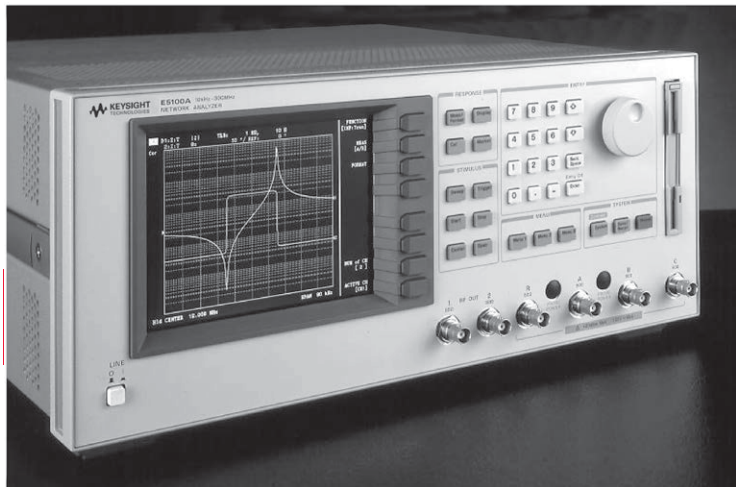
Keysight Technologies
E5100A Network Analyzer
10 kHz to 180 MHz/300 MHz



Technical Overview

Discontinued Product Information
– For Support Reference Only –

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Fastest analyzer improves production capability and reduces costs.

KEYSIGHT TECHNOLOGIES
Unlocking Measurement Insights

The Keysight Technologies, Inc. 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 highspeed 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 (1,1.5, 2, 3, 4, 5, 8 steps)
Dynamic range: 120 dB (1FBW = 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

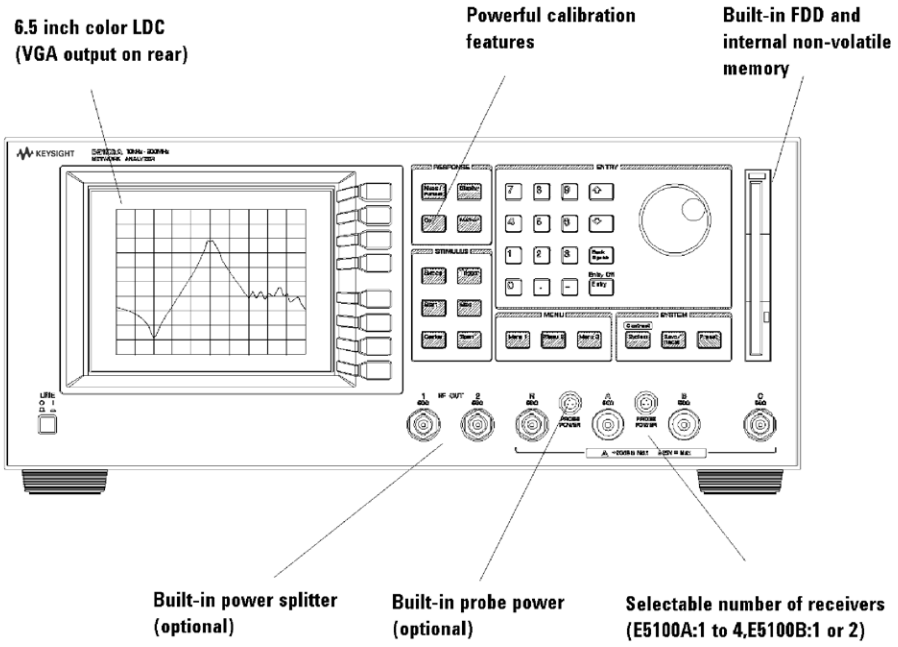

Figure 1. The E5100A analyzers offer 0.4 ms/point measurement speed.

The E5100A adds value to resonator and filter production lines

Note: For detailed specifications refer to the E5100A datasheet (publication number 6.5 inch color LDC 5966-2888E).

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 Keysight 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.

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.

Selectable source output
You can choose single, dual (builtin power splitter), or switched sources outputs.

50 Ω/1 MΩ switchable input impedance
Input impedance of receivers A and B can be changed to 50 Ω/1 MΩ, switchable. 50 Ω fixed configuration is also available.

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 autohandlers. For noise immunity, an optical-isolated, open-collector parallel I/O is available.

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.

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 Keysight E5100A makes high-quality, high-speed tests with its fine IFBW resolution and lownoise circuitry. Its convenient analysis and processing functions improve the productivity of finaltest 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.

