User Manual

8500B Series

Programmable DC Electronic Loads

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BK PRECISION

Contents

Compliance Information

1.1 EMC

EC Declaration of Conformity - EMC

Compliance was demonstrated to the following specifications listed in the Official Journal of the European Communities: EMC Directive 2014/30/EU.

EN 61010-1:2010 Safety requirements for electrical equipment for measurement, control, and laboratory use Part 1: General requirements

1.2 IEC Measurement Category & Pollution Degree Definitions

Measurement Category (CAT) - classification of testing and measuring circuits according to the types of mains circuits to which they are intended to be connected.

Measurement Category other than II, III, or IV : circuits that are not directly connected to the mains supply.

Measurement Category II (CAT II) : test and measuring circuits connected directly to utilization points (socket outlets and similar prints) of the low-voltage mains installation.

Measurement Category III (CAT III) : test and measuring circuits connected to the distribution part of a building's low-voltage mains installation.

Measurement Category IV (CAT IV) : test and measuring circuits connected at the source of the building's low-voltage mains installation.

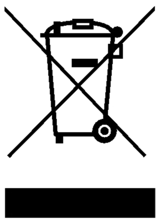
Mains Isolated : is for measurements performed on circuits not directly connected to a mains supply.

Pollution - addition of foreign matter, solid, liquid, or gaseous (ionized gases) that may produce a reduction of dielectric strength or surface resistivity.

Pollution Degree 2 (P2) - only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation is expected

1.3 Product End-of-Life Handling

The equipment may contain substances that could be harmful to the environment or human health if improperly handled at the product's end of life. To avoid release of such substances into the environment and to reduce the use of natural resources, we encourage you to recycle this product to an appropriate system that will ensure that most of the materials are reused or recycled appropriately.



This product is subject to Directive 2012/19/EU of the European Parliament and the Council of the European Union on waste electrical and electronic equipment (WEEE), and in jurisdictions adopting that Directive, is marked as being put on the market after August 13, 2005, and should not be disposed of as unsorted municipal waste. Please utilize your local WEEE collection facilities in the disposition of this product.

1.4 Terms and Symbols

Terms

CAUTION

A caution statement calls attention to an operating procedure, practice, or condition, which, if not followed correctly, could result in damage to or destruction of parts or the entire product.

WARNING

A warning statement calls attention to an operating procedure, practice, or condition, which, if not followed correctly, could result in injury or death to personnel.

NOTICE

A note statement calls attention to an operating procedure, practice, or condition, which, should be noted before proceeding.

Symbols

WARNING - HIGH VOLTAGE - possibility of electric shock.

CAUTION – Statements or instructions that must be consulted in order to find out the nature of the potential hazard and any actions which must be taken.

On (Supply). This is the AC mains connect/disconnect switch on the front of the instrument.

Off (Supply). This is the AC mains connect/disconnect switch on the front of the instrument.

Alternating current

Chassis (earth ground) symbol

Earth (ground) TERMINAL - Refer to the instructions accompanying this symbol in this manual.

Safety Notices

The following safety precautions apply to both operating and maintenance personnel and must be followed during all phases of operation, service, and repair of this instrument.

Before applying power to this instrument:

- Read and understand the safety and operational information in this manual.
- Apply all the listed safety precautions.
- Verify that the voltage selector at the line power cord input is set to the correct line voltage. Operating the instrument at an incorrect line voltage will void the warranty.
- Make all connections to the instrument before applying power.
- Do not operate the instrument in ways not specified by this manual or by B&K Precision.

Failure to comply with these precautions or with warnings elsewhere in this manual violates the safety standards of design, manufacture, and intended use of the instrument. B&K Precision assumes no liability for a customer's failure to comply with these requirements.

Electrical Power

This instrument is intended to be powered from a CATEGORY II mains power environment. The mains power should be 115 V RMS or 230 V RMS. Use only the power cord supplied with the instrument and ensure it is appropriate for your country of use.

WARNING

Do not use this instrument in an electrical environment with a higher category rating than what is specified in this manual for this instrument.

WARNING

You must ensure that each accessory you use with this instrument has a category rating equal to or higher than the instrument's category rating to maintain the instrument's category rating. Failure to do so will lower the category rating of the measuring system.

Ground the Instrument

WARNING

To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical safety ground. This instrument is grounded through the ground conductor of the supplied, three-conductor AC line power cable. The power cable must be plugged into an approved three-conductor electrical outlet. The power jack and mating plug of the power cable meet IEC safety standards.

WARNING

Do not alter or defeat the ground connection. Without the safety ground connection, all accessible conductive parts (including control knobs) may provide an electric shock. Failure to use a properly-grounded approved outlet and the recommended three-conductor AC line power cable may result in injury or death.

WARNING

Unless otherwise stated, a ground connection on the instrument's front or rear panel is for a reference of potential only and is not to be used as a safety ground. Do not operate in an explosive or flammable atmosphere.

Environmental Conditions

This instrument is intended to be used in an indoor pollution degree 2 environment. The operating temperature range is 0°C to 40°C and 20% to 80% relative humidity, with no condensation allowed.

Measurements made by this instrument may be outside specifications if the instrument is used in non-office-type environments. Such environments may include rapid temperature or humidity changes, sunlight, vibration and/or mechanical shocks, acoustic noise, electrical noise, strong electric fields, or strong magnetic fields.

WARNING

Do not operate the instrument in the presence of flammable gases or vapors, fumes, or finely-divided particulates.

WARNING

The instrument is designed to be used in office-type indoor environments. Do not operate the instrument

- **In the presence of noxious, corrosive, or flammable fumes, gases, vapors, chemicals, or finely-divided particulates.**
- **In relative humidity conditions outside the instrument's specifications.**
- **In environments where there is a danger of any liquid being spilled on the instrument or where any liquid can condense on the instrument.**
- **In air temperatures exceeding the specified operating temperatures.**
- **In atmospheric pressures outside the specified altitude limits or where the surrounding gas is not air.**
- **In environments with restricted cooling air flow, even if the air temperatures are within specifications.**
- **In direct sunlight.**

Do not operate instrument if damaged

WARNING

If the instrument is damaged, appears to be damaged, or if any liquid, chemical, or other material gets on or inside the instrument, remove the instrument's power cord, remove the instrument from service, label it as not to be operated, and return the instrument to B&K Precision for repair. Notify B&K Precision of the nature of any contamination of the instrument.

WARNING

Hazardous voltages may be present in unexpected locations in circuitry being tested when a fault condition in the circuit exists.

Clean the instrument only as instructed

WARNING

Do not clean the instrument, its switches, or its terminals with contact cleaners, abrasives, lubricants, solvents, acids/bases, or other such chemicals. Clean the instrument only with a clean dry lint-free cloth or as instructed in this manual. Not for critical applications.

Do not touch live circuits

WARNING

Instrument covers must not be removed by operating personnel. Component replacement and internal adjustments must be made by qualified service-trained maintenance personnel who are aware of the hazards involved when the instrument's covers and shields are removed. Under certain conditions, even with the power cord removed, dangerous voltages may exist when the covers are removed.

To avoid injuries, always disconnect the power cord from the instrument, disconnect all other connections (for example, test leads, computer interface cables, etc.), discharge all circuits, and verify there are no hazardous voltages present on any conductors by measurements with a properly-operating voltage-sensing device before touching any internal parts. Verify the voltage-sensing device is working properly before and after making the measurements by testing with known-operating voltage sources and test for both DC and AC voltages.

Do not attempt any service or adjustment unless another person capable of rendering first aid and resuscitation is present.

General Safety

WARNING

Do not insert any object into an instrument's ventilation openings or other openings.

WARNING

This instrument is not authorized for use in contact with the human body or for use as a component in a life-support device or system.

Servicing

WARNING

Do not substitute parts that are not approved by B&K Precision or modify this instrument. Return the instrument to B&K Precision for service and repair to ensure that safety and performance features are maintained.

WARNING

Fuse replacement must be done by qualified service-trained maintenance personnel who are aware of the instrument's fuse requirements and safe replacement procedures. Disconnect the instrument from the power line before replacing fuses. Replace fuses only with new fuses of the fuse types, voltage ratings, and current ratings specified in this manual or on the back of the instrument. Failure to do so may damage the instrument, lead to a safety hazard, or cause a fire. Failure to use the specified fuses will void the warranty.

For continued safe use of the instrument

- Do not place heavy objects on the instrument.
- Do not obstruct cooling air flow to the instrument.
- Do not place a hot soldering iron on the instrument.
- Do not pull the instrument with the power cord, connected probe, or connected test lead.
- Do not move the instrument when a probe is connected to a circuit being tested.

General Information

3.1 Product Overview

The 8500B Series DC Electronic Loads are versatile instruments used for static and dynamic testing of DC power supplies, batteries, DC-to-DC converters, battery chargers, and other applications including fuel-cell, and solar cell test. Primary modes include constant voltage (CV), constant current (CC), constant resistance (CR), and constant power (CW). A wide range of dynamic loading applications can also be simulated through user-programmable slew rates, load levels, duration, and conducting voltage.

Further, transient, list mode, battery mode, and LED modes further extend testing capabilities. Versatile triggering options allow the dynamic load behavior to be synchronized with other events. The DC load is remotely programmable via the TTL serial interface. This interface requires 0-5V signal levels and can connect to typical serial ports via an adapter such as the IT-E132B.

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

Table 3.1 HVL Series Models

Figure 3.1 8500B

3.2 Features

- 16-bit voltage and current measurement system providing up to 0.1 mV / 0.1 mA resolution
- Supports both SCPI and backwards compatible 8500 series protocol
- CC/CV/CR/CW operating modes
- List mode
- Transient mode up to 10 kHz in CC mode
- Measurement speed up to 40 kHz
- Remote sense function
- Battery test function
- OCP and OPP automatic test
- CR-LED function
- Store/recall up to 100 setups
- Analog current monitoring
- Adjustable slew rate in CC mode
- OVP/OCP/OPP/OTP and reverse voltage protection

3.3 Contents

Please inspect the instrument mechanically and electrically upon receiving it. Unpack all items from the shipping carton, and check for any obvious signs of physical damage that may have occurred during transportation. Report any damage to the shipping agent immediately.

Save the original packing carton for possible future reshipment. Every instrument is shipped with the following contents:

- 8500B series DC Electronic load
- IT-E132B USB to TTL adapter
- AC Power Cord
- Certificate of Calibration

NOTICE

Verify that all items above are included in the shipping container. If anything is missing, please contact B&K Precision.

3.4 Product Dimensions

All models are designed to fit in a standard 19-inch rackmount. The dimensions are shown in **table 3.2**.

Model	Dimensions (W x H x D)	Weight
8542B 8500B 8502B	8.5” x 3.5” x 14” (214.5 x 88.2 x 354.6 mm)	10.3 lbs (4.7 kg)
8510B	8.5” x 3.5” x 18.5” (214.5 x 88.2 x 470 mm)	15.8 lbs (7.2 kg)
8514B	17.2” x 3.5” x 18.5” (436.5 x 88.2 x 470 mm)	45 lbs (20.5 kg)

Table 3.2 Dimensions and Weight

3.5 Rackmount Installation

The instrument can be installed in a standard 19 inch rack. For half-rack models, the optional rackmount kit IT-E151 is required. **Figure 3.2** shows one of the half-rack sized units using the IT-E151 rackmount kit. This rackmount kit also accommodates up to two half-rack models installed side by side. The full size 8514B includes rack mounting ears.

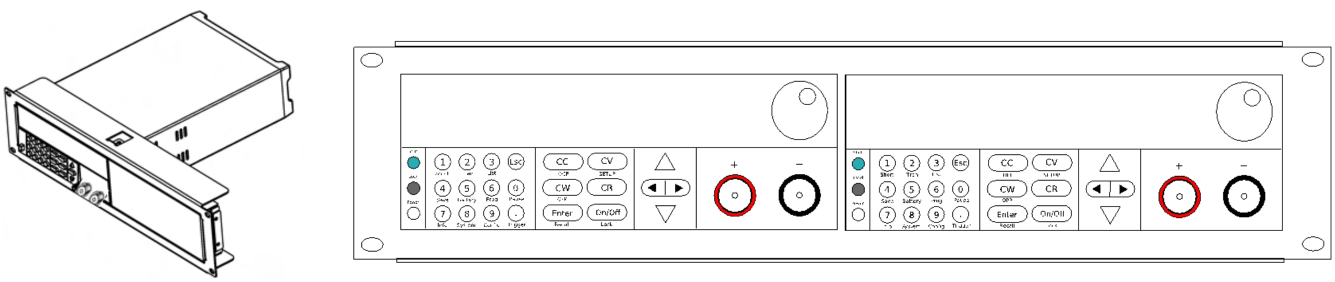


Figure 3.2 Half-Rack sized Unit

3.6 Front Panel Overview

Figure 3.3 Front Panel

Item	Name	Description
1	Display	Vacuum Fluorescent Display
2	Power Button	Toggles the instrument ON or OFF.
3	Numeric Keypad	Used to enter precise values and call advanced functions.
4	Function Keys	See **section 5.1.1** for details.
5	Navigation Keys	Used to navigate menus or configure parameters.
6	Rotary Knob	Used to navigate menus or configure parameters.
7	Input Terminals	Front terminals providing spade connection and 4mm banana plug.

