Agilent E5100A Network Analyzer

Manual Supplement for Option 509

Agilent Technologies

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Notice

The information contained in this document is subject to change without notice.

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Manual Printing History

The manual's printing date and part number indicate its current edition. The printing date changes when a new edition is printed. (Minor corrections and updates that are incorporated at reprint do not cause the date to change.) The manual part number changes when extensive technical changes are incorporated.

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Safety Summary

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific *WARNINGS* elsewhere in this manual may impair the protection provided by the equipment. In addition it violates safety standards of design, manufacture, and intended use of the instrument.
The Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

Note

E5100A comply with INSTALLATION CATEGORY II and POLLUTION DEGREE 2 in IEC1010-1. E5100A are INDOOR USE product.

Ground The Instrument

To avoid electric shock hazard, the instrument chassis and cabinet must be connected to a safety earth ground by the supplied power cable with earth blade.

DO NOT Operate In An Explosive Atmosphere

Do not operate the instrument in the presence of flammable gasses or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Keep Away From Live Circuits

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with the power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

DO NOT Service Or Adjust Alone

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

DO NOT Substitute Parts Or Modify Instrument

Because of the danger of introducing additional hazards, do not install substitute parts or perform unauthorized modifications to the instrument. Return the instrument to a Agilent Technologies Sales and Service Office for service and repair to ensure that safety features are maintained.

Dangerous Procedure Warnings

Warnings , such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

Warning

Dangerous voltages, capable of causing death, are present in this instrument. Use extreme caution when handling, testing, and adjusting this instrument.

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Introduction

Option 509

The option 509 limit the functions of HP E5100A to the following functions.

- The following functions are not available:
  - Front pannel key operation
  - Graphic display
  - Flexible disk drive
  - Printing
  - I/O port
  - Ramp sweep
  - Power sweep
  - List sweep
  - Group delay measurment
  - External trigger input
  - External RUN/CONT input
- HP-IB address is fixed to 17.
- HP-IB commands are limited. Refer to "HP-IB Commands for Option 509".
- Specifications are changed. Refer to Chapter 3

Warning **Avoid turning on the instrument with water condensed.**

HP-IB Commands for Option 509

The following commands are available for the HP E5100A with Option 509. The commands are categolized into two types (Part 1 and 2). HP-IB Commands in PART 1 are used for speedy measurements customized. Commands in PART 2 are used for linear frequency sweep measurements. When high speed measurements are required, avoid using commands in PART 2 if it is possible. Becasue throughput time of commands in part 2 is long.

Table 1-1. HP-IB Commands for Option 509

Part 1 : HP-IB commands specific to option 509

■ **System**

```
.hpib_echo={ON|OFF}
.hpib={ON|OFF}
contrast=;<numeric>
PRES
exit
```

■ **Stimulus**

```
CENT=;<numeric>
POIN=;<numeric>
POWE=;<numeric>
SPAN=;<numeric>
STAR=;<numeric>
WAITM=;<numeric>
```

■ **Input**

```
ATTIA={0|25}
ATTIAAUTO={ON|OFF}
ATTIB={0|25}
ATTIBAUTO={ON|OFF}
ATTIR={0|25}
ATTIRAUTO={ON|OFF}
FILT={1|2|3|4}
IFBW=;<numeric>
```

■ **Setup command for measurement**

```
MSETENV?
```

■ **N point measurement command**

```
MNPT f1 f2 ... fn?
```

■ **N point linear sweep measurement command**

```
MSING?
```

Part 2 : HP-IB commands for linear frequency sweep measurement

■ **Stimulus**

```
SING
SING?
```

■ **Response**

```
FORM={'logm'|'phas'|'pola'}
MEAS={'r'|'a'|'ar'|'b'|'br'}
```

■ **I/O prot**

```
OUTPFORM
OUTPSTIM?
```

■ **Data transfer**

```
HPIBFORM={'ASC'|'REAL'}
```

Any set command except for FORM and MEAS can be used to inquire the internal value by sending the command with "?" instead of "=". For example,

```
OUTPUT 717;"POIN?"
ENTER 717;Nop
```

gives the number of points.

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Command Reference

This chapter provides a reference for the HP-IB commands of HP E5100A with Option 509. Use this information as a reference to the syntax requirements and general function of the individual commands.

The following conventions and definitions are used to describe the commands.