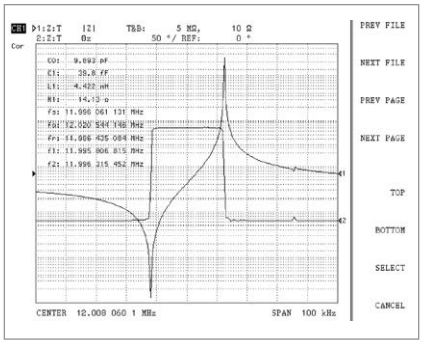

Figure 2. Example of equivalent circuit analysis of a resonator

Table 1. Comparison of E5100A versions

	E5100A 300 MHz version	E5100A 180 MHz version
Test frequency	10 kHz to 300 MHz	10 kHz to 180 kHz
Number of receivers	2 to 4 E5100A-200 E5100A-300 E5100A-400	2 to 3 E5100A-218 E5100A-318
Measurement points	2 to 1601	2 to 1601
List sweep	Yes	Yes
Dynamic range	120 dB	120 dB
Phase tracking DLD function	Yes (E5100A-023)	Yes (E5100A-823)
Evapolation monitor function	Yes (E5100A-022)	No

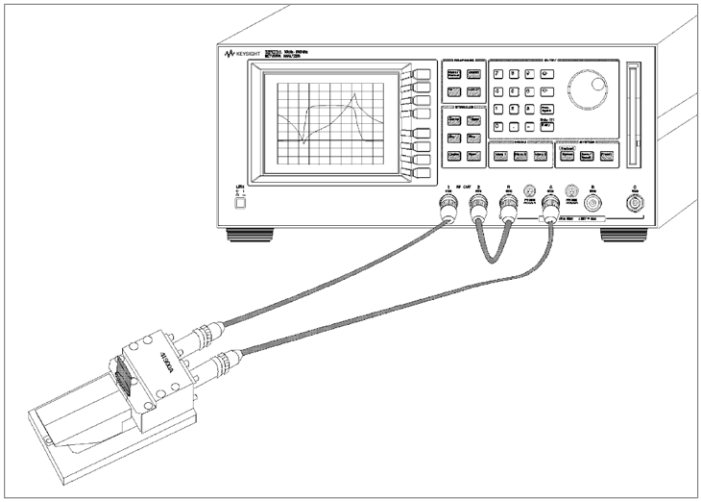

Figure 3. Crystal resonator test with a PI network

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, rippleanalysis, 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).

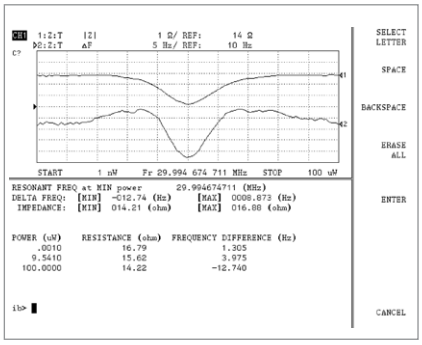

Figure 4. Example of DLD measurement using Opt. E5100A-823 and E5100A-023 phase tracking function

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 threeterm 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.

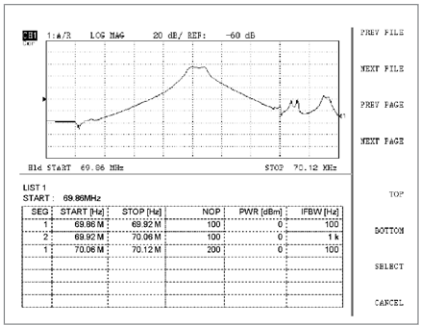

Figure 5. Example of list sweep for filter test

[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 Keysight 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.

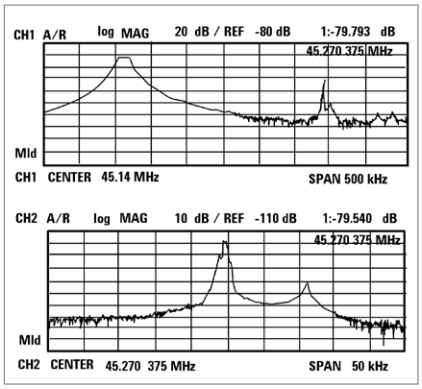

Figure 6. Spurious measurement results (top: wide span, bottom: narrower span)

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 groupdelay time are also available (see Figure 7).

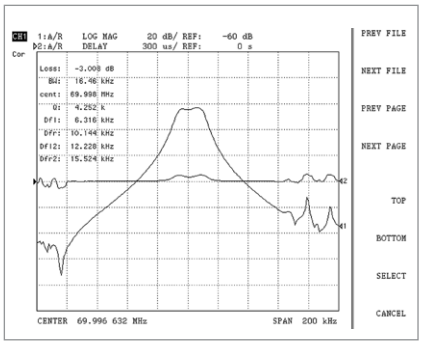

Figure 7. Built-in waveform analysis

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 processmonitoring 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 Keysight 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-volatilememory 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.

