Agilent
E5100A Network Analyzer
10 kHz to 180 MHz/300 MHz

Technical Overview

Discontinued Product Information
— For Support Reference Only —

Information herein, may refer to products/services no longer supported. We regret any inconvenience caused by obsolete information. For the latest information on Agilent’s test and measurement products go to: www.agilent.com/find/products

In the US, call Agilent Technologies at 1-800-829-4444 (any weekday between 8am–5pm in any U.S. time zone)

World-wide Agilent sales office contact information is available at: www.agilent.com/find/contactus

Agilent’s fastest analyzer improves production capability and reduces costs.
The Agilent Technologies E5100A network analyzer is most appropriately employed on production lines of electronic component manufacturers. They are especially well suited for crystal and ceramic resonator or filter manufacturers. These analyzers improve production line productivity with fast measurement speed, fast waveform analysis commands, and a high-speed processor. They provide faster measurements with lower fluctuations because of their low-noise performance and fine-resolution IFBW.

The E5100A (10 kHz to 180/300 MHz) is a versatile and affordable network analyzer with many functions and options to fit your particular needs with a minimal investment. You can choose the 300 MHz version or the low-priced 180 MHz version.

Major specifications of the E5100A

**Frequency range**
10 kHz – 180 MHz/300 MHz

**Power (One RF OUT)**
–48 dBm to +22 dBm (option),
–9 dBm to +11 dBm (standard)

**Measurement parameters**
Gain (Amplitude Ratio), Phase, Group-Delay, Amplitude, Gain-Phase, Gain-Delay

**IFBW**
10 Hz – 30 kHz (1 kHz steps)

**Dynamic range**
120 dB (1 FBW = 1 kHz)

**Dynamic accuracy**
±0.05 dB, ±0.3 degrees

**Measurement speed**
0.04 ms/point (IFBW = 30 kHz, Ramp-sweep)

**Display**
6.5-inch (diag.) color LCD

**Programming**
Instrument BASIC

**Mass storage**
FDD and internal non-volatile memory

The E5100A adds value to resonator and filter production lines

**0.04 ms/point measurement speed**
This fast speed increases throughput and reduces testing costs.

**Ramp sweep and step sweep**
Ramp sweep provides fast measurements without dead-time between points. Step sweep improves accuracy and stability because the analyzer pauses for signal output and receiver settling before making a measurement.

**Fine-resolution IFBW**
Seven IFBW choices per decade provide the best compromise between measurement time and data stability.

**Stable measurements**
The low-noise design of the Agilent E5100A allows a 120 dB dynamic range and makes possible low-noise measurements. You get more stable data at wider IFBW settings.

**Fast processing**
A fast CPU shortens processing time and improves the total throughput. Waveform analysis commands and Instrument BASIC run even faster.

Note: For detailed specifications refer to the E5100A datasheet (publication number 5966-2888E).

---

Figure 1. The E5100A analyzers offer 0.4 ms/point measurement speed.
Options add capabilities
Selectable number of receivers
The number of receivers on the E5100A can be tailored to your needs so that the best instrument configuration can be chosen for each production line. The E5100A 300 MHz version can have up to 4 receivers; the E5100A 180 MHz version can have up to 3 receivers.

Small-sized, lightweight
Shorter depth
The E5100A’s short depth (425 mm) allows a larger work area in front of the instrument.

Lightweight
Weighing just 12 kg (typical), the analyzers are easy to move when production line layouts change.

Other features
PC-compatible external keyboard and external CRT
The external DIN keyboard and the external display output (VGA) are compatible with popular personal computers.

2-mode DOS floppy disk drive
The built-in FDD supports 2 modes: 720 kbyte (2DD), and 1.44 Mbyte (2HD) DOS formats.

Other features
Supports active probes
Probe power sockets are installed on the front panel. Input connectors on receivers A and B can be changed to type-N for connecting active probes. (Standard is BNC.)

Optical-isolated parallel I/O
A TTL-level parallel interface is standard for interfacing with auto-handlers. For noise immunity, an optical-isolated, open-collector parallel I/O is available.

The E5100A—a great fit for productions line final tests
During final tests, both precision and high-speed are required for better yield and better productivity. The Agilent E5100A makes high-quality, high-speed tests with its fine IFBW resolution and low-noise circuitry. Its convenient analysis and processing functions improve the productivity of final-test processes.

