Data Sheet

Programmable DC Electronic Loads
8500B Series

8514B only

The 8500B Series programmable DC electronic loads improve upon all aspects of its predecessor while maintaining dependability at a value price. A set of comprehensive functions make these loads a versatile tool for testing and evaluating DC power supplies, DC-DC converters, batteries, battery chargers, and photovoltaic arrays.

List mode, transient mode, automatic test mode, and battery test mode offer a variety of test tools for lab or production line applications. Continuously switching and pulsing load conditions put a dynamically changing load on DC sources. Load behavior can be triggered internally, externally, or remotely from the included application software.

Contained in a compact benchtop form factor, these loads operate in constant current (CC), constant voltage (CV), constant resistance (CR), or constant power (CW) mode. Internal memory allows for 100 sets of user configurable parameters such as voltage, current, slew rate and width for quick system recall.

Special applications

- Performance verification of photovoltaic solar panels
- CR-LED mode to simulate loading behavior and test LED drivers
- Fuel and solar cell tests
- Battery test and power supply evaluations

Features and benefits

- Maximum input power 1500 W
- CC/CV/CR/CW operating modes
- 16-bit voltage and current measurement system providing up to 0.1 mV / 0.1 mA resolution
- Transient mode up to 10 kHz in CC mode
- List mode function for custom step sequences
- Supports both SCPI and backwards compatible 8500 series protocol
- Store and recall up to 100 instrument settings

Features and benefits (cont.)

- Adjustable slew rate in CC mode
- Flexible triggering options via front panel, external input, timer, or bus
- Built-in battery test function, specify cut-off voltage, capacity level, and time
- Test modes to validate the OCP/OPP protection functions of a power supply
- OVP/OCP/OPP/OTP including local and remote reverse voltage (LRV/RRV) protection
- Remote sense
- Short-circuit test
- Analog current monitoring
- Two thermostatically controlled fans (linear-speed control to minimize noise)
- Integrated meter measures voltage, current, & power
- Rack-mountable

Model	8542B	8500B	8502B	8510B	8514B
Power	150 W	300 W	300 W	600 W	1500 W
Rated Voltage	150 V	150 V	500 V	120 V	120 V
Rated Current	30 A	30 A	15 A	120 A	240 A
I/O Interface	TTL (DB9) interface with USB adapter				USB, RS232
Form Factor	2U half-rack				2U

▶ Models 8542B, 8500B, 8502B and 8510B

Front panel

Bright dual-line display
The 8500B Series display shows both measured input values and set parameters simultaneously.

Rotary control knob
Increment and decrement values quickly and precisely

Numeric keypad
Input values directly

Function keys
Backlit buttons indicate mode of operation

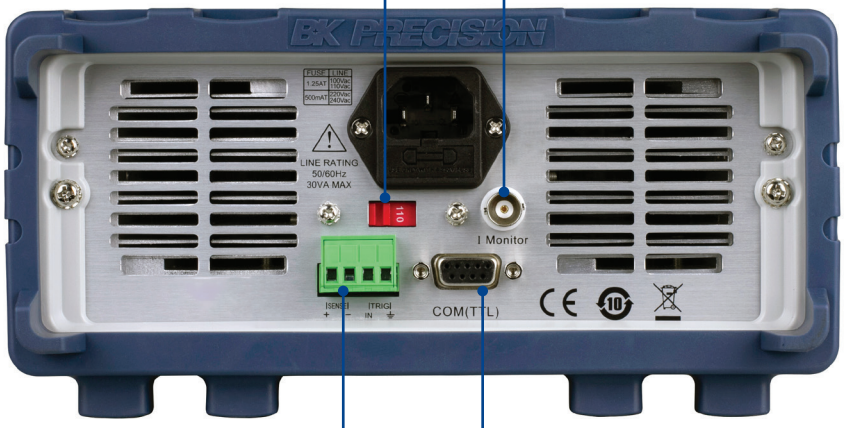
Cursor keys
Set values on a digit-by-digit basis and easily configure test parameters

Multi-type input terminals
Supports banana jack (up to 10 A) or spade type for full current connections

Rear panel

Line voltage switch
110 or 220 VAC input

Current monitor BNC output
Connect external voltmeter or oscilloscope to observe change in input current

