data management							
Manual data logging	No	Yes	Yes	Yes	Yes	Yes	Yes
PC connectivity	No	No	IR-USB	IR-USB	IR-USB	IR-USB	IR-USB
General							
Battery life	300 hours	300 hours	72 hours	36 hours	8 hours	300 hours	300 hours
Advanced functions	Switch counter	Switch counter, harmonic ratio, dual and differential temperature measurements	None	20 MHz frequency counter, programmable square wave generator	Organic LED display, 20 MHz frequency counter, programmable square wave generator	Low pass filter, AC and/or DC voltage check	Low pass filter, low impedance mode, offset compensation
Measurements							
Voltage AC/DC	1 to 1000 V		50 mV to 1000 V			300 mV to 1000 V	
Current AC/DC	1 mA to 10 A		500 μA to 10 A			300 μA to 10 A	
Resistance	1 kΩ to 100 MΩ		500 Ω to 500 MΩ			300 Ω to 100 MΩ	30 Ω to 300 MΩ
Frequency	100 Hz to 1000 kHz		99.999 Hz to 999.99 kHz				
Temperature:	K: −40 °C to 1000 °C	K: −40 °C to 1000 °C	K: −200 °C to 1372 °C	K: −200 °C to 1372 °C		K: −200 °C to 1372 °C	K: −200 °C to 1372 °C
K/J thermocouple type		J: −40 °C to 1000 °C		J: −210 °C to 1200 °C			J: −200 °C to 1200 °C
Standard accessories							
All units	• Test report ,certificate of calibration and Quick start guide • 4-mm and 19-mm tip probes						
Additional standard accessories	None		Standard for the U1251A and U1252A only • Alligator clips • Mini grabber • Fine-tip test probes • Soft carrying case • SMT grabber • Battery charger U1252A/B only			• Alligator clips • Battery charger	• K-type thermocouple and adapter



Optional accessories	
U1161A	Extended test lead kit
U1162A	Alligator clips
U1163A	SMT grabbers
U1164A	Fine-tip test probes
U1173A	IR-to-USB connectivity cable
U1174A	Soft carrying case with zipper
U1180A	T/C adapter + lead kit, J- and K-type
U1181A	Immersion temperature probe

U1182A	Industrial surface temperature probe
U1183A	Air temperature probe
U1184A	Temperature probe adapter
U1185A	Thermocouple (J-type) & adapter
U1186A	Thermocouple (K-type) & adapter
U1583B	400-A AC current clamp
U1176A	LED probe clip light
U1171A	Magnetic hanging kit

# U1600 Series Handheld Oscilloscope



*High-performance features in a handheld ideal for customers who make measurements on the go.*

Starting price: **\$1,358**

## Competitive advantage

<b>Agilent U11600</b>	<ul style="list-style-type: none"><li>• Large color screen</li><li>• Higher real-time sampling rate (200 MSa/s)</li><li>• Up to 125,000 points recording length</li></ul>
<b>Fluke 120 Series</b>	<ul style="list-style-type: none"><li>• External triggering</li></ul>

## Key features

- Large 4.5" color display
- Optional USB host capability (option 001) to save data to flash drive
- Dual waveform math, FFT (available on U1604A), cursor, zoom, XY mode
- 3-year standard warranty

## Qualify

- **Need more bandwidth?** Up-sell 2000 X-Series (pages 58-59).

## Included accessories with the U1602/4B

U1561A	Scope probe 10:1 CAT III 600 V (2 units)
U1571A	Ni-MH battery pack 7.2 V, 4500 mA
U1580A	DMM test lead
	USB cable
	Calibration certificate
	Power cord and AC adapter

## Optional accessories

U1562A	Scope probe 100:1
U1561A	Scope probe 10:1 (additional)
U1560A	Scope probe 1:1 (additional)
U1590A	Soft carrying case
U1507A	AC power adapter
U1571A	Ni-MH battery pack (additional)
U1583B	AC current clamp
U1586B	Temperature adapter

For more accessories, visit [www.agilent.com/find/handheldscope](http://www.agilent.com/find/handheldscope)

## Cross-sell

- U1240, U1250 and U1270 Series handheld DMMs
- 33220A or 33250A function/arbitrary waveform generator

# U1401B Handheld Multi-Function Calibrator/Meter



*Calibrate, validate, service or troubleshoot process control devices with just one tool.*

Starting price: **\$701**

## Competitive advantage

<b>Agilent U1401B</b>	<ul style="list-style-type: none"> <li>• Simultaneous source and measure</li> <li>• Full-featured DMM</li> <li>• More accurate voltage source</li> <li>• Dual display with LCD backlight</li> <li>• Square wave generator</li> </ul>
<b>Fluke 715</b>	<ul style="list-style-type: none"> <li>• Source power for loop up to 24 V</li> </ul>
<b>Fluke 787/789</b>	<ul style="list-style-type: none"> <li>• Higher voltage readings up to 1000 V</li> <li>• Higher current readings up to 1 A</li> </ul>

## Key features

- Dual display with bright LCD backlight
- Simultaneous source and measurement capabilities
- Bipolar voltage and current, square-wave, auto scan and ramp outputs
- Full-span DMM capability, including AC/DC voltage and current, resistance, temperature, frequency, diode and continuity

## Qualify

- **Need to calibrate while you measure?** Sell U1401B; if higher measurement accuracy needed, sell U1251/2/3B.
- **Need to source signals and have a full-featured DMM?** Sell U1401B; if wider power rating needed, sell E3600 power supplies (page 84).

## Included accessories with the U1401B

- Calibrator/meter standard test lead kit
- Ni-MH rechargeable battery pack
- Certificate of calibration
- U5402A yellow test lead for mA simulation
- AC power adapter and cord
- Protective holster

## Optional accessories

U5481A	IR-to-USB cable
U1182A	Industrial surface temperature probe
U1184A	Temperature probe adapter
U1160A	Standard test lead kit
U1162A	Alligator clips

U1181A	Immersion temperature probe
U1183A	Air temperature probe
U1186A	Thermocouple (K-type) & adapter
U1161A	Extended test lead kit
U1591A	Carrying case (PVC leather)

## Cross-sell

- U1602A/B and U1604A/B handheld scopes
- U1731A/B and U1732A/B handheld LCR meters
- E3600 Series of bench power supplies
- U1701 handheld capacitance meter
- U1240, U1250, and U1270 Series handheld DMMs



# U1700 Series Handheld Capacitance/LCR Meters



*Perform quick, basic LCR measurements at your convenience.*

U1701B starting price: **\$150**

U1731B/U1732B starting price: **\$276**

## Competitive advantage

<b>Agilent</b>	• Higher quality and reliability standards
<b>U1700 Series</b>	• 3-year warranty
<b>B+K</b>	• None

## Key features: U1701B Capacitance Meter

- 11,000 counts resolution with dual display
- Wide measurement range from 0.1 pF to 199.99 mF
- Compare mode with non-volatile 25 high/low limit settings
- Tolerance mode: 1%, 5%, 10% and 20%

## Key features: U1731B/U1732B LCR Meter

- 20,000 counts resolution with dual display
- LCR measurements with multiple test frequency
- Visible and audible tolerance mode
- Auto-calculation of dissipation factor and quality factor

## Qualify

- **Need to test resistance, capacitance and inductance?** Sell U1731/2B; for capacitance only, sell U1701B.
- **Need higher accuracy?** Sell 4263B benchtop LCR meter.

## Included accessories with the U1401B

- U1781A alligator clip leads
- Certificate of calibration
- Alkaline 9 V battery

## Optional accessories

U1780A	AC power adapter
U5418A	IR-to-USB cable
U1174A	Soft carrying case
U1781A	Alligator clip leads
U1782A	SMD tweezer

## Cross-sell

- U1602A/B and U1604A/B handheld scope
- U1401A multi-function calibrator/meter
- U1240, U1250 and U1270 Series handheld DMM

# U1212A/13A/14A Clamp Meter



General-purpose, precise handheld DMMs.

Starting price: \$250

## Competitive advantage

Agilent U1210 Series	• Higher current measurement
Fluke 337	• In-rush current measurement

## Key features

- Large clamp opening of 2"
- Current measurement up to 1000 A
- Includes full-featured DMM functionality
- Large backlight dual display

## Qualify

- **Need to measure high current up to 1000 A in thick cable?** Sell U1211A.
- **Need to measure high current up to 1000 A and use full-featured DMM functionality?** Sell U1213A.
- **Need a basic DMM?** Sell U1242B.

## Included accessories

- U1169A test leads
- 19 mm tip test probes
- 4 mm tip test probes
- U1175A soft carrying case
- Calibration certificate

## Optional accessories

U1162A	Alligator clips
U1168A	Standard test lead kit
U1181A	Immersion temperature probe
U1182A	Industrial surface temperature probe
U1183A	Air temperature probe
U1186A	Thermocouple (K-type) and adapter

## Cross-sell

- U1240, U1250 and U1270 handheld DMM
- U1602A/B and U1604A/B handheld scope





# GPIB and Instrument Control Products

For Employees of Agilent Authorized Distributors Only – Not for Customers or End Users

# GPIB and Instrument Control Products

## What are GPIB and instrument control products?

**Measurement/function:** Provides a connection between the instrument and PC, and an extension for remote control of the instrument interfaces in a network. Most legacy instruments require a converter, while most new instruments feature built-in USB and LAN ports. Instruments with GPIB require a computer with GPIB as well. GPIB interface is the most common interface on instruments and requires a convertor for control by a PC.

## Customer application and needs

R&D	Design validation	Manufacturing
<ul style="list-style-type: none"> <li>Connect various instruments to a PC for product design and analysis</li> </ul>	<ul style="list-style-type: none"> <li>Connect various instruments in a lab to a PC to validate device under test (DUT) design</li> </ul>	<ul style="list-style-type: none"> <li>Automate instruments in electronics manufacturing</li> </ul>
User needs:	User needs:	User needs:
<ul style="list-style-type: none"> <li>Quick plug-and-play connection from instrument to PC</li> <li>Seamless connectivity to multi-vendor instruments using industry-standard I/O libraries</li> </ul>	<ul style="list-style-type: none"> <li>Quick plug-and-play connection from instrument to PC</li> <li>High data transfer rates</li> </ul>	<ul style="list-style-type: none"> <li>Robust and reliable connection between instruments</li> <li>Flexibility to connect multi-vendor instruments with ease</li> <li>Cost-effective solution to daisy-chain multiple instruments</li> </ul>

## Competitive cross reference

	USB/GPIB adapter	PCI/GPIB card	PCIe/GPIB card	LAN/GPIB gateway
Agilent	82357B USB/GPIB interface	82350B PCI/GPIB interface card	82351A PCIe/GPIB interface card	E5810A LAN/GPIB gateway
National Instruments	GPIB USB NI 488.2 (778927-01)	NI PCI-GPIB interface card (778032-01)	NI PCIe-GPIB interface card (778930-01)	NI GPIB-ENET/100 controller (778209-01)
Keithley	USB-to-GPIB adapter (KUSB-488B)	IEEE-488.2 interface board for the PCI bus (KPCI-488LPA)	None	None



## Questions for your customer

Use the answers and the Interface/Connection Features Chart below to choose the most suitable model from the table below.

### 1. Convert from/to


- What kind of interface is on the back of your instrument: GPIB, USB, LAN or RS-232?
- What kind of connection is on the back of your computer: USB, LAN, PCI or PCIe™?

### 2. Planned use

- What features are most important to you – throughput, convenience, operating distance or cost?

Interface/Connection Features Chart

Standard	Throughput	Convenience	Maximum operating distance	Cost
<b>GPIB</b>	High	Low	8 m (max. cable length)	Highest
<b>USB</b>	Average	Highest	5 m	Average
<b>LAN</b>	High	High	Remote possible	High
<b>RS-232</b>	Low	Low	1 m	Low

Model number	Why buy? 1-minute sell	Convert from (on PC)	Convert to (on instrument)	Starting price USD
<b>82350B</b>	<ul style="list-style-type: none"> <li>• GPIB connection for PCI-based PCs or workstations</li> <li>• Maximum throughput for all configurations</li> <li>• Built-in buffering to provide transfer rates up to 900 kB/sec</li> <li>• Dual-processor support on the latest Windows OS</li> </ul>	PCI (5 V)	GPIB	\$531
<b>82351A</b>	<ul style="list-style-type: none"> <li>• GPIB connection for PCIe™-based PCs or workstations</li> <li>• High-throughput applications up to 1.4 MB/sec</li> <li>• Flexibility to plug into x4 and x8 PCIe slots</li> </ul>	PCIe™ (3.3 V)	GPIB	\$551
<b>82357B</b> 	<ul style="list-style-type: none"> <li>• GPIB connectivity, including notebook computers</li> <li>• Ideal to connect to legacy instruments with GPIB (over 2.5 m cable length)</li> <li>• Convenient, fast setup</li> <li>• Consistent board address assignment after rebooting PC</li> </ul>	USB	GPIB	\$541
<b>E5810A</b>	<ul style="list-style-type: none"> <li>• Connection to remote GPIB and RS-232 instruments</li> <li>• Built-in web API</li> <li>• Rackmount kit option available</li> <li>• Ideal for test-system sharing and collaboration among multiple users</li> </ul>	LAN	GPIB or RS-232	\$1,112
<b>10833x cable</b>	Connection from PC to instrument via GPIB <ul style="list-style-type: none"> <li>◦ 10833A: 1 m cable</li> <li>◦ 10833B: 2 m cable</li> <li>◦ 10833C: 4 m cable</li> <li>◦ 10833D: 0.5 m cable</li> <li>◦ 10833E: 6 m cable</li> <li>◦ 10833G: 8 m cable</li> </ul>	N/A	N/A	\$77
<b>10834A adapter</b>	<ul style="list-style-type: none"> <li>• Adapter for tight-fitting GPIB connections</li> <li>• Extends first cable 2.3 cm away from ear panel to provide clearance for sother connectors, switches and cables</li> </ul>	N/A	N/A	\$41

## Cross-sell





- Instruments that need to be connected to a PC
- Agilent VEE (W4000A-PRO) software for automation and instrument control



[www.agilent.com/find/vee](http://www.agilent.com/find/vee)



# Specifications Comparison

	<b>Maximum GPIB throughput for all configurations</b>		<b>Easiest GPIB connection:</b> <ul style="list-style-type: none"> <li>• Plug-and-play configuration</li> <li>• No switches to set, no PC cards to install, no external power supplies</li> </ul>	<ul style="list-style-type: none"> <li>• Remote GPIB and RS-232 connections</li> <li>• Sharing of instruments in a distributed system</li> </ul>
	<b>82350B PCI GPIB interface card</b>  <ul style="list-style-type: none"> <li>• 32-bit, 5-volt PCI bus</li> </ul>	<b>82351A PCI Express GPIB interface card</b>  <ul style="list-style-type: none"> <li>• 32-bit, 3.3-volt PCIe bus</li> <li>• Half-height card fits into smaller PCs</li> <li>• Flexible up-plugging to x1, x4 and x8 slots</li> </ul>	<b>82357B USB/GPIB interface</b>  <ul style="list-style-type: none"> <li>• No GPIB cable required to connect to instrument</li> <li>• Shielded USB cable, connector specified to 1500 insertions</li> <li>• Parallel-polling capability checks responses of up to 8 instruments in a single pole</li> </ul>	<b>E5810A LAN/GPIB gateway</b>  <ul style="list-style-type: none"> <li>• LAN extends cabling connection to virtually unlimited distance</li> <li>• Easy setup and use with built-in digital display and web browser</li> </ul>
Max. transfer rate	More than 900 KB/s	More than 1.4 MB/s	More than 1.15 MB/s	More than 900 KB/s (GPIB interface)
Max. connected instruments	14 (daisy-chained)	14 (daisy-chained)	14 (daisy-chained)	14 (daisy-chained)
Operating system	Windows® 2000/XP/Vista/Windows 7	Windows® 2000/XP/Vista/Windows 7	Windows® 2000/XP/Vista/Windows 7	Windows® 2000/XP/Vista/Windows 7
Driver	Agilent I/O Libraries Suite (included)	Agilent I/O Libraries Suite (included)	Agilent I/O Libraries Suite (included)	Agilent I/O Libraries Suite (included)
Accessories	10833x GPIB cables and 10834A GPIB-to-GPIB adapter	10833x GPIB cables and 10834A GPIB-to-GPIB adapter	N/A	Rackmount kit (Option 100), 10833x GPIB cables and 10834A GPIB-to-GPIB adapter



# LCR Meters

For Employees of Agilent Authorized Distributors Only – Not for Customers or End Users

# LCR Meters

## What is an LCR meter?

**Measurement/function:**

- Measure impedance parameters (inductance, capacitance and resistance) at multi-spot frequencies.
- Perform high- or low-resistance measurements (with resistance meter).

## Customer application and needs

R&D	Quality assurance	Manufacturing
<ul style="list-style-type: none"><li>• Perform general evaluation of electronic components by impedance measurement</li></ul>	<ul style="list-style-type: none"><li>• Perform general evaluation of electronic components by impedance measurement</li></ul>	<ul style="list-style-type: none"><li>• Sort, perform final test of electronic components</li></ul>
User needs:	User needs:	User needs:
<ul style="list-style-type: none"><li>• High accuracy and resolution</li><li>• Ease of use and reliability</li></ul>	<ul style="list-style-type: none"><li>• High accuracy and resolution</li><li>• Ease of use and reliability</li></ul>	<ul style="list-style-type: none"><li>• High accuracy and resolution</li><li>• Fast measurement speed</li><li>• System integration capability</li><li>• Low cost</li></ul>

## Competitive cross reference


Brand	Low-cost LCR meter	Precision LCR meter
Agilent	4263B	E4980A
Hioki	3522-50	3532-50
QT	1730T	7600 Plus
Discontinued Agilent models	None	4284A and 4279A



## Questions for your customer

Use the answers to choose the most suitable model from the table below.

Target application	What components do you plan to test?
Large volumes of electric components and materials	For measurements on large numbers of electric components and materials, choose an LCR meter.
Connectors, switches, inductors and materials	For measurements on connectors, switches, inductors and other materials, choose a m $\Omega$ meter or high-resistance meter.
Measurement parameters	What impedance or resistance range will you measure?
Wide impedance range	The <b>E4980A</b> or <b>4263B</b> both offer general-purpose LCR measurements over a wide impedance range.
Low-resistance	For low-resistance measurements at 1 kHz, choose the <b>4338B</b> .
High-resistance	For high-resistance measurements, choose the <b>4339B</b> , which can also measure low current.
Frequency	Do you need to measure impedance at a fixed frequency or over a broad frequency range?
Fixed frequencies	For impedance measurements at fixed frequencies, choose the <b>4263B</b> .
Broad frequency	For impedance measurements over a broad frequency range, choose the <b>E4980A</b> .

Model number	Why buy? 1-minute sell	Target or primary applications	Basic accuracy	Measurement range	Frequency range	Internal DC bias	DC source	Starting price USD
<b>E4980A</b> 	<ul style="list-style-type: none"> <li>General-purpose LCR meter</li> <li>Best combination of accuracy, speed and versatility for both high- and low-impedance measurements</li> </ul>	<ul style="list-style-type: none"> <li>LCR components (ceramic, electrolytic, film capacitor, inductor, etc.)</li> <li>Materials</li> <li>Semiconductors</li> </ul>	.05%	4 m $\Omega$ to 174 M $\Omega$	20 Hz to 2 MHz; 4-digit resolution at any frequency	1.5, 2 V (Standard)  $\pm 40$ V (Option 001)	$\pm 10$ V (Option 001)	\$16,302
<b>4263B</b>	<ul style="list-style-type: none"> <li>Compact, easy-to-use, entry-level LCR meter</li> <li>Ideal for impedance measurements at fixed frequencies</li> </ul>	<ul style="list-style-type: none"> <li>LCR components (ceramic, electrolytic, film capacitor, inductor, transformer, coil measurements, etc.)</li> </ul>	0.1%	0.8 m $\Omega$ to 100 M $\Omega$	100 Hz to 100 kHz; fixed frequencies	1.5, 2 V		\$2,583
<b>4338B</b>	<ul style="list-style-type: none"> <li>Milli-ohm meter ideal for low-resistance measurements</li> </ul>	<ul style="list-style-type: none"> <li>Connectors</li> <li>Resistors</li> <li>Switches</li> <li>Batteries</li> </ul>	0.4%	140 $\mu\Omega$ to 19 k $\Omega$	1 kHz			\$4,415
<b>4339B</b>	<ul style="list-style-type: none"> <li>High-resistance meter</li> <li>Also handles low-current measurements</li> </ul>	<ul style="list-style-type: none"> <li>Connectors</li> <li>Switches</li> <li>Capacitors</li> <li>Relays</li> </ul>	0.4%	1E+3 $\Omega$ to 1.6E+16 $\Omega$ and DC	DC (0.1 to 1000 V)			\$5,012

# E4980A Precision LCR Meter, 20 Hz to 2 MHz

## LXI



*A new standard for precise impedance measurements.*

Starting price: **\$16,302**

### Competitive advantage

<b>Agilent E4980A</b>	<ul style="list-style-type: none"> <li>• Fastest speed with high accuracy</li> <li>• Test signal level up to 20 Vrms</li> <li>• Signal level monitor (Vac, Iac, Vdc, Idc)</li> <li>• Internal DC bias up to 40 V</li> </ul>
<b>Hioki 3532</b>	<ul style="list-style-type: none"> <li>• Low price</li> <li>• 42 Hz to 5 MHz frequency range</li> <li>• Interactive touch panel operation</li> </ul>
<b>QT 7600 Plus</b>	<ul style="list-style-type: none"> <li>• Graphical format</li> <li>• Test sequencing</li> </ul>

### Key features

- Accurate measurements: 0.05% basic accuracy
- Fast measurement speed: 5.6 ms at 1 MHz (five times faster than the Agilent 4284 LCR meter)
- Measurement parameters: Z, Y, Theta, R, X, G, B, C, L, D, Q, Rdc
- Measurement versatility: 201 points sweep measurement supported (Sweep type: frequency, OSC level, DC bias, DC source)
- PC connectivity: LAN/USB – LAN connection enables control over Web browser on PC
- System integration capability: GPIB/handler/comparator/cable extension

### Qualify

- **Current user of 4284A or 4279A LCR meter?** Sell E4980A.
- **Need LCR features but lower speed and cost?** Sell Option 005.

