User Manual

9810 Series
Programmable AC Power Sources

bkprecision.com

BK PRECISION

Contents

Compliance Information

1.1 EMC

1.1.1 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 61000-3-2: 2006 Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current <= 16 A per phase)

EN 61000-3-3: 1995+A1: 2001+A2: 2005 Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection

EN 61000-4-2 / -3 / -4 / -5 / -6 / -11 Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques:

- Electrostatic discharge immunity test
- Radiated, radio-frequency, electromagnetic field immunity test
- Electrical fast transient/burst immunity test
- Surge immunity test
- Immunity to conducted disturbances, induced by radio-frequency fields
- Voltage dips, short interruptions and voltage variations immunity tests

EN 61326-1: 2006 Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

1.2 Safety

1.2.1 EC Declaration of Conformity - Low Voltage

Compliance was demonstrated to the following specification as listed in the Official Journal of the European Communities: Low Voltage Directive: 2006/95/EC.

EN61010-1: 2001 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements

1.3 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.

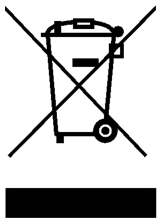
Mains Isolated: is for measurements performed on circuits not directly connected to a mains supply.

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.

1.4 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.

1.5 Terms and Symbols

1.5.1 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

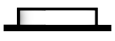
A note statement calls attention to an operating procedure, practice, or condition, which, should be noted before proceeding.

1.5.2 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:

1. Read and understand the safety and operational information in this manual.
2. Apply all the listed safety precautions.
3. 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.
4. Make all connections to the instrument before applying power.
5. 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.

2.1 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.

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

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.

2.2 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.

2.3 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.

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.**

WARNING

- **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.**

2.4 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.

2.5 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.

2.6 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.

2.7 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.**

2.8 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.

2.9 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.

Introduction

3.1 Overview

The 9810 Series programmable AC power sources provide high performance and low total harmonic distortion in a compact 2U form factor. Utilizing a linear amplifier design, these sources deliver high accuracy and stability, making them ideal for evaluating transformers, TRIACs, SCRs, and passive components.

The series features a clear **4.3" color LCD (480 x 272 dots)** for displaying measurements and settings. It includes a built-in power meter capable of measuring voltage (Vrms, Vdc, Vpk), current (Irms, Idc, Ipk), power (Watts, VA, VAR), power factor, and frequency.

Beyond standard power generation, the 9810 Series offers advanced simulation capabilities. The **Power Line Disturbance (PLD)** function simulates voltage sags, surges, drops, and frequency variations. The **Sweep** function allows for continuous voltage and frequency sweeping, while the **Dimmer** function varies the phase angle from 0 to 360 degrees. Standard USB (VCOM/Host), RS232, and LAN interfaces provide flexibility for remote control and system integration.

3.2 Features

- Linear amplifier design for low noise and high stability.
- 4.3" color LCD display (480 x 272 resolution).
- High precision measurements for Vrms, Irms, Vdc, Idc, Power, PF, Frequency, and Peak Voltage/Current.
- Low Total Harmonic Distortion (THD) < 0.3% at 50/60 Hz.
- **PLD Simulation**: List mode for simulating power line disturbances.
- **Dimmer Function**: Adjustable phase angle control (0~360°).
- **Sweep Function**: Voltage and frequency sweep capability.
- **Memory Capacity**:
  - Manual Mode: 50 configurations.
  - Program Mode: 50 programs (9 steps per program).
- Standard USB (VCOM/Host), RS232, and LAN interfaces.
- Comprehensive protection: Low Voltage (LVP), Over Voltage (OVP), Over Current (OCP), Over Power (OPP), and Over Temperature (OTP).

3.3 Model Description

The 9810 Series includes the following models with varying power capacities and AC input requirements.

Model	Capacity	AC Input	Max Output Current
9812	600 VA	115 VAC ± 15% (47~63 Hz)	6.0 A (0~150V) / 3.0 A (0~300V)
9812-220V	600 VA	230 VAC ± 15% (47~63 Hz)	6.0 A (0~150V) / 3.0 A (0~300V)
9814-220V	1200 VA	230 VAC ± 15% (47~63 Hz)	12.0 A (0~150V) / 6.0 A (0~300V)

Table 3.1 9810 Series Models

NOTICE **All models support Single Phase AC input.**

3.4 Package 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 power supply is shipped with the following contents:

- 1 x 9810 Series AC Power Source
- 1 x Power Cord
- 1 x Certificate of Calibration

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

3.5 Dimensions

The 9810 Series features a uniform form factor across all models.

Model	Dimensions (W x H x D)	Weight
9812	430 x 88 x 600 mm (16.9" x 3.5" x 23.6")	30 kg (66 lbs)
9812-220V	430 x 88 x 600 mm (16.9" x 3.5" x 23.6")	30 kg (66 lbs)
9814-220V	430 x 88 x 600 mm (16.9" x 3.5" x 23.6")	40 kg (88 lbs)

Table 3.2 Dimensions and Weight

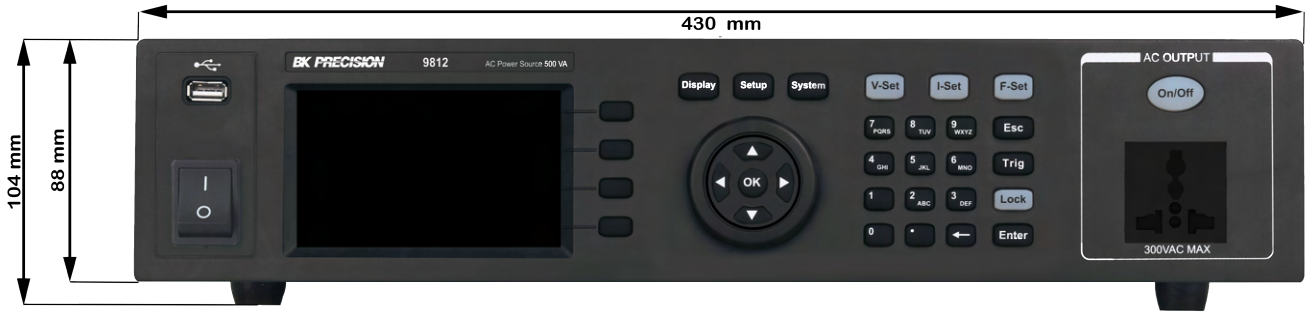


Figure 3.1 9810 Series Dimensions

3.6 Front Panel Overview

Figure 3.2 Front Panel Overview

Item	Name	Description
1	Power Switch	Turns the instrument ON or OFF.
2	LCD Display	4.3" Color LCD showing measurement results and settings.
3	Numeric Keypad	Used to enter specific values for parameters.
4	Function Keys	Keys for selecting measurement modes and system settings.
5	Rotary Knob	Used to navigate menus and adjust values.
6	Output Terminals	Universal output socket for connecting the DUT .
7	Output Button	Enables or disables the AC output.
8	Cursor Keys	Used to move the cursor position for parameter editing.