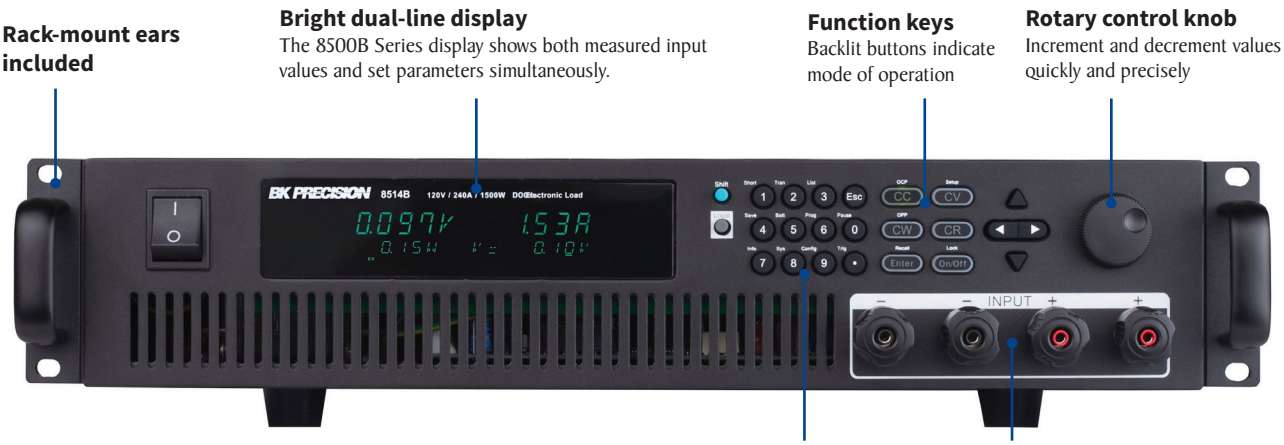


Remote sense and trigger
Compensate for voltage drops due to load wire resistance. Two connections for remote TTL trigger input signal.

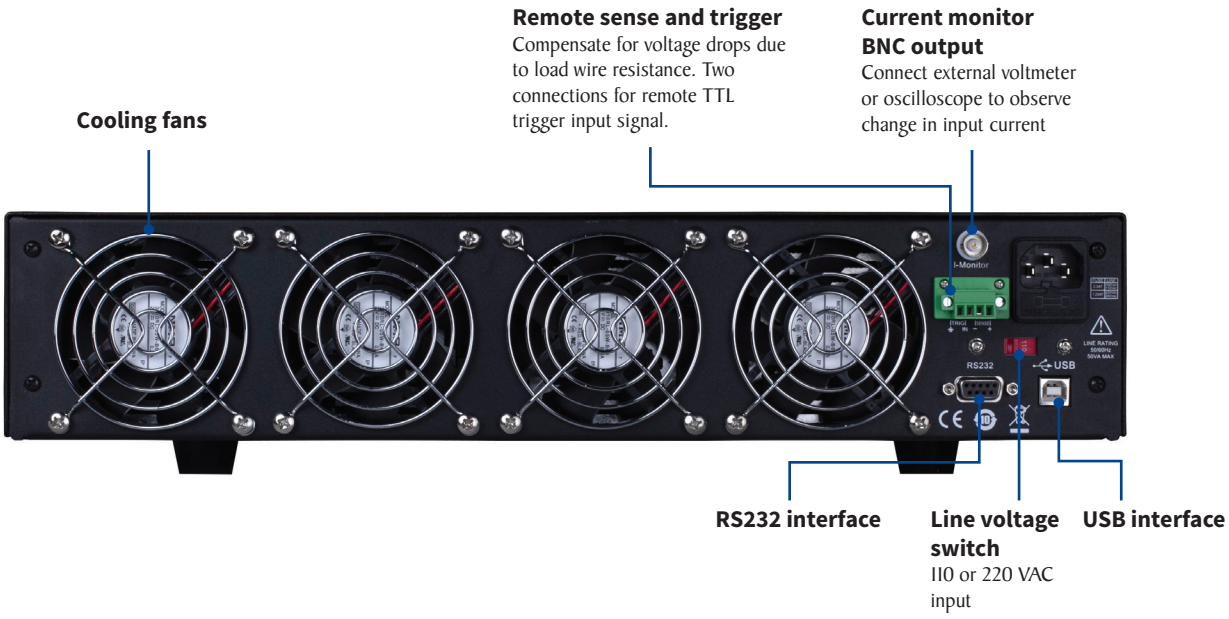
DB9 interface connection
Serial interface connector for remote communication

