

KEYSIGHT TECHNOLOGIES (AGILENT HP)

B1500A

The Keysight Technologies B1500A is a modular, high-precision Semiconductor Device Analyzer designed for comprehensive characterization of electronic materials and devices. Featuring a 10-slot mainframe, it supports a wide variety of Source Monitor Units (SMUs), Capacitance Measurement Units (MFCMUs), and Waveform Generator/Fast Measurement Units (WGFMUs) to enable extremely sensitive DC, AC, and ultra-fast pulsed measurements.

SPECIFICATIONS

General

Interfaces	GPIB, LAN (10/100/1000Base-T), USB 2.0 (Front x2, Rear x2), Trigger In/Out, Interlock, VGA, Digital I/O
Display	15-inch XGA active matrix TFT color touch screen (1024 x 768 resolution)

Physical

Power Supply	100 V to 240 V AC ($\pm 10\%$), 50 Hz to 60 Hz ($\pm 10\%$), maximum 900 VA
Operating Temperature	5 °C to 40 °C °C
Dimensions (W×H×D)	426 mm × 330 mm × 575 mm mm
Weight	20 kg (mainframe empty) kg

General System Architecture

Ground Unit (GNDU) Output Voltage	0 V $\pm$ 100 μ V
Ground Unit (GNDU) Maximum Sink Current	4.2 A
Maximum Number of Slots	10 slots
Supported Module Types	HRSMU, MPSMU, HPSMU, MCSMU, MFCMU, HV-SPGU, WGFMU
Internal ADC Resolution	High-resolution ADC (up to 25-bit) and High-speed ADC (16-bit)
Measurement Processing Speed	100 μ s minimum sampling interval
Ground Unit (GNDU) Output Terminal	Triaxial connector

Source Monitor Unit (SMU) Specifications

Maximum Voltage Force Range	±200 V (HPSMU)
Minimum Voltage Force Resolution	0.5 uV (HRSMU)
Maximum Current Force Range	±1 A (HPSMU/MCSMU)
Minimum Current Force Resolution	1 ff (without ASU), 1 fA (with ASU)
Maximum Voltage Measurement Range	±200 V (HPSMU)
Minimum Voltage Measurement Resolution	0.5 uV (HRSMU)
Maximum Current Measurement Range	±1 A (HPSMU/MCSMU)
Minimum Current Measurement Resolution	0.1 fA (HRSMU)
SMU Isolation Impedance	>= 10 ¹³ ohms
SMU Connection Types	Kelvin triaxial connections

Measurement Modes & Stimulus Functions

Sweep Measurement Modes	Linear, Logarithmic, Pulsed, Single, Double Sweep
Sampling Measurement Modes	Linear, Logarithmic, up to 100,000 points
Pulsed Sweep Measurement Modes	Pulse sweep, Pulse-and-sweep, Pulsed sampling
Hold Time Setting Range	0 to 655.35 s
Delay Time Setting Range	0 to 65.535 s
Integration Time Settings	Auto, PLC (0.01 to 100 PLC), Time (100 us to 2 s)

Multi-Frequency Capacitance Unit (MFCMU)

Measurement Frequencies	1 kHz to 5 MHz
Frequency Resolution	1 mHz (at 1 kHz to 10 kHz)
AC Drive Voltage Range	1 mV to 250 mV rms
AC Drive Voltage Resolution	1 mV
Internal DC Bias Voltage Range	±25 V
Internal DC Bias Voltage Resolution	1 mV

Pulse Generator Unit (PGU) & Ultra-Fast I-V

Number of Pulse Channels	Up to 10 channels (with 5 SPGU modules)
Pulse Mode	Two-level pulse, three-level pulse
Amplitude Range	±10 V (into 50 ohms) or ±20 V (open circuit)
Amplitude Resolution	1 mV
Pulse Width Range	10 ns to 10 s
Pulse Period Range	20 ns to 10 s
Transition Time Range (Rise/Fall)	8 ns to 10 ms
WGFMU Minimum Sampling Interval	10 ns
WGFMU Minimum Pulse Width	100 ns

User Interface & Display Capabilities

Display Type	15-inch XGA active matrix TFT color LCD
Display Resolution	1024 x 768 pixels
Plot Display Formats	X-Y, X-Y1-Y2, List, Roll, Trace
Analysis Tools	Markers, Cursors, Line Approximation, Auto-Scale
Front Panel Keypad/Controls	Touch screen

Connectivity, Interfaces & Storage

GPIO Interface Support	Yes (IEEE-488)
LAN Interface	10BASE-T / 100BASE-TX / 1000BASE-T
Interlock Connector	Yes
External Trigger Inputs/Outputs	BNC connectors
Internal Storage Types	Hard Disk Drive (HDD) or Solid State Drive (SSD)

Software & Programming

Built-in Operating System	Windows 10 Pro (or Windows 7 on older units)
Application Software Compatibility	EasyEXPERT group+ software
Built-in Semiconductor Device Libraries	Over 300 application libraries

Power & Operating Environment

Line Voltage Input Range	100 V to 240 V AC ($\pm 10\%$)
Maximum Power Consumption	900 VA
Storage Temperature Range	-20 °C to +60 °C
Operating Humidity Range	20% to 70% RH (non-condensing)
Altitude Limits	Operating: up to 2,000 m; Non-operating: up to 4,600 m
Cooling Mechanism	Forced air cooling by internal fans

Compliance & Certifications

Safety Standards Compliance	IEC61010-1, CAN/CSA-C22.2 No. 61010-1, UL61010-1
Electromagnetic Compatibility (EMC) standards	EN61326-1, AS/NZS CISPR 11
Calibration Interval	1 year

Measurement Modules

MPSMU Maximum Voltage and Current	±100 V, ±100 mA
HPSMU Maximum Voltage and Current	±200 V, ±1 A
MCSMU Maximum Voltage and Current	±30 V, ±1 A (pulsed) / ±100 mA (DC)
MFCMU Frequency Range	1 kHz to 5 MHz
MFCMU Frequency Resolution	1 mHz
MFCMU AC Signal Voltage Range	10 mV to 250 mV rms
MFCMU DC Bias Range	±25 V (built-in)
SPGU Maximum Output Channels	2 channels per module (up to 10 channels per mainframe)
SPGU Pulse Voltage Range	Up to ±40 V (into open load)

Accessories

DC Bias Range with SCUU	±200 V (using SMU via SCUU)
Atto-sense and Switch Unit (ASU) Current Resolution	0.1 fA minimum resolution
SMU CMU Unification Unit (SCUU) Function	Automatic switching between SMU and CMU measurements without cable reconnection

HRSMU Module Specifications

HRSMU Maximum Voltage and Current	100 V / 100 mA
HRSMU Minimum Current Measurement Resolution	1 fA (0.1 fA with ASU)
HRSMU Minimum Current Force Resolution	10 fA
HRSMU Minimum Voltage Force Resolution	0.5 µV
HRSMU Minimum Voltage Measurement Resolution	0.5 µV

WGFMU Module Specifications

WGFMU Output Voltage Range	±3 V, ±10 V
WGFMU Current Measurement Ranges	1 µA, 10 µA, 100 µA, 1 mA, 10 mA

System Integration & Software

Supported Switching Matrix Models	Keysight B2200A, B2201A, E5250A
EasyEXPERT Software Execution Modes	Interactive mode, GUI-less (COM) mode

TECHNOLOGY

Semiconductor Characterization & Parameter Analysis

APPLICATIONS

High-precision characterization of semiconductor devices, materials, active components, and nanomaterials

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