Titan Series Regenerative Programmable AC Power Supply

User Manual

1.Preface

1.1.Preface

Dear Customer, thank you for choosing our company's Titan series bidirectional programmable AC Power Supply products. We sincerely hope that this product meets your needs and welcome your valuable feedback on its performance and functionality. We are committed to continuous improvement in product performance and service quality.

About This Manual

Retention and Use

This manual should be kept near the product for easy reference during operation. It must be transferred with the equipment when its storage location or user changes.

Validity

This manual applies to our company's Titan series bidirectional programmable AC power source, and includes instructions for installation, operation, and electrical connections. Please read and understand this manual carefully before using the equipment, paying close attention to safety information and operating specifications.

1.2.Safety

This product's design complies with relevant standards and has been factory-approved after comprehensive safety testing. Failure to follow operating procedures during use may compromise the provided safety features. Therefore, strictly adhere to the operating procedures.

High temperatures and voltages are present within the system. During equipment installation, operation, and maintenance, local safety regulations and related operating procedures must be followed to prevent personal injury or equipment damage. The safety precautions mentioned in this manual supplement local safety regulations. Our company assumes no liability for violations of general safety operating requirements pertaining to equipment design, production, and use, or for violations of safety standards.

Safety Markings on the Device

To remind users of safe operation, the following safety markings are affixed to the Power Supply unit. Before using this product, please carefully read the following safety precautions.

	This symbol is intended to remind users that this product should only be operated by trained professionals who have received proper guidance.
	This symbol is intended to remind users that if operation or maintenance is required, to avoid contact with hazardous Voltage components that may not be fully discharged, users should wait 15 minutes after the product is powered off and the Voltage drops below 24V_AC before performing any operation or maintenance. This is for safety reasons.

The following symbols in this manual indicate important precautions and warnings! Please strictly adhere to all warnings and operating instructions in this manual and on the equipment. Before operating or using this product, please refer to the relevant information in this manual and retain it for future reference.

	Electric shock hazard: Improper operation poses a high risk of user death or serious personal injury.
	Caution: Incorrect operation may result in personal injury or product damage.

Safety Precautions

Carefully read and understand the following safety tips before operating the equipment.

	Do not allow the Power Supply to get wet. Do not touch or operate the Power Supply with wet hands, as this could result in electric shock. Do not touch the Power Supply input and output terminals or any components displaying high-voltage warning signs, as this poses a risk of electric shock. Product maintenance or modifications must only be performed by authorized technical personnel; otherwise, there is a risk of electric shock. To ensure user safety, the Power Supply unit must have proper grounding protection and must be reliably grounded before use. Tighten the Power Supply input and output wiring screws to prevent overheating and potential fire hazards. Before replacing mobile devices or cables, disconnect the input Power Supply and allow the unit to Shutdown for 15 minutes before proceeding to avoid Electric Shock.

To prevent product damage, avoid subjecting the product to strong impacts during transportation and operation. Severe impacts from drops must be avoided.

Keep the air intake and exhaust vents unobstructed. Obstructed ventilation of the intake and exhaust vents will cause the internal system temperature to rise, shortening the lifespan of internal components and affecting the overall lifespan of the equipment.

The use of power cables with defects, cracks, wear, or breaks is strictly prohibited. If any such issues are found, please contact personnel immediately.

In the event of a fire in or around the Power Supply, first disconnect the Power Supply and then use a dry powder fire extinguisher. Do not use liquid fire extinguishers, as this poses a risk of Electric Shock.

This unit is a dedicated Power Supply and should not be used to power other Loads, as this may result in unforeseen consequences.

2.Product

2.1.Introduction

The Titan series Regenerative programmable AC Power Supply is a high-precision, high-dynamic, high-standard AC Power Supply with simulated comprehensive Power Grid characteristics, manufactured by Xi'an ACTIONPOWER Electric Co., Ltd., and is hereinafter referred to as the "TA Series Power Grid Simulator." It is designed for Power Grid compatibility testing of equipment connected to the Power Grid and can output stable Voltage and Frequency. In accordance with relevant national standards, it can also provide a power supply environment with various power quality characteristics, such as Voltage variations, Frequency variations, Harmonics, Interharmonics, Unbalanced conditions, and Flicker. .

In addition to providing power to electrical equipment, the Power Supply can also receive energy returned from the Load and feed it back to the Power Grid, saving energy and improving the testing environment.

2.2.System Architecture

The block diagram of the TA Series Power Grid Simulator is shown in Figure 2-1. The TA Series Power Grid Simulator utilizes a bidirectional energy flow topology, enabling it to both supply energy to the Load and absorb energy from the Load. The TA Series Power Grid Simulator is comprised of two sections: a rectifier and an inverter. The rectifier provides a stable DC bus Voltage for the inverter stage. The inverter employs a Three-phase Independent control topology, converting the DC Voltage into Three-phase AC Voltage via three single-phase inverters. The RMS value, Frequency, and Phase of the output Three-phase Voltage can be independently adjusted. By adjusting the RMS value, Frequency, and Phase of the Power Supply's output Phase Voltage, the normal and abnormal characteristics of the Power Grid can be simulated.

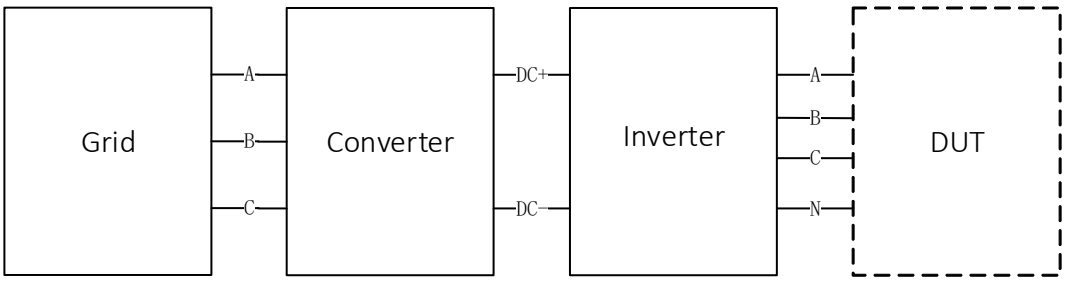


Figure 2-1 Block Diagram

2.3.Product Features

- High Precision: Voltage accuracy ±0.1% F.S.; Frequency accuracy ±0.005 Hz;
- High Dynamics: 10%-90% rise Time less than 1 ms, meeting the industry's 1 ms interruption test requirement;
- High Standard: Harmonics, Interharmonics, and fault ride-through capabilities exceed the standard test requirements of South Africa, Germany, and the United Kingdom;

● Comprehensive Power Grid characteristic simulation: Continuous adjustment of Three-phase Voltage, Three-phase Phase, and Frequency across the full range; simulation of Harmonics, Interharmonics, Unbalance, Flicker, etc.; fault ride-through compliant with multiple international standards; features Time and Phase Angle Trigger functions;

● It can simulate voltage harmonics and interharmonics, superimposing harmonics from the 2nd to the 50th order, with adjustable harmonic phase angles. It can also superimpose interharmonics from 1Hz to 2500Hz.

● Multiple units of the same model can be connected in parallel to increase output capacity and facilitate capacity upgrades.

● It outputs a synchronization signal to accurately capture the moment and process of change. The trigger mode is optional.

● It can simulate fault ride-through functions such as low-voltage ride-through (LVRT), high-voltage ride-through (HVRT), and high/low-voltage ride-through. The phase angles of the A, B, and C three-phase voltages are adjustable, and the trigger angle can be set to meet the requirements of various international standards, including VDE-AR-N 4105, NRS 097-2-1, G83, EN50438, and EN61010.

● Multiple communication interfaces: RS485/LAN.

2.4.Model Information

Model	Output Power (kVA)	Voltage Range (V) @L-N	Frequency Range (Hz)	Maximum Current (A) @Three-phase	Weight (kg)	Dimensions (mm) W×H×D
TA300-576-03	300	0-576	40-70	300	2960	2410×1955×1200
TA400-576-04	400	0-576	40-70	400	2960	2410×1955×1200
TA500-576-05	500	0-576	40-70	500	2960	2410×1955×1200
TA600-576-06	600	0-576	40-70	600	5300	3410×1955×1400
TA750-576-07	750	0-576	40-70	750	5300	3410×1955×1

						400

1) Model List

2) Naming Rules

TAXXX-XXX-XX

TAXXX: T is the abbreviation for ACTIONPOWER's "Titan" series product, A is the abbreviation for ACTIONPOWER AC source, and XXX refers to the power of the source in kVA. For example, TA500 represents an ACTIONPOWER "Titan" series AC source with a rated power of 500kVA.

XXX: The maximum output phase voltage. For example, “576” indicates a maximum phase voltage of 576V.

XX: Indicates the maximum output current value. For example, 07 indicates a maximum output current of 700A.

2.5.Technical Specifications

Index Item		Technical Specifications
Basic Parameters		
Load Power Factor		-1 ~ +1
AC Output		
Voltage	Set Resolution (V)	0.01
	Accuracy	±0.1% F.S.
	Waveform Type	Sine
	DC Component (mV)	<50
	Voltage Distortion	<0.5% @50Hz/60Hz >=220V No Load, <1% @50Hz/60Hz >=220V Linear Load;
		<1.0% @Other Frequencies >=220V No Load, <1.5% @Other Frequencies >=220V Linear Load;
	Regulation	±0.1% F.S
	Source regulation	±0.1% F.S.
	Voltage slew	AC>1.0V/μs

	rate	
	Dynamic response	＜1ms（10%-90%Umax）
	Three-phase Unbalance	Complies with GB/T 15543-2008, not exceeding 1/2 of the specified limits (negative-sequence voltage ≤ 1%, short-term ≤ 2%)
Frequency	Output frequency range	40-70Hz
	Set resolution (Hz)	0.001
	Accuracy	±0.005Hz
Phase	Range	A = 0°, B = 240°, C = 120° (default)
		Programmable range: 0°–359.9°, Three-phase Independent adjustable
	Accuracy	±0.3°
	Set resolution	0.1°
Harmonics	Order	Up to the 50th order @ 50Hz, Up to the 50th order @ 60Hz
	Content	Harmonics of the 2nd to 10th order: single harmonic content ≤ 40%, Total Harmonics Distortion (THD) ≤ 60%;
		Harmonics of the 10th to 20th order: single harmonic content ≤ 20%, Total Harmonics Distortion (THD) ≤ 20%;
		Single harmonics of orders 21~30: maximum 10%, total harmonics no more than 10%;
		Single harmonics of orders 31~50: maximum 5%, total harmonics no more than 10%;
	Amplitude error	±5% of harmonic content setting value
	Phase Angle range	0°-359.9°

	Preview function	Harmonic superposition waveform preview available
	Edit mode	Import, Export, Read, Storage
Interharmonics	Frequency range	1Hz~2500Hz, Content <10%
	Programming steps	100 steps
	Programming parameters	Content, Start Frequency, End Frequency, Frequency Increment, Execution Time, Interval Time, Number of Cycles, Sequence
	Edit mode	Add, Delete, Import, Export, Storage, Read
Flicker	Flicker level	1 to 10, a total of 10 levels, one-key recall
	Adjustment Step	1
	Accuracy	±0.2
	Preview function	Flicker trend chart preview available, pst visible
Three-phase Unbalance Simulation	Adjustment Method	Three-phase Voltage, Phase, Unbalance Factor, Duration
	Unbalance Factor Adjustment Range (%)	1 to 100, one-key recall Class 123X
	Unbalance Factor Adjustment Step (%)	0.01%
	Accuracy (%)	±0.5%
	Preview function	Three-phase Unbalance trend chart preview available
High and Low Voltage Ride-	Mode	Low Voltage Ride-Through / High Voltage Ride-Through / High and Low Voltage Ride-Through Combination

Through	Configuration Parameters	Voltage, Frequency, Phase, Rise Time, Hold Time, Trigger Phase Angle, Trigger Pulse Output
Programming	Programming steps	100 steps
	Programming parameters per step	Voltage, Frequency, Phase, Change Time, Hold Time, Trigger Phase Angle, Trigger Pulse Output
	Rise Time Range	100μs-999s
	Top Time Range	100μs-999s
	Minimum Programming Time Step	100μs
	Trigger Output and Enable	Outputs a Low Voltage Trigger Signal, electrically isolated from other parts of the device, synchronized with changes in the Power Supply Output Parameters; Single Step, Single Cycle, Single Trigger; (Pulse or Level selectable)
	Edit mode	Import, Export, Storage, Read
	Related Functions	Three-phase Unbalance, Voltage Sag, Interruption, High and Low Voltage Ride-Through, and other functions, with an automated integrated interface.
	Run Mode	Run, Stop, Large Loop (1000) + Small Loop Nested Programming (9999)
	Trigger source	Local Software, External Hardware
	Trigger mode	Automatic, Single Step
Frequency Modulation	Supported Modes	Source Mode
	Programming steps	100 Step
	Programming parameters	Modulation Amplitude, Modulation Frequency, Hold Time, Trigger Phase Angle

	Edit mode	Import, Export, Storage, Read
	Trigger source	Local Software, External Hardware
	Trigger mode	Automatic, Single Step
Amplitude Modulation	Supported Modes	Source Mode
	Programming steps	100 Step
	Programming parameters	Modulation Amplitude, Modulation Frequency, Hold Time, Trigger Phase Angle
	Edit mode	Import, Export, Storage, Read
	Trigger source	Local Software, External Hardware
	Trigger mode	Automatic, Single Step
	Control Mode	Percentage (%), Absolute Value (Abs)
Measurement Parameters	Voltage Resolution (Vrms)	0.01
	Voltage Accuracy	±0.1% F.S.
	Frequency Resolution (Hz)	0.001
	Frequency Accuracy	±0.005Hz
	Current Resolution (A)	0.1
	Current Accuracy	±0.2% F.S.
	Active Power Resolution (W)	1
	Active Power	±0.3% F.S.

	Accuracy	
	Apparent Power Resolution (VA)	1
	Apparent Power Accuracy	±0.3% F.S.
	Power Factor Range	-1.00~+1.00
	Power Factor Resolution	0.001
Input	Wiring Method	Three-phase Four-Wire ABC+PE
	Frequency (Hz)	47- 63
	Voltage Range (V)	400±10%
	Power Factor	0.99 @ Half Load or Above
	Efficiency	>94%
	Harmonic Current	≤3%
other	Communication Interface	LAN、RS485
	External Interlock	External interlock input: Normally Open/Normally Closed; External interlock output: Normally Open/Normally Closed
	Trigger signal	Trigger Input/Output
	Control Display	Local touchscreen control, remote Host computer control; displays Voltage, Current, Frequency, and Power.
	Altitude	≤2000m
	Protection	I

	Level	
	Pollution level	PD 2
	Site Requirements	An indoor and dry environment
	Standard	EN IEC61010-1 etc.
	Insulation, Voltage Withstand	10MΩ/DC500V；3600VAC/1min
	Cooling Method	Forced Air Cooling
	Noise (dB)	<750kW: No-load 70, Half-load 75, Full-load 85. ≥750kW: No-load 70, Half-load 75, Full-load 85.
	Operating Temperature	-10℃～40℃
	Relative Humidity	10%～90% Non-condensing
	Noise (dB)	<750kW: No-load 70, Half-load 75, Full-load 80. ≥750kW: No-load 70, Half-load 75, Full-load 85.

3.Product Functionality

The TA Series Power Grid Simulator's basic functions are described below:

●Source Mode

Function	Description
Basic Function	The main interface allows simulation of normal and abnormal Power Grid characteristics by adjusting parameters such as Output voltage, Frequency, and Phase. The Three-phase Output is independently adjustable, and the rate of change for Output voltage and Frequency can be configured. Electrical parameters are adjustable online.
Harmonic Injection	A distorted voltage waveform is output by setting parameters such as harmonic order and harmonic content.
Interharmonic Injection	A distorted voltage waveform is output by setting parameters such as interharmonic order and interharmonic content.
Transient Programming	The output voltage is programmed step-by-step through parameter settings, including list, pulse, and step modes.
Flicker	Flicker function output enabled.
Three-phase Unbalance	Three-phase Unbalance function output enabled.
Frequency Modulation	The output voltage frequency changes according to the set value through parameter settings.
Amplitude Modulation	The output voltage amplitude changes according to the set value through parameter settings.

4.Host Computer Usage Instructions

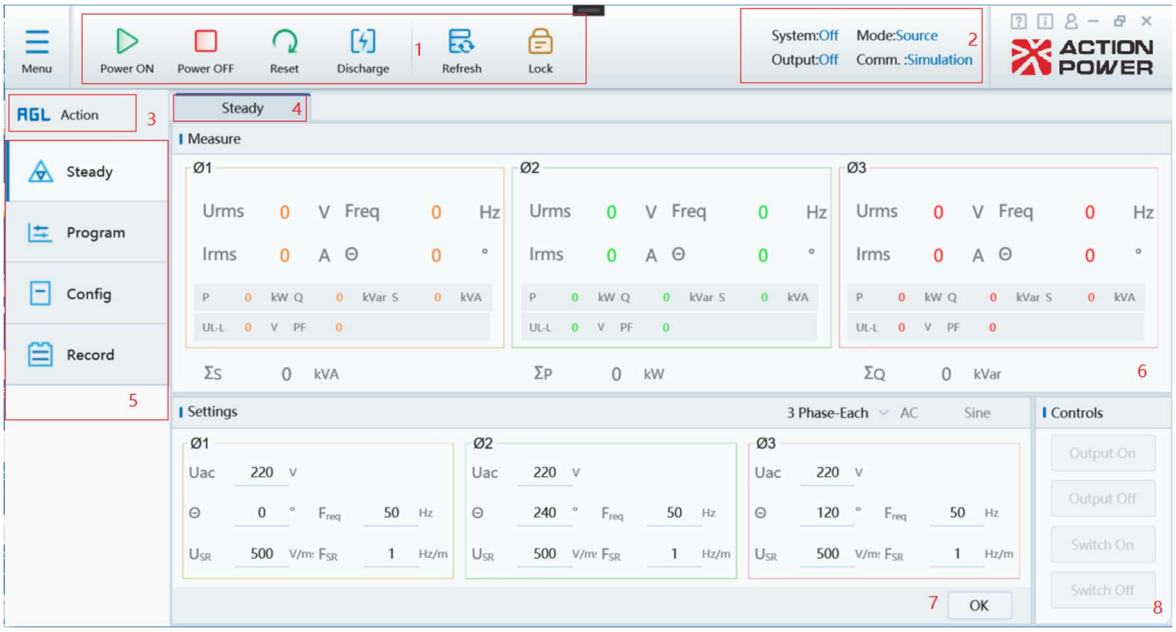
4.1.Introduction

4.1.1.Background

The TA series AC Source Host computer from Xi'an ACTIONPOWER Electric Co., Ltd. is developed as a supporting product for ACTIONPOWER programmable AC Power Supplies. It operates the AC Power Supply through the LAN control interface. For AC Power Supply equipment, it provides functions such as Run parameter setting and display, Transient List Programming, Transient Pulse Programming, Transient Step Programming, Harmonic Programming, Interharmonic Programming, Three-phase Unbalance Programming, Flicker Programming, Frequency Modulation, Amplitude Modulation, advanced settings, and fault recording. For AC Load equipment, it provides functions such as Steady State setting and display, Transient List Programming, Harmonic Programming, Custom Waveform editing, advanced settings, and fault recording.

This Host computer is suitable for 64-bit Windows PCs and requires the Net 4.5 framework. The minimum supported display resolution is 1280×76. If the Host computer interface is not fully displayed, adjust the screen display scaling to 100% and increase the resolution.

4.1.2.Main Interface



Area 1: Device control operation buttons.

Area 2: Displays the current device status. System Status: Indicates whether the system is currently in Shutdown, Standby, Run, or Fault state. Source/Load Mode: Indicates whether the device is operating in source or load mode. Output Status: Reflects the state of the Output engage and Output disengage buttons in Area 8. Communication Status: Indicates whether the network connection is normal or faulty.

Area 3: Device name (Setting: Configuration- Extended Settings- Device name).

Area 4, Area 5: Navigation and Menu Bar.

Note: Areas 1-3 and 5 are visible on all interfaces, allowing users to operate the device at any time, observe its current status, and switch between display interfaces.

Area 6: Measurement Data Display Area.

Area 7: Steady State Setting Area, where Run data can be configured.

Area 8: Output Control Area. After entering Standby mode, these buttons are enabled, allowing control of the device.

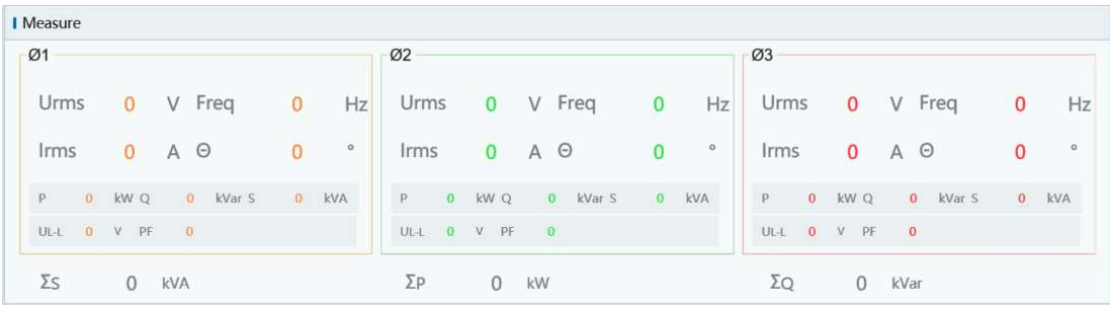
Please note that not all Navigation and Menus are always visible or identical. The Host computer program adapts to the connected device and hides functions and menus irrelevant to the specific device in use. The AC source device is used here as an example of a Host computer application.

4.2.Detailed Function Description

4.2.1.Steady State

4.2.1.1.Measurement Parameters

After the equipment outputs, the equipment's operational data is displayed.



4.2.1.2.Output Settings

Within specified limits, users can modify the Three-phase Voltage, Phase, Frequency, Output voltage slew rate, and Frequency ramp rate of the AC Power Supply equipment's output.

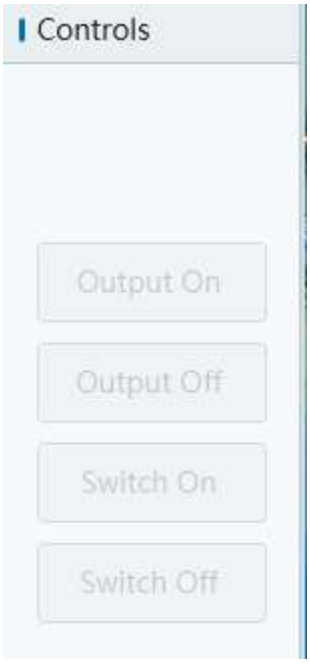
The output Number of Phases can be switched between Three-phase Independent and Three-phase Linked using the drop-down menu in the upper right corner.

After confirming the data here, it can be sent to the device. To prevent data loss after a power failure, the

parameter information can be modified while the device is running; however, the output Number of Phases cannot be modified during operation.