Low-cost 180 MHz version
The E5100A 180 MHz version is the economical solution for lower frequency applications. The test frequency range is 10 kHz to 180 MHz. It provides the same measurement performance and measurement speed as the 300 MHz version with lower prices.

Note: The frequency type of the E5100A (180 MHz or 300 MHz) is selected by specifying the receiver options.

Table 1. Comparison of E5100A versions

<table>
<thead>
<tr>
<th></th>
<th>E5100A 300 MHz version</th>
<th>E5100A 180 MHz version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test frequency</td>
<td>10 kHz – 300 MHz</td>
<td>10 kHz – 180 MHz</td>
</tr>
<tr>
<td>Number of receivers</td>
<td>2 to 4</td>
<td>2 to 3</td>
</tr>
<tr>
<td></td>
<td>E5100A-200</td>
<td>E5100A-218</td>
</tr>
<tr>
<td></td>
<td>E5100A-300</td>
<td>E5100A-318</td>
</tr>
<tr>
<td></td>
<td>E5100A-400</td>
<td></td>
</tr>
<tr>
<td>Measurement points</td>
<td>2 to 1601</td>
<td>2 to 1601</td>
</tr>
<tr>
<td>List sweep</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Dynamic range</td>
<td>120 dB</td>
<td>120 dB</td>
</tr>
<tr>
<td>Phase tracking DLD function</td>
<td>Yes (E5100A-023)</td>
<td>Yes (E5100A-823)</td>
</tr>
<tr>
<td>Evaporation monitor function</td>
<td>Yes (E5100A-022)</td>
<td>No</td>
</tr>
</tbody>
</table>
Resonator tests
High-speed evaluation using waveform analysis commands
The waveform analysis commands of the E5100A perform accurate parameter extraction in a very short time. For example, a single command simultaneously extracts resonant frequency and impedance. The analyzer also has other commands for complex tests of resonators, such as equivalent circuit analysis, peak-search, ripple-analysis, etc. (see Figure 2).

Phase Tracking function improves throughput of DLD measurement
The E5100A network analyzer with Opt.E5100A-823 and E5100A-023 is a good solution for measuring the drive level dependency (DLD) of crystals. This option provides a very quick measurement because it measures only the resonant frequency (Fr) and the resonant impedance (CI) as it sweeps the drive level (see Figure 4).

For crystal resonator tests with a PI network
The E5100A supports high-frequency crystal resonator tests using the 41900A/41901A PI network fixture. The E5100A with Opt. E5100A-618 and E5100A-600 has dual source output ports with different power levels. RF OUT-1 provides higher power for the receiver port A and RF OUT-2 provides lower power for the receiver port R. This capability allows the E5100A to apply a 1-mW drive level (when CI is 25 Ω) even when the PI network test fixture with large attenuation is used. In addition, it is not necessary to connect an external attenuator to the receiver port R.

Accuracy can be increased by eliminating residual impedance and stray admittance around the fixture using the transmission three-term calibration of the E5100A and the furnished calibration kits of the 41900A/41901A. Resonator tests with load capacitors can also be performed with the 41900A/41901A's load capacitor adapter kit.

[Watt] and [Amp] are available to set output power
The drive level of crystal resonators is normally defined as power [Watt] or current [Amp]. The E5100A has a convenient function to set the drive level in Watts or Amperes with nominal crystal impedance. No calculator is needed to convert dBm to Watt or Ampere.
For filter tests

Effective filter tests using list sweep

The Agilent E5100A’s list sweep capability reduces sweep time on filters. The test frequency range of filters varies depending on the rejection band, the pass band, and the user’s specifications. The list sweep capability operates over various frequency ranges. The sweep frequency range is separated into segments, each of which can have an independent frequency range, number of sweep points, IFBW, and power level settings. By using list sweep, separate frequency bands can be measured in one sweep, or a different IFBW can be set for pass band and rejection band. Wide dynamic range measurements can be completed less time.

Efficient spurious detection

When detecting high-Q spurs, narrow-span sweeps are necessary after wide-span sweeps, but changing the span degrades the test throughput. The E5100A’s short setup changing time improves test efficiency (see Figure 6).