▶ Model 8514B

Front panel

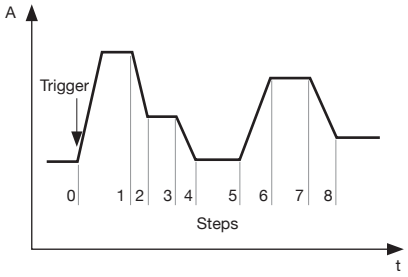


Rear panel



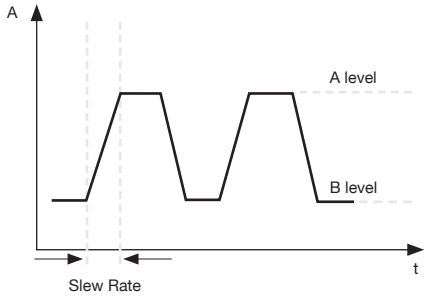
Flexible operation

List mode



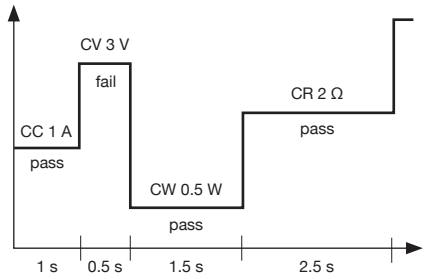
List mode lets you generate more complex sequences of input changes with several different levels. Save up to 7 groups of list files to internal memory for recall and set parameters including step counts (range 2 to 84), width time of a single step (minimum 20 µs), step value, and slope.

Transient operation



Transient operation to periodically switch between two load levels. A power supply's regulation and transient characteristic can be evaluated by monitoring the supply's output voltage under varying combinations of load levels, frequency, duty cycle, and slew rate. These combinations are all controllable in the continuous, pulse, and toggled modes.

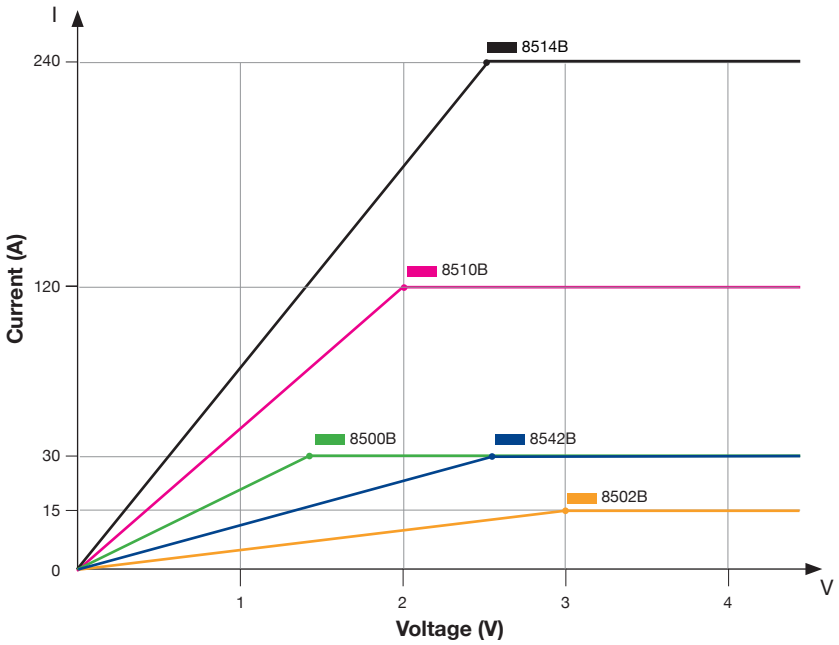
Automatic test mode



Execute multiple test sequences in automatic test mode. Up to 100 different sequences can be linked to run steps of various operating modes and load conditions.

