Agilent 4155C Semiconductor Parameter Analyzer

Agilent 4156C Precision Semiconductor Parameter Analyzer

Data Sheet

Introduction

Agilent 4155C and 4156C Basic functions

- Set measurement and/or stress conditions
- Control measurement and/or stress execution
- Perform arithmetic calculations
- Display measured and calculated results on the LCD display
- Perform graphical analysis
- Store and recall measurement setups, and measurement and graphical display data
- Dump to printers or plotters for hardcopy output
- Perform measurement and analysis with built-in instrument BASIC
- Self test, Auto calibration

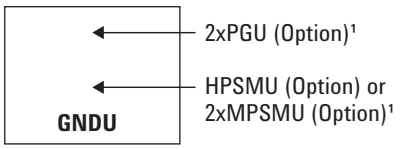
Configuration

The 4155C and 4156C both come standard with Desktop EasyEXPERT software. A PC-based instrument controller with Desktop EasyEXPERT preinstalled is also included with the standard configuration. You have the option of deleting the controller and cable from your order, but Desktop EasyEXPERT Standard edition is always included with both instruments.

If you want the Desktop EasyEXPERT Plus edition, you can request the B1541A-002 when you order a 4155C or 4156C. For more information about the Desktop EasyEXPERT Plus, please refer to page 11 of this data sheet.

4155C	4156C
4xMPSMU	4xHRSMU
2xVMU	2xVMU
2xVSU	2xVSU
Desktop EasyEXPERT	Desktop EasyEXPERT
Standard PC-based controller and USB/GPIB interface	

41501B (Optional)



1. Minimum number of installable MPSMU or PGU is two.

SMU: Source monitor unit
Display resolution: 6 digits at each current range (0.01 fA display resolution at 10 pA range)[2]
HRSMU: High Resolution SMU (1 fA/2 µV to 100 mA/100 V)
MPSMU: Medium Power SMU (10 fA/2 µV to 100 mA/100 V)
HPSMU: High Power SMU (10 fA/2 µV to 1 A/200 V)
VMU: Voltage Monitor Unit (0.2 µV resolution in differential mode)
VSU: Voltage Source Unit
PGU: Pulse Generator Unit (1 channel)
GNDU: Ground Unit

2. Accuracy not guaranteed. Minimum guaranteed resolution is 1 fA at 10 pA range.

Agilent Technologies

Hardware

Specification Condition

The "supplemental" information and "typical" entries in the following specifications are not warranted, but provide useful information about the functions and performance of the instruments.

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

1. 23 °C ±5 °C (double between 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. Integration time: medium or long
5. Filter: ON (for SMUs)
6. Kelvin connection (for HRSMU, HPSMU, and GNDU)
7. Calibration period: 1 year

Agilent 4156C Precision Semiconductor Parameter Analyzer

HRSMU (High Resolution SMU) Specifications

Voltage Range, Resolution, and Accuracy (HRSMU)

Voltage Range	Set Reso.	Set Accuracy	Meas. Reso.	Meas. Accuracy	Max. Current
±2 V	100 µV	±(0.02%+400 µV)	2 µV	±(0.01%+200 µV)	100 mA
±20 V	1 mV	±(0.02%+3 mV)	20 µV	±(0.01%+1 mV)	100 mA
±40 V	2 mV	±(0.025 %+6 mV)	40 µV	±(0.015%+2 mV)	[1]
±100 V	5 mV	±(0.03%+15 mV)	100 µV	±(0.02%+5 mV)	[2]

1 100 mA (Vout ≤20 V), 50 mA (20 V<Vout≤40 V)

2 100 mA (Vout ≤20 V), 50 mA (20 V<Vout≤40 V), 20 mA (40 V<Vout≤100 V)

Current Range, Resolution, and Accuracy (HRSMU)

Current Range	Set Reso.	Set Accuracy	Meas. Reso.	Meas. Accuracy	Max. V
±10 pA	10 fA	±(4%+400 fA) [1, 2]	1 fA	±(4%+20 fA+1 fA×Vout/100) [1, 2]	100 V
±100 pA	10 fA	±(4%+400 fA) [1, 2]	1 fA	±(4%+40 fA+10 fA×Vout/100) [1, 2]	100 V
±1 nA	100 fA	±(0.5%+0.7 pA+1 fA×Vout) [2]	10 fA	±(0.5%+0.4 pA+1 fA×Vout) [2]	100V
±10 nA	1 pA	±(0.5%+4 pA+10 fA×Vout)	10 fA	±(0.5%+2 pA+10 fA×Vout)	100V
±100 nA	10 pA	±(0.12%+40 pA+100 fA×Vout)	100 fA	±(0.1%+20 pA+100 fA×Vout)	100V
±1 µA	100 pA	±(0.12%+400 pA+1 pA×Vout)	1 pA	±(0.1%+200 pA+1 pA×Vout)	100V
±10 µA	1 nA	±(0.07%+4 nA+10 pA×Vout)	10 pA	±(0.05%+2 nA+10 pA×Vout)	100V
±100 µA	10 nA	±(0.07%+40 nA+100 pA×Vout)	100 pA	±(0.05%+20 nA+100 pA×Vout)	100V
±1 mA	100 nA	±(0.06%+400 nA+1 nA×Vout)	1 nA	±(0.04%+200 nA+1 nA×Vout)	100V
±10 mA	1 µA	±(0.06%+4 µA+10 nA×Vout)	10 nA	±(0.04%+2 µA+10 nA×Vout)	100V
±100 mA	10 µA	±(0.12%+40 µA+100 nA×Vout)	100 nA	±(0.1%+20 µA+100 nA×Vout)	[3]

1 The accuracy is applicable when offset cancellation has been performed.

2 The offset current specification is multiplied by one of the following factors depending upon the ambient temperature and humidity (RH = Relative Humidity):

	Humidity % RH	
Temperature	5 - 60	60 - 80
5 °C to 18 °C	×2	×2
18 °C to 28 °C	×1	×2
28 °C to 40 °C	×2	×5

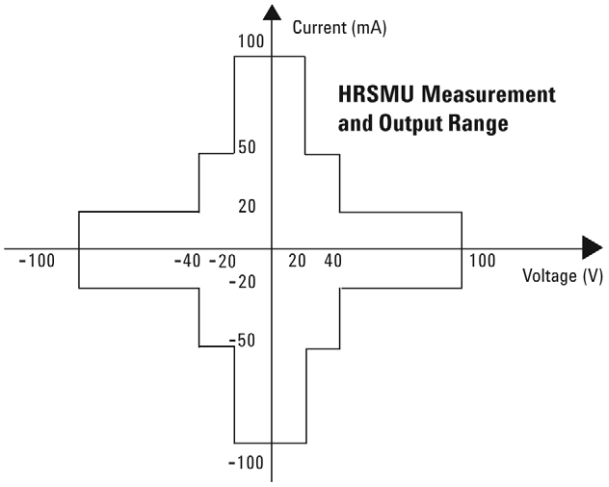
3 100 V (Iout≤20 mA), 40 V (20 mA<Iout≤50 mA), 20 V (50 mA<Iout≤100 mA)

Vout is the output voltage in volts. Iout is the output current in amps. For example, accuracy specifications are given as ±% of set/measured value (0.04%) plus offset value (200 nA+1 nA×Vout) for the 1 mA range. The offset value consists of a fixed part determined by the set/measurement range and a proportional part that is multiplied by Vout or Vout/100.