Table 3.3 Front Panel Overview

3.7 Rear Panel Overview

Figure 3.3 Rear Panel Overview

Item	Name	Description
1	AC Input	AC power input socket with fuse holder.
2	RS232 Interface	Serial communication port for remote control.
3	USB Interface	USB-VCOM/TMC interface for remote control.
4	LAN Interface	Ethernet interface for remote control.
5	Rear Output	Rear panel output terminal block (Parallel with front output).
6	Cooling Fan	Fan exhaust vent. Do not block.
7	Sync Output	BNC connector for synchronization signal output.

Table 3.4 Rear Panel Overview

Front Panel Operation

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

4.1 Function Keys

The function keys provide quick access to the main operational modes of the instrument.

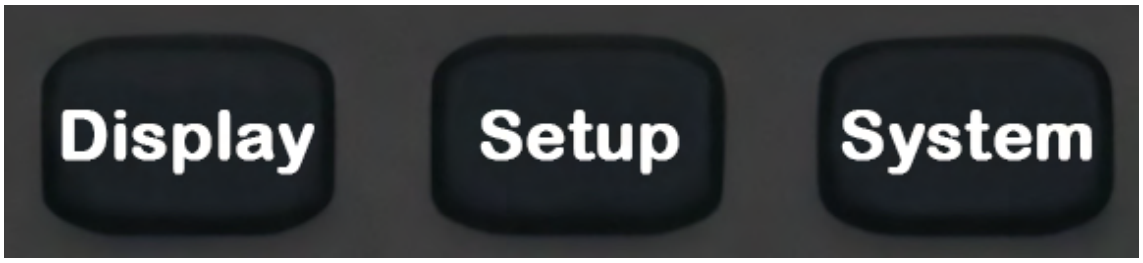


Figure 4.1 Function Keys

4.1.1 Display

Description: Returns to the main measurement view from any menu.

4.1.2 Setup

Description: Accesses the operation mode configuration (Manual, Program) and output parameters.

4.1.3 System

Description: Accesses system-level settings, communication configuration, and file management.

4.2 Set Keys

The **Set keys** allow for immediate editing of the most common output parameters without navigating through menus.

Figure 4.2 Parameter Set Keys

4.2.1 V-Set

Description: Directly accesses the Voltage setting field. Use the numeric keypad to enter a new voltage value.

4.2.2 I-Set

Description: Directly accesses the Current Limit setting field.

4.2.3 F-Set

Description: Directly accesses the Frequency setting field.

4.3 Softkeys

Softkeys are the vertical buttons located to the right of the LCD screen. Their functions change dynamically based on the current menu displayed.

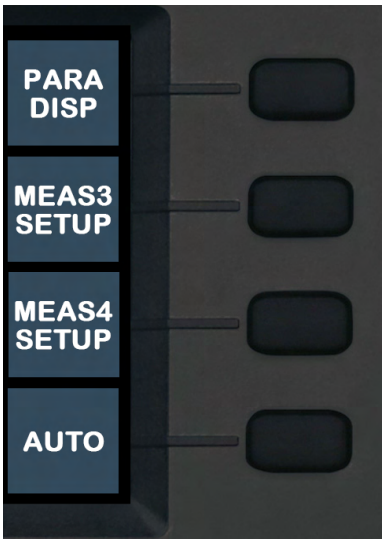


Figure 4.3 Softkeys

Step 1. Look at the text displayed on the screen immediately to the left of the softkey.

Step 2. Press the corresponding softkey to select that function or toggle the setting.

4.4 Control Keys

Control keys perform specific operational actions, such as triggering events, locking the interface, or confirming inputs.

Figure 4.4 Control Keys

4.4.1 Esc

Description: Exits the currently selected parameter or menu. If editing a value, pressing **Esc** cancels the changes and restores the previous value.

4.4.2 Trig

Description: Manually initiates a trigger event when the trigger source is set to Manual (e.g., for PLD or Sweep functions).

4.4.3 Lock

Description: Locks the front panel keys to prevent accidental changes.

- When locked, only the **On/Off** and **Lock** keys remain active.
- Press **Lock** again to unlock the front panel.

4.4.4 Enter

Description: Confirms the set parameter value or selects the highlighted menu item.

4.5 Numeric Keys

The numeric keypad allows for fast and precise entry of parameter values.

Figure 4.5 Numeric Keypad

Step 1. Select a parameter (e.g., press **V-Set**).

Step 2. Use the number keys (0-9) and decimal point (.) to enter the value.

Step 3. Press **Enter** to confirm and apply the value.

Step 4. Press **Esc** to clear an entry or cancel editing.

4.6 Navigation and Rotary Knob

Figure 4.6 Rotary Knob and Arrow Keys

4.6.1 Rotary Knob

Description:

- **Rotate:** Navigates through menu lists or increases/decreases a selected parameter value.
- **Press (OK):** Acts as an Enter key to select items or confirm values.

4.6.2 Arrow Keys

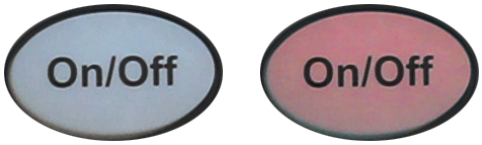
Description:

- **Left/Right:** Moves the cursor position when editing a parameter, allowing for coarse or fine adjustment.
- **Up/Down:** Navigates through menu items.

4.7 Output Control

The **On/Off** button controls the AC output state of the instrument.

- Press **On/Off** to enable the output. The button will light up (Green/Red depending on model) and the screen will display **OUTPUT ON**.
- Press **On/Off** again to disable the output. The light will turn off.



Output OFF (Unlit)

Output ON (Lit)

Figure 4.7 Output On/Off Button

Basic Operations and Description

This chapter mainly describes the operation of the setting parameters under the <Measurement Display> page, the description and operation of the soft key area buttons, and the description of the status area. It also covers the setting parameters under the <Manual mode> and <Programmable mode> pages, parameters under the <System setting> page, and file management operations.