Note: The adjustment range of the control device is determined by the AC Power Supply model. The AC Power Supply model Configuration is completed before shipment.

4.2.1.3.Output Control



The device power-on output sequence is as follows: click the power-on button on the left side of the Toolbar, then wait for the System Status on the right side of the Toolbar to display Standby.

Output: Device output voltage is established.

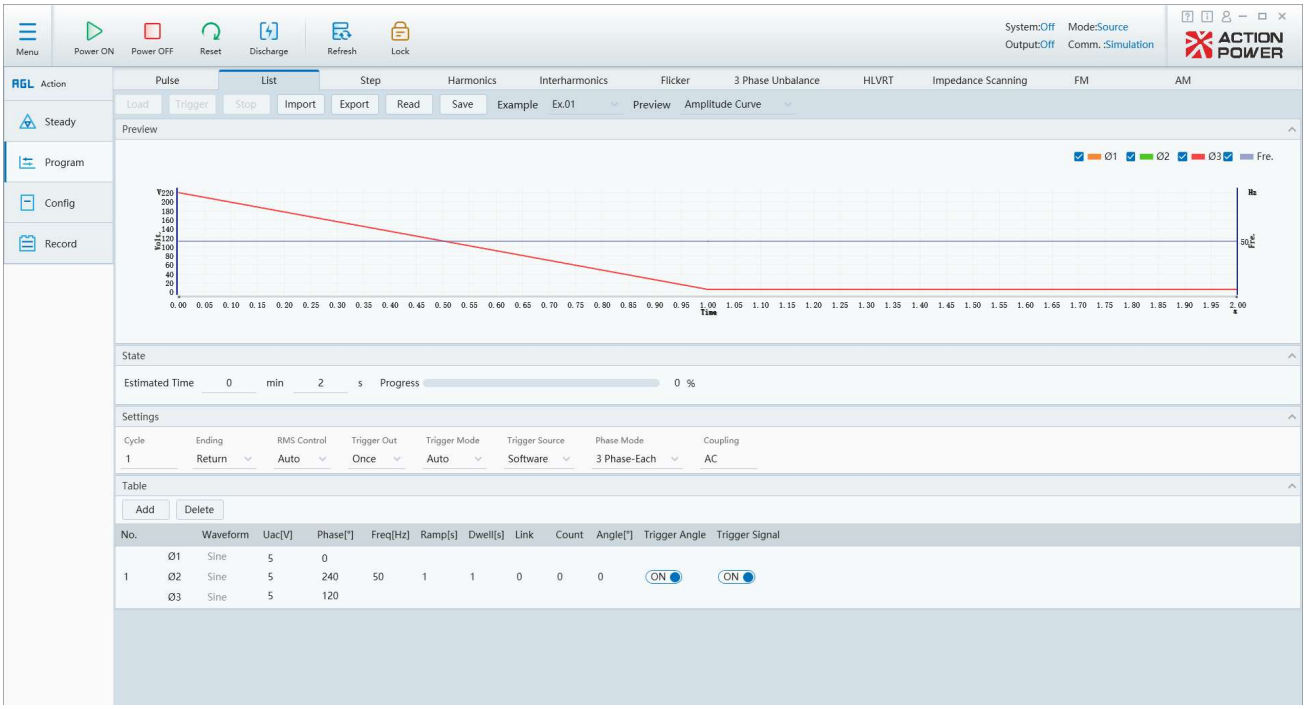
Stop: Device output voltage is not established.

Output engage: After the command is issued, the device engages the output contactor. Engaging the output contactor before the Run command initiates a loaded start; engaging the output contactor after the Run command initiates a sudden load.

Output disengage: After the command is issued, the device disengages the output contactor. It automatically disengages during shutdown and fault conditions.

Note: The enabled/disabled state of the output control button is related to the System Status and output state. All Programming Experiments are performed only during Run mode.

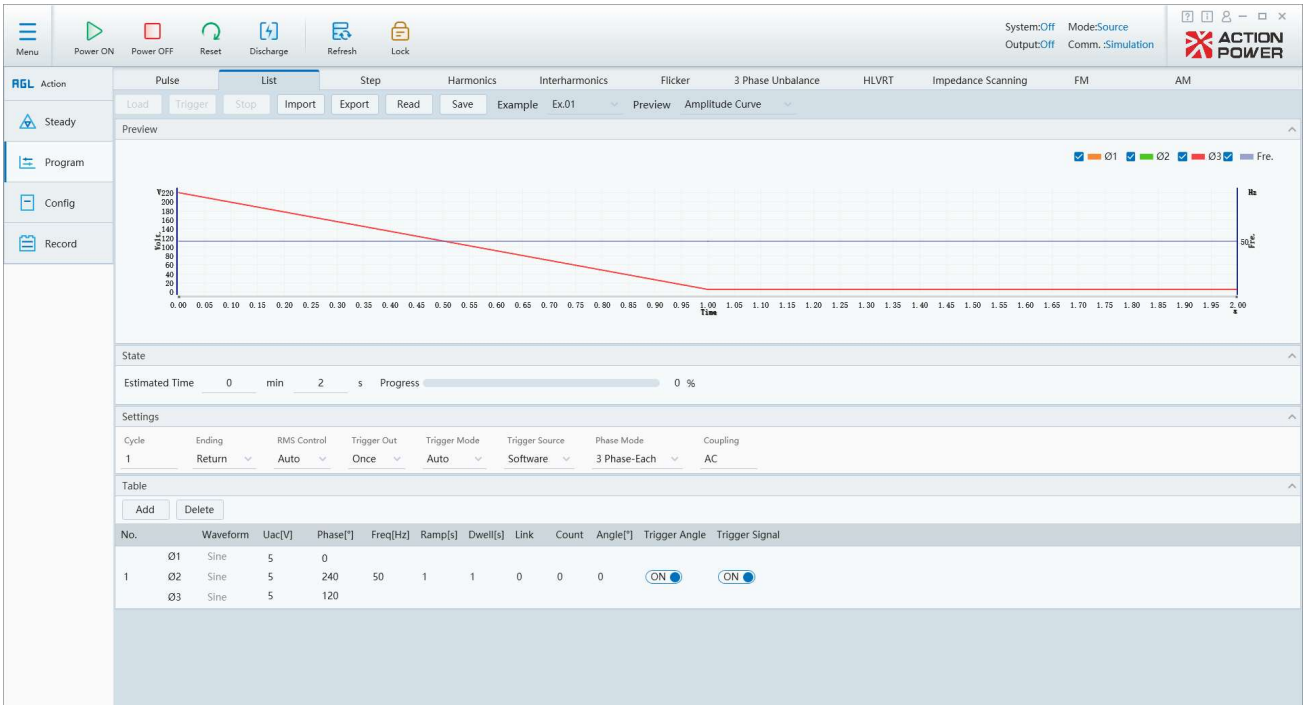
4.2.2.Programming



Click “Programming” in the Menu to enter the source programming interface. This interface includes options for Transient List, Transient Pulse, Transient Step, Harmonics, Interharmonics, Flicker, Three-phase Unbalance, High and Low Voltage Ride-Through Experiment, Frequency Modulation, and Amplitude Modulation.

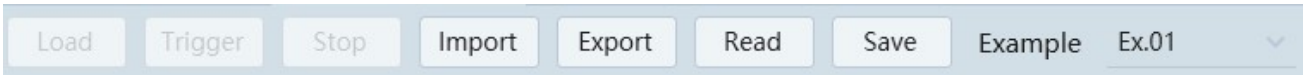
4.2.2.1.Transient List

Click 'Transient List' in the Navigation to access the Transient List interface. The ACTIONPOWER AC Power Supply utilizes a Programming Event List to provide robust transient capabilities. The Transient Programming Window allows users to create, save, call, and execute Transient Lists. The List interface is shown in the figure:



The operation sequence for this interface involves configuring the Programming Configuration and Programming List. After configuration, click the 'Load' button to transmit the Programming Configuration Data and Programming List Data. Once loaded, click the 'Trigger' button to Execute the Experiment.

4.2.2.1.1.Transient List Programming Control



Load: Transmits the Programming Configuration Data to the device.

Trigger: Executes the Programming Output.

End: During a Programming Experiment, the End Button can be clicked to terminate the transient and return to Steady State.

Import: Imports Programming Data from a local source to display on the interface.

Export: Exports the current interface's Programming Configuration Data to a local destination, facilitating subsequent Import and eliminating the need for repetitive editing.

Read: Used in conjunction with the Instance drop-down menu to read the Programming Configuration Data stored in Instance X of the Power Supply Equipment.

Storage: Used in conjunction with the Instance drop-down menu to store the current interface Programming Configuration Data to the Memory Area of Power Supply Equipment Instance X.

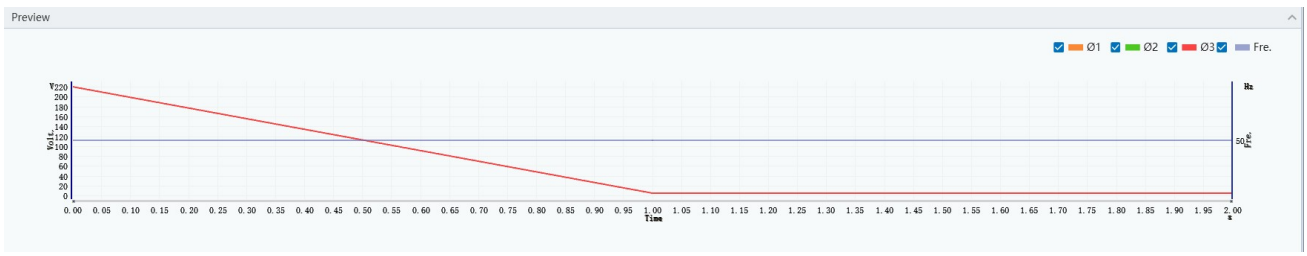
Supports storage and reading for 100 Instances.

Note: The enabled/disabled status of the Load, Trigger, and End Buttons corresponds to the System Status displayed on the right side of the Toolbar. When the System Status is not “Run”, the Load, Trigger, and End Buttons are disabled. When the System Status is “Run”, the Load Button is enabled, while the Trigger and End Buttons are disabled. When the System Status is “ Transient List experiment ”, the Load Button is disabled, and the Trigger and End Buttons are enabled. Pressing the End Button during Transient execution will abort the Transient experiment.

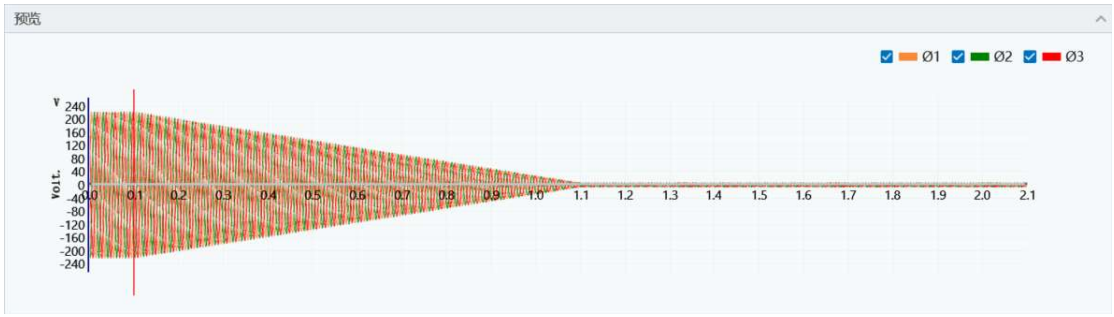
After successful loading, the System Status displays “ Awaiting Trigger ”; after the Trigger output is executed, the System Status displays “ Transient List experiment ”; after the experiment ends or the End Button is clicked, the System Status displays “ Run ”.

4.2.2.1.2.Transient Waveform Preview

Amplitude/Phase curves can be plotted based on the Preview type.



Amplitude curve: Displays the Amplitude variation Waveform for one cycle.



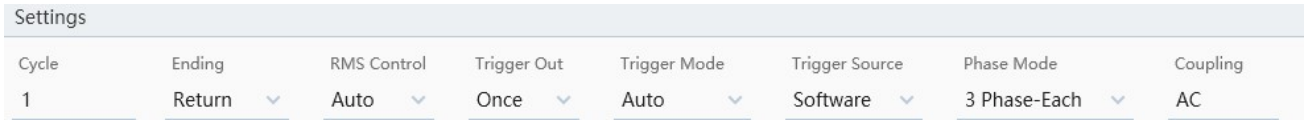
Phase Angle curve: Displays the actual Phase Angle Waveform of the two steps preceding and following the selected step, allowing for easy viewing of Phase Angle transitions. Select the step to view, then click 'Drawing' to plot the Phase Angle Waveform. Use the mouse wheel to zoom the horizontal axis, and slide left or right to navigate.

4.2.2.1.3.Status Display

The Execution Time of the current Programming Data is displayed on the left. After triggering, the Progress bar displays the Programming Experiment Progress.

4.2.2.1.4.Transient List Programming Configuration Parameters

4.2.2.1.4.1.Programming Configuration



Number of Cycles: The number of times the List Data is run cyclically. It supports settings from 0-1000, where 0 indicates an Infinite Loop.

End Status: Exit—Returns to Steady State operation after the Programming Event List is run; Hold—Maintains the output state of the last step after the Programming Event List is run. You can click the End Button to return to Steady State; Standby—Returns to Standby State after the Programming Event List is run; Shutdown—Returns to Shutdown State after the Programming Event List is run.

RMS Mode: Indicates whether the RMS loop algorithm function is enabled. It is recommended to select Automatic/Enable.

Trigger Output: Used with an Oscilloscope to detect Programming Trigger events. In Single mode, the first step of the entire Programming Experiment outputs a Trigger signal. In Single Step mode, it is used in conjunction with Trigger Enable in the List, and each step of programming outputs a Trigger signal. In Single Cycle Time, a Trigger signal is output once per List cycle.

Trigger Mode: In Automatic mode, click once to trigger and automatically execute the experiment according to the list until completion. In Single Step mode, click once to trigger a single step.

Trigger Source: You can select Local software or External Hardware to trigger the List Event Output Waveform.

Local software triggering is typically used.

Phase Number Selection: In Three-phase Independent mode, different Voltage amplitudes can be set for each of the three phases. In Three-phase Linked mode, the Three-phase Voltage amplitudes are identical.

4.2.2.1.4.2.Programming List

No.		Waveform	Uac[V]	Phase[°]	Freq[Hz]	Ramp[s]	Dwell[s]	Link	Count	Angle[°]	Trigger Angle	Trigger Signal
	Ø1	Sine	100	0								
1	Ø2	Sine	100	240	50	0	1	0	0	90	Off	ON
	Ø3	Sine	100	120								
	Ø1	Sine	220	0								
2	Ø2	Sine	220	240	60	0	0.5	1	2	90	ON	ON
	Ø3	Sine	220	120								
	Ø1	Sine	50	0								
3	Ø2	Sine	50	240	60	1	1	0	0	30	ON	Off
	Ø3	Sine	50	120								

Add: When a row is selected, clicking the Add button inserts a programming step below the selected row.

Delete: When a row is selected, clicking the Delete button removes the selected programming step.

Note: The list supports a length of 1 to 100 entries.

Uac[V]: Sets the Three-phase Voltage value for each step. By setting different Voltage values for adjacent steps, Voltage dips/swells can be simulated.

Phase [°]: Sets the phase of the Three-phase Voltage for each step.

Frequency [Hz]: Sets the frequency of the Output Waveform.

Change Time [s]: The change time from the previous step to the current step determines the rate of change (slope) of Voltage and Frequency between the two steps.

Note: The phase transition is abrupt.

Hold Time [s]: The execution time for the current step.

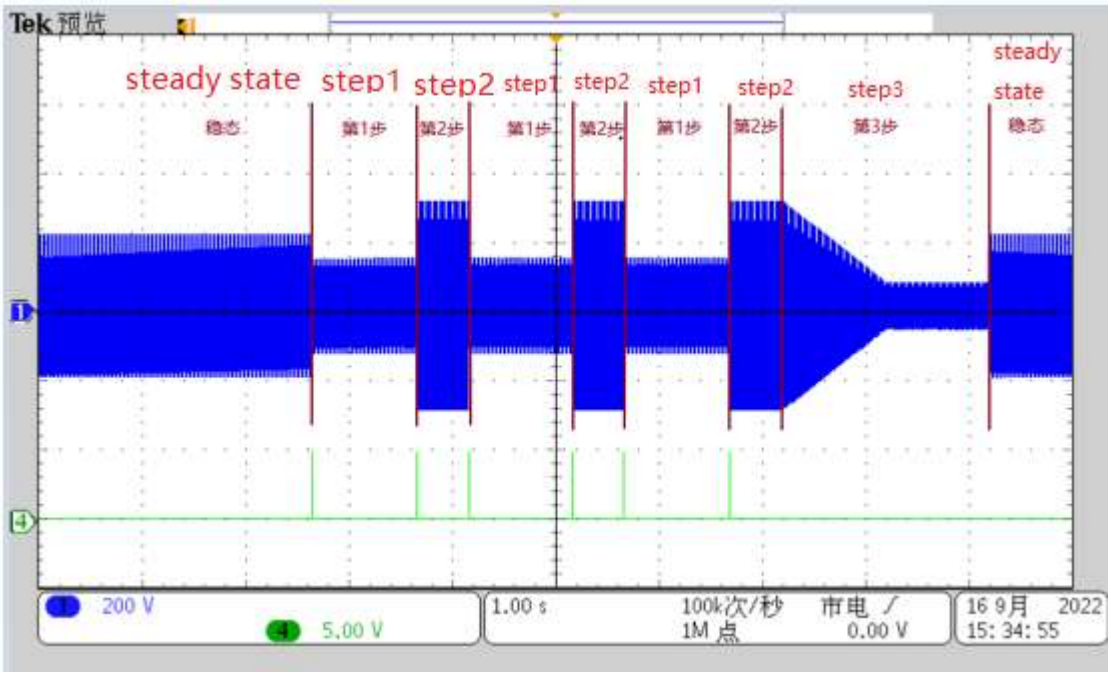
Step 1

Phase Angle and Phase Angle Enable: You can specify the Starting Phase Angle and enable Phase Angle control for any step in the List. If the Starting Phase Angle is not enabled, the current step will begin immediately after the Hold Time of the previous step has elapsed. If the Starting Phase Angle is enabled, after the Hold Time of the previous step has elapsed, the system will wait for the Phase A Voltage Phase to reach the Phase Angle set for the current step before beginning the current step. During this waiting period, the Amplitude, Frequency, and Phase from the previous step are held.

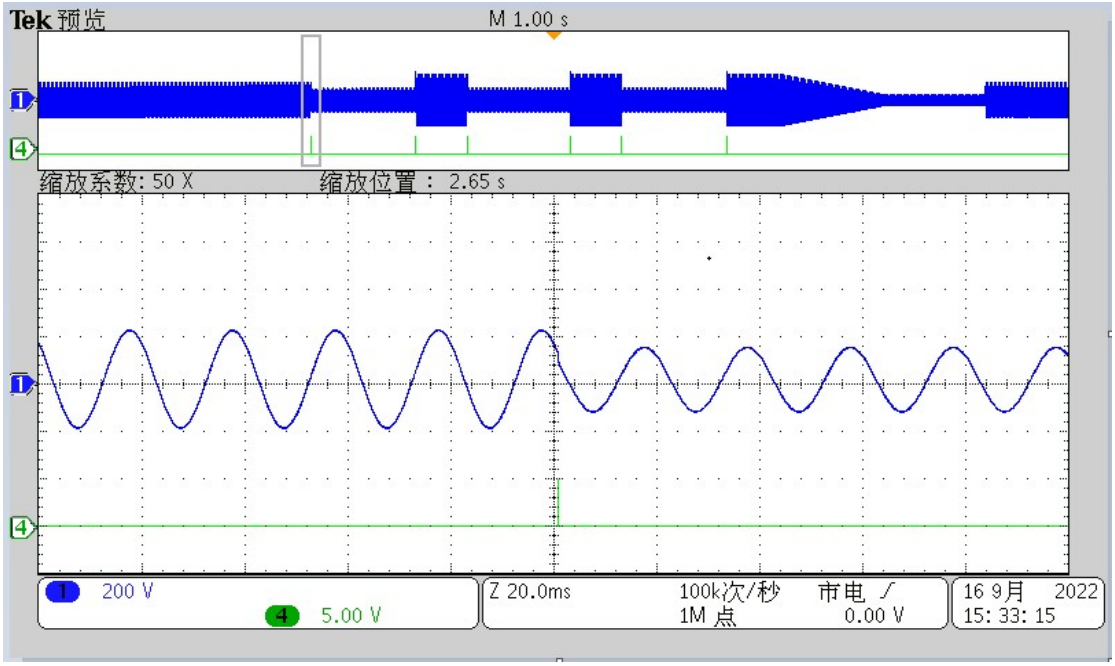
Trigger Enable: This function is used in conjunction with the Trigger output in the Programming Configuration.