Output Terminal/Connection:
Dual triaxial connectors, 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: ±100 fA to ±100 mA
Compliance Accuracy: Same as the current (voltage) settling accuracy.

HRSMU Supplemental Information:
Maximum allowable cable resistance when using Kelvin connection (Force, Sense): 10 Ω
Typical voltage source output resistance (Force line/non-Kelvin connection): 0.2 Ω
Voltage measurement input resistance/current source output resistance:
≥10^{15} Ω (10 pA range)
Current compliance setting accuracy for opposite polarity:
10 pA to 10 nA range: V/I setting accuracy ±12% of range
100 nA to 100 mA range: V/I setting accuracy ±2.5% of range



Agilent 4156C Semiconductor Parameter Analyzer

MPSMU (Medium Power SMU) Specifications

Voltage Range, Resolution, and Accuracy (MPSMU)

Voltage Range	Set Reso.	Set Accuracy	Meas. Reso.	Meas. Accuracy	Max. Current
±2 V	100 µV	±(0.03%+900 µV+0.3×Iout)	2 µV	±(0.02%+700 µV+0.3×Iout)	100 mA
±20 V	1 mV	±(0.03%+4 mV+0.3×Iout)	20 µV	±(0.02%+2 mV+0.3×Iout)	100 mA
±40 V	2 mV	±(0.03%+7 mV+0.3×Iout)	40 µV	±(0.02%+3 mV+0.3×Iout)	[1]
±100 V	5 mV	±(0.04%+15 mV+0.3×Iout)	100 µV	±(0.03%+5 mV+0.3×Iout)	[2]

1 100 mA (Vout ≤20 V), 50 mA (20 V<Vout ≤40 V)

2 100 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	Set Reso.	Set Accuracy	Meas. Reso.	Meas. Accuracy	Max. V
±1 nA	100 fA	±(0.5%+3 pA+2 fA×Vout)	10 fA	±(0.5%+3 pA+2 fA×Vout)	100 V
±10 nA	1 pA	±(0.5%+7 pA+20 fA×Vout)	10 fA	±(0.5%+5 pA+20 fA×Vout)	100 V
±100 nA	10 pA	±(0.12%+50 pA+200 fA×Vout)	100 fA	±(0.1%+30 pA+200 fA×Vout)	100 V
±1 µA	100 pA	±(0.12%+400 pA+2 pA×Vout)	1 pA	±(0.1%+200 pA+2 pA×Vout)	100 V
±10 µA	1 nA	±(0.12%+5 nA+20 pA×Vout)	10 pA	±(0.1%+3 nA+20 pA×Vout)	100 V
±100 µA	10 nA	±(0.12%+40 nA+200 pA×Vout)	100 pA	±(0.1%+20 nA+200 pA×Vout	100 V
±1 mA	100 nA	±(0.12%+500 nA+2 nA×Vout)	1 nA	±(0.1%+300 nA+2 nA×Vout)	100 V
±10 mA	1 µA	±(0.12%+4 µA+20 nA×Vout)	10 nA	±(0.1%+2 µA+20 nA×Vout)	100 V
±100 mA	10 µA	±(0.12%+50 µA+200 nA×Vout)	100 nA	±(0.1%+30 µA+200 nA×Vout)	[1]

1 100 V (Iout ≤20 V), 40 V (20 mA<Iout≤50 mA), 20 V (50 mA<Iout≤100 mA)

Vout is the output voltage in volts. Iout is the output current in amps.
For example, accuracy specifications are given as ±% of set/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 set/measurement range and a proportional part that is multiplied by Vout.

Output Terminal/Connection:

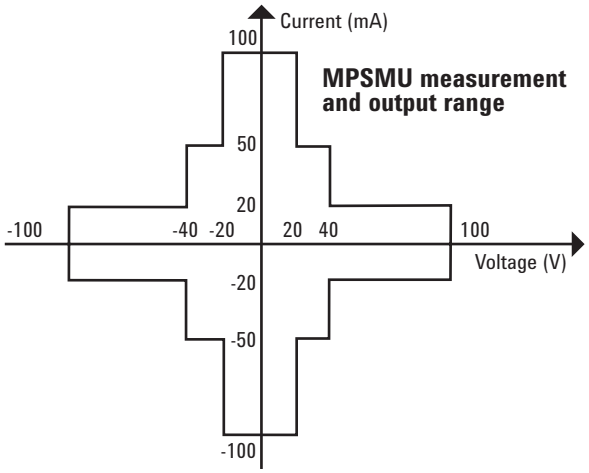
Single triaxial connector, non-Kelvin (no remote sensing)

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 ±100 mA
Compliance Accuracy: Same as the current (voltage) settling accuracy.

MPSMU Supplemental Information:

Typical voltage source output resistance: 0.3 Ω
Voltage measurement input resistance/current source output resistance: ≥10^{13} Ω (1 nA range)
Current compliance setting accuracy for opposite polarity:
1 nA to 10 nA range: V/I setting accuracy ±12% of range
100 nA to 100 mA range: V/I setting accuracy ±2.5% of range



VSU and VMU specifications are common to both the 4155C and 4156C

VSU (Voltage Source Unit) Specifications

VSU Output Range:

Voltage Range	Meas. Reso.	Meas. Accuracy
±20 V	1 mV	±(0.05% of setting +10 mV)[1]

1 Specification is applicable under no load current. Max. Output Current: 100mA

VSU Supplemental Information:

Output resistance: 0.2 Ω (typical)
Maximum load capacitance: 10 µF
Maximum slew rate: 0.2 V/µs
Current limit: 120 mA (typical)
Output Noise: 1 mV rms (typical)

VMU (Voltage Monitor Unit) Specifications

VMU Differential Mode Range, Resolution, and Accuracy:

Diff V Range	Meas. Reso.	Meas. Accuracy
±0.2 V	0.2 µV	±(0.03%+10 µV+0.3 µV×Vi)
±2 V	2 µV	±(0.02%+100 µV+3 µV×Vi)

Max. Common Mode Voltage: ± 20 V
Note: Vi is the input voltage of VMU2 in volts.
For example, accuracy specifications are given as ±% of set/measured value (0.02%) plus offset value (100 µV+3 µV×Vi) for the 2 V range. The differential mode offset value consists of a fixed part determined by the measurement range and a proportional part that is multiplied by Vi.