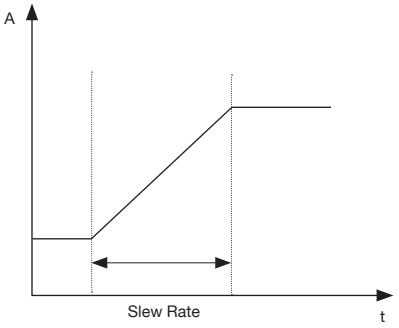
Low voltage operation

The 8500B Series can operate at low voltages for applications in fuel cell and solar cell testing.



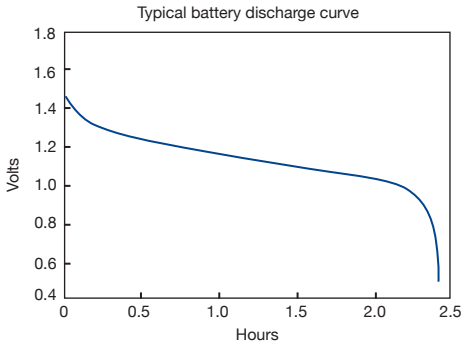
Typical minimum operating voltage at full scale current				
8542B	**8500B**	**8502B**	**8510B**	**8514B**
2.5 V	1.4 V	3 V	2 V	2.5 V

Adjustable slew rate



In CC mode, users can control the rate or slope of the change in current in a transient response test. Set the slew rate as slow as 0.0001 A/µs or as fast as 1 A/µs depending on the model and selected current range.

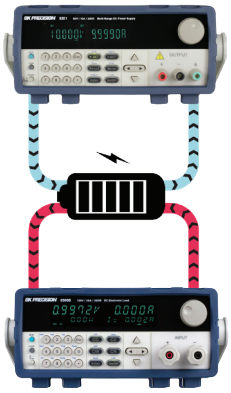
Battery test function



Built-in battery test function to calculate the Ah characteristic and capacity of a battery using a fixed current load discharge. Specify stop conditions for cut-off voltage, capacity level, and time up to 27 hours.

Remote control and programming

Battery test software



Couple the 8500B load with power supplies such as the 9115 or 9200 series to perform charge/ discharge tests on batteries.

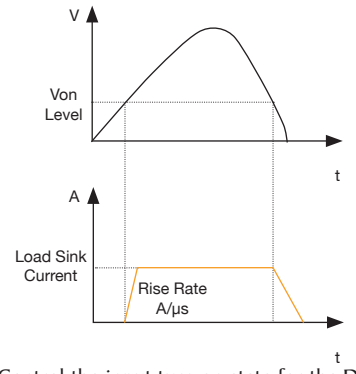
TTL to USB serial interface

Included adapter (IT-EI32B)
for 8542B, 8500B, 8502B, and 8510B models.

External monitoring interface

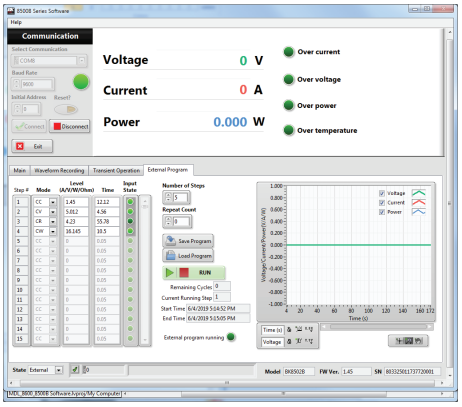
A BNC output is available on the rear for monitoring the current with a 0 to 10 V output signal. Connect an external voltmeter or oscilloscope to observe changes in input current.

Voltage-on (Von) latch operation



Control the input turn on state for the DC electronic load by configuring the Von latch functions. This can be used to start and stop discharging of a battery or other power source once a specified voltage level is reached.

Application software

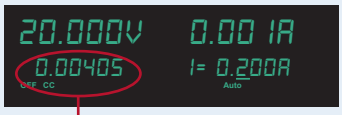


PC software is provided for front panel emulation, generating and executing test sequences, or logging measurement data without the need to write source code. Additionally, this application software integrates with NI Data Dashboard for LabVIEW applications, allowing users to create a custom dashboard on a tablet computer or smart phone to remotely monitor 8500B Series DC loads.