### Options

E4980A-005	Entry-model precision LCR meter, 20 Hz to 2 MHz (same accuracy but lower speed)
E4980A-001	Power and DC bias enhancement
E4980A-002	Bias current interface
E4980A-201	Handler interface
E4980A-301	Scanner interface
E4980A-1CM	Rackmount kit

### Included accessories

- USB cable
- Product manuals, programming and reference CD-ROMs

### Optional accessories and fixtures

16334A	SMD tweezers test fixture
16089B	Medium Kelvin clip leads
16047A/E	Axial/radial test fixture
16034E/G/H	SMD component test fixture
16048A/D/E	0.94 meter/1.89 meter/3.8 meter BNC test leads
16065A	200 Vdc external voltage bias fixture
GPIB connectivity	82350B PCI high-performance GPIB card or 82351A PCIe™-GPIB interface card
10833A/B/C/D/E/G	GPIB cable

### Cross-sell

- 7000 Series oscilloscope
- 33250A function/arbitrary waveform generator
- E3600 Series of bench power supplies
- 34410/11A DMM

# 4263B LCR Meter At Fixed Frequencies Between 100 Hz to 100 kHz



*Cost-effective LCR meter for production line and fundamental impedance testing.*

Starting price: **\$2,583**

## Competitive advantage

<b>Agilent 4263B</b>	<ul style="list-style-type: none"> <li>• Low price</li> <li>• Fastest speed with high accuracy</li> <li>• Wide fixture availability</li> <li>• System integration capability</li> </ul>
<b>Hioki 3522-50</b>	<ul style="list-style-type: none"> <li>• 1 mHz to 100 kHz frequency range</li> <li>• Interactive touch panel operation</li> </ul>
<b>QT 1730T</b>	<ul style="list-style-type: none"> <li>• Internal DC bias voltage up to 5 V</li> <li>• Internal DC bias current up to 200 mA</li> </ul>

## Key features

- Six test frequencies: 100 Hz, 120 Hz, 1 kHz, 10 kHz, 20 kHz and 100 kHz
- Fast measurement speed: 25 ms
- Measurement parameters: Z, Y, Theta, R, Z, G, B, C, L, D, Q, Rdc, N, M
- Transformer measurement capability: N (turns ratio), M (mutual inductance)
- System integration capability: GPIB/handler/comparator/contact check function/cable extension

## Qualify

- **Need component evaluation on the production line?** Sell 4263B.
- **Need fundamental impedance testing for benchtop applications?** Sell 4263B.

## Options

4263B-001	N/M/DCR measurement function ■	4263B-1CM	Rackmount kit
4263B-002	20 kHz test frequency ■	4263B-1CN	Handle kit

■ **4263B-001 and 4263B-002 are installed by default, free of charge.**

## Included accessories

- Product manual (operation and programming) on CD-ROM

## Optional accessories and fixtures

16334A	SMD tweezers test fixture	16065A	200-Vdc external voltage bias fixture
16089B	Medium Kelvin clip leads	16089C	Kelvin IC clip leads
16047A/E	Axial/radial test fixture	16089D	Alligator clip leads
16034E/G/H	SMD component test fixture	10833A/B/C/D/E/G	GPIB cable
16048A/D/E	0.94 m BNC test leads 1.89 m BNC test leads 3.8 m BNC test leads	Connectivity	82350B PCI high-performance GPIB card 82351A PCIe™-GPIB interface card 82357B GPIB/USB interface E5810A GPIB/LAN gateway
16060A	Transformer test fixture		

## Cross-sell



- 34401A DMM
- 33210A function/arbitrary waveform generator
- E3600 Series of bench power supplies
- 3000 X-Series oscilloscopes

## Sell more: additional resistance products

- **4338B** milli-ohm meter for low-resistance measurements
- **4339B** advanced tool for making precision high-resistance measurements
- **Fixtures** designed to make measurements simpler and more reliable



# Most Popular Test Fixtures for Benchtop LCR Meters

Product	Description		Applicable Products	
16334A Test fixture (Tweezers contacts)		The 16334A is designed for impedance evaluations of SMD. The minimum SMD size that this fixture is adapted to evaluate is 1.6 mm L x 0.8 mm W. The tweezer's contacts on this fixture makes it easy to hold the DUT.	Frequency: ≤ 15 MHz Maximum voltage: ±42 V peak max (AC+DC) Applicable SMD size: Minimum 1.6 mm L x 0.8 mm W	4263B, E4980A, 4285A, 4294A, E4981A
16089B Medium Kelvin clip leads		The 16089B makes it possible to measure odd-shaped components that cannot be measured with conventional fixtures. It is equipped with two insulated Kelvin clips.	Clip type: Kelvin alligator clips (small) Frequency: 5 Hz to 100 kHz Maximum voltage: ±42 V peak max (AC+DC) Cable length: 0.94 m	4263B, E4980A, 4285A, 4294A, E4981A
16047A Test fixture (axial and radial)		The 16047A is designed for impedance evaluation of axial/radial lead type devices of up to 13 MHz. The 16047A employs Kelvin contacts that can handle a wide impedance measurement range. The contact tip can be changed according to the device shape.	Frequency: ≤ 13 MHz Maximum voltage: ±42 V peak max (AC+DC) Four-terminal (Kelvin) contacts	4263B, E4980A, 4285A, 4294A, E4981A
16047E Test fixture		The 16047E is designed for impedance evaluation of lead type devices up to 110 MHz. A guard terminal is available for three terminal devices and a shorting plate comes secured on this fixture.	Frequency: ≤ 110 MHz Maximum voltage: ±42 V peak max (AC+DC)	4263B, E4980A, 4285A, 4294A, E4981A
16338A Test lead kit		The 16338A contains four types of test leads and a mating cable, which are designed to operate with the 4338A/B. These test leads can be mixed or matched depending on the type of sample being measured.	Test lead kit for 4338B Furnished accessories: Kelvin clip leads/Kelvin IC clip leads/pin type probe leads/alligator clip leads/mating cable	4338B
16117B Low noise test leads		The 16117B is designed to operate specifically with the 4339A/B. With its wide jaw clips, it is capable of holding DUTs with large terminals. The clips can be replaced with probes (Option 001) for measurements of small DUTs, such as PC boards or IC sockets. Option 002 enables the construction of simple custom-made test leads. Shielded cables help reduce electrical noise effects. A built-in interlocking circuit enables safe high-voltage measurements.	Test leads with replaceable clips and probes Maximum voltage: 1000 V dc Maximum current: 0.5 mA dc Measurable resistance range: 1E+3 to 1E+11 Ω	4339B



# Oscilloscopes and Logic Analyzers

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# Oscilloscopes and Logic Analyzers

## What is an Oscilloscope?

**Measurement/function:** Measures signal voltage against time and also displays waveform shape, frequency and phase.

*For Logic Analyzers, see page 68.*

## Customer application and needs

R&D	Manufacturing	Education
<ul style="list-style-type: none"><li>• Perform debug and functional validation of digital devices during board turn-on and system integration</li></ul>	<ul style="list-style-type: none"><li>• Test device to defined standard along production line</li><li>• Determine cause of device failures and perform repair</li></ul>	<ul style="list-style-type: none"><li>• Teach electrical engineering and physics students effective debug and test of devices</li></ul>
<b>User needs:</b>	<b>User needs:</b>	<b>User needs:</b>
<ul style="list-style-type: none"><li>• Capture of signal detail and anomalies</li><li>• Capture/view of analog and digital signals simultaneously</li><li>• Protocol view of standardized serial buses</li><li>• Large screen to view many signals at once</li></ul>	<ul style="list-style-type: none"><li>• Fast test throughput</li><li>• No failed device escapes</li><li>• Debug of failed devices</li><li>• Capability for efficient rework of failed devices</li></ul>	<ul style="list-style-type: none"><li>• Low cost to outfit many lab stations</li><li>• Localized and easy-to-use interface with quick-access help</li><li>• Small form factor to optimize limited lab bench space</li><li>• Easy curriculum setup using new instruments</li></ul>

## Competitive cross reference

	Economy	General purpose	Full-featured	Mid-range
<b>Agilent</b>	InfiniiVision 2000 X-Series	InfiniiVision 3000 X-Series	InfiniiVision 7000B	Infiniium 9000
<b>Tektronix</b>	TDS2000C	DPO/MSO2000, TDS3000 DPO/MSO3000	DPO/MSO4000B	DPO/MSO5000 DPO7000
<b>LeCroy</b>	WaveAce 100/200	WaveJet 300A	WaveSurfer Xs-A	WaveRunner Xi-A, WavePro 7 Zi



## Questions for your customer

Use the answers to choose the most suitable model from the table below.

<b>Bandwidth</b>	<b>What is the frequency of the signal you will need to view with the scope?</b>
Select an oscilloscope that has sufficient bandwidth to capture the highest frequency content of the customer's signal. Reference table below for availability.	
<b>Number of channels</b>	<b>How many signals do you need to see at one time?</b>
Select a digital storage oscilloscope (DSO) with 2 or 4 analog channels only or a mixed-signal oscilloscope (MSO) with additional 8 or 16 digital timing channels. Reference table below for availability.	
<b>Memory depth</b>	<b>How long a capture time do you need?</b>
Select an oscilloscope that has sufficient memory to capture longer periods of time at high sample rates. Memory available up to 1 Gpts. Reference table below for availability.	
<b>Measurement applications</b>	<b>Do you need faster insight into your signals beyond basic scope measurements?</b>
Measurement application options enable customers to customize a unit to give faster insight to signals under test. Reference measurement options tables on each product family page for availability.	

Model series	Why buy? 1-minute sell	Bandwidth	Maximum memory	Maximum sample rate	Channels	Price
<b>InfinitiVision 2000 X-Series</b>	<ul style="list-style-type: none"> <li>Only economy-class scopes with mixed signal oscilloscope (MSO) capability</li> <li>Only built-in WaveGen 20 MHz function generator</li> <li>Large 8.5" WVGA display</li> </ul>	70 to 200 MHz	100 Kpts	2 GSa/s	2 or 4 analog, +8 digital*	\$1,230
<b>InfinitiVision 3000 X-Series</b>	<ul style="list-style-type: none"> <li>Industry's fastest update rate of up to 1,000,000 waveforms per second</li> <li>Only built-in WaveGen 20 MHz function generator</li> <li>Large 8.5" WVGA display</li> </ul>	100 to 500 MHz	Up to 4 Mpts	4 GSa/s	2 or 4 analog, +16 digital*	\$2,810
<b>InfinitiVision 7000 Series</b>	<ul style="list-style-type: none"> <li>Large 12.1" XGA display for best signal visibility</li> <li>Largest suite of measurement applications in this class</li> </ul>	100 MHz to 1 GHz	8 Mpts	4 GSa/s	2 or 4 analog, +16 digital*	\$4,995
<b>Infinitium 9000 Series</b>	<ul style="list-style-type: none"> <li>Large 15" XGA display</li> <li>Windows-based, high-performance analysis scope</li> <li>Largest suite of measurement applications in this class</li> </ul>	600 MHz to 4 GHz	Up to 1 Gpt	20 GSa/s	4 analog, +16 digital*	\$17,476

\* +8 or +16 digital channels on mixed-signal oscilloscope models or DSO-to-MSO upgrade kits



Scope functionality also available as a USB modular instrument.

See USB Instruments on page 121.

Scope functionality also available in a handheld model.

See Handheld Instruments on page 40.



# 2000 X-Series Oscilloscopes



*Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget.*

Starting price: **\$1,230**



**InfiniiVision 2000 X-Series replaces the Agilent 1000 Series.**

In all cases, a new 2000 X-Series will outperform a 1000 Series. If customers need to repeat a 1000 Series purchase for an automated test system, the 1000 is still available.

## Key features

- Only economy-class scopes with mixed-signal capability
- Only 20 MHz built-in WaveGen function generator
- 8.5" WVGA display with 2X the viewing area and 5X the resolution
- Up to 50,000 waveform updates/second
- Fully upgradable: bandwidth, MSO, measurement applications and WaveGen

## Qualify

- **Need more than 8 digital channels?** Up-sell the 3000 X-Series.
- **Need serial decode and triggering?** Up-sell the 3000 X-Series.
- **Need more memory than 100 kpts?** Up-sell 3000 X-Series.

## Model comparison

	DSO/MSO X2002A	DSO/MSO X2004A	DSO/MSO X2012A	DSO/MSO X2014A	DSO/MSO X2022A	DSO/MSO X2024A
Bandwidth	70 MHz		100 MHz		200 MHz	
Sample rate	2 GSa/s					
Channels	2 or 4 scope channels on DSOs, 2 or 4 scope channels +8 logic channels on MSOs					
Memory	100 kpts standard					
Display	8.5" WVGA (800x480)					
Update rate	50,000 wfms/s					
Warranty	3 years standard					
Connectivity	USB host (one front, one back), USB device, LAN (optional), GPIB (optional), VGA (optional)					
Triggering	Edge, pulse width, pattern, video					
Dimensions	38 cm W x 20.4 cm H x 14.1 cm D					
Weight	3.85 kg					

## Included probes

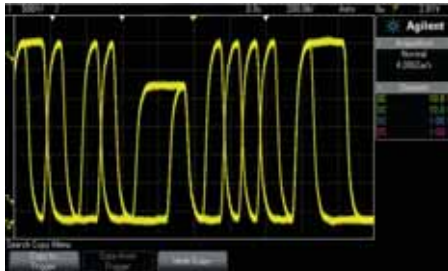
N2862B	Passive probe 150 MHz 10:1 attenuation (1 per channel included 70 to 100 MHz models)
N2863B	Passive probe 300 MHz 10:1 attenuation (1 per channel included 200 MHz models)
N6459-60001	8 digital channel MSO cable (1 per scope on all MSO models and on DSOX2MSO upgrades)

*See page 67 for additional probing options.*

## Cross-sell

- 34405A economy DMM
- 32210A function/arbitrary waveform generator
- E3600 Series of bench power supplies

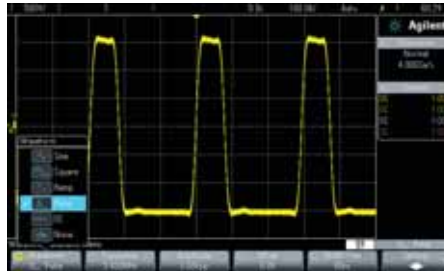
# 2000 X-Series Oscilloscopes



## See more

of your signal more of the time

- High resolution 8.5" display
- Up to 50,000 wfms/s update rate
- Fast, responsive MegaZoom IV deep memory, 100 kpts



## Do more

with the power of three instruments in one

- Best-in-class oscilloscope
- Integrated 8-channel logic analyzer
- Industry-exclusive built-in WaveGen 20 MHz function generator (optional)



## Get more

investment protection with the industry's only fully upgradable scope

- Upgradable bandwidth
- Upgradable MSO
- Upgradable built-in WaveGen 20 GHz function generator
- Upgradable measurement applications

## Measurement options

DSOX2MSO	◆	DSO to MSO upgrade, 8 digital channels
DSOX2WAVEGEN	◆	WaveGen 20 MHz function generator
DSOXEDK	◆	Educator's oscilloscope training kit
DSOX2MASK	◆	Mask limit testing
DSOX2SGM	◆	Segmented memory

◆ Options may be purchased either initially or as upgrades later.

## Accessories

DSOXLAN	VGA and LAN module
DSOXGPB	GPB module
N6456A	Rackmount kit
N6457A	Soft carrying case and front cover
N6458A	Hard copy users manual

## Competitive information

	Agilent 2000 X-Series	Textronix TDS2000C
Bandwidth	70 MHz, 100 MHz, 200 MHz	70 MHz, 100 MHz, 200 MHz
Upgradable bandwidth	Yes	No
Maximum sampling rate	2 GSa/s	1 GSa/s, 2 GSa/s
Maximum memory depth	100 kpts	2.5 kpts
Display	8.5" WVGA (800x480)	5.7" QVGA (320x240)
Function generator	Yes	No
Mixed signal oscilloscope	Yes – 8 channel	No
Update rate	> 50,000 wfms/sec	180 wfms/sec
Segmented memory	Yes	No
Standard warranty	3 years	Limited lifetime
Hardware-based mask-test	Yes	No
Pricing	Similar	Similar



# 3000 X-Series Oscilloscopes



*Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget.*

Starting price: **\$2,810**



**InfiniiVision 3000 X-Series replaces the Agilent 5000 Series.**

In all cases, a new 3000 X-Series will outperform a 5000 Series. If customers need to repeat a 5000 Series purchase for an automated test system, the 5000 is still available.

## Key features

- 8.5" WVGA display 50% larger than competing models with 2X the resolution
- Up to 1,000,000 waveform updates/second
- Hardware-based measurement applications including serial decode
- Only 20 MHz built-in WaveGen function generator in this class
- Fully upgradable: bandwidth, MSO, memory, measurement applications and WaveGen

## Qualify

- **Need more than 500 MHz bandwidth?** Up-sell the 7000B Series.
- **Need a larger than 8.5" display?** Up-sell the 7000B Series.
- **Need more memory than 4 Mpts?** Up-sell the 7000B Series.
- **Need FlexRay, MIL-STD 1533, Xilinx or Altera FPGA applications?** Up-sell the 7000B Series.

## Model comparison

	DSO/MSO X3012A	DSO/MSO X3014A	DSO/MSO X3024A	DSO/MSO X3032A	DSO/MSO X3034A	DSO/MSO X3052A	DSO/MSO X3054A
Bandwidth	100 MHz		200 MHz	300 MHz		500 MHz	
Sample rate	4 GSa/s						
Channels	2 or 4 scope channels on DSOs, 2 or 4 scope channels +16 logic channels on MSOs						
Memory	2 Mpts standard, up to 4 Mpts optional						
Display	8.5" WVGA (800 x 480)						
Update rate	1,000,000 wfms/s						
Warranty	3 years standard						
Connectivity	USB host (one front, one back), USB device, LAN (optional), GPIB (optional)						
Triggering	Edge, pulse width, pattern, video, Nth edge burst, runt, logic, setup and hold, rise/fall time, serial bus (I²C, SPI, RS-232/UART, CAN, LIN, I²S and USB)						
Dimensions	38 cm W x 20.4 cm H x 14.1 cm D						
Weight	3.85 kg						

## Included probes

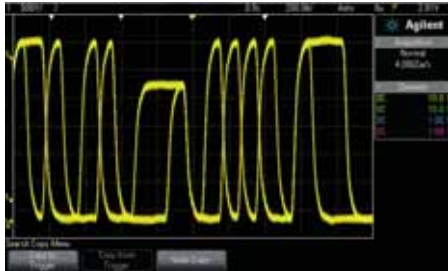
N2862B	Passive probe 150 MHz 10:1 attenuation (1 per channel included 100 MHz models)
N2863B	Passive probe 300 MHz 10:1 attenuation (1 per channel included 200 MHz models)
N6450-60001	16 digital channel MSO cable (1 per scope on all MSO models and on DSOX3MSO upgrades)
N2890A	Passive probe 500 MHz 10:1 attenuation (1 per channel included 350/500 MHz models)

*See page 67 for additional probing options.*

## Accessories

Model	Description
DSOXLAN	VGA and LAN module
DSOXGPIB	GPIB module
N6456A	Rackmount kit
N6457A	Soft carrying case and front cover
N6458A	Hard copy manual

# 3000 X-Series Oscilloscopes



## See more

of your signal more of the time

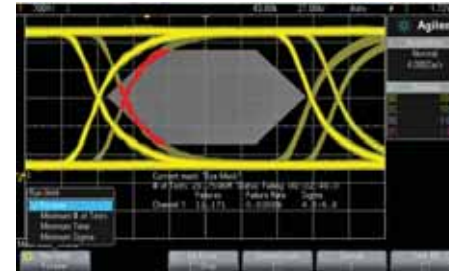
- High resolution 8.5" display
- Up to 1,000,000 wfms/s update rate
- Fast, responsive MegaZoom IV deep memory



## Do more

with the power of four instruments in one

- Best-in-class oscilloscope
- Integrated 16 channel logic analyzer
- Serial protocol analyzer (optional)
- Built-in WaveGen 20 MHz function generator (optional)



## Get more

investment protection with the industry's only fully upgradable scope

- Upgradable bandwidth
- Upgradable memory
- Upgradable MSO
- Upgradable WaveGen built-in function generator
- Upgradable measurement applications

## Competitive information

	Agilent 3000 X-Series	Textronix DP02000	Textronix DP03000
Bandwidth	100 MHz, 200 MHz, 350 MHz, 500 MHz	100 MHz, 200 MHz	100 MHz, 300 MHz, 500 MHz
Upgradable	Yes	No	No
Max Sampling rate	4 GSa/s	1 GSa/s	2.5 GSa/s
Max Memory depth	4 M	1 M	5 M
Display	8.5" WVGA (800x480)	7" WQVGA (480x234)	9" WVGA (800x480)
Update rate	> 1,000,000 wfms/sec	5,000 wfms/sec	55,000 wfms/sec
Function generator	Yes	No	No
Mixed signal oscilloscope	Yes – 16 channels	Yes – 16 channels	Yes – 16 channels
Serial trigger, decode, search	I <sup>2</sup> C, SPI, RS-232, CAN, LIN, I <sup>2</sup> S	I <sup>2</sup> C, SPI, RS-232, CAN, LIN	I <sup>2</sup> C, SPI, RS-232, CAN, LIN, I <sup>2</sup> S
Hardware-based serial decode	Yes	No	No
Segmented memory	Yes	No	No
Hardware-based mask test	Yes—up to 240 K/sec	No	No
Pricing	Lower	Similar	Higher

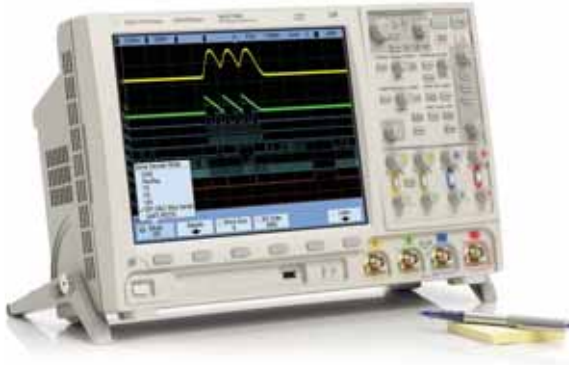
## Measurement options

DSOX3MEMUP	◆	Memory upgrade from 2 Mpts to 4 Mpts
DSOX3MSO	◆	DSO to MSO upgrade, 16 digital channels
DSOX3WAVEGEN	◆	WaveGen 20 MHz function generator
DSOXEDK	◆	Educator's oscilloscope training kit
DSOX3MASK	◆	Mask limit testing
DSOX3SGM	◆	Segmented memory
DSOX3EMBD	◆	Embedded serial triggering and decode (I <sup>2</sup> C, SPI)
DSOX3COMP	◆	Computer serial triggering and decode (RS-232/422/485/UART)
DSOX3AUTO	◆	Automotive serial triggering and decode (CAN, LIN)
DSOX3AUDIO	◆	Audio serial triggering and decode (I <sup>2</sup> S)
U1881A	◆	Power measurement and analysis

◆ Options may be purchased either initially or as upgrades later.