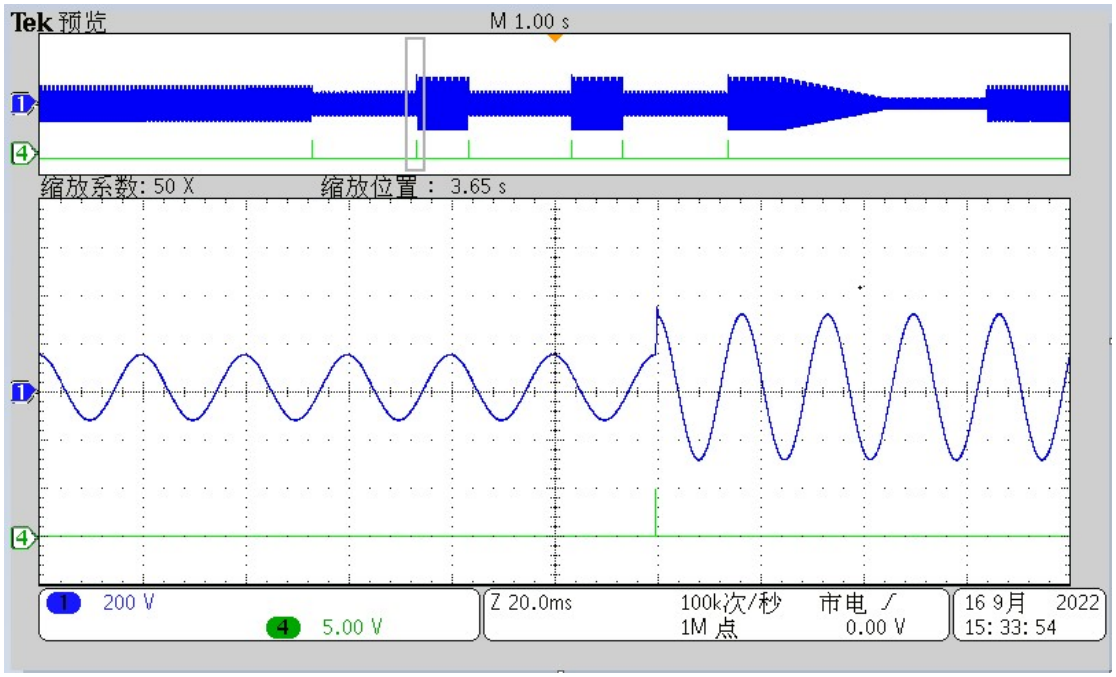
4.2.2.1.4.3.Output Waveform

The figure illustrates the Data Triggered Output Waveform. (CH1: Phase A Voltage, CH4: Trigger output signal)



A.Impact of Phase Angle and Phase Angle Enable on the Output Waveform:

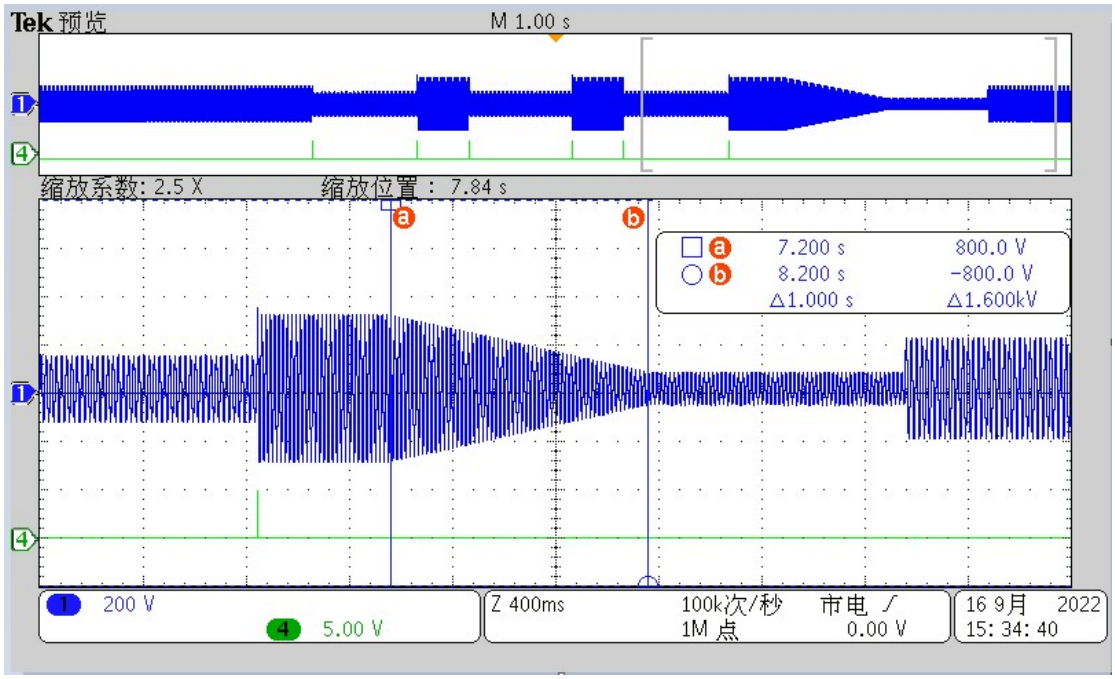




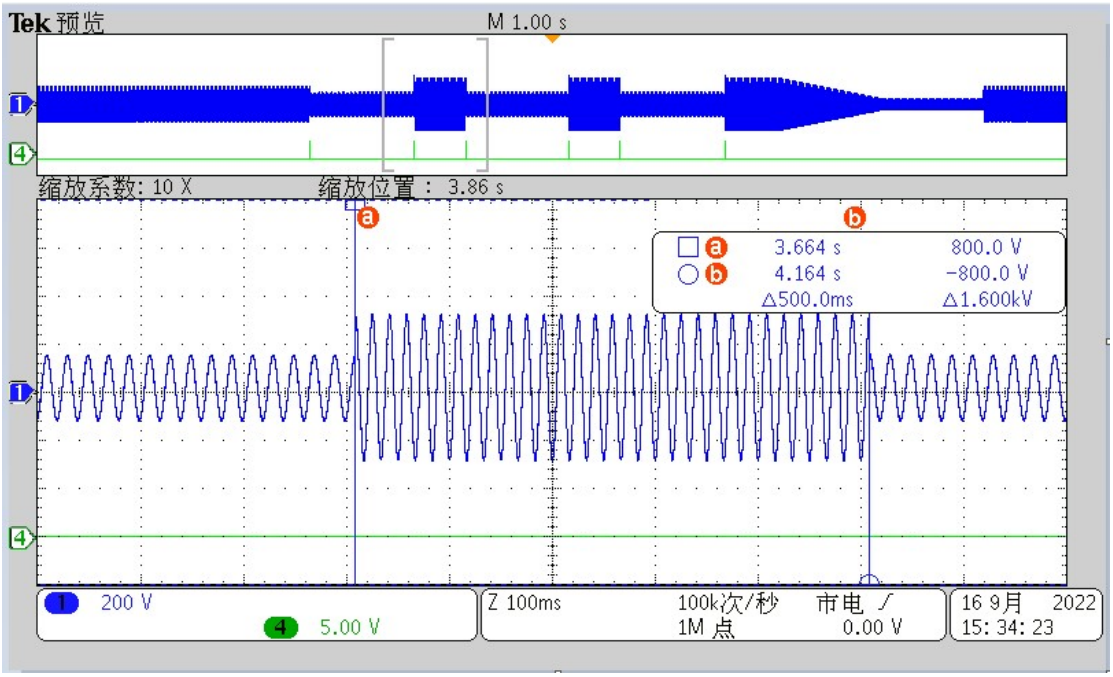
Comparing the two figures: In the first scenario, the Starting Phase Angle is disabled, so the experiment proceeds directly to the current step upon starting. In the second scenario, the Starting Phase Angle is enabled. After the Hold Time of the first step elapses, the system waits for the Phase Angle of Phase A Voltage to reach the Phase Angle (90°) configured for the current step before proceeding to the second step.

Verification of Change Time and Hold Time:

As shown in the figure, the Change Time for the third step is 1s, consistent with the List Data.



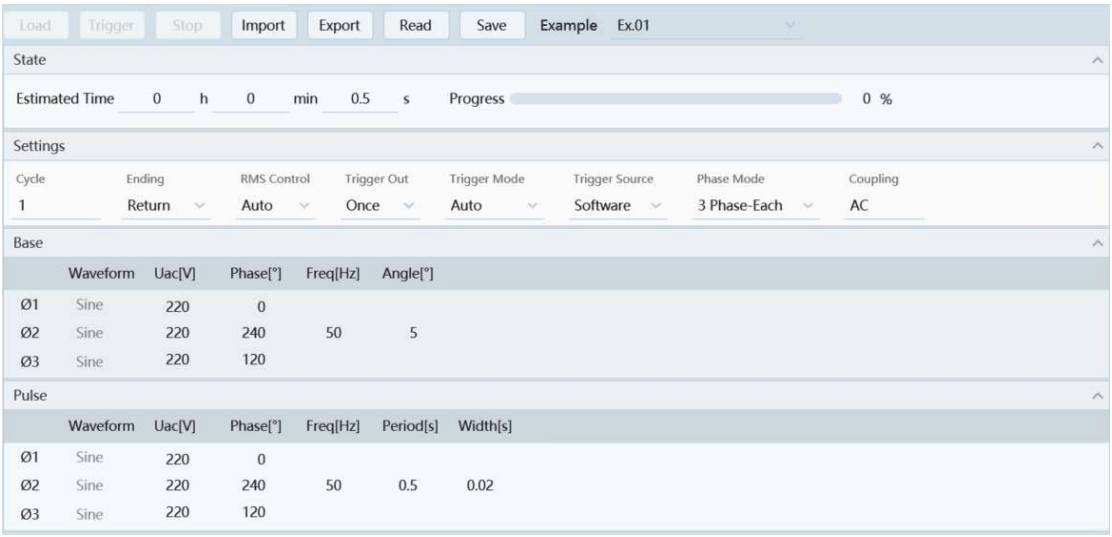
As shown in the figure, the Hold Time for the second step is 500ms, consistent with the List Data.



B.Verification of Sequence Combination and Number of Repetitions:

Step 1

4.2.2.2.Transient Pulse Programming



Click Transient Pulse Programming in the Menu/Navigation to access the Transient Pulse Programming interface. The Programming Window allows modification, saving, calling, and execution of Programming Data.

The Operation Sequence for this interface involves setting the Programming Configuration, Fundamental Wave, and Pulse. After setting these parameters, click the “Load” button to transmit the Programming Configuration, Fundamental Wave, and Pulse data. Once loaded, click the “Trigger” button to Execute the Experiment.

4.2.2.2.1.Programming Control

Consistent with the control usage of Transient List Programming.

Load: Transmits the Programming Configuration Data to the device.

Trigger: Executes the Programming Output.

End: During a Programming Experiment, the End Button can be clicked to terminate the transient and return to Steady State.

Import: Imports Programming Data from a local source to display on the interface.

Export: Exports the current interface's Programming Configuration Data to a local destination, facilitating subsequent Import and eliminating the need for repetitive editing.

Read: Used in conjunction with the Instance drop-down menu to read the Programming Configuration Data stored in Instance X of the Power Supply Equipment.

Storage: Used in conjunction with the Instance drop-down menu to store the current Programming Configuration Data from the interface to Memory Area X of the Power Supply Equipment Instance.

Supports storage and reading for 100 Instances.

Note: The disabled state of the Load, Trigger, and End Buttons corresponds to the System Status changes in the Toolbar, similar to Transient List Programming.

Upon successful loading, the Toolbar System Status displays " Awaiting Trigger "; upon successful triggering, it displays " Transient Pulse Experiment "; when the experiment ends or the End Button is clicked, it displays " Run ".

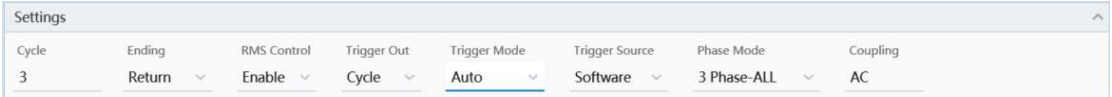
4.2.2.2.2.Status Display

The current Programming Data Execution Time is displayed on the left. After triggering, the Progress bar displays the Programming Experiment Progress.

4.2.2.2.3.Transient Pulse Programming Configuration Parameters

4.2.2.2.3.1.Programming Configuration

Same meaning as the Transient List Programming Configuration.



Number of Cycles: The number of times the Pulse and Fundamental Wave data are run in a loop. Supports settings from 0 to 1000, where 0 indicates an Infinite loop.

End Status: Exit—Returns to Steady State operation after the Programming Event List is run; Hold—Maintains the output state of the last step after the Programming Event List is run. You can click the End Button to return to Steady State; Standby—Returns to Standby State after the Programming Event List is run; Shutdown—Returns to Shutdown State after the Programming Event List is run.

RMS Mode: Indicates whether the RMS loop algorithm function is enabled. It is recommended to select Automatic/Enable.

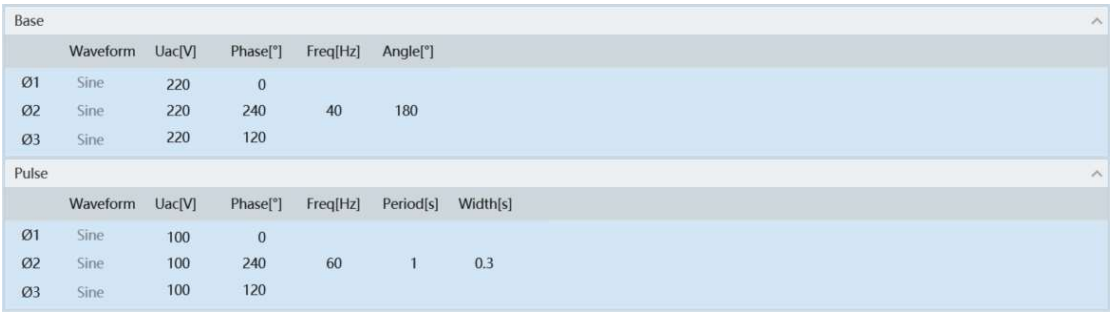
Trigger output: Used with an oscilloscope to detect programming trigger events. In single mode, a trigger signal is output at the beginning of the programming experiment. In single cycle mode, a signal consisting of one pulse and one fundamental wave cycle is output.

Trigger Mode: In Automatic mode, click once to trigger and automatically execute the experiment according to the list until completion. In Single Step mode, click once to trigger a single step.

Trigger source: Waveform output can be triggered by either local software or external hardware events. Local software triggering is typically used.

Phase Number Selection: In Three-phase Independent mode, different Voltage amplitudes can be set for each of the three phases. In Three-phase Linked mode, the Three-phase Voltage amplitudes are identical.

4.2.2.2.3.2.Programming List



Base

	Waveform	Uac[V]	Phase[°]	Freq[Hz]	Angle[°]
Ø1	Sine	220	0		
Ø2	Sine	220	240	40	180
Ø3	Sine	220	120		

Pulse

	Waveform	Uac[V]	Phase[°]	Freq[Hz]	Period[s]	Width[s]
Ø1	Sine	100	0			
Ø2	Sine	100	240	60	1	0.3
Ø3	Sine	100	120			

Uac[V]: Sets the three-phase voltage value.

Phase[°]: Sets the phase angle of the three-phase voltage.

Frequency[Hz]: Sets the frequency of the output waveform.

Period: The duration of one cycle consisting of a pulse and a fundamental wave.

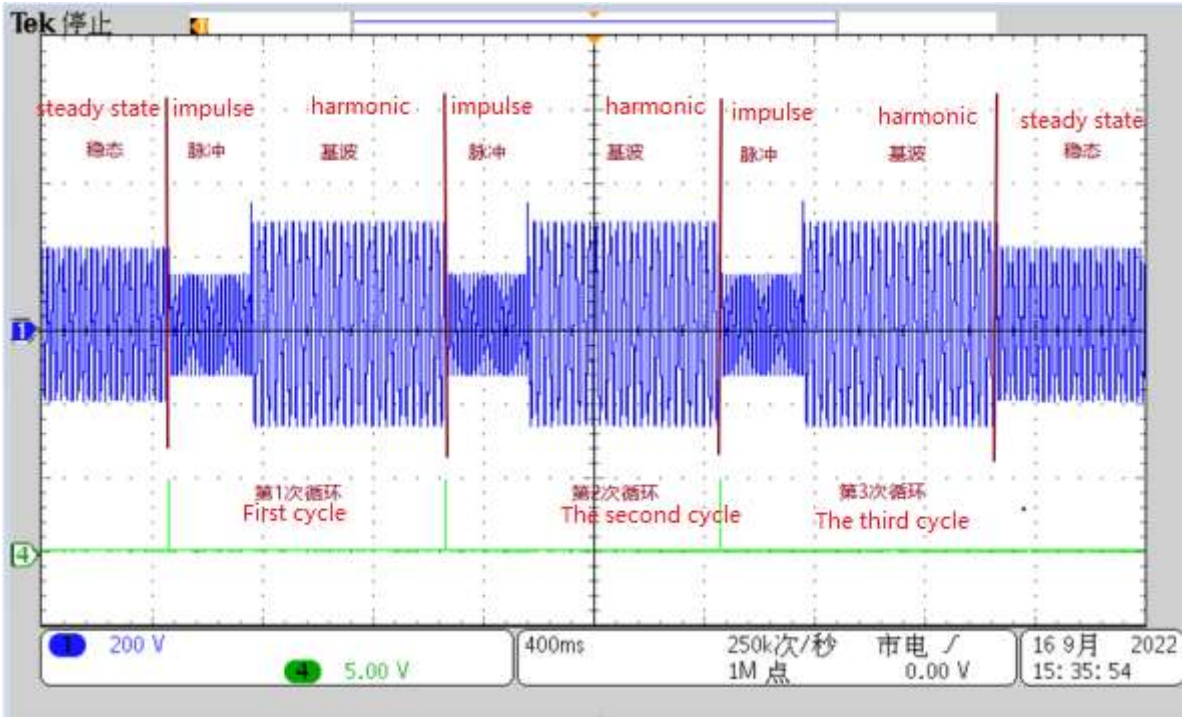
Pulse Width: The duration of the pulse waveform within one output cycle.

Phase Angle: After a trigger, the experiment begins when the Phase A Voltage reaches the specified phase angle.

Note: Fundamental Wave List: Configures the fundamental wave output. Pulse List: Configures the pulse output. Upon a Trigger, the Pulse List is executed first, followed by the Fundamental Wave List.

4.2.2.2.3.3.Output Waveform

The figure illustrates the Data Triggered Output Waveform. (CH1: Phase A Voltage, CH4: Trigger output signal)

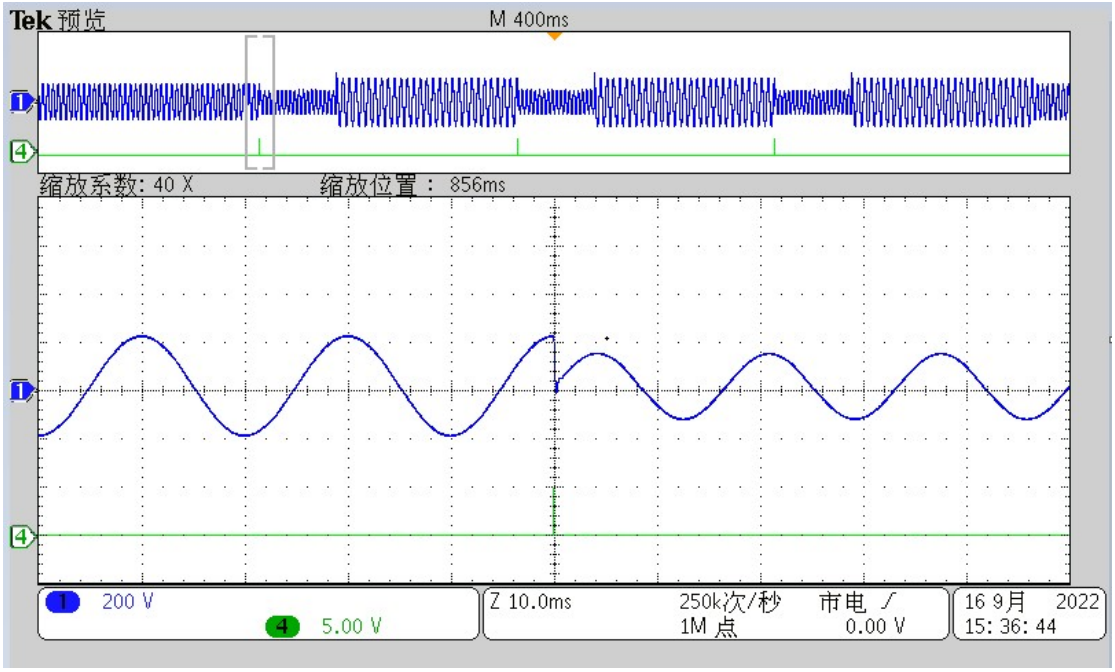


A.Number of Cycles Verification:

The Output Waveform above shows 3 cycles, which corresponds to the Programming Configuration settings.

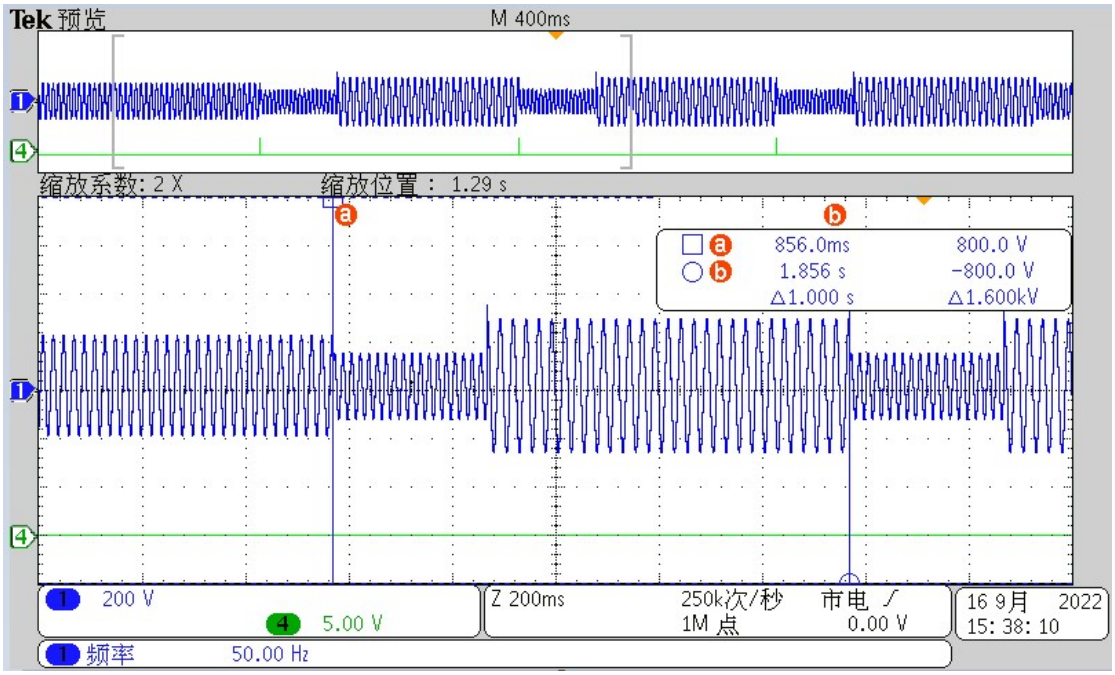
B.Phase Angle Verification:

As shown in the figure, the Experiment starts at Phase A 90° when transitioning from Steady State, consistent with the Phase Angle setting.



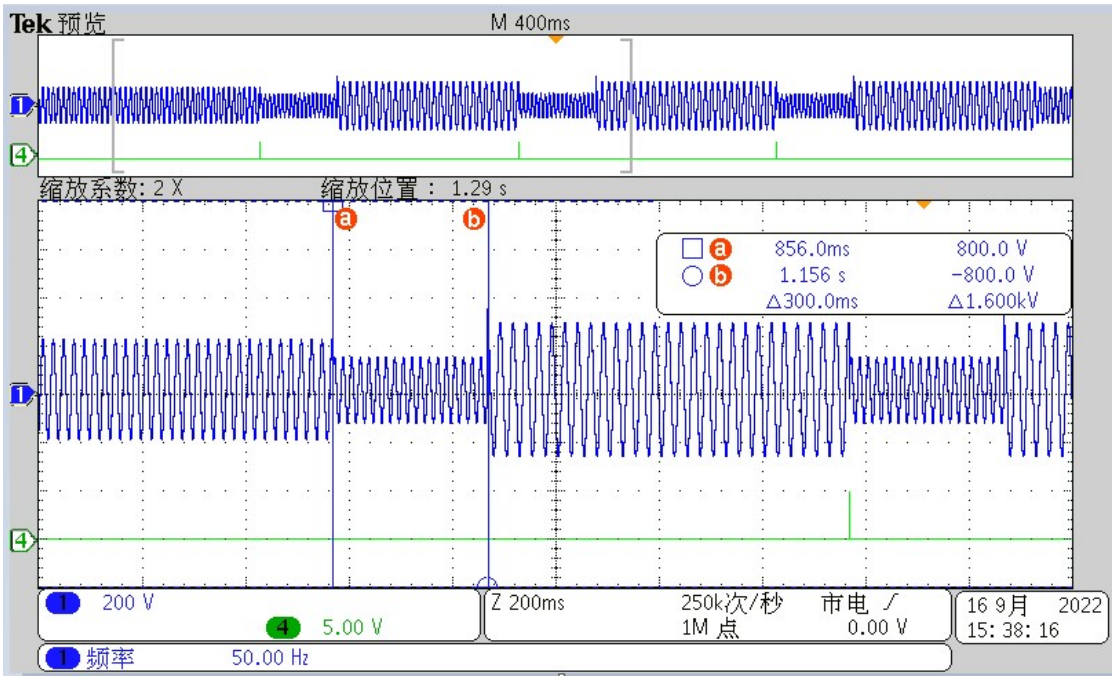
C.Period Verification:

As shown in the figure, the Period is 1s, consistent with the configured Period.



