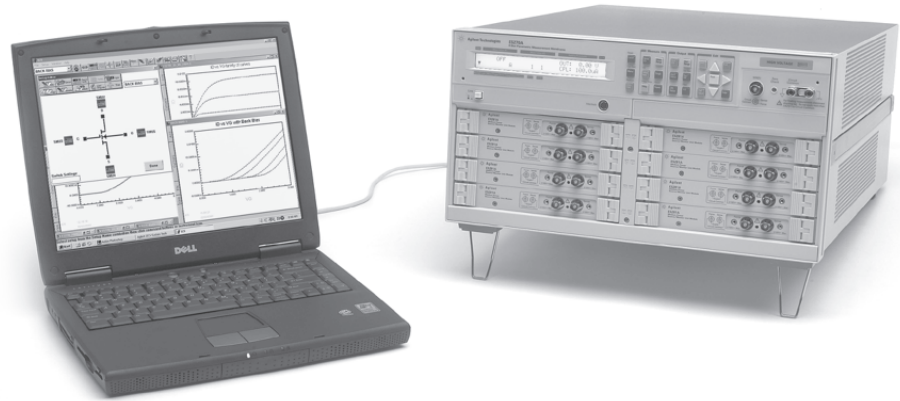


Agilent 4157A Modular Semiconductor Parameter Analyzer

Data Sheet



Introduction

The Agilent 4157A Modular Semiconductor Parameter Analyzer combines the hardware flexibility of the Agilent E5270A 8-Slot Parametric Measurement Mainframe with the software versatility of I/CV 2.1 Lite Automation Software.

Configuration

The 4157A is an integrated, turnkey solution. The standard configuration includes the E5270A mainframe, a PC-based instrument controller with I/CV 2.1 Lite pre-installed, and an Agilent 82357A USB/GPIB interface. The E5270A mainframe is completely user-configurable. You have the option of deleting the controller and cable from your order, but I/CV 2.1 Lite is always included with the 4157A. If you want the full version of I/CV 2.1, you can request the E5240BU upgrade kit when you order the 4157A. For more information about the differences between I/CV 2.1 Lite and I/CV 2.1, please refer to the Agilent I/CV 2.1 Technical Overview, publication number 5988-8474EN.

Software Functions

- PC-based instrument control via a GUI
- Set measurement conditions
- Control measurement execution
- Perform arithmetic calculations
- Display measured and calculated results
- Perform graphical analysis
- Store and recall measurement setups and measurement and graphical display data
- Test sequencing and data disposition
- Wafer prober control
- Post-test data analysis (wafer maps, histograms, statistical information)
- Print to networked printers
- Transfer measurement data and setups over a LAN
- Self-test, self-calibration, diagnostics

Hardware Functions

- Performs high-speed, dc parametric measurements
- Eight slots for plug-in modules
- High-resolution analog-to-digital converter (HR-ADC) available to all installed modules
- High-speed analog-to-digital converter (HS-ADC) present on each installed SMU
- 4 Amp ground unit
- GPIB port for instrument control
- User interface allows spot measurements to be made from the E5270A front panel
- Self-test, self-calibration, diagnostics

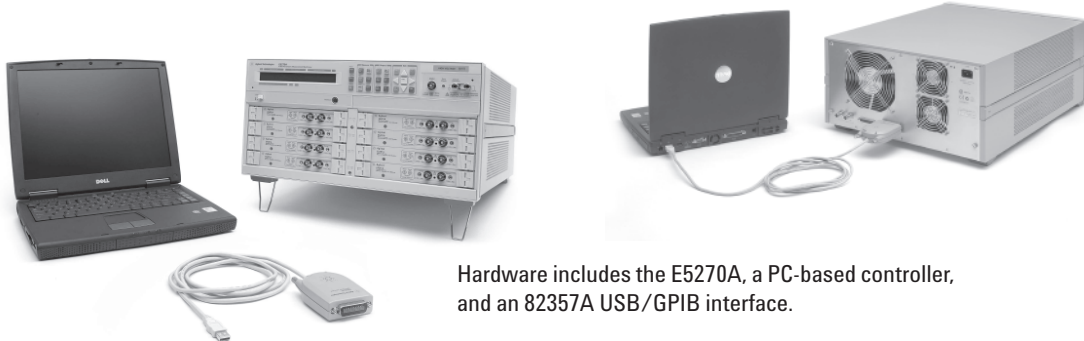
Measurement Modes

- Spot
- Staircase Sweep
- Multi-channel Sweep
- Custom Sweep
- Pulsed Spot
- Pulsed Sweep
- Staircase Sweep with Pulsed Bias
- Sampling



Agilent Technologies

Hardware



Hardware includes the E5270A, a PC-based controller, and an 82357A USB/GPIB interface.