# InfiniiVision 7000B Series Oscilloscopes

**LXI**



*Engineered for the best signal visibility.*

Starting price: **\$5,462**

## Key features

- Industry's biggest high resolution 12.1" XGA display
- Up to 100,000 waveform updates/second
- Responsive deep memory up to 8 Mpts
- Hardware-based measurement applications including serial decode
- Upgradable MSO and measurement applications

## Qualify

- **Need a 1U-high scope for an automated test system?** Sell 6000L Series.
- **Need a battery-operated scope?** Sell 6000 Series.
- **Need more than 1 GHz bandwidth?** Up-sell 9000 Series.
- **Need more than 8 Mpts memory or more advanced measurement applications?** Up-sell 9000.

## Model comparison

	DSO/MSO 7012B/14B	DSO/MSO 7032B/34B	DSO/MSO 7052/54B	DSO/MSO 7104B
Bandwidth	100 MHz	350 MHz	500 MHz	1 GHz
Sample rate	2 GSa/s	4 GSa/s max, 2 GSa/s each channel		
Channels	2 or 4 scope channels on DSOs, 2 or 4 scope channels +16 logic channels on MSOs			
Memory	8 Mpts standard			
Display	12.1" XGA (1024 x 768)			
Update rate	100,000 wfms/s			
Warranty	3 years standard			
Connectivity	USB host (one front, one back), USB device, LAN, VGA			
Triggering	Edge, pulse width, pattern, TV, Nth edge burst, duration, sequence, serial bus (I²C, SPI, RS-232/UART, CAN, LIN, I²S, MIL-STD 1553, and USB)			
Dimensions	45.4 cm W x 29.8 cm H x 22 cm D			
Weight	5.9 kg			

## Included probes

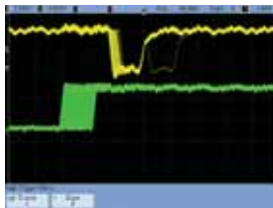
10073D	10:1, 500 MHz passive probe (1 per channel included 350 MHz to 1 GHz models)
N54620-68701	16 digital channel MSO cable (1 per scope on all MSO models and on MSO upgrade kits)
10074D	10:1, 150 MHz passive probe (1 per channel included 100 MHz models)

*See page 67 for additional probing options.*

# InfiniiVision 7000B Series Oscilloscopes



**Attractive.** 12.1" XGA display with 256 levels of intensity grading.



**Fast.** MegaZoom III technology delivers up to 100,000 deep-memory acquisitions per second to see infrequent events and subtle signal detail.



**Smart.** Customize with a wide range of application packages.



**Form factors.** 7000B Series technology is also available in a smaller, more traditional bench-top form factor that offers a battery, and space-saving 1U-high 19" wide version.

## Competitive information

	<b>Agilent 7000B Series</b>	<b>Texttronix DPO/MSO4000</b>	<b>LeCroy WaveSurfer Xs-A, MXs-A</b>
Bandwidth	100 MHz, 350 MHz, 500 MHz 1 GHz	350 MHz, 500 MHz 1 GHz	200 MHz, 400 MHz, 600 MHz 1 GHz
Upgradable MSO	Yes	No	Yes, external module
Sampling rate	Up to 4 GSa/s	Up to 5 GSa/s	Up to 5 GSa/s
Memory depth	8 Mpts	10 Mpts	10 Mpts
Analog channels	2 and 4 channels	4 channels	2 and 4 channels
Display	12.1" XGA (1024x768)	10.4" XGA (1024x768)	10.4" SVGA (800x600)
Update rate	100,000 wfms/sec	50,000 wfms/sec (only analog channels)	40 wfms/sec
Integrated mixed signal oscilloscope	Yes – 16 channels	Yes – 16 channels	No, external module
Serial trigger, decode, search	I <sup>2</sup> C, SPI, CAN, LIN, FlexRay, RS-232/UART, I <sup>2</sup> S, MIL-STD 1553	I <sup>2</sup> C, SPI, CAN, LIN, FlexRay, RS-232/UART, I <sup>2</sup> S	I <sup>2</sup> C, SPI, CAN, LIN, FlexRay, RS-232/UART, I <sup>2</sup> S, MIL-STD 1553
Hardware-based serial decode	Yes	No	No
Segmented memory	Yes	No	Yes
Hardware-based mask test	Yes	No	No
FPGA dynamic probe	Yes	Yes	No
Pricing	Similar	Similar	Xs-A: lower MXs-A: similar

## Accessories

N2733A	Soft carrying case
N2732A	Rackmount kit
N2895A	Hard copy users manual

## Measurement options

N2741A ♦	MSO upgrade, 16 digital channels for DS0701xB models
N2735A ♦	MSO upgrade, 16 digital channels for DS0703xB models
N2736A ♦	MSO upgrade, 16 digital channels for DS0705xB models
N2737A ♦	MSO upgrade, 16 digital channels for DS0710xB models
N5455A ♦	Mask limit testing
N5454A ♦	Segmented memory
N5423A <sup>1</sup> ♦	Embedded serial triggering and analysis (I <sup>2</sup> C, SPI)
N5457A <sup>1</sup> ♦	Computer serial triggering and analysis (RS-232/422/485/UART)
N5424A <sup>1</sup> ♦	Automotive serial triggering and analysis (CAN, LIN)
N5469A <sup>1</sup> ♦	MIL-STD 1553 serial triggering and analysis
N5468A <sup>1</sup> ♦	Audio serial triggering and analysis (I <sup>2</sup> S)
N5432C <sup>1</sup> ♦	FlexRay serial triggering and analysis
N5406A <sup>2</sup> ♦	Xilinx FPGA dynamic probe
N5434A <sup>2</sup> ♦	Altera FPGA dynamic probe
U1881A ♦	Power measurement and analysis

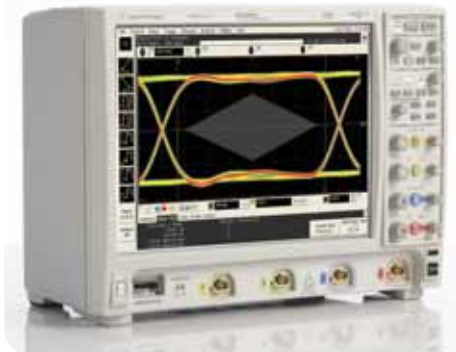
♦ Options may be purchased either initially or as upgrades later.

1. Available on 4-channel DSO models and 4+16-channel MSO models only.

2. Available on MSO models only.

# Infiniium 9000 Series Oscilloscopes

**LXI**



*Engineered for the broadest measurement capability.*

Starting price: **\$17,476**

## Key features

- Three instruments in one:
  - Oscilloscope: Fast sample rate, deepest memory up to 1 Gpts, upgradable bandwidth to 4 GHz
  - Logic analyzer: Integrated 16 digital channels in MSO models, upgradable on DSO models (N2901x)
  - Protocol analyzer: World's only scope-based protocol viewer with multi-tab viewing
- Widest range of application-specific measurement software
- Sized to fit your environment with the largest 15.1" XGA display

## Qualify

- **Need less than 600 MHz bandwidth?** Sell 7000B Series.
- **Need more than 4 GHz bandwidth?** Up-sell Agilent 90000 Series.

## Model comparison

	<b>DSO/MSO 9064A</b>	<b>DSO/MSO 9104A</b>	<b>DSO/MSO 9254A</b>	<b>DSO/MSO 9404A</b>
Bandwidth	600 MHz	1 GHz	2.5 GHz	4 GHz
Sample rate	20 GSa/s max, 10 GSa/s each channel			
Channels	4 scope channels on DSOs, 4 scope channels +16 logic channels on MSOs			
Memory	10 Kpts standard, up to 1 Gpts optional			
Display	15.1" XGA (1024 x 768)			
Warranty	1 year standard			
Connectivity	LAN, USB host (3 front, 4 side), USB device, RS-232, PS/2 (2 side), VGA, DVI			
Triggering	Edge, edge transition, edge then edge, glitch, runt, timeout, pattern/pulse range, state, pulse width, line, window, setup and hold, video, serial (I <sup>2</sup> C, SPI, CAN, LIN, FlexRay, RS-232/UART, JTAG, USB, PCIe, MIPI D-Phy, generic 8B/10B)			
Dimensions	42.4 cm W x 31.8 cm H x 22.6 cm D			
Weight	13.9 kg			

## Included probes

N2873A	10:1, 500 MHz passive probes (quantity 4)
N54620-68701	16 digital channel MSO cable (1 per scope on all MSO models and on MSO upgrade kits)

*See page 67 for additional probing options.*

## Cross-sell

- N9320B spectrum analyzer
- N8700 power supplies
- N9000A signal analyzer
- 81150A function/arbitrary/noise and pulse generator



# Infiniium 9000 Series Oscilloscopes



**Powerful Infiniium scope.** Fast sample rate. Use responsive deep memory to capture longer periods of time at high sample rates.



**Integrated mixed signal oscilloscope.** Trigger across time-correlated 4 analog and 16 digital channel combinations.



**Protocol analysis capability.** Trigger and view packets at the protocol level and drill up or down between the physical and protocol layers.



**Sized to fit your environment.** The Infiniium 9000 offers a 15.1" display, largest in the industry, with a small footprint form factor.

## Competitive information

	<b>Agilent 9000 Series</b>	<b>Texttronix DPO/MSO5000</b>	<b>Texttronix DPO7000</b>	<b>LeCroy WaveRunner Xi-A, Mxi-A</b>
Bandwidth	600 MHz, 1 GHz, 2.5 GHz, 4 GHz	350 MHz, 500 MHz, 1 GHz, 2 GHz	500 MHz, 1 GHz, 2.5 GHz, 3.5 GHz (software boosted)	400 MHz, 600 MHz, 1 GHz, 2 GHz
Upgradable	Yes	No	No	No
Half-channel sampling rate	20 GSa/s	10 GSa/s	20 GSa/s	10 GSa/s
Half-channel memory depth	Up to 1 Gpts	Up to 250 Mpts	Up to 250 Mpts	Up to 25 Mpts
Display	15.1" XGA (1024x768)	10.4" XGA (1024x768)	12.1" XGA (1024x768)	10.4" SVGA (800x600)
Upgradable MSO	Yes	Yes	No	Yes, external module
Mixed signal oscilloscope	Yes – 16 channels	Yes – 16 channels	No	No, external module
Serial trigger, decode, search	I <sup>2</sup> C, SPI, CAN, LIN, FlexRay, RS-232/UART, JTAG, USB, PCIe, MIPI D-Phy, generic 8B/10B	I <sup>2</sup> C, SPI, CAN, LIN, RS-232/UART, USB	I <sup>2</sup> C, SPI, CAN, LIN, FlexRay, RS-232/UART	I <sup>2</sup> C, SPI, CAN, LIN, FlexRay, RS-232/UART, I <sup>2</sup> S, MIL-STD-1553
Compliance applications	USB 2.0 MIP D-Phy, Ethernet, memory	USB 2.0, Ethernet, memory	USB 2.0, Ethernet, memory	USB 2.0, Ethernet
InfiniiScan zone-qualified-measurements	Yes, 8 zones	No	No	No
Drag and drop measurements	Yes	No	No	No
Pricing	Similar	Lower	Similar	Lower

## Application software





N5391B	◆	I <sup>2</sup> C/SPI triggering and decode
N5462B	◆	RS-232/UART triggering and decode
N8803B	◆	CAN, LIN, FlexRay triggering and decode
N5463B	◆	PCI Express 1.1 triggering and decode
N5464B	◆	USB triggering and decode
N5416A	◆	USB 2.0 compliance
N8802A	◆	MIPI D-PHY trigger and decode
U7238A	◆	MIPI D-PHY compliance
N8801A	◆	SATA protocol trigger and decode
N8817A	◆	JTAG triggering and decode
U7233A	◆	DDR1 validation
N5413A	◆	DDR2 validation
U7246A	◆	SD UHS-1 compliance
N5392A	◆	Ethernet compliance
N5384A	◆	High-speed SDA and clock recovery
N5415A	◆	InfiniiScan
E2681A	◆	EZJIT jitter analysis
N5400A	◆	EZJIT Plus jitter analysis
N5467A	◆	User-definable application
N5430A	◆	User-defined function
U1882A	◆	Power measurement
N5397A	◆	Xilinx FPGA dynamic probe
N5433A	◆	Altera FPGA dynamic probe

◆ Options may be purchased either initially or as upgrades later.



# Probes

To get the best performance from your oscilloscope, you need the right probes and accessories for your applications

Passive probes	Single-ended active probes	Differential active probes	Current probes
			
<ul style="list-style-type: none"> <li>• Measure ground reference voltages</li> <li>• Most durable, economical and widely used probe type</li> <li>• Available with various attenuation ratios: 1:1, 10:1, 100:1 and 1000:1</li> </ul>	<ul style="list-style-type: none"> <li>• Best overall combination of low resistive and capacitive loading</li> <li>• Use on high-impedance, high-frequency circuits that would be heavily loaded by passive probes</li> </ul>	<ul style="list-style-type: none"> <li>• View of signals referenced to each other rather than earth ground</li> <li>• View of small signals in the presence of large DC offsets or other common-mode signals</li> </ul>	<ul style="list-style-type: none"> <li>• Measure up to 100 MHz bandwidth and 500 A current</li> <li>• Hybrid technology to measure AC and DC current</li> <li>• Compatible with 1 MΩ scope input</li> </ul>

## N2744A T2A Interface Adapter



- An easy-to-use plug-on adapter to the Agilent oscilloscope's AutoProbe interface
- Provides necessary probe power, offset control and calibration as needed to the attached Tektronix probe interface

With the N2744A T2A adapter, the following Tektronix probes will work with all Agilent 3000 X, 7000 and 9000 Series oscilloscopes.

Tek probe number	Probe bandwidth	Probe type or attenuation
<b>Current probe</b>		
TCP202	50 MHz	AC/DC
<b>Single-ended active probes</b>		
P6243	1 GHz	10:1
P6245	1.5 GHz	10:1
P6205	750 MHz	10:1
P6241	4 GHz	10:1
P6249	4 GHz	10:1
<b>Differential active probes</b>		
P6246	400 MHz	10:1/1:1
P6247	1 GHz	10:1/1:1
P6248A	1.5 GHz	10:1/1:1
P6250	500 MHz	50:1/5:1
P6251	1 GHz	50:1/5:1

# Probes

## Recommended probes for Agilent oscilloscopes

	2000 X-Series	3000 X-Series	7000 Series	9000 Series
<b>Scope bandwidth</b>	70 to 200 MHz	100 to 500 MHz	100 MHz to 1 GHz	600 MHz to 4 GHz
<b>Probe interface</b>	BNC	AutoProbe Lite	AutoProbe Lite	AutoProbe
<b>Standard probe (scope bandwidth)</b>	N2862B (70 MHz/100 MHz) N2863B (200 MHz)	N2862B (100 MHz) N2863B (200 MHz) N2890A (350 MHz/500 MHz)	10074D (100 MHz) 10073D (350 MHz to 1 GHz)	N2873A (all)
<b>Passive probe 1:1</b>	10070D	10070D, N2870A	10070D, N2870A	10070D, N2870A
<b>Passive probe 10:1</b>	N2862B, N2863B	N2862B, N2863B, N2889A, N2890A	10074D, 10073D, N2871A, N2873A	N2873A
<b>High-voltage passive probe 100:1</b>	10076B	10076B	10076B	10076B
<b>High-voltage passive probe 1000:1</b>	N2771B	N2771B	N2771B	N2771B
<b>Low Z passive probe</b>		N2874A, N2876A	N2874A, N2876A	N2874A, N2876A
<b>Active single-ended probe</b>		N2795A	N2795A/96A, 1144A <sup>1</sup> , 1145A <sup>1</sup> , 1156A, or 1130A <sup>3</sup> with SE probe accessory	N2795A/96A, 1156A-58A, 1130A-32A <sup>3</sup> with SE probe accessory
<b>Active differential probe (high speed)</b>		1141A <sup>1</sup> , 1130A <sup>3</sup>	1141A <sup>1</sup> , 1130A <sup>3</sup>	1130A/31A/32A <sup>3</sup>
<b>Active differential probe (high voltage)</b>	N2791A, N2891A	N2790A, N2791A, N2792A, N2793A, N2891A	N2790A, N2791A, N2792A, N2793A, N2891A	N2790A, N2791A, N2792A, N2793A, N2891A
<b>Current probe</b>	1146A, N2780A/81A/82A/83A <sup>2</sup>	1146A, 1147A, N2893A, N2780A/81A/82A/83A <sup>2</sup>	1146A, 1147A, N2893A, N2780A/81A/82A/83A <sup>2</sup>	1146A, 1147A, N2893A, N2780A/81A/82A/83A <sup>2</sup>

1. Requires 1142A power supply.

2. Requires N2779A power supply.

3. Order one or more InfiniiMax probe heads or connectivity kit per amplifier.



# Logic Analyzers

## What is a logic analyzer?

**Measurement/function:** Simultaneously measures signal voltage against time across many signals. Each signal is recognized to be either high or low when a voltage threshold is crossed by the signal. The results are displayed in multiple formats including waveforms, state machine traces, assembly language, protocol or source code.

## Customer application and needs

R&D	Design validation	Manufacturing
<ul style="list-style-type: none"><li>Perform debug and functional validation of digital devices during board turn-on and system integration</li></ul>	<ul style="list-style-type: none"><li>Ensure design is within spec</li><li>Determine operational margins</li><li>Verify operating characteristics under various conditions</li></ul>	<ul style="list-style-type: none"><li>Compare capability to known good unit</li><li>Determine root cause of manufacturing failures</li></ul>
User needs:	User needs:	User needs:
<ul style="list-style-type: none"><li>Measurement accuracy and capability</li><li>Ease-of-use</li><li>Reliability</li></ul>	<ul style="list-style-type: none"><li>Measurement accuracy and capability</li><li>Ease-of-use</li><li>Reliability</li></ul>	<ul style="list-style-type: none"><li>Comparative capability</li><li>Measurement accuracy</li><li>Ease-of-use</li></ul>

## Competitive cross reference

	Portable	Modular
Agilent	16800 Series	16900 Series
Tektronix	TLA5000/6000 Series	TLA7000 Series

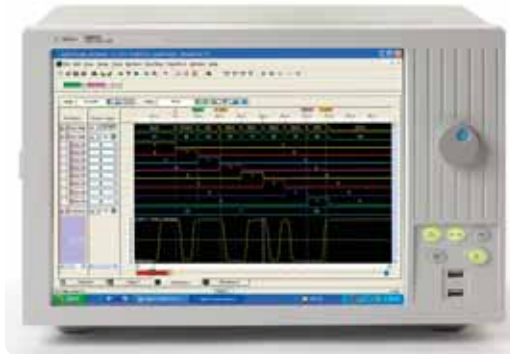
## Questions for your customer

Use the answers to choose the most suitable model from the table on page 69.

Number of channels	How many signals do you need to see at one time?
Each channel represents one signal. Channel count is not upgradable, so order enough channels for future measurement needs.	
Pattern generation	Do you need to generate digital signals as well as acquire them?
Order model with a built-in 48-channel pattern generator. Specify pattern generator clock and data pods for signal logic levels (TTL, CMOS, ECL, LVDS, 1.8 V, 2.5V, 3.3 V, 3.3 V LVPECL, 5 V PECL).	
Memory depth	How much signal activity do you need to capture at one time?
Memory depth is upgradable later if budget is tight. State mode memory is halved if all channels are used. Memory depth is halved if all channels are used in state mode.	
State speed	How fast is your bus data rate?
Select a maximum state speed that is at least as high as the bus data rate.	



# 16800 Series Logic Analyzers



*Logic analyzers with performance you can use, priced to fit your budget.*

Starting price: **\$10,716**

## Competitive advantage

<b>Agilent 16802A</b>	<ul style="list-style-type: none"> <li>• Larger display, 2X viewing area</li> <li>• Highest state speed (450 MHz optional)</li> <li>• Intuitive, simple triggering</li> <li>• Simultaneously view two separate buses with two analyzers</li> </ul>
<b>Tektronix TLA5202</b>	<ul style="list-style-type: none"> <li>• Lower price</li> <li>• 8 GHz MagniVu (high-speed timing, shallow memory depth of 16 K)</li> <li>• Automated measurements</li> </ul>

## Key features

- Highest channel count in a portable logic analyzer (204)
- Only integrated pattern generator in a portable logic analyzer (3 models available)

Model	16801A	16802A	16803A	16804A	16806A
	16821A	16822A	16823A		
Logic analyzer channels	34	68	102	136	204
Pattern generator channels	48	48	48	N/A	N/A
High speed timing zoom	4 GHz (250 ps) with 64 K depth				
Maximum timing sample rate	1 GHz (1 ns) half channel/500 MHz (2 ns) full channel				
Maximum state clock rate	250 MHz	450 MHz with option 500 250 MHz with option 250			
Maximum state data rate	250 Mb/s	500 Mb/s with option 500 250 Mb/s with option 250			
Maximum memory depth	1 M standard; 4 M, 16 M or 32 M optional				
Supported signal types	Single-ended				
Form factor	Display: 15" Dimensions: 44.32 cm W x 28.82 cm H x 33.03 cm D Weight: 12.9 kg to 14.5 kg (depending on model)				
Warranty	1-year warranty with options for 3-year or 5-year				

## Qualify

- **Need the flexibility of a modular system?** Up-sell the Agilent 16900 Series.
- **Need a built-in removable hard drive?** Up-sell the Agilent 16900 Series.
- **Need even faster state or timing speeds, more channels or greater memory depth?** Up-sell the Agilent 16900 Series.