D.Pulse Width Verification:

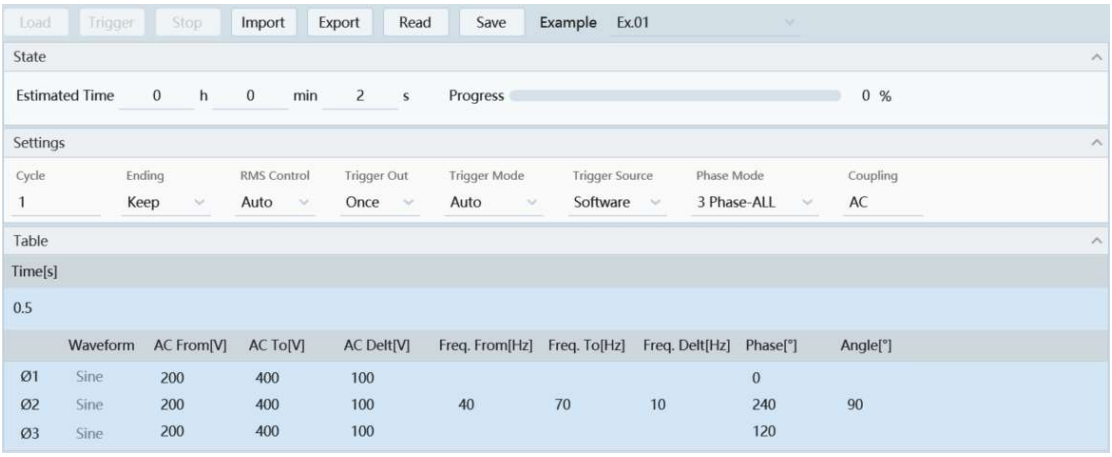
As shown in the figure, the Pulse Width is 0.3s, consistent with the configured value.



4.2.2.3.Transient Step Programming

Click 'Transient Step Programming' in the Navigation to access the Transient Step Programming interface. The Programming Window allows for modification, saving, loading, and execution of Programming Data.

The Operation Sequence for this interface involves setting the Programming Configuration and sequence. After setting, click the "Load" button to send the Programming Configuration and Programming List Data. Once loaded, click the "Trigger" button to Execute the Experiment.



4.2.2.3.1.Programming Control

Consistent with the usage of Transient List Programming control.

Load: Transmits the Programming Configuration Data to the device.

Trigger: Executes the Programming Output.

End: During a Programming Experiment, the End Button can be clicked to terminate the transient and return to Steady State.

Import: Imports Programming Data from a local source to display on the interface.

Export: Exports the current interface's Programming Configuration Data to a local destination, facilitating subsequent Import and eliminating the need for repetitive editing.

Read: Used in conjunction with the Instance drop-down menu to read the Programming Configuration Data stored in Instance X of the Power Supply Equipment.

Storage: Used in conjunction with the Instance drop-down menu to store the current Programming Configuration Data from the interface to Memory Area X of the Power Supply Equipment Instance.

Supports storage and reading for 100 Instances.

Note: The disabled state of the Load, Trigger, and End Buttons corresponds to the System Status changes in the Toolbar, similar to Transient List Programming.

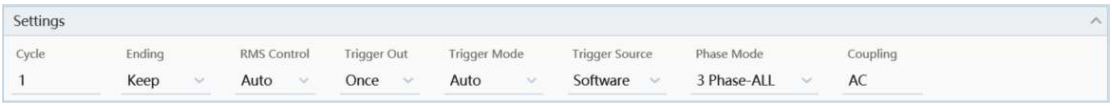
If loading is successful, the Toolbar System Status displays " Awaiting Trigger ". If the Trigger is successful, it displays " Transient Step Experiment ". When the Experiment Ends or the End Button is clicked, it displays " Run ".

4.2.2.3.2.Status Display

The Execution Time of the current Programming Data is displayed on the left. After triggering, the Progress bar displays the Programming Experiment Progress.

4.2.2.3.3.Transient Step Programming Configuration Parameters

4.2.2.3.3.1.Programming Configuration



Same meaning as the Transient List Programming Configuration.

Number of Cycles: The number of times the List Data is run cyclically. It supports settings from 0-1000, where 0 indicates an Infinite Loop.

End Status: Exit---Returns to Steady State operation after the Programming Event is Run; Hold---Maintains the output status of the last step after the Programming Event is Run. The End Button can be clicked to return to Steady State; Standby---Returns to Standby State after the Programming Event List is Run; Shutdown---Returns to Shutdown State after the Programming Event List is Run.

RMS Mode: Indicates whether the RMS loop algorithm function is enabled. It is recommended to select Automatic/Enable.

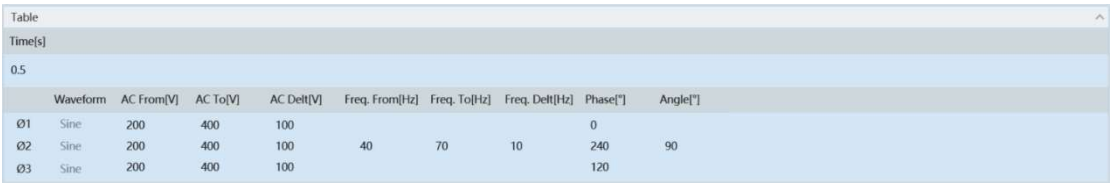
Trigger output: Used with an oscilloscope to detect programming trigger events. In single mode, a trigger signal is output at the beginning of the programming experiment. In single cycle mode, a signal consisting of one pulse and one fundamental wave cycle is output.

Trigger Mode: In Automatic mode, click once to trigger and automatically execute the experiment according to the list until completion. In Single Step mode, click once to trigger a single step.

Trigger source: Waveform output can be triggered by either local software or external hardware events. Local software triggering is typically used.

Phase Number Selection: In Three-phase Independent mode, different Voltage amplitudes can be set for each of the three phases. In Three-phase Linked mode, the Three-phase Voltage amplitudes are identical.

4.2.2.3.3.2.Programming List



Time [s]: Hold Time for each step.

AC Start [V]: Sets the three-phase start voltage value.

AC End [V]: Sets the three-phase end voltage value.

AC Increment [V]: Sets the three-phase voltage increment for each step.

Start Frequency [Hz]: Sets the start frequency value.

End Frequency [Hz]: Sets the end frequency value.

Frequency Increment [Hz]: Sets the frequency increment for each step.

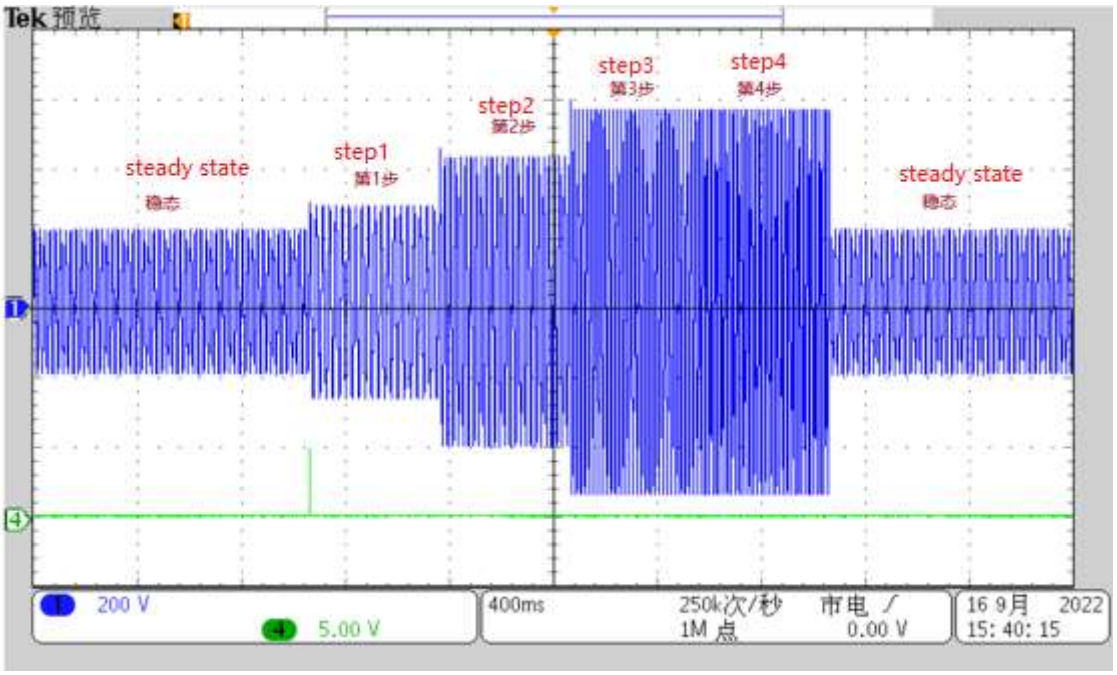
Phase[°]: Sets the phase angle of the three-phase voltage.

Phase Angle [°]: Sets the phase angle, relative to Phase A Voltage, at which each step begins.

4.2.2.3.3.3.Output Waveform

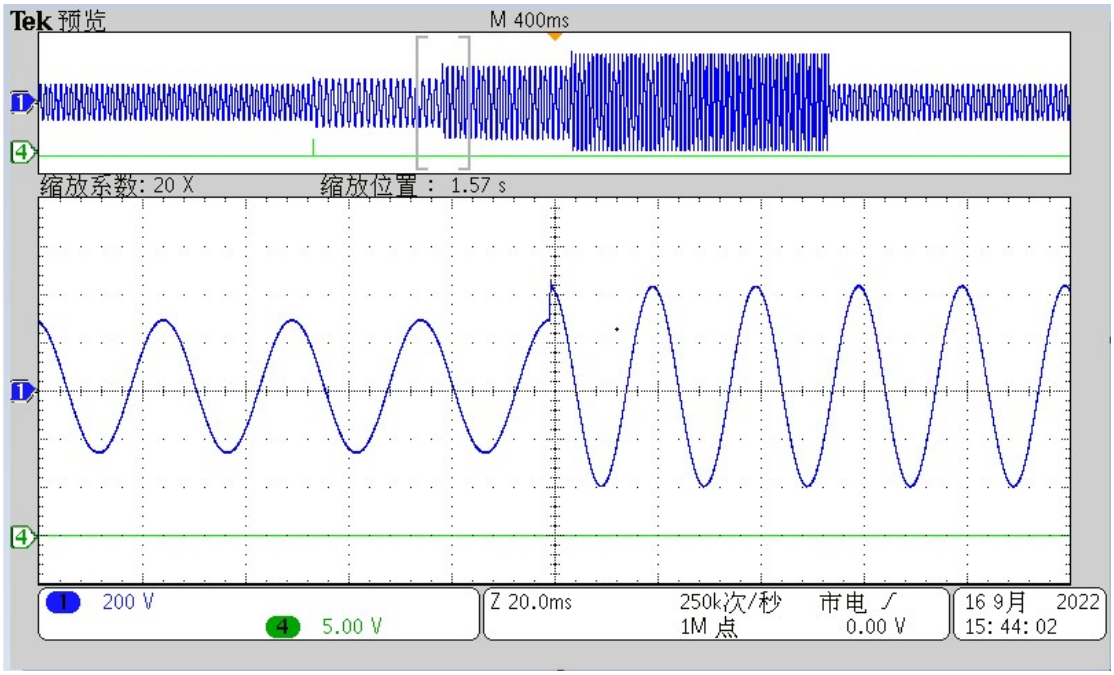
The figure illustrates the Data Triggered Output Waveform. (CH1: Phase A Voltage, CH4: Trigger output signal)

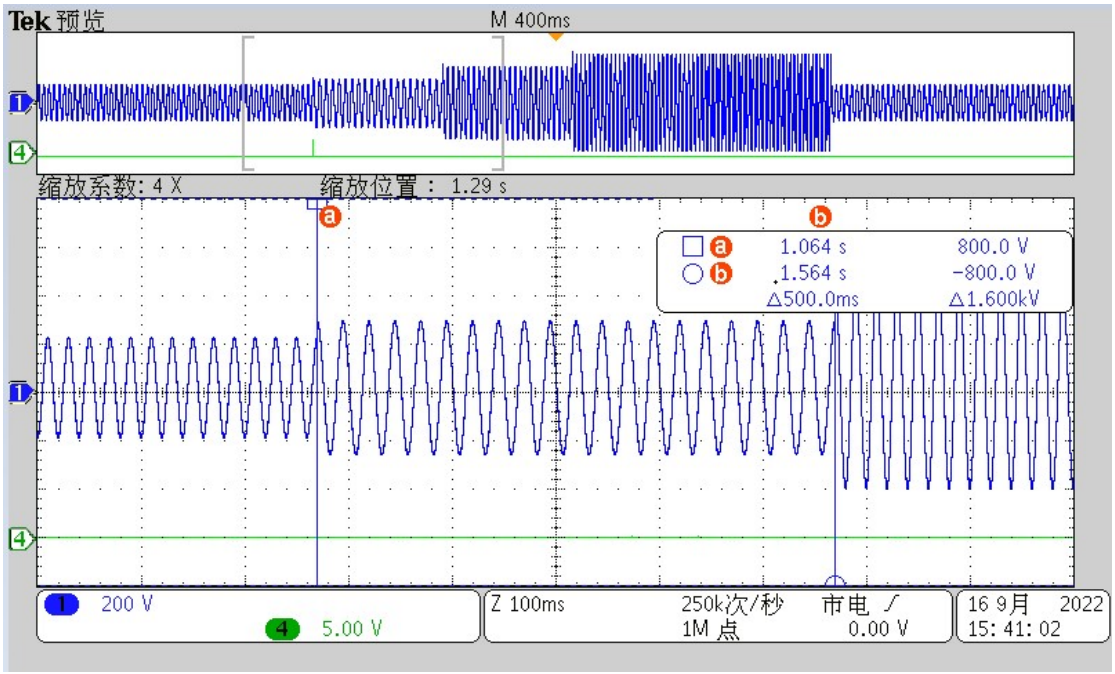
Steady State (Voltage 150, Frequency 50)-> Step 1 (Voltage 200, Frequency 40)-> Step 2 (Voltage 300, Frequency 50)-> Step 3 (Voltage 400, Frequency 60)-> Step 4 (Voltage 400, Frequency 70)-> Steady State (Voltage 150, Frequency 50).



A. Verify Phase Angle:

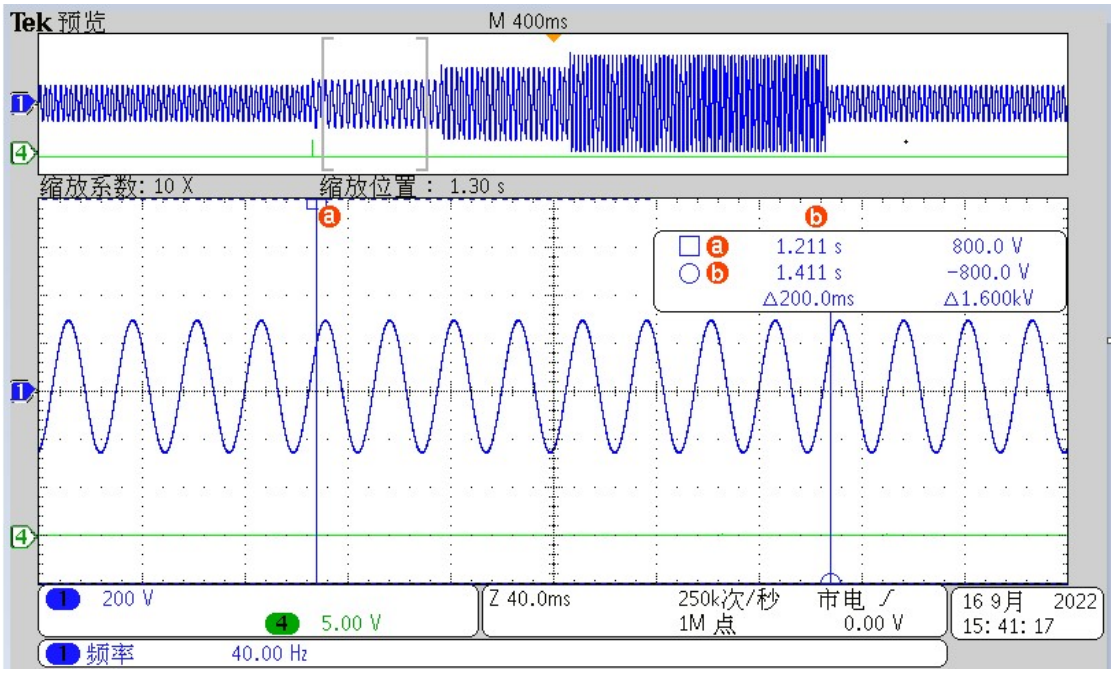
As shown in the figure, each step begins at a specific phase angle (90°) of the Phase A Voltage.





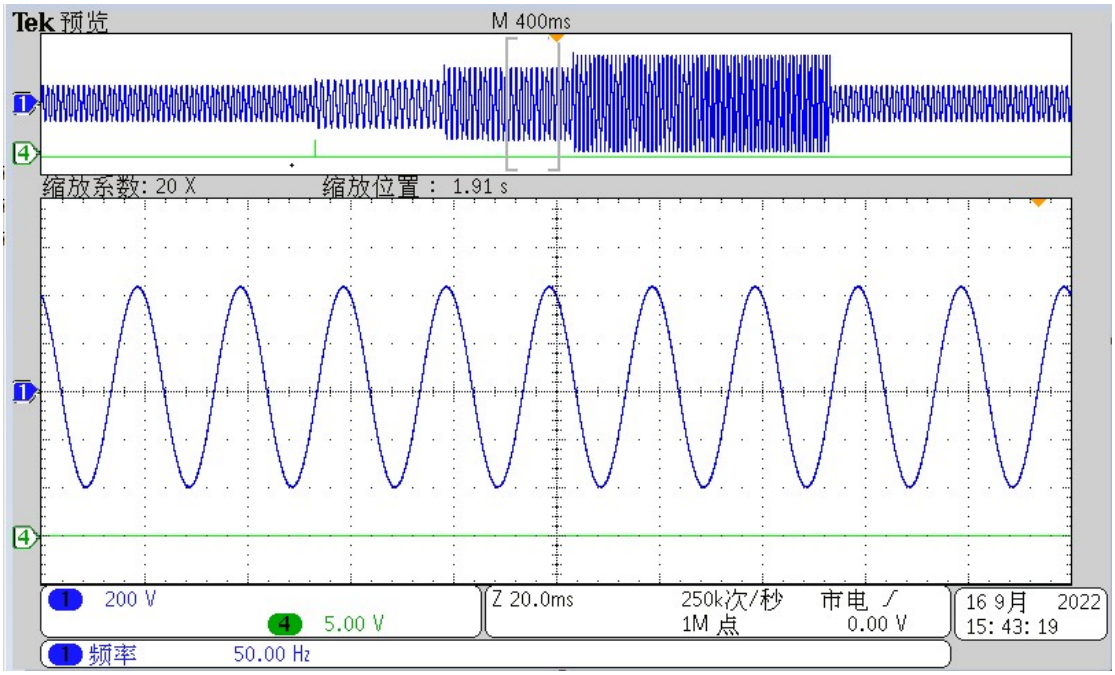
B. Verify Single Step Time:

As shown in the figure, the duration of each step is 0.5s, consistent with the setting.



C. Verify Frequency Increment:

The frequency difference between step 1 and step 2 is 10Hz, consistent with the setting.

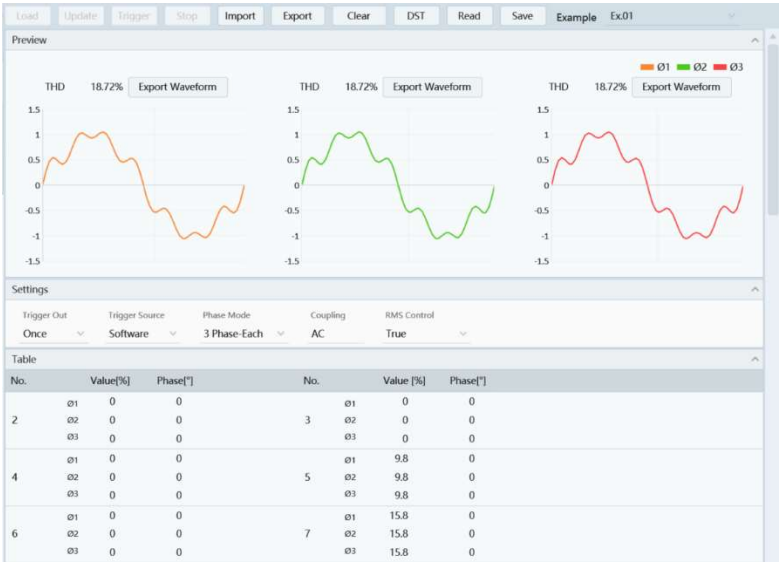


4.2.2.4.Harmonic Generation

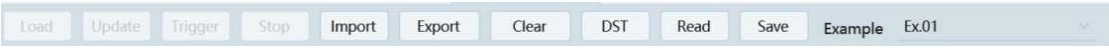
In the Navigation panel, click Harmonic Generation to access the Harmonic Programming interface. The Programming Window allows you to modify, save, load, and execute experiments.

Note: Harmonic programming is only available when the steady-state frequency is 50/60Hz. There are restrictions on the harmonic content of each harmonic order: the total harmonic content must not exceed 60% for harmonics 2-10, 20% for harmonics 11-20, 10% for harmonics 21-30, and 10% for harmonics 31-50.

The operation sequence for this interface involves configuring the Programming Configuration and Programming List. After configuration, click the 'Load' button to transmit the Programming Configuration Data and Programming List Data. Once loaded, click the 'Trigger' button to Execute the Experiment.



4.2.2.4.1.Programming Control



Load: Sends the Programming Data to the equipment and enables the Trigger;

Update: Experiment data can be reset mid-experiment;

Trigger: Programming Output.

End: During a Programming Experiment, the End Button can be clicked to terminate the transient and return to Steady State.

Import: Imports Programming Data from a local source to display on the interface.