Specification Conditions

Note: This document lists specifications and supplemental information for the E5270A and its associated modules. The specifications are the standards against which the E5270A and its associated modules are tested. When the E5270A or any of its associated modules are shipped from the factory, they meet the specifications. The “supplemental” information and “typical” entries in the following specifications

are not warranted, but provide useful information about the functions and performance of the instrument.

The measurement and output accuracy are specified at the module connector terminals when referenced to the Zero Check terminal under the following conditions:

1. 23° C ±5° C (double for 5° C to 18° C, and 28° C to 40° C if not noted otherwise)
2. After 40 minutes warm-up
3. Ambient temperature change less than ±1° C after auto calibration execution
4. Measurement made within one hour after auto calibration execution
5. Averaging (high-speed per-SMU ADC): 128 samples in 1 PLC; Integration time (high-resolution central ADC): 1 PLC
6. Filter: ON (for SMUs)
7. Kelvin connection
8. Calibration period: 1 year

E5270A Mainframe Specifications

Supported Plug-In Modules

The E5270A supports eight slots for plug-in modules.

Part Number	E5270A Option	Description	Slots Occupied	Range of Operation
E5280A	E5270A-400	HPSMU	2	2 μV to 200 V, 10 fA to 1 A
E5281A	E5270A-410	MPSMU	1	2 μV to 100 V, 10 fA to 200 mA

Maximum Output Power

The total module power consumption cannot exceed 80 W. *Note: Using the HPSMU and MPSMU units, it is impossible to create a combination that exceeds the 80 Watt limit.*

Maximum Voltage between Common and Ground

Maximum Common to Ground voltage must be ≤42 V.

Pulse Measurement

Pulse width: 500 μs to 2 s
 Pulse period: 5 ms to 5 s
 (≥Pulse width + 2 ms: Pulse width ≤100 ms)

(≥Pulse width + 10 μs: Pulse width >100 ms)

Pulse resolution: 100 μs

Ground Unit (GNDU) Specifications

The GNDU is furnished with the E5270A mainframe.

Output Voltage: 0 V ±100 μV

Maximum sink current: 4 A

Output terminal/connection:

Triaxial connector, Kelvin (remote sensing)

GNDU Supplemental Information

Load capacitance: 1 μF

Cable resistance:

For $I_s \leq 1.6$ A:

Force Line R < 1 Ω

For 1.6 A < $I_s \leq 2.0$ A:

Force Line R < 0.7 Ω

For 2.0 A < $I_s \leq 4.0$ A:

Force Line R < 0.35 Ω

For all cases:

Sense Line R ≤ 10 WΩ

Where I_s is the current being sunk by the GNDU.

MPSMU (Medium Power SMU) Module Specifications

Voltage Range, Resolution, and Accuracy (MPSMU)

Voltage Range	Force Resolution	Measure Resolution ¹	Measure Resolution ²	Force Accuracy	Measure Accuracy ³	Measure Accuracy ⁴	Maximum Current
±2 V	100 μV	100 μV	2 μV	±(0.03% + 900 μV)	±(0.03% + 700 μV)	±(0.02% + 700 μV)	200 mA
±20 V	1 mV	1 mV	20 μV	±(0.03% + 4 mV)	±(0.03% + 4 mV)	±(0.02% + 2 mV)	200 mA
±40 V	2 mV	2 mV	40 μV	±(0.03% + 7 mV)	±(0.03% + 8 mV)	±(0.02% + 3 mV)	⁵
±100 V	5 mV	5 mV	100 μV	±(0.04% + 15 mV)	±(0.03% + 20 mV)	±(0.03% + 5 mV)	⁶

¹ Measurement resolution when using the high-speed per-SMU ADC
² Measurement resolution when using the high-resolution central ADC
³ Measurement accuracy when using the high-speed per-SMU ADC
⁴ Measurement accuracy when using the high-resolution central ADC
⁵ 200 mA (Vout ≤ 20 V), 50 mA (20 V < Vout ≤ 40 V)
⁶ 200 mA (Vout ≤ 20 V), 50 mA (20 V < Vout ≤ 40 V), 20 mA (40 V < Vout ≤ 100 V)

Current Range, Resolution, and Accuracy (MPSMU)