VMU Measurement Range, Resolution, and Accuracy:

Voltage Range	Meas. Reso.	Meas. Accuracy
±2 V	2 µV	±(0.02%+200 µV)
±20 V	20 µV	±(0.02%+1 mV)

VMU Supplemental Information:

Input Impedance: ≥1 GΩ
Input leakage current (@0 V): ≤500 pA
Measurement noise: 0.01% of range (p-p) (typical) when integration time is 10 PLC
Differential mode measurement noise: 0.005% of range (p-p) (typical) when integration time is short.

Agilent 41501B SMU and Pulse Generator Expander

HPSMU (High Power SMU) Specifications

Voltage Range, Resolution, and Accuracy (HPSMU)

Voltage Range	Set. Reso.	Set. Accuracy	Meas. Reso.	Meas. Accuracy	Max. Current
±2 V	100 µV	±(0.03%+900 µV)	2 µV	±(0.02%+700 µV)	1 A
±20 V	1 mV	±(0.03%+4 mV)	20 µV	±(0.02%+2 mV)	1 A
±40 V	2 mV	±(0.03%+7 mV)	40 µV	±(0.02%+3 mV)	500 mA
±100 V	5 mV	±(0.04%+15 mV)	100 µV	±(0.03%+5 mV)	125 mA
±200 V	10mV	±(0.045%+30 mV)	200 µV	±(0.035%+10 mV)	50 mA

Current Range, Resolution, and Accuracy (HPSMU)

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

1 200 V (Iout ≤50 mA), 100 V (50 mA<Iout≤100 mA)

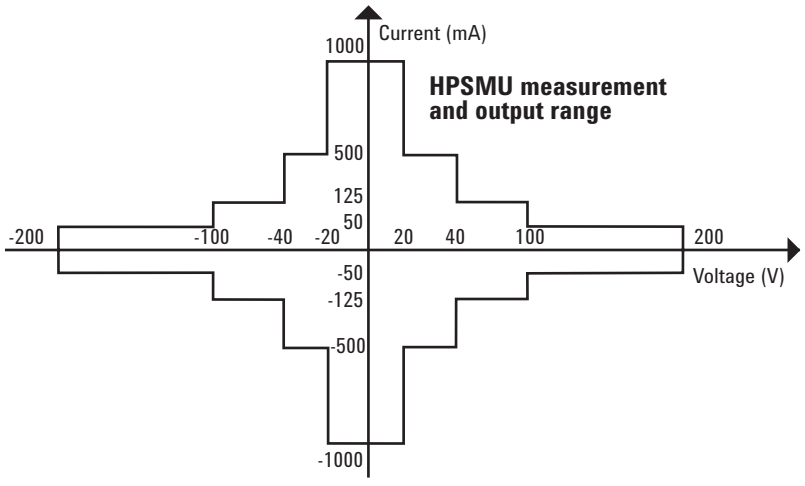
2 200 V (Iout ≤50 mA), 100 V (50 mA<Iout≤125 mA), 40 V (125 mA<Iout≤500 mA), 20 V (500 mA<Iout≤1 mA)

Vout is the output voltage in volts. Iout is the output current in amps. For example, accuracy specifications are given as ±% of set/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 set/measurement range and a proportional part that is multiplied by Vout.

Output Terminal/Connection:
Dual triaxial connectors, Kelvin (remote sensing)

Voltage/Current Compliance (Limiting):
Voltage: 0 V to ±200 V
Current: ±1 pA to ±1 A
Compliance Accuracy: Same as the current (voltage) settling accuracy.

HPSMU Supplemental Information:
Maximum allowable cable resistance when using Kelvin connection:
Force: 0.7 Ω (100 mA to 1 A)
Force: 10 Ω (≤100 mA)
Sense: 10 Ω
Typical voltage source output resistance (Force line/non-Kelvin connection): 0.2 Ω
Voltage measurement input resistance/ current source output resistance:
$\geq 10^{13}$ Ω (1 nA range)
Current compliance setting accuracy for opposite polarity:
1 nA to 10 nA range: V/I setting accuracy ±12% of range
100 nA to 1 A range: V/I setting accuracy ±2.5% of range



PGU (Pulse Generator Unit) Specifications

Modes: Pulse or constant
Amplitude: 0 Vp-p to 40 Vp-p
Window: -40.0 V to +40.0 V
Maximum current:
  ±100 mA
  ±200 mA (pulse width: ≤1 ms, average current 100 mA)
Pulse width: 1.0 µs to 9.99 s
Minimum resolution: 100 ns
Pulse period: 2.0 µs to 10.0 s
Minimum resolution: 100 ns
Delay: 0 s to 10 s
Minimum resolution: 100 ns
Transition time: 100 ns to 10 ms
Minimum resolution: 1 ns
Output impedance: 50 Ω or low impedance (≤1 Ω)
Burst count range: 1 – 65535
Pulse parameter accuracy:
  Period: ±(2% +2 ns)
  Width: ±(3% +2 ns)
Delay: ±(2% +40 ns)
Transition time: ±(5% +10 ns)
Trigger output:
  Level: TTL
  Timing: Same timing and width as PGU1 pulse output

PGU Supplemental Information

Overshoot: ≤±5% of amplitude ±10 mV (50 Ω output impedance to 50 Ω load)
Pulse width jitter: 0.2% + 100 ps
Pulse period jitter: 0.2% + 100 ps
Maximum slew rate: 100 V/µs (50 Ω output impedance to 50 Ω load)
Noise: 0.2% of range (@ DC output)

Pulse/DC Output Voltage and Accuracy (PGU)

Set Parameter	Voltage Range	Resolution	Accuracy[1]
Base	±20 V	4 mV	±(1% of Base +50 mV +1% of Pulse)
	±40 V	8 mV	±(1% of Base +50 mV +1% of Pulse)
Pulse	±20 V	4 mV	±(3% of Base +50 mV)
	±40 V	8 mV	±(3% of Base +50 mV)

Note: DC output is performed by the Base Parameter.