Table 3.3 Front Panel Overview

3.6.1 Combination Keys

Press Shift button first and then other keys to activate the more advanced functions.

Shift + Short (1)	Turn short circuit on or off.
Shift + Tran (2)	Start or stop transient condition.
Shift + List (3)	Set LIST operation parameters.
Shift + Save (4)	Store the DC Load state in non-volatile memory.
Shift + Batt (5)	Turn on or off battery testing function.
Shift + Prog (6)	Enter auto test function.
Shift + Info (7)	Display product's Model/SN/Version.
Shift + Sys (8)	System menu setting
Shift + Config (9)	Configure menu setting
Shift + Pause (0)	Press this button if you need a pause when running an auto test file.
Shift + Trig (·)	Cause an immediate trigger.
Shift + CC	Enter OCP test function.
Shift + CV	Set detailed parameters in CC/CV/CW/CR mode.
Shift + CW	Enter OPP test function.
Shift + Enter	Recall the DC Load state from non-volatile memory.
Shift + On/Off	Key lock function

3.7 Rear Panel Overview

Figure 3.4 Rear Panel Overview

Item	Name	Description
1	AC power input & fuse box	Houses the fuse as well as the AC input.
2	Line Voltage Selection	Select 110/220V±10%AC input.
3	Current Monitoring	Connect an external voltmeter or oscilloscope to display the input's current.
4	Sense	Remote Sense terminals
5	Comm. Interface	Connect TTL adapter/USB cable to remotely control the unit.

Table 3.4 Rear Panel Overview

3.8 Display Overview

Figure 3.5 Display Overview

Item	Description
1	Measured Voltage
2	Measured Current
3	Measured Power
4	Set Value
5	Input Off indicator, lit when input is off
6	Operation mode indicators (CC, CV, CW, CR)
12	Remote control active indicator
13	Error indicator
14	Waiting for Trigger indicator
15	Timer indicator
16	External indicator
16	Remote Sense active indicator
17	Protection event indicator
18	Auto range
19	Key Lock indicator
20	Shift indicator

Table 3.5 Display Overview

Getting Started

Before connecting and powering up the instrument, please review the instructions in this chapter.

4.1 Input Power and Fuse Requirements

The load has a selectable AC input that accepts line voltage input within:

	8542B | 8500B | 8502B | 8510B	8514B
AC Line Input	115 V (±10%) or 230 V (±10%), 50/60 Hz	
AC Line Phase	Single Phase	
Maximum Rated Input Power	30 VA	50 VA

Before connecting to an AC outlet or external power source, be sure that the power switch is in the OFF position and verify that the AC power cord, including the extension line, is compatible with the rated voltage/current and that there is sufficient circuit capacity for the dc load. Once verified, connect the cable firmly.

WARNING

The included AC power cord is safety certified for this instrument operating in rated range. To change a cable or add an extension cable, be sure that it can meet the required power ratings for this instrument. Any misuse with wrong or unsafe cables will void the warranty.

The power cord provides a chassis ground through a third conductor. Verify that your power outlet is of the three-conductor type with the correct pin connected to earth ground.

4.2 Fuse Requirements and Replacements

An AC input fuse is necessary when powering the instrument. All models in the HVL series require a Time delay low breaking capacity 5A/250V **(T 5A L 250V)**.

WARNING **For safety, no power should be applied to the instrument while changing line voltage operation. Disconnect all cables connected to the instrument before proceeding.**

1. Locate the fuse box next to the AC input connector in the rear panel. (See figure **3.4**)
2. Insert a small flathead screwdriver into the fuse box slit to pull and slide out the fuse box.
3. Check and replace fuse if necessary. (See figure **4.1**)

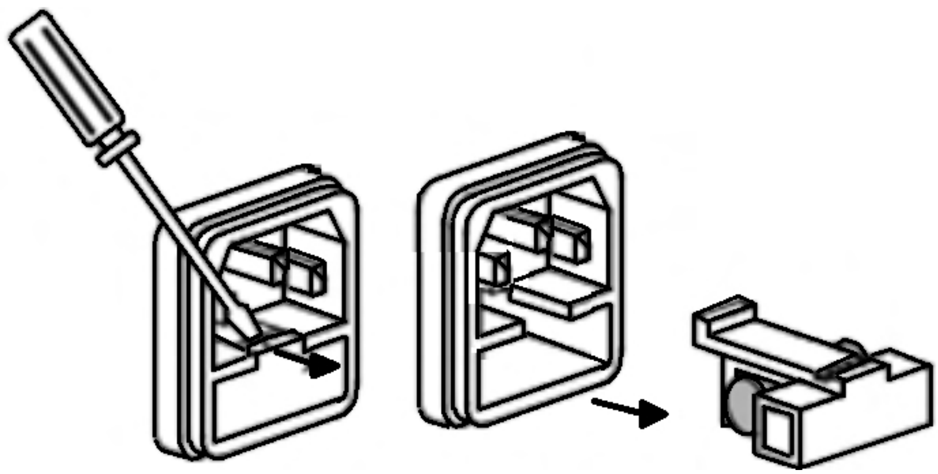


Figure 4.1 Fuse Removal

WARNING **Any disassembling of the case or changing the fuse not performed by an authorized service technician will void the warranty of the instrument.**

Hazardous voltages may exist at the outputs and the load connections when using a power supply with a rated output greater than 60 V. To protect personnel against accidental contact with hazardous voltages, ensure that the load and its connections have no accessible live parts. Ensure that the load wiring insulation rating is greater than to the maximum output voltage of the power supply.

4.3 Input Connection

It is recommended to use the proper wire and lug for the load wiring. The following factors are needed to take into consideration:

- Insulation rating of the wire
- Current carrying capacity of the wire
- Noise and impedance effects of the load lines
- Maximum load wiring length for remote sense operation

4.3.1 Current Carrying Capacity

As a minimum, load wiring must have a current capacity greater than the output current rating of the power source. This ensures that the wiring will not be damaged even if the load is shorted.

Table 4.3.1shows the maximum current rating, based on 450 A/cm^2, for various gauges of wire rate for 105°C operations. Operating at the maximum current rating results in an approximately 30°C temperature rise for a wire operating in free air.

When load wiring must operate in areas with elevated ambient temperatures or bundled with other wiring, use larger gauges or wiring rated for higher temperature.

Wire Size AWG	2/0	1/0	1	2	4	6	8	10	12	14
Max. Current(A)	303	247	192	155	97	61	36	21	16	10

Table 4.1 Current Carrying Capacity

Hazardous voltages may exist at the input terminals with a power source output greater than 40V. To protect personnel against accidental contact with hazardous voltages, ensure that the power source and its connections have no accessible live parts. Ensure that the load wiring insulation rating is greater than to the maximum output voltage of the power source. And, use the input protection cover.

4.3.2 Noise and Impedance Effects

To minimize noise pickup or radiation interference, use a shielded pair wiring or the shortest possible length for load wires. Connect the shield to the chassis via a rear panel mounting screw.

If shielding is impossible or impractical, simply twisting the wires together will offer some noise immunity. When using local sense connections, the user must use the largest practical wire size to minimize the effects of load line impedance on the regulation of the load.

4.4 Local/Remote Sense

The electronic load is capable of sensing voltage locally or remotely. If the load wiring is relatively short and the load regulation is not critical, local sense configuration is good enough. On the other hand, if the load wiring is relatively long, configuring to remote sense will compensate for the voltage drop of the long load leads. Below are figures for local and remote sense configurations.

Remote sensing is used to counteract the effect of lead resistance. For example, if you connect a power supply to the DC Load, the voltage at the power supply's terminals will not be the same as the voltage at the DC Load's terminals if there is a current flowing because of the finite resistance from the wires. Using remote sensing, you can sense the voltage at the power supply's terminals, effectively removing the effect of the voltage drop in the connection wire.

For local remote sense connect the "+" and "-" terminals at the rear of the unit to the power source.

NOTICE To reduce interference, twist the sense lines together and run together with the wires connecting the load to the source.

NOTICE When using remote sensing, the power displayed by the instrument includes both the power dissipated inside the instrument and the power dissipated in the leads from the power supply to the DC Load's input terminals.

To configure the local or remote sense:

Step 1. Press Shift + Config 9 to enter the configuration menu.

Step 2. Use the arrow keys to navigate to the **"SENSE"** menu item. Press Enter to enter the menu.

Step 3. Use the arrow keys to select the desired value "ON, or OFF" and press to confirm the setting.

Step 4. When active, the **"Sense"** indicator will show on the display.

NOTICE To prevent oscillation or noise interference, it is recommended to twist the remote sense + and – leads.

4.5 Preliminary Check

Complete the following steps to verify the Power supply is ready for use.

Verify AC Input Voltage

Verify and check to make sure proper AC voltages are available to power the instrument. The AC voltage range must meet the acceptable specification as explained in section "**2.1 Input Power and Fuse Requirements**".

Connect Power & Self-Test

Connect AC power cord to the AC receptacle in the rear panel and press the power button. It will run through a self-test procedure initially before booting to the main screen.

Input Check

Follow the steps below to check that the load is operating correctly, and that the load elements (power transistors) are not damaged. **A DC power supply rated for at least 5V and 1 A is required for this check.**

Step 1. Connect the input terminal to a DC power supply and configure the supply to output 5 V and current limit to 1 A.

Step 2. Power on the load. The display will show the "OFF" annunciator above the voltage display.

Step 3. Turn on the DC power supply's output. Observe the load's measured voltage display, it should read approximately 5 V.

Step 4. Press the "CC" button to enable the constant current load mode.

Step 5. Use the keypad to enter 0.5 A. Press the Enter key to set the value.

Step 6. The display should show **CC = 0.500A** on the bottom right.

Step 7. Press "On/Off" to enable the load. The "On/Off" button should light up, and the "Off" indicator on screen should disappear. The measured current should now display a value close to 0.5 A.

Step 8. This setup verifies that the load is drawing power correctly from the power supply.

If the load does not show 5 V, or shows significant current draw from the connected power supply, the load may be damaged and need service. If when the supply is connected, showing 5 V on the load's display, and no current is drawn, the load may be damaged and need service.

NOTICE

If the load is not drawing power from the DC power supply, check all load protection limits and settings within the menu to verify that the load is configured to allow drawing power at 5V, 0.500 A. Also, verify that the CC mode parameters are setup to operate within the configured valid ranges by pressing Shift + Enter

If after checking all of the above, and verifying the power supply used for testing is not at fault, contact B&K for further assistance.

Front Panel Operation

At power-on, the power supply will automatically enter the front-panel operation mode and the instrument can be controlled via the front panel keys and knob.

5.1 Keys

5.1.1 Function Keys

The 8500B series is equipped with six function keys.

Figure 5.1 Function Keys

The CC, CV, CW, and CR buttons change the operation mode of the load to the corresponding mode. For more information on each operation mode refer to **Chapter 6**.

The Enter is used to select parameters or confirm input values of the selected parameter.

The On/Off button toggles the input On/Off. When input is enabled, the ON button will turn yellow and the load will commence the loading function.

5.1.2 Numeric Keys and ESC

Figure 5.2 Numeric Keys

The numeric keys allow for the configuration of the currently selected parameter. Using the numeric keys provides a fast and precise input. Pressing the Enter key will assign the selected value to the desired parameter.

Pressing the **ESC** will exit the currently selected parameter or menu. If a parameter is chosen the configuration of the parameters will be exited without saving any values that may have been adjusted after entering the parameter configuration. When viewing a menu pressing the **ESC** key will return the user to the previous menu.