Current Range	Force Reso.	Meas. Reso. ¹	Meas. Reso. ²	Force Accuracy	Measure Accuracy ³	Max. Voltage
±1 nA	50 fA	50 fA	10 fA	±(0.5 % + 3 pA + 2 fA×Vout)	±(0.5 % + 3 pA + 2 fA×Vout)	100 V
±10 nA	500 fA	500 fA	10 fA	±(0.5 % + 7 pA + 20 fA×Vout)	±(0.5 % + 5 pA + 20 fA×Vout)	100 V
±100 nA	5 pA	5 pA	100 fA	±(0.12 % + 50 pA + 200 fA×Vout)	±(0.1 % + 30 pA + 200 fA×Vout)	100 V
±1 mA	50 pA	50 pA	1 pA	±(0.12 % + 400 pA + 2 pA×Vout)	±(0.1 % + 200 pA + 2 pA×Vout)	100 V
±10 mA	500 pA	500 pA	10 pA	±(0.12 % + 5 nA + 20 pA×Vout)	±(0.1 % + 3 nA + 20 pA×Vout)	100 V
±100 mA	5 nA	5 nA	100 pA	±(0.12 % + 40 nA + 200 pA×Vout)	±(0.1 % + 20 nA + 200 pA×Vout)	100 V
±1 mA	50 nA	50 nA	1 nA	±(0.12 % + 500 nA + 2 nA×Vout)	±(0.1 % + 300 nA + 2 nA×Vout)	100 V
±10 mA	500 nA	500 nA	10 nA	±(0.12 % + 4 mA + 20 nA×Vout)	±(0.1 % + 2 mA + 20 nA×Vout)	100 V
±100 mA	5 mA	5 mA	100 nA	±(0.12 % + 50 mA + 200 nA×Vout)	±(0.1 % + 30 mA + 200 nA×Vout)	⁴
±200 mA	10 mA	10 mA	200 nA	±(0.12 % + 100 mA + 400 nA×Vout)	±(0.1 % + 60 mA + 400 nA×Vout)	⁵

¹ Measurement resolution when using the high-speed per-SMU ADC
² Measurement resolution when using the high-resolution central ADC
³ Measurement accuracy when using either the high-speed per-SMU ADC or the high-resolution central ADC
⁴ 100 V (Iout ≤ 20 mA), 40 V (20 mA < Iout ≤ 50 mA), 20 V (50 mA < Iout ≤ 100 mA)
⁵ 100 V (Iout ≤ 20 mA), 40 V (20 mA < Iout ≤ 50 mA), 20 V (50 mA < Iout ≤ 200 mA)
Vout is the output voltage in Volts. Iout is the output current in Amps. For example, accuracy specifications are given as ±% of output/measured value (0.1%) plus offset value (30 pA + 200 fA × Vout) for the 100 nA range. The offset value consists of a fixed part determined by the output/measurement range and a proportional part that is multiplied by Vout.

Power Consumption (MPSMU)

Voltage source mode:

Voltage

Range	Power
2 V	$20 \times I_c$ (W)
20 V	$20 \times I_c$ (W)
40 V	$40 \times I_c$ (W)
100 V	$100 \times I_c$ (W)

Where I_c is the current compliance setting.

Current source mode:

Voltage

Compliance	Power
$V_c \leq 20$	$20 \times I_o$ (W)
$20 < V_c \leq 40$	$40 \times I_o$ (W)
$40 < V_c \leq 100$	$100 \times I_o$ (W)

Where V_c is the voltage compliance setting and I_o is output current.

Output terminal/connection:

Dual triaxial connector, Kelvin (remote sensing)

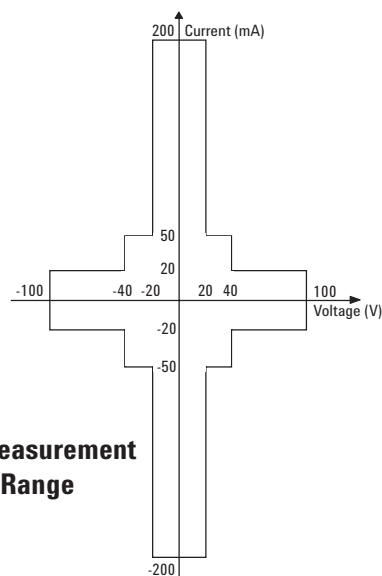
Voltage/Current Compliance (Limiting)

The SMU can limit output voltage or current to prevent damaging the device under test.

Voltage: 0 V to ± 100 V

Current: ± 1 pA to ± 200 mA

Compliance Accuracy: Same as the current (or voltage) set accuracy.