1 Accuracy is specified at leading edge - trailing edge = 1 µs

Pulse Range and Pulse Parameter (PGU)

Range	Period	Width	Delay	Set Resolution
1	2 µs -100 µs	1 µs - 99.9 µs	0 - 100 µs	0.1 µs
2	100 µs - 1000 µs	1 µs - 999 µs	0 - 1000 µs	1 µs
3	1 ms - 10 ms	.01 ms - 9.99 ms	0 - 10 ms	10 µs
4	10 ms - 100 ms	0.1 ms - 99.9 ms	0 - 100 ms	100 µs
5	100 ms - 1000 ms	1 ms - 999 ms	0 - 1000 ms	1 ms
6	1 s - 10 s	0.01 s - 9.99 s	0 - 10 s	10 ms

Note: Pulse width is defined when leading time is equal to trailing time.
PGU2 must be set in the same range as PGU1

Leading/Trailing Edge Times (PGU)

Range	Set Resolution	Accuracy
100 ns - 1000 ns	1 ns	±(5% + 10 ns)
0.5 µs - 10 µs	10 ns	±(5% + 10 ns)
5.0 µs - 100 µs	100 ns	±(5% + 10 ns)
50 µs - 1000 µs	1 µs	±(5% + 10 ns)
0.5 ms - 10 ms	10 µs	±(5% + 10 ns)

Restrictions:
Pulse width < Pulse Period, Delay time < Pulse period, Leading time < Pulse width × 0.8
Trailing time < (Pulse period - Pulse width) × 0.8
Period, width, and delay of PGU1 and PGU2 must be in the same range. Leading time and trailing time for a PGU must be in the same range.

MPSMU Specifications

Same as 4155C MPSMU.

GNDU (Ground Unit) Specifications

Output Voltage: 0 V ±100 µV
Maximum sink current: 1.6 A
Output terminal/connection:
  Single triaxial connector, Kelvin (remote sensing)

GNDU Supplemental Information

Load Capacitance: ≤1 µF
Cable resistance:
  Force ≤1 Ω
  Sense ≤10 Ω

HRSMU, MPSMU, HPSMU Supplemental Information

Maximum capacitive load: 1000 pF
Maximum guard capacitance: 900 pF
Maximum shield capacitance: 5000 pF
Maximum guard offset voltage: ±1 mV
Noise characteristics (typical, Filter: ON):
  Voltage source noise:
    0.01% of V range (rms)
  Current source noise:
    0.1% of I range (rms)
Voltage monitor noise:
  0.02% of V range (p-p)
Current monitor noise: 0.2% of I
Output 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
Maximum slew rate: 0.2 V/µs

Capacitance Calculation Accuracy (Supplemental Data)

Accuracy is derived from the current range, voltage range, capacitance measurement and leakage current measurement integration times, and the guard capacitance of cabling and step voltage. The information in the chart below is based on the following conditions: Voltage Range ±20 V; Voltage Step: 100 mV; Guard Capacitance: 100 pF; Equivalent parallel resistance of DUT: 1×10^{15} Ω. The ratio of integration times for capacitance measurement and leakage current measurement is 1:1.

HRSMU

Current Range	Integration Time	Max. Meas. Value	Resolution	Accuracy Reading %	Offset
10 pA/	0.5 sec	100 pF/1 pF	5 fF	4.2	70 fF
100 pA	1 sec	2 pF/20 pF	10 fF	4.3	90 fF
	2 sec	76 pF/760 pF	20 fF	4.3	130 fF
1 nA	0.1 sec	700 pF	10 fF	0.84	160 fF
	0.5 sec	4.5 nF	40 fF	0.85	280 fF
	2 sec	18 nF	200 fF	0.93	740 fF
10 nA	0.1 sec	7 nF	10 fF	0.84	200 fF
	0.5 sec	45 nF	40 fF	0.85	440 fF
	2 sec	180 nF	200 fF	0.93	1.4 pF
	10 sec	940 nF	1 pF	1.3	6.2 pF

MPSMU

Current	Integration Time	Max. Meas. Value	Resolution	Accuracy Reading %	Offset
1 nA	0.1 sec	700 pF	10 fF	0.91	170 fF
	0.5 sec	4.5 nF	40 fF	0.94	340 fF
	2 sec	18 nF	200 fF	1.0	1 pF
10 nA	0.1 sec	7 nF	10 fF	0.91	180 fF
	0.5 sec	45 nF	40 fF	0.94	480 fF
	2 sec	180 nF	200 fF	1.0	1.6 pF
	10 sec	940 nF	1 pF	1.6	7.6 pF

Current compliance must be smaller than the current range. The capacitance of the DUT and measurement path must be smaller than the maximum measurement value.

Functions

Measurement Setup

Setting

- Fill-in-the-blanks using front-panel or full-size external keyboard
- Load settings from floppy disk or via the LAN port
- Program using internal Instrument BASIC or via GPIB
- HELP Function
- Library: Default measure setup, Vce-Ic, Vds-Id, Vgs-Id, and Vf-If are predefined softkeys
- User-defined measurement setup library
- Auto file load function on power-up

Measurement

The 4155C and 4156C can perform dc or pulsed force/measure, and stress force. For dc, voltage/current sweep and sampling (time domain) measurements are available.

Voltage/Current Sweep Measurement Characteristics

Each SMU and VSU can sweep using VAR1 (primary sweep), VAR2 (subordinate sweep), or VAR1 (synchronous sweep).

VAR1

Primary sweep controls the staircase (dc or pulsed) voltage or current sweep.

Maximum number of steps: 1001 for one VAR1 sweep.

Sweep type: linear or logarithmic

Sweep direction: Single or double sweep

Hold time: Initial wait time or wait time after VAR2 is set: 0 to 655.35 s with 10 ms resolution

Delay time: Wait time from VAR1 step to the start of the measurement: 0 to 65.535 s with 100 µs resolution

VAR2

Subordinate linear staircase or linear pulsed sweep. After primary sweep is completed, the VAR2 unit output is incremented.

Maximum number of steps: 128

VAR1'

Staircase or pulse sweep synchronized with the VAR1 sweep. Sweep is made with a user specified ratio and offset value. VAR1' output is calculated as VAR1' = a × VAR1 + b, where “a” is the user specified ratio and “b” is the user specified offset value.

CONSTANT

A source unit can be set as a constant voltage or current source depending on the unit.

PULSE

One of the SMUs can be set as a pulse source.

Pulse width: 0.5 ms to 100 ms, 100 µs resolution.

Pulse period: 5 ms to 1 s (pulse width + 4 ms), 100 µs resolution.

SMU pulse setting accuracy (supplemental information, at fixed range measurement except multi-channel measurement):

Width: 0.5% + 50 µs

Period: 0.5% + 100 µs

Trigger output delay for pulsed measurement: 0 - 32.7 ms with 100 µs resolution (< pulse width).

Sampling (Time Domain) Measurement Characteristics

Displays the time sampled voltage/current data versus time.
Max. sampling points: 10,001 (linear)
Sampling mode: linear, log, and thinned-out

Note: The thinned-out mode is similar to reverse-log sampling. Sampling measurement continues by thinning out older data until the sampling completion condition is satisfied.