5.1 Measurement Display

Press the DISP menu button. When the test mode is set to manual mode, the <Measurement Display> page appears as shown below:

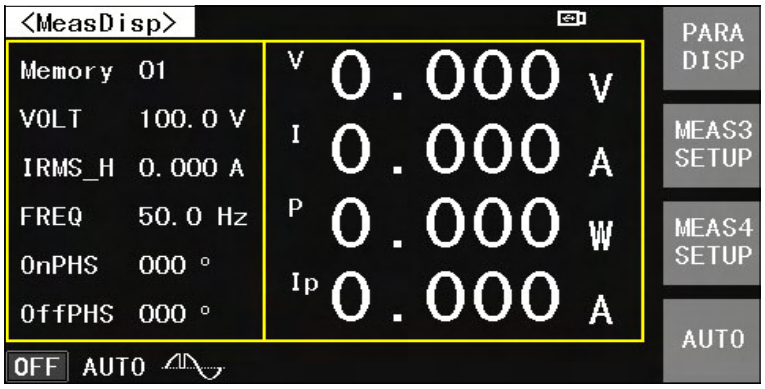


Figure 5.1 Measurement Display (Programmable)

5.1.1 Parameter setting description and operation

Parameter	Description	Operation
Memory	In manual mode, indicates memory group (1-50). In programmable mode, indicates memory group (1-50) and step (1-9). (*) indicates step connection is ON.	Press arrow keys to select. Change value via numeric keys, press ENTER to confirm.
Voltage (VOLT)	Sets output voltage (0.0 to 300.0 V). Manual mode allows quick change via V-SET. Cannot change directly in Prog mode display.	Move cursor to VOLT, enter value using numeric keys, press ENTER.
Current (IRMS_H)	Sets current upper limit. Range: 0.000-8.400A (≤150V) or 0.000-4.200A (>150V). 0.000 turns off limit.	Move cursor to parameter, enter value, confirm with ENTER.
Frequency (FREQ)	Sets output frequency (45.0 to 500 Hz). Manual mode allows quick access via F-SET.	Move cursor to FREQ, input value, confirm with ENTER.
Initial Phase (ONPHS)	Sets the start phase angle of the output waveform (0 to 359°).	Move cursor to OnPHS, input value, confirm with ENTER.
Ending Phase (OFFPHS)	Sets the end phase angle of the output waveform (0 to 359°).	Move cursor to OffPHS, input value, confirm with ENTER.

Table 5.1 Measurement Parameters

5.1.2 Soft keypad description and operation

Key	Description	Operation
PARA DISP	Switches the displayed measurement parameters.	Press the PARA DISP soft key to toggle the view.
MEAS3 SETUP	Configures 3rd display slot (Power, Peak Current, PF, or CF).	Press MEAS3 soft key, select parameter.
MEAS4 SETUP	Configures 4th display slot (Power, Peak Current, PF, or CF).	Press MEAS4 soft key, select parameter.
AUTO / HIGH	Sets voltage range. AUTO switches 150V/300V automatically. HIGH forces 300V range.	Press soft key to toggle between AUTO and HIGH.

Table 5.2 Soft Key Functions

5.1.3 State Zone Description

State	Description
OFF	Output is disabled.
ON	Output is enabled.
AUTO	Voltage mode is set to Auto.
00:00:22	Timer countdown. If set, output disables when it reaches zero.
	Indicates Surge/Drop function is enabled.

Table 5.3 Status Indicators

5.1.4 Test Status Instruction

In the <MeasDisp> page, press the ON/OFF button to enable the output.

Function	Description
DATA HOLD	Pressing this soft key keeps the displayed values constant (freezes display). Press again to resume real-time updates.

Table 5.4 Test Status Controls

5.2 MANUAL SETUP

5.2.1 Memory Setting

In MANU SETUP mode, the instrument operates as a standard power supply. Users can set memory sequences, voltage, frequency, limits, and surge/drop parameters.

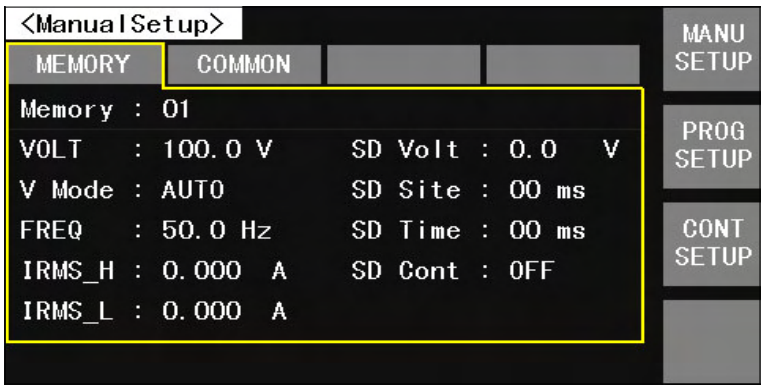


Figure 5.2 Manual Memory Setup

Parameter	Description
Memory	Selects the memory group (1 to 50).
Voltage (VOLT)	Sets output voltage (0.0 to 300.0 V).
Voltage Mode	Selects AUTO or HIGH range.
Frequency (FREQ)	Sets frequency (45.0 to 500 Hz).
Current (IRMS_H)	Sets the over-current protection limit (HI-A).
Current (IRMS_L)	Sets the lower current limit for Pass/Fail judgment.
Surge/Drop Config	Configures SD Volt, SD Site, SD Time, and SD Cont.

Table 5.5 Manual Memory Parameters

5.2.2 Common Setting

These parameters apply to all memory sequences in Manual Mode. Accessible via the COMMON tab in the Setup page.

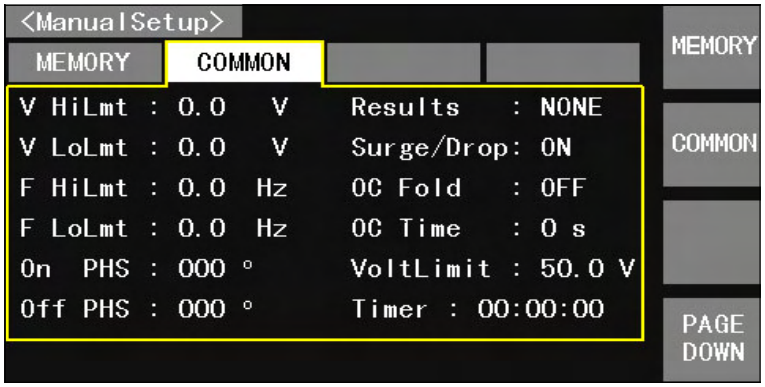


Figure 5.3 Manual Common Setup

Parameter	Description
V HiLmt	Sets the upper limit for output voltage setting (0.0 - 300.0 V).
V LoLmt	Sets the lower limit for output voltage setting.
F HiLmt	Sets the upper limit for frequency setting (45.0 - 500.0 Hz).
F LoLmt	Sets the lower limit for frequency setting.
On PHS	Start phase angle (0 - 359°).
Off PHS	End phase angle (0 - 359°).
Results	Sets result display mode: LAST, ALL, or P/F (Pass/Fail).
Surge/Drop	Enables (ON) or disables (OFF) the Surge/Drop configuration fields.
OC Fold	Over-current foldback. If ON, voltage is reduced to maintain current at limit instead of tripping off.
Dimmer Mode	Sets Front or Back edge dimming simulation (or OFF).
Timer	Sets a countdown timer for the output (0 to 9999 hours).
VoltLiLmt	Sets voltage deviation limit for OVP/LVP protection.

Table 5.6 Common Setting Parameters

5.3 Programmable Mode

5.3.1 Memory Setting

The <ProgramSetup> page allows configuration of complex test sequences. Each of the 50 memory groups can contain up to 9 steps.