MPSMU Measurement and Output Range

MPSMU Supplemental Information

Maximum allowable cable resistance (Kelvin connection):

Force Line: 10Ω ($I \leq 100$ mA)

Force Line: 1.5Ω (100 mA $< I \leq 200$ mA)

Sense Line: 10Ω (All cases)

Voltage source output resistance:

0.3Ω Typical (Force line, Non-Kelvin connection)

Voltage measurement input resistance:

$\geq 10^{13} \Omega$

Current source output resistance:

$\geq 10^{13} \Omega$ (1 nA range)

Current compliance setting accuracy (for opposite polarity):

For 1 nA to 10 nA ranges:

V/I setting accuracy $\pm 12\%$ of range

For 100 nA to 200 mA ranges:

V/I setting accuracy $\pm 2.5\%$ of range

Maximum capacitive load:

For 1 nA to 10 nA ranges: 1000 pF

For 100 nA to 10 mA ranges: 10 nF

For 100 mA to 200 mA ranges: 100 μ F

Maximum guard capacitance: 900 pF

Maximum shield capacitance: 5000 pF

Maximum guard offset voltage: ± 1 mV

Noise characteristics (typical, filter ON):

Voltage source: 0.01% of V range (rms.)

Current source: 0.1% of I range (rms.)

Overshoot (typical, filter ON):

Voltage source: 0.03% of V range

Current source: 1% of I range
Range switching transient noise (typical, filter ON):

Voltage ranging: 250 mV

Current ranging: 10 mV

Slew rate: 0.2 V/ μ s

SMU pulse setting accuracy (fixed measurement range):

Width: 0.5 % + 50 μ s

Period: 0.5 % + 100 μ s

Trigger out delay (pulsed measurements):

0 to 32.7 ms with 100 μ s resolution

(< pulse width)

HPSMU (High Power SMU) Module Specifications

Voltage Range, Resolution, and Accuracy (HPSMU)

Voltage Range	Force Reso.	Meas. Reso. ¹	Meas. Reso. ²	Force Accuracy	Measure Accuracy ³	Measure Accuracy ⁴	Maximum Current
± 2 V	100 μ V	100 μ V	2 μ V	$\pm(0.03\% + 900 \mu\text{V})$	$\pm(0.03\% + 700 \mu\text{V})$	$\pm(0.02\% + 700 \mu\text{V})$	1 A
± 20 V	1 mV	1 mV	20 μ V	$\pm(0.03\% + 4 \text{ mV})$	$\pm(0.03\% + 4 \text{ mV})$	$\pm(0.02\% + 2 \text{ mV})$	1 A
± 40 V	2 mV	2 mV	40 μ V	$\pm(0.03\% + 7 \text{ mV})$	$\pm(0.03\% + 8 \text{ mV})$	$\pm(0.02\% + 3 \text{ mV})$	500 mA
± 100 V	5 mV	5 mV	100 μ V	$\pm(0.04\% + 15 \text{ mV})$	$\pm(0.03\% + 20 \text{ mV})$	$\pm(0.03\% + 5 \text{ mV})$	125 mA
± 200 V	10 mV	10 mV	200 μ V	$\pm(0.045\% + 30 \text{ mV})$	$\pm(0.035\% + 40 \text{ mV})$	$\pm(0.035\% + 10 \text{ mV})$	50 mA

¹ Measurement resolution when using the high-speed per-SMU ADC

² Measurement resolution when using the high-resolution central ADC

³ Measurement accuracy when using the high-speed per-SMU ADC

⁴ Measurement accuracy when using the high-resolution central ADC

Current Range, Resolution, and Accuracy (HPSMU)

Current Range	Force Reso.	Meas. Reso. ¹	Meas. Reso. ²	Force Accuracy	Measure Accuracy ³	Maximum Voltage
±1 nA	50 fA	50 fA	10 fA	±(0.5% + 3 pA + 2 fA × Vout)	±(0.5% + 3 pA + 2 fA × Vout)	200 V
±10 nA	500 fA	500 fA	10 fA	±(0.5% + 7 pA + 20 fA × Vout)	±(0.5% + 5 pA + 20 fA × Vout)	200 V
±100 nA	5 pA	5 pA	100 fA	±(0.12% + 50 pA + 200 fA × Vout)	±(0.1% + 30 pA + 200 fA × Vout)	200 V
±1 µA	50 pA	50 pA	1 pA	±(0.12% + 400 pA + 2 pA × Vout)	±(0.1% + 200 pA + 2 pA × Vout)	200 V
±10 µA	500 pA	500 pA	10 pA	±(0.12% + 5 nA + 20 pA × Vout)	±(0.1% + 3 nA + 20 pA × Vout)	200 V
±100 µA	5 nA	5 nA	100 pA	±(0.12% + 40 nA + 200 pA × Vout)	±(0.1% + 20 nA + 200 pA × Vout)	200 V
±1 mA	50 nA	50 nA	1 nA	±(0.12% + 500 nA + 2 nA × Vout)	±(0.1% + 300 nA + 2 nA × Vout)	200 V
±10 mA	500 nA	500 nA	10 nA	±(0.12% + 4 µA + 20 nA × Vout)	±(0.1% + 2 µA + 20 nA × Vout)	200 V
±100 mA	5 µA	5 µA	100 nA	±(0.12% + 50 µA + 200 nA × Vout)	±(0.1% + 30 µA + 200 nA × Vout)	⁴
±1 A	50 µA	50 µA	1 µA	±(0.5% + 500 µA + 2 µA × Vout)	±(0.5% + 300 µA + 2 µA × Vout)	⁵