Export: Exports the current interface's Programming Data to a local file for convenient future Import, avoiding the need to re-edit.

Clear Data: Clears the Harmonics List Data;

DST: Contains 27 built-in groups of common Harmonics data, ranging from DST1 to DST27.

Read: Used in conjunction with the Instance drop-down box, reads the Programming Configuration Data stored in Instance X of the Power Supply Equipment.

Storage: Used in conjunction with the Instance drop-down box, stores the current interface's Programming Configuration Data to the Memory Area of Power Supply Equipment Instance X.

Supports storage and reading for 100 Instances.

Note: The disabled state of the Load, Update, Trigger, and End Buttons corresponds to the System Status in the Toolbar. When not running, the Load, Update, Trigger, and End Buttons will be Disabled. Upon successful loading, the Toolbar System Status displays “ Awaiting Trigger ”. Upon successful triggering, it displays “ Harmonics Experiment ”. Pressing End during experiment execution will abort the experiment. Experiment End/Clicking the End Button displays “ Run ”.

4.2.2.4.2.Waveform Preview

The harmonic list data output waveform can be previewed. Clicking the waveform export button exports the waveform data of the corresponding phase in a custom waveform data format for user convenience.

4.2.2.4.3.Harmonic Programming Configuration Parameters

4.2.2.4.3.1.Programming Configuration

Harmonic Trigger Output: This function is used with an oscilloscope to detect programming trigger events. In Single mode, a trigger signal is output once at the beginning of the experiment. In Fundamental Wave mode, the trigger signal is output relative to the fundamental wave, starting from the beginning of the experiment.

Trigger source: Waveform output can be triggered by either local software or external hardware events. Local software triggering is typically used.

Phase Number Selection: When Three-phase Independent is selected, different Harmonic content and Phase can be set for each of the three phases. When Three-phase Linked is selected, the Harmonic content and Phase are identical for all three phases.

Control Mode: In Fundamental Wave RMS mode, the fundamental wave content is controlled to maintain the steady-state set Voltage value. Superimposing harmonics increases the total RMS value. In Total RMS mode, the total content of the fundamental wave and harmonics combined is controlled to maintain the steady-state set Voltage value.

4.2.2.4.3.2.Programming List

It is possible to set the content and phase of individual harmonics from the 2nd to the 50th, for Three-phase harmonics.

Table

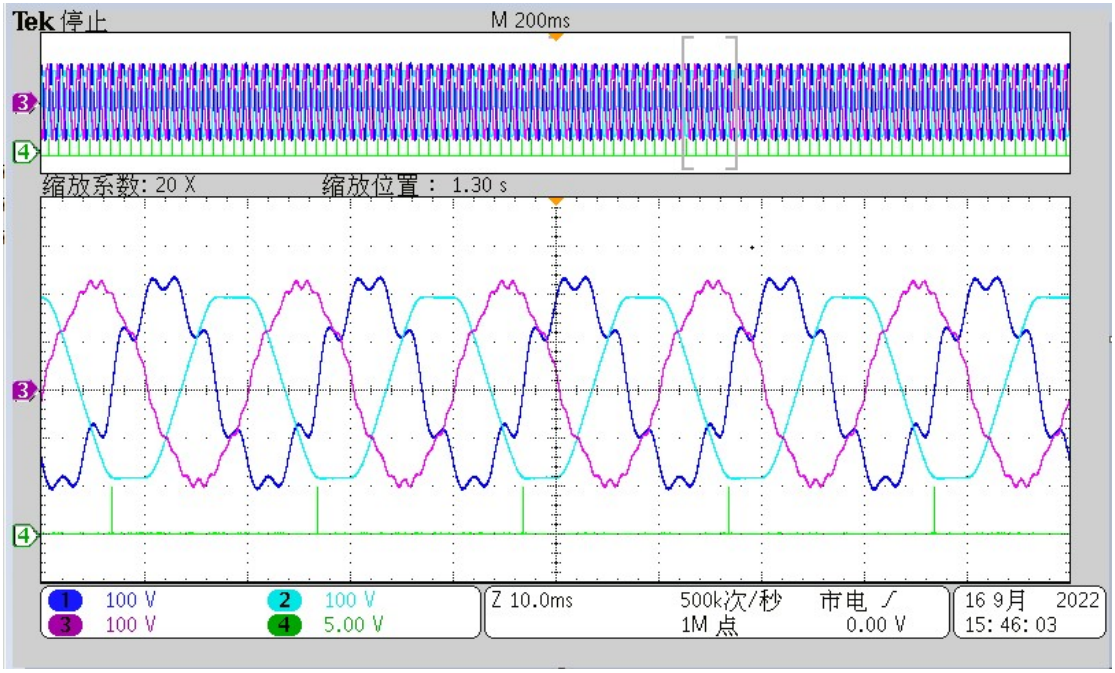
No.		Value[%]	Phase[°]	No.		Value [%]	Phase[°]
2	Ø1	0	0	3	Ø1	0	0
	Ø2	0	0		Ø2	0	0
	Ø3	0	0		Ø3	0	0
4	Ø1	0	0	5	Ø1	9.8	0
	Ø2	0	0		Ø2	9.8	0
	Ø3	0	0		Ø3	9.8	0
6	Ø1	0	0	7	Ø1	15.8	0
	Ø2	0	0		Ø2	15.8	0
	Ø3	0	0		Ø3	15.8	0
8	Ø1	2.16	0	9	Ø1	0	0
	Ø2	2.16	0		Ø2	0	0
	Ø3	2.16	0		Ø3	0	0
10	Ø1	0	0	11	Ø1	0	0
	Ø2	0	0		Ø2	0	0
	Ø3	0	0		Ø3	0	0
12	Ø1	0	0	13	Ø1	0	0
	Ø2	0	0		Ø2	0	0
	Ø3	0	0		Ø3	0	0
14	Ø1	0	0	15	Ø1	0	0
	Ø2	0	0		Ø2	0	0
	Ø3	0	0		Ø3	0	0
16	Ø1	0	0	17	Ø1	0	0
	Ø2	0	0		Ø2	0	0
	Ø3	0	0		Ø3	0	0
18	Ø1	0	0	19	Ø1	0	0
	Ø2	0	0		Ø2	0	0
	Ø3	0	0		Ø3	0	0
	Ø1	0	0		Ø1	0	0

Note: For this group, harmonic content values from the 20th to the 50th are set to 0.

4.2.2.4.3.3 Harmonic Waveform

The Data Triggered Output Waveform is configured as follows: (CH1 Phase A Voltage, CH2 Phase B Voltage, CH3

Phase C Voltage, CH4 Trigger output signal)



4.2.2.5.Interharmonic Programming

Click Interharmonics in the Menu/Navigation to access the Interharmonics Programming interface. The Programming Window allows the creation, storage, recall, and execution of a Transient List.

The operation sequence for this interface involves configuring the Programming Configuration and Programming List. After configuration, click the 'Load' button to transmit the Programming Configuration Data and Programming List Data. Once loaded, click the 'Trigger' button to Execute the Experiment.

4.2.2.5.1 Programming Control

Load: Transmits the Programming Configuration Data to the equipment.

Trigger: Executes the Programming Output.

End: During a Programming Experiment, the End Button can be clicked to terminate the transient and return to Steady State.

Import: Imports Programming Data from a local source to display on the interface.

Export: Exports the current interface's Programming Configuration Data to a local destination, facilitating subsequent Import and eliminating the need for repetitive editing.

Read: Used in conjunction with the Instance drop-down menu to read the Programming Configuration Data stored in Instance X of the Power Supply Equipment.

Storage: In conjunction with the Instance drop-down menu, stores the current interface's Programming Configuration Data to the Power Supply Equipment Instance X Memory Area. Supports the Storage and Read of 100 Instances.

Note: The Load, Trigger, and End Buttons are enabled or Disabled based on the System Status displayed in the Toolbar. Upon successful loading, the Toolbar System Status displays " Awaiting Trigger "; after successful triggering, it displays " Interharmonics Experiment "; after the experiment concludes or the End Button is clicked, it displays " Run ".

4.2.2.5.1.Interharmonic Programming Configuration Parameters

4.2.2.5.1.1.Programming Configuration

Same meaning as the Transient List Programming Configuration.

Number of Cycles: The number of times the List Data is run cyclically. It supports settings from 0-1000, where 0 indicates an Infinite Loop.

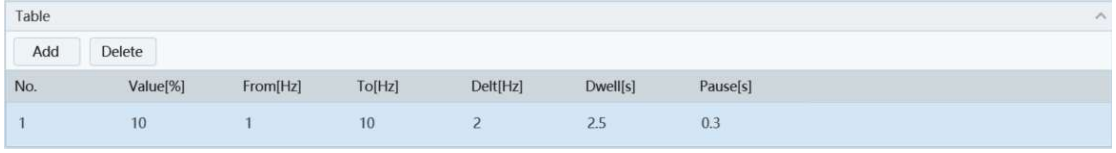
Interharmonics Trigger Output: This is used with an oscilloscope to detect programming trigger events. In Single mode, a Trigger signal is output during the first step of the entire Programming Experiment. In Single Step mode, it is used in conjunction with Trigger Enable in the List, where each programming step outputs a Trigger signal. In Single Cycle Time mode, a signal is output once per List cycle. In Fundamental Wave mode, the Trigger signal is output based on the start time of the Experiment as a reference point.

Trigger Mode: In Automatic mode, click once to trigger and automatically execute the experiment according to the list until completion. In Single Step mode, click once to trigger a single step.

Trigger Source: You can select Local software or External Hardware to trigger the List Event Output Waveform. Local software triggering is typically used.

Phase Mode: This is divided into 0 Phase, which is similar to Fundamental Wave and Custom. 0 Phase indicates that the Three-phase Interharmonics superposition Phase is consistent. 'Same as Fundamental Wave' indicates that the Three-phase Interharmonics superposition Phase uses the Steady State setting Phase. 'Custom' indicates that the Three-phase Interharmonics superposition Phase uses the value set in the interface (the Phase setting bar will appear in Custom mode).

4.2.2.5.1.2.Programming List



Add: When a row is selected, clicking the Add button inserts a programming step below the selected row.

Delete: When a row is selected, clicking the Delete button will remove that programming step.

Note: The list supports a length of 1 to 100 entries.

Content [%]: Sets the interharmonic content value.

Start Frequency [Hz]: The starting frequency for interharmonics.

End Frequency [Hz]: The ending frequency for interharmonics.

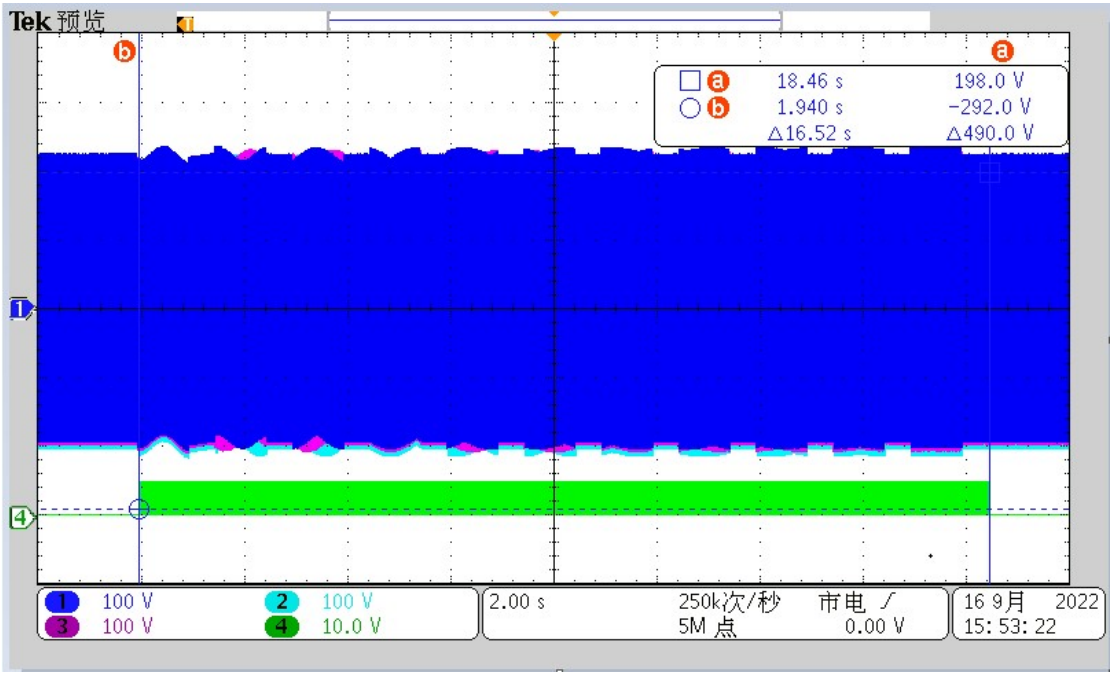
Frequency Increment [Hz]: The frequency increment/decrement value applied at each step from the start frequency to the end frequency.

Execution Time: The duration for which the frequency is held after each increment/decrement.

Interval Time: The time interval between the end of the execution time and the next frequency change.

4.2.2.5.1.3.Output Waveform

Configure the data-triggered output waveform as follows: (CH1 Phase A Voltage, CH2 Phase B Voltage, CH3 Phase C Voltage, CH4 Trigger Output Signal)



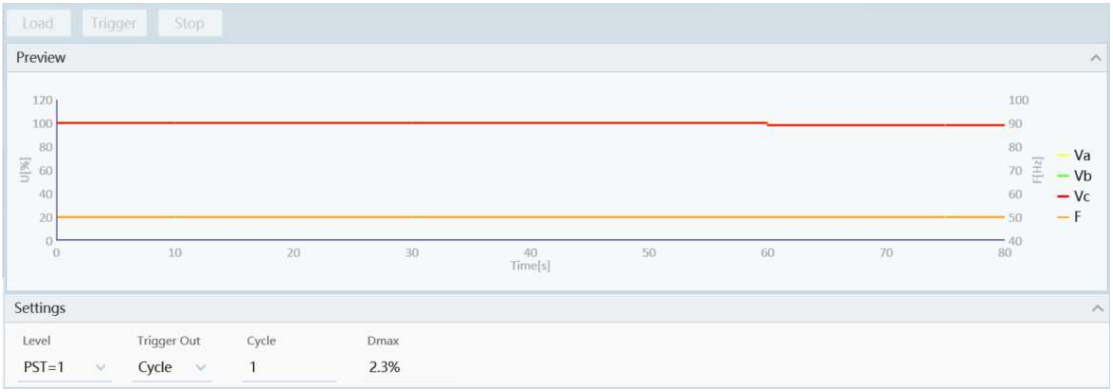
The total execution time is 16.52s, which theoretically should be

$$((10-1)/2+1)*(2.5)+((10-1)/2)*(2.5)=16.5。$$

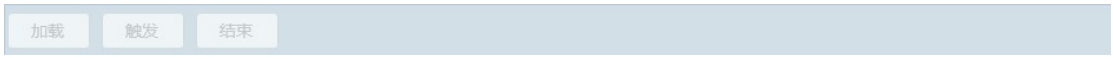
4.2.2.6.Flicker Programming

The ACTIONPOWER AC Power Supply provides 10 levels of Voltage Flicker output. Click Flicker in the Menu/Navigation to access the Flicker Programming interface. The Programming Window allows you to Execute Flicker Level Experiments.

The Operation Sequence for This interface is to configure the Programming Configuration. After setting the configuration, click the Load Button to send the Programming Configuration Data. Once loaded, click the Trigger button to Execute the Experiment.



4.2.2.6.1.Programming Control



Load: Transmits the Programming Configuration Data to the equipment.

Trigger: Executes the Programming Output.

End: During a Programming Experiment, the End Button can be clicked to terminate the transient and return to Steady State.

Note: The Disabled state of the Load, Trigger, and End Buttons corresponds to the System Status changes in the Toolbar. This logic is the same as the Transient List Programming button.

Upon successful Load, the Toolbar System Status displays “ Awaiting Trigger ”. Upon successful Trigger, it displays “ Flicker Experiment ”. When the Experiment Ends or the End Button is clicked, it displays “ Run ”.

4.2.2.6.2.Waveform Preview

Preview of the Output Waveform corresponding to the Programming Data.

4.2.2.6.3.Programming Configuration

Flicker value: Built-in 10 flicker values, PST=1~10.

Trigger output: Used with an oscilloscope to detect programming trigger events. Single: A trigger signal is output at the first step of the entire Programming Experiment. Single Cycle: A trigger signal is output once per cycle.

Note: This does not affect the user's normal Programming Experiment and can be ignored.

Number of Cycles: The number of flicker executions. Supports settings from 0-1000, where 0 represents an Infinite loop.

Dmax: Displays the percentage of the maximum voltage difference relative to the Steady State Voltage at the current flicker level.

4.2.2.7.Three-phase Unbalance

The ACTIONPOWER AC Power Supply provides three standard and one Custom Three-phase Unbalance Experiment output. In the Menu/Navigation, click Three-phase Unbalance to enter the Three-phase Unbalance Programming Window. The Programming Window allows for editing and execution of Three-phase Unbalance Experiments.

The operation sequence for this interface is to configure the Programming Configuration and Programming List. After configuration, click the Load Button to send the Programming Configuration and List Data. After loading, click the Trigger button to execute the experiment.

4.2.2.7.1.Programming Control

Load: Transmits the Programming Configuration Data to the device.

Trigger: Executes the Programming Output.

End: During a Programming Experiment, the End Button can be clicked to terminate the transient and return to Steady State.

Note: The Disabled state of the Load, Trigger, and End Buttons corresponds to the System Status changes in the Toolbar. This logic is the same as the Transient List Programming button.

If loading is successful, the System Status in the Toolbar displays " Awaiting Trigger "; if the trigger is successful,

it displays " Three-phase Unbalance Experiment "; when the experiment ends or the End Button is clicked, it displays " Run ".

4.2.2.7.2.Vector Diagram

4.2.2.7.3.Three-phase Unbalance Configuration Parameters

4.2.2.7.3.1.Programming Configuration

Number of Cycles: The number of times the List Data is run cyclically. It supports settings from 0-1000, where 0 indicates an Infinite Loop.

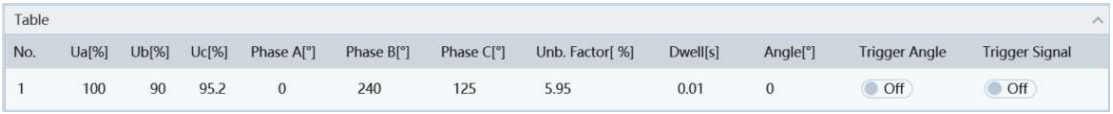
Trigger output: This is used to detect Programming Trigger events using an Oscilloscope. Single: A trigger signal is output at the first step of the entire Programming Experiment. Single Cycle: A trigger signal is output once per cycle.

Note: This does not affect the user's normal Programming Experiment and can be ignored.

Class: 1-3 are built-in standards; X is the Custom mode. Selecting X mode enables the following: 

Disabling the unbalance factor allows modification of the Three-phase Voltage and Phase in the list, and automatically calculates the corresponding Three-phase Unbalance. Enabling the unbalance factor allows direct modification of the unbalance, and automatically calculates a set of Three-phase Voltage and Phase values.

4.2.2.7.3.2.Programming List



Ua-Uc[%]: Sets the percentage of the three-phase voltage relative to the steady-state output voltage for each step.

Phase[°]: The Three-phase Unbalance output starts with Phase A Voltage at the set Phase Angle.

Duration[s]: The Time duration for which the output state of this step remains stable during operation.

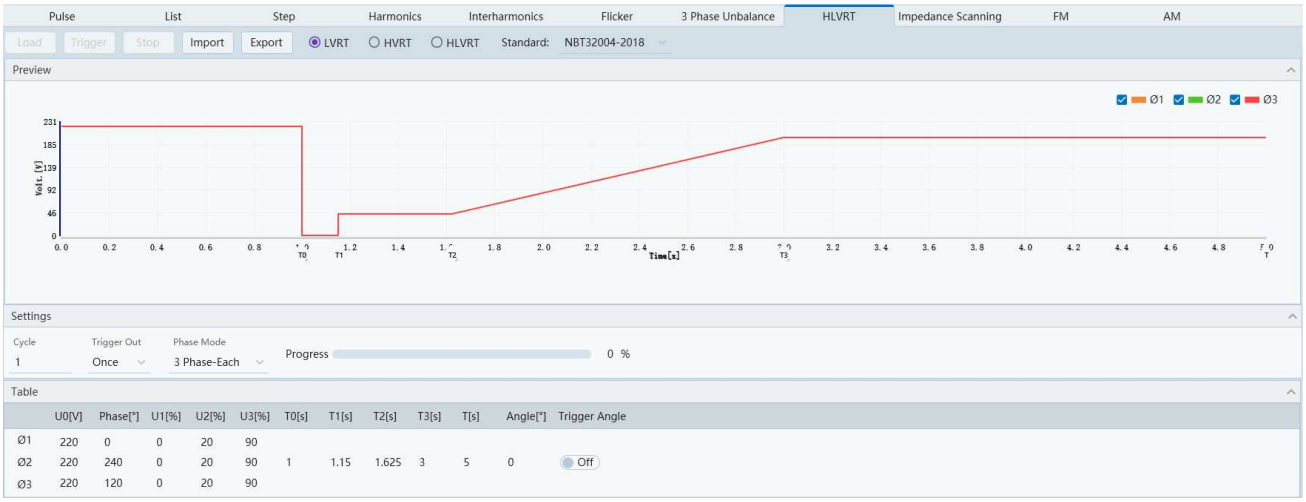
Phase Angle and Starting Phase Enable: Same as in Transient List Programming.

Trigger Enable: Used in conjunction with the Trigger output in the Programming Configuration. Enabling or

disabling this feature does not affect the normal Experiment.

4.2.2.8.High and Low Voltage Ride-Through

Click “High and Low Voltage Ride-Through” in the Navigation to access the interface. It supports standard selections, Custom List editing, saving, calling, and List execution. The interface is shown in the figure:



4.2.2.8.1.Programming Control

Load: Transmits the Programming Configuration Data to the device.

Trigger: Executes the Programming Output.

End: During a Programming Experiment, the End Button can be clicked to terminate the transient and return to Steady State.

Import: Imports Programming Data from a local source to display on the interface.

Export: Exports the current interface's Programming Configuration Data to a local destination, facilitating subsequent Import and eliminating the need for repetitive editing.

Ride-Through Type Selection: Low Voltage Ride-Through, High Voltage Ride-Through, Combined High and Low Voltage Ride-Through;

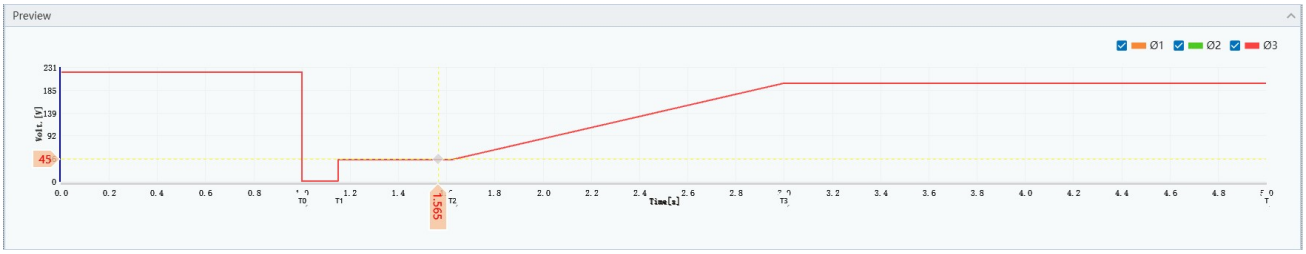
Standard: Depending on the Ride-Through type, either GB or Custom can be selected.