## Included accessories

- Mouse and keyboard
- Installation guide
- Software CD kit and recovery DVD kit

## Compatible logic analyzer probes

E5383A	17-channel flying lead
E5346A	34-channel Mictor probe
E5385A	34-channel Samtec probe
E5396A	17-channel Soft touch probe
E5394A	34-channel Soft touch probe
E5404A	34-channel Pro-series soft touch probe

## Ordering Information

- 16800A-103 touch screen
- 16800A-109 external removable hard drive
- For pattern generator clock and data pods:  
**[www.agilent.com/find/16800](http://www.agilent.com/find/16800)**  
(Accessories and Related Products)
- Increase memory depth or state speed after initial purchase: E5876A (32-ch models), E5877A (68-ch models), E5878A (102-ch models), E5879A (136-ch models), E5880A (204-ch models)





# Power Meters and Power Sensors

For Employees of Agilent Authorized Distributors Only – Not for Customers or End Users



# Power Meters and Power Sensors

## What are power meters and sensors?

### Function/measurements:

#### Power meter

- Basic instrument used to measure RF output power
- Requires a power sensor to make a measurement

#### Power sensor

- Measures a physical quantity and converts into a signal readable by an observer or instrument

#### USB power sensor

- Makes a power measurement without a power meter
- Must be used with a PC or compatible Agilent instrument (e.g., N9340B handheld spectrum analyzer)

## Customer application and needs

R&D	Design validation	Manufacturing
<ul style="list-style-type: none"><li>• Check RF output power and accuracy to ensure within design spec or tolerance</li></ul>	<ul style="list-style-type: none"><li>• Check power accuracy and stability in various operating and environmental conditions</li></ul>	<ul style="list-style-type: none"><li>• Make RF power measurements to ensure no component defects or process problems</li></ul>
User needs:	User needs:	User needs:
<ul style="list-style-type: none"><li>• High accuracy and resolution</li><li>• Ease of use</li><li>• Reliability</li></ul>	<ul style="list-style-type: none"><li>• High accuracy and resolution</li><li>• Power measurement capabilities</li></ul>	<ul style="list-style-type: none"><li>• High speed and the best accuracy possible at a low cost</li></ul>

## Competitive cross reference

	Average power				Peak and average power	
Agilent	U2000 Series power sensors	Handheld RF power meter	EPM Series power meter	Thermistor power meter	P -Series power meter	EPM-P Series power meter
Anritsu, Rohde & Schwarz	Rohde NRP-Zxx sensors		Anritsu ML2437/ 38A		Rohde NRP-Z81	Anritsu ML2480 Series
Ladybug and Tegam		Ladybug LB478A		Tegam 1830A		




## Questions for your customer

Use the answers to choose the most suitable model from the table below.

**Note:** Users traditionally require both a power meter and a power sensor to make measurements, except with the V3500A handheld and U2000 Series sensors.

Measurement made	Do you need to make average or both average and peak power measurements?
Average power	Choose the <b>N1913/4A</b> , <b>N432A</b> , <b>U2000</b> or <b>V3500A</b> .
Peak and average power	Choose the <b>E4416A/17A</b> or <b>N1911A/12A</b> .
Power range and frequency required	What power and frequency range do you need to measure?
Sensor dependent	<ul style="list-style-type: none"> <li>The power sensor used will determine the bandwidth and power level of signals that can be measured.</li> <li>Choose the power sensor needed and then make sure it is compatible with the power meter you selected.</li> </ul>

Model number	Why buy? 1-minute sell	Measurement made	Power range (sensor-dependent)	Frequency range (sensor-dependent)	Starting price USD
<b>U2000 Series</b>	<ul style="list-style-type: none"> <li>Mobile testing</li> <li>Plug-and-play ease</li> <li>Combines power meter and power sensor capabilities</li> </ul>	<ul style="list-style-type: none"> <li>Average and time-gated measurements</li> </ul>	–60 dBm to +44 dBm	9 kHz to 24 GHz	\$2,630
<b>V3500A</b>	<ul style="list-style-type: none"> <li>For portable RF measurements</li> <li>Palm-sized power meter with an integrated power sensor and built-in display</li> </ul>	<ul style="list-style-type: none"> <li>Average power measurements</li> </ul>	–63 dBm to +20 dBm	10 MHz to 6 GHz	\$1,808
<b>N432A</b>	<ul style="list-style-type: none"> <li>Replaces legendary 432A</li> <li>For high-accuracy measurements, particularly in metrology and calibration lab environments</li> </ul>	<ul style="list-style-type: none"> <li>Average power measurements</li> </ul>	–30 dBm to +10 dBm	100 kHz to 18 GHz (with Option 478A H63)	\$8,764
<b>N1913/14A EPM Series</b> 	<ul style="list-style-type: none"> <li>Replaces popular E4418/19B meters</li> <li>400 readings/sec with E-series sensors</li> <li>Up to 4 channels</li> <li>Industry's first color LCD readout</li> </ul>	<ul style="list-style-type: none"> <li>Average power measurements</li> </ul>	–70 dBm to +50 dBm (with Option N8482B-H01)	9 kHz to 110 GHz	\$3,888
<b>E4416A/17A EPM-P Series</b>	<ul style="list-style-type: none"> <li>For testing of complex modulation formats</li> </ul>	<ul style="list-style-type: none"> <li>Peak, average and peak-to-average ratio and time-gated measurements</li> </ul>	–70 dBm to +50 dBm (full range); –65 dBm to +20 dBm (peak range)	9 kHz to 110 GHz (full range); 50 MHz to 18 GHz (peak range)	\$4,754
<b>N1911A/12A P-Series</b>	<ul style="list-style-type: none"> <li>For effective capture of wireless signals</li> </ul>	<ul style="list-style-type: none"> <li>Peak and average power measurements, peak-to-average ratio</li> </ul>	–70 dBm to +50 dBm (full range); –65 dBm to +20 dBm (peak range)	9 kHz to 110 GHz (full range); 50 MHz to 40 GHz (peak range)	\$7,501
<b>N8262A P-Series</b>	<ul style="list-style-type: none"> <li>Same specifications as N1911A/12A P-Series</li> <li>1U high for compact ATE systems</li> </ul>	<ul style="list-style-type: none"> <li>Peak and average power measurements</li> </ul>	–70 dBm to +50 dBm (full range); –65 dBm to +20 dBm (peak range)	9 kHz to 110 GHz (full range); 50 MHz to 40 GHz (peak range)	\$11,784

# Power Meters Selection Chart

## Peak power measurement

EPM-P E4416A/17A (VBW: 5 MHz)



### Power sensor options

- E932x peak-and-average sensors (300 kHz, 1.5 MHz, 5 MHz)
- \* Also compatible with all average power sensors

P-Series N1911A/12A (VBW: 30 MHz)



P-Series modular N8262A (VBW: 30 MHz)



### Power sensor options

- N192x wideband sensors (30 MHz)
- E932x peak-and-average sensors (300 kHz, 1.5 MHz, 5 MHz)
- \* Also compatible with all average power sensors

Video BW	5 MHz	20 MHz	30 MHz	100 MHz
GSM/GPRS/EDGE	W-CDMA			
	HSDPA/HSUPA (FDD)			
		LTE		
TD-SCDMA				Cellular
HSDPA (TD-SCDMA)				
cdmaOne				
cdma2000®				
1xEV-DO				
iDEN/WiDEN				Two-Way Trunked
TETRA/TEDS				
APCO 25				
RFID				Personal Area Network
	ZigBee			
Bluetooth 1.2 & EDR				
Ultra-Wideband (Bluetooth Future)				
DVB-H				Mobile Broadcast
ISDB-T				
MediaFLO				
T-DMB				
	WiBro			
			WiMAX	
		WLAN		Broadband
		MMDS		
			LMDS	
			MIMO	
		GPS		Navigation
			Pt-Pt	
			Radar	

■ Accuracy warranted up to 30 MHz

## Average power measurement

EPM N1913A/14A



### Power sensor options

- 848x diode and thermocouple sensors
- N848x thermocouplesensors
- N848x and 848x waveguide sensors
- E441x 1-path diode CW-only sensors
- E930x 2-path diode True-Average sensors
- U200x USB sensors

N432A thermistor power meter



### Power sensor options

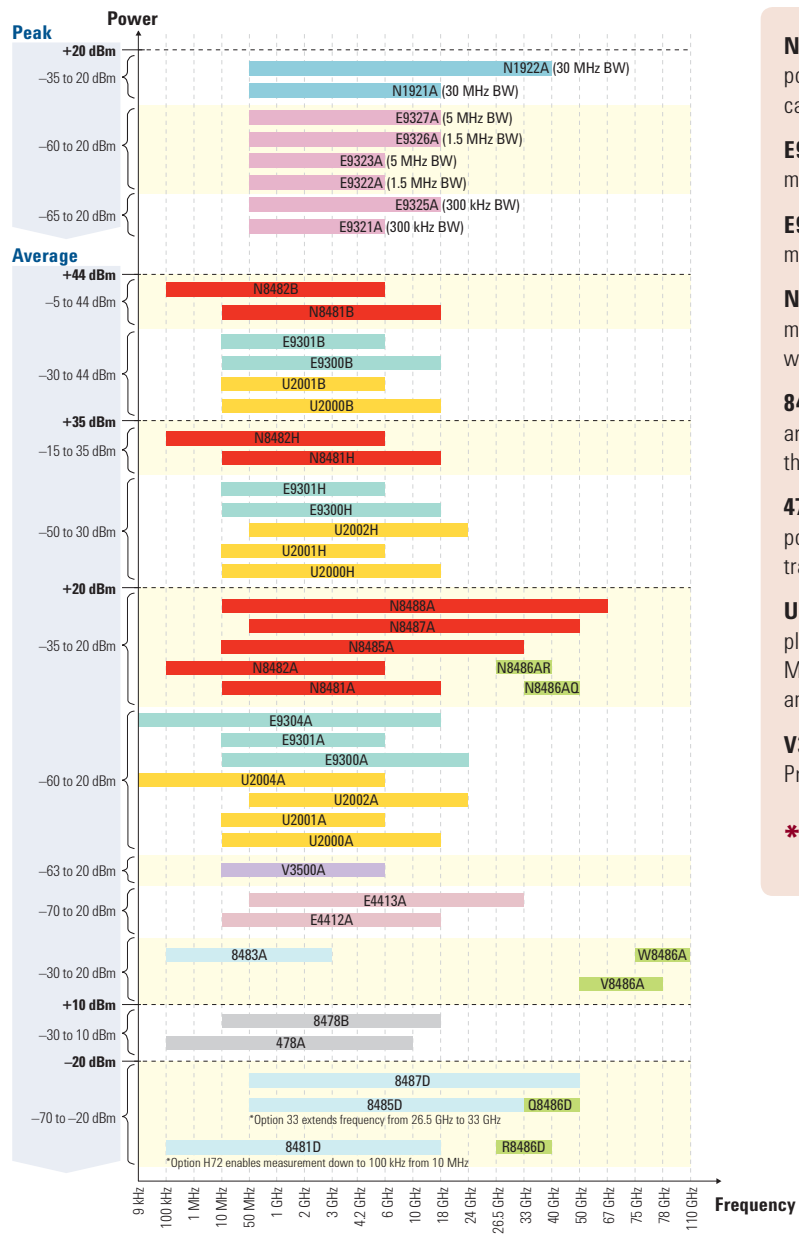
- 478A thermistor sensor
- 8478B thermistor sensor

U2000 Series USB power sensors



V3500A handheld RF power meter





**N192x P-Series wideband sensors:** *Diode technology.* Provides peak and average power measurements. 100 Msamples/sec continuous sampling rate. Internal zeroing and calibration without need to disconnect from DUT.

**E932x E-Series sensors:** *Diode technology.* Provides peak and average power measurements. 20 Msamples/sec continuous sampling rate.

**E930x and E441x E-Series sensors:** *Diode technology.* Provides average power measurements.

**N848x Series sensors:** *Thermocouple technology.* Provides average power measurements. Widest frequency range, measures up to 67 GHz. Excellent linearity of <1%. Includes waveguide sensors.

**848x Series sensors:** *Diode technology.* (All thermocouple sensors except the 8483A are now obsolete.) Provides average power measurements. Includes Waveguide sensors that enable measurements up to 110 GHz.

**478A and 8478 sensors:** *Coaxial thermistor mount technology.* Provides average power measurements. High 0.2% accuracy (with 478A-H75/H76) excellent for 1 mW transfer calibration in metrology and calibration labs.

**U200x sensors:** *Diode technology.* Provides average power measurements. Operates by plugging sensor straight into the PC's USB port. Displays results via N1918A Power Analysis Manager software. Internal zeroing without need to disconnect from DUT. Built-in triggering and trace graph display. Also compatible with the N1913A/4A EPM Series power meter.

**V3500A RF power meter:** *Diode technology.* Integrated sensor and built-in display. Provides average power measurements.

**\* Calibration and correction factors stored in EEPROM for all sensors except the 8480 Series.**

# U2000 Series USB Power Sensor



*Compact, lightweight power measurements without a power meter with just one tool.*

Starting price: **\$3,402**

## Competitive advantage

<b>Agilent U2000 Series USB power sensor</b>	<ul style="list-style-type: none"> <li>• Lower price (economy)</li> <li>• All-in-one package with built-in trigger</li> <li>• Easy zeroing execution</li> </ul>
<b>Rohde &amp; Schwarz NRP-Zxx Sensors</b>	<ul style="list-style-type: none"> <li>• Faster speed (1500 readings/sec)</li> <li>• Better dynamic range (90 dB)</li> </ul>

## Key features

- Combines power meter and power sensor capabilities with the use of N1918A power analysis manager software
- Connects directly to a PC on selected Agilent RF analyzers
- Simple setup via USB plug-and-play — no external power adapter needed
- Internal zeroing saves time and eliminates external calibration
- High measurement speed of up to 1000 readings/second (buffer mode)
- True average power measurement for all signal types, unlimited bandwidth
- Trace display and internal trigger

## Qualify

- **Need peak power measurements?** Sell E4416A/17A (video bandwidth < 5 MHz) or N1911A/12A (video bandwidth > 5 MHz).

## Included accessories

- Standard product manuals, calibration test report, and programming and reference CD-ROMs
- 1.5 m USB 2.0 compliance cable with USB mini-B connector
- Trigger cable BNC male to SMB female 50  $\Omega$ , 1.5 m

## Optional accessories

U2031A	Power sensor cable 1.5 m
U2031B	Power sensor cable 3 m
U2031C	Power sensor cable 5 m
Option 201	Transit case

Option 202	Soft carrying case
Option 203	Holster
Option 204	Soft carrying pouch

## Cross-sell

N1913/14A EPM Series power meters  
 N1918A Power analysis manager software  
 N9340B Handheld spectrum analyzer  
 N9912A Fieldfox analyzer

ON5181A/83A MXG signal generators  
 N9320B Economic spectrum analyzer  
 N9330B Handheld cable antenna tester

## Ordering Information

U2000A	10 MHz to 18 GHz	−60 to +20 dBm	+25 dBm average, 20 VDC +33 dBm peak, < 10 $\mu$ s
U2001A	10 MHz to 6 GHz		
U2002A	50 MHz to 24 GHz		
U2004A	9 kHz to 6 GHz	−60 to +20 dBm	+25 dBm average, 5 VDC +33 dBm peak, < 10 $\mu$ s
U2000B	10 MHz to 18 GHz	−30 to +44 dBm	+45 dBm average, 20 VDC +47 dBm peak, 1 $\mu$ s
U2001B	10 MHz to 6 GHz		
U2000H	10 MHz to 18 GHz	−50 to +30 dBm	+33 dBm average, 20 VDC +50 dBm peak, 1 $\mu$ s
U2001H	10 MHz to 6 GHz		
U2002H	50 MHz to 24 GHz	−50 to +30 dBm	+33 dBm average, 10 VDC +50 dBm peak, 1 $\mu$ s

# V3500A Handheld Power Meter



*Palm-sized power meter that delivers lab-quality RF power measurements.*

Starting price: **\$1,808**

## Competitive advantage

<b>Agilent V3500A</b>	• Built-in LCD display
<b>Ladybug LB478A</b>	• Lower price

## Key features

- Frequency range of 10 MHz to 6 GHz, wide dynamic range of –63 to +20 dBm
- Integrated power sensor and built-in LCD display
- Internal power reference for self-calibration
- Absolute accuracy as good as  $\pm 0.21$  dB enables more precise characterization of devices

## Included accessories

- USB interface cable Type A to Mini-B, 2.5 m

## Optional accessories

V3500A-PWR	External power supply
V3500-SHL	Holster carrying case with shoulder strap
V3500-CA1	USB cable Type A to Mini-B

# N432A Thermistor Power Meter



*High accuracy for metrology and calibration lab environments.*

Starting price: **\$8,764**

## Competitive advantage

<b>Agilent N432A</b>	• 1 mW transfer calibration (with 478A-H75) • Dual channels; one for thermistor sensor; optional channel for average power sensors
<b>Tegam 1830A</b>	• Better meter accuracy at $\pm 0.05\%$ of reading, $\pm 0.5$ $\mu$ W (0.1% at 1 mW)

## Replacement for the legacy 432A analog power meter

## Key features

- Frequency range: 100 kHz to 18 GHz (sensor-dependent)
- Dynamic range: –30 dBm to +10 dBm
- High accuracy ( $\leq 0.2\% \pm 0.5$   $\mu$ W), excellent for 1 mW transfer calibration (with 478A-H75/H76)
- Built-in 6.5-digit ADC eliminates need for external DMM
- Selectable bridge resistance (100/200/300/400  $\Omega$ )

## Compatible power sensors

Agilent 478A and 8478B Thermistor sensors

## Included accessories

- Thermistor sensor adapter cable 1.5 m and USB cable
- Standard product manuals, calibration test report, and programming and reference CD-ROMs

## Optional accessories

478A	Coaxial Thermistor mount, 10 MHz to 10 GHz
478A-H63	Frequency range, 100 kHz to 1 GHz
478A-H75	Frequency range, 1 MHz to 1 GHz
8478B	Coaxial Thermistor mount, 10 MHz to 18 GHz



# N1913/14A EPM Power Meters



*Single- or dual-channel meter for clear readings, easy viewing and exceptional portability.*

Starting price: **\$3,402**

## Competitive advantage

<b>Agilent U2000 Series USB power sensor</b>	<ul style="list-style-type: none"> <li>• Lower price (economy)</li> <li>• All-in-one package with built-in trigger</li> <li>• Easy zeroing execution</li> </ul>
<b>Rohde &amp; Schwarz NRP-Zxx Sensors</b>	<ul style="list-style-type: none"> <li>• Faster speed (1500 readings/sec)</li> <li>• Better dynamic range (90 dB)</li> </ul>

*Replacement for the legacy E4418/19B EPM power meters*

## Key features

- Frequency range of 9 kHz to 110 GHz, dynamic range of –70 to +44 dBm (sensor-dependent)
- Automated frequency/power sweep measurements with the optional external trigger IN/OUT feature
- Speed improvement by 2X for E-Series sensors: up to 400 readings/sec
- LXI Class C-compliant with GPIB, USB and LAN
- Two additional U2000 Series power sensors connectable using optional USB hosts
- Code compatibility with 436A, 437B (N1913A) and 438 (N1914A) power meters

## Compatible power sensors

- U2000 Series USB power sensors (9 kHz to 24 GHz; –60 dBm to +44 dBm)
- E4410 and E9300 E-Series (9 kHz to 26.5 GHz; –70 dBm to +44 dBm)
- 848xD Series, V8486A/W8486A diode sensors (10 MHz to 110 GHz; –70 dBm to +20 dBm)
- N8480 Series thermocouple sensors (100 kHz to 67 GHz; –35 dBm to +44 dBm)
- 8480 Series (100 kHz to 110 GHz; –70 dBm to +20 dBm)

## Options

N1913A	Single-channel average power meter
Option 102	Battery
Option 104	VGA
Option 106	One front and one rear USB port
N1913A-200	436A and 437B code compatibility

N1914A	Dual-channel average power meter
Option 103	Battery, two rear USB ports
Option 105	Battery, one front and one rear USB port
Option 107	External trigger IN/OUT
N1914A-200	438A code compatibility

## Included accessories

- Standard product manuals, calibration test report, and programming and reference CD-ROMs
- Power sensor cable (N11730A)

## Optional accessories

N11730A/B/C/D/E/F	Power sensor and SNS noise source cable, length 1.5/3/6.1/15.2/30.5 or 61 m
34131A	Transit case
34161A	Accessory pouch
Option 908	Rackmount kit
34141A	Soft carrying case
Option 300	Spare battery pack

## Cross-sell

- U2000 USB Power sensor
- N9310A Signal generator
- 7000 Series oscilloscopes
- See above compatible power sensors
- N9320A Spectrum analyzer

# E4416A/17A EPM P-Series Power Meters



Complete TDMA/CDMA characterization plus optimum dynamic range for peak power measurements.

Starting price: **\$4,763**

## Competitive advantage

<b>Agilent E4416/17A</b>	<ul style="list-style-type: none"><li>• Wider dynamic and frequency range</li><li>• Faster system speed</li><li>• Lower price</li></ul>
<b>Anritsu ML2480 Series</b>	<ul style="list-style-type: none"><li>• Meters and sensors offer more bandwidth and a faster sampling rate</li></ul>

**Other competition:** Rohde & Schwarz NRP, Boonton 4230A

## Key features

- Peak, average, peak-to-average ratio power measurements for TDMA, CDMA, W-CDMA and radar signals
- Four independent time gates for up to four simultaneous measurements
- One-button measurement setups for common wireless modulation formats

## Qualify

- **Need average power measurements?** Sell N1913/14A or U2000 Series USB power sensors.

## Compatible power sensors

- E9320 E-Series (50 MHz to 18 GHz; -65 dBm to +20 dBm)
- E4410 & E9300 E-Series (9 kHz to 26.5 GHz; -70 dBm to +44 dBm)
- 8480 Series (100 kHz to 110 GHz; -70 dBm to +20 dBm)
- N8480 Series (100 kHz to 67 GHz; -35 dBm to +440 dBm)

## Options

Option 002	Rear-panel sensor input
Option E20	Bundled with sensor

## Included accessories

- Standard product manuals, calibration test report, and programming and reference CD-ROMs
- Power sensor cable (E9288A)

## Optional accessories

34131A	Transit case for half-rack 2U-high instruments		
E9288A/B/C	Power sensor cable, 1, 5, 3 or 10 m		
34161A	Accessory pouch		
10833A/B/C/D/E/G	GPIB cable		
Connectivity (one of the following):			
82350B	PCI high-performance GPIB card	82351A	PCIe™-GPIB interface card
82357B	GPIB-to-USB interface	E5810A	GPIB-to-LAN gateway

## Cross-sell

- See above compatible power sensors
- N9310A Signal generator
- 7000 Series oscilloscopes
- N9320A Spectrum analyzer

# N1911A Single-Channel/12A Dual-Channel P-Series Power Meters



*Best-in-class pulse analysis/radar measurements with quick setup and easy connectivity.*

Starting price: **\$7,516**

## Competitive advantage

<b>Agilent E4411A/12A</b>	<ul style="list-style-type: none"> <li>Higher single-shot bandwidth</li> <li>Higher sample rate</li> <li>More measurements</li> <li>More connectivity choices</li> <li>Greater system speed</li> <li>Hassle-free internal zero and calibration</li> </ul>
<b>Rohde &amp; Schwarz NRP-Z81</b>	<ul style="list-style-type: none"> <li>Peak power USB sensor with lower overall performance</li> <li>Lower frequency coverage, up to 18 GHz</li> </ul>

**Other competition:** Anritsu ML 2490

## Key features

- Easy internal calibration and zeroing
- 30 MHz video bandwidth and 100 MSa/s for wireless communication
- Quick setup with 22 radio presets
- Automatic pulse capture

## Qualify:

- **Need average power measurements?** Sell N1913/14A or U2000 Series USB power sensors.