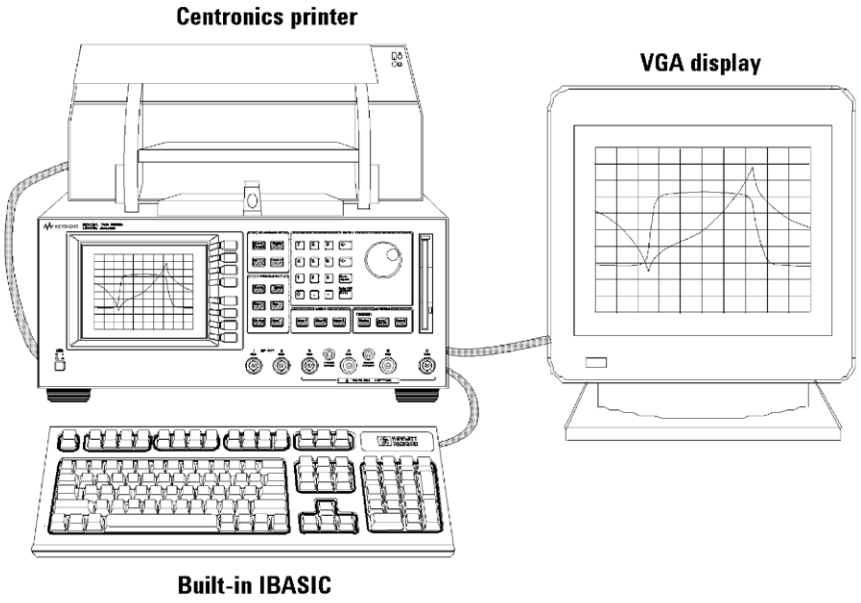

Figure 8. An external monitor can be used to reduce operator eye strain and fatigue.

Ordering Information

Keysight 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 an RF out port option
- E5100A-001 One RF OUT port
- E5100A-002 Two RF OUT ports, built-in power splitter
- E5100A-003 Two RF OUT ports, switched single output
- E5100A-801 Power extended one RF OUT port
- E5100A-802 Power extended Two RF OUT ports, built-in power splitter
- E5100A-803 Power extended Two RF OUT ports, switched single output

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 M Ω selectable input on port A
- E5100A-704 Type-BNC 50/1 MΩ selectable input on port A and B
- E5100A-705 Type-N 50 Ω input connector on port A
- E5100A-706 Type-N 50 Ω input connectors, ports A and B
- E5100A-707 Type-N 50/1 MΩ selectable input on port A
- E5100A-708 Type-N 50/1 MΩ selectable inputs, port A and B

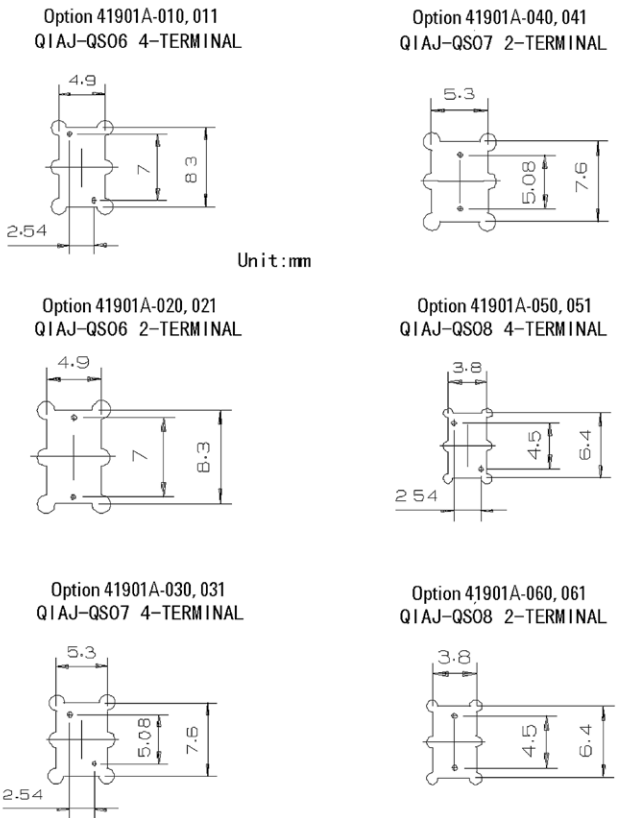

Figure 9. Applicable DUT size and contact pin position of 41901A

<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.

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 PC style keyboard
- ❑ E5100A-1F0 PC style keyboard -U.S. version

For a rack mount accessories
- ❑ E5100A-1CM Rackmount kit
- ❑ E5100A-1CN Handle kit
- ❑ E5100A-1CP Rackmount and handle kit

For a language of the manual[1]
- ❑ E5100A-ABA U.S. - English localization
- ❑ E5100A-ABJ Japan - Japanese localization
- ❑ E5100A-0BW – 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[2]
- ❑ 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[3]
- ❑ 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

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, 704, 707, and 708 cannot be ordered with Option E5100A-003 or 803. 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.

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

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

3. 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.

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