Note: The list information changes based on the selected Ride-Through type and standard.

Note: The enabled/disabled status of the Load Button, Trigger, and End Button corresponds to the System Status displayed on the right side of the Toolbar. When the System Status is not “Run”, the Load Button, Trigger, and End Button will be disabled. When the System Status is “Run”, the Load Button is enabled, while the Trigger and End Button are disabled. When the System Status is “ High and Low Voltage Ride-Through ”, the Load Button is disabled, and the Trigger and End Button are enabled. Pressing the End Button during a Transient execution will abort the Transient Experiment.

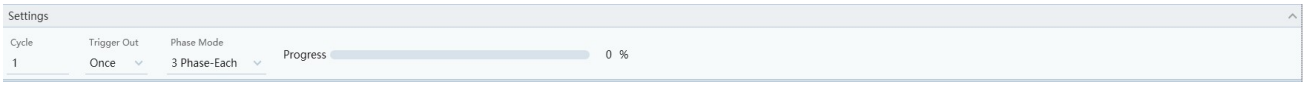
After the Load is successful, the System Status displays “ Awaiting Trigger ”. After the Trigger output is executed, the System Status displays “ High and Low Voltage Ride-Through ”.

4.2.2.8.2.Waveform Preview



4.2.2.8.3.Configuration Parameters

4.2.2.8.3.1.Programming Configuration



Number of Cycles: The number of times the List Data is run cyclically. It supports settings from 0-1000, where 0 indicates an Infinite Loop.

Trigger Output: Used with an Oscilloscope to detect Programming Trigger events. In Single mode, the first step of the entire Programming Experiment outputs a Trigger signal. In Single Step mode, it is used in conjunction with Trigger Enable in the List, and each step of programming outputs a Trigger signal. In Single Cycle Time, a Trigger signal is output once per List cycle.

Phase Number Selection: When Three-phase Independent is selected, different Voltage amplitudes and Voltage slopes can be set for each of the three phases. When Three-phase Linked is selected, the Three-phase Voltage amplitude and Voltage slope are the same for all three phases.

4.2.2.8.3.2.Programming List

4.2.2.9.Frequency Modulation

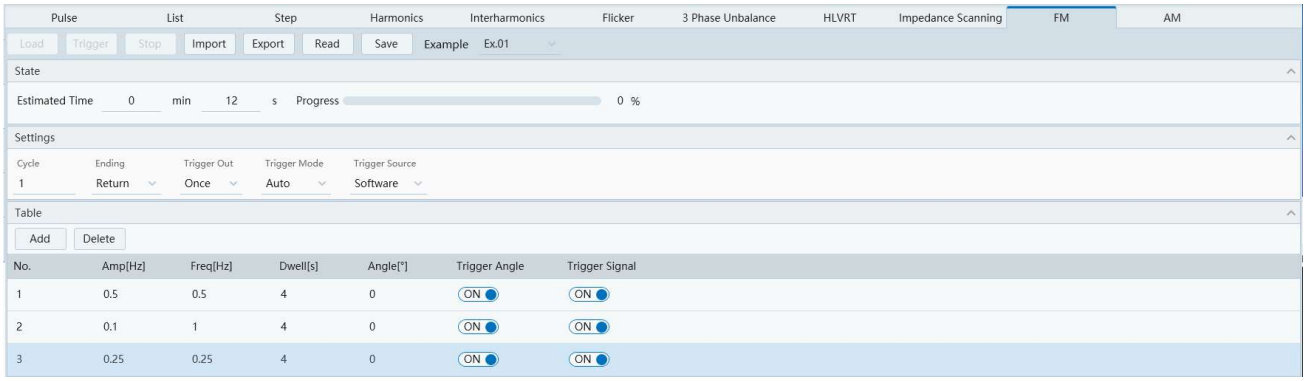
Click “Frequency Modulation” in the Navigation menu to access the interface. The ACTIONPOWER AC source provides a “Frequency Modulation” programming function that allows the Output voltage Frequency to vary sinusoidally based on the Steady State setting, according to the configured Amplitude and Frequency. The formula for this variation is as follows:

$$f_0 = f_{set} + A \cdot \sin(2\pi \cdot B \cdot t)$$

$$0 < A < 0.5(Hz)$$

$$0 < B < 100(Hz)$$

The interface is shown in the figure:



The operation sequence for this interface is to configure the Programming Configuration and Programming List. After configuration, click the Load Button to send the Programming Configuration and List Data. After loading, click the Trigger button to execute the experiment.

4.2.2.9.1.Frequency Modulation Control

Load: Transmits the Programming Configuration Data to the device.

Trigger: Executes the Programming Output.

End: During a Programming Experiment, the End Button can be clicked to terminate the transient and return to Steady State.

Import: Imports Programming Data from a local source to display on the interface.

Export: Exports the current interface's Programming Configuration Data to a local destination, facilitating subsequent Import and eliminating the need for repetitive editing.

Read: Used in conjunction with the Instance drop-down menu to read the Programming Configuration Data stored in Instance X of the Power Supply Equipment.

Storage: Used in conjunction with the Instance drop-down menu to store the current interface Programming Configuration Data to the Memory Area of Power Supply Equipment Instance X.

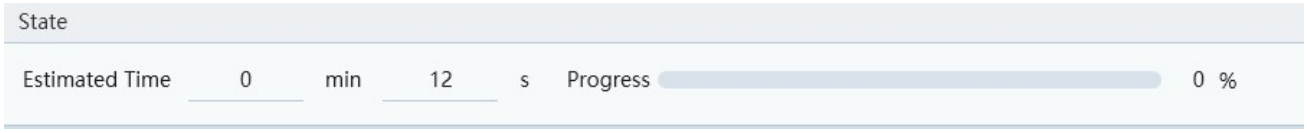
Supports storage and reading for 100 Instances.

Note: The enabled/Disabled status of the Load, Trigger, and End Buttons corresponds to the System Status displayed on the right side of the Toolbar. When the System Status is not “Run”, the Load, Trigger, and End Buttons are Disabled. When the System Status is “Run”, the Load Button is enabled, while the Trigger and End Buttons are Disabled. When the System Status is “ Frequency Modulation Experiment ”, the Load Button is Disabled, and the Trigger and End Buttons are enabled. Pressing the End Button during experiment execution will abort the experiment.

After successful loading, the System Status displays “ Awaiting Trigger ”. After the Trigger output is executed, the System Status displays “ Frequency Modulation Experiment ”. When the experiment ends, or the End Button is clicked, the System Status displays “ Run ”.

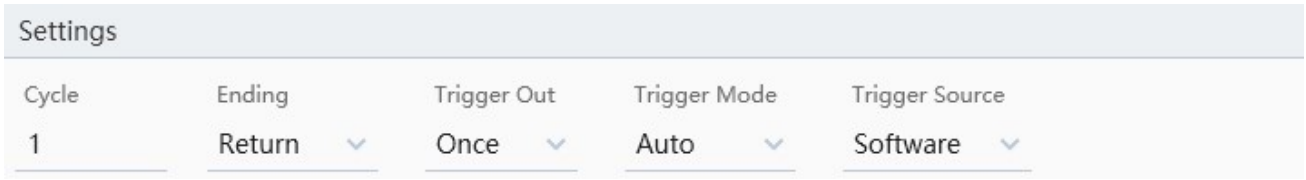
4.2.2.9.2.Status Display

The Execution Time of the current Programming Data is displayed on the left. After triggering, the Progress bar displays the Programming Experiment Progress.



4.2.2.9.3.Frequency Modulation Configuration Parameters

4.2.2.9.3.1.Programming Configuration



Number of Cycles: The number of times the List Data is run cyclically. It supports settings from 0-1000, where 0 indicates an Infinite Loop.

End Status: Exit—Returns to Steady State operation after the Programming Event List is run; Hold—Maintains the output state of the last step after the Programming Event List is run. You can click the End Button to return to Steady State; Standby—Returns to Standby State after the Programming Event List is run; Shutdown—Returns to Shutdown State after the Programming Event List is run.

Trigger Output: Used to detect programming trigger events using an Oscilloscope. In Single mode, the first step of the entire Programming Experiment outputs a Trigger signal. In Single Step mode, it is used in conjunction with Trigger Enable in the List; each step of programming outputs a Trigger signal. In Single Cycle mode, a signal is output once per programming cycle.

Trigger Mode: In Automatic mode, click once to trigger and automatically execute the experiment according to the list until completion. In Single Step mode, click once to trigger a single step.

Trigger Source: You can select Local software or External Hardware to trigger the Frequency Modulation event and output a Waveform. Typically, the Local software trigger is selected.

4.2.2.9.3.2.Programming List

Add: When a row is selected, clicking the Add button inserts a programming step below the selected row.

Delete: When a row is selected, clicking the Delete button removes the selected programming step.

Note: The list supports a length of 1 to 100 entries.

Amp[Hz]: Sets the Amplitude of the output Frequency variation.

Freq[Hz]: Sets the period for changes in the output frequency.

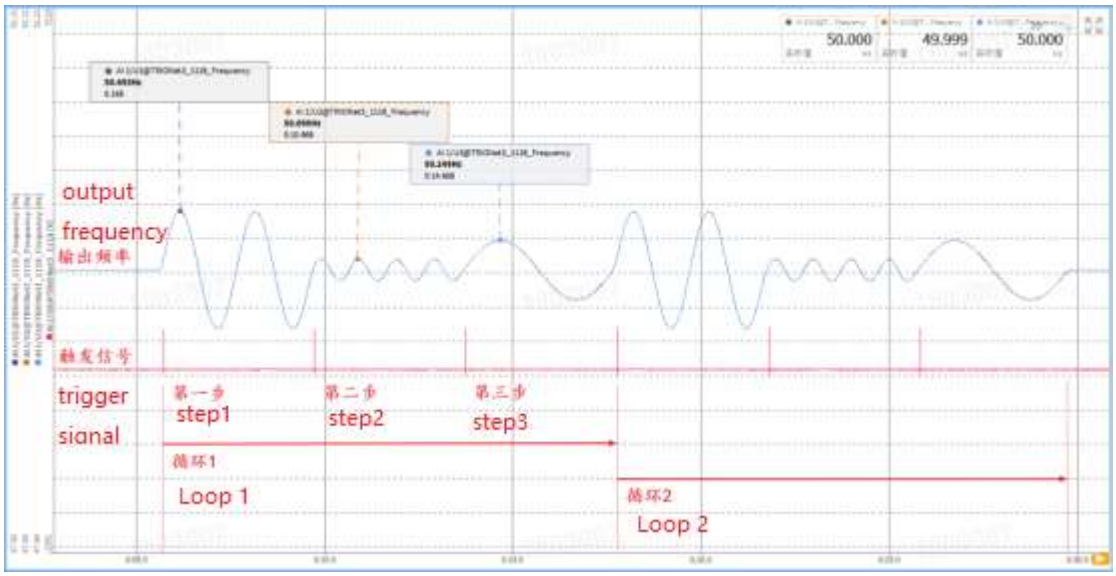
Hold Time [s]: The execution time for the current step.

Phase Angle and Starting Phase Enable: Same as in Transient List Programming.

Trigger Enable: This function is used in conjunction with the Trigger output in the Programming Configuration.

4.2.2.9.3.3.Output Waveform

The figure illustrates the waveform corresponding to the Programming List, showing the output frequency and trigger signal.



4.2.2.10.Amplitude Modulation

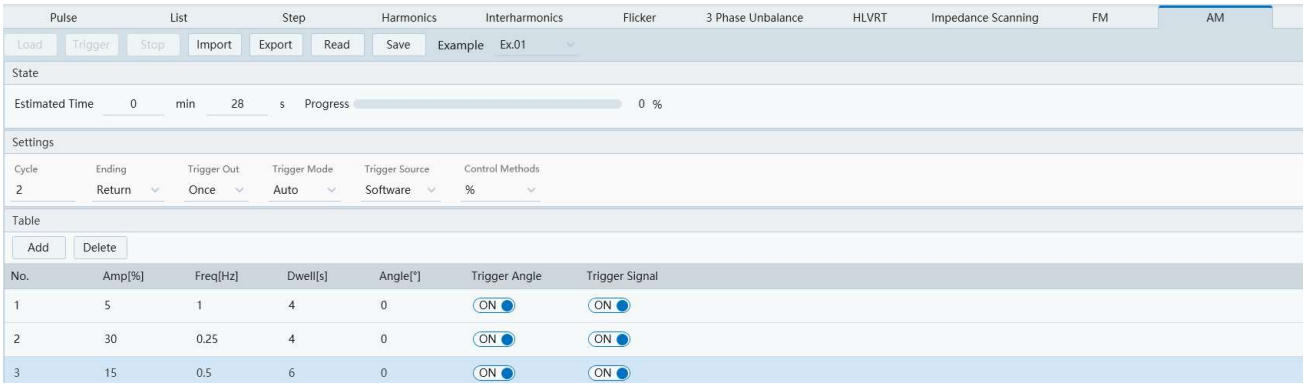
Click “Modulation” in the Navigation to access the interface. The ACTIONPOWER AC source offers an “Amplitude Modulation” programming function, enabling the output voltage amplitude to vary sinusoidally based on a steady-state setting, according to the configured amplitude and frequency. The governing equation is as follows:

$$U_0 = U_{set} \cdot (1 + \mathrm{A} \cdot \sin(2\pi \cdot B \cdot t))$$

$$0 < \mathrm{A} < 30\%$$

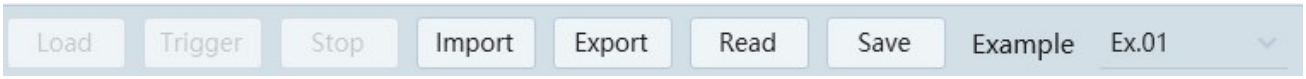
$$0 < \mathrm{B} < 100(\mathrm{Hz})$$

The interface is shown in the figure:



The operation sequence for this interface is to configure the Programming Configuration and Programming List. After configuration, click the Load Button to send the Programming Configuration and List Data. After loading, click the Trigger button to execute the experiment.

4.2.2.10.1.Amplitude Modulation Control



Load: Transmits the Programming Configuration Data to the device.

Trigger: Executes the Programming Output.

End: During a Programming Experiment, the End Button can be clicked to terminate the transient and return to Steady State.

Import: Imports Programming Data from a local source to display on the interface.

Export: Exports the current interface's Programming Configuration Data to a local destination, facilitating subsequent Import and eliminating the need for repetitive editing.

Read: Used in conjunction with the Instance drop-down menu to read the Programming Configuration Data stored in Instance X of the Power Supply Equipment.

Storage: Used in conjunction with the Instance drop-down menu to store the current interface Programming Configuration Data to the Memory Area of Power Supply Equipment Instance X.

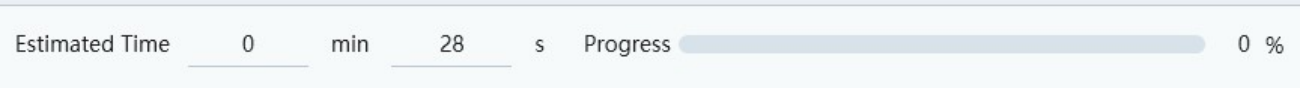
Supports storage and reading for 100 Instances.

Note: The enabled/disabled states of the Load, Trigger, and End Buttons correspond to the System Status displayed on the right side of the Toolbar. When the System Status is not “Run”, the Load, Trigger, and End Buttons are disabled. When the System Status is “Run”, the Load Button is enabled, while the Trigger and End Buttons are disabled. When the System Status is “ Amplitude Modulation Experiment ”, the Load Button is disabled, and the Trigger and End Buttons are enabled. Pressing the End Button during the experiment will terminate the experiment.

After loading successfully, the System Status displays “ Awaiting Trigger ”. After the Trigger output is executed, the System Status displays “ Amplitude Modulation Experiment ”. After the experiment ends or the End Button is clicked, the System Status displays “ Run ”.

4.2.2.10.2.Status Display

The Execution Time of the current Programming Data is displayed on the left. After triggering, the Progress bar displays the Programming Experiment Progress.



4.2.2.10.3.Frequency Modulation Configuration Parameters

4.2.2.10.3.1.Programming Configuration

Number of Cycles: The number of times the List Data is run cyclically. It supports settings from 0-1000, where 0 indicates an Infinite Loop.

End Status: Exit—Returns to Steady State operation after the Programming Event List is run; Hold—Maintains the output state of the last step after the Programming Event List is run. You can click the End Button to return to Steady State; Standby—Returns to Standby State after the Programming Event List is run; Shutdown—Returns to Shutdown State after the Programming Event List is run.

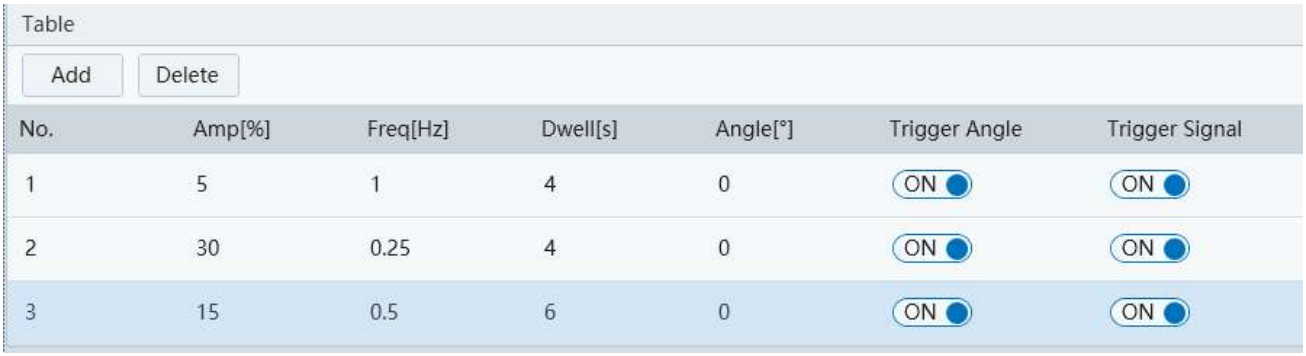
Trigger Output: Used to detect programming trigger events using an Oscilloscope. In Single mode, the first step of the entire Programming Experiment outputs a Trigger signal. In Single Step mode, it is used in conjunction with Trigger Enable in the List; each step of programming outputs a Trigger signal. In Single Cycle mode, a signal is output once per programming cycle.

Trigger Mode: In Automatic mode, click once to trigger and automatically execute the experiment according to the list until completion. In Single Step mode, click once to trigger a single step.

Trigger source: The Output Waveform of the Amplitude Modulation event can be triggered by either Local software or External Hardware. Local software triggering is typically used.

Control method: Select the unit for the Amp setting. When '%' is selected, the parameter in the Amp Configuration field represents the Amplitude change Percentage. When 'Abs' is selected, the parameter represents the absolute value of the Amplitude change.

4.2.2.10.3.2.Programming List



Add: When a row is selected, clicking the Add button inserts a programming step below the selected row.

Delete: When a row is selected, clicking the Delete button removes the selected programming step.

Note: The list supports a length of 1 to 100 entries.

Amp[%/V]: Sets the Percentage or absolute value of the Output Voltage Amplitude change.

Freq[Hz]: Sets the Period of the Output Voltage Amplitude change.

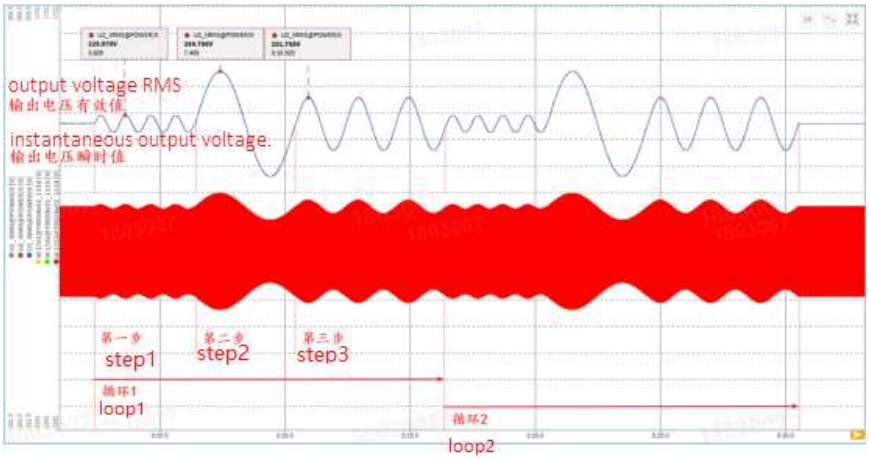
Hold Time [s]: The execution time for the current step.

Phase Angle and Starting Phase Enable: Same as in Transient List Programming.

Trigger Enable: This function is used in conjunction with the Trigger output in the Programming Configuration.

4.2.2.10.3.3.Output Waveform

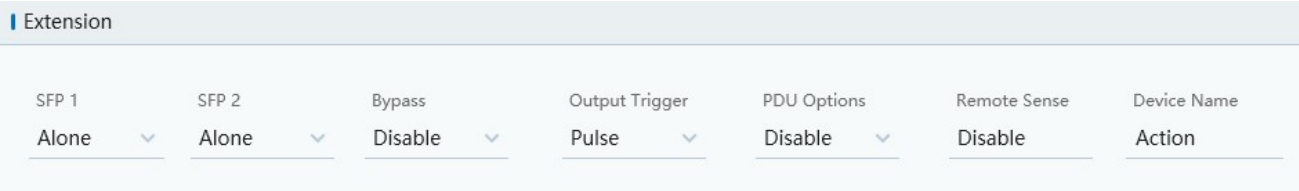
The figure illustrates the waveform corresponding to the Programming List, displaying both the output voltage RMS value and the instantaneous output voltage.



4.2.3.Configuration

Click “Configuration” in the Menu/Navigation to access the advanced settings interface. This window allows configuration of Extended Settings, User Protection Settings, Communication Settings, and Source-Load Settings.

4.2.3.1.Extended Settings



Port 1 and Port 2: Configuring these two ports enables Parallel Operation settings, as detailed in the table below:

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主 单	单 从	从 主
单 主	从 单	

Parallel Operation Transparent Transmission: To use the device as a standalone unit within a Parallel Operation system, enable Parallel Operation Transparent Transmission.