## Compatible power sensors

- E9320 E-Series (50 MHz to 18 GHz; -65 dBm to +20 dBm)
- E4410 and E9300 E-Series (9 kHz to 26.5 GHz; -70 dBm to +44 dBm)
- 8480 Series (100 kHz to 110 GHz; -70 dBm to +20 dBm)
- N8480 Series (100 kHz to 33 GHz; -67 dBm to +44 dBm)
- P-Series (50 MHz to 40 GHz; -35 dBm to 20 dBm)

## Options

Option 003	Rear sensor and power ref connectors	Option 101	Front sensor and power ref connectors
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## Included accessories

- Standard product manuals, calibration test report, and programming and reference CD-ROMs

## Optional accessories

34131A	Transit case for half-rack 2U-high instruments		
N1917A/B/C	P-Series meter cable adapter 1.5/3/10 m		
34161A	Accessory pouch		
10833A/B/C/D/E/G	GPIB cable		
Connectivity (one of the following):			
82350B	PCI high-performance GPIB card	82351A	PCIe™-GPIB interface card
82357B	GPIB-to-USB interface		

## Cross-sell

- See above compatible power sensors
- 7000 Series Oscilloscope
- N9310A Signal generator
- N9320A Spectrum analyzer

## Up-sell

**N8262A P-Series power meters** – Performance equivalent to the P-Series N1911A/12A benchtop instrument. Slim, compact build (1U half-rack) for easy deployment and LXI class-C compliance for seamless integration into an ATE system.



# Power Supplies and Electronic Loads

For Employees of Agilent Authorized Distributors Only – Not for Customers or End Users

# Power Supplies and Electronic Loads

## What is a power supply?

**Measurement/function:** Circuits that transform input AC power into DC output power. This power is then applied to the device under test (DUT) to enable functional tests to be performed. Depending on the number of circuits you need to power, the power supply may have one or more outputs.

## Customer application and needs

R&D and calibration/metrology	Design validation	Manufacturing
<ul style="list-style-type: none"> <li>Apply DC power to a prototype DUT to understand power consumption</li> </ul>	<ul style="list-style-type: none"> <li>Check power consumption under various operating and environmental conditions</li> </ul>	<ul style="list-style-type: none"> <li>Apply DC power to DUT in appropriate sequence to perform functional testing</li> </ul>
User needs:	User needs:	User needs:
<ul style="list-style-type: none"> <li>Front-panel controls</li> <li>Low ripple and noise</li> <li>Capability to set up and view critical turn-on/ turn-off sequences</li> <li>Lower power for bench use</li> <li>DUT protection from over-voltage and over-current</li> </ul>	<ul style="list-style-type: none"> <li>Lowest ripple and noise</li> <li>Wide range of power for various applications</li> <li>DUT protection from over-voltage and over-current.</li> <li>Statistical and trending capabilities</li> </ul>	<ul style="list-style-type: none"> <li>Fast programming speed</li> <li>Low ripple and noise (PARD) at a low cost</li> <li>Wide power range for various applications</li> <li>DUT protection from over-voltage and over-current</li> <li>Interfaces: LAN/LXI, GPIB, read-back voltage and current</li> <li>Small footprint to conserve rack space</li> </ul>

## Competitive cross reference

Company	Bench	System		
	Basic	Basic	Performance	Modular
<b>Agilent</b>	U3606A, U8000, E3600	N5700/N8700, 6030	6500/6600	N6700, 66000
Ametek (Sorensen/Xantrex)	None	DLM series 3K & 4K, XFR, DHP, SGI, XTR	DLM 600, XMP, XTR	HPD, XT, XMP, DLM 600
Tektronix	PWS2000 and PWS4000 Series	None	None	None
Chroma (Ametek OEM)	6200 (XT), 6203 (HPD)	6202F (XFR)		6203 (HPD)
AmRel	None	None	PD	PD
GW Instek	PST and PSS Series Programmable PS, GPS-3303, GPR-M and GPS Series Manual PS.	PSS Series Programmable PS, GPS-3303	None	PSS Series Programmable PS, GPS-3303
Kepco	None	None	None	MST
Lambda	None	Genesys	None	None

## Performance



## Questions for your customer:

Use the answers to choose the most suitable model from the table below.

Number of outputs	How many circuits need to be powered?
Popular models provide from one to eight outputs. Generally the more outputs, the less power available to each.	
Output power	How much power does your application require?
The maximum voltage and maximum current determine the power needed for an application (max volts x max current = max power). The same output power can be produced by different voltage and current combinations. Generally the higher the output power, the more a unit costs.	
Configuration	How and where will you use the power supply?
<b>Basic</b>	Basic units provide essential capabilities at an economical price, with low ripple and noise, excellent regulation and reliable performance.
<b>Performance</b>	Performance units provide precise control over output power levels with the lowest noise and highest accuracy for automated test applications.
<b>Modular</b>	Modular units are optimized for ATE use and come in a smaller and easy to customize form factor.
<b>DC power analyzer</b>	DC power analyzers are optimized for R&D to characterize power consumption of prototypes.

Model number	Why buy? 1-minute sell	Number of outputs	Output power	Starting price USD
<b>U3606A*</b>	<ul style="list-style-type: none"> <li>Combination DMM and power supply</li> </ul>	1	30 W	\$1,199
<b>U8000 Series</b>	<ul style="list-style-type: none"> <li>Low-cost, single-output, non-programmable DC power supplies</li> </ul>	1	Up to 150 W	\$307
<b>E3600 Series</b>	<ul style="list-style-type: none"> <li>Value price</li> <li>Consistent power and variety of voltage, current and power choices</li> </ul>	1, 2, 3	Up to 200 W	\$451
<b>603x</b>	<ul style="list-style-type: none"> <li>Autoranging outputs – max power at a variety of voltages</li> <li>Measures voltage and current output</li> <li>GPIB for remote control</li> </ul>	1	Up to 1200 W	\$5,870
<b>6500 and 6600 Series</b>	<ul style="list-style-type: none"> <li>Measures voltage and current output</li> <li>Excellent performance: fast, low noise, extremely accurate</li> <li>GPIB for remote control</li> </ul>	1	Up to 6600 W	\$2,236
<b>N5700 and N8700</b>	<ul style="list-style-type: none"> <li>Compact form factor ideal for system racks</li> <li>Measures voltage and current output</li> <li>LAN LXI Class C-compliant</li> </ul>	1	Up to 1500 W (N5700) Up to 5.5 kW (N8700)	\$2,239
<b>N6700 low-profile modular</b>	<ul style="list-style-type: none"> <li>Best ATE solution for up to 1200 W: fast, low noise, advanced programming, LAN and GPIB, compact form factor</li> <li>Choose from more than 20 N6700 DC power modules, including basic, performance and precision models</li> </ul>	1 to 4	Up to 300 W per output, up to 1200 W total	\$2,434
<b>N6705B DC power analyzer</b>	<ul style="list-style-type: none"> <li>Ideal for R&amp;D: provides power and features to analyze prototypes</li> <li>Choose from more than 20 N6700 DC power modules, including basic, performance and precision models</li> </ul>	1 to 4	Up to 300 W per output, up to 600 W total	\$6,908
<b>66000 modular</b>	<ul style="list-style-type: none"> <li>Compact, modular mainframe with good selection of plug-in modules</li> <li>Fast, low-noise, accurate</li> <li>GPIB for remote control</li> </ul>	1 to 8	Up to 150 W per output, up to 1200 W total	\$2,435

\* See page 21 for more information on the U3606A.



# E3600 and U8000 Series Basic DC Power Supplies



*Affordable family with many models, including programmable units, ideal for basic applications and bench use.*

E3600 Starting price: **\$451**



*Value-priced family of general-purpose units with efficient setup and reliable DC power.*

U8000 Starting price: **\$307**

## Key features: E3600 Series

- 23 models from 30 W to 200 W
- Constant-voltage and constant-current modes
- Low-noise linear regulation (best at 1 mVp-p/0.2 mVrms)
- Remote sensing
- Manual control to adjust output, some with GPIB

## Key features: U8000 Series

- Excellent load regulation  $<0.01\% + 2 \text{ mV}$
- Over-Voltage Protection (OVP) and Over-Current Protection (OCP)
- Save/Recall function for up to three memory states
- Key lock feature and physical lock mechanism

## Qualify

- **Bench use okay?** If system use needed, up-sell N5700.
- **Need additional performance features?** Sell E3600 Series.
- **Basic affordable supply needed?** Sell U8000 series.

## Optional accessories

- E36xxA/U800xA-1CM rackmount kit
- E3600A-100 test lead kit
- 82357B GPIB-to-USB interface

## Cross-sell

- 34405A economy DMM
- 33210A function waveform generator
- 2000 X-Series oscilloscopes
- U3606A DMM/DC power supply
- U3400 Series low-cost DMMs

# 6500 and 6600 Series High-Performance Bench and System



*Extensive selection of performance power supplies offering low noise, high accuracy and specialty features.*

Starting price: **\$2,236**

## Key features

- 40 W to 6600 W outputs, up to 120 V and up to 875 A
- Fast, low-noise and extremely accurate outputs
- Computer control via GPIB on 6600 series; manual control on the 6500 series
- Rapid voltage changes, including active down programming
- Outputs connectable in parallel and in series
- Built-in measurements and advanced programming features

## Cross-sell

- 34401A industry-standard DMM
- 33220A function/arbitrary waveform generator
- 2000 X-Series oscilloscopes

*For more info, visit*

*[www.agilent.com/find/6600](http://www.agilent.com/find/6600) and [www.agilent.com/find/6500](http://www.agilent.com/find/6500).*

# N5700 and N8700 Series Low-Profile System

**LXI**



*Affordable family of single-output, programmable DC supplies designed for use in system racks.*

N5700 Starting price: **\$2,497**

N8700 Starting price: **\$4,699**

## Key features

- 45 models from 750 W to 5 kW output power
- Built-in voltage and current measurements
- Outputs connectable in parallel and in series
- LXI Class C-compliant with GPIB, LAN and USB 2.0 interfaces standard
- Over-voltage, over-current protection
- Space-saving 1U and 2U rack height

## Cross-sell

- 33521A function/arbitrary waveform generator
- 34110/11A DMM
- 53210A universal frequency counter/timer

*For more info, visit*

*[www.agilent.com/find/lowcostpower](http://www.agilent.com/find/lowcostpower) and [www.agilent.com/find/N5700](http://www.agilent.com/find/N5700).*

# N6700 Low-Profile Modular DC Power Supplies



*Basic and performance 1U modules that simplify test-system assembly, programming, debugging and operation.*

Starting price: **\$2,434**

## Competitive advantage

<b>Agilent N6700 Series</b>	<ul style="list-style-type: none"> <li>Up to four modules in 1U-high package</li> <li>Fast programming/downprogramming</li> <li>Good output settling and transient recovery for frequent voltage changes</li> </ul>
<b>Sorensen DLM 600 Series PS</b>	<ul style="list-style-type: none"> <li>Lower cost</li> <li>Higher power</li> <li>Single-output solution</li> </ul>

## Key features

- Three mainframes with more than 20 modules to choose from; mainframe requires at least one module; can use up to 4 modules from 30 W to 300 W
- Fast settling times and fast command processing (<1 ms)
- Output sequencing, triggering and LIST mode for user-defined, arbitrary output
- LXI Class-C compliant with standard GPIB, USB and LAN

## Mainframes

- N6700B – 400 W, up to 4-output mainframe
- N6702A – 1200 W, up to 4-output mainframe
- N6701A – 600 W, up to 4-output mainframe
- N6705B – 600 W, up to 4-output mainframe (described below)

## Optional accessories

- N6709A rackmount kit

## Modules for both N6700 and N6705B

50 W models	
N6731B	5 V, 10 A
N6732B	8 V, 6.25 A
N6733B	20 V, 2.5 A
N6734B	35 V, 1.5 A
N6735B	60 V, 0.8 A
N6736B	100 V, 0.5 A
N6751A ■	50 V, 5 A
N6761A ■	50 V, 1.5 A

100 W models	
N6741B	5 V, 20 A
N6742B	8 V, 12.5 A
N6743B	20 V, 5 A
N6744B	35 V, 3 A
N6745B	60 V, 1.6 A
N6746B	100 V, 1 A
N6752A ■	50 V, 10 A
N6782A ■	50 V, 3 A

300 W models	
N6773A	20 V, 15 A
N6774A	35 V, 8.5 A
N6775A	60 V, 5 A
N6776A	100 V, 3 A
N6753A	20 V, 50 A
N6754A ■	60 V, 20 A

- High performance
- Precision

*Modules must be installed in one of the N6700 mainframes, sold separately.*

# N6705B DC Power Analyzer



*Quickly understand your device's power consumption.*

Starting price: **\$6,908**

## Key features

- No programming required, designed for the R&D bench
- Combines 1 to 4 DC power supplies, plus basic DMM, scope, function generator, and data logger capabilities in one instrument.
- Tailor the N6705B using the same modules for the N6700 (listed above)
- LXI Class C-compliant with standard GPIB, USB and LAN



# DC Power Supply Selection Index

## Instructions

From the list below, match voltage, current, or power to requirements of the application.

## Basic models

Max volts per output	Max amps per output	Max watts per output	Number of outputs*	Number of ranges*	Computer interface	Rack size	Model type	US List
-25	1	80	1 of 3	1	GPIO	1/2 w x 3U h	E3631A	\$1,294
-20	0.5	35	1 of 3	1	none	1/2 w x 2U h	E3630A	\$615
5	10	50	1	1	module none**	module **	N6731B Module	\$517
5	20	100	1	1	module none**	module **	N6741B Module	\$953
6	2.5	35	2 of 3	1	none	1/2 w x 2U h	E3630A	\$615
6	5	80	2 of 3	1	GPIO	1/2 w x 3U h	E3631A	\$1,294
6	100	600	1	1	GPIO, LAN, USB	full w x 1U h	N5741A	\$2,497
6	180	1080	1	1	GPIO, LAN, USB	full w x 1U h	N5761A	\$2,959
8	3	30	1	2	none	1/2 w x 2U h	E3610A	\$451
8	3	30	1	2	GPIO	1/2 w x 2U h	E3640A	\$739
8	3	60	1 of 2	2	GPIO	1/2 w x 3U h	E3646A	\$1,033
8	3	30	1	2	GPIO, USB	1/2 w x 2U h	U3606A	\$1,201
8	5	50	1	2	GPIO	1/2 w x 2U h	E3642A	\$788
8	5	100	1 of 2	2	GPIO	1/2 w x 3U h	E3648A	\$1,235
8	6	48	1	1	none	1/2 w x 2U h	E3614A	\$707
8	6.25	50	1	1	module none**	module **	N6732B Module	\$517
8	8	80	1	2	GPIO	1/2 w x 2U h	E3644A	\$962
8	12.5	100	1	1	module none**	module **	N6742B Module	\$953
8	20	200	1	2	GPIO	1/2 w x 3U h	E3633A	\$1,368
8	90	720	1	1	GPIO, LAN, USB	full w x 1U h	N5742A	\$2,497
8	165	1320	1	1	GPIO, LAN, USB	full w x 1U h	N5762A	\$2,959
8	400	3200	1	1	GPIO, LAN, USB	full w x 2U h	N8731A	\$4,699
10	330	3300	1	1	GPIO, LAN, USB	full w x 2U h	N8732A	\$4,699
12.5	60	750	1	1	GPIO, LAN, USB	full w x 1U h	N5743A	\$2,497
12.5	120	1500	1	1	GPIO, LAN, USB	full w x 1U h	N5763A	\$2,959
15	2	30	1	2	none	1/2 w x 2U h	E3610A	\$451
15	7	120	1	2	GPIO	1/2 w x 3U h	E3632A	\$1,131
15	220	3300	1	1	GPIO, LAN, USB	full w x 2U h	N8733A	\$4,699
20	0.5	35	3 of 3	1	none	1/2 w x 2U h	E3630A	\$615
20	1.5	30	1	2	none	1/2 w x 2U h	E3611A	\$451
20	1.5	30	1	2	GPIO	1/2 w x 2U h	E3640A	\$739
20	1.5	60	2 of 2	2	GPIO	1/2 w x 3U h	E3646A	\$1,033
20	2.5	50	1	2	GPIO	1/2 w x 2U h	E3642A	\$788
20	2.5	100	2 of 2	2	GPIO	1/2 w x 3U h	E3648A	\$1,235
20	2.5	50	1	1	module none**	module **	N6733B	\$517
20	3	60	1	1	none	1/2 w x 2U h	E3615A	\$707
20	4	80	1	2	GPIO	1/2 w x 2U h	E3644A	\$962
20	5	100	1	1	module none**	module **	N6743B Module	\$830

## Basic models continued

Max volts per output	Max amps per output	Max watts per output	Number of outputs*	Number of ranges*	Computer interface	Rack size	Model type	US List
20	10	200	1	2	GPIO	1/2 w x 3U h	E3633A	\$1,368
20	15	300	1	1	module none**	module **	N6773A Module	\$1,382
20	30	232	1	auto (3)	GPIO	1/2 w x 4U h	6033A	\$4,625
20	38	760	1	1	GPIO, LAN, USB	full w x 1U h	N5744A	\$2,497
20	76	1520	1	1	GPIO, LAN, USB	full w x 1U h	N5764A	\$2,959
20	120	1,064	1	auto (3)	GPIO	1 w x 3U h	6031A	\$6,163
20	165	3300	1	1	GPIO, LAN, USB	full w x 2U h	N8734A	\$4,699
20	250	5000	1	1	GPIO, LAN, USB	full w x 2U h	N8754A	\$6,512
25	1	50	1 of 2	1	none	1/2 w x 2U h	E3620A	\$615
25	1	50	2 of 2	1	none	1/2 w x 2U h	E3620A	\$615
25	1	80	3 of 3	1	GPIO	1/2 w x 2U h	E3631A	\$1,294
25	7	200	1	2	GPIO	1/2 w x 3U h	E3634A	\$1,368
30	1	30	1	2	GPIO, USB	1/2 w x 2U h	U3606A	\$1,201
30	3	90	1	1	none	1/2 w x 2U h	U8001A	\$316
30	4	120	1	2	GPIO	1/2 w x 3U h	E3632A	\$1,131
30	5	150	1	1	none	1/2 w x 2U h	U8002A	\$396
30	25	750	1	1	GPIO, LAN, USB	full w x 1U h	N5745A	\$2,497
30	50	1500	1	1	GPIO, LAN, USB	full w x 1U h	N5765A	\$2,959
30	110	3300	1	1	GPIO, LAN, USB	full w x 2U h	N8735A	\$4,699
30	170	5100	1	1	GPIO, LAN, USB	full w x 2U h	N8755A	\$6,512
35	0.8	30	1	2	GPIO	1/2 w x 2U h	E3641A	\$739
35	0.8	60	1 of 2	2	GPIO	1/2 w x 3U h	E3647A	\$1,033
35	0.85	30	1	2	none	1/2 w x 2U h	E3611A	\$451
35	1.4	50	1	2	GPIO	1/2 w x 2U h	E3643A	\$788
35	1.4	100	1 of 2	2	GPIO	1/2 w x 3U h	E3649A	\$1,235
35	1.5	52.5	1	1	module none**	module **	N6734B Module	\$517
35	1.7	60	1	1	none	1/2 w x 2U h	E3616A	\$707
35	2.2	80	1	2	GPIO	1/2 w x 2U h	E3645A	\$962
35	3	105	1	1	module none**	module **	N6744B Module	\$953
35	8.5	300	1	1	module none**	module **	N6774A Module	\$1,382
40	19	760	1	1	GPIO, LAN, USB	full w x 1U h	N5746A	\$2,497
40	38	1520	1	1	GPIO, LAN, USB	full w x 1U h	N5766A	\$2,959
40	85	3400	1	1	GPIO, LAN, USB	full w x 2U h	N8736A	\$4,699
40	125	5000	1	1	GPIO, LAN, USB	full w x 2U h	N8756A	\$6,112
50	4	200	1	2	GPIO	1/2 w x 3U h	E3634A	\$1,368
60	0.5	30	1	2	none	1/2 w x 2U h	E3612A	\$451
60	0.5	30	1	2	GPIO	1/2 w x 2U h	E3641A	\$739
60	0.5	60	2 of 2	2	GPIO	1/2 w x 3U h	E3647A	\$1,033
60	0.8	50	1	2	GPIO	1/2 w x 2U h	E3643A	\$788
60	0.8	100	2 of 2	2	GPIO	1/2 w x 3U h	E3649A	\$1,235
60	0.8	50	1	1	module none**	module **	N6735B Module	\$517
60	1	60	1	1	none	1/2 w x 2U h	E3617A	\$707

## Basic models continued

Max volts per output	Max amps per output	Max watts per output	Number of outputs*	Number of ranges*	Computer interface	Rack size	Model type	US List
60	1.3	80	1	2	GPIO	1/2 w x 2U h	E3645A	\$962
60	1.6	100	1	1	module none**	module **	N6745B Module	\$953
60	5	300	1	1	module none**	module **	N6775A Module	\$1,382
60	10	240	1	auto (3)	GPIO	1/2 w x 4U h	6038A	\$4,404
60	12.5	750	1	1	GPIO, LAN, USB	full w x 1U h	N5747A	\$2,497
60	25	1500	1	1	GPIO, LAN, USB	full w x 1U h	N5767A	\$2,959
60	50	1,200	1	auto (3)	GPIO	1 w x 3U h	6032A	\$6,163
60	55	3300	1	1	GPIO, LAN, USB	full w x 2U h	N8737A	\$4,699
60	85	5100	1	1	GPIO, LAN, USB	full w x 2U h	N8757A	\$6,112
80	9.5	760	1	1	GPIO, LAN, USB	full w x 1U h	N5748A	\$2,497
80	19	1520	1	1	GPIO, LAN, USB	full w x 1U h	N5768A	\$2,959
80	42	3360	1	1	GPIO, LAN, USB	full w x 2U h	N8738A	\$4,699
80	65	5200	1	1	GPIO, LAN, USB	full w x 2U h	N8758A	\$6,112
100	0.5	50	1	1	module none**	module **	N6736B Module	\$517
100	1	100	1	1	module none**	module **	N6746B Module	\$953
100	3	300	1	1	module none**	module **	N6776A Module	\$1,382
100	7.5	750	1	1	GPIO, LAN, USB	full w x 1U h	N5749A	\$2,497
100	15	1500	1	1	GPIO, LAN, USB	full w x 1U h	N5769A	\$2,959
100	33	3300	1	1	GPIO, LAN, USB	full w x 2U h	N8739A	\$4,699
100	50	5000	1	1	GPIO, LAN, USB	full w x 2U h	N8759A	\$6,112
120	0.25	30	1	2	none	1/2 w x 2U h	E3612A	\$451
150	5	750	1	1	GPIO, LAN, USB	full w x 1U h	N5750A	\$2,497
150	10	1500	1	1	GPIO, LAN, USB	full w x 1U h	N5770A	\$2,959
150	22	3300	1	1	GPIO, LAN, USB	full w x 2U h	N8740A	\$4,699
150	34	5100	1	1	GPIO, LAN, USB	full w x 2U h	N8760A	\$6,112
200	17	1,200	1	auto (3)	GPIO	1 w x 3U h	6030A	\$6,163
300	2.5	750	1	1	GPIO, LAN, USB	full w x 1U h	N5751A	\$2,497
300	5	1500	1	1	GPIO, LAN, USB	full w x 1U h	N5771A	\$2,959
300	11	3300	1	1	GPIO, LAN, USB	full w x 2U h	N8741A	\$4,699
300	17	5100	1	1	GPIO, LAN, USB	full w x 2U h	N8761A	\$6,112
500	5	1,050	1	auto (3)	GPIO	1 w x 3U h	6035A	\$6,789
600	1.3	780	1	1	GPIO, LAN, USB	full w x 1U h	N5752A	\$2,497
600	2.6	1560	1	1	GPIO, LAN, USB	full w x 1U h	N5772A	\$2,959
600	5.5	3300	1	1	GPIO, LAN, USB	full w x 2U h	N8742A	\$4,699
600	8.5	5100	1	1	GPIO, LAN, USB	full w x 2U h	N8762A	\$6,112