The Numeric keys have a secondary function which can be called by pressing the Shift along with the corresponding key. For more information about each combination refer to **section 3.6.1**.

5.1.3 Navigation Keys

The navigation keys are a set of keys used to navigate through parameters in menus or increase/decrease the value of the selected parameter.

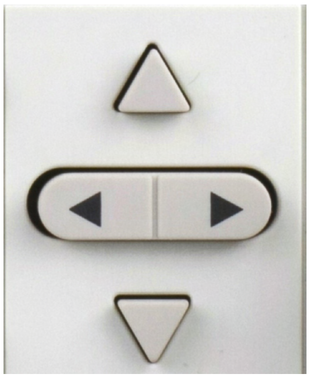


Figure 5.3
Navigation Keys

Operation Modes

The 8500B series offers the following modes.

6.1 Static Modes

The electronic load provides five static load modes. They are constant current **(CC)** mode, constant voltage **(CV)** mode, constant resistance **(CR)** mode, constant power **(CW)** mode, and **short** mode.

To select a **Mode** press the corresponding function key as shown in **section 5.1.1**. For **short** mode the Shift + Short ① combination must be used.

When programmed to a mode, the electronic load remains in that mode until another mode is selected.

NOTICE If the selected mode is in operation, selecting another mode will automatically disable the input.

6.1.1 Range Configuration

The range for all static modes can be configured under the **Setup** menu. To enter the setup menu press the Shift + CV buttons.

NOTICE The range can be configured to any valid value in the instrument's full range. Limiting the instrument's range can improve the reading resolution if the set range fall in the instrument's low range. **Table 6.1** list the threshold for low and high range for all operation modes and models in the 8500B series.

Model		8542B	8500B	8502B	8510B	8514B
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	
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
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
CW mode						
Range		150 W	300 W	300 W	600 W	1500 W

Table 6.1 Static Ranges

6.1.2 Slew Rate Configuration

In CC mode, the rate or slope of the change can be configured. 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 as shown in **table 6.2**.

The Rise and Fall time of the load can be configured under the **Setup** menu. To enter the setup menu press the Shift + CV buttons then use the **up / down** navigation keys to navigate to the **UP** and **DOWN** parameters.

Model		8542B	8500B	8502B	8510B	8514B
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	

Table 6.2 Slew Rate

(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

These parameters correspond to the **Rise Time / Fall Time** which define the current slew rate of the load as it changes to a new programmed value. The programmed slew rate takes effect immediately when set, so if the transient or triggered modes are active, it will apply immediately.

Current slew rate is defined as the change in current over time. A programmable slew rate allows a controlled transition from one load setting to another. The actual transition time is defined as the time for the input to change from 10% to 90%, or 90% to 10% of the programmed current values.

Between the 10% and 90% region, the slew rate can be measured by observing the steepest slope portion. 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 (measured) time. For this reason, the firmware allows the user to program slew rate values outside of the specified slew rate ranges. The minimum transition time for all programmable slew rates is limited in cases where the transition from one setting to another is very small, due to bandwidth limitations of the load.

6.1.3 Constant Current Mode (CC)

In constant current mode, the load will sink a current in accordance with the programmed value regardless of the input voltage.

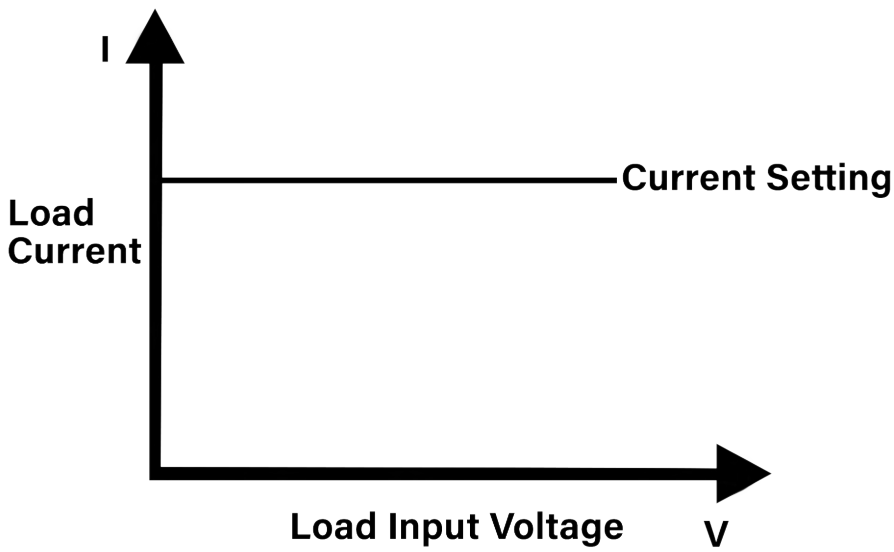


Figure 6.1 Constant Current Mode

To run the CC operation **RUNMODE** must be set to **Normal** and CC must be selected by pressing the CC button. For more information about **RUNMODE** please refer to section RUNMODE.

Configure CC Parameters

The following parameters are configurable under the **Setup** menu once CC mode is selected.

Range

Defines the maximum allowed current set value. Use this limit to protect against accidentally entering excessive current values either from the keypad or dial. Please refer to section **Range Configuration**.

UP/ DOWN

Sets the rise and fall slew rate of the load, which determines the rate at which the input current increases and decreases to a new programmed value. Please refer to section **Slew Rate Configuration**.

6.1.4 CV Mode

In constant voltage mode the load will sink enough current to control the DUT voltage to the programmed value. The load acts as a shunt voltage regulator when operating in CV mode.

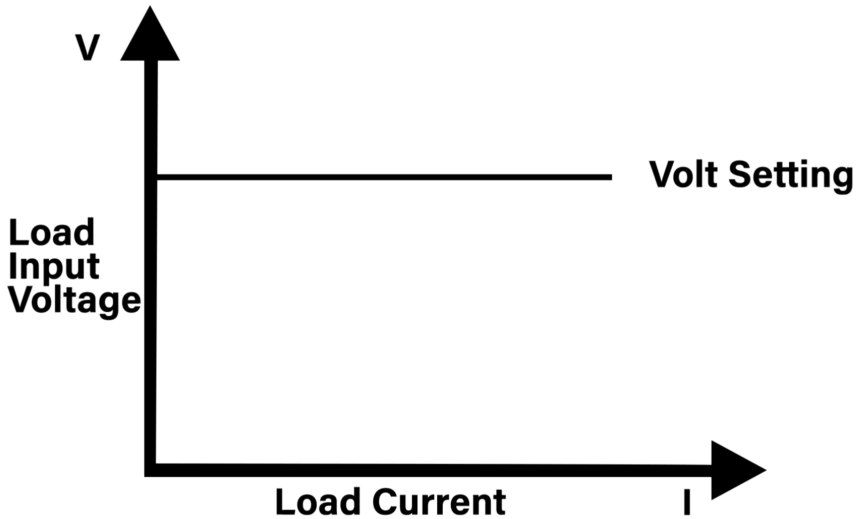


Figure 6.2 Constant Voltage Mode

To run the CV operation **RUNMODE** must be set to **Normal** and CV must be selected by pressing the CV button. For more information about **RUNMODE** please refer to section RUNMODE.

Configure CV Parameters

The following parameter is configurable under the **Setup** menu once CV mode is selected.

Range

Defines the maximum allowed voltage set value. Use this limit to protect against accidentally entering excessive voltage values either from the keypad or dial. Please refer to section **Range Configuration**.

6.1.5 CR Mode

In constant resistance mode the load will sink a current linearly proportional to the voltage in accordance with the programmed resistance value to approximate a resistor. The performance of this mode is not as fast as in CC or CV mode. This is because it is a sampled system and response to changing input takes a finite amount of time.

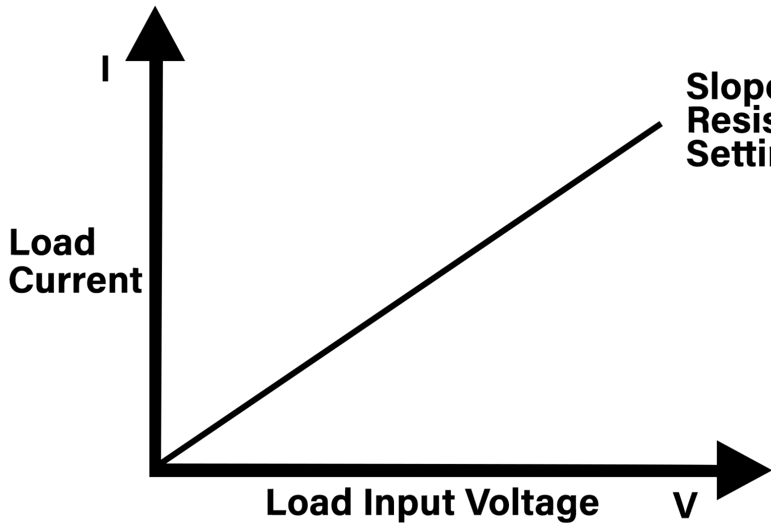


Figure 6.3 CR Mode

To run the CR operation **RUNMODE** must be set to **Normal** and CR must be selected by pressing the CR button. For more information about **RUNMODE** please refer to section RUNMODE.

Configure CR Parameters

The following parameter is configurable under the **Setup** menu once CR mode is selected.

Range

Defines the maximum allowed resistance set value. Use this limit to protect against accidentally entering excessive resistance values either from the keypad or dial. Please refer to section **Range Configuration**.

6.1.6 CW Mode

In constant power mode the load will maintain the input power at the specified programmed power level. When input voltage increases, the input current will decrease, while power (P = V*I) will remain the same. This is a sampled system, so the performance is not as fast as in CC and CV modes.

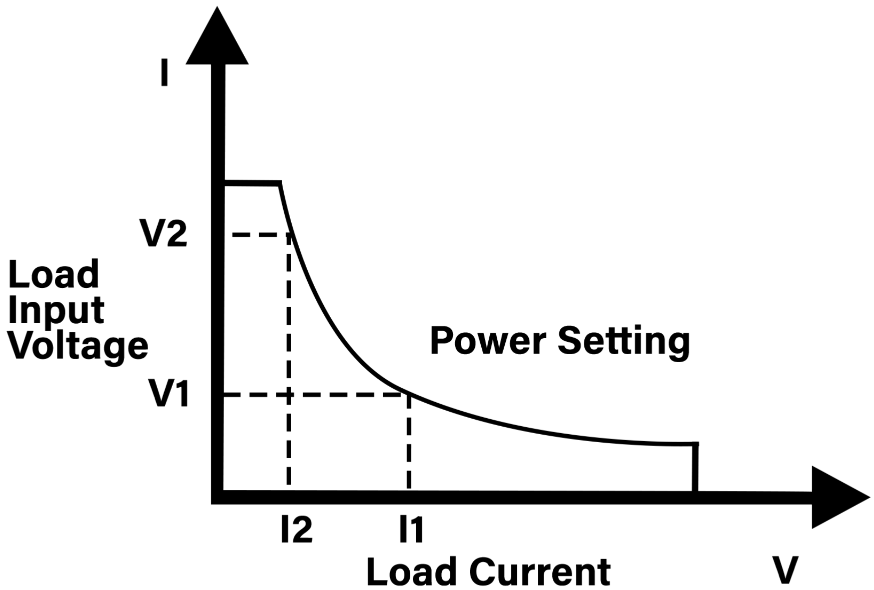


Figure 6.4 CP Mode

To run the CW operation **RUNMODE** must be set to **Normal** and CW must be selected by pressing the CW button. For more information about **RUNMODE** please refer to section RUNMODE.

Configure CW Parameters

The following parameter is configurable under the **Setup** menu once CW mode is selected.

Range

Defines the maximum allowed power set value. Use this limit to protect against accidentally entering excessive power values either from the keypad or dial. Please refer to section **Range Configuration**.

NOTICE CW mode only has a single range as shown in **table 6.1**. There is no threshold that changes the reading resolution.

6.1.7 Short Mode

Short mode simulates a short-circuit at the input. In short mode, the DC load will draw the maximum current from the source. The short function is available in any of the four operation modes (CC,CV,CW or CR).

To select **Short** mode press the Shift + Short ① buttons

CAUTION

The load will still report the previously selected mode. To stop short mode press the Shift + Short ① buttons once more. The load will return to its previous operation. If CW mode was previously chosen the load will not return to CW mode, the short current will continue to be drawn. To stop the short, press the On/Off key before pressing Shift + Short ①.