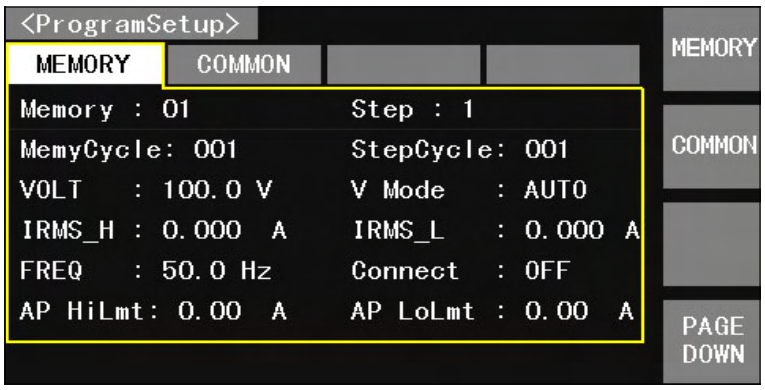


Figure 5.4 Program Memory Setup

Parameter	Description
Memory / Cycle	Select memory group (1-50) and cycle count (0 = infinite).
Step / Cycle	Select step number (1-9) and repeat count for the step.
Connect	ON: Proceeds to next step. OFF: Stops output after step.
Ramp Up / Down	Sets time to change voltage (0 to Target or Target to 0).
Delay / Dwell	Delay: Wait time before measurement. Dwell: Step duration.
Limits (W, PF, A)	High/Low limits for Power, PF, and Peak Current (Pass/Fail).

Table 5.7 Sequence Parameters

5.3.2 Common Setting

Similar to Manual mode, the Common settings in Programmable mode define global limits and start/stop phases for the sequences.

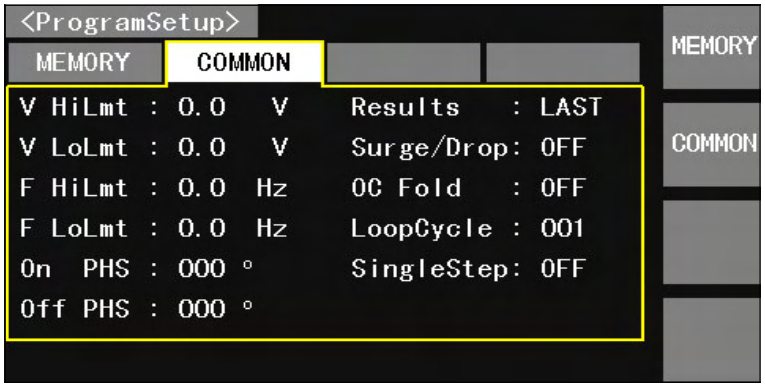


Figure 5.5 Program Common Setup

Parameter	Description
LoopCycle	Sets total cycles for the entire programmed sequence chain.
SingleStep	ON: Waits for user trigger per step. OFF: Auto-proceeds.

Table 5.8 Programmable Common Settings

5.4 System Setting

Press the SYSTEM button to access system configurations.

5.4.1 System Environment (SysEnv)

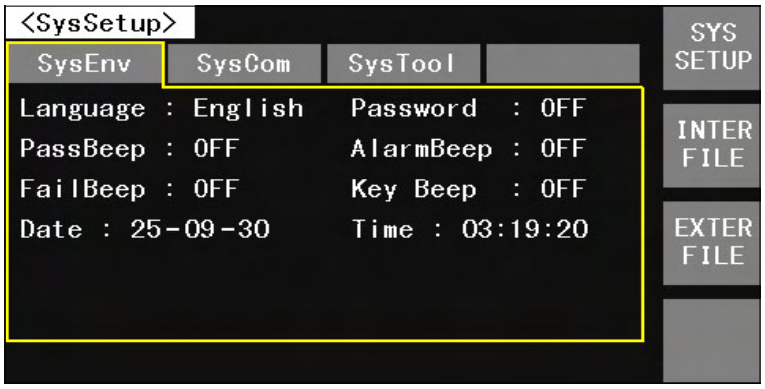


Figure 5.6 System Environment Setup

Parameter	Description
Language	Sets system language (English / Chinese).
Password	Enables/Disables boot password protection.
PassBeep	Enables beep sound on Pass result.
FailBeep	Enables beep sound on Fail result.
AlarmBeep	Enables beep sound on system alarms (OVP, OCP, etc.).
Key Beep	Enables beep sound on key presses.
Date / Time	Sets the internal real-time clock.

Table 5.9 System Environment Parameters

5.4.2 System Communication (SysCom)

Configures the remote interface settings.

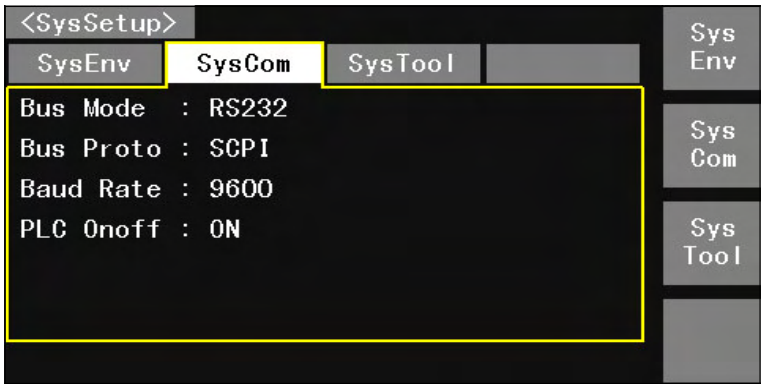


Figure 5.7 System Communication Setup

Parameter	Description
Bus Mode	Selects the interface: RS232 or USBCOM.
Bus Proto	Selects the protocol: SCPI or MODBUS.
Baud Rate	Sets RS232/USB baud rate (4800 to 115200 bps).
Bus Addr	Sets instrument address (1-31) for Modbus.
PLC Onoff	Enables or disables the external PLC remote control interface.

Table 5.10 Communication Settings

5.4.3 System Tool

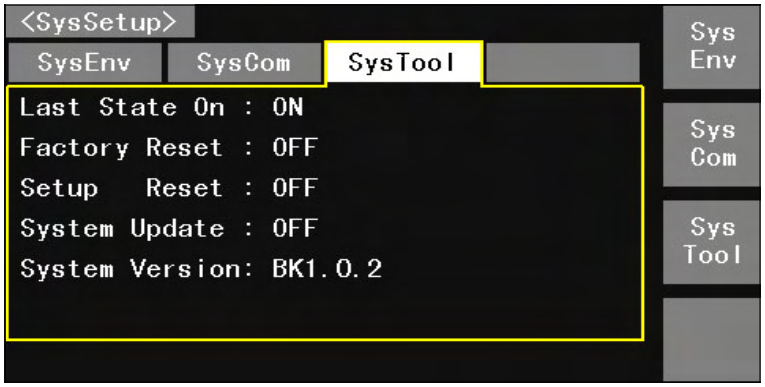


Figure 5.8 System Tools Setup

Parameter	Description
Last State On	ON: Restores settings from last power-off. OFF: Default boot.
Factory Reset	Resets the instrument to factory default settings.
Setup Reset	Resets measurement parameters to defaults.
System Update	Upgrades firmware via USB flash drive.