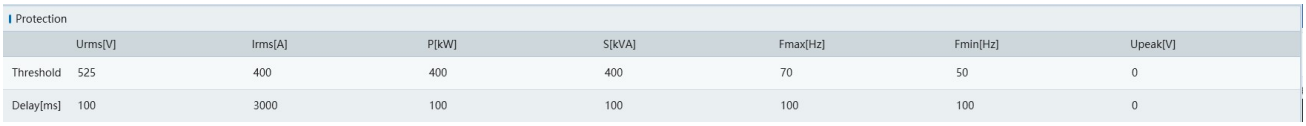
Trigger output signal type: Pulse/Level Trigger.

PDU Enable and Remote Compensation: Configure PDU Enable and Remote Compensation to implement remote Voltage compensation.

Note: This function requires additional hardware component support. Please contact us if you require this feature.

Device name: Configurable device name, supports up to 8 alphanumeric characters.

4.2.3.2.Protection Settings



Users can set voltage, current, power, and frequency protection limits based on testing requirements to protect the device under test (DUT). Before running the equipment, carefully review the protection parameter settings to prevent damage to the DUT.

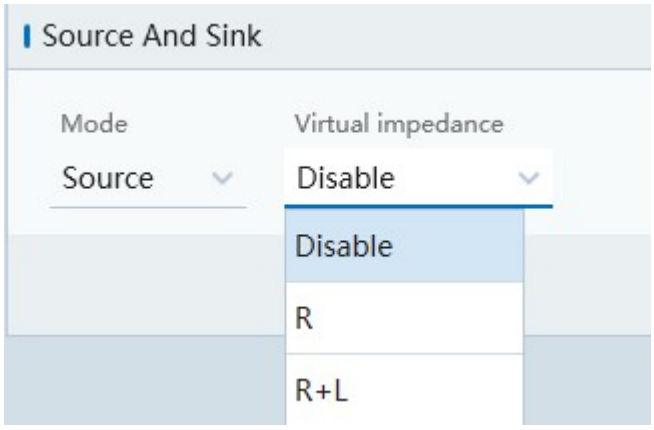
4.2.3.3.Communication Settings

If the host computer communication status indicates a fault, enter the device IP address, port number, and gateway used by the host computer connection here. Click 'Confirm' to save the settings. Restart the host computer application for the changes to take effect.

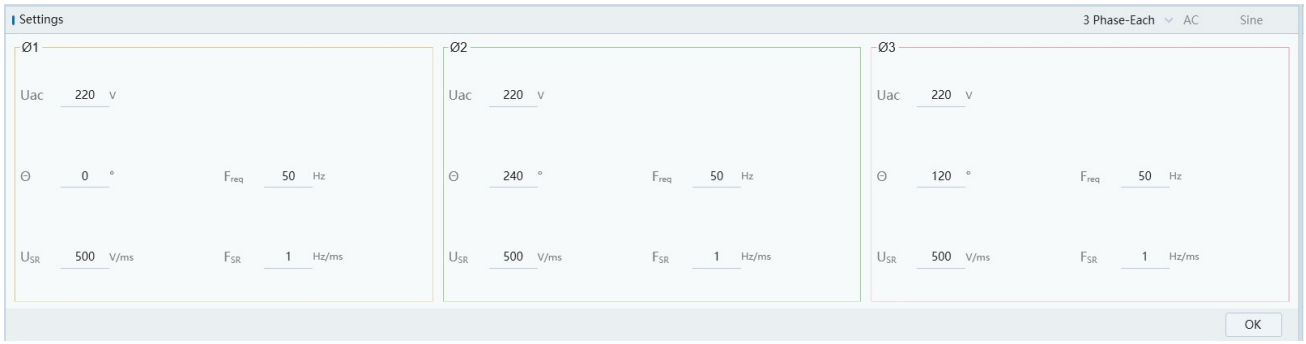
Note: The IP address of the host computer must be on the same network segment as the device to be connected.

4.2.3.4.Source Setting

If the device supports a weak power grid simulation feature, the virtual impedance can be configured here.



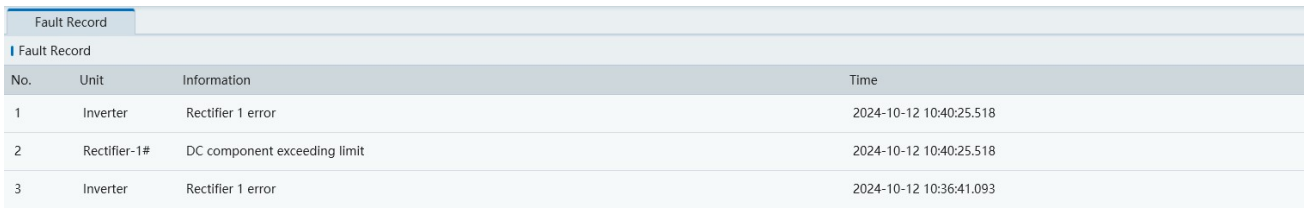
With R, the steady state setting is:



With R+L, the steady state setting is:

4.2.4.Record

Click “Record” to access the fault record interface. The fault list displays current and historical faults, up to a maximum of 500 entries.



5.Display Function and Application

The "TA Series Power Grid Simulator" display screen's functional interface is divided into 7 sections, as shown in Figure 5-1:

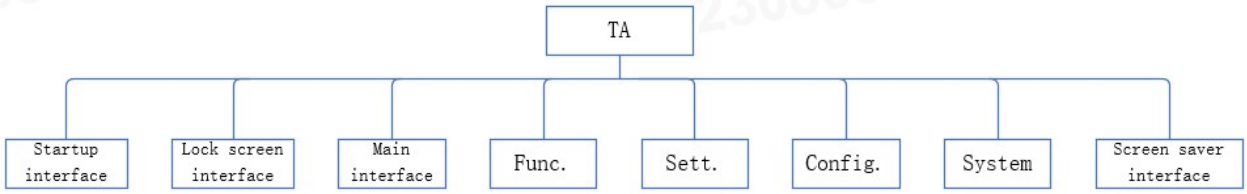


Figure 5-1: Function Tree Diagram

5.1.Startup Interface

The power supply initially displays an advanced startup interface, then transitions to either the lock screen (if the lock screen password is enabled) or the main interface (if the lock screen password is disabled). The startup interface is shown in Figure 5-2:

Figure 5-2: Startup Interface

5.2.Lock Screen Interface

After enabling the lock screen password in the "System-Screen-Lock Screen" settings, the lock screen will appear after exiting the startup interface or screen saver. If disabled, the lock screen will not appear. See Figure 5-3 for the

lock screen interface:

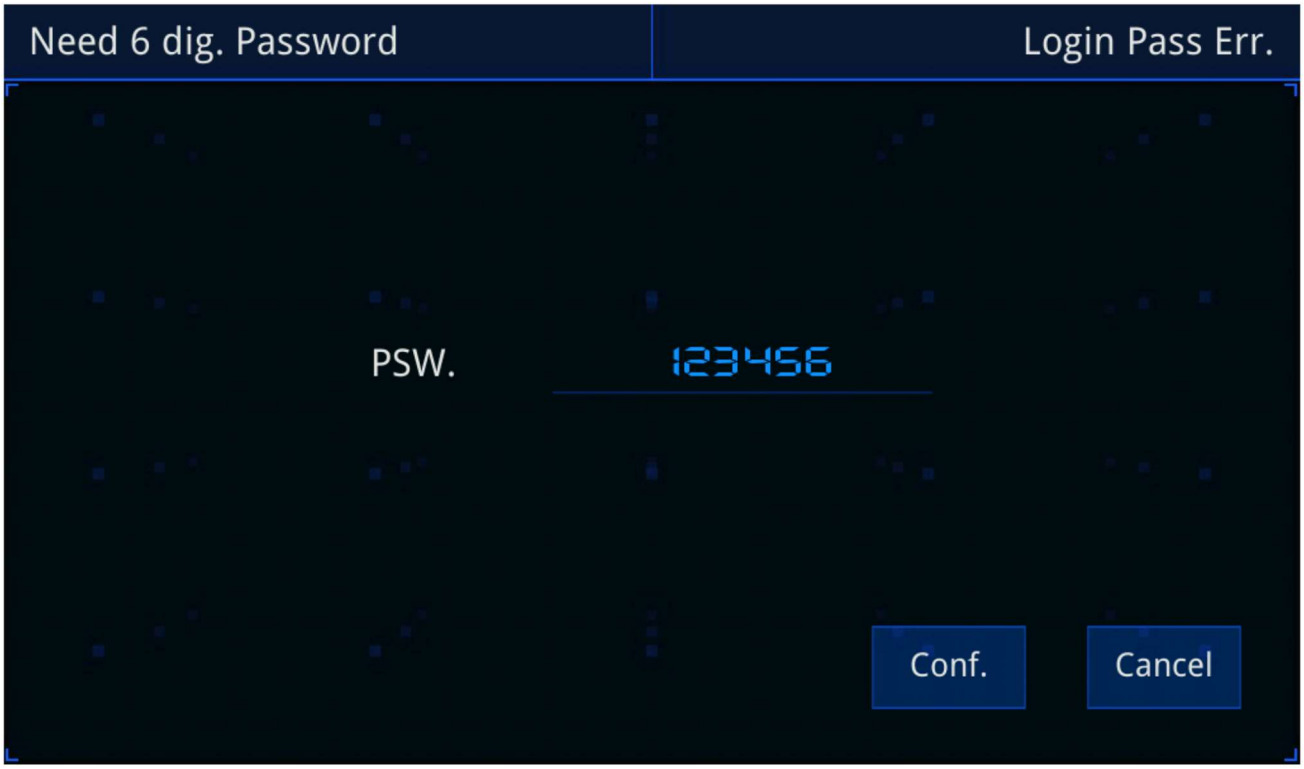


Figure 5-3 Lock Screen Interface

5.3.Main Interface

The main interface is divided into five areas, as shown in Figure 5-4: the status display area, the output display area, the Menu operation area, the output setting area, and the output control area. Each area provides distinct functions, allowing users to quickly access the information they need.

Figure 5-4 Main Interface Area Diagram

5.3.1.Status Display Area

The status display area at the top of the screen indicates the AC Power Supply's operating status and mode (see Figure 5-5). Details are provided in Table 5-1, Status Display Area Function Table.

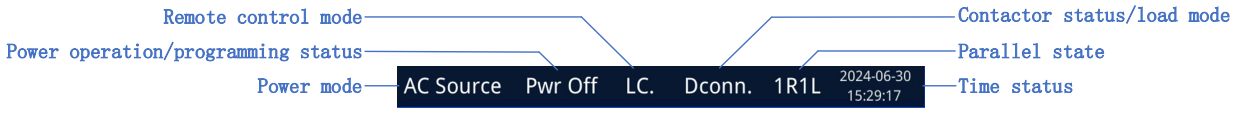


Figure 5-5 Status Display Area Diagram

Table 5-1 Status Display Area Function Table

Status Area	Display Content	Definition and Application
Power Supply Mode	AC Source	Source mode.
Power Supply Run/Programming State	Shutdown	Shutdown State: the white “Shutdown” indicator is on and steady.
	Standby	Standby State: the white “Standby” indicator is on and steady.
	Run	Run State: the white “Run” indicator is on and steady.
	Fault	Fault State: the red “Fault” indicator flashes. Click to view the fault record (see Figure 5-6, Fault Pop-up Interface).
	Reset	Reset State: the white “Reset” indicator is on and steady.
	Programming State Display	Programming State: the current programming state is displayed with white scrolling text.
Remote Control Mode	Local Control	Local Control Mode: the white “Local Control” indicator is on and steady.
	LAN	Remote Control LAN Mode: the white “LAN” indicator is on and steady.
	RS485	In remote control RS485 mode, “RS485” is displayed in white and does not flash.
Contactor Status / Load Mode	On	In Source mode, when the contactor is on, “On” is displayed in white and does not flash.
	Off	In Source mode, when the contactor is off, “Off” is displayed in white and does not flash.
Parallel Operation Status	xRxL	Indicates x row x column. “xRxL” is displayed in white and does not flash. See Figure 5-7, Parallel Operation pop-up window interface. When set to 1R1L, click to display the information box with the following content:

Status Area	Display Content	Definition and Application
		Series-parallel combination: xSxP (P = number in parallel, S = number in series) Total Power (kW): xxx.x (Rated Power * Series Number * Parallel Number) Total Voltage (V): xxx.x (Rated Voltage * Series Number) Total Current (A): xxx.x (Rated Current * Parallel Number) Number of rows in this column: x (Current number of rows in this column) When 1RnL (n>1), clicking displays an information box with the following content: Series-Parallel Configuration: xSxP Number of rows in this column: x When nRnL (n>1), clicking displays an information box with the following content: Series-Parallel Configuration: xSxP
	Handshake	"Handshake" is displayed with a flashing yellow indicator.
	SP-ERR	"SP-ERR" is displayed with a flashing yellow indicator.
Time Status	2021-06-11 13：29：14	Displays the current time (YYYY-MM-DD-HH-MM-SS).

Figure 5-6: Fault Pop-up Interface

Figure 5-7: Parallel Operation Pop-up Interface

5.3.2.Output Display Area

The output display is divided into three categories: Main Interface 1 (Source) output display area, and Main Interface 2 output display area. See Table 5-2 for display content details. 。

Table 5-2: **Output Display Area Content**

Output Display Area		Display Content
Main Interface 1 (Source)	Urms(V)	Voltage RMS Value
	Ull(V)	Phase Voltage
	Irms(A)	Current RMS Value
	θ(°)	Phase
	F(Hz)	Frequency
	PF	Power Factor
Main Interface 2	P(kW)	Active Power
	Q(kVar)	Reactive Power
	S(kVar)	Reactive Power
	ΣP(kW)	Total Active Power
	ΣQ(kVar)	Total Reactive Power
	ΣS(kVar)	Total Apparent Power

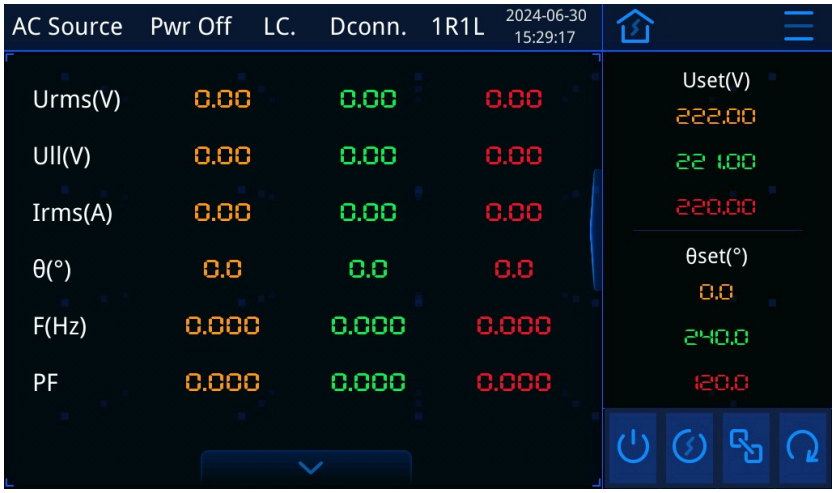


Figure 5-8: Main Interface 1 (Source)

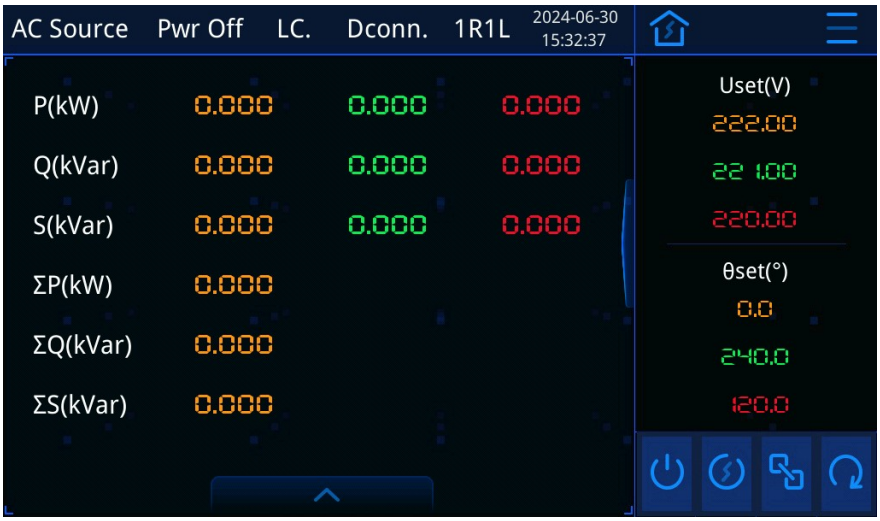


Figure 5-10 Main Interface 2

5.3.3.Menu Operation Area

The Menu operation area is shown in Figure 5-11. Click to access the main interface from any screen. Click to access the first-level menu interface, as shown in Figure 5-12.

Figure 5-11 Menu Operation Area

Figure 5-12 First-Level Menu Interface

In remote control mode, the first-level menus “Function” and “Setting” are grayed out, and the corresponding buttons are disabled.

In run mode, the first-level menu “Configuration” is grayed out, and the corresponding button is disabled.

5.3.4.Output Settings Area

Output parameters can be configured in this area.

The setting parameters and setting pages vary depending on the power supply mode. Refer to Table 5-3 for details on the output setting area.

When there are ≤ 2 setting parameters, their display and configuration are completed on the main page.

When 2 < the number of setting parameters ≤ 4, only a subset of the setting parameters are displayed on the main page. The complete display and configuration are available on the main setting page 2.

Category 4 < When setting parameters ≤ Category 6, the main page displays only a subset of the configurable parameters. Configure and display all parameters on Main Settings Page 1.

Note: After configuring parameters in linear load RLC mode, click the OK button to transmit all data on this page. The OK button is enabled when data has been modified and disabled after the data transmission is complete. For other modes, data is transmitted immediately after parameter configuration.

Table 5-3: **Output Settings Area Content**

Power Supply Mode	Setting Parameters		Setting Parameters Displayed on Main Page	Settings Page
Source Mode	Uset(V)	Voltage Setting	Voltage Setting, Phase Setting	Main Settings Page 2
	SR(V/ms)	Voltage slope		
	θset(°)	Phase Setting		
	Fset(Hz)	Frequency Setting		
	SR(kW/ms)	Power Slope		
	CFset	CF Setting		
	Load Type	Load Type		

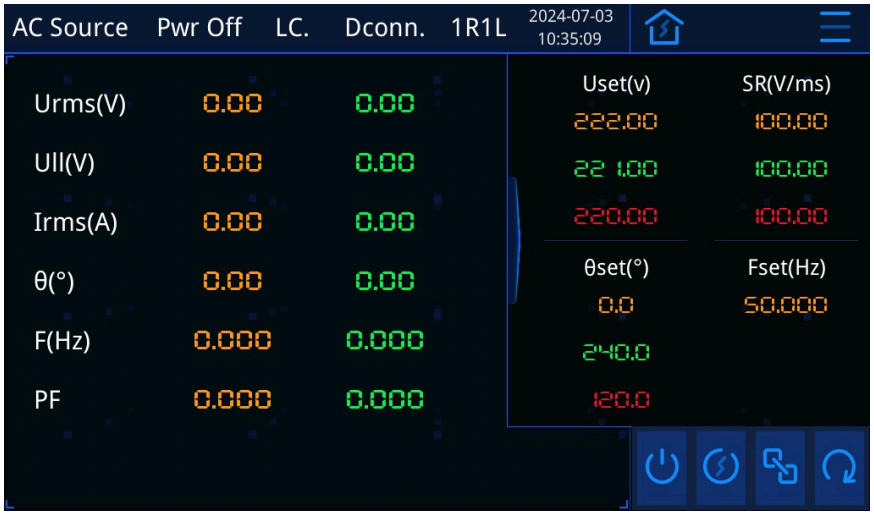


Figure 5-13 Main Settings Interface 2 (Source/Load Mode)

5.3.5 Output Control Area

The output control of the Power Supply can be performed in this area. See Figure 5-16 for the output control buttons, Figure 5-17 for descriptions of the output buttons, and Table 5-4 for detailed button functions.

Figure 5-16 Output Control Button Diagram

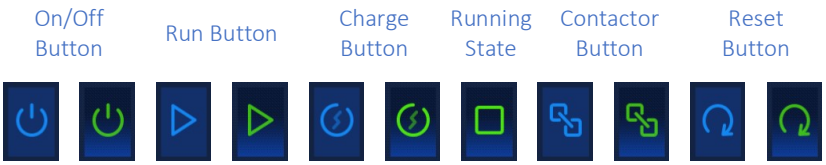


Figure 5-17 Diagram of Output Control Button Descriptions

Table 5-4 **Button Function Table for the Output Control Area**

Button Type	Function (button disabled in remote control mode).
Power On Button	A: Enable State: Enabled in any state. B: Display State: Displayed in Shutdown State.  , Displayed in Standby State.  , from Shutdown to Standby State.  Flashing display (Frequency: 100ms). C: Send Command: Click to send a power-on command in the shutdown state; click to send a shutdown command in a non-shutdown and non-fault state.
Output/Discharge Button	A: Enable State: Disabled during a fault, disabled during discharge. B: Display State: Displayed in Shutdown State.  , Displayed in Discharge State.  , Displayed in Standby State.  , Displayed in Run State.  , From Standby to Run State.  Flashing display (Frequency: 100ms). C: Send Command: Click to send a discharge command in the shutdown state; click to send a run command in the standby state; click to send a standby command in the run state.
Contactor Button	A: Enable Status: This button is disabled in load mode (contactor is normally closed by default). In source mode, this button is enabled when the system is neither in shutdown nor in a fault state. B: Display Status: Displayed when the contactor is on.  , Displayed when the contactor is off.  C: Command Issued: Click to toggle the contactor state.
Reset Button	A: Enable Status: This button is enabled only when a fault state exists. B: Display Status: Displayed when not in a fault state.  , Displayed when in a fault state.  C: Command Issued: Click to issue a reset command.

5.4.Function

AGS is configured with powerful programming functions, greatly facilitating users in simulating various operating conditions and equipment functional characteristics. The function diagram is shown in Figure 5-18.

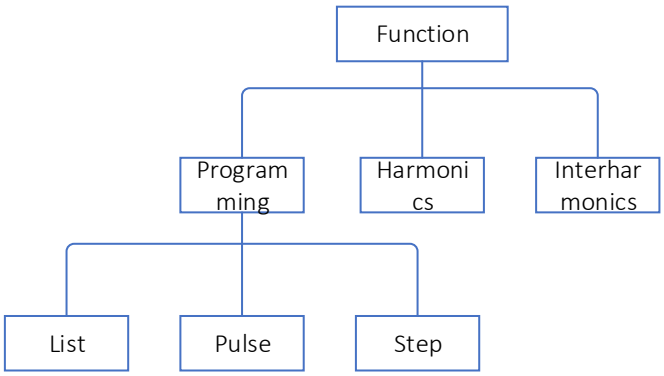


Figure 5-18: Function Tree Diagram

Click the first-level menu “Function” to access the second-level menu, Function. See Figure 5-19 for details.