¹ Measurement resolution when using the high-speed per-SMU ADC
² Measurement resolution when using the high-resolution central ADC
³ Measurement accuracy when using either the high-speed per-SMU ADC or the high-resolution central ADC
⁴ 200 V (Iout ≤ 50 mA), 100 V (50 mA < Iout ≤ 100 mA)
⁵ 200 V (Iout ≤ 50 mA), 100 V (50 mA < Iout ≤ 125 mA), 40 V (125 mA < Iout ≤ 500 mA), 20 V (500 mA < Iout ≤ 1 A)
Vout is the output voltage in Volts. Iout is the output current in Amps. For example, accuracy specifications are given as ±% of output/measured value (0.1%) plus offset value (30 pA + 200 fA × Vout) for the 100 nA range. The offset value consists of a fixed part determined by the output/measurement range and a proportional part that is multiplied by Vout.

Power Consumption (HPSMU)

Voltage source mode:

Voltage

Range	Power
2 V	20 × Ic (W)
20 V	20 × Ic (W)
40 V	40 × Ic (W)
100 V	100 × Ic (W)
200 V	200 × Ic (W)

Where Ic is the current compliance setting.

Current source mode:

Voltage Compliance	Power
Vc ≤ 20	20 × Io (W)
20 < Vc ≤ 40	40 × Io (W)
40 < Vc ≤ 100	100 × Io (W)
100 < Vc ≤ 200	200 × Io (W)

Where Vc is the voltage compliance setting and Io is output current.

Output terminal/connection: Dual triaxial connector, Kelvin (remote sensing)

Voltage/Current Compliance (Limiting):

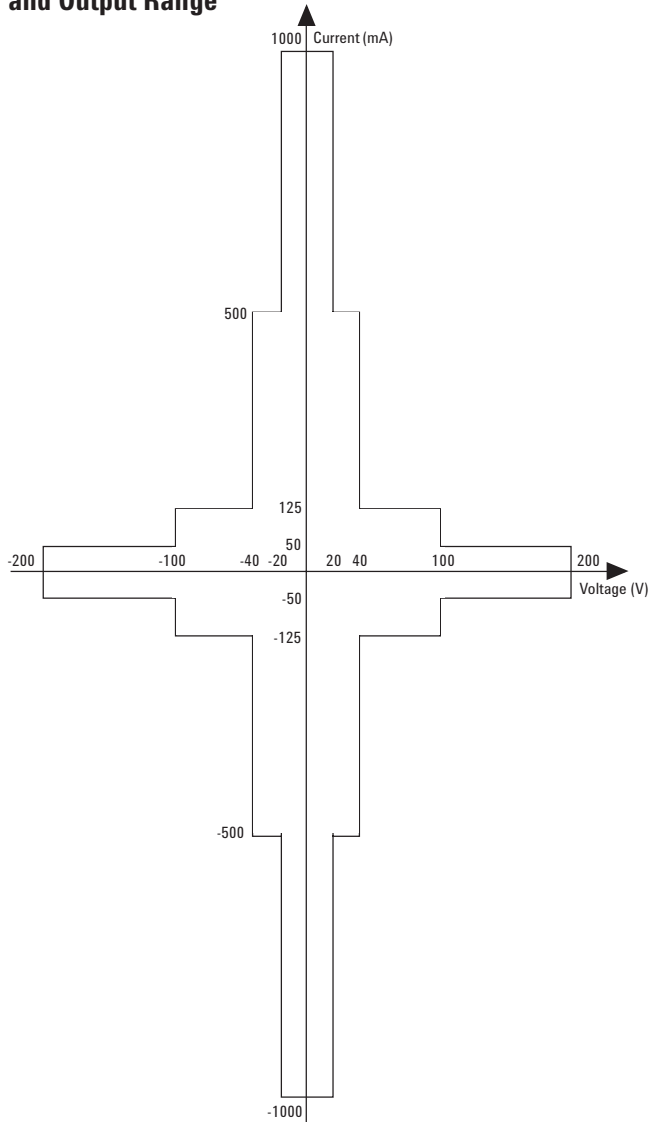
The SMU can limit output voltage or current to prevent damaging the device under test.