## Performance models (higher accuracy and faster speed)

Max volts per output	Max amps per output	Max watts per output	Number of outputs*	Number of ranges*	Computer interface	Rack size	Model type	US List
5	875	4375	1	1	GPIOB	full w x 5U h	6680A	\$8,070
8	5	40	1	1	GPIOB	1/2 w x 2U h	6611C	\$2,244
8	10	80	1	1	GPIOB	full w x 2U h	6631B	\$2,518
8	16	128	1	1	module none**	module ***	66101A Module	\$2,130
8	20	160	1	1	none/GPIB	full w x 2U h	6541A/6641A	\$2,821/\$2,834
8	50	400	1	1	none/GPIB	full w x 3U h	6551A/6651A	\$3,462/\$3,484
8	220	1760	1	1	none/GPIB	full w x 3U h	6571A/6671A	\$4,987/\$4,998
8	580	4640	1	1	GPIOB	full w x 5U h	6681A	\$8,070
15	440	6600	1	1	GPIOB	full w x 5U h	6690A	\$8,991
20	2	40	1	1	GPIOB	1/2 w x 2U h	6612C	\$2,244
20	5	80	1 of 3	2	GPIOB	full w x 3U h	6623A	\$8,982
20	5	40	1 of 4	2	GPIOB	full w x 3U h	6624A	\$9,932
20	5	40	2 of 4	2	GPIOB	full w x 3U h	6624A	\$9,932
20	5	100	1	1	GPIOB	full w x 2U h	6632B	\$2,518
20	7.5	150	1	1	module none**	module ***	66102A Module	\$2,130
20	10	200	1	1	none/GPIB	full w x 2U h	6542A/6642A	\$2,821/\$2,834
20	4	80	2	2	GPIOB	full w x 3U h	6621A	\$8,024
20	10	80	2 of 3	2	GPIOB	full w x 3U h	6623A	\$8,982
20	25	500	1	1	none/GPIB	full w x 3U h	6552A/6652A	\$3,462/\$3,484
20	50	300	1	auto	module none**	module **	N6753A Module	\$2,488
20	100	2000	1	1	none/GPIB	full w x 3U h	6572A/6672A	\$4,987/\$4,998
21	240	5040	1	1	GPIOB	full w x 5U h	6682A	\$8,474
30	220	6600	1	1	GPIOB	full w x 5U h	6691A	\$9,441
32	160	5120	1	1	GPIOB	full w x 5U h	6683A	\$8,474
35	4.5	150	1	1	module none**	module ***	66103A Module	\$2,130
35	6	210	1	1	none/GPIB	full w x 2U h	6543A/6643A	\$2,821/\$2,834
35	15	525	1	1	none/GPIB	full w x 3U h	6553A/6653A	\$3,462/\$3,484
35	60	2100	1	1	none/GPIB	full w x 3U h	6573A/6673A	\$4,987/\$4,998
40	128	4800	1	1	GPIOB	full w x 5U h	6684A	\$8,474
50	1	50	1	1	GPIOB	1/2 w x 2U h	6613C	\$2,244
50	1.5	50	1	auto/mult	module none**	module **	N6761A Module	\$2,300
50	2	80	3 of 3	2	GPIOB	full w x 3U h	6623A	\$8,982
50	2	40	3 of 4	2	GPIOB	full w x 3U h	6624A	\$9,932
50	2	40	4 of 4	2	GPIOB	full w x 3U h	6624A	\$9,932
50	0.8	40 on each output	4	2	GPIOB	full w x 3U h	6627A	\$10,409
50	2	100	1	1	GPIOB	full w x 2U h	6633B	\$2,518
50	3	100	1	auto/mult	module none**	module **	N6762A Module	\$2,738
50	2	100	2	2	GPIOB	full w x 3U h	6622A	\$8,425
50	5	50	1	auto	module none**	module **	N6751A Module	\$1,172
50	10	100	1	auto	module none**	module **	N6752A Module	\$1,615
50	0.5	40	2	2	GPIOB	full w x 3U h	6625A	\$10,409
50	0.5	50	4	2	GPIOB	full w x 3U h	6626A	\$16,757
50	0.5	50	4	2	GPIOB	full w x 3U h	6626A	\$16,757

## Performance models continued

Max volts per output	Max amps per output	Max watts per output	Number of outputs*	Number of ranges*	Computer interface	Rack size	Model type	US List
50	2	40	2	2	GPIO	full w x 3U h	6625A	\$10,409
50	2	50	4	2	GPIO	full w x 3U h	6626A	\$16,757
50	2	50	4	2	GPIO	full w x 3U h	6626A	\$16,757
50	2	50	2	2	GPIO	full w x 3U h	6628A	\$10,409
50	2	50	4	2	GPIO	full w x 3U h	6629A	\$16,757
60	2.5	150	1	1	module none**	module **	66104A Module	\$2,130
60	3.5	210	1	1	none/GPIO	full w x 2U h	6544A/6644A	\$2,821/\$2,834
60	9	540	1	1	none/GPIO	full w x 3U h	6554A/6654A	\$3,462/\$3,484
60	20	300	1	auto	module none**	module **	N6754A Module	\$2,488
60	35	2100	1	1	none/GPIO	full w x 3U h	6574A/6674A	\$4,987/\$4,998
60	110	6600	1	1	GPIO	full w x 5U h	6692A	\$9,441
100	0.5	50	1	1	GPIO	1/2 w x 2U h	6614C	\$2,244
100	1	100	1	1	GPIO	full w x 2U h	6634B	\$2,518
120	1.25	150	1	1	module none**	module **	66105A Module	\$2,130
120	1.5	180	1	1	none/GPIO	full w x 2U h	6545A/6645A	\$2,821/\$2,834
120	4	480	1	1	none/GPIO	full w x 3U h	6555A/6655A	\$3,462/\$3,484
120	18	2160	1	1	none/GPIO	full w x 3U h	6575A/6675A	\$4,987/\$4,998
200	0.75	150	1	1	module none**	module **	66106A Module	\$2,130

Notes:

\* If a model provides more than one range or output, it will be listed for each along with the maximum voltage and current.

\*\* Modules require a mainframe. See the mainframe for rack (physical) size and connectivity information.

### N6700 Imainframes

Model	Type of N6700 mainframe	Power, W	Maximum number of modules	Physical size	Connectivity	US list
N6700B	Low profile modular power system	400	4	Full RU w x 1 RU h	GPIO, LAN, USB	\$2,434
N6701A	Low profile modular power system	600	4	Full RU w x 1 RU h	GPIO, LAN, USB	\$2,761
N6702A	Low profile modular power system	1200	4	Full RU w x 1 RU h	GPIO, LAN, USB	\$3,644
N6705B	DC power analyzer	600	4	Full RU w x 1 RU h	GPIO, LAN, USB	\$6,908

### 66000 modular power system mainframe

Model	Power, W	Maximum number of modules	Physical size	Connectivity	US list
N6600A	600	4	Full RU w x 4 RU h	GPIO	\$2,435

# N3300 Series DC Electronic Loads



*Increase your manufacturing test throughput with fast electronic loads.*

N3300A mainframe, 6 slots, starting price: **\$2,372**

N3301A mainframe, 2 slots, starting price: **\$2,015**

**Measurement/function:** Used to test power circuits and devices, such as a product's power supply or DC-to-DC converter. Instead of applying power, the load receives the power as an input.

## Key features

- Full-rack, 6-slot mainframe (N3300A) or half-rack, 2-slot mainframe (N3301A)
- Up to 6 modules as single, parallel or series loads for up to 1800 W input in a single mainframe
- Measure voltage and current simultaneously on each electronic load module in constant current (CC), constant voltage (CV) and constant resistance (CR) mode
- Download command lists for fast test execution
- GPIB interface

## Modules

Input rating	N3302A	N3303A	N3304A	N3305A	N3306A	N3307A
<b>Current</b>	0 to 30 A	0 to 10 A	0 to 60 A	0 to 60 A	0 to 120 A	0 to 30 A
<b>Voltage</b>	0 to 60 V	0 to 240 V	0 to 60 V	0 to 150 V	0 to 60 V	0 to 150 V
<b>Maximum power at 40° C</b>	150 W	250 W	300 W	500 W	600 W	250 W
<b>Number of slots</b>	1	1	1	2	2	1
<b>Starting price USD</b>	\$1,653	\$2,354	\$2,044	\$3,014	\$2,900	\$2,194

*For more info, visit [www.agilent.com/find/N3300](http://www.agilent.com/find/N3300).*

# 6800 Series AC Power Source/Analyzer



*Generation, measurement, and AC analysis in one box.*

6811B 375 VA, starting price: **\$6,865**

6812B 750 VA, starting price: **\$8,381**

6813B 1750 VA, starting price: **\$11,539**

**Measurement/function:** Designed for applications require precise control, accurate measurement, and analysis of single-phase AC power. These products are ideal for applications such as power supply testing, AC mains CE mark testing, UPS testing, avionics, air traffic control equipment, testing power-factor corrected equipment and telecom equipment.

## Key features

- Up to 1750 VA of single-phase AC power and 1350 W of DC power in a single instrument, 0 to 300 Vrms
- Over-current, over-voltage, over-power, over-temperature protection, output disconnect relays and remote inhibit capabilities to protect DUTs
- GPIB interface

*For more info, visit [www.agilent.com/find/6800](http://www.agilent.com/find/6800).*



# RF and Microwave Test Accessories

For Employees of Agilent Authorized Distributors Only – Not for Customers or End Users

# RF and Microwave Test Accessories

## What is a RF and microwave test accessory?

**Measurement/function:** Complete test and measurement for RF and microwave instruments (DC to 67 GHz) and provides optimal measurement results by maintaining signal integrity as signals are routed and moved around a system, multiple DUTs, circuit or between instruments.

**Target customer:** Customers who own or inquire about Agilent signal sources, spectrum analyzers, power meters and data acquisition instruments.

## Customer application and needs

R&D	Quality assurance	Manufacturing
<ul style="list-style-type: none"> <li>Check RF performance to ensure it is within design specifications with good margin</li> </ul>	<ul style="list-style-type: none"> <li>Check RF performance under various test scenarios, including electrostatic discharge, shock and temperature stress</li> </ul>	<ul style="list-style-type: none"> <li>Help to simplify Automated Test Systems by reducing test time and increasing throughput</li> </ul>
User needs:	User needs:	User needs:
<ul style="list-style-type: none"> <li>High accuracy and reliability to ensure system performance</li> <li>Broad operating frequency for various applications</li> </ul>	<ul style="list-style-type: none"> <li>Reliable and repeatable results for consistency</li> </ul>	<ul style="list-style-type: none"> <li>Reliable and repeatable results for test system duplication</li> <li>High throughput at a low cost</li> </ul>

## What types of products are available?

**Most commonly used accessories:** Switches, attenuators and amplifiers (See charts below for more information on selecting a model.)

**Other accessories:** Adapters, detectors, directional couplers and bridges, filters and limiters, impedance test accessories, mixers, network analyzer accessories and calibration kits, RF probes, power dividers and splitters, spectrum analyzer accessories, terminators and waveguide accessories.



### Agilent RF and microwave test accessories

**Over 200 accessories** — the key to getting great performance, accuracy, and flexibility.

Ask for a MTA catalog to explore all the possibilities:  
[www.agilent.com/find/MTAproductguide](http://www.agilent.com/find/MTAproductguide)



*Guarantees accurate and repeatable results and reduces cost of test*

# Switches

Switches route high-frequency signals between the DUT and test instrument. Different switch configurations provide the flexibility to create complex matrices and automated test systems. The charts show typical switch configurations and specifications.

## Electromechanical switches

Electromechanical switches are used in switch matrix systems for testing telecommunication devices when low insertion loss is critical and power-handling requirements are higher. Electromechanical switches are widely used in both basic signal routing and application-specific switch matrices, such as tree or full-access matrices.

Type	Typical use	Most popular models	Frequency range	RF connectors	Starting price USD
Single-pole double-throw switches (SPDT)	Route signals from input to two output paths	8762B 8762C N1810TL N1810UL 8765B 8765C 8765F	DC to 18 GHz DC to 26.5 GHz DC to 26.5 GHz DC to 26.5 GHz DC to 20 GHz DC to 26.5 GHz DC to 4 GHz	SMA (f) 3.5 mm SMA (f) SMA (f) SMA (f) 3.5 mm Mini SMB (m)	\$850 \$943 \$477 \$215 \$454 \$471 \$546
Multiport switches	Allow a single input and multiple (3 or more) output paths	87106B (SP6T) 87104D (SP4T) 8766K (SP3T) 87104B (SP4T) L7104C (4 port) L7106C (6 port) L7204A (4 port) U9397C (FET)	DC to 20 GHz DC to 4 GHz DC to 40 GHz DC to 20 GHz DC to 26.5 GHz DC to 26.5 GHz DC to 4 GHz 300 kHz to 18 GHz	SMA (f) 2.92 mm (f) 3.5 mm (f) SMA (f) SMA (f) SMA (f) SMA (f) SMA (f)	\$2,227 \$2,386 \$1,083 \$1,999 \$1,308 \$1,488 \$837 \$1,150
Matrix switches	Configured for blocking 1x5, 2x4, or 3x3 switching applications	87406B 87606B	DC to 20 GHz DC to 20 GHz	SMA (f) SMA (f)	\$2,523 \$2,583
Transfer switches	Switch between two inputs and two outputs	8722C 8722D 8722E L7222C	DC to 26.5 GHz DC to 40 GHz DC to 50 GHz DC to 26.5 GHz	SMA (f) 2.92 mm (f) 2.4 mm (f) SMA (f)	\$1,216 \$2,092 \$2,540 \$837

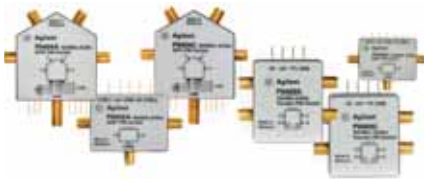
### Flexible configurations for signal routing purposes

Agilent EM switches can be used in large number of applications, increasing system flexibility and simplifying system design. One of the most common applications is to use the switches in a switch matrix automated testing system. Switch matrices use Agilent high-performance multiport-switches to route multiple input signals to multiple output signals simultaneously with minimum insertion loss and guaranteed 0.03 dB repeatability.








## Solid-state Switches:



### Key features

Solid-state switches provide greater reliability, longer lifetime and faster switching times than electromechanical switches. However, solid-state switches have higher insertion due to their higher innate ON resistance. Solid-state switches are often used in switch matrix systems for testing of semiconductor devices where high switching speed is critical and power-handling requirements are lower.

Type	Typical use	Most popular models	Frequency range	RF connectors	Starting price USD
Single-pole double-throw switches (SPDT) 	Route signals from input to two output paths	U9397A (FET) U9397C (FET) P9402A (PIN) P9402C (PIN) 85331B (PIN)	300 kHz to 18 GHz 300 kHz to 18 GHz 100 MHz to 8 GHz 100 MHz to 18 GHz 45 MHz to 50 GHz	SMA (f) SMA (f) SMA (f) SMA (f) 2.4 mm (f)	\$867 \$1,150 \$759 \$965 \$3,773
Single-pole four-throw switches (SP4T) 	Allow a single input and four output paths	P9404A (PIN) P9404C (PIN) 85332B (PIN)	100 MHz to 8 GHz 100 MHz to 18 GHz 45 MHz to 50 GHz	SMA(f) SMA(f) 2.4 mm (f)	\$1,289 \$1,779 \$4,262
Transfer switches 	Switch between two inputs and two outputs	P9400C (FET) U9400A (FET) P9400A (PIN) P9400C (PIN)	100 MHz to 18 GHz 100 MHz to 8 GHz 300 kHz to 8 GHz 300 kHz to 18 GHz	SMA (f) SMA (f) SMA (f) SMA (f)	\$2,230 \$2,262 \$2,003 \$2,520

For more info, visit [www.agilent.com/find/switches](http://www.agilent.com/find/switches).

For the Agilent RF & Microwave Switch Selection Guide, see [www.agilent.com/find/MTAproductguide](http://www.agilent.com/find/MTAproductguide).

## J7211A/B/C Attenuation Control Unit



Starting price: \$6,249

### Key features

- 0.03 dB RF repeatability per section for entire 5 million cycles to minimize system uncertainty and setup cost
- Excellent attenuation accuracy and flatness to maximize measurement accuracy
- Agilent-calibrated data correction value for accurate and precise measurement
- Application-specific attenuation sweep function to set desired attenuation, step size, dwell time and number of cycles to suit the application requirement
- Complete connectivity standard powered by LXI Class C-compliance

For more info, visit [www.agilent.com/find/J7211](http://www.agilent.com/find/J7211).

# U1818A/B 7/12 GHz Active Differential Probes



*Convenient biasing from probe power ports or benchtop power supplies.*

Starting price: **\$5,500**

## Competitive advantage

There are no competitive products on the market.

## Key features

- Measures both single-ended and differential signals
- Probes RF traces without the need to remove components
- Performs response calibration when used with a network analyzer
- Broad bandwidth with flat frequency response,  $-1.5$  dB
- Low noise floor,  $< -130$  dBm/Hz at 10 MHz to 12 GHz

## Product specifications (typical)

Model	Frequency	Input impedance at 1 MHz	Nominal probe attenuation	Maximum CW input power	Maximum DC input voltage	Common mode rejection
U1818A	10 kHz to 7 GHz	Single ended: 25 K $\Omega$	$-10$ dB	16 dBm	$\pm 10$ V	$< 2$ GHz: 35 dB
U1818B	10 kHz to 12 GHz	Differential: 50 K $\Omega$				2 to 12 GHz: $< 30$ dB

## Probe head options

N5380A	12 GHz differential SMA adapter
N5381A	12 GHz differential solder-in
N5382A	12 GHz differential browser
N5425/6A	12 GHz differential; ZIF probe lead/tip
E2695A	Differential SMA probe head
E4980A-1CM	Rackmount kit

## Optional accessories

1582B	Minimum loss attenuator pad
N2880A	In-line attenuator kit
N2881A	DC blocking capacitor
N2784A	1-arm probe positioner
N2785A	2-arm probe positioner
N2787A	3D probe positioner
N5450A	Extreme temperature extension cable

## Compatible Agilent signal/spectrum analyzers

- N9030A PXA signal analyzer, 3 Hz to 3.6/8.4/13.6/26.5 GHz
- N9000A CXA signal analyzer, 9 KHz to 3.5/7.5 GHz
- N9020A MXA signal analyzer, 20 Hz to 3.6/8.4/13.6/26.5 GHz
- N9010A EXA signal analyzer, 9 KHz to 3.6/7/13.6/26.5 GHz
- E4440/3/5 PSA spectrum analyzer, 3 Hz to 26.5/6.7/13.2 GHz
- E4402/4/5/7B ESA-E spectrum analyzer, 100 Hz to 3/6.7/13.2/26.5 GHz

# Amplifiers



*Boost signal levels by increasing available power from instruments and reducing overall system noise figure*

## Product terms

- **Noise figure:** An excellent amplifier noise figure significantly reduces the overall test-system noise figure.
- **Gain:** High gain increases available power from spectrum analyzers and improves test-system sensitivity.

Type	Why buy?	Popular models	Frequency	Gain	Noise figure	Starting price USD
Preamplifiers	<ul style="list-style-type: none"> <li>• Low-noise, high-gain amplifier</li> <li>• Improves sensitivity of test equipment</li> </ul>	87405C	100 MHz to 18 GHz	25 dB	5 dB	\$2,566
		87405B	10 MHz to 4 GHz	25 dB	5 dB	\$2,311
Low-noise amplifier	<ul style="list-style-type: none"> <li>• Detects low-level emissions from DUT</li> </ul>	11909A	9 kHz to 1 GHz	32.5 dB	2.5 dB	\$3,139
Microwave system amplifiers	<ul style="list-style-type: none"> <li>• Provides additional power to recover system losses and boost available power</li> </ul>	83006A	10 MHz to 26.5 GHz	20 dB	13 dB	\$5,815
		83017A	50 MHz to 26.5 GHz	25 dB	13 dB	\$7,289
		83020A	2 to 26.5 GHz	21 dB	13 dB	\$26,608
		83050A	2 to 50 GHz	25 dB	10 dB	\$30,707

*For more info, visit [www.agilent.com/find/amplifiers](http://www.agilent.com/find/amplifiers).*

# Attenuators



- 1) Reduce signal amplitude or power for measurement
- 2) Improve matching impedances of sources and loads
- 3) Measure gain or loss of two-port devices

Type	Popular models	Frequency range	Attenuation range	Attenuation step	Starting price USD
<b>Fixed attenuation</b>					
	8491A	DC to 12.4 GHz	3 to 60 dB	n/a	\$247
	8498A	DC to 18 GHz	30 dB	n/a	\$1,619
	8493C	DC to 26.5 GHz	3 to 40 dB	n/a	\$430
	8490G	DC to 67 GHz	3 to 40 dB	n/a	\$840
<b>Manual step</b>					
	8494A	DC to 4 GHz	0 to 11 dB	1 dB	\$1,009
	8496A	DC to 4 GHz	0 to 110 dB	10 dB	\$1,009
	8495D	DC to 26.5 GHz	0 to 70 dB	10 dB	\$1,429
<b>Programmable</b>					
	8494G	DC to 4 GHz	0 to 11 dB	1 dB	\$1,349
	8497K	DC to 26.5 GHz	0 to 90 dB	10 dB	\$2,119
	84907L	DC to 40 GHz	0 to 70 dB	10 dB	\$3,544
	84908M	DC to 50 GHz	0 to 65 dB	5 dB	\$4,456



# RF Handheld Products

For Employees of Agilent Authorized Distributors Only – Not for Customers or End Users

# RF Handheld Products

## What is an RF Handheld product?

**Function/measurements:** Perform spectrum analysis, such as interference analysis, and verify the signal is at the correct frequency and power; also used in network analysis and cable and antenna test, such as line sweeping and distance-to-fault testing, in the field.