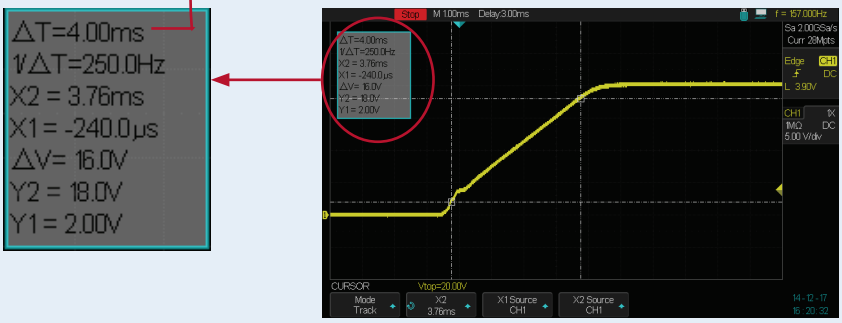
- Remote monitoring on iOS, Android or Windows 8 compatible tablets or smartphones
- Log voltage, current, and power values with timestamp
- Run transient operation and list mode programs remotely
- Create an unlimited number of external list files to be executed from PC memory

Built-in rise and fall time measurement

8500B Series display



Oscilloscope display



The 8500B Series can measure the rise or fall time from a specified start and stop voltage level of the measured input without the need for an oscilloscope. This function can also be used as an internal timer to count how long the input has been enabled.

SCPI and Legacy Protocol

The 8500B series supports the SCPI protocol which is the industry standard for remote communication. The 8500B series also maintains backward compatibility for system integrators still using the legacy 8500 series proprietary (26 byte) protocol.

Specifications

Note: All specifications apply to the unit after a temperature stabilization time of 30 minutes over an ambient temperature range of 23 °C ± 5 °C.

Model		8542B	8500B	8502B	8510B	8514B
Input ratings						
Input voltage		0 to 150 V	0 to 150 V	0 to 500 V	0 to 120 V	0 to 120 V
Input current	Low	0 to 3 A	0 to 3 A	0 to 3 A	0 to 12 A	0 to 24 A
	High	0 to 30 A	0 to 30 A	0 to 15 A	0 to 120 A	0 to 240 A
Input power		150 W	300 W	300 W	600 W	1500 W
Minimum operating voltage	Low	0.25 V at 3 A	0.14 V at 3 A	0.6 V at 3 A	0.2 V at 12 A	0.25 V at 24 A
	High	2.5 V at 30 A	1.4 V at 30 A	3 V at 15 A	2 V at 120 A	2.5 V at 240 A
CV mode						
Range	Low	0.1 to 18 V		0.1 to 50 V	0.1 to 18 V	
	High	0.1 to 150 V		0.1 to 500 V	0.1 to 120 V	
Resolution	Low	1 mV				
	High	10 mV				
Accuracy	Low	±(0.05% + 0.02% FS)				
	High	±(0.05% + 0.025% FS)				
CC mode						
Range	Low	0 to 3 A		0 to 3 A	0 to 12 A	0 to 24 A
	High	0 to 30 A		0 to 15 A	0 to 120 A	0 to 240 A
Resolution	Low	0.1 mA			1 mA	1 mA
	High	1 mA			10 mA	10 mA
Accuracy	Low	±(0.05% + 0.05% FS)				
	High	±(0.05% + 0.05% FS)				
CR mode						
Range	Low	0.05 Ω to 10 Ω		0.3 Ω to 10 Ω	0.05 Ω to 10 Ω	0.05 Ω to 10 Ω
	High	10 Ω to 7.5 kΩ		10 Ω to 7.5 kΩ	10 Ω to 7.5 kΩ	10 Ω to 7.5 kΩ
Resolution		16 bit				
Accuracy (Input Current ≥ FS 10%, Input Voltage ≥ FS 10%)	Low	0.01% + 0.08 S (0.01% + 12.5 Ω)				
	High	0.01% + 0.0008 S (0.01% + 1250 Ω)				
CW mode						
Range		150 W	300 W	300 W	600 W	1500 W
Resolution		10 mW	10 mW	10 mW	10 mW	10 MW
Accuracy (Input Current ≥ FS 10%, Input Voltage ≥ FS 10%)		±(0.2% + 0.2% FS)	±(0.1% + 0.1% FS)		±(0.2% + 0.2% FS)	
Transient mode (CC mode)						
T1 & T2[1]		50 µs to 3600 s/Resolution: 1 µs			100 µs to 3600 s/Resolution: 1 µs	
Accuracy		5 µs ± 100 ppm				10 µs ± 100 ppm
Slew rate [2]	Low	0.0001 to 0.2 A/µs		0.0001 to 0.2 A/µs	0.001 to 0.2 A/µs	0.001 to 0.3 A/µs
	High	0.001 to 1 A/µs	0.001 to 0.8 A/µs	0.001 to 0.4 A/µs	0.01 to 0.8 A/µs	