Quick and easy filter parameter extraction

The E5100A can analyze data quickly using the built-in waveform analysis commands. These commands provide parameters within the pass band (such as insertion loss, 3 dB bandwidth) or parameters within the rejection band. Many commands for analyzing pass-band ripple or group-delay time are also available (see Figure 7).
Improving filter adjustment productivity
When manually adjusting filters, the E5100A’s quick display of the filter response (waveform) and pass/fail results improve productivity. An external VGA monitor can be connected to the analyzer for an even larger display that reduces operator fatigue.

For in-process testing of filters and resonators
For blank crystal tests
The demand for higher-frequency crystal components is growing, which means blank crystals are thinner. When an oscillator and a frequency counter are used to test these higher-frequency crystals, the results aren’t accurate. The E5100A’s fast measurement speed of 0.04 ms/pt and fast waveform analysis commands improves crystal test productivity.

For vacuum evaporation testing (frequency adjustment) of crystals
The E5100A is an ideal process-monitoring tool for the vacuum evaporation process of crystal resonators and filers. It outputs information necessary to control the process in a real-time manner, so evaporation chamber throughput and adjustment accuracy can be improved. Option E5100A-022, the evaporation monitoring function, is a good solution for adjustment of crystal resonators.

For other applications
Incoming inspection
The Agilent E5100A can be used for incoming inspection of filters and resonators. When inspecting many kinds of devices, the built-in floppy disk drive and non-volatile-memory are useful for saving and recalling test conditions, calibration data, and test data.

Adjustments of active components and electronic circuits
The E5100A’s fast sweep allows rapid adjustments of filter circuitry or active devices such as amplifiers or modulators.
Ordering Information
Agilent E5100A network analyzer

Furnished accessory
Power cable

Configuration guide
Choose option group <A> or <B>, depending on your measurement needs. Then choose the appropriate options within the chosen group. Lastly, choose the appropriate options from the option group <C>.

Choose ONE and ONLY one (Options are mutually exclusive)

Choose any combination

<A> For crystal resonator test function
- E5100A-600 300MHz X’tal resonator test w/PI-network
- E5100A-618 180MHz X’tal resonator test w/PI-network

<B> For generic test (including ceramic resonator test, filter test) function

For a number of ports option
- E5100A-200 300MHz, 2 receivers, ports R and A
- E5100A-218 180MHz, 2 receivers, ports R and A
- E5100A-300 300MHz, 3 receivers, ports R, A and B
- E5100A-318 180MHz, 3 receivers, ports R, A and B
- E5100A-400 300MHz, 4 receivers, ports R, A, B and C

For a connector type option
- E5100A-701 Type-BNC 50 Ω input connector on port A
- E5100A-702 Type-BNC 50 Ω input connector ports A and B
- E5100A-703 Type-BNC 50/1 MΩ selectable input on port A
- E5100A-704 Type-BNC 50/1 MΩ selectable input on port A and B

Option 41901A-010, 011 Q1A-JQSO6 4-TERMINAL

Option 41901A-040, 041 Q1A-JQSO7 2-TERMINAL

Note: Options E5100A-701, 703, 705, and 707 are for Options E5100A-200 and 218 only.
Options E5100A-702, 704, 706, and 708 are for Options E5100A-300, 318 and 400 only.
Options E5100A-703, 705, 707, and 708 cannot be ordered with Option E5100A-003 or 803.

1. Manual is not furnished as standard. (add)

Figure 9. Applicable DUT size and contact pin position of 41901A
<C> For common functions step
For a special measurement function option
- E5100A-022 Evaporation monitoring function (300 MHz option only)
- E5100A-023 Phase tracking function for 300 MHz ver.
- E5100A-823 Phase tracking function for 180 MHz ver.

Note: Option E5100A-022 is for Options E5100A-200, 300, 400, and 600 only. Option E5100A-023 is for Options E5100A-200, 300, 400, and 600 only and can’t order with Option E5100A-823. Option E5100A-823 is for Options E5100A-218, 318, and 618 only and can’t order with Option E5100A-023.