NOTICE

When emulating a Short in CC, CW or CR mode, the maximum allowable short current is equal to the 110% of current range

6.2 Transient Operation

The 8500b series provides 3 transient testing modes:

- **Continuous**
- **Pulse**
- **Toggle**

The transient operation enables the module to periodically switch between two load levels. This function allows for dynamic characteristics of power supplies or other DC sources. Transient operation is available in CC, CR, CV and CP modes.

Transient testing can be used to check the stability of the source voltage. Transient functions have two levels denoted as Level-A and Level-B, which must be in the same range. You can set the frequency as well as the duty cycle, which will affect the timing and width of each level. The slew rate determines the rate at which the level changes.

Refer to **table 6.3** to view the limitations of the transient operation.

Model		8542B	8500B	8502B	8510B	8514B
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	

Table 6.3 Transient Specifications

(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

6.2.1 Continuous Transient Mode

A continuous transient generates a respective pulse stream that toggles between two load levels. Upon receiving a trigger the load will continuously switch between the A/B levels preset as shown in **Figure 6.2.1**.

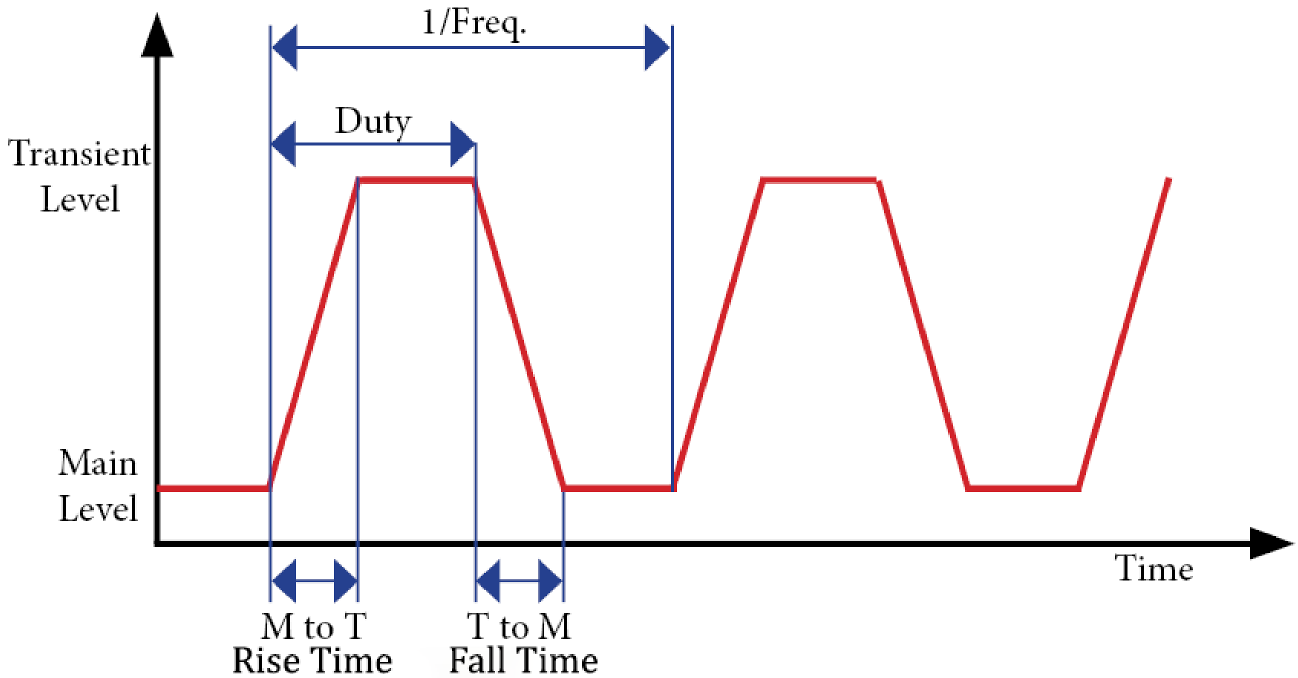


Figure 6.5 Continuous Transient Mode

Freq/Period

The period value represents the time it takes for a periodic waveform to complete one full cycle or repetition. The period is set in seconds and is inversely proportional to the frequency of the waveform.

A shorter period indicates a higher frequency and faster repetition of the waveform, while a longer period signifies a lower frequency and slower repetition.

Duty Cycle

Duty cycle value refers to the ratio of time that a periodic waveform spends in the "on" state compared to the total period of the waveform. It describes the proportion or percentage of time that a signal or pulse is active or high during each cycle.

The duty cycle is expressed as a percentage where a duty cycle of 50% means the signal is active for half of the period, and a duty cycle of 100% indicates that the signal remains active for the entire period. Conversely, a duty cycle of 0% means the signal is always inactive. The duty cycle can only be set between 01% and 99%.

A/B Level

The A/B Level refers to the two values the transient function will transition between. The values units will vary depending on the selected Load Mode.

6.2.2 Configure Continuous Transient Mode

To configure and run the Continuous Transient operation:

Step 1. Select the desired Static Mode.

Step 2. Press the Shift + Tran 2 buttons to enter the Transient Configuration menu.

Step 3. Use the right and left **navigation keys** to set **TRAN** to "ON", then press the Enter to confirm the selection.

Step 4. Use the right and left **navigation keys** to set **MODE** to "CONTINUOUS". Press the Enter to confirm the transient mode.

NOTICE **Steps 5 and 6 only apply if the static mode is set to Constant Current.**

Step 5. Use the **numeric keypad** to set **UP**. Press the Enter to confirm the current rise time.

Step 6. Use the **numeric keypad** to set **DOWN**. Press the Enter to confirm the current fall time.

Step 7. Use the **numeric keypad** to set **LEVEL A**. Press the Enter to confirm the value of level A.

Step 8. Use the **numeric keypad** to set **LEVEL B**. Press the Enter to confirm the value of level B.

Step 9. Use the **numeric keypad** to set **FREQ**. Press the Enter to confirm the frequency of the transient.

Step 10. Use the **numeric keypad** to set **DUTY**. Press the Enter to confirm the duty cycle of the transient.

Step 11. Use the right and left **navigation keys** to set **TRAN** to "ON", then press the Enter to enable configured transient.

- Upon pressing Enter the VFD will display **TRAN.** below the current reading.

Step 12. Enable the input and provide the required trigger function to start the transient operation.

- The initiation trigger required will vary based on the currently set trigger type. For additional details on the available trigger types, please refer to **section 7.5**.

6.2.3 Pulse Transient Mode

In pulse transient operation, the electronic load generates a pulse with user-defined amplitude and width when a trigger signal is received.

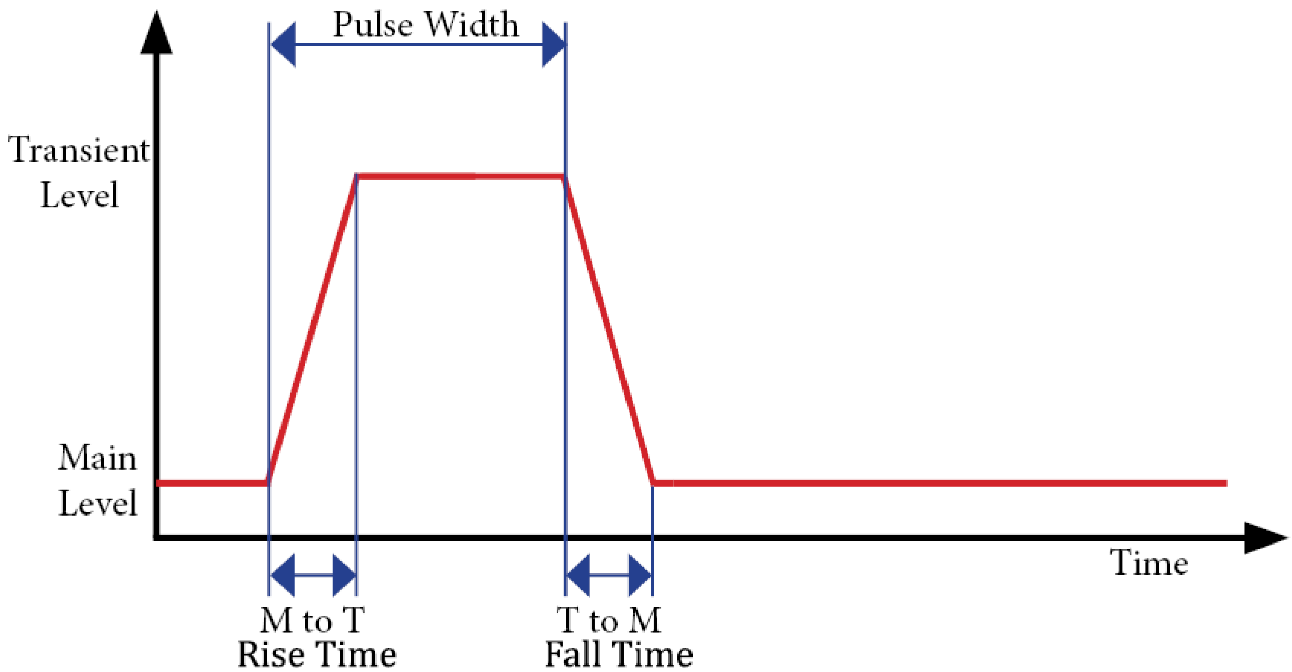


Figure 6.6 Pulse Transient Mode

Pulse Width

The pulse width value refers to the duration or length of time that a pulse remains on the specified level. Pulse width is measured is specified in ms.

A shorter pulse width corresponds to a narrower active portion of the waveform, resulting in a higher frequency and faster switching. Conversely, a longer pulse width indicates a wider active portion, resulting in a lower frequency and slower switching. By adjusting the pulse width, the duty cycle can precisely be manipulate to achieve the behavior and functionality of a transient system.

A/B Level

The A/B Level refers to the two values the transient function will transition between. The values units will vary depending on the selected Load Mode.

6.2.4 Configure Pulse Transient Mode

To configure and run the Pulse Transient operation:

Step 1. Select the desired Static Mode.

Step 2. Press the Shift + Tran 2 buttons to enter the Transient Configuration menu.

Step 3. Use the right and left **navigation keys** to set **TRAN** to "ON", then press the Enter to confirm the selection.

Step 4. Use the right and left **navigation keys** to set **MODE** to "PULSE". Press the Enter to confirm the transient mode.

NOTICE **Steps 5 and 6 only apply if the static mode is set to Constant Current.**

Step 5. Use the **numeric keypad** to set **UP**. Press the Enter to confirm the current rise time.

Step 6. Use the **numeric keypad** to set **DOWN**. Press the Enter to confirm the current fall time.

Step 7. Use the **numeric keypad** to set **LEVEL A**. Press the Enter to confirm the value of level A.

Step 8. Use the **numeric keypad** to set **LEVEL B**. Press the Enter to confirm the value of level B.

Step 9. Use the **numeric keypad** to set **WIDTH**. Press the Enter to confirm the pulse width of the transient.

Step 10. Use the right and left **navigation keys** to set **TRAN** to "ON", then press the Enter to enable configured transient.

- Upon pressing Enter the VFD will display **TRAN.** below the current reading.

Step 11. Enable the input and provide the required trigger function to start the transient operation.

- The initiation trigger required will vary based on the currently set trigger type. For additional details on the available trigger types, please refer to **section 7.5**.

6.2.5 Toggle Transient Mode

In toggle transient operation the electronic load will switch between the main level and the transient level when a trigger signal is received.

The load will remain at the transient level until another trigger is received, at which time the load will switch back from the transient level to the main level.

Both of these switches in level occur in accordance with the user specified slew rate. **Figure 6.2.5** shows the current waveform in toggle transient operation.