(1) Fast pulse trains with large transitions may not be achievable.
(2) The slew rate specifications are not warranted but are descriptions of typical performance. The actual transition time is defined as the time for the input to change from 10% to 90%, or vice versa, of the programmed current values. In case of very large load changes, e.g. from no load to full load, the actual transition time will be larger than the expected time. The load will automatically adjust the slew rate to fit within the range (high or low) that is closest to the programmed value.

Specifications (continued)

Model		8542B	8500B	8502B	8510B	8514B
Readback voltage						
Range	Low	0 to 18 V		0 to 50 V	0 to 18 V	
	High	0 to 150 V		0 to 500 V	0 to 120 V	
Resolution	Low	0.1 mV		1 mV	0.1 mV	
	High	1 mV		10 mV	1 mV	
Accuracy		±(0.05% + 0.05% FS)				
Readback current						
Range	Low	0 to 3 A		0 to 3 A	0 to 12 A	0 to 24 A
	High	0 to 30 A		0 to 15 A	0 to 120 A	0 to 240 A
Resolution	Low	0.1 mA			1 mA	
	High	1 mA			10 mA	
Accuracy		±(0.05% + 0.05% FS)				
Readback power						
Range		150 W	300 W	300 W	600 W	1500 W
Resolution		10 mW				
Accuracy		±(0.1% + 0.1% FS)			±(0.2% + 0.2% FS)	
Protection range (typical)						
OPP		160 W	320 W	320 W	620 W	1550 W
OCP	Low	3.3 A		3.3 A	13 A	26.7 A
	High	33 A		16 A	130 A	267 A
OVP		160 V		530 V	125 V	125 V
OTP		185 °F (85 °C)			203 °F (95 °C)	185 °F (85 °C)
Short circuit (typical)						
Current (CC)	Low	3.3 A	3.3 A	3.3 A	13 A	26.7 A
	High	33 A	33 A	16 A	130 A	267 A
Voltage (CV)		0 V				
Resistance (CR)		80 mΩ	40 mΩ	180 mΩ	15 mΩ	8 mΩ
General						
Input terminal impedance (typical)		150 kΩ		1 MΩ	150 kΩ	
AC input		110 V/220 V ±10%, 50/60 Hz				
I/O Interface		DB9 (TTL) with TTL to USB serial adapter				USB, RS232
Temperature	Operating	32 °F to 104 °F (0 °C to 40 °C)				
	Storage	14 °F to 140 °F (-10 °C to 60 °C)				
Humidity		Indoor use, ≤ 95 %				
Safety		EN 61010-1:2010, Low Voltage Directive (LVD) 2014/35/EU				
Electromagnetic compatibility		EN61326-1:2013, CISPR 11, EN 61000-3-2:2014, EN61000-3-3:2013, EMC Directive 2014/30/EU				
Dimensions (W x H x D)		8.5" x 3.5" x 14" (214.5 x 88.2 x 354.6 mm)			8.5" x 3.5" x 18.5" (214.5 x 88.2 x 470 mm)	17.2" x 3.5" x 18.5" (436.5 x 88.2 x 470 mm)
Weight		10.3 lbs (4.7 kg)			15.8 lbs (7.2 kg)	45 lbs (20.5 kg)
Warranty		3 years				
Standard accessories		Power cord, USB cable, certificate of calibration, USB to TTL serial converter IT-E132B[3], rack-mount ears[4]				
Optional accessories		TLPWRI high current test leads, IT-E151 rackmount kit				

(3) Standard for 8542B, 8500B, 8502B, and 8510B models only. (4) Standard for 8514B only.

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