① → **ATTIA = {0|25}**
② → Set A input attenuator.
③ →

Parameter	Description
0	0 dB (Maximum input level is −20 dBm)
25	25 dB (Maximum input level is +5 dBm) (default)

①	Command name and required parameter. The command must appear exactly as shown with no embedded spaces. A constant or a pre-assigned simple or complex numeric or string variable transferred to the analyzer. There must be a space between it and the code. (␣ indicates a space.) Characters enclosed in the { } brackets are qualifiers attached to the root mnemonic. There can be no spaces or symbols between the root mnemonic and its appendage. For example, {OFF|ON|0|1} means OFF, ON, 0, or 1, and {1-4} means 1, 2, 3, or 4.
②	Description. The brackets may include more additional information.
③	Parameter description.

Any set command except for FORM and MEAS can be used to inquire the internal value by sending the command with "?" instead of "=". For example,

```
OUTPUT 717;"POIN?"
ENTER 717;Nop
```

gives the number of points.

Command Reference in Alphabetical Order

ATTIA = {0|25}

Set A input attenuator.

Parameter	Description
0	0 dB (Maximum input level is −20 dBm)
25	25 dB (Maximum input level is +5 dBm) (default)

ATTIAAUTO = {ON|OFF}

Set A input auto ranging on or off.

Parameter	Description
ON	Input auto ranging on
OFF	Input auto ranging off (Default)

ATTIB = {0|25}

Set B input attenuator.

Parameter	Description
0	0 dB (Maximum input level is −20 dBm)
25	25 dB (Maximum input level is +5 dBm) (default)

ATTIBAUTO = {ON|OFF}

Set B input auto ranging.

Parameter	Description
ON	Input auto ranging on
OFF	Input auto ranging off (default)

ATTIR = {25|0}

Set R input attenuator.

Parameter	Description
0	0 dB (Maximum input level is −20 dBm)
25	25 dB (Maximum input level is +5 dBm) (Default)

ATTIRAUTO = {ON|OFF}

Set R input auto ranging on or off.

Parameter	Description
ON	Input Auto ranging ON
OFF	Input Auto ranging OFF (Default)

CENT = ;<numeric>

Set frequency center.

Parameter	Range	Unit
<numeric>	50k to 300M	Hz

contrast = <numeric>

Set contrast of the front display.

Parameter	Range	Unit
<numeric>	0 to 255	

exit

Exit the current firmware program and wait for firmware update.

FILT = {1|2|3|4}

Set filter type. Filter type may affect the trace noise when measuring high-Q DUTs.

Parameter	Description
1	Filter type 1
2	Filter type 2 (Default)
3	Filter type 3
4	Filter type 4

FORM = {'logm'|'phas'|'pola'}

Set format data. This setting will be ignored when using `MNPT` or `MSING` commands.

Parameter	Description
'logm'	LOG-MAG format
'phas'	PHASE format
'pola'	REAL and IMAG format

.hpib = {ON|OFF}

Set HP-IB on or off. When `.hpib=off`, the external keyboard can be used, Ctrl key swaps places with Caps Lock key.

Parameter	Description
ON	HP-IB is available (default)
OFF	HP-IB is not available

.hpib_echo = {ON|OFF}

Set HP-IB echo mode on or off. This command is used to monitor the HP-IB when developing HP-IB control software. `.hpib_echo` should be turned off otherwise to avoid any buffer overflow and transfer time increase.

Parameter	Description
ON	HP-IB echo mode on (default)
OFF	HP-IB echo mode off

HPIBFORM = {ASC|REAL}

Set ASCII transfer mode. When measuring using `MNPT` or `MSING`, BINARY transfer is used regardless of the set mode.

Parameter	Description
'ASC'	ASCII transfer (Default)
'REAL'	BINARY transfer

IFBW = ;<numeric>

Set IF bandwidth.

Parameter	Range	Unit
<numeric>	10 to 30000 with 1, 1.5, 2, 3, 4, 5, 8 step	Hz

MEAS = {'r'|'a'|'ar'|'b'|'br'}

Set input port. This setting will be ignored when using `MNPT` or `MSING` commands.

Parameter	Description
'r'	R-ch.
'a'	A-ch.
'ar'	A/R.
'b'	B-ch.
'br'	B/R.

MNPT␣f1␣f2␣ ... ␣fn?