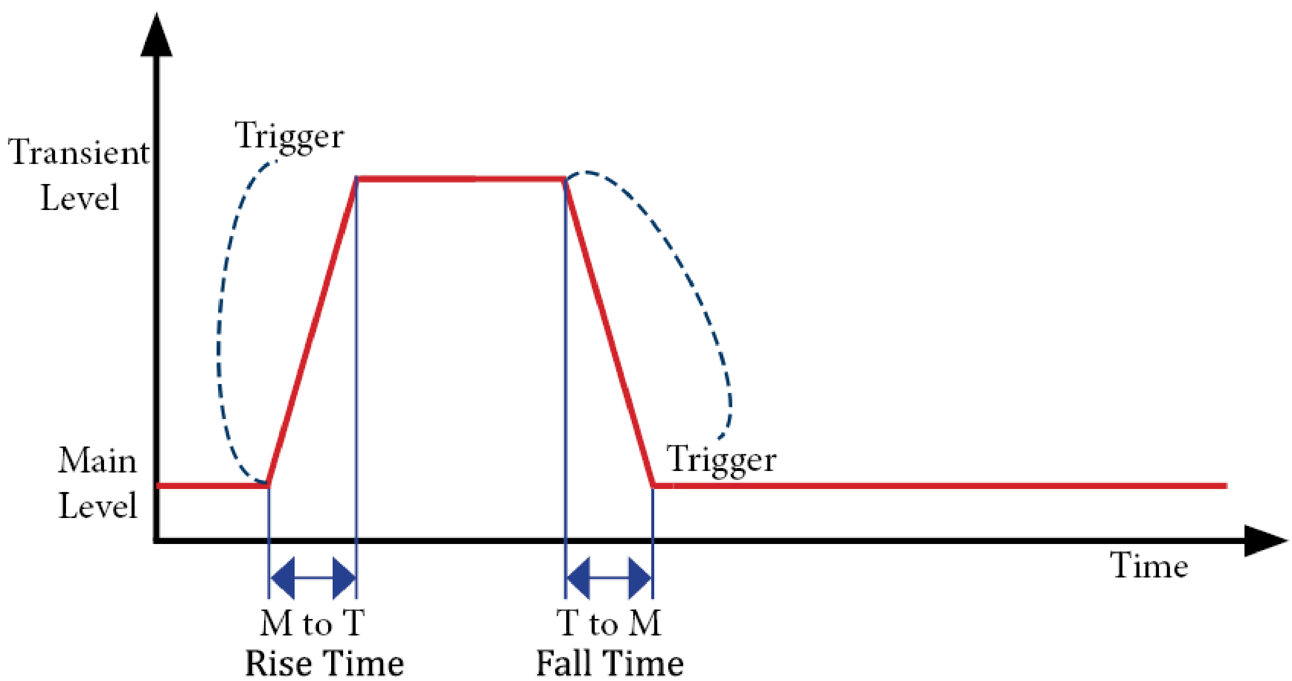


Figure 6.7 Toggle Transient Mode

A/B Level

The A/B Level refers to the two values the transient function will transition between. The values units will vary depending on the selected Load Mode.

6.2.6 Configure Toggle Transient Mode

To configure and run the Pulse Transient operation:

Step 1. Select the desired Static Mode.

Step 2. Press the Shift + Tran 2 buttons to enter the Transient Configuration menu.

Step 3. Use the right and left **navigation keys** to set **TRAN** to "ON", then press the Enter to confirm the selection.

Step 4. Use the right and left **navigation keys** to set **MODE** to "TOGGLE". Press the Enter to confirm the transient mode.

NOTICE **Steps 5 and 6 only apply if the static mode is set to Constant Current.**

Step 5. Use the **numeric keypad** to set **UP**. Press the Enter to confirm the current rise time.

Step 6. Use the **numeric keypad** to set **DOWN**. Press the Enter to confirm the current fall time.

Step 7. Use the **numeric keypad** to set **LEVEL A**. Press the Enter to confirm the value of level A.

Step 8. Use the **numeric keypad** to set **LEVEL B**. Press the Enter to confirm the value of level B.

Step 9. Use the right and left **navigation keys** to set **TRAN** to "ON", then press the Enter to enable configured transient.

– Upon pressing Enter the VFD will display **TRAN.** below the current reading.

Step 10. Enable the input and provide the required trigger function to start the transient operation.

– The initiation trigger required will vary based on the currently set trigger type. For additional details on the available trigger types, please refer to **section 7.5**.

6.3 List Mode

List mode allows users to generate complex sequences of input changes with rapid, precise timing, which may be synchronized with internal or external signals.

The internal memory has the capacity to save up to 7 list files, with each file capable of storing up to 84 steps. The width of time for each step is configurable, ranging from 20 µs to 3000 s.

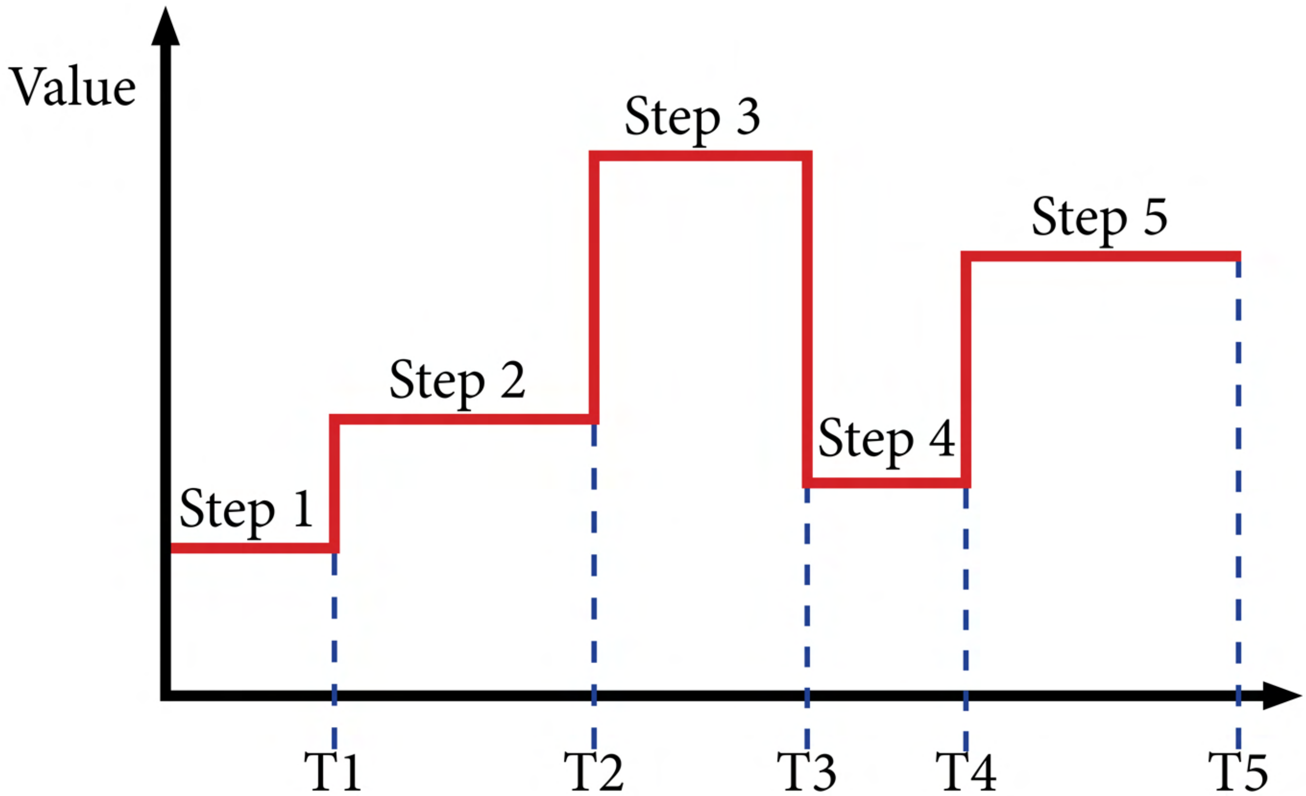


Figure 6.8 List Programmed Steps

NOTICE List mode only supports CC mode.

6.3.1 Create/Edit a List File

List mode consist of two portions **List Setup** and **List Configuration**.
To setup up list mode follow the steps below:

Step 1. Press the Shift + List 3 buttons to enter the **LIST** menu.

Step 2. Use the right and left **navigation keys** to select **EDI**, then press the Enter

NOTICE In order to edit a file List mode must be disabled.

Step 3. Use the **numeric keypad** to set the LIST RANGE. Press the Enter to confirm the list range.

Step 4. Use the **numeric keypad** to set **LIST STEP**. Press the Enter to confirm the number of step in the file.

Step 5. Use the **numeric keypad** to configure the **STEP <n>** parameters.

- Use the **numeric keypad** to set the **Sink Current**. Press the Enter to confirm the current sink value of the displayed step.
- Use the **numeric keypad** to set the **Slew Rate**. Press the Enter to confirm the current's rise and fall time of the displayed step.
- Use the **numeric keypad** to set the **Dwell time**. Press the Enter to confirm the dwell time of the displayed step.

Step 6. Repeat all step's parameters configuration for the remaining step in the file.

Step 7. Use the **numeric keypad** to set the **REPEAT**. Press the Enter to confirm the number of times the list program will repeat.

Step 8. Use the **numeric keypad** to assign a **SAVE LIST** location. Press the Enter to confirm the internal memory location where the file will be stored.

6.3.2 Run List

To run a previously saved list file:

Step 1. Press the Shift + List 3 buttons to enter the **LIST** menu.

Step 2. Use the right and left **navigation keys** to select **CALL**, then press the Enter

Step 3. Use the **numeric keypad** to set the RECALL LIST. Press the Enter to recall the specified list file.

Step 4. Use the right and left **navigation keys** to select **OFF**, then press the Enter to enable list mode.

NOTICE If the **OFF** option is not available and **ON** is displayed, list mode is already enabled

Step 5. Press the Esc to exit the **LIST** menu.

NOTICE The center of the display will now show L<n>, signaling that list mode is active, where <n> corresponds to the active list file.

Step 6. Enable the input and provide the required trigger function to run the list.

– The initiation trigger required will vary based on the currently set trigger type. For additional details on the available trigger types, please refer to **section 7.5**.

6.4 Battery Mode

The battery test function of our DC load offers comprehensive assessment capabilities for battery performance through the use of the constant current operation.

The process involves configuring the test mode and specifying discharge stop conditions. For our product line, three distinct discharge stop conditions can be set. When users require testing under fewer stop conditions, the system allows for easy adjustment of the remaining parameters. The test concludes based on predefined criteria such as discharging time, battery voltage, or capacity reaching specified values or when an insecure state is detected.

Throughout the test, crucial information including battery voltage, discharge current, discharge time, and discharged capability is prominently displayed on the visual interface for quick and insightful analysis. This battery test function ensures a thorough evaluation of battery capabilities with user-friendly customization options.

6.4.1 Battery Test Configuration

The 8550B series is capable of storing up to 10 Battery Test profiles.
To configure a battery test profile:

Step 1. Press the Shift + Batt 5 button to enter the Battery Profile menu.

Step 2. Use the **numeric keypad** to set the Range. Press the Enter to confirm the current range for the profile.

Step 3. Use the **numeric keypad** to set the **CURRENT**. Press the Enter to confirm the sink current value of the profile.

Step 4. Use the **numeric keypad** to set the **STOP VOLTAGE**. Press the Enter to confirm the voltage level that will terminate the battery test.

Step 5. Use the **numeric keypad** to set the **STOP CAP**. Press the Enter to confirm the battery capacity level that will terminate the battery test.

Step 6. Use the **numeric keypad** to set the **STOP TIMER**. Press the Enter to confirm the run time of the battery test.

NOTICE

If any of the **STOP** parameters are not desired set the predefined values **(STOP VOLT: 0V; STOP CAP: 999.999AH; STOP TIMER: 99999S)** to ignore the stop condition.

Step 7. Use the **numeric keypad** to assign a **SAVE BATT FILE** location. Press the Enter to confirm the internal memory location where the file will be stored.

6.4.2 Run Battery Test

NOTICE To run the battery test operation **RUNMODE** must be set to **BATTERY** and CC must be selected by pressing the CC button. For more information about **RUNMODE** please refer to section RUNMODE.

To run a previously saved battery test profile:

Step 1. Press the Shift + Enter buttons to enter the **RECALL** menu.

NOTICE If **RUNMODE** is not set to **BATTERY** the **RECALL** menu will not be accessible.

Step 2. Use the **numeric keypad** to set the **RECALL BATTTERY** location. Press the Enter to load the specified battery file.

Step 3. Provide the required trigger to execute the battery test.

- The initiation trigger required will vary based on the currently set trigger type. For additional details on the available trigger types, please refer to **section 7.5**.