Table 5.11 System Tools

File Management

6.1 Internal File

The 9810 Series programmable AC power supply can store all user-configured parameters into the internal non-volatile memory as a file. When users need to use the same settings again, they do not need to reset the parameters; simply loading the corresponding file retrieves the previous settings. "I" stands for Internal, representing the internal non-volatile memory.

6.1.1 Operation

Press the SYSTEM button, then press the INTER FILE soft key to enter the <InterFile> interface. The instrument can manage up to 50 internal files.

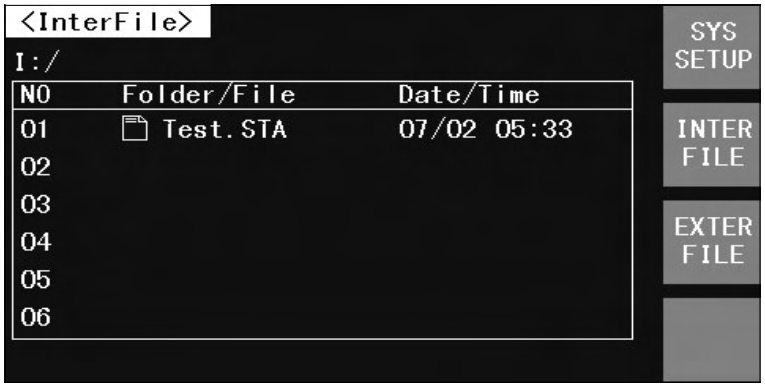


Figure 6.1 Internal File Menu

Function	Steps
Save	1) Move the cursor to the serial number of an empty file, then press the SAVE button. 2) Use the arrow keys or knob to select characters in the pop-up panel, then press ADD CHAR to name the file. Use BACK SPACE to correct errors or EXIT to cancel. 3) Press ENTER or OK to confirm. If no name is entered, the default name UNNAMExx.STA is used.
Load	1) Move the cursor to the file number to be loaded. 2) Press the LOAD soft key to recall the settings.
Copy to E:	1) Move the cursor to the file number to be copied. 2) Press the Copy to E: soft key to copy the file to an external USB drive. A USB drive must be inserted; otherwise, an error will prompt.
Delete	1) Move the cursor to the file number to be deleted. 2) Press the DEL soft key to remove the file.

Table 6.1 Internal File Operations

6.2 External File

The 9810 Series can also store parameters into external memory, such as a USB flash drive. "E" stands for External memory.

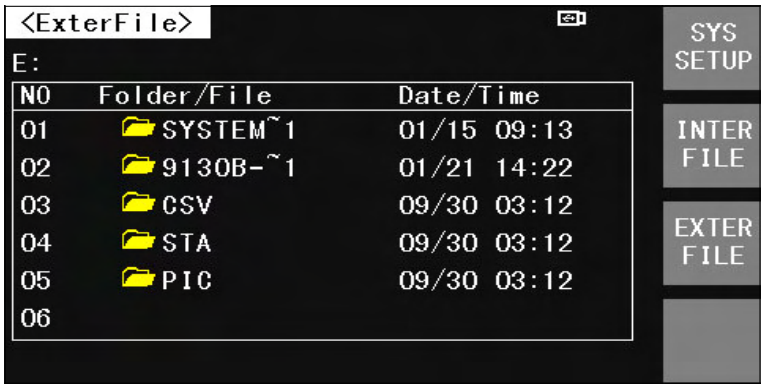


Figure 6.2 External File Menu

NOTICE

1) Use a USB 2.0 drive. 2) Format the drive as FAT16 or FAT32 (FAT32 recommended for drives > 512 MB). 3) Back up data before use. To ensure efficient saving, avoid storing excessive files/folders on the drive.

Type	Format	Description
Setting Saving (I/E)	.STA	Instrument parameter settings.
Data Saving (E)	.CSV	Test results (cannot be re-loaded into unit).

Table 6.2 Supported File Types

6.2.1 Operation

Press the SYSTEM key, then press the EXTER FILE soft key to enter the <ExterFile> interface.

Function	Steps
Save	1) Move the cursor to an empty file slot and press SAVE. 2) Enter the file name using the character selection panel. 3) Press ENTER or OK to save. Default name is UNNAMExx.STA if left blank.
Load	1) Move the cursor to the file number to be loaded. 2) Press the LOAD key to recall the settings from the USB drive.
Copy to I:	1) Move the cursor to the external file to be copied. 2) Press the Copy to I: soft key to copy the file to the internal non-volatile memory.
Delete	1) Move the cursor to the file number to be deleted. 2) Press the DEL key to delete the file from the USB drive.

Table 6.3 External File Operations

Function Introduction

7.1 Function Structure Introduction

The 9810 Series programmable AC power supply supports manual mode and program control mode. Users can set the system parameters to select manual mode or program control mode.

In manual mode, there are 50 memory sequences in total. Each memory sequence includes parameters such as voltage, voltage mode, frequency, current high limit, current low limit, SD voltage, SD site, SD time, and SD connection.

The 50 memory sequences have common voltage high limit, voltage low limit, frequency high limit, frequency low limit, starting angle, ending angle, test result, surge drop, over current fold, dimmer mode, timer and other parameters.

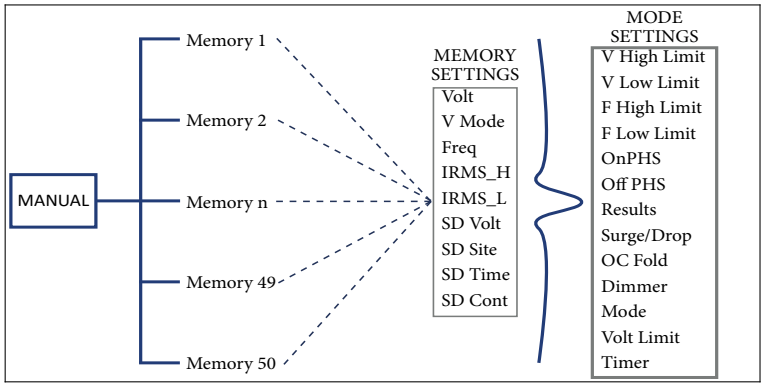


Figure 7.1 Manual Mode Structure

In the programmable mode, there are 50 memory sequences, and each memory sequence includes 9 steps. Each step includes memory number, number of steps, voltage, voltage mode, current high limit, current low limit, frequency, step connection, high limit of peak current, low limit of peak current, power high limit, power low limit, PF high limit, PF low limit, time unit, delay time, dwell time, ramp up time, ramp down time, SD voltage, SD site, SD time, SD connection and other parameters.

All the steps share the voltage high limit, voltage low limit, frequency high limit, frequency low limit, starting angle, ending angle, test result, surge drop, over current fold, loop cycle, step cycle and other parameters.