Voltage: 0 V to ±200 V

Current: ±1 pA to ±1 A

Compliance Accuracy: Same as the current (or voltage) set accuracy.

HPSMU Measurement and Output Range



HPSMU Supplemental Information:

Maximum allowable cable resistance (Kelvin connection):

Force Line: 10Ω ($I \leq 100 \text{ mA}$)

Force Line: 1.5Ω ($100 \text{ mA} < I \leq 1 \text{ A}$)

Sense Line: 10Ω (All cases)

Voltage source output resistance:

0.2Ω Typical (Force line, Non-Kelvin connection)

Voltage measurement input resistance: $\geq 10^{13} \Omega$

Current source output resistance: $\geq 10^{13} \Omega$ (1 nA range)

Current compliance setting accuracy (for opposite polarity):

For 1 nA to 10 nA ranges: V/I setting accuracy $\pm 12\%$ of range

For 100 nA to 1 A ranges: V/I setting accuracy $\pm 2.5\%$ of range

Maximum capacitive load:

For 1 nA to 10 nA ranges: 1000 pF

For 100 nA to 10 mA ranges: 10 nF

For 100 mA to 1 A ranges: 100 μF

Maximum guard capacitance: 900 pF

Maximum shield capacitance: 5000 pF

Maximum guard offset voltage: $\pm 1 \text{ mV}$

Noise characteristics (typical, filter ON):

Voltage source: 0.01% of V range (rms.)

Current source: 0.1% of I range (rms.)

Overshoot (typical, filter ON):

Voltage source: 0.03% of V range

Current source: 1% of I range

Range switching transient noise (typical, filter ON):

Voltage ranging: 250 mV

Current ranging: 10 mV

Slew rate: $0.2 \text{ V}/\mu\text{s}$

SMU pulse setting accuracy (fixed measurement range):

Width: $0.5\% + 50 \mu\text{s}$

Period: $0.5\% + 100 \mu\text{s}$

Trigger out delay (pulsed measurements): 0 to 32.7 ms with 100 μs resolution ($<$ pulse width)

Functions

Front Panel Operations

Display

- Display error messages
- Display spot measurement set value
- Display spot measurement result

Keypad Operations

- Set GPIB address
- Set local/remote mode
- Select measurement channel
- Set spot measurement set value
- Start calibration/diagnostics

MPSMU and HPSMU Measurement Mode Details

Spot measurement mode:

Outputs and measures voltage and current.

Staircase Sweep measurement mode:

Outputs swept voltage or current, and measures dc voltage or current. One channel can sweep current or voltage while up to eight channels can measure current or voltage. A second channel can be synchronized with the primary sweep channel as an additional voltage or current sweep source. Linear or log sweeps can be performed.

Number of Steps: 1-1,001

Hold Time: 0 - 655.35s, 1ms resolution

Delay Time: 0 - 65.5350s, 100 μ s resolution

Multi-Channel Sweep measurement mode:

Outputs swept voltage or current, and measures dc voltage or current.

Up to eight channels can sweep current or voltage and up to eight channels can measure current or voltage. Linear or log sweeps can be performed.

Number of Steps: 1-1,001

Hold Time: 0 - 655.35s, 1 ms resolution

Delay Time: 0 - 65.5350s, 100 μ s resolution

Pulsed Spot measurement mode:

Outputs a voltage or current pulse and measures dc voltage or current.

Pulse Width: 500 3s to 100 ms, 100 μ s resolution

Pulse Period: 5ms to 1 s (\geq pulse width + 4 ms), 100 μ s resolution

Maximum Pulse Duty: 50%

Pulsed Sweep measurement mode:

Outputs pulsed swept voltage or current, and measures dc voltage or current. A second channel can be programmed to output a staircase sweep voltage or current synchronized with the pulsed sweep output.

Staircase Sweep with Pulsed Bias measurement mode:

Outputs swept voltage or current, and measures dc voltage or current. A second channel can be programmed to output a pulsed bias voltage or current. A third channel can be synchronized with the primary sweep channel as an additional voltage or current sweep source.

Quasi-Pulsed Spot measurement mode:

Outputs quasi-pulsed voltage and measures dc voltage or current.

Linear Search measurement mode:

Outputs and measure voltage or current by using linear search method.

Binary Search measurement mode:

Outputs and measure voltage or current by using binary search method.

Time Stamp

The E5270A supports a time stamp function utilizing an internal quartz clock.

Resolution: 100 μ s

Program Memory

The E5270A mainframe contains (volatile) memory that can be used to increase test measurement throughput. Program memory allows the storage of program code in the E5270A, eliminating the need to communicate over the GPIB interface. In addition, input data can be passed to code sequences stored in program memory.