For an I/O option
- E5100A-804 Parallel I/O standard
- E5100A-005 Parallel I/O mode A (8 bit I/O)
- E5100A-006 Parallel I/O mode B (24 bit I/O)
- E5100A-007 Opto-isolated parallel I/O (24 bit I/O)

For a frequency reference option
- E5100A-800 Standard frequency reference
- E5100A-1D5 High stability frequency reference

For the IBASIC option
- E5100A-UKR Delete instrument BASIC

For a language of the manual
- E5100A-ABA U.S. - English localization
- E5100A-ABJ Japan - Japanese localization
- E5100A-OBW Add service manual

Accessories
- 41800A Active probe
- 41802A 1 MΩ input adapter

41900A PI-network test fixture
- Option 41900A-001 Variable CL adapter kit

41901A SMD PI-network test fixture
Fixed CL adapter options
- Option 41901A-010 Attachment kit QIAJ-QS06 4-terminal type (fixed)
- Option 41901A-020 Attachment kit QIAJ-QS06 2-terminal type (fixed)
- Option 41901A-030 Attachment kit QIAJ-QS07 4-terminal type (fixed)
- Option 41901A-040 Attachment kit QIAJ-QS07 2-terminal type (fixed)
- Option 41901A-050 Attachment kit QIAJ-QS08 4-terminal type (fixed)
- Option 41901A-060 Attachment kit QIAJ-QS08 2-terminal type (fixed)

Variable CL adapter options
- Option 41901A-011 Attachment kit QIAJ-QS06 4-terminal type (variable)
- Option 41901A-021 Attachment kit QIAJ-QS06 2-terminal type (variable)
- Option 41901A-031 Attachment kit QIAJ-QS07 4-terminal type (variable)
- Option 41901A-041 Attachment kit QIAJ-QS07 2-terminal type (variable)
- Option 41901A-051 Attachment kit QIAJ-QS08 4-terminal type (variable)
- Option 41901A-061 Attachment kit QIAJ-QS08 2-terminal type (variable)
- 87512A Transmission/reflection test kit
- 11850C 50 Ω three-way power splitter

1. These options include a contact board, 22 fixed CL boards, a device positioner and calibration standard (short and 50 Ω).

2. These options include a variable CL board and SMD capacitors. They don’t include a contact board, so this option should be ordered with the correspond option from Option 41901A-010 to 41901A-060.
Agilent Technologies’ Test and Measurement Support, Services, and Assistance

Agilent Technologies aims to maximize the value you receive, while minimizing your risk and problems. We strive to ensure that you get the test and measurement capabilities you paid for and obtain the support you need. Our extensive support resources and services can help you choose the right Agilent products for your applications and apply them successfully. Every instrument and system we sell has a global warranty. Two concepts underlie Agilent’s overall support policy: “Our Promise” and “Your Advantage.”

Our Promise
Our Promise means your Agilent test and measurement equipment will meet its advertised performance and functionality. When you are choosing new equipment, we will help you with product information, including realistic performance specifications and practical recommendations from experienced test engineers. When you receive your new Agilent equipment, we can help verify that it works properly and help with initial product operation.

Your Advantage
Your Advantage means that Agilent offers a wide range of additional expert test and measurement services, which you can purchase according to your unique technical and business needs. Solve problems efficiently and gain a competitive edge by contracting with us for calibration, extra-cost upgrades, out-of-warranty repairs, and onsite education and training, as well as design, system integration, project management, and other professional engineering services. Experienced Agilent engineers and technicians worldwide can help you maximize your productivity, optimize the return on investment of your Agilent instruments and systems, and obtain dependable measurement accuracy for the life of those products.

www.agilent.com

For more information on Agilent Technologies’ products, applications or services, please contact your local Agilent office. The complete list is available at:

www.agilent.com/find/contactus

Phone or Fax

United States:
(tel) 800 829 4444
(fax) 800 829 4433

Canada:
(tel) 877 894 4414
(fax) 800 746 4866

China:
(tel) 800 810 0189
(fax) 800 820 2816

Europe:
(tel) 31 20 547 2111

Japan:
(tel) (81) 426 56 7832
(fax) (81) 426 56 7840

Korea:
(tel) (080) 769 0800
(fax) (080) 769 0900

Latin America:
(tel) (305) 269 7500

Taiwan:
(tel) 0800 047 866
(fax) 0800 286 331

Other Asia Pacific Countries:
(tel) (65) 6375 8100
(fax) (65) 6755 0042
Email: tm_ap@agilent.com
Contacts revised: 09/26/05

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

Printed in USA. July 13, 2006
5968-1873E