6.5 Program Test

The Program Test feature comprises Test files, offering a broader scope than lists. These files enable the creation of test sequences, incorporating various modes, mode parameters, and durations. They prove instrumental in executing a series of tests on a device and subsequently indicating whether each test passed or failed. Up to 10 testing files, and within each file, they can define 10 steps.

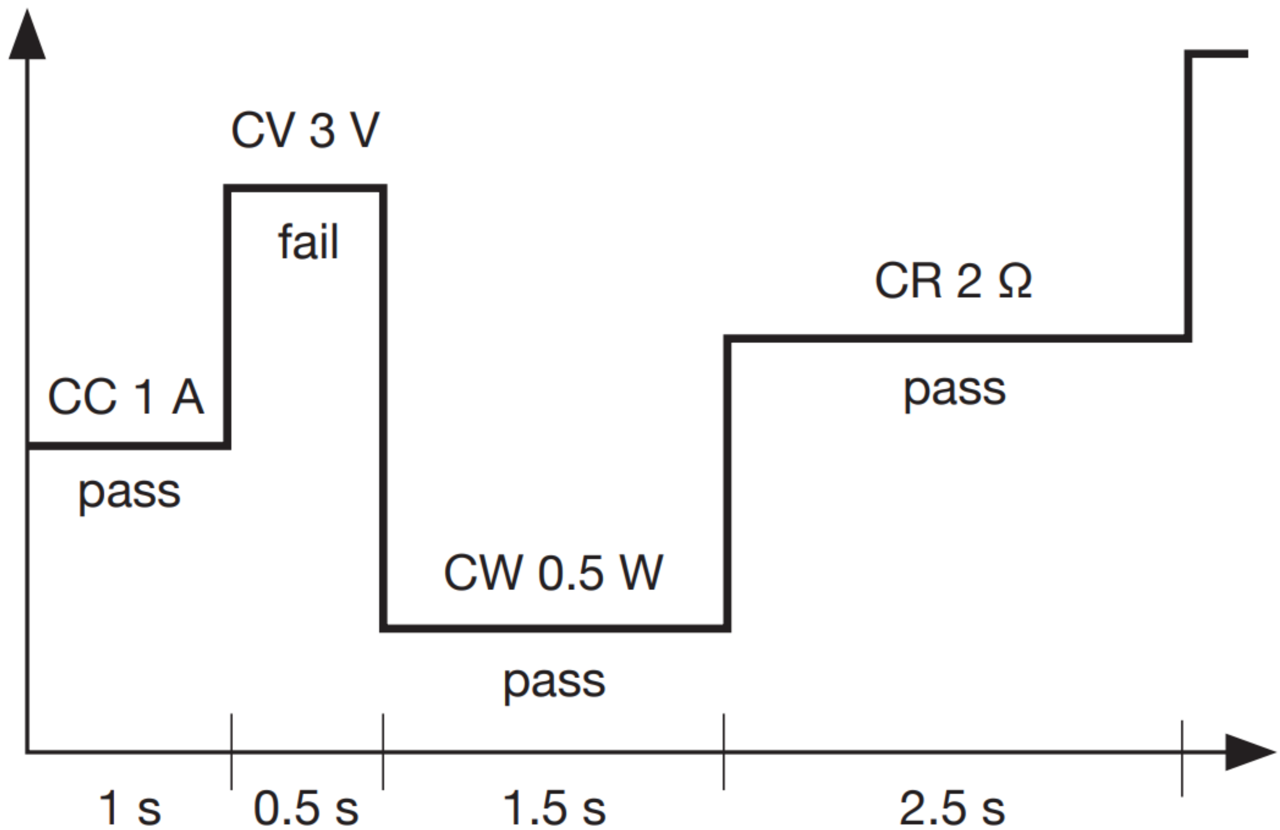


Figure 6.9 Program Test

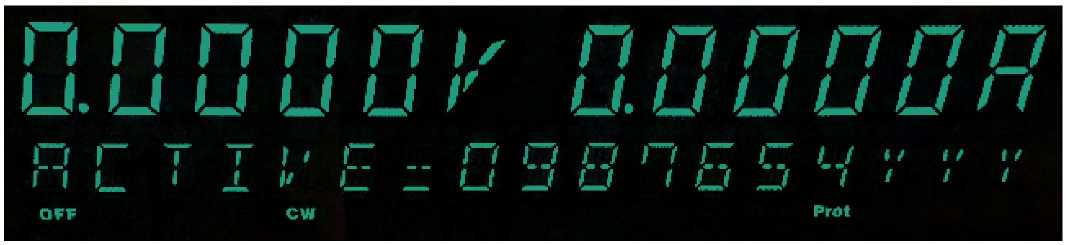
6.5.1 Program Test Configuration

The 8550B series is capable of storing up to 10 Program Test profiles.
To configure a program test file:

Step 1. Press the Shift + Prog 6 button to enter the Program Test menu.

Step 2. Use the **numeric keypad** to activate the desired steps. Press the Enter to confirm the active steps.

NOTICE



Pressing Short 1, Tran 2, List 3 will enable step 1, 2, and 3 as shown in the figure above.

Step 3. Use the **numeric keypad** to enable a pause in the selected steps. Press the Enter to confirm the active steps.

NOTICE

Pressing Short 1, Tran 2, List 3 will enable a pause for steps 1, 2, and 3 as shown in the figure above. Press the down **navigation key** to resume a paused step.

Step 4. Use the **numeric keypad** to enable the short circuit function for the selected steps. Press the Enter to confirm short function for the selected steps.

NOTICE

Pressing Tran 2 activates the short function for step 2. In the visual representation, inactive steps are denoted by N, active steps with the short function enabled are indicated by Y, and active steps with the short function disabled will display the step number, as illustrated in the figure above.

Step 5. Use the **numeric keypad** to set the parameters of each step.

- **SEQ<n> ON**: Specifies the input on time of the step. Press the Enter to confirm the value.
- **SEQ<n> OFF**: Specifies the input off time of the step. Press the Enter to confirm the value.
- **SEQ<n> P/F**: Specifies a delay time before the conditions are tested and the results are displayed. Press the Enter to confirm the value.

Step 6. Repeat Step 5 for all active steps.

Step 7. Use the **numeric keypad** to set the **Auto Start** voltage value. Press the Enter to confirm the voltage value that will automatically start the Program Test.

Step 8. Use the navigation keys to set the **STOP** condition.

- **COMP**: The program will not stop until all steps have executed.
- **FAILURE**: The program test will at the fist failure reported.
- Press the Enter to confirm the run time of the battery test.

Step 9. Use the **numeric keypad** to set the **CHAIN PROGRAM**. Press the Enter to confirm the memory location of the program file that will execute once the current program is complete.

Step 10. Use the **numeric keypad** to set the **SAVE PROGRAM** location. Press the Enter to confirm the memory location where the currently configured program will be stored.

- Upon pressing Enter the instrument will automatically exit the Program Test menu.

Step 11. Configure the operation modes, input values, and mask values for each active step.

- Press the button of the corresponding static mode that will be assigned to the step. (CC, CV, CW, or CR).
- Press the Shift + CV to enter the Setup menu.
- Use the **numeric keypad** to set the RANGE. Press the Enter to confirm the range value.
- Use the **numeric keypad** to set the **HIGH** value. Press the Enter to confirm the upper limit for the program test step.

- Use the **numeric keypad** to set the **LOW** value. Press the Enter to confirm the lower limit for the program test step.

- Use the **numeric keypad** to set the **UP** value. Press the Enter to confirm the rise time for the program test step.

- Use the **numeric keypad** to set the **DOWN** value. Press the Enter to confirm the fall time for the program test step.

- Use the **numeric keypad** to set input value for the selected static operation mode. Press the Enter to confirm.

- Press the Shift + Save 4 to enter the save menu.

  – Use the **numeric keypad** to the step value to whom the configured setup will be assigned to.

Step 12. Repeat step 11 for all remaining active steps.

6.5.2 Run a Program Test

Once you have configured the program test, proceed to follow the steps below for executing the program test.

Step 1. Press the Shift + Sys 8 to enter the System menu.

Step 2. Use the navigation keys to select the **RUNMODE** submenu. Press the Enter to enter the **RUNMODE** submenu.

Step 3. Use the navigation keys to select the **PROG_TEST** mode. Press the Enter to enable the program test mode.

- Upon enabling the program test mode the instrument will automatically exit the system menu and load the program test interface.

Step 4. Press the Shift + Enter to enter the Recall Program menu.

Step 5. Use the **numeric keypad** to select the program file that will be executed. Press the Enter to recall the selected file.

Step 6. Provide the required trigger to execute the program test.

– The initiation trigger required will vary based on the currently set trigger type. For additional details on the available trigger types, please refer to **section 7.5**.

6.6 OCP Test Mode

OCP Test Process: Once the input voltage reaches the VON point, the DC load initiates drawing current from the source after a delay time. The current value incrementally rises at regular intervals. Concurrently, the DC load assesses whether the input voltage is below the set OCP voltage. If it is, the current value is then compared to determine if it falls within the specified current range. Within this range, the OCP test will either pass or fail.

6.6.1 OCP Test Configuration

The 8550B series is capable of storing up to 5 OCP Test profiles.

NOTICE While configuring test parameters, you can use the up navigation key at any point to choose the preceding parameter for editing.

To configure an OCP test file:

Step 1. Press the Shift + CC to enter the OCP file configuration menu.

Step 2. Use the **numeric keypad** to set the **VON LEVEL**. Press the Enter to confirm the input enable threshold.

Step 3. Use the **numeric keypad** to set the **VON DELAY**. Press the Enter to confirm the delay time before the input is enabled.

Step 4. Use the **numeric keypad** to set the current **RANGE**. Press the Enter to confirm the current range.

Step 5. Use the **numeric keypad** to set the current **START** value. Press the Enter to confirm the initial sink current.

Step 6. Use the **numeric keypad** to set the current **STEP** value. Press the Enter to confirm the current increment between steps.

NOTICE The test proceeds in steps only if the measured input voltage exceeds the "OCP Voltage." Alternatively, if the input voltage is below the "OCP Voltage," the test concludes after executing the "Start Current" for the duration specified in "Step Delay."

Step 7. Use the **numeric keypad** to set the **STEP DEL**. Press the Enter to confirm the delay time to hold each step. This dictates the speed at which the test will progress through each step.

Step 8. Use the **numeric keypad** to set the current **END** value. Press the Enter to confirm the current value that will terminate the test.

Step 9. Use the **numeric keypad** to set the **OCP VOLT** value. Press the Enter to confirm the voltage stop condition.

NOTICE

This threshold serves as a benchmark for assessing Over Current Protection (OCP) conditions. Should an overcurrent situation arise with the input voltage surpassing this threshold, the test will progress incrementally from "Start Current" to "End Current." Throughout this progression, the input current, representing the overcurrent, will be scrutinized. If the current falls within the limits defined by "Max Trip Current" and "Min Trip Current," the system will register a "Pass" at the conclusion of the test. Conversely, if the current exceeds these boundaries, the system will register a "Fault."

Step 10. Use the **numeric keypad** to set the **MAX TRIP** value. Press the Enter to confirm the acceptable upper current limit .

Step 11. Use the **numeric keypad** to set the **MIN TRIP** value. Press the Enter to confirm the acceptable lower current limit .

Step 12. Use the **numeric keypad** to set the **SAVE OCP FILE** location. Press the Enter to confirm the memory location where the configured file will be stored.

- Upon pressing Enter the instrument will automatically exit the OCP Test Configuration menu.

6.6.2 Run an OCP Test

Once you have configured the OCP test, proceed to follow the steps below.

Step 1. Press the Shift + Sys 8 to enter the System menu.

Step 2. Use the navigation keys to select the **RUNMODE** submenu. Press the Enter to enter the **RUNMODE** submenu.

Step 3. Use the navigation keys to select the **OCP_TEST** mode. Press the Enter to enable the OCP test mode.

- Upon enabling the program test mode the instrument will automatically exit the system menu and load the OCP test interface.

Step 4. Press the Shift + Enter to enter the CALL OCP FILE menu.

Step 5. Use the **numeric keypad** to select the file that will be executed. Press the Enter to recall the selected file.

Step 6. Provide the required trigger to execute the OCP test.

– The initiation trigger required will vary based on the currently set trigger type. For additional details on the available trigger types, please refer to **section 7.5**.