Measure n points given n frequencies f1, f2, ... ,fn. Then outputs $2n$ complex (real and imaginary format) data of (A/R and B/R)×n. There are no restrictions on the frequency order.

MSETENV? should be sent one time before this command is sent.

Data will be sent in BINARY format.

Parameter	Range	Unit
Number of measurement points (n)	1 to 31	

- EXAMPLE

```
ASSIGN @E5100a to 717; FORMAT OFF
:
OUTPUT 717,"MNPT";F(*);"?"
ENTER 717 USING "#,8A";dummy$                !Kill header
ENTER @E5100a, Data(*)
ENTER 717 USING "#,1A";dummy$                !Kill footer
```

MSETENV?

Setup environment for MNPT and/or MSING measurements. This is to setup POWER, IFBW, and RF attenuators internally.

This command must be sent to HP E5100A *after* the following commands are sent:

POWE, IFBW, ATTIAAUTO, ATTIA=, ATTIBAUTO, ATTIB=, ATTIRAUTO, ATTIR=

This commands must be sent *before* the following commands are sent:

MNPT, MSIN

Once ESETENV? is sent, MNPT and MSING can be repeated without sending ENVNPT again until one of the POWE, IFBW, ATTIAAUTO, ATTIA=, ATTIBAUTO, ATTIB=, ATTIRAUTO and ATTIR=, is changed.

- EXAMPLE

```
OUTPUT 717,"MSETENV?"
ENTER 717,dummy          !Wait until the environment is set.
```

MSING?

Measure NOP points then outputs data of A/R and B/R (2×*NOP* complex data). Frequency range and NOP are specified by STAR, STOP, CENT, SPAN and POIN.

MSETENV? should be sent one time before this command is sent.

Data will be sent in BINARY format.

- EXAMPLE

```
ASSIGN @E5100a to 717; FORMAT OFF
:
OUTPUT 717,"STAR=";Fstart
OUTPUT 717,"STOP=";Fstop
OUTPUT 717,"POIN=";Nop
:
OUTPUT 717,"MSING?"
```

MSING?

```
ENTER 717 USING "#,8A";dummy$                    !Kill header
ENTER @E5100a, Data(*)
ENTER 717 USING "#,1A";dummy$                    !Kill footer
```

OUTPFORM?

Output Format data array.

OUTPSTIM?

Output Stimulus data array.

POIN = ;<numeric>

Set Number of Points. This command should be sent before the following commands:

`STAR, STOP, CENT, SPAN`

Parameter	Range	Unit
<numeric>	2 to 801	

POWE = ;<numeric>

Set power level.

Parameter	Range	Unit
<numeric>	Range is specified in the *Function Reference*	dBm

PRES

Preset the instrument.

SING

Trigger a sweep.

SING?

Trigger a sweep and wait sweep complete.

SPAN = ;<numeric>

Set frequency span.

Parameter	Range	Unit
<numeric>	0 to 299.95 M	Hz

STAR = ;<numeric>

Set start frequency.

Parameter	Range	Unit
<numeric>	50k to 300M	Hz

STOP = ;<numeric>

Set stop frequency.

Parameter	Range	Unit
<numeric>	50k to 300M	Hz

WAITM = ;<numeric>

Set wait time [$\times 10^{-5}$ sec] between synthesizer change and measurement start at each measurement frequency point. Default value is 0 sec.

Parameter	Range	Unit
<numeric>	0 to 2000 with 4 step	$\times 10^{-5}$ sec

- Example (to set the wait time 40 μsec)

```
OUTPUT 717, "WAITM=4"
```

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Specifications

when Option 509 is installed.

Values followed by (SPC): are Supplemental Performance Characteristics.

- The following specifications are deleted.

  "Absolute Amplitude Accuracy" in the "Magnitude Characteristics"
  "Delay Characteristics"

- The following specifications are changed.

  "Frequency Range" in the "Frequency Characterisitics" ..... 50 kHz to 300 MHz
  "Frequency Response" in the "Magnitude Characteristics" ..... ±6 dB (SPC)
  "Frequency Response" in the "Phase Characteristics" ..... ±10 ° (SPC)
  "EXT REF INPUT 10 MHz" in the "Connector"
  Input Frequency ..... 10 MHz±5 ppm (SPC)

Customer Order Number

E5100-90009

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Manufacturing Part Number

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