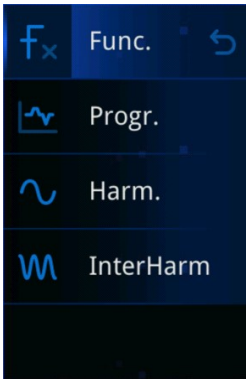


Figure 5-19: Second-level Menu- Function Diagram

In load mode, the “Interharmonics” option in the second-level menu, Function, is grayed out and disabled.

5.4.1.Programming

Click the second-level menu, Function, “Programming” to access the third-level menu, Programming. See 5-20. The third-level menu, Programming, includes the “List”, “Pulse”, and “Step” programming menus.

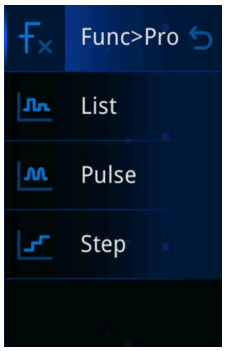


Figure 5-20: Third-level Menu- Programming Diagram

In load mode, the “Pulse” and “Step” options in the third-level menu, Programming, are grayed out and disabled.

5.4.1.1.List Programming

List Programming offers source and load modes, each with Configuration, Data, and Storage interfaces.

The programming List (Source) Configuration interface is detailed in Figure 5-21 and Parameter Function Table 5-4.

The programming List (Source) Data interface is detailed in Figure 5-22, Parameter Function Table 5-5, and Button Function Table 5-6.

The programming List (Source) Storage interface is detailed in Figure 5-23 and Button Function Table 5-7.

Figure 5-21 Programming List (Source) Configuration Interface

Table 5-4 Parameter Function Table for Programming List (Source) Configuration Page

Parameter	Function
Number of Cycles	Number of Cycles for List Data Run. Supports setting from 0-1000; 0 indicates an Infinite loop.
End Status	Exit: After the Programming Event List finishes running, the system returns to Steady State operation; Hold: After the Programming Event List finishes running, the system maintains the output state of the last step. Click the End Button to return to Steady State; Standby: After the Programming Event List finishes running, the system returns to Standby State; Shutdown: After the Programming Event List finishes running, the system returns to Shutdown State.
RMS mode	It is recommended to select Automatic/Enable for the RMS loop algorithm function.
Trigger output	This function is used with an oscilloscope to detect programming trigger events. In Single Time mode, the first step of the entire Programming Experiment outputs a Trigger signal. In Single Step Time mode, it is used in conjunction with Trigger Enable in the Programming Event List; each step outputs a Trigger signal. In Single Cycle Time mode, a signal is output once per List cycle.
Trigger mode	Automatic: Click Trigger once to automatically execute the Programming Experiment according to the Programming Event List until the experiment is completed. Single

	Step: Click Trigger once to perform a single step.
Trigger source	The List Event Output Waveform can be Triggered by either Local software or External Hardware. Local software Trigger is typically used.
Phase Number Selection	In Three-phase Independent mode, different Voltage amplitudes can be set for each of the three phases. In Three-phase Linked mode, the Voltage amplitudes of all three phases are identical.
Coupling Method	When the coupling method parameter is set to AC, "AC+DC" is grayed out, and the button is disabled.

Figure 5-22: Programming List (Source) Data Interface

Table 5-5: **Programming List (Source) Data Interface Parameter Function List**

Parameter	Function
Current Sequence	——
Total Sequences	——
Execution Sequence	——
Number of	The number of loop iterations for the List Data. Supports a setting range of 0-1000,

Cycles	where 0 represents an Infinite loop.
Waveform	In AC mode, the Waveform defaults to a sine Wave and is not configurable.
Uac[V]	Set the Three-phase Voltage value for each step. By setting the Voltage values of adjacent steps, Voltage dips and swells can be simulated.
Phase [°]	Set the phase of the three-phase voltage for each step.
Frequency [Hz]	Set the frequency of the output waveform.
Trigger Angle [°] Starting Phase	The trigger angle can be specified, and the starting phase enable can be activated for any step in the list. If the starting phase is not enabled, the current step will begin immediately after the hold time of the previous step has elapsed. If the starting phase is enabled, after the hold time of the previous step has elapsed, the system will wait until the Phase A Voltage phase reaches the trigger angle specified for the current step before beginning the current step. During this waiting period, the amplitude, frequency, and phase from the previous step are maintained.
Change Time [s]	The change time from the previous step to the current step determines the slew rate of voltage and frequency between the two steps.
Hold Time [s]	Execution Time for the current step.
Sequence Combination	Step 1
Number of repetitions	
Trigger	Used in conjunction with the Trigger output in the Programming Configuration.

Table 5-6: **Programming List Data Interface Button Functions**

Button	Function (displayed in white when Enabled, displayed in gray when Disabled)
Load	When running, the “Load” button is Enabled. Click to Load Programming Data. When not running, the “Load” button is Disabled. After loading is complete, the “End” button is Enabled. Click to End Programming.
Trigger	After loading is complete, the button is Enabled. Click to Trigger Programming. The button is Disabled when loading is not complete.
Add	The button is enabled when the total sequence number is less than 100. Click to add a sequence. The button is disabled when the total sequence number is greater than or equal to 100.

Delete	The button is enabled when the total sequence number is greater than 1. Click to delete a sequence. The button is disabled when the total sequence number is equal to 1.
Previous Page	The button is enabled when the current sequence number is greater than 1. Click to switch to the previous page. The button is disabled when the current sequence number is equal to 1.
Next Page	The button is enabled when the current sequence number is less than the total sequence number. Click to switch to the next page. The button is disabled when the current sequence number is equal to the total sequence number.

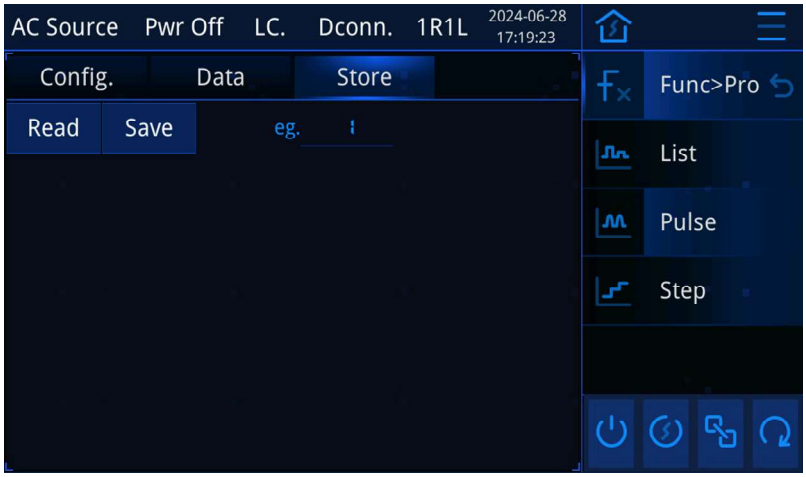


Table 5-7 Programming Storage Interface Button Function Table

Button	Function (displayed in white when Enabled, displayed in gray when Disabled)
Read	This button is always enabled. If instance x contains programming data for the current mode, clicking it will read and update the current programming data from instance x. If instance x does not contain programming data for the current mode, a pop-up window will indicate a read failure. (x range: 1-100)
Storage	This button is always enabled. Clicking it stores the current Programming Data to Instance x (x range: 1-100).

Table 5-8: Function Programming List Configuration Interface Parameter List

Configuration Parameters	Function
Number of Cycles	The number of loop iterations for the List Data. Supports a setting range of 0-1000, where 0 represents an Infinite loop.

End Status	Exit: After the Programming Event List completes, the system returns to Steady State operation. Hold: After the Programming Event List completes, the system holds the output state of the last step. The End Button can be clicked to return to Steady State. Standby: After the Programming Event List completes, the system returns to Standby State. Shutdown: After the Programming Event List completes, the system returns to Shutdown State.
RMS mode	It is recommended to select Automatic/Enable for the RMS loop algorithm function.
Trigger output	This is used to detect Programming Trigger events using an Oscilloscope. Single: A Trigger signal is output during the first step of the entire Programming Experiment. Single Step: When used in conjunction with Trigger Enable in the Programming Event List, a Trigger signal is output for each step. Single Cycle: A Trigger signal is output once per Programming Event List cycle.
Trigger mode	In Automatic mode, a single click triggers the execution of the experiment list until completion. In Single Step mode, a single click triggers one step.
Trigger source	The List Event Output Waveform can be triggered by either local software or external hardware. Local software triggering is generally preferred.
Phase Number Selection	In Three-phase Independent mode, each phase can be set to a different Voltage amplitude. In Three-phase Linked mode, all three phases share the same Voltage amplitude.
Run Mode	Supports Constant Current and Constant Power operating modes. In Constant Power mode, users can select PF priority or PQ priority.
PF/PQ Priority	When the operating mode is Constant Current, the 'PF Priority' and 'PQ Priority' options are grayed out and disabled. When the operating mode is Constant Power, the 'PF Priority' and 'PQ Priority' options are highlighted and enabled.

Table 5-9 Programming List (Load) Data Interface Parameter Function Table

Data Parameters	Function
Current Sequence	——
Total Sequences	——
Execution Sequence	——

Number of Cycles	The number of loop iterations for the List Data. Supports a setting range of 0-1000, where 0 represents an Infinite loop.
Waveform	Supports 10 waveform types: "Sine Wave", "Square Wave", "Triangle Wave", "5% Clipped Wave", "10% Clipped Wave", "20% Clipped Wave", "X% Clipped Wave", "Waveform A", "Waveform B", and "Waveform C". "Waveform A", "Waveform B", and "Waveform C" are waveform identifiers, and their styles can be edited and configured in the custom waveform interface.
I[A]/S[kVA]/P[kW]	Set the three-phase current value for each step. By setting the current values of adjacent steps, current dips and rises can be simulated.
Power Factor/Q[kVar]	When the run mode is Constant Power or PQ Priority, the Power Factor column on the data page changes to the Q[kVar] column.
Load Type	RC/RL. RC: Current Phase lags Voltage Phase; RL: Current Phase leads Voltage Phase.
Percentage	When the current Waveform is Sine Wave, 5% Clipping, 10% Clipping, 20% Clipping, Waveform A, Waveform B, or Waveform C, the Percentage setting is disabled. When the current Waveform is Square Wave, Triangle Wave, or X% Clipping, the Percentage setting is enabled.
Power Factor	Power Factor, adjustment range:-1 to 1.
Frequency [Hz]	Output Frequency; The “Frequency” display is grayed out, and the button is disabled, providing only a display function.
Change Time [s]	The Time taken to transition from the previous state to the next determines the rate of change (slope) between the two states.
Hold Time [s]	This is the time for which the output state of this step runs stably and maintains operation.
Sequence Combination	When used together, the sequence combination determines how many steps to go back, and the number of repetitions determines how many times this process is repeated.
Number of repetitions	
Trigger Angle [°]	Transient step execution can begin at a specific trigger angle. This allows for simulating worst-case scenarios, such as full amplitude at 90°, to study the impact of maximum inrush current on the device under test. The “Trigger Angle [°]” and Starting Phase Enable columns in the data entry table are used for this purpose. A starting phase angle can be specified and starting phase enable can be turned on for
Starting Phase	

	any step in the list. If the starting phase is not enabled, execution proceeds from one step to the next without phase interruption. If a trigger angle is specified and enabled, and the hold time has elapsed but the trigger angle has already passed, the source must wait for the next 0° crossing of Phase A Voltage at the specified phase angle to synchronize the next step. This can potentially cause delays between steps.
Trigger	It is used in conjunction with the Trigger output in the Programming Configuration. Enabling or disabling it does not affect the customer's normal Transient experiment.

5.4.1.2.Pulse Programming

Pulse programming in source mode has three interfaces: Configuration, Data, and Storage.

See Figure 5-27 and Parameter Function Table 5-10 for details on the Programming Pulse Configuration interface.

See Figure 5-28 for the Programming Pulse (Fundamental Wave) Data interface, Figure 5-29 for the Pulse Data page, Parameter Function Table 5-11, and Button Function Table 5-12.

See Figure 5-30 for the Programming Pulse Storage page and Button Function Table 5-13.

Figure 5-27: Programming Pulse Configuration Interface

Table 5-10: Parameter Function Table for Programming Pulse Configuration Interface

Parameter	Function
Number of Cycles	Number of loop iterations for Pulse + Fundamental Wave data. Supports setting from 0 to 1000; 0 indicates an Infinite loop.
End Status	Exit: After the Programming Event List completes, the system returns to Steady State operation. Hold: After the Programming Event List completes, the system holds the

	output state of the last step. The End Button can be clicked to return to Steady State. Standby: After the Programming Event List completes, the system returns to Standby State. Shutdown: After the Programming Event List completes, the system returns to Shutdown State.
RMS mode	It is recommended to select Automatic/Enable for the RMS loop algorithm function.
Trigger output	Used to detect programming trigger events with an oscilloscope. In Single mode, the first step of the programming experiment outputs a trigger signal. In Single Cycle mode, one pulse and Fundamental Wave cycle outputs a signal.
Trigger mode	In Automatic mode, a single click triggers the execution of the experiment list until completion. In Single Step mode, a single click triggers one step.
Trigger source	Waveform output can be triggered by either local software or external hardware events. Local software triggering is typically used.
Phase Number Selection	In Three-phase Independent mode, each phase can be set to a different Voltage amplitude. In Three-phase Linked mode, all three phases share the same Voltage amplitude.
Coupling Method	When the coupling method parameter is set to AC, “AC+DC” is grayed out, and the button is disabled.

Figure 5-28: Programming Pulse (Fundamental Wave) Data Interface

Figure 5-29: Programming Pulse (Pulse) Data Interface

Table 5-11: Programming Pulse Data Interface Parameter Function List

Parameter	Function
Waveform	In AC mode, the waveform defaults to a sine wave and is not configurable.
Uac[V]	Set the Three-phase Voltage values.
Phase [°]	Set the Three-phase Voltage Phases.
Frequency [Hz]	Set the frequency of the output waveform.
Trigger Angle [°]	After a Trigger, the experiment will begin when the Phase A Voltage Phase reaches the configured Phase Angle.
Period [s]	Time for one Period of Pulse and Fundamental Wave
Pulse Width [s]	Pulse waveform output time in one output Period

Table 5-12: Programming Pulse Data Interface Button Functions

Button	Function (displayed in white when Enabled, displayed in gray when Disabled)
Load	When running, the “Load” button is enabled. Click to Load Programming Data. When not running, the “Load” button is disabled. After loading is complete, the “End” button is enabled. Click to End Programming.
Trigger	After loading is complete, the button is enabled. Click to Trigger Programming. The button is disabled when loading is incomplete.

Previous Page	The button on the Pulse interface is enabled. Click to enter the Fundamental Wave interface. The button on the Fundamental Wave interface is disabled.
Next Page	The button on the Fundamental Wave interface is enabled. Click to enter the Pulse interface. The button on the Pulse interface is disabled.

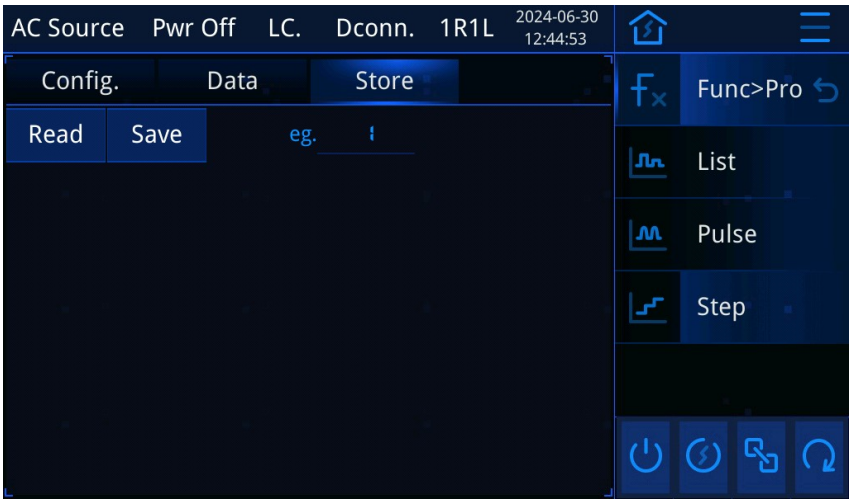


Figure 5-30: Programming Pulse Storage Interface

5.4.1.3.Step Programming

Step programming in source mode has only three interfaces: Configuration, Data, and Storage.

See Figure 5-31 for the Programming Step Configuration interface, and Parameter Function Table 5-13 for details.

See Figure 5-32 for the Programming Step Data interface, Parameter Function Table 5-14, and Button Function Table 5-15 for details.

See Figure 5-33 for the Programming Step Storage interface, and Button Function Table 5-16 for details.

Figure 5-31 Programming Step Configuration Interface

Table 5-13 Parameter Function Table for the Programming Step Configuration Interface

Parameter	Function
Number of Cycles	The number of loop iterations for the List Data. Supports a setting range of 0-1000, where 0 represents an Infinite loop.
End Status	Exit: Returns to Steady State operation after the programming event is run. Hold: Maintains the output state of the last step after the programming event is run; click the End Button to return to Steady State. Standby: Returns to Standby State after the Programming Event List is run. Shutdown: Returns to Shutdown State after the Programming Event List is run.
RMS mode	It is recommended to select Automatic/Enable for the RMS loop algorithm function.
Trigger output	Used to detect programming trigger events with an oscilloscope. In Single mode, the first step of the programming experiment outputs a trigger signal. In Single Cycle mode, one pulse and Fundamental Wave cycle outputs a signal.
Trigger mode	In Automatic mode, a single click triggers the execution of the experiment list until completion. In Single Step mode, a single click triggers one step.
Trigger source	Waveform output can be triggered by either local software or external hardware events. Local software triggering is typically used.
Phase Number	In Three-phase Independent mode, each of the three phases can be set with different Voltage amplitude and Voltage slope. In Three-phase Linked mode, the

Selection	Three-phase Voltage amplitude and Voltage slope are the same.
Coupling Method	For the AC coupling mode of the model parameters, “AC+DC” is grayed out, and the button is disabled.

Figure 5-32 Programming Step Data Interface

Table 5-14 Programming Step Data Interface Parameter Function List

Parameter	Function
Waveform	In AC mode, the waveform defaults to a sine wave and is not configurable.
AC Start [V]	Set the Three-phase starting Voltage value.
AC End [V]	Set the Three-phase ending Voltage value.
AC Increment [V]	Set the Three-phase Voltage increment for each step.
Phase [°]	Set the Three-phase Voltage Phases.
Start Frequency [Hz]	Set the starting Frequency value.
End Frequency	Set the ending Frequency value.

[Hz]	
Frequency increment [Hz]	Set the Frequency increment for each step.
Trigger Angle [°]	After a Trigger, the experiment will begin when the Phase A Voltage Phase reaches the configured Phase Angle.
Step Time [s]	Hold Time for each step.

Table 5-15 Programming Step Data Interface Button Function List

Button	Function (displayed in white when Enabled, displayed in gray when Disabled)
Load	When running, the “Load” button is enabled. Click to Load Programming Data. When not running, the “Load” button is disabled. After loading is complete, the “End” button is enabled. Click to End Programming.
Trigger	After loading is complete, the button is enabled. Click to Trigger Programming. The button is disabled when loading is incomplete.
Previous Page	The AC+DC mode button is enabled; click to switch pages. The AC mode button is disabled.
Next Page	The AC+DC mode button is enabled; click to switch pages. The AC mode button is disabled.

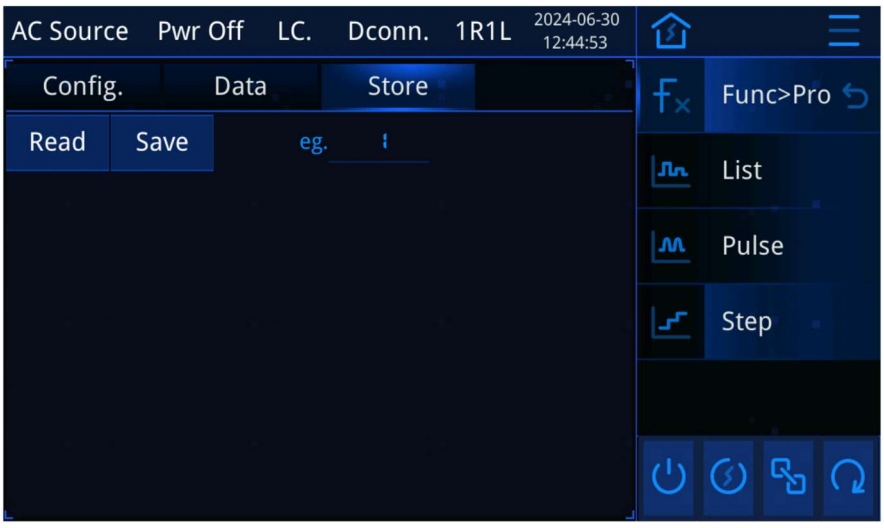


Figure 5-33 Programming Step Storage Interface

5.4.2.Harmonics

Harmonic programming in active and load modes each have three corresponding interfaces: Configuration, Data,

and Storage.

See Figure 5-34 and Parameter Function Table 5-16 for details on the Function Harmonic Programming Configuration interface.

See Figure 5-35, Parameter Function Table 5-17, and Button Function Table 5-18 for details on the Function Harmonic Programming Data interface.

See Figure 5-36 and Button Function Table 5-19 for details on the Function Harmonic Programming Storage interface.

Figure 5-34: Function Harmonic Programming Configuration Interface

Table 5-16: Function Harmonic Programming Configuration Interface Parameter Function Table

Parameter	Function
Trigger output	This is used to detect the programming trigger using an oscilloscope. In single mode, a trigger signal is output once at the start of the experiment. In fundamental wave mode, a trigger signal is output based on the fundamental wave, starting from the beginning of the experiment.
Trigger source	Waveform output can be triggered by either local software or external hardware events. Local software triggering is typically used.
Phase Number Selection	In Three-phase Independent mode, each phase can be set with different Harmonic content and Phase; in Three-phase Linked mode, the Harmonic content and Phase are the same for all three phases.

Coupling Method	——

Figure 5-35: Function Harmonic Programming Data Interface

Table 5-17: Function Harmonic Programming Data Interface Parameter Function Table

Parameter	Function
Sequence	——
Content [%]	Set the Harmonic content value.
Phase [°]	Set the Three-phase Voltage Phases.

Table 5-18: Function Harmonic Programming Data Interface Button Function Table

Button	Function (displayed in white when Enabled, displayed in gray when Disabled)
Load	When running, the “Load” button is enabled. Click to Load Programming Data. When not running, the “Load” button is disabled. After loading is complete, the “End” button is enabled. Click to End Programming.

Trigger	After loading is complete, the button is enabled. Click to Trigger Programming. The button is disabled when loading is incomplete.
Update	After a Programming Trigger, the button is enabled. Click to Update Programming Data; the non-Programming Trigger button is disabled.
Clear	This button is always enabled. Click to clear the Harmonic data.
Previous Page	When the current page is greater than 1, the button is enabled. Click to switch to the previous page; when the current page is equal to 1, the button is disabled.
Next Page	When the current page is less than the total number of pages, the button is enabled. Click to switch to the next page; when the current page is equal to the total number of pages, the button is disabled.