6.7 OPP Test Mode

OPP Test Process: Once the input voltage reaches the VON point, power activation will commence following a specified delay. The power level will increment at regular intervals. Concurrently, the DC load assesses whether the input voltage falls below the designated OPP voltage. If the voltage is below the OPP threshold, the current value is then scrutinized to determine if it aligns with the predefined current range. If the current falls within this range, the OPP test results in a Pass; otherwise, it fails. Conversely, if the input voltage surpasses the OPP threshold, the power will persist within the cut-off current range. Additionally, a comparison is made between the OPP voltage and the input voltage during this process.

6.7.1 OPP Test Configuration

The 8550B series is capable of storing up to 5 OPP Test profiles.

NOTICE While configuring test parameters, you can use the up navigation key at any point to choose the preceding parameter for editing.

To configure an OPP test file:

Step 1. Press the Shift + CW to enter the OPP file configuration menu.

Step 2. Use the **numeric keypad** to set the **VON LEVEL**. Press the Enter to confirm the input enable threshold.

Step 3. Use the **numeric keypad** to set the **VON DELAY**. Press the Enter to confirm the delay time before the input is enabled.

Step 4. Use the **numeric keypad** to set the current **RANGE**. Press the Enter to confirm the current range.

Step 5. Use the **numeric keypad** to set the power **START** value. Press the Enter to confirm the initial power input.

Step 6. Use the **numeric keypad** to set the power **STEP** value. Press the Enter to confirm the power increment between steps.

NOTICE The test proceeds in steps only if the measured input voltage exceeds the "OPP Voltage." Alternatively, if the input voltage is below the "OPP Voltage," the test concludes after executing the "Start Power" for the duration specified in "Step Delay."

Step 7. Use the **numeric keypad** to set the **STEP DEL**. Press the Enter to confirm the delay time to hold each step. This dictates the speed at which the test will progress through each step.

Step 8. Use the **numeric keypad** to set the power **END** value. Press the Enter to confirm the power value that will terminate the test.

Step 9. Use the **numeric keypad** to set the **OPP VOLT** value. Press the Enter to confirm the voltage stop condition.

NOTICE

This threshold serves as a benchmark for assessing Over Power Protection (OPP) conditions. Should an overcurrent situation arise with the input voltage surpassing this threshold, the test will progress incrementally from "Start Power" to "End Power." Throughout this progression, the input current, representing the overcurrent, will be scrutinized. If the current falls within the limits defined by "Max Trip Power" and "Min Trip Power," the system will register a "Pass" at the conclusion of the test. Conversely, if the power exceeds these boundaries, the system will register a "Fault."

Step 10. Use the **numeric keypad** to set the **MAX TRIP** value. Press the Enter to confirm the acceptable upper power limit .

Step 11. Use the **numeric keypad** to set the **MIN TRIP** value. Press the Enter to confirm the acceptable lower power limit .

Step 12. Use the **numeric keypad** to set the **SAVE OPP FILE** location. Press the Enter to confirm the memory location where the configured file will be stored.

- Upon pressing Enter the instrument will automatically exit the OPP Test Configuration menu.

6.7.2 Run an OPP Test

Once you have configured the OPP test, proceed to follow the steps below.

Step 1. Press the Shift + Sys 8 to enter the System menu.

Step 2. Use the navigation keys to select the **RUNMODE** submenu. Press the Enter to enter the **RUNMODE** submenu.

Step 3. Use the navigation keys to select the **OPP_TEST** mode. Press the Enter to enable the OPP test mode.

- Upon enabling the program test mode the instrument will automatically exit the system menu and load the OPP test interface.

Step 4. Press the Shift + Enter to enter the CALL OPP FILE menu.

Step 5. Use the **numeric keypad** to select the file that will be executed. Press the Enter to recall the selected file.

Step 6. Provide the required trigger to execute the OPP test.

– The initiation trigger required will vary based on the currently set trigger type. For additional details on the available trigger types, please refer to **section 7.5**.

6.8 Current Monitoring (I Monitor)

The current monitor output, the BNC connector, outputs a scaled voltage relative to the current flowing. The relationship is $Vout = 10V * curr/max$.

For example, the 8542B maximum current is 30 A. When a current of 1 A is flowing, the current monitor output will be $10V * 130 = 333mV$.

NOTICE The output accuracy is approximate. Verify the scaling relationship for each unit.

6.9 LED Test Mode

The Constant Resistance LED mode approximates a diode characteristic by configuring two main parameters: the overall resistance and the diode threshold voltage (Vd). When the input voltage surpasses the threshold (Vd), the load's resistance decreases.

For instance, by setting Vd to 1.6 V, R to 0.1, and connecting to a current-limited power supply with voltage limit set to 5 V and current limit to 300 mA, activating the input results in an input voltage of approximately 1.6 V and a current of 300 mA. This corresponds to a resistance of 16 Ohms, significantly higher than the set value of 0.1 Ohms (refer to **table 6.4**).

Similar to the Constant Resistance (CR) mode, a resistance value is established to determine the slope of the diode characteristic. For example, with a 3 V VD, 0.1 Ohms, and 1.38 A, the calculation yields 3 + $0.1\Omega * 1.38 = 3.18$.

Voltage	Current	Equivalent Load Resistance
1.00	0	infinite
1.58	15 mA	105 Ohms
1.62	215 mA	7.5 Ohms
1.63	300 mA	5.4 Ohms
1.69	1 A (limit changed)	1.7 Ohms

Table 6.4 LED Mode Example

6.9.1 Configure LED Mode

NOTICE Similar to CR Mode, the control system speed can make load switching power supplies problematic.

To configure the LED test:

Step 1. Press the Shift + CR to enter the LED State configuration menu.

Step 2. Use the navigation keys to select the **ON** option. Press the Enter to enable the LED test.

Step 3. Use the **numeric keypad** to set the **Vd**. Press the Enter to confirm the VD threshold.

System Menu

7.1 Navigating the System Menu

To effectively navigate the menu and optimize your experience with the instrument, familiarize yourself with its menu structure and understand how to view or modify settings and parameters. Follow these steps for seamless navigation:

Step 1. Begin by accessing the System menu by pressing the Shift + Sys 8.

Step 2. Once in the system menu, the selected submenu will start blinking. Utilize the left **(**←**)** and right **(**→**)** arrow keys to smoothly navigate through the submenu selections.

Step 3. When the desired submenu section is actively blinking, press the Enter button to access its specific submenu settings.

7.2 POWER-ON

The Power-On option facilitates the customization of the instrument's startup behavior, catering to specific needs and preferences. This functionality enables swift deployment of a saved configuration or the default configuration of all parameters during startup.

RST All instrument settings will be set to factory default at power on.

SAV 0 The settings saved to address 0 will be restored at power on.

NOTICE To save the set settings press the Shift + Save 4 and select address 0, then press the Enter. The input state cannot be saved. The input will always power on in the off state.

7.3 BUZZER

The buzzer setting allows the user to disable/enable the buzzer beep when a key is pressed.

ON Disables the key press beep.

NOTICE Disabling the buzzer will not disable any audible warnings only key press beeps.

OFF Enables the key press beep.

7.4 Knob

The knob setting allows the user to configure the auto save of parameter's adjustment when the rotary knob is used.

UPDATE The adjusted value using the knob during operation will be retained/saved even after the load is turned off. For instance, if the DC load is initially set to 1 A, and then increased to 2 A using the knob, the modified setting will persist even after turning off the load, once powered again, the setting value will remain at 2 A.

OLD The adjusted value using the knob during operation will be automatically saved. To save the adjusted value the Enter button must be pressed after completing the value adjustment.

For instance, if the DC load is initially set to 1 A, and then increased to 2 A using the knob, the modified setting will overwritten after turning off the load/input, once powered again, the setting value will recall the previous 1 A value. If the Enter button is pressed after adjusting the current value to 2 A, the current will remain at 2 A after turning of the load/input.

7.5 TRIGGER

The trigger setting for configuration of the trigger source. There are four trigger sources available.

MANUAL The trigger signal is manually provided by pressing the Shift + Trig buttons.

EXTERNAL The trigger signal is externally supplied via a TTL high signal at the trigger connector located on the rear panel.

BUS The trigger signal is supplied via a serial bus command. (5AH for the frame protocol or *TRIG for the SCPI protocol)

HOLD The trigger signal is supplied via a serial bus command. (FRAME protocol only 9DH)

7.6 MEMORY

The instrument has the capability to store up to 100 settings in its non-volatile memory. This memory is organized into 10 storage groups (group 0 to 9), with each group having 10 memory locations (0 to 9) for storing settings. These locations are referenced by numbers 1 to 100. When saving a setting, numbers 1 to 100 are selected. However, during the recall process, the user must first choose the group and then use the numeric keypad buttons 1 through 9 and 0, corresponding to the 10 locations within the selected storage group.

In recalling settings, each numeric keypad number corresponds to a memory location based on the chosen storage group. For instance, for storage group 0, recalling memory location 1 is done by pressing Short 1, location 2 by pressing Tran 2, and so forth. Memory location 10 is recalled by pressing Pause 0. Similarly, for storage group 1, recalling memory location 11 is achieved by pressing Short 1, location 12 by pressing Tran 2, and so on.

Example If settings are saved to memory location 60 and the user wishes to recall them, they would set the storage group to 5 from the **MEMORY GROUP** submenu, then press the Shift + Enter buttons to enter the recall menu, and select address 0 by pressing the Pause 0 button.

Storage Group	Memory locations
0	1 – 10
1	11 – 20
2	21 – 30
3	31 – 40
4	41 – 50
5	51 – 60
6	61 – 70
7	71 – 80
8	81 – 90
9	91 - 100

Table 7.1 Memory Locations

7.7 DISPLAY

The instrument features an internal timer that monitors the duration of the enabled (ON) input.

ON Enables the timer.

NOTICE The timer will replace the input measurement shown on the display below the voltage measurement.

Figure 7.1 Timer Disabled

OFF Disables the timer.

7.8 RS-232

Configures the RS 232 interface settings.
The following settings are supported:

- **4800_8N 1** : baud rate 4800, data bit 8, none parity, stop bit 1
- **9600_8N 1** : baud rate 9600, data bit 8, none parity, stop bit 1
- **19200_8N 1** : baud rate 19200, data bit 8, none parity, stop bit 1
- **38400_8N 1** : baud rate 38400, data bit 8, none parity, stop bit 1

7.9 PROTOCOL

Configures the protocol used to remotely control the instrument.

FRAME The DC Load is programmed using packets of bytes. A packet always contains 26 bytes, either going to or coming from the instrument. The basic programming rule is: You send a 26 byte packet to the instrument. You then read a 26 byte packet back from the DC Load to either get the status of your submitted packet, or get the data you requested.

SCPI SCPI is an ASCII language that consists of configuration and query commands that are specific to the instrument and a set of IEEE 488.2 operations and commands that are common to all SCPI-based instruments. SCPI commands have long and short forms, where the long form is very descriptive, and the short form is an abbreviation.

7.10 ADDRESS

Sets the instrument's communication address (0-31).

NOTICE For successful communication, it is essential that the communication address in the DC load aligns with the computer software; otherwise, communication will not be established.

7.11 RUNMODE

Sets the instruments operation mode. The instrument supports 5 modes:

- **NORMAL**
- **BATTEI**
- **PROG TEST**
- **OCP TEST**
- **OPP TEST**

NOTICE To access additional details about each mode, click on the respective mode.

7.12 DEFAULT

Returns all instrument settings to their factory default values. The default values are shown in **table 7.2**

Parameter	Default
Communication	RS232 (4800, 8, N, 1, NONE)
Display On Timer	Off
Trigger Source	Manual
Protocol	SCPI
Von	Latch
A-Limit	Off
Memory Group	0
Power-On	RST
Buzzer	On
Load On Knob	Update
On Timer	Off
Voltage Auto Range	On
Averaging Filter	2^{14}
Remote Sense	Off
External Program	Off

Table 7.2 Default Settings

Configuration Menu

8.1 Navigating the Configuration Menu

To effectively navigate the menu and optimize your experience with the instrument, familiarize yourself with its menu structure and understand how to view or modify settings and parameters. Follow these steps for seamless navigation:

Step 1. Begin by accessing the Configuration menu by pressing the Shift + Sys (8).

Step 2. Once in the system menu, the selected submenu will start blinking. Utilize the left **(←)** and right **(→)** arrow keys to smoothly navigate through the submenu selections.