Maximum lines of Storable Code: 40,000

Maximum number of program sequences: 2,000

Output Data Buffer

The number of data points that can be stored in the data buffer varies with the choice of the output data format.

Minimum number of Storable Data Points: 34,034

Trigger I/O

Trigger in/out synchronization pulses before and after setting and measuring dc voltage and current. Arbitrary trigger events can be masked or activated independently.

Input

An external trigger input signal can be used to do any of the following:

1. Start a measurement
2. Start a measurement at each sweep step for a staircase sweep or multi-channel sweep measurement
3. Start the source output at each sweep step for a staircase sweep, pulsed sweep, staircase sweep with pulsed bias, or multi-channel sweep measurement.
4. Start the pulsed output for a pulsed spot measurement.
5. Recover from a wait state.

Input Level: TTL level, negative or positive edge trigger, or TTL level, negative or positive gate trigger.

Output

An output trigger signal can be sent when one of the following events occurs:

1. The end of a measurement is reached.
2. The end of a measurement at each sweep step for a staircase sweep or multi channel sweep measurement is reached.
3. Completion of the source output setup at each sweep step for a staircase sweep, pulsed sweep, staircase sweep with pulsed bias, or multi-channel sweep measurement.
4. Completion of the pulsed output setup for a pulsed spot measurement.
5. A trigger command is issued.

Output Level: TTL level, negative or positive edge trigger, or TTL level, negative or positive gate trigger.

General Purpose Digital I/O

16 general-purpose digital I/O signals are available via a 25-pin DIN connector. These pins can be used as an alternative to the BNC trigger-in and trigger-out lines to synchronize the E5270A with other instruments. They can also be used as output and input ports for digital signals. The user can selectively assign pins to trigger mode or digital I/O mode.

Attached Software

A *VXIplug&play* driver for the E5270A and E5270 TIS Library software are supplied.

Supported operating systems:

Microsoft® Windows® 95, NT, 2000 Professional, and XP Professional

General Specifications

Temperature range

Operating: +5° C to +40° C

Storage: -20° C to +60° C

Humidity range

Operating: 15% to 80% RH,
non-condensing

Storage: 5% to 90% RH,
non-condensing

Altitude

Operating: 0 m to 2,000 m (6,561 ft)

Storage: 0 m to 4,600 m (15,092 ft)

Power requirement

ac Voltage: 90 V to 264 V

Line Frequency: 47 Hz to 63 Hz

Maximum Volt-Amps (VA)

E5270A: 600 VA

Regulatory Compliance

EMC: EN61326-1:+A1

AS/NZS 2064.1

Safety: CSA C22.2 No.1010.1-1992

IEC61010-1:+A2/EN61010-

1:+A2

UL3111-1:1994

Certification

CE, CSA, NRTL/C, C-Tick

Dimensions

E5270A: 426 mm W x 235 mm H x

575 mm D

Weight

E5270A (empty): 17 kg

E5280A: 2.5 kg

E5281A: 1.6 kg

Automation Software

I/CV 2.1 Lite

Overview

Agilent I/CV 2.1 Lite provides automated test solutions for semiconductor characterization. It supports the Agilent E5270 Series, the Agilent 4155C and 4156C, the Agilent E5250A Low Leakage Switch, the Keithley 707 Switching Matrix, the Agilent 4284A and 4294A LCR meters, and many popular semi-automatic wafer probers. I/CV Lite also provides wizard-based test development, test execution, and sequencing along with data logging and post-analysis tools on Microsoft® Windows.®

Configuration Information

I/CV 2.1 Lite comes standard with the 4157A. A PC-based instrument controller with I/CV 2.1 Lite pre-installed and an Agilent 82357A USB/GPIB interface are also included in the standard 4157A configuration. If you prefer to use your own PC and GPIB interface, the controller and cable can be deleted from your order. I/CV 2.1 Lite,



however, is always included with the 4157A. If you want the full version of I/CV 2.1, you can request the E5240BU upgrade kit when you order the 4157A. For more information on the differences between I/CV 2.1 Lite and I/CV 2.1, please refer to the Agilent I/CV 2.1 Technical Overview, publication number 5988-8474EN.

Software Functions

Interactive Measurements

I/CV Lite includes Agilent ICS as the default measurement tool. ICS provides point-and-click measurements, intuitive matrix control, and graphical analysis capabilities for semiconductor parametric measurements. Created setups can be used as measurement algorithms in the script editor.