Sampling interval range and resolution:

Linear scale (auto mode):
- 60 µs to 480 µs range: 20 µs resolution
- 480 µs to 1 s range: 80 µs resolution
- 1 s to 65.535 s range: 2 ms resolution

Linear scale (no limit mode), log scale, and thinned-out modes:
- 560 µs (720 µs at thinned-out mode) to 1 s range: 80 µs resolution
- 1 s to 65.535 s range: 2 ms resolution

Note: The following conditions must be set when initial interval is less than 2 ms.
- Number of measurement channels: 1
- Measurement ranging: fixed range
- Stop condition: disable

Hold time:
Initial wait time: 0.03 s to 655.35 s, 100 µs resolution
Sampling measurement stop condition:
A condition to stop the sampling can be defined.
Sampling interval setting accuracy (supplemental data):
- 0.5% + 10 µs (sampling interval ≤480 µs)
- 0.5% + 10 µs (480 µs ≤sampling interval <2 ms)
- 0.5% + 100 µs (2 ms ≤sampling interval)

C-V Measurement Characteristics

Capacitance is a calculated value derived from the following equation:

$$C = \frac{\Delta Q}{\Delta V}$$

ΔQ is the change in charge when ΔV, the step voltage, is applied by the SMU; ΔQ is derived from the measurement current (amps) and the integration time (seconds).

Maximum Measurable Value

Maximum measurable value depends on the current range, integration time, and step voltage (refer to the chart in supplemental data).

Capacitance Calculation Accuracy

Accuracy is dependent on accuracy of the current measurement and voltage measurement and the stray capacitance and leakage current of measurement path, etc. (Refer to the chart in supplemental data).

Zero Offset

Cancels stray capacitance of the fixtures and test leads.

Leakage Current Compensation

Cancels the influence of the leakage current to the capacitance measurement.

Stress Force Characteristics

SMU, VSU, and PGU output can be forced for the user specified period.
Stress time set range: 500 µs to 31,536,000 s (365 days)
Resolution:
100 µs (500 µs ≤stress time ≤10 s)
10 ms (10 s <stress time ≤31,536,000 s)
Burst pulse count: 1–65,535 (PGU only)
Trigger: The 4155C and 4156C output a gate trigger while stress channels are forcing stress.

Knob Sweep

In knob sweep mode, sweep range is controlled instantaneously with the front-panel rotary knob. Only the Channel Definition page need be defined.

Standby Mode

SMUs in "Standby" remain programmed to their specified output value even as other units are reset for the next measurement.

Other Characteristics

Measurement Control: Single, append, repeat, and stop
Stress Control: Stress force and stop
SMU Setting Capabilities: Limited autoranging, voltage/current compliance, power compliance, automatic sweep abort functions, self-test, and self-calibration.

Arithmetic and Analysis Functions

Arithmetic Functions User Functions

Up to six USER FUNCTIONS can be defined using arithmetic expressions. Measured data and analyzed variables from graphics analysis (marker, cursor, and line data) can be used in the computation. The results can be displayed on the LCD.

Arithmetic Operators

+, -, *, /, ^, LGT (logarithm, base 10), LOG (logarithm, base e), EXP (exponent), DELTA, DIFF (differential), INTEG (integration), MAVG (moving average), SQRT, ABS (absolute value), MAX, MIN, AVG (averaging), COND (conditional evaluation).

Physical Constants

Keyboard constants are stored in memory as follows:
- q: Electron Charge, 1.602177 E-19 C
- k: Boltzman's Constant, 1.380658 E-23
- ε (e): Dielectric Constant of Vacuum, 8.854188 E-12

Engineering Units

The following unit symbols are also available on the keyboard: f (10^{-15}), p (10^{-12}), n (10^{-9}), u or µ (10^{-6}), m (10^{-3}), K (10^{3}), M (10^{6}), G (10^{9})

Analysis Capabilities

Overlay Graph Comparison

A graphics plot can be stored and later recalled as an overlay plane. Four overlay planes can be stored. One plane can be overlaid onto the current data.

Marker

Marker to min/max, interpolation, direct marker, and marker slip

Cursor

Long and short, direct cursor.

Line

Two lines, normal mode, grad mode, tangent mode, and regression mode.

Scaling

Auto scale and zoom.

Data Variable Display

Up to two user defined parameters can be displayed on the graphics screen.

Read Out Function

The read out functions are built-in functions for reading various values related to the marker, cursor, or line.

Automatic Analysis Function
On a graphics plot, the markers and lines can be automatically located using the auto analysis setup. Parameters can be automatically determined using automatic analysis, user function, and read out functions.

User Variable
Display the data on the LCD via GPIB or instrument BASIC.

Output

Display
Display Modes
Graphics and list.

Graphics Display
X-Y or X-Y1/Y2 plot of source current/ voltage, measured current/ voltage, time, or calculated USER FUNCTION data.

List Display
Measurement data and calculated USER FUNCTION data are listed in conjunction with VAR1 step number or time domain sampling step number. Up to eight data sets can be displayed.

Display
8.4-inch diagonal color active matrix LCD, 640 dot (H × 480 dot (V). More than 99.99% of the pixels on an LCD are active.

Hard Copy Functions
Graphics Hard Copy
Measured data and all data appearing on the LCD can be output via GPIB, parallel printer port, or network interface to supported HP plotters or printers. PCL, HR PCL (high-resolution PCL), and HP-GL formats are supported (selectable).

Text Hard Copy
Print out setup information or measured data list as ASCII text via GPIB, parallel printer port, or network interface to supported HP plotters or printers. PCL, HR PCL, and HP GL formats are supported (selectable).

Hard Copy File
Hard copy output can be stored to an internal or external mass storage device instead of sending it to a printer or plotter. The data can be stored in PCL, HR PCL, TIFF, HR TIFF (highresolution TIFF), or HP GL formats.

Hard Copy via Network Interface
The network interface has lpr client capability.

High-Resolution (HR) Mode
This file mode is available for cases where an extremely clean print-out or plot is desired.

Note: High-resolution mode takes significantly greater CPU time to generate, so its use is recommended for final reports only.

Data Storage

Mass storage device:
- Built-in 3.5-inch floppy disk drive

Media: 3.5-inch 2HD or 2DD diskette

Format type: HP LIF and DOS

User area: 1.44 Mbyte (2HD) or 720 Kbyte (2DD)

File types:
- Auto start program file, initial setup file, measurement setup file, measurement setup/result file, stress setup file, customize file, hard copy data file, and Instrument BASIC program and data file.

Format of data made by the HP BASIC program:
- Data made by the HP BASIC program and data made by the Instrument BASIC program are compatible.