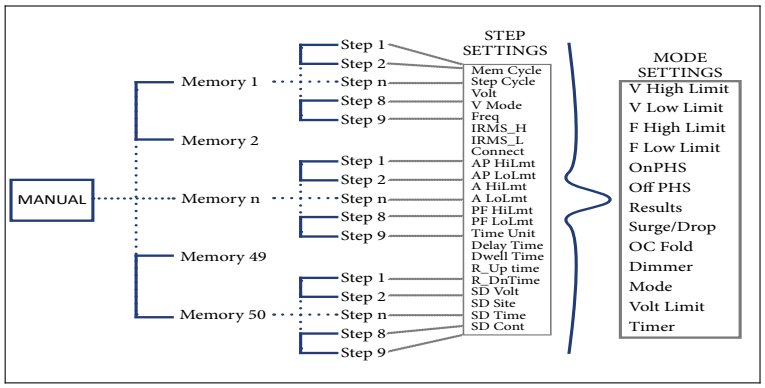


Figure 7.2 Programmable Mode Structure

7.2 Programmable Mode Output Function

The 9810 Series programmable AC power supply can set different parameters through each step to achieve powerful programmable output functions. The instrument has the same factory default settings which is M1-1 to M50-9. The step connection of the 9 steps of each memory sequence needs to be turned on so that after these 9 step connection tests are completed, the next memory sequence can be performed.

For example, in memory 1, only the step connection of step 1, step 2, step 3, and step 4 is set to "ON", and the step connection of step 1 of the memory 2 is set to "ON". Only M1-1, M1-2, M1-3, M1-4 are executed; M2-1 will not be executed because the step connections of M1-5, M1-6, M1-7, M1-8, M1-9 are "OFF".

Example 1: LoopCycle = 2, MemoryCycle (M1) = 1

Step	Configuration
M1-1	Connect = ON, Step Cycle = 2
M1-2	Connect = ON, Step Cycle = 1
M1-3	Connect = ON, Step Cycle = 2
M1-4	Connect = ON, Step Cycle = 2
M1-5	Connect = ON, Step Cycle = 3
M1-6	Connect = ON, Step Cycle = 1

Table 7.1 Sequence Execution (Example 1)

The whole test process is: M1-1 (2x) → M1-2 (1x) → M1-3 (2x) → M1-4 (2x) → M1-5 (3x) → M1-6 (1x). This entire sequence repeats 2 times.

Example 2: LoopCycle = 2, MemoryCycle (M1) = 2, MemoryCycle (M2) = 3

Range	Configuration
M1-1 to M1-9	Configured with various step cycles and connections.
M2-1 to M2-2	Configured with various step cycles and connections.

Table 7.2 Sequence Execution (Example 2)

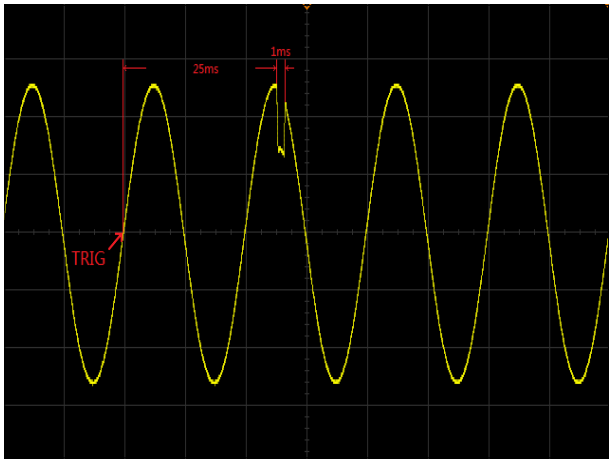
The instrument will execute the M1 sequence 2 times, then the M2 sequence 3 times. This entire chain (M1 x 2 + M2 x 3) will repeat 2 times (LoopCycle).

7.3 Surge Drop Function

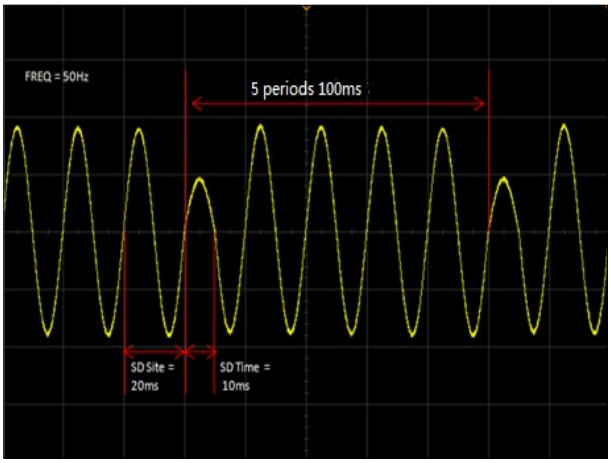
The 9810 Series programmable AC power supply can generate a surge/drop waveform by setting parameters of surge drop voltage, site, time, and connection.

Parameter	Description
SD Volt	Indicates the operating voltage of the surge/drop (0.0 to 300V). If the value is greater than the set voltage, it is a surge; if less, it is a drop.
SD Site	Represents the position where the Surge/Drop appears (time from 0 phase point). Range: 0-20ms (SD Cont ON) or 0-99ms (SD Cont OFF).
SD Time	Indicates the waveform width of the surge or drop. Range: 0-20ms (SD Cont ON) or 0-99ms (SD Cont OFF).
SD Cont	Indicates whether the Surge or Drop is triggered automatically or manually. **ON:** System executes trigger action continuously (every 100ms) after pressing ON/OFF. **OFF:** System executes trigger action only when pressing the TRIG button.

Table 7.3 Surge/Drop Parameters



Manual Triggered Drop



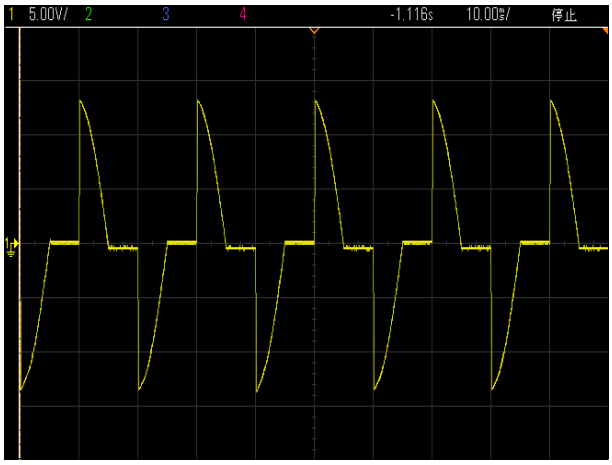
Auto Triggered Drop

Figure 7.3 Surge/Drop Waveforms

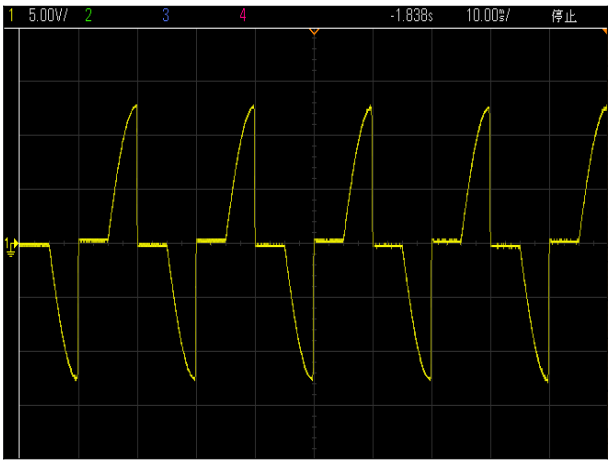
7.4 Dimmer Mode Function

This parameter is used to set the front dimmer mode or back dimmer mode. When the dimming mode is turned on, the surge/drop and SD count are enabled by default.