## Customer application and needs

R&D	Field Testing (Installation & Maintenance)
<ul style="list-style-type: none"><li>• Test transmitters</li><li>• Verify that a signal is at the correct frequency and power level, and not interfering with adjacent channels</li></ul>	<ul style="list-style-type: none"><li>• Validate the performance of transmitters in the field</li><li>• Verify that a signal is at the correct frequency and power level, and not interfering with adjacent channels</li></ul>
User needs:	User needs:
<ul style="list-style-type: none"><li>• Signal visualization</li><li>• Ease of use</li><li>• Reliability</li></ul>	<ul style="list-style-type: none"><li>• Signal visualization</li><li>• Ease of use</li><li>• Reliability</li><li>• Portability, light weight, compact size, durability</li><li>• Backlit keys easy to see in the dark</li><li>• Screen easy to view in sunlight or dark with high-contrast display</li><li>• Battery with long life, fast recharge, easily swappable</li><li>• Safe, fast and easy-to-save measurement results</li><li>• Built-in capabilities, tracking generator, bridge and power meter</li></ul>

## Competitive cross reference

Agilent	N9340B	N9342C	N9330B	N9912A	N9923A
Rohde & Schwarz	FSH3/FSH4	FSH6/FSH8			
Anritsu	Spectrum Master MS2711D/MS2712E	Spectrum Master MS2713E/MS2721B	Site Master S331D/S331E	Site Master S332D/S332E	VNA Master



## Questions for your customer

Use the answers to choose the most suitable model from the table below.

<b>Spectrum analyzer</b>	<b>Do you need the unit to perform spectrum analysis?</b>
<b>N9340B and N9342C</b>	The <b>N9340B</b> (up to 3 GHz) and N9342C (up to 7 GHz) offer best-in-class spectrum analysis, interference analysis, USB power-sensor support, plus options for scalar network analysis and AM/FM/ASK/FSK modulation analysis.
<b>Vector network analyzer</b>	<b>Do you need the unit to perform vector network analysis?</b>
<b>N9923A</b>	The <b>N9923A</b> Fieldfox is the world's most accurate handheld VNA.
<b>Cable and antenna tester</b>	<b>Do you need a basic cable and antenna tester and scalar network analysis?</b>
<b>N9330B</b>	The N9330B provides both, plus optional USB power-sensor support at a low price point.
<b>Cable and antenna tester with extensive options</b>	<b>Do you need a standard cable and antenna tester with options for other functions (network analyzer, vector voltmeter, spectrum analyzer, USB power-sensor support)?</b>
<b>N9912A</b>	The <b>N9912A</b> offers all of the above features in a rugged and portable package.

Model number	Why buy? 1-minute sell	Frequency range	Battery life	Product dimensions and weight	Starting price USD
<b>N9340B</b>	<b>Handheld spectrum analyzer</b> <ul style="list-style-type: none"> <li>Field ready, MIL CLASS-2 compliant</li> <li>Best-in-class RF specifications</li> <li>Extensive measurement features</li> </ul>	100 kHz to 3 GHz	4 hours	<ul style="list-style-type: none"> <li>3.5 kg</li> <li>318 mm H x 207 mm W x 69 mm D</li> </ul>	\$7,987
<b>N9342C</b>	<b>Handheld spectrum analyzer</b> <ul style="list-style-type: none"> <li>Field ready, MIL CLASS-2 compliant</li> <li>Best-in-class RF specifications</li> <li>Built-in GPS receiver and antenna</li> <li>Field test automation capability</li> </ul>	100 kHz to 7 GHz	4 hours	<ul style="list-style-type: none"> <li>3.7 kg</li> <li>318 mm H x 207 mm W x 69 mm D</li> </ul>	\$11,113
<b>N9923A</b>	<b>Handheld vector analyzer</b> <ul style="list-style-type: none"> <li>Features of the N9912A plus:</li> <li>2-channel vector voltmeter to replace legacy HP 8508A</li> </ul>	2 MHz to 4 or 6 GHz	4 hours	<ul style="list-style-type: none"> <li>2.8 kg</li> <li>292 mm H x 188 mm W x 72 mm D</li> </ul>	\$12,000
<b>N9330B</b>	<b>Handheld cable and antenna tester</b> <ul style="list-style-type: none"> <li>Field ready, MIL CLASS-2 compliant</li> <li>Low-cost</li> <li>Easy-to-use</li> </ul>	25 MHz to 4 GHz	4 hours	<ul style="list-style-type: none"> <li>2.9 kg</li> <li>318 mm H x 207 mm W x 69 mm D</li> </ul>	\$6,485
<b>N9912A</b>	<b>Handheld RF analyzer</b> <ul style="list-style-type: none"> <li>Built-in QuickCal technology for calibration without a cal kit</li> <li>Lightweight, battery-operated</li> <li>No fans, no vents, display viewable indoors and outdoors, MIL CLASS-2 compliant with no exceptions</li> </ul>	Up to 4 or 6 GHz	4 hours	<ul style="list-style-type: none"> <li>2.8 kg</li> <li>292 mm H x 188 mm W x 72 mm D</li> </ul>	\$7,614



# N9340B Handheld Spectrum Analyzer (HSA)



*Optimized for spectrum analysis in the field, including installation and maintenance.*

Starting price: **\$7,987**

## Competitive advantage

<b>Agilent N9340B HSA</b>	<ul style="list-style-type: none"><li>• Better RF performance</li><li>• More measurement features</li></ul>
<b>Rohde &amp; Schwarz FSH3/4</b>	<ul style="list-style-type: none"><li>• Optional cable sweep feature</li></ul>

**Other competition:** Anritsu MS2712E and MS2711D

## Key features

- Best-in-class RF performance with low DANL and fast sweep
- Power suite: spectrum emission mask (SEM), channel power, occupied bandwidth (OBW), adjacent channel power ratio (ACPR)
- Interference analysis and spectrum monitoring with spectrogram record and playback
- AM/FM and ASK/FSK modulation analysis
- Remote control via USB or LAN connection

## Qualify

- **Need return loss, VSWR and distance-to-fault (DTF) measurement?** Sell N9330B.
- **Need more than 3 GHz frequency?** Sell the N9342C HSA up to 7 GHz).
- **Need lowest noise floor (DANL)?** Sell Option N9340B-PA3.

## Options

N9340B-PA3 ♦	3 GHz preamplifier	N9340B-TG3 ♦	3 GHz tracking generator
N9340B-AMA ♦	AM/FM modulation analysis	N9340B-DMA ♦	ASK/FSK modulation analysis
N9340B-XDM	xDSL measurement capability	N9340B-INM	Enhanced spectrogram feature
N9340B-IBC	AM/FM In-band on-channel IBOC measurement		

♦ Options may be purchased either initially or as upgrades later.

## Ordering information

- To order accessories, use N9311X with options found on [www.agilent.com/find/N9311X](http://www.agilent.com/find/N9311X).
- To order options with new products, use options above.
- To retrofit options, use N9912BK with options above (note option IBC and XDM cannot be retrofitted).

## Included accessories

Soft carrying case, multi-language quick start tutorial, CD-ROM (manual and PC software), AC/DC power adapter, rechargeable battery, USB cable, earphone

## Optional accessories

N9340B-BAT	Spare battery pack	N9340B-BCG	External battery charger
N9340B-1DN	12 V automotive charger	N9340B-1TC	Hard transit case
N9340B-TAD	Adapter Type-N (m) 50 $\Omega$ to Type N (f) 75 $\Omega$ DC to 1 GHz		

## Cross-sell

- N9330B cable and antenna tester
- U2000 USB power sensor
- N9000AEP signal analyzer
- N9310A signal generator
- N9320B spectrum analyzer
- N9912A handheld RF analyzer

# N9342C Handheld Spectrum Analyzer (HSA)



*Field testing just got easier.*

Starting price: **\$11,113**

## Competitive advantage

<b>Agilent N9340B HSA</b>	<ul style="list-style-type: none"><li>Better DANL, faster sweep, unique features like Task Planner and built-in GPS</li></ul>
<b>Rohde &amp; Schwarz FSH6/8</b>	<ul style="list-style-type: none"><li>Optional cable sweep feature</li></ul>

**Other competition:** Anritsu MS2713E and MS2721B

## Key features

- Best-in-class RF performance with low DANL and fast sweep
- Industry's first built-in GPS receiver and GPS antenna
- Industry's first Task Planner to enable field test automation
- Interference analysis and spectrum monitoring with spectrogram record and playback
- Remote control via USB or LAN connection
- Secure erase of user data
- 4-hour battery life, field replaceable

## Qualify

- **Need GPS information?** Sell option N9342C-GPS.
- **Need 2-port transmission measurement?** Sell option N9342C-TG7.
- **Need field test automation?** Sell N9342C-TPN.

## Options

N9342C-GPS	◆	GPS receiver with built-in GPS antenna	N9342C-PA7	◆	7 GHz preamplifier
N9342C-TPN	◆	Task Planner for test automation	N9342C-TG7	◆	7 GHz tracking generator
N9342C-PWM	◆	USB power sensor support	N9342C-SEC	◆	Secure erase of user data
N9342C-SIM	◆	Spectrum monitor with spectrogram record and playback			

◆ Options may be purchased either initially or as upgrades later..

## Included accessories

Multi-language quick start tutorial, CD-ROM (manual and PC software), AC/DC power adapter, rechargeable battery, USB cable, earphone

## Optional accessories

N9311X-508	Directional antenna, 680 MHz to 8 GHz, 5 dBi	N9342C-BAT	Spare battery pack
N9342C-BCG	External battery charger	N9342C-1TC	Hard transit case
N9342C-1DN	Automotive 12 V DC charger	N9311X	RF and microwave
N9342C-SCC	Backpack accessory collection for hands-free operation		

## Cross-sell

- N9310A signal generator
- U2000 USB power sensor
- N9912A handheld RF analyzer
- N9000AEP signal analyzer

# FieldFox N9923A Handheld Network Analyzer



*World's most integrated handheld RF analyzer.*

Starting price: **\$12,000**

## Competitive advantage

<b>Agilent N9923A</b>	<ul style="list-style-type: none"><li>• Higher dynamic range</li><li>• QuickCal</li></ul>
<b>Rohde &amp; Schwarz FSH424/828</b>	<ul style="list-style-type: none"><li>• Includes spectrum analyzer</li></ul>

## Key features

- Full 2-port QuickCal, eliminating the need to carry a mechanical cal kit into the field
- Full 2-port error-corrected S-parameters, magnitude and phase
- 2-channel vector voltmeter to replace legacy HP 8508A

## Qualify

- **Need to test RF components for both magnitude and phase information?** Sell N9923A; if only magnitude information needed, sell N9912A.
- **Need benchtop spectrum analyzer and cable and antenna tester?** Sell N9912A.

## Options

N9923A-104	◆	4 GHz RF VNA, trans/reflect
N9923A-305	◆	Cable and antenna analyzer
N9923A-106	◆	6 GHz RF VNA, trans/reflect
N9923A-302	◆	External USB power sensor support
N9923A-112	◆	QuickCal
N9923A-308	◆	Vector voltmeter
N9923A-122	◆	Full 2-port S-parameter

◆ Options may be purchased either initially or as upgrades later.

## Ordering information

- To order accessories, use N9910X with options found on [www.agilent.com/find/fieldfox](http://www.agilent.com/find/fieldfox).
- To order options with new products, use options above.
- To retrofit options, use N9912AU with options above.

## Included accessories

- AC/DC adapter, battery, soft carrying case, LAN cable, Quick Reference Guide and full User Guide

## Cross-sell

- U2000 USB power sensors
- N9330B handheld cable and antenna tester
- N9340B handheld spectrum analyzer
- E7495B wireless base station test set

# N9330B Handheld Cable and Antenna Tester



*Affordable basic handheld unit with fast measurements ideal for installation and maintenance.*

Starting price: **\$6,485**

## Competitive advantage

<b>Agilent N9330B</b>	<ul style="list-style-type: none"> <li>Better price-performance ratio</li> <li>Field ready, MIL CLASS-2 compliant</li> <li>USB connectivity for memory stick and PC connection</li> </ul>
<b>Anritsu S331D</b>	<ul style="list-style-type: none"> <li>Handheld cable and antenna tester in the market longer</li> <li>Weighs slightly less than Agilent model</li> </ul>

## Key features

- USB connectivity for memory stick and PC connection
- 25 MHz to 4000 MHz
- Measure SWR/return loss/cable loss and distance-to-fault test functions
- Calibrate with the electronic calibrator for fast and hassle-free calibration
- Make high-accuracy power measurements with Agilent U2000 series USB power sensor
- Start up and sweep quickly-test speed typically less than 1.6 seconds plus up to 521 points for trace resolution
- Export data easily via the USB port
- 6.5" TFT color display and 4-hour battery operating time

## Qualify

- **Need power measurement?** Sell N9330B-PWM (need to purchase Agilent U2000 USB power sensor separately).
- **Need handheld spectrum analyzer?** Sell N9340B.
- **Need 6 GHz handheld cable antenna tester?** Sell N9912A.

## Options

N9330B-PWM	◆	Power monitoring (USB power sensor not included)
N9330B-203	◆	Electronic calibrator
N9330B-201	◆	Precision mechanical short/open/50 Ω load DC to 4 GHz Type N (m)
N9330B-301	◆	Phase stable extension cable 1.5 m Type N (m) to Type N (f)

- ◆ Options may be purchased either initially or as upgrades later.

## Ordering information

- To order accessories, use N9311X with options found on [www.agilent.com/find/N9311X](http://www.agilent.com/find/N9311X).
- To order options with new products, use options above.
- To retrofit options, use N9330BK with options above.

## Included accessories

Soft carrying case	Rechargeable battery	USB cable
Standard product manuals, calibration test report and programming and reference CD-ROMs		

## Optional accessories

N9330B-203	Electronic calibrator	N9330B-1DC	12 V automotive adapter
N9330B-201	Phase-stable extension cable 1.5 m, Type N (m) to Type N (f)		
N9330B-202	Phase-stable extension cable 1.5 m, Type N (m) to 7/16 DIN (m)		
N9330B-BAT	Spare battery		

## Cross-sell

- N9340B handheld spectrum analyzer
- N9310A signal generator
- U2000 USB power sensor
- N9912A RF analyzer

# FieldFox N9912A Handheld RF Analyzer



World's most integrated handheld RF analyzer.

Starting price: **\$7,614**

### Competitive advantage

<b>Agilent N9912A</b>	<ul style="list-style-type: none"><li>• Integrated handheld RF analyzer</li><li>• Bright display for use indoors, outdoors and at night</li><li>• Connectivity and storage options unavailable on competitive models</li><li>• Can be retrofit with extra options</li></ul>
<b>Anritsu S331/2D</b>	<ul style="list-style-type: none"><li>• Lower starting price</li></ul>

### Key features

- Cellular radio standard including LTE, channel power measurement, occupied
- Special functionality includes analog AM/FM demodulated audio signal, external and video trigger, FFT gating function
- Comes standard as cable and antenna tester 4 GHz (6 GHz with Option 106)
- Integrated QuickCal (an industry first) lets you calibrate without a calibration kit
- Rugged design for field use: 6.5" bright display for indoor and outdoor use, 4-hour battery, compliant with military environment standard
- Modern connectivity and storage: USB, miniSD and LAN

### Qualify

- **Need only handheld spectrum analyzer?** Sell the N9340B HSA (3 GHz) or the N9342C HSA (7 GHz).
- **Need benchtop spectrum analyzer and cable and antenna tester?** Sell N9000AEP CXA signal analyzer express configuration.

### Options

N9912A-104 ♦	4 GHz cable and antenna analyzer	N9912A-106 ♦	6 GHz cable and antenna analyzer
N9912A-110 ♦	Transmission measurement	N9912A-111 ♦	QuickCal
N9912A-230 ♦	4 GHz spectrum analyzer	N9912A-231 ♦	6 GHz spectrum analyzer
N9912A-235 ♦	Preamplifier for spectrum analysis capability	N9912A-302 ♦	External USB power sensor support
N9912A-303 ♦	Network analysis capability	N9912A-308 ♦	Vector voltmeter
Option 236 ♦	Provides spectrogram (2D), waterfall display (3D) and record/playback spectrum sweep to USB or SD card		
Option 230 or Option 231 ♦	Complete cellular radio standard including LTE, channel power measurement, occupied bandwidth (OBW), adjacent channel power measurement		

♦ Options may be purchased either initially or as upgrades later.

### Ordering information

- To order accessories, use N9910X with options found on [www.agilent.com/find/fieldfox](http://www.agilent.com/find/fieldfox).
- To order options with new products, use options above.
- To retrofit options, use N9912AU with options above.

### Included accessories

- AC/DC adapter, battery and soft carrying case
- User manual and FieldFox datalink software

### Cross-sell

- U2000 USB power sensors
- N9330B handheld cable and antenna tester
- N9340B handheld spectrum analyzer
- E7495B wireless base station test set



# RF Radio Frequency Products

For Employees of Agilent Authorized Distributors Only – Not for Customers or End Users



# Benchtop Radio Frequency (RF) Products

This broad category of instruments includes spectrum analyzers (also called signal analyzers) and signal generators (also called signal sources) that, respectively, measure and generate wireless communications signals.

For signal generator customer and product information, see page 109.

## What are spectrum analyzers?

**Function/measurements:** Measures the output of a transmitter to verify that it is tuned to the correct frequency and delivers the correct output power or amplitude. The analyzer also shows any unwanted signals—spurs and harmonics—generated by the transmitter itself or nearby transmitters (interference).

## Customer application and needs

R&D	Design validation	Manufacturing
<ul style="list-style-type: none"><li>• Test all aspects of a transmitter (Tx) to discover the performance limits and unexpected behaviors</li><li>• Evaluate individual components and integrated transmitter system</li><li>• View the signal created by the transmitter or lower level components</li></ul>	<ul style="list-style-type: none"><li>• Test and troubleshoot transmitters</li><li>• Perform detailed characterization of the DUT and optimize performance</li><li>• Isolate problems</li><li>• View the transmitted signal, then investigate and remedy issues</li></ul>	<ul style="list-style-type: none"><li>• Test and troubleshoot transmitters in consumer electronics manufacturing</li><li>• Make transmitter measurements to ensure no component defects or problems in the manufacturing process</li></ul>
User needs:	User needs:	User needs:
<ul style="list-style-type: none"><li>• Signal visualization</li><li>• High accuracy and resolution</li><li>• Ease of use</li><li>• Reliability</li></ul>	<ul style="list-style-type: none"><li>• Signal visualization</li><li>• High accuracy and resolution</li><li>• Demodulation metrics, spectrogram, stimulus and response measurements</li></ul>	<ul style="list-style-type: none"><li>• Fast test speed</li><li>• Low cost of ownership</li><li>• Best accuracy possible for the cost</li></ul>

## Competitive cross reference


Agilent	N9320B	N9000AEP	N9010AEP
Rohde & Schwarz	FSC	FSL	FSL/FSV/FSP
Anritsu	MS2717B		MS2687A/ MS2830



## Questions for your customer

Use the answers to choose the most suitable model from the table below.

Frequency range	What part of the spectrum do you need to measure?
26.5 GHz	N9010AEP-004
7.5 GHz	N9000AEP-002 and N9000AEP-004
6.0 GHz	N1996A
3.0 GHz	N9320B
Displayed Average Noise Level (DANL)	How small a signal do you need to measure?
DANL refers to the analyzer's noise floor (effectively the sensitivity), which is the amplitude displayed when no signal is present. The noise level must have lower dBm than the signal you want to measure. Higher performance analyzers have lower DANL.	
Third order intercept (TOI)	How large a signal do you need to measure?
TOI is a figure of merit that indicates how much distortion the analyzer generates. Higher performance analyzers have higher TOI.	
Resolution bandwidth (RBW)	How close together are the signals you need to measure?
<ul style="list-style-type: none"> <li>• RBW refers to the ability of the analyzer to resolve closely spaced signals.</li> <li>• A 1 Hz RBW means you see only 1 Hz of the spectrum at a time, so you can resolve signals only a few Hz apart. A 300 Hz RBW would not be able to resolve signals spaced this closely.</li> <li>• Higher performance analyzers have smaller RBWs. In general, a narrow RBW will have a slower sweep time.</li> </ul>	

Model number	Why buy? 1-minute sell	Frequency range	DANL	Starting price USD
<b>N9320B spectrum analyzer</b> 	<ul style="list-style-type: none"> <li>• Basic, low-cost unit</li> <li>• Best-in-class measurement speed and DANL, narrow RBW, wide dynamic range and multiple-language graphic user interface</li> <li>• <math>\pm 1.5</math> dB absolute amplitude accuracy</li> <li>• +13 dBm TOI (typical)</li> </ul>	9 kHz to 3 GHz	–148 dBm with preamp	\$7,553
<b>N9010AEP EXA signal analyzer express configuration</b>	<ul style="list-style-type: none"> <li>• Includes 3.6 or 7 GHz preamplifier and 3.6 GHz electronic attenuator standard</li> <li>• <math>\pm 0.27</math> dB absolute amplitude accuracy</li> <li>• +15 dBm TOI (typical)</li> <li>• 10 MHz (standard) analysis bandwidth</li> <li>• 300% faster measurement throughput than other analyzers</li> </ul>	9 kHz to 3.6, 7, 13.6 or 26.5 GHz	–163 dBm with preamp included standard (typical)	\$17,845
<b>N9000AEP CXA signal analyzer express configuration</b>	<ul style="list-style-type: none"> <li>• Includes 3 or 7.5 GHz preamplifier and 3 or 6 GHz tracking generator as standard</li> <li>• <math>\pm 0.5</math> dB absolute amplitude accuracy (95% confidence)</li> <li>• +13 dBm TOI</li> <li>• 10 MHz (standard) analysis bandwidth</li> <li>• New lowest-cost X-Series model with breakthrough performance for this price point</li> </ul>	9 kHz to 3 or 7.5 GHz	–161 dBm with preamp included as standard (typical)	\$13,310
<b>N1996A CSA spectrum analyzer</b>	<ul style="list-style-type: none"> <li>• Capable of both cable and antenna test and spectrum analysis</li> <li>• <b>Being discontinued</b>, last day to order is May 31, 2011.</li> </ul>	100 kHz to 6 GHz	–156 dBm w/preamp	\$8,999

What are signal generators?

**Function/measurements:** Emulate the output of a wireless transmitter—such as a radio, cell phone, satellite or radar—to test the system’s receiver. A signal generator can also be used to generate interfering or blocking signals.