Network mass storage device:
- An NFS mountable mass storage device

File types:
- Auto start program file, initial setup file, measurement setup file, measurement setup/result file, stress setup file, customize file, and hard copy data file.

Maximum number of files allowed per directory on network mass storage device: 199

Data storage (supplemental data):
- 2HD DOS format:
- Available bytes: 1457 K (byte)

File size:
- Measurement setup: 3843 (byte)
- Stress setup: 601 (byte)
- Measurement setup/result (Typical data): 15387 (byte) (VAR1: 101, VAR2: 5)
- Customized system setup: 1661 (byte)
- Hardcopy data: 30317 (byte) (Monochrome PCL 75DPI file)
- Hardcopy data: 38702 (byte) (monochrome TIFF file)

Note: For LIF format, the total number of files is limited to 199.

Repeating and Automating Test

Instrument Control
Agilent 4155C and 4156C function control:
- Internal or external computer controls the 4155C and 4156C functions via the GPIB interface

Command sets:
- SCPI command set
- Agilent FLEX command set
- Agilent 4145B command set

Program Memory:
- Using the Agilent FLEX command set, the user can store program code in the 4155C or the 4156C. The maximum number of subprograms is 255 (8 bit).

External instrument remote control:
- Control external equipment via the GPIB interface.

Instrument BASIC
Instrument BASIC is a subset of HP BASIC.

Functions:
- Arithmetic operation, binary operation, string manipulation, logical operation, array operation, program flow control, event-initiated branching, program editing and debugging support, mass storage operation, instrument control, real-time clock, softkey operation, and graphics.

Agilent 4145B automatic sequence program (ASP) typing aid:
- 4145B ASP-like syntax softkeys are available in instrument BASIC. A 4145B ASP file cannot be read by the 4155C or 4156C.

Remote control:
- Instrument BASIC is remote controllable from an external computer via the GPIB interface.

Instrument BASIC memory area (supplemental data):
- Program (text) area: 16 K (byte)
- Variable/stack area: 500 K (byte)
- Common variable area: 600 K (byte)

Note: The memory size for common variable is decreased when hard copy or disk operation is performed.

Trigger
Input:
External trigger input starts a sweep or sampling measurement or can be used as a trigger input for continuing an Instrument BASIC program.
Input Level:
TTL level, negative or positive edge trigger
Output:
External edge trigger outputs can be generated by the start of a sweep measurement, the start of each sweep step in a staircase sweep, the start of each pulse leading edge for an SMU in pulse mode, and the issuance of an an IBASIC trigger out command execution. In addition, you can set the trigger signal to be active during the Stress Force State. If you have a 41501A/B with PGU option, you can output a synchronized trigger output through the 41501A/B trigger output.
Output Level:
TTL level, negative or positive logic

4145B Data Compatibility and Syntax Commands

Setup and data file
Measurement setup and data from the 4145B can be loaded.
GPIB program
GPIB programs for the 4145B can be used when the 4145B command set is selected.
Note: There is a possibility that GPIB programs for the 4145B will need to be modified.

Interfaces

GPIB interface:
SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C1, C2, C3, C4, C11, E2
Parallel interface: Centronics RJ45:
Ethernet IEEE 802.3 10BASE-T for a 10 Mbps CSMA/CD local area network
External keyboard:
Compatible PC-style 101-key keyboard (mini DIN connector)
Interlock and LED connector R-BOX control connector
Trigger in/out
SMU/PGU selector control connector (41501B)

Sample Application Programs

Flash EEPROM test
TDDB
Constant I (Electromigration test)
V-Ramp test
J-Ramp test
SWEAT
GO/NO-GO test
HCI degradation test
Charging pump test

Sample VEE Program

Vth measurement using the 4155C or 4156C, the E5250A, and a wafer prober.

VXI *plug&play* Drivers

VXI *plug&play* drivers for the 4155C and 4156C
Supported VXI *plug&play* operating systems:
Microsoft Windows 95, 98, NT, 2000 Professional, and XP Professional
Format
Tree-structured function panel.
Panel mode for hardware configuration and manual parameter setting.
Parameter mode for variable definition and I/O configuration.

General Specifications

Temperature range
Operating:
+10 °C to +40 °C (if using floppy disk drive)
+5 °C to +40 °C (if not using floppy disk drive)
Storage: -22 °C to +60 °C
Humidity range
Operating:
20% to 80% RH, non-condensing and wet bulb temperature ≤29 °C (if using floppy disk drive)
15% to 80% RH, non-condensing and wet bulb temperature ≤29 °C (if not using floppy disk drive)
Storage: 5% to 90% RH, non-condensing and wet bulb temperature ≤39 °C
Altitude
Operating: 0 to 2,000 m (6,561 ft)
Storage: 0 to 4,600 m (15,091 ft)
Power requirement
90 V to 264 V, 47 to 63 Hz
Maximum VA
4155C and 4156C: 450 VA
41501B: 350 VA
Regulatory Compliance
EMC: EN 61326-1:+A1, AS/NZS 2064.1
Safety:
CSA C22.2 NO.1010.1 (1992), IEC 61010-1:+A2/EN 61010-1:+A2
UL3111-1:1994
Certification:
CE, CSA, NRTL/C, C-Tick
Dimensions
4155C and 4156C: 235 mm H × 426 mm W × 600 mm D
41501B: 190 mm H × 426 mm W × 600 mm D
Weight (approx.)
4155C and 4156C: 21 kg
41501B: 16 kg (option 412, HPSMU + 2 × PGU)

4155C and 4156C Furnished Accessories

Triaxial cable, 4 ea. (4155C)
Kelvin triaxial cable, 4 ea. (4156C)
Coaxial cable, 4 ea.
Interlock cable, 1 ea.
Keyboard, 1 ea.
User manual, 1 set
Sample application program disk, 1 ea.
Sample VEE program disk, 1 ea.
VXI*plug&play* drivers disk for the 4155C and 4156C, 1 ea.
VXI*plug&play* drivers disk for the E5250A, 1 ea.
LAN Interface Test Adapter, 1 ea.

Accessory Specifications

Specification Condition

The “supplemental information” and “typical” entries in the following specifications are not warranted, but provide useful information about the functions and performance of the instruments (23 °C ±5 °, 50% RH).

16440A SMU/Pulse Generator Selector

The 16440A switches either an SMU or PGU to the associated output port. You can expand to 4 channels by adding an additional 16440A. The channel 1 PGU port provides a “PGU OPEN” function, which can disconnect the PGU by opening a semiconductor relay. The 16440A cannot work without two pulse generator units of the 41501A/B (SMU and Pulse Generator Expander).