In this mode, the manual mode MEMORY setting can only set parameters such as voltage, frequency $(45^{\sim}100Hz)$ and SD voltage. The measurement display page cannot display the measurement results due to the special waveform, but the waveform can be exported through the output interface.



Front Dimmer Mode



Back Dimmer Mode

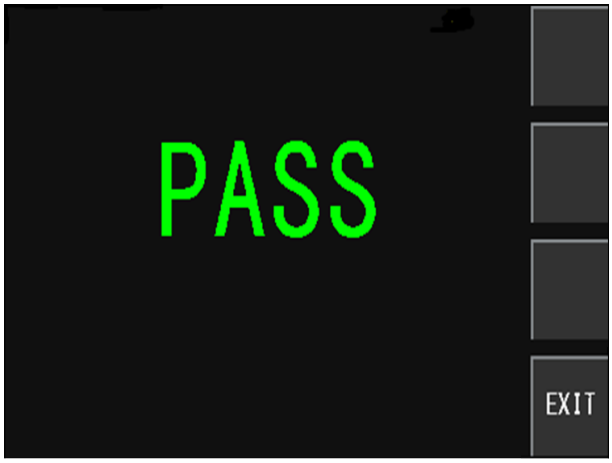
Figure 7.4 Dimmer Mode Waveforms

7.5 Result Display Function

The result display function is used to judge whether the test result is qualified. It can be set to "NONE", "LAST", "ALL", or "P/F".

Mode	Description
NONE	No test results are displayed.
LAST	Displays the test result of the last step (Pass/Fail and values).
ALL	Displays the test results of all steps in a list format.
P/F	Displays a large "PASS" or "FAIL" indicator on the screen.

Table 7.4 Result Display Options



Pass

Fail

Figure 7.5 Result Display Examples

7.6 Protection Function

The instrument provides comprehensive protection functions. When an abnormal action occurs, the display shows the error status, the output turns off, the alarm beeps (if enabled), and the ON/OFF indicator flashes.

Alarm	Description
HI-A	Current Limit Protection. Triggered when output current exceeds the set IRMS_H limit.
OVP	Over Voltage Protection. Triggered when output voltage exceeds the set voltage by >5V (Low Range) or >10V (High Range).
LVP	Low Voltage Protection. Triggered when output voltage is lower than the set voltage by >5V (Low Range) or >10V (High Range).
OCP	Over Current Protection. Triggered when output current exceeds 110% of rated full load current for 1s, or if output is shorted.
OPP	Over Power Protection. Triggered when output power exceeds 105%-110% of rated power for 5s, or >110% for <1s.
OTP	Over Temperature Protection. Fan accelerates at $60^{\circ}C$. Output shuts off if heat sink exceeds $130^{\circ}C$.

Table 7.5 Protection Alarms

7.7 Remote Signal Output Function

There is a remote signal output terminal (SIGNAL OUT) on the rear panel. It provides "PASS", "FAIL", and "PROCESSING" signals for remote monitoring. This function is valid only if the test result is set to "P/F".

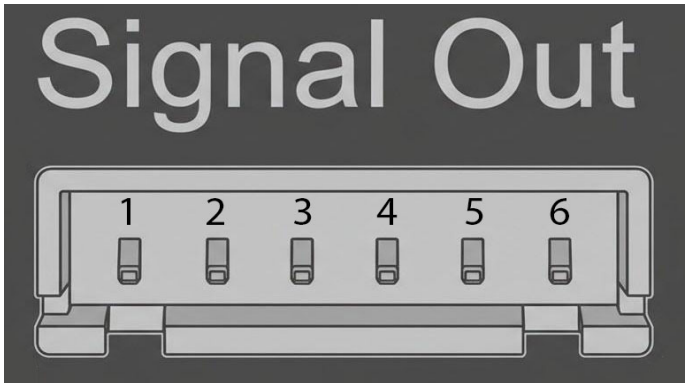


Figure 7.6 Remote Signal Output Interface

Signal	Connection / Description
PASS Signal	Connected between PIN1 and PIN2. Relay closes when DUT passes.
FAIL Signal	Connected between PIN3 and PIN4. Relay closes when DUT fails.
PROCESSING Signal	Connected between PIN5 and PIN6. Relay closes while test is running.

Table 7.6 Remote Signal Connections

7.8 Remote Control Function

The remote control interface on the rear panel allows external control of the output switch and memory group selection.

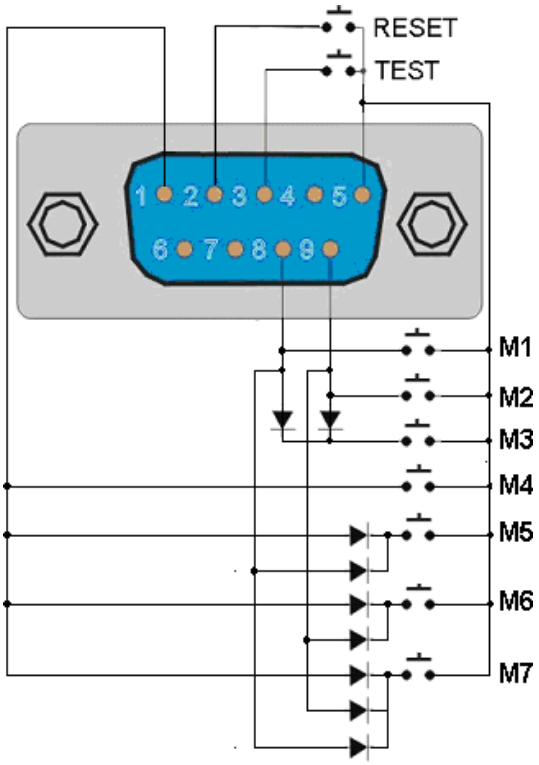


Figure 7.7 Remote Control Interface

Function	Description
Trigger (Output On/Off)	Connect a control switch between PIN1 and PIN2. A momentary low level (more than 100ms) toggles the output.
Memory Selection (M1-M7)	Connect PIN1 to combinations of PIN8, PIN9, and PIN5 to select memory groups.

Table 7.7 Remote Control Functions

Memory	Connection Requirement (Connect PIN1 to...)
M1	PIN8.
M2	PIN9.
M3	PIN8 and PIN9.
M4	PIN5.
M5	PIN8 and PIN5.
M6	PIN9 and PIN5.
M7	PIN8, PIN9, and PIN5.

