

KEYSIGHT TECHNOLOGIES (AGILENT HP)

4142B

The Keysight (Agilent/HP) 4142B is a highly flexible, modular DC source/monitor mainframe designed for high-speed, high-precision semiconductor parametric test and characterization. Featuring an 8-slot expandable architecture, it accommodates a variety of plug-in measurement modules—such as Source/Monitor Units (SMUs), High Voltage Source Units (HVSUs), High Current Source Units (HCSUs), and Voltage Source/Monitor Units (VS/VMUs)—to support specialized test requirements in both lab and automated production environments.

SPECIFICATIONS

General

Interfaces	GPIB (HP-IB)
Display	None (status LED indicators only)
Warm-Up Time	40 minutes

Physical

Operating Temperature	5 °C to 40 °C °C
Dimensions (W×H×D)	426 mm × 235 mm × 512 mm mm
Weight	15 kg kg

Mainframe Architecture & Capacity

Total Number of Module Slots	8
Maximum Number of SMU Channels	8 (using 1-slot modules)
Built-in Ground Unit (GNDU)	Yes
GNDU Maximum Sink Current	1.6 A
GNDU Connection Terminal	Triaxial
Internal Command Language	FLEX Command Set
Internal Measurement Buffer	4096 readings
Backplane Synchronization	Built-in real-time synchronization between plug-in modules

Sourcing & Measurement Capabilities

Minimum Current Measurement Resolution	20 fA
Minimum Voltage Measurement Resolution	4 μ V
Maximum Sourcing Voltage	± 1000 V (with HP 41423A)
Maximum Sourcing Current	± 10 A (with HP 41422A)
Voltage Measurement Accuracy	0.05%
Current Measurement Accuracy	0.2%
Spot Measurement Speed	4 ms (typical for V_{th} or h_{fe} measurements)
Sourcing Modes	DC, Pulsed
Sweep Types	Linear, logarithmic, dual-channel staircase
Measurement Modes	Spot, staircase sweep, pulsed spot, pulsed sweep, analog search

HP 41420A High Power SMU

HPSU Slot Width	2 slots
HPSU Maximum Voltage	± 200 V
HPSU Maximum Current	± 1 A (at ≤ 20 V)
HPSU Maximum DC Sourcing Power	20 W
HPSU Sourcing Voltage Ranges	2 V, 20 V, 40 V, 100 V, 200 V
HPSU Sourcing Current Ranges	10 nA, 100 nA, 1 μ A, 10 μ A, 100 μ A, 1 mA, 10 mA, 100 mA, 1 A
HPSU Minimum Voltage Sourcing Resolution	40 μ V
HPSU Minimum Current Sourcing Resolution	200 fA

HP 41421B Medium Power SMU

MPSU Slot Width	1 slot
MPSU Maximum Voltage	± 100 V
MPSU Maximum Current	± 100 mA
MPSU Maximum DC Sourcing Power	2 W
MPSU Sourcing Voltage Ranges	2 V, 20 V, 40 V, 100 V
MPSU Sourcing Current Ranges	10 nA, 100 nA, 1 μ A, 10 μ A, 100 μ A, 1 mA, 10 mA, 100 mA
MPSU Minimum Voltage Sourcing Resolution	40 μ V
MPSU Minimum Current Sourcing Resolution	200 fA

HP 41422A High Voltage Source Unit

HVSU Slot Width	2 slots
HVSU Maximum Voltage	± 1000 V
HVSU Maximum Current	± 10 mA (at ± 1000 V), ± 20 mA (at ± 500 V)
HVSU Sourcing Voltage Ranges	200 V, 1000 V

HP 41424A VS/VM Unit

VS/VMU Slot Width	1 slot
VS Sourcing Channels	2 channels
VM Monitoring Channels	2 channels
VS Channel Output Range	± 20 V
VS Channel Max Current Output	± 100 mA
VM Channel Max Input Voltage	± 20 V

HP 41425A High Current Source Unit

HCSU Slot Width	2 slots
HCSU Maximum Peak Current	± 20 A (pulsed)
HCSU Maximum Sourcing Voltage	± 40 V (at ≤ 1 A DC)
HCSU Current Ranges	100 mA, 1 A, 10 A (pulsed), 20 A (pulsed)

Pulsed Sourcing & Measurement

HPSU/MPSU Pulse Width Range	1 ms to 50 ms (in 100 μ s steps)
HCSU Pulse Width Range	100 μ s to 1 ms

Triggering & Synchronization

External Trigger Input Connector	BNC female
External Trigger Output Connector	BNC female

Guarding & Shielding

Safety Interlock Terminal	Yes (rear panel, 3-pin connector)
Interlock Voltage Threshold	High voltage output (at >40 V) is disabled unless interlock loop is closed

Physical Characteristics

Cooling Configuration	Forced-air cooling (internal rear-mounted fan)
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Power Requirements

Line Voltage	100 V / 120 V / 220 V / 240 V ($\pm 10\%$, selectable)
Line Frequency Range	47 Hz to 66 Hz
Maximum Power Consumption	750 VA

Memory & Buffer

Command Program Memory Capacity	2000 lines
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Measurement Performance

Integration Time Settings	Short, Medium (1 PLC), Long (16 PLC)
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Connectivity

HP-IB Interface Capabilities	SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0
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VS/VMU Module Specifications

VM Channel Voltage Ranges	2 V, 20 V
VM Channel Minimum Voltage Resolution	100 μ V
VS Channel Voltage Ranges	20 V, 40 V
VS Channel Minimum Voltage Sourcing Resolution	1 mV

MPSU Module Specifications

MPSU Current Measurement Ranges	1 nA, 10 nA, 100 nA, 1 μ A, 10 μ A, 100 μ A, 1 mA, 10 mA, 100 mA
MPSU Voltage Measurement Ranges	2 V, 20 V, 40 V, 100 V

HPSU Module Specifications

HPSU Voltage Measurement Ranges	2 V, 20 V, 40 V, 200 V
HPSU Current Measurement Ranges	1 nA, 10 nA, 100 nA, 1 μ A, 10 μ A, 100 μ A, 1 mA, 10 mA, 100 mA, 1 A

Triggering

External Trigger Input Signal Type	TTL level, active low or active high
External Trigger Output Signal Type	TTL level, active low or active high pulse

Interfaces

HP-IB Subset Compatibility	SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, E1
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Compliance & Safety

Safety Standards	CSA C22.2 No. 1010.1, EN 61010-1
EMC Standards	CISPR 11: Group 1, Class A; EN 55011: Group 1, Class A

Accessories

Compatible Test Fixtures	HP 16087A, HP 16088A
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TECHNOLOGY

Semiconductor Parametric Analyzer / Source Measure Unit (SMU) Mainframe

APPLICATIONS

Semiconductor device characterization, parametric testing, wafer-level testing, and high-speed DC/pulsed measurements

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