Script Editor

The script editor provides a wizard-based interface for building test scripts used in the execution of automated tests. It allows access to libraries of built-in

software components that support functions for creating test plans. Components include:

- Automated sub-die prober movement
- Switch connection execution
- Test algorithm execution
- Pass/Fail determination and processing
- Conditional branching: IF, ELSE
- Looping: FOR, WHILE
- User variable creation
- User prompts
- Message displays
- Test script commenting

Wafer Prober Navigation

I/CV Lite provides support for popular semiautomatic probers as well as several automatic probers. Probe plans can be defined that include sub-die movement for performing automated test of multiple modules or individual devices across a wafer. Interactive prober control can also be implemented for analytical applications.

Test Execution

Test scripts can be executed for either manual or automated tests. Manual tests are used for single devices or single modules (which can include several devices) on a manual prober. Automated tests are used for wafer tests combining semiautomatic prober control with die or module test scripts. Test wizards provide step-by-step instructions for entering runtime information, selection of wafer navigation plans, selection of test plans, and starting a test.

Auto-Analysis and Test Reporting

Parametric quantities from test data can be extracted and standard reports and graphs can be generated. Supported graphs and reports include:

- Color wafer maps
- Histograms
- Parameter statistics
- Parametric values vs. die location
- Tables of I-V or C-V curve data

Software Measurement

Tool Support

Test algorithms can be created using the following tools:

- Agilent ICS
- Microsoft VBScript (resident in the script editor)

Computer System Requirements

Operating System

Microsoft Windows 2000 Professional or XP Professional with Service Pack 1

CPU

300 MHz Pentium II-class (500 MHz Pentium III-class or faster recommended)

Hard Disk

5 GB available space (20 GB recommended)

Memory

128 MB for Windows 2000 Professional (256 MB recommended)

256 MB for Windows XP Professional

Disk Drive

CD-ROM

Software Security

Parallel or USB port required to attach security key

Control I/F

Supported GPIB card (see requirements below)

GPIB Card Support

Agilent

Card	Windows 2000 Professional	Windows XP Pro. (Service Pack 1)
82341C (ISA)	X	–
82357A* (USB/GPIB)	X	X

Agilent I/O Library L.02.01 required

*The 4142B cannot be controlled with the 82357A.

National Instruments

Card	Windows 2000 Professional	Windows XP Pro. (Service Pack 1)
PCI-GPIB	X	X
GPIB-USB-A	X	X

Prober Support

Cascade Microtech

S 300 with Nucleus version 2.1 or 2.5

Summit 12k with Nucleus version 2.1 or 2.5

Electroglas

2001 and 408X

SUSS MicroTec

All SUSS MicroTec probe stations using Prober Bench NT v4.2

Vector Semiconductor

AX-2000 / VX-3000, Version 3.2 or later

Supported Measurement

Instruments

- E5270 Series of Parametric Measurement Solutions
- 4155A/B/C Semiconductor Parameter Analyzer
- 4156A/B/C Precision Semiconductor Parameter Analyzer
- 4284A Precision LCR Meter
- 4294A Impedance Analyzer*
- E5250A Low Leakage Switch Mainframe
- Keithley 707 Switch

* VBScript libraries are supplied.

For more information about Agilent and its products, go to www.agilent.com.

For more information about Agilent Technologies semiconductor test products, applications, and services, visit our website: www.agilent.com/go/semiconductor or you can call one of the centers listed and ask to speak with a semiconductor test sales representative.

Americas

Brazil (11) 4197-3600
Canada (French) 1 877 894-4414
Canada (English) 1 800 447-8378
Mexico 33 134-5841
United States 1 800 447-8378

Asia/Asia Pacific

Australia 1 800 629-485
China 1 800 276-3059
Hong Kong 852 2599 7889
India 91/11 690-6156
Japan 0120 421-345
Malaysia 1 800 880-780
New Zealand 0 800 738 378
Philippines 1 800 1651-0135
Singapore 1 800 276-3059
South Korea 080 778-0011
Taiwan 0 800 047-662
Thailand 1 800 2758-5822

Europe

Austria (01) 25 125-7183
Belgium (0) 2 404-9380
Denmark 080301040
Finland 20 547-9999
France (0) 825 010710
Germany (0) 18 05 24-63 34
Greece 20 547-9999
Ireland 016158393
Italy 02 92 60 8333
Luxembourg (0) 2 404-9340
Netherlands (0) 20 547-9999
Poland 20 547-9999
Russia 20 547-9999
Spain 91 631 3383
Sweden 020 120-9975
Switzerland (Italian) (0) 2 92 60 8484
Switzerland (German) (0) 1 735-9300
Switzerland (French) (0) 825 010 700
United Kingdom (0) 7004 222-222

Middle East

Israel 20 547-9999

Technical data subject to change without notice.

Microsoft and Windows are U.S. registered trademarks of Microsoft Corporation.

© Copyright 2003 Agilent Technologies

Printed in USA April 21, 2003

5988-9162EN



Agilent Technologies