Channel configurations:
Two channels (CH1, CH2)
CH1: INPUT ports: 2 (SMU and PGU, PGU port has additional series semiconductor relay)
OUTPUT port: 1
CH2: INPUT ports: 2 (SMU and PGU)
OUTPUT port: 1

Voltage and Current Range

Input port	Max. V	Max. I
SMU	200 V	1.0 A
PGU	40 V	0.2 A (AC Peak)

Supplemental Information (at 23 °C ± 5 °C, 50%RH)

SMU port leakage current:
< 100 fA @100 V
SMU port residual resistance (typical):
0.2 Ω
SMU port stray capacitance (typical @1 MHz):
Force ⇔ Common: 0.3 pF
Force ⇔ Guard: 15 pF
Guard ⇔ Common: 130 pF
PGU port residual resistance: 3.4 Ω
PGU port OFF capacitance (typical):
5 pF
PGU port OPEN capacitance (typical):
700 pF (@ 1 MHz, Vin - Vout = 0V)

PGU port signal transfer characteristics

Overshoot: <5% of pulse amplitude (@20 ns leading and trailing time, 50 Ω pulse generator source impedance, 50 pF and 1 MΩ in parallel load).

General Specifications

Dimensions:
50 mm H × 250 mm W × 275 mm D
Approximate weight: 1.1 kg

16441A R-BOX

The 16441A R-BOX adds a selectable series resistor to the SMU output. You can select the resistor from the setup page, and the voltage drop due to the series resistor is automatically compensated for in the measurement result.

Measurement limitations with the 4155C and 4156C and R-BOX:
If you measure device characteristics including negative resistance over 1 MΩ with the 4155C/4156C and R-BOX, there is a possibility that they cannot be measured. There is a possibility that the 4155C and 4156C cannot perform measurements because of DUT oscillations even with the R-BOX. Whether oscillation occurs or not depends upon the DUT and measurement conditions.
Number of SMU channels that can add a resistor: 2
Resistor values:
1 MΩ, 100 kΩ, 10 kΩ, 0 Ω (each channel)
Resistance accuracy:
0.3% (at 23 °C ±5 °C, between input/output terminal)
Maximum voltage: 200 V
Maximum current: 1 A (0 Ω selected)
Kelvin connection: Kelvin connection is effective only when 0 Ω is selected.

Supplemental Information (at 23 °C ± 5 °C, 50%RH)

Leakage current: <100 fA @ 100 V

General Specifications

Dimensions:
72 mm H × 250 mm W × 270 mm D
Approximate weight: 1.6 kg

16442A Test Fixture

Channel Information

SMU:
6 channels (1 triaxial connector per channel)
3 channels (1 Kelvin triaxial connector per channel)
VSU:
2 channels (1 BNC connector per channel)
VMU:
2 channels (1 BNC connector per channel)
PGU:
2 channels (1 BNC connector per channel)
GNDU:
1 channel (1 triaxial connector)
INTLK: 6-pin connector

Supplemental Information (at 23°C ± 5°C, 50% RH)

SMU channel:
Leakage current: 10 pA max @200 V (Force or Sense ⇔ Common)
Stray capacitance: 15 pF max (Force or Sense ⇔ Common)
Stray capacitance: 3 pF typical (Force or Sense ⇔ Other SMU)
Residual resistance: 60 mΩ typical (Force, Sense)
Guard capacitance: 70 pF max (Force or Sense ⇔ Guard)
VSU channel residual resistance:
60 mΩ typical
VMU channel residual resistance:
60 mΩ typical
PGU channel characteristic impedance:
50 mΩ typical
GNDU channel residual resistance:
40 mΩ typical (Force, Sense)

General Specifications

Temperature range:
Operating: +5 °C to +40 °C
Storage: -40 °C to +70 °C
Humidity range:
Operating: 5% to 80% RH (no condensation)
Storage: 5% to 90% RH at 65 °C (no condensation)
Dimensions:
140 mm H × 260 mm W × 260 mm D
Weight (approx.): 2.5 kg

Agilent Desktop EasyEXPERT Software

Introduction

Agilent Desktop EasyEXPERT software makes every user a parametric test expert. The Microsoft® Windows®-based interface is familiar, even to new engineers who have limited experience using parametric measurement instruments. Its unique task-based approach enables the user to focus on the real task-at-hand (device characterization) without having to be a specialist at using the instrument hardware. Desktop EasyEXPERT supports all aspects of parametric test, from basic manual measurements to test automation across a wafer in conjunction with a semiautomatic wafer prober.

Features and benefits

Large application test library

Desktop EasyEXPERT comes with more than 230 application tests conveniently organized by device type, application, and technology. Many of these application tests will run on the 4155 and 4156 without modification. You also can easily edit and customize the furnished application tests to fit your specific needs.

Offline capability

Desktop EasyEXPERT can run in either online or offline mode. In offline mode you can perform tasks such as analyzing data and creating new application tests. This frees up your existing analyzer from being needed for development work and enables you to use it for its primary purpose: making measurements.

GUI-based classic test mode

Desktop EasyEXPERT offers a classic test mode that maintains the look, feel, and terminology of the 4155/4156 user interface. In addition, it improves the 4155/4156 user interface by taking full advantage of the Windows GUI features.

Easy test sequencing

A GUI-based Quick Test mode lets you to perform test sequencing without programming. You can select, copy, rearrange and cut-and-paste any application tests with a few simple mouse clicks. Once you have selected and arranged your tests, simply click on the measurement button to begin running an automated test sequence.

Prober control

All popular semiautomatic wafer probers are supported by Desktop EasyEXPERT. You can define wafer, die and module information for probing across an entire wafer. You can also combine wafer prober control with either Quick Test mode or an application test-based test sequence to perform multiple testing on various devices across the wafer.

Automatic data export

Desktop EasyEXPERT has the ability to automatically export measurement data in real time, in a variety of formats. You can save data to any drive connected to the PC. If you wish, you can export data to a network drive and view test results on your desktop PC at the same time your instruments are performing testing in the lab.

Software Functions

Operation mode

Application test mode, Classic test mode, Quick test mode

Key Functions

- Categorized and predefined application library
- Device definition
- Measurement parameter settings
- Save/Recall My Favorite Setups
- Define/customize application library
- Execute measurement (Single/Repeat/Append)
- Quick test execution
- Save/Recall measurement data and settings
- Test result data management
- Import/Export device definition, measurement settings, my favorite setup, measurement data, and application library
- Graph plot display/analysis/printing
- Switching matrix control
- Workspace management

Application Library

Category:
Sample test definitions for the following applications. They are subject to change without notice.
Structure, CMOS, Bipolar (BJT), TFT, Discrete, Nanotechnology, Utility

Supported 4155/4156 Functionality

Desktop EasyEXPERT Standard edition

- Staircase Sweep

Desktop EasyEXPERT Plus edition

The following additional functions are supported.