Table 7.8 Memory Selection Truth Table

Communication Interface

8.1 RS232 Interface

8.1.1 Description

At present, the widely used serial communication standard is the RS-232 standard, also called the asynchronous serial communication standard. It is used to implement data communication between computers and peripherals. RS is the English abbreviation of "Recommended Standard" and 232 is the standard number. This standard was published by the Electronic Industries Association (EIA) in 1969. The serial interface of the 9810 Series is not strictly based on the RS-232 standard but provides a minimal subset. The RS232C connector uses a 9-core pin type DB socket (DB9).

Signal	Symbol	Connector Pin
Transmit Data	TXD	3
Receive Data	RXD	2
Grounding	GND	5

Table 8.1 RS-232 Signal Subset

NOTICE

To avoid electrical shock, turn off the power before plugging or unplugging the connector. Do not short-circuit the output terminals or the chassis to avoid damage to the device.

8.1.2 Operation

8.1.2.1 Communication with a Computer

The pin definition of this instrument is the same as that of the 9-core connector serial interface used by IBM AT compatible machines. Users can use a double-core shielded cable to make a three-wire connection (length $<$ 1.5m) or purchase a standard DB9 cross-over cable (Null Modem).

PC Pin	Link	Instrument Pin
Pin 2 (RXD)	↔	Pin 3 (TXD)
Pin 3 (TXD)	↔	Pin 2 (RXD)
Pin 5 (GND)	↔	Pin 5 (GND)

Table 8.2 RS232 Wiring Connections

8.1.2.2 Transmit and Receive Data Format

The 9810 Series uses a full-duplex asynchronous communication transmission method with start and stop bits.

Parameter	Setting
Data bits	8-bit
Stop bit	1 bit
Parity	None
Terminator	<LF> (Newline, ASCII code 10)

Table 8.3 Data Transmission Format

8.1.2.3 Select Baud Rate

The baud rate is the rate at which the instrument communicates with the computer. There are 8 baud rates to choose from: 4800, 9600, 14400, 19200, 38400, 57600, 96000, 115200 bps. The default baud rate is 9600 bps.

8.2 USB Virtual Serial Port

8.2.1 Description

The USB interface of the 9810 Series provides convenience and speed. By installing the USB driver, the USB port (USB Type B) on the rear panel functions as a virtual serial port (VCOM), allowing users to communicate using standard RS232 protocols.

[Image of USB Type B Port]

8.2.2 Driver Installation

Step	Action
1	Download the driver from the B&K Precision website (www.bkprecision.com).
2	Connect the instrument to the computer via a USB cable.
3	Install the appropriate driver (e.g., CP210x or similar).
4	Open the Device Manager on the PC. A successful connection is indicated when a "USB to UART Bridge Controller" (COMx) appears in the port list.

Table 8.4 USB Driver Installation Steps

8.3 SCPI Communication Commands

SCPI (Standard Commands for Programmable Instruments) is an ASCII-based instrument command language. It uses a hierarchical structure (tree system) where related commands are grouped under a common node.
Please refer to the programming manual for the full SCPI command list.

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. Specifications are subject to change without notice.

Model		9812/9812-220V	9814-220V
AC Input			
Voltage		230 VAC ± 15% 115 VAC ± 15%	
Frequency		47 Hz to 63 Hz	
Phase		Single	
Maximum Current	110 V	16 A	-
	220 V	8 A	16 A
Power Factor		0.7 (typical)	
Output Parameters			
Rated Power		500 VA	1000 VA
Output Voltage		0 to 300 V	
Output Frequency		45.0 Hz to 500 Hz	
Max. Current (RMS)	0 to 150 V	4.2 A	8.4 A
	0 to 300 V	2.1 A	4.2 A
Max Current (Peak)	0 to 150 V	12.6 A	25.2 A
	0 to 300 V	6.3 A	12.6
Total Harmonic Distortion (THD)		At 45 Hz to 500 Hz, ≤ 0.5 % (resistive load)	
Phase		2-wire single phase	
Crest Factor		3	
Line Regulation		0.1% max for a ± 10% line change	
Load Regulation		≤ 0.5% FS (resistive load)	
Response Time		< 100 μs	
Setting Parameters			
Voltage (rms)	Range	0 to 300 V	
	Resolution	0.1 V	
Frequency	Range	45.0 Hz to 500 Hz	
	Resolution	< 100 Hz, 0.1 Hz ; ≥ 100 Hz, 1Hz	
Initial / Final Phase Angle	Range	0 to 359°	
	Resolution	1°	

Ordering Information

Model	Description
9812	Programmable AC Power Source - 110 VAC Line Input
9812-220V	Programmable AC Power Source - 220 VAC Line Input
9814-220V	Programmable AC Power Source - 220 VAC Line Input

AC Power Cord for 220 V

5 mm ring terminals to support #10 and #8 stud size plugs

Measurement Parameters			
Voltage (rms)	Range	0 to 300 V	
	Resolution	0.1 V	
	Accuracy	±0.5% + 2 digits	
Frequency	Range	45.0 Hz to 500 Hz	
	Resolution	< 100 Hz, 0.1 Hz ; ≥ 100 Hz, 1Hz	
	Accuracy	± 0.1 Hz	
Current (rms)	0 to 150 V	0.000 to 4.200 A	0.000 to 8.400 A
	0 to 300 V	0.000 to 2.100 A	0.000 to 4.200 A
	Resolution	0.001 A	
	Accuracy	± (0.5% + 3 digits)	
Peak Current	0 to 150 V	0.00 to 12.60 A	0.00 to 25.20 A
	0 to 300 V	0.00 to 6.30 A	0.00 to 12.60 A
	Resolution	0.01 A	
	Accuracy	± (5% + 2 digits)	
Power	Range	0 to 500 W	0 to 1000 W
	Resolution	0.1 W	
	Accuracy	± 0.6 % + 5 digits	
Power Factor	Range	0.001 to 1.000	
	Resolution	0.001	
	Accuracy	± 2 % + 2 digits	

General			
Display Resolution		4.3" color LCD, 480 x 272 dots	
Safety Protections		Low voltage (LVP), overvoltage (OVP), overcurrent (OCP), overpower (OPP), and overtemperature protection (OTP)	
I/O interfaces		USB VCOM, RS232, USB host port	
Memory		Manual mode: 50 configurations Program mode : 50 programs with 9 steps per program	
Dimensions (W x H x D)		16.9 x 3.5 x 23.6 inches (430 x 88 x 600 mm)	
Weight		66 lbs (30 kg)	88 lbs (40 kg)
Temperature	Operation	32 °F to 104 °F (0 °C to 40 °C)	
	Storage	-4 °F to 158 °F (-20 °C to 70 °C)	
Humidity		20 % to 80 % (non-condensation)	
Operating Altitude		≤ 2000 meters	
Warranty		3 Years	
Standard Accessories		Terminated power cord with NEMA 5-15P (9812 only), unterminated power cord with ring terminals (9812-220V and 9814-220V) , and certificate of calibration	

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 **13years** 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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