Customer application and needs

R&D	Design validation	Manufacturing
<ul style="list-style-type: none"><li>• Test all aspects of the DUT to discover performance limits and unexpected behaviors Evaluate individual components and integrated Rx system</li><li>• Generate signals that closely approximate real-world signals, either transmitted or interfering</li></ul>	<ul style="list-style-type: none"><li>• Test and troubleshoot receivers</li><li>• Perform detailed characterization and optimize performance of the DUT</li><li>• Isolate problems</li><li>• Generate signals that can be modified in precise ways to operate the receivers (Rx) as usual or at performance limits</li></ul>	<ul style="list-style-type: none"><li>• Test and troubleshoot receivers in consumer electronics manufacturing</li><li>• Make receiver measurements to ensure no component defects and no problems in the manufacturing process</li></ul>
User needs:	User needs:	User needs:
<ul style="list-style-type: none"><li>• Capability to generate signals that emulate the correct output of a transmitter or interferer</li><li>• Flexibility to modify the signal in predefined ways for amplitude, frequency, phase and pulse</li></ul>	<ul style="list-style-type: none"><li>• Capability to generate specific signals that emulate the correct output of a transmitter or interferer</li><li>• Flexibility to modify the signal in predefined ways for amplitude, frequency, phase and pulse</li></ul>	<ul style="list-style-type: none"><li>• Fast test speed</li><li>• Low cost of ownership</li><li>• Best accuracy possible for the cost</li></ul>

Competitive cross reference

Agilent	N9310A	N5181AEP	N5183AEP
Rohde & Schwarz		SMA100A/ SMB100A/ SMC100A	SMF100A/SMR20
Anritsu	MG3641A	MG3641A/ MG3642A	MG3692C
Aeroflex	2023/24/25	2023/24/25 Series/ 2030 Series/ 2040 Series	2050 Series



## Questions for your customer

Use the answers to choose the most suitable model from the table below.

Frequency range	What part of the spectrum do you need to measure?
100 kHz to 1 GHz	N5181AEP-001
100 kHz to 3 GHz	N5181AEP-002
100 kHz to 6 GHz	N5181AEP-003
100 kHz to 20 GHz	N5183AEP-001
9 kHz to 3 GHz	N9310A
Spectral purity	How close to a pure sine tone can you generate without any other tones showing up in your pass band?
<ul style="list-style-type: none"> <li>Single side-band (SSB) phase noise must be an insignificant contribution to the measurement you want to make. An example of this would be LO substitution. Higher performance instruments have lower SSB phase noise.</li> <li>Spurious and harmonic/sub-harmonic signals should not interfere with the signal you want to measure. An example of this is LO blocker testing.</li> </ul>	
Modulation	How large a signal do you need to measure?
FM	Periodically change the frequency of the sine wave by a predetermined amount
AM	Periodically change the amplitude of the sine wave by a predetermined amount
Phase modulation	Periodically change the phase of the sine wave by a predetermined amount
Pulse modulation	Periodically turn the sine wave on and off in a predetermined pattern
Output power and power accuracy	What is the highest power signal that you need to generate to stimulate your DUT? How accurate does the output power need to be?
<ul style="list-style-type: none"> <li>Allows for accurate power calibration</li> <li>Allows user to compensate for system losses</li> <li>Can be used as a blocker or for interference testing with high-power signals</li> </ul>	

Model number	Why buy? 1-minute sell	Frequency range	Phase noise	Output power	Starting price USD
<b>N9310A</b> signal generator	<ul style="list-style-type: none"> <li>Compact size, competitive price</li> </ul>	9 kHz to 3 GHz	−95 dBc/Hz at 1 GHz and 20 kHz offset	+13 dBm at 1 GHz	\$6,843
<b>N5181AEP</b> signal generator	<ul style="list-style-type: none"> <li>AM/FM/phase modulation included standard</li> <li>Accurate and repeatable output power for calibration and verification</li> <li>5 ms frequency switching speed (typical) to increase throughput</li> </ul>	100 kHz to 1, 3 or 6 GHz	−121 dBc/Hz at 1 GHz and 20 kHz offset	+23 dBm at 1 GHz	\$7,170
<b>N5183AEP</b> signal generator	<ul style="list-style-type: none"> <li>100 kHz to 20 GHz with AM/FM/phase modulation and step attenuator included as standard</li> <li>Excellent power and level accuracy for calibration and verification</li> <li>5 ms frequency switching speed to increase throughput</li> </ul>	100 kHz to 20 GHz	−113 dBc/Hz at 1 GHz and 20 kHz offset	+18 dBm at 1 GHz	\$23,440

# N9320B Spectrum Analyzer



*Best-in-class basic spectrum analysis for high-volume consumer electronic manufacturing, R&D and education teaching labs.*

Starting price: **\$7,871**

## Competitive advantage

<b>Agilent N9320B</b>	<ul style="list-style-type: none"> <li>• Straightforward, intuitive user interface with large display, supports localization for 11 languages</li> <li>• Minimum RBW 10 Hz</li> <li>• Better DANL</li> <li>• Better dynamic range</li> </ul>
<b>Rohde &amp; Schwarz FS300/315</b>	<ul style="list-style-type: none"> <li>• Untrue claim of more ergonomic user interface</li> <li>• Untrue claim of unrivaled accuracy in this class at a lower price</li> <li>• Minimum RBW only 200 Hz</li> </ul>

## Key features

- Auto-tune signal detection
- One-button power measurements: channel power, OBW (occupied bandwidth), TOI (third order interception) measurement, spectrum emission mask (SEM) and adjacent channel power ratio (ACPR)
- Built-in power-meter function with Agilent U2000 Series power sensor
- Optional 3 GHz tracking generator
- -148 dBm displayed average noise level overall amplitude accuracy  $< \pm 1.5$  dB
- Remote control PC software

## Qualify

- **Need more than 3 GHz frequency?** Sell the N9000AEP-002 or N9000AEP-004 CXA signal analyzer express configuration.
- **Need lowest noise floor (DANL)?** Sell option N9320B – PA3.

## Options

N9320B-PA3	3 GHz preamplifier
N9320B-AMA	AM/FM demodulation metrics
N9320B-DMA	ASK/FSK demodulation metrics

N9320B-TG3	3 GHz tracking generator
N9320B-G01	GPIO interface

## Included accessories

- Quickstart guide, calibration test report and documentation CD-ROMs
- N-BNC adapter, BNC cable

## Optional accessories

N9320B-1HB	Handle and bumpers
N9320B-1CM	Rackmount kit
N9320B-1TC	Hard transit case
N9320B-TR1	RF training kit

## Cross-sell

- N9310A signal generator
- U2000 power sensor

# N1996A CSA Spectrum Analyzer



*Unbeatable combination of frequency range and functionality for its class.*

Starting price: **\$10,310**

## Competitive advantage

<b>Agilent N1996A</b>	<ul style="list-style-type: none"> <li>Amplitude accuracy of <math>\pm 0.5</math> dB</li> <li>Low-level spur search speed up to 100X faster than U3751</li> <li>Larger display</li> <li>Easier-to-use graphic user interface</li> </ul>
<b>Advantest U3751</b>	<ul style="list-style-type: none"> <li>Ultra-lightweight portable spectrum analyzer</li> <li>Frequency range of 100 kHz to 8 GHz</li> <li>Claims best-in-class amplitude accuracy (<math>\pm 0.8</math> dB) and high throughput</li> </ul>

**Other competition:** Rohde & Schwarz FSL

### Discontinued

last day to order is  
May 31, 2011

Recommended the  
N9320B or N9340B HSA  
on pages 111 or 105  
respectively.

## Key features

- Effective scalar network analysis capability with built-in Voltage Standing Wave Ratio (VSWR) bridge
- Convenient measurement personalities

## Qualify

- Need handheld solution?** Sell N9340B handheld spectrum analyzer.
- Need lowest noise floor (DANL)?** Sell Option N1996A-P06.

## Options

N1996A-503	100 kHz to 3 GHz
N1996A-506	100 kHz to 6 GHz
N1996A-P03/6	Preamplifier, 3 GHz/6 GHz
N1996A-AFM	AM/FM tune and listen
N8996A-1FP	AM/FM demodulation metrics
N1996A-271	Spectrogram measurement suite
N8995A-SR3/6	Stimulus response suite, 3 GHz/6 GHz

## Included accessories

- Calibration test report, manual, programming and reference CD-ROMs

## Optional accessories

N1996A-1CM	Rackmount kit
N1996A-SCC	Soft carrying case
N1996A-BAT	Battery pack, 2 pieces
N1996A-BCG	External battery charger
N1996A-SRK	Stimulus response calibration kit

## Cross-sell

- N9310A signal generator
- N9320B spectrum analyzer
- N9340B handheld spectrum analyzer



# N9010AEP EXA Signal Analyzer Express Configuration



Maximum throughput.

Starting price: \$17,845

## Competitive advantage

<b>Agilent N9010AEP</b>	<ul style="list-style-type: none"><li>• Fastest measurement throughput</li><li>• Ease of use</li><li>• Fastest delivery (available for off-shelf delivery from stocking distributors)</li></ul>
<b>Rohde &amp; Schwarz FSP</b>	<ul style="list-style-type: none"><li>• Lower base price — but does not include many N9010A standard features</li><li>• Higher frequency coverage (up to 40 GHz)</li></ul>

Other competition: Anritsu MS2663C, Advantest R3162A

## Key features

- Includes 3.6 or 7 GHz preamplifier and 3.6 GHz electronic attenuator included as standard
- $\pm 0.27$  dB absolute amplitude accuracy and +15 dBm third order intercept (TOI) (typical)
- -163 dBm displayed average noise level (DANL) with standard preamplifier (typical)
- 10 MHz (standard) analysis bandwidth

## Qualify

- **Need battery?** Sell N9340B or N9342C handheld spectrum analyzer.
- **10 dB step mechanical attenuator ok?** Optimize dynamic range with a 2 dB mechanical fine-step attenuator (option FSA).
- **Need to make EMC measurements?** Sell option EMC.

## Options

N9010AEP-001	9 kHz to 3.6 GHz frequency, 3.6 GHz preamplifier, 3.6 GHz electronic attenuator
N9010AEP-002	9 kHz to 7.0 GHz frequency, 7.0 GHz preamplifier, 3.6 GHz electronic attenuator
N9010AEP-003	9 kHz to 13.6 GHz frequency, 7.0 GHz preamplifier, 3.6 GHz electronic attenuator
N9010AEP-004	9 kHz to 26.5 GHz frequency, 7.0 GHz preamplifier, 3.6 GHz electronic attenuator
N9010AEP-FSA	Fine resolution step attenuator
N9010AEP-EMC	Basic EMC functionality
N9010AEP-PFR	Precision frequency reference

## Cross-sell

- N5181AEP RF analog signal generator express configuration
- N5183AEP MW analog signal generator express configuration
- U2000 power sensor

# N9000AEP CXA Signal Analyzer Express Configuration



Expect more.

Starting price: **\$13,312**

## Competitive advantage

<b>Agilent N9000AEP</b>	<ul style="list-style-type: none"><li>• More standard features – lower cost for comparable configuration</li><li>• Fastest measurement throughput</li><li>• Better performance</li><li>• Easier to use</li></ul>
<b>Rohde &amp; Schwarz FSL</b>	<ul style="list-style-type: none"><li>• Lower price</li><li>• Wider demodulation bandwidth</li><li>• 1-hour battery operation</li></ul>

*Other competition:* Anritsu MS2717B

## Key features

- Includes 3 or 7.5 GHz preamplifier and 3 or 6 GHz tracking generator standard
- $\pm 0.5$  dB absolute amplitude accuracy (95% confidence)
- +13 dBm third order intercept (TOI)
- -163 dBm displayed average noise level (DANL) with standard preamplifier (typical)
- 10 MHz (standard) analysis bandwidth

## Options

N9000AEP-001	9 kHz to 3.0 GHz frequency, 3.0 GHz preamplifier
N9000AEP-002	9 kHz to 7.5 GHz frequency, 7.5 GHz preamplifier
N9000AEP-003	9 kHz to 3.0 GHz frequency, 3.0 GHz preamplifier, 3.0 GHz tracking generator
N9000AEP-004	9 kHz to 7.5 GHz frequency, 7.5 GHz preamplifier, 6.0 GHz tracking generator
N9000AEP-FSA	Fine resolution step attenuator
N9000AEP-EMC	Basic EMC functionality
N9000AEP-PFR	Precision frequency reference

## Cross-sell

- N5181AEP RF analog signal generator express configuration
- N5183AEP MW analog signal generator express Cconfiguration
- U2000 power sensor

# N9310A RF Signal Generator



Low-cost, general-purpose signal generator for high-volume manufacturing, start-up R&D and RF teaching labs.

Starting price: \$7,273

## Competitive advantage

<b>Agilent N9310A</b>	<ul style="list-style-type: none"><li>Higher output power</li><li>40 MHz analog I/O modulator</li><li>11 localized language graphic user interface</li></ul>
<b>Rohde &amp; Schwarz SCM 100A</b>	<ul style="list-style-type: none"><li>Better phase noise</li><li>Better reversal power protection</li><li>Additional GPIB connectivity</li></ul>

## Key features

- Full sweep function RF (9 kHz to 3 GHz), amplitude (–127 to +13 dBm), low-frequency output (20 Hz to 80 kHz)
- Modulation: AM, FM,  $\Phi$ M and pulse; optional I/Q modulator
- Easy front-panel and remote operation (via standard USB) with an intuitive GUI offering 11 languages

## Options

N9310A - 001	40 MHz analog I/Q modulator
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## Optional accessories

Option-1HB	Handle and bumpers
Option-1CM	Rackmount kit
Option-1TC	Hard transit case

## Cross-sell

- N9320B spectrum analyzer
- N9330B cable and antenna tester

# N5181AEP RF Analog Signal Generator Express Configuration and N5183AEP Microwave Analog Signal Generator Express Configuration



*Fast frequency and amplitude switching, high reliability, and simplified self-maintenance all in a 2U unit.*

Starting price: **\$7,172/\$23,444**

## Competitive advantage

<b>Agilent N5181A</b>	<ul style="list-style-type: none"><li>• Lower base price</li><li>• High reliability</li><li>• 2x faster switching speeds</li></ul>
<b>Rohde &amp; Schwarz SMB</b>	<ul style="list-style-type: none"><li>• Higher price</li><li>• Higher output power (applications &gt; 3 GHz)</li><li>• Frequency coverage down to 9 kHz</li></ul>

## Key features

- Fastest switching frequency and amplitude switching in it's class, 1.2 ms in SCPI mode
- High power (+18 dBm at 20 GHz)
- AM, FM, phase modulation
- Frequency range 100 kHz to 6 GHz (N5181A) or 100 kHz to 40 GHz (N5183A)
- Pulse modulation
- Instrument security

## N5181AEP MXG RF analog signal generator express configuration

- 100 kHz to 1, 3, or 6 GHz with AM/FM/phase modulation included as standard
- +23 dBm output power at 1 GHz (optional) to compensate for system losses or drive device into compression
- Accurate and repeatable output power for calibration and verification
- -121 dBc/Hz (typical) phase noise at 1 GHz and 20 kHz offset is useful for VCO substitution
- 5 ms frequency switching speed (typical) to increase throughput

## N5183AEP MXG microwave analog signal generator express configuration

- 100 kHz to 20 GHz with AM/FM/phase modulation and step attenuator included as standard
- +18 dBm output power at 1 GHz (optional) to compensate for system losses or drive device into compression
- Excellent power and level accuracy for calibration and verification
- -113 dBc/Hz (typical) phase noise at 1 GHz and 20 kHz offset is useful for VCO substitution

## Cross-sell

- N9320A spectrum analyzer
- N9330B cable and antenna tester





# USB Modular Products

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# USB Modular Instruments

## What is a USB modular product?

**Measurement/function:** Provides capabilities in a cost-effective, space-saving form factor by eliminating a computing device in the instrument. Instruments connect via USB cable to a PC for post-processing and can be used alone like traditional instruments or grouped together in a chassis for synchronized measurements.

## Customer application and needs

Electronic troubleshooting	Electronic functional test	Education
Perform the following tests <ul style="list-style-type: none"><li>• Power-up sequence</li><li>• In-rush current</li><li>• Rise/settling/fall time</li><li>• Phase of stepper motor</li><li>• DC test</li></ul>	<ul style="list-style-type: none"><li>• Quick validation against specification that the DUT is within range for the following; connectivity, leakage current, resistance.</li><li>• Simple automation of many different instruments including source and measure, emulation, and analog signal viewing.</li></ul>	<ul style="list-style-type: none"><li>• Teach and research</li></ul>
<b>User needs:</b> <ul style="list-style-type: none"><li>• A set of modular products that are flexible, easy-to-use and compact</li><li>• Multiple instruments able to be synchronized to perform different tests</li></ul>	<b>User needs:</b> <ul style="list-style-type: none"><li>• Compact instruments with a small foot print to save test space</li><li>• Multiple instruments able to be synchronized to perform different tests</li></ul>	<b>User needs:</b> <ul style="list-style-type: none"><li>• Faceless instruments with intuitive soft front panels</li><li>• Low cost</li></ul>



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Product type	Model	Key specifications	Why buy? 1-minute sell	Accessories	Starting price USD
Modular multifunction data acquisition	U2351A	16 analog input channels, 250 kSa/s, 2 analog out channels	<ul style="list-style-type: none"> <li>• High analog input sampling rate</li> <li>• Up to 16-bit resolution to ensure measurement accuracy</li> <li>• Multifunction features with standard analog input channel, 24 DIO lines, 2 counter channel and optional analog output channel</li> </ul>	U2901A/2A Terminal block and SCSI-II 68-pin connector with 1 m/2 m cable	\$1,289
	U2352A	16 analog input channels, 250 kSa/s			\$1,082
	U2353A	16 analog input channels, 500 kSa/s, 2 analog out channels			\$1,611
	U2354A	16 analog input channels, 500 kSa/s			\$1,503
	U2355A	64 analog input channels, 250 kSa/s			\$1,369
	U2356A	64 analog input channels, 500 kSa/s, 2 analog out channels			\$1,827
	U2331A	64 analog input channels, up to 3 MSa/s, 2 analog out channels			\$2,146
Modular simultaneous sampling multifunction data acquisition	U2531A	4 analog input channels, up to 2 MSa/s	<ul style="list-style-type: none"> <li>• Individual ADCs for each channel enables high sampling rates and simultaneous acquisition of signals for phase-sensitive applications.</li> <li>• Up to 16-bit resolution to ensure measurement accuracy.</li> <li>• Multifunction features with 2 analog output channels, 24 DIO lines, and 2 counter channels</li> </ul>	U2901A/2A Terminal block and SCSI-II 68-pin connector with 1 m/2 m cable	\$1,876
	U2541A	4 analog input channels, 250 kSa/s			\$1,564
	U2542A	4 analog input channels, 500 kSa/s			\$1,876
Modular isolated digital I/O	U2651A	32-input, 32-output	<ul style="list-style-type: none"> <li>• 64 opto-isolated lines and up to 35 V voltage range</li> <li>• Isolation voltage of up to 1250 Vms for U2600A Series</li> <li>• Virtual port grouping function</li> <li>• Interrupt function</li> </ul>	U2901A/2A Terminal block and SCSI-II 100-pin connector with 1 m/2 m cable	\$438
	U2652A	64-input			\$438
	U2653A	64-output			\$438
Thermocouple input	U2802A	31-channel	<ul style="list-style-type: none"> <li>• Works with U2355A and U2356A for temperature measurements</li> <li>• Configurable for either temperature or voltage measurements up to 10 V</li> </ul>	U2802A Thermocouple kit	\$1,147
Modular oscilloscope	U2701A	100 MHz – 2-channel, 8 bits, up to 1 GSa/s	<ul style="list-style-type: none"> <li>• Highest sampling rate in class at up to 1 GS/s</li> <li>• Highest memory depth in class at up to 32 Mpts</li> </ul>	U2921A-100 BNC cable	\$1,358
	U2702A	200 MHz – 2-channel, 8 bits, up to 1 GSa/s		U2921A-101 USB secure cable, 2 m 10070C 1:1 20 MHz passive probe N2962A 10:1 150 MHz passive probe U2921A-100 BNC cable U2921A-101 USB secure cable, 2 m 10070C 1:1 20 MHz passive probe N2963A 10:1 300 MHz passive probe	\$1,674

Product type	Model	Key specifications	Why buy? 1-minute sell	Accessories	Starting price USD
Modular function generator	U2761A	1-channel, 20 MHz	<ul style="list-style-type: none"> <li>• 6 standard waveforms including 64 KB arbitrary waveforms up to 6 MHz</li> </ul>	U2921A-100 BNC cable U2921A-101 USB secure cable, 2 m	\$1,686
Modular source measure unit	U2722A	20 V/120 mA 3-channel	<ul style="list-style-type: none"> <li>• Up to 3 channels with 2.4 W on each</li> <li>• Greater accuracy and higher resolution than competitive models</li> </ul>	U2921A-101 USB secure cable, 2 m U2941A Parametric test fixture	\$2,213
	U2723A	20 V/120 mA 3-channel	<ul style="list-style-type: none"> <li>• Embedded test scripts to support coherent source and measurement capabilities</li> <li>• IV curve support</li> <li>• 3 times faster than U2722A</li> </ul>		\$3,609
Modular digital multimeter	U2741A	5½ digit resolution	<ul style="list-style-type: none"> <li>• Fast measurements with up to 100 Sa/s</li> <li>• Wide measurement range: 100 mV DC to 300 V DC and 10 mA to 2 A with 5½ digit resolution</li> </ul>	U2921A-101 USB secure cable, 2 m 34138A Test lead set	\$1,054
Modular switch matrix	U2751A	32-channel 4x8 2-wire	<ul style="list-style-type: none"> <li>• Higher bandwidth with minimal cross-talk performance</li> </ul>	U2922A-201 Terminal block	\$957
			<ul style="list-style-type: none"> <li>• Lower cost than competition</li> </ul>	U2921A-101 USB secure cable, 2 m	
USB modular instrument chassis	U2781A	High-speed USB 2.0 (480 Mbits/s)	<ul style="list-style-type: none"> <li>• 6-slot chassis for expanded channel count and synchronization between multiple modules</li> <li>• Use with U23xx Series, U25xx Series, U26xx Series, and U27xx Series</li> </ul>	U2905A Rackmount kit	\$1,212
Parametric test fixture	U9241A	3 input channels (use with U2722A/U2723A)	<ul style="list-style-type: none"> <li>• Supports up to 3 source/measure channels</li> <li>• Different socket modules to match a wide variety of pin configurations</li> <li>• Free Parametric Measurement Manager software for easy setup, testing and data recording.</li> </ul>		\$1,470



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