- I/V-t Sampling except Thinned-out and Logarithmic modes
- VSU/VMU except differential voltage measurement using VMU
- PGU (41501B)

Each SMU can sweep using VAR1 (primary sweep), VAR2 (secondary sweep), or VAR1' (synchronous sweep).

Staircase Sweep Measurement Mode

Forces 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.
Number of Steps for VAR1 and VAR1': 1 to 1001
Number of Steps for VAR2: 1 to 128
Sweep type: Linear or logarithmic
Sweep direction: Single or double sweep
Hold Time: 0 to 655.35 s, 10 ms resolution
Delay Time: 0 to 65.5350 s, 100 μs resolution

Pulsed Sweep Measurement Mode

This mode forces 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

This mode forces 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.

Sampling (Time Domain) Measurement Mode

This mode displays the time sampled voltage/current data (by SMU) versus time.
Sampling channels: up to 6
For sampling intervals < 2 ms, the number of sampling channels is 1
Sampling points: 1 to 10,001/ (number of channels)
Sampling mode: linear
Sampling interval range:
60 µs to 2 ms, 10 µs resolution
2 ms to 65.535 s, 1 ms resolution
Hold time: -30 ms to -100 µs, 100 µs resolution
Bias hold time: 0 s

Bias Hold Function

This function is used to keep source output after measurement. Source modules apply the specified bias between measurements in a quick test or application test that defines some classic test setups, or a repeat measurement. Also, the source modules change the output value and the unused modules are disconnected when the next measurement is started.

Current Offset Cancel

This function subtracts the offset current from the current measurement raw data, and returns the result as the measurement data. It is used to compensate the error factor (offset current) caused by the measurement path such as the measurement cables, manipulators, or probe card.

Other Measurement Characteristics

Measurement Control:
Single, Repeat, Append, and Stop
SMU Setting Capabilities:
Limited auto ranging, voltage/ current compliance, power compliance, automatic sweep abort functions

Arithmetic and Analysis Functions

User Functions

Up to 20 user-defined functions can be defined using arithmetic expressions.
Measured data and pre-defined variables can be used in the computation, and the results can be displayed on the LCD.

Analysis Capabilities

Overlay Graph Comparison

A graphics plot can be stored and overlaid.

Scale

Auto scale and zoom

Marker

Marker to min/max, interpolation, direct marker, and marker skip

Cursor

Direct cursor

Line

Two lines, normal mode, grad mode, tangent mode, and regression mode

Automatic Analysis Function

On a graphics plot, the markers and lines can be automatically located using the auto analysis setup. Parameters can be automatically determined using automatic analysis, user function, and read out functions.

Data Variable Display

Up to 20 user-defined parameters can be displayed on the graphics screen.

Analysis Functions

Up to 20 user-defined analysis functions can be defined using arithmetic expressions.
Measured data, pre-defined variables and read out functions can be used in the computation, and the results can be displayed on the LCD.

Read Out Functions

These built-in functions are for reading various values related to the marker, cursor, or line.

Graph Plot

Display Mode

The data display window can be printed. Only the X-Y graph can be printed.

Graph Plot File

The graph plot can be stored as image data to clip board or mass storage device.
File type: bmp, gif, png, emf

Output

Display Modes

X-Y graph, list display, and parameter display

X-Y Graph Display

X-axis and up to eight Y-axes
Linear and log scale
Real time graph plotting

List Display

Measurement data and calculated user function data are listed in conjunction with VAR1 step number or time domain sampling step number. Up to 20 data sets can be displayed.

Other Functions

Import/Export files

File type:
Agilent EasyEXPERT format, XML-SS format, CSV format

System Requirements

The following are the minimum requirement for executing Desktop EasyEXPERT.

Operating System and Service Pack	Microsoft Windows XP Professional SP2	Microsoft Windows VISTA Business SP1
Processer	Intel Celeron 2 GHz	Vista Certified PC with 1 GB memory
Memory	512 Megabytes DDR266	
Display	XGA 1024 × 768 (SXGA 1280 × 1024 recommended)	
HDD	1 GB free space on the C drive, 10 GB (30 GB recommended) free space on a drive for test setup/result data strage.	
.NET Framework	Microsoft .NET Framework Ver. 2.0 Redistributable Package Microsoft .NET Framework 2.0 SP1	Microsoft .NET Framework Ver. 3.0
IO Libraries (for online mode)	Agilent IO Libraries Suite 15.0	
Supported GPIB I/F (for online mode)	Agilent 82350B Agilent 82357A Agilent 82357B	

Supported 4155/4156 Parameter Analyzers

4155B, 4156B, 4155C, and 4156C
Supported 4155/4156 firmware:
HOSTC: 03.08 or later
SMUC: 04.08 or later

Supported External Instruments

Desktop EasyEXPERT Standard edition

- Supported by switching matrix GUI: B2200A/B2201A
- Supported by application tests: E5250A (E5252A), 4284A/E4980A, 81110A, 3458A

Desktop EasyEXPERT Plus edition

- All auxiliary instruments supported by Desktop EasyEXPERT Standard edition
- Also supported by switching matrix GUI: E5250A (E5252A)

Setup Converter Tool

In addition to Desktop EasyEXPERT, Agilent supplies a Setup File Converter tool that runs on any Windows-based PC. This tool can convert 4155 and 4156 measurement setup files (files of type MES and DAT) into equivalent Desktop EasyEXPERT classic test mode setup files.

Attached Software

Prober Control execution files
Supported Probers:
Cascade Microtech Summit 12 K or S300
SUSS MicroTec PA200 or PA300
Vector Semiconductor VX-2000 or VX-3000
4155/56 setup file converter tool
Supported operating systems: Microsoft Windows 2000 Professional and XP Home or Professional

Ordering Information

B1541A
Agilent Desktop EasyEXPERT software and measurement libraries
B1541A-001
Agilent Desktop EasyEXPERT with license-to-use for standard edition
B1541A-002
License-to-use for Agilent Desktop EasyEXPERT Plus

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Agilent Direct

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Americas

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Latin America	305 269 7500
United States	800 829 4444

Asia Pacific

Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 112 929
Japan	81 426 56 7832
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Thailand	1 800 226 008

Europe & Middle East

Austria	01 36027 71571
Belgium	32 (0) 2 404 93 40
Denmark	45 70 13 15 15
Finland	358 (0) 10 855 2100
France	0825 010 700* *0.125 €/minute
Germany	07031 464 6333
Ireland	1890 924 204
Israel	972 3 9288 504/544
Italy	39 02 92 60 8484
Netherlands	31 (0) 20 547 2111
Spain	34 (91) 631 3300
Sweden	0200-88 22 55
Switzerland	0800 80 53 53
United Kingdom	44 (0) 118 9276201

Other European Countries:
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