Step 3. When the desired submenu section is actively blinking, press the Enter button to access its specific submenu settings.

8.2 Protect

The PROTECTION settings are configurable parameters and safeguards designed to prevent damage to the load itself or the connected power source in the event of excessive current or power levels. These settings play a critical role in ensuring the safe and reliable operation of the load and the equipment under test.

Model		8542B	8500B	8502B	8510B	8514B
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)

Table 8.1 Protection Ranges

8.2.1 MAX-P

Max power limits the power dissipation within the load. By defining a maximum power threshold, the load will limit the current value it draws despite the program CC, CV, CW, or CR value.

Example For example, if MAX P is configured for 5 W, the CC value is set to 1 A, and the source provides 6 V, the load will only draw 830 mA to prevent the wattage from exceeding 5 W.

8.2.2 A-LIMIT

A-Limit limits the maximum current that can flow through the load. When the current exceeds the set threshold, the load shuts down to prevent damage to the load or the power source. OCP is crucial for preventing excessive current that could lead to overheating, component failure, or unsafe conditions.

A delay can be introduced to extend the time between crossing the current threshold and the subsequent disabling of the input.

NOTICE

When Overcurrent Protection (OCP) is triggered, the input will be temporarily disabled. Once the OCP is cleared, the input will automatically re-enable. It is crucial to adjust the power source before clearing OCP to prevent its reactivation.

8.2.3 P-LIMIT

The P-Limit function constrains the maximum power dissipation of the load. If the power surpasses the defined threshold, the load initiates a shutdown to safeguard against potential damage to both the load and the power source. OPP (Over Power Protection) is essential for averting excessive power, which could otherwise result in overheating, component failure, or unsafe operating conditions.

A delay can be introduced to extend the time between crossing the current threshold and the subsequent disabling of the input.

NOTICE

When Overpower Protection (OPP) is triggered, the input will be temporarily disabled. Once the OPP is cleared, the input will automatically re-enable. It is crucial to adjust the power source before clearing OPP to prevent its reactivation.

8.2.4 TIMER

The timer setting empowers users to establish a precise duration or time limit for the load operation. This functionality facilitates automated control over the load's on/off cycles, offering convenient timing capabilities for both testing and operational applications.

By utilizing the timer setting, users can precisely define the duration of the load operation in seconds. When the predetermined time limit is reached, the load can automatically switch off, concluding the intended testing cycle. This feature proves especially valuable in scenarios such as endurance tests, assessing battery life, or conducting evaluations based on time constraints.

8.3 MEASURE

The MEASURE settings comprise parameters specifically crafted to customize the process of capturing voltage measurements. These settings encompass the voltage range, filter count, and voltage thresholds for calculation of the voltage rise/fall time.

8.3.1 V-RANGE

The V-RANGE parameter enables/disables the auto voltage range function on a DC load. When enabled the load will automatically adjusts the voltage range based on the applied load, ensuring optimal and precise voltage measurements without manual intervention.

8.3.2 FILTER

Configures the measurement averaging filter. Elevating the averaging results in more precise readings, albeit with a slower measurement update rate. Conversely, reducing the averaging leads to a faster measurement update rate, albeit with less accuracy in the readings.

8.3.3 TIME-V1

Sets the start voltage threshold, determining the voltage level from which the timer for slew rate calculation initiates.

8.3.4 TIME-V2

Sets the end voltage threshold, determining the voltage level from which the timer for slew rate calculation terminates.

8.4 Sense

Enables/Disables the sense function. For more information regarding this function refer to **Local/Remote Sense**.

8.5 VON

VON safeguards an electronic system under test, preventing power application unless the supply voltage surpasses a specific threshold. It is crucial not to arbitrarily set this value if there is no specific testing requirement. In cases where the instrument is unable to function normally, such as when setting CC=1 A and the current remains at 0 A after turning on the input, it is advisable to check the VON set initially. If the VON set is not configured at 0 V, it should be modified accordingly.

8.5.1 LIVING

In Living mode, the DC load requires the applied power to bring the voltage above the VON setting before drawing current from the source. If the voltage on the load's terminals falls below the VON setting, the load will deactivate the input.

8.5.2 LATCH

In Latch mode, similar to the previous behavior, the load activates only when the voltage surpasses the VON setting. However, once turned on, it will remain active even if the voltage subsequently drops to zero.

8.6 RESET

Sets all the parameters in the configuration menu back to the factory default values.

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	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		±(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)

<table>
<tr><th colspan="2">Model</th><th>8542B</th><th>8500B</th><th>8502B</th><th>8510B</th><th>8514B</th></tr>
<tr><td colspan="7">Readback voltage</td></tr>
<tr><td rowspan="2">Range</td><td>Low</td><td colspan="2">0 to 18 V</td><td>0 to 50 V</td><td colspan="2">0 to 18 V</td></tr>
<tr><td>High</td><td colspan="2">0 to 150 V</td><td>0 to 500 V</td><td colspan="2">0 to 120 V</td></tr>
<tr><td rowspan="2">Resolution</td><td>Low</td><td colspan="2">0.1 mV</td><td>1 mV</td><td colspan="2">0.1 mV</td></tr>
<tr><td>High</td><td colspan="2">1 mV</td><td>10 mV</td><td colspan="2">1 mV</td></tr>
<tr><td colspan="2">Accuracy</td><td colspan="5">±(0.05% + 0.05% FS)</td></tr>
<tr><td colspan="7">Readback current</td></tr>
<tr><td rowspan="2">Range</td><td>Low</td><td colspan="2">0 to 3 A</td><td>0 to 3 A</td><td>0 to 12 A</td><td>0 to 24 A</td></tr>
<tr><td>High</td><td colspan="2">0 to 30 A</td><td>0 to 15 A</td><td>0 to 120 A</td><td>0 to 240 A</td></tr>
<tr><td rowspan="2">Resolution</td><td>Low</td><td colspan="3">0.1 mA</td><td colspan="2">1 mA</td></tr>
<tr><td>High</td><td colspan="3">1 mA</td><td colspan="2">10 mA</td></tr>
<tr><td colspan="2">Accuracy</td><td colspan="5">±(0.05% + 0.05% FS)</td></tr>
<tr><td colspan="7">Readback power</td></tr>
<tr><td colspan="2">Range</td><td>150 W</td><td>300 W</td><td>300 W</td><td>600 W</td><td>1500 W</td></tr>
<tr><td colspan="2">Resolution</td><td colspan="5">10 mW</td></tr>
<tr><td colspan="2">Accuracy</td><td colspan="3">±(0.1% + 0.1% FS)</td><td colspan="2">±(0.2% + 0.2% FS)</td></tr>
<tr><td colspan="7">Protection range (typical)</td></tr>
<tr><td colspan="2">OPP</td><td>160 W</td><td>320 W</td><td>320 W</td><td>620 W</td><td>1550 W</td></tr>
<tr><td rowspan="2">OCP</td><td>Low</td><td colspan="2">3.3 A</td><td>3.3 A</td><td>13 A</td><td>26.7 A</td></tr>
<tr><td>High</td><td colspan="2">33 A</td><td>16 A</td><td>130 A</td><td>267 A</td></tr>
<tr><td colspan="2">OVP</td><td colspan="2">160 V</td><td>530 V</td><td>125 V</td><td>125 V</td></tr>
<tr><td colspan="2">OTP</td><td colspan="3">185 °F (85 °C)</td><td>203 °F (95 °C)</td><td>185 °F (85 °C)</td></tr>
<tr><td colspan="7">Short circuit (typical)</td></tr>
<tr><td rowspan="2">Current (CC)</td><td>Low</td><td>3.3 A</td><td>3.3 A</td><td>3.3 A</td><td>13 A</td><td>26.7 A</td></tr>
<tr><td>High</td><td>33 A</td><td>33 A</td><td>16 A</td><td>130 A</td><td>267 A</td></tr>
<tr><td colspan="2">Voltage (CV)</td><td colspan="5">0 V</td></tr>
<tr><td colspan="2">Resistance (CR)</td><td>80 mΩ</td><td>40 mΩ</td><td>180 mΩ</td><td>15 mΩ</td><td>8 mΩ</td></tr>
<tr><td colspan="7">General</td></tr>
<tr><td colspan="2">Input terminal impedance (typical)</td><td colspan="2">150 kΩ</td><td>1 MΩ</td><td colspan="2">150 kΩ</td></tr>
<tr><td colspan="2">AC input</td><td colspan="5">110 V/220 V ±10%, 50/60 Hz</td></tr>
<tr><td colspan="2">I/O Interface</td><td colspan="4">DB9 (TTL) with TTL to USB serial adapter</td><td>USB, RS232</td></tr>
<tr><td rowspan="2">Temperature</td><td>Operating</td><td colspan="5">32 °F to 104 °F (0 °C to 40 °C)</td></tr>
<tr><td>Storage</td><td colspan="5">14 °F to 140 °F (-10 °C to 60 °C)</td></tr>
<tr><td colspan="2">Humidity</td><td colspan="5">Indoor use, ≤ 95 %</td></tr>
<tr><td colspan="2">Safety</td><td colspan="5">EN 61010-1:2010, Low Voltage Directive (LVD) 2014/35/EU</td></tr>
<tr><td colspan="2">Electromagnetic compatibility</td><td colspan="5">EN61326-1:2013, CISPR 11, EN 61000-3-2:2014, EN61000-3-3:2013, EMC Directive 2014/30/EU</td></tr>
<tr><td colspan="2">Dimensions (W x H x D)</td><td colspan="3">8.5" x 3.5" x 14" (214.5 x 88.2 x 354.6 mm)</td><td>8.5" x 3.5" x 18.5"
(214.5 x 88.2 x 470 mm)</td><td>17.2" x 3.5" x 18.5"
(436.5 x 88.2 x 470 mm)</td></tr>
<tr><td colspan="2">Weight</td><td colspan="3">10.3 lbs (4.7 kg)</td><td>15.8 lbs (7.2 kg)</td><td>45 lbs (20.5 kg)</td></tr>
<tr><td colspan="2">Warranty</td><td colspan="5">3 years</td></tr>
<tr><td colspan="2">Standard accessories</td><td colspan="5">Power cord, USB cable, certificate of calibration, USB to TTL serial converter IT-E132B(3), rack-mount ears(4)</td></tr>
<tr><td colspan="2">Optional accessories</td><td colspan="5">TLPWR1 high current test leads, IT-E151 rackmount kit</td></tr>
</table>

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

Service Information

Warranty Service: Please go to the support and service section on our website at bkprecision.com to obtain an RMA #. Return the product in the original packaging with proof of purchase to the address below. Clearly state on the RMA the performance problem and return any leads, probes, connectors and accessories that you are using with the device.

Non-Warranty Service: Please go to the support and service section on our website at bkprecision.com to obtain an RMA #. Return the product in the original packaging to the address below. Clearly state on the RMA the performance problem and return any leads, probes, connectors and accessories that you are using with the device. Customers not on an open account must include payment in the form of a money order or credit card. For the most current repair charges please refer to the service and support section on our website.

Return all merchandise to B&K Precision Corp. with prepaid shipping. The flat-rate repair charge for Non-Warranty Service does not include return shipping. Return shipping to locations in North America is included for Warranty Service. For overnight shipments and non-North American shipping fees please contact B&K Precision Corp.

Include with the returned instrument your complete return shipping address, contact name, phone number and description of problem.

B&K Precision Corp.
22820 Savi Ranch Parkway
Yorba Linda, CA 92887
bkprecision.com
714-921-9095

LIMITED THREE-YEAR WARRANTY

B&K Precision Corp. warrants to the original purchaser that its products and the component parts thereof, will be free from defects in workmanship and materials for a period of **three years** from date of purchase.
B&K Precision Corp. will, without charge, repair or replace, at its option, defective product or component parts. Returned product must be accompanied by proof of the purchase date in the form of a sales receipt.
To help us better serve you, please complete the warranty registration for your new instrument via our website www.bkprecision.com

Exclusions: This warranty does not apply in the event of misuse or abuse of the product or as a result of unauthorized alterations or repairs. The warranty is void if the serial number is altered, defaced or removed.

B&K Precision Corp. shall not be liable for any consequential damages, including without limitation damages resulting from loss of use. Some states do not allow limitations of incidental or consequential damages. So the above limitation or exclusion may not apply to you.
This warranty gives you specific rights and you may have other rights, which vary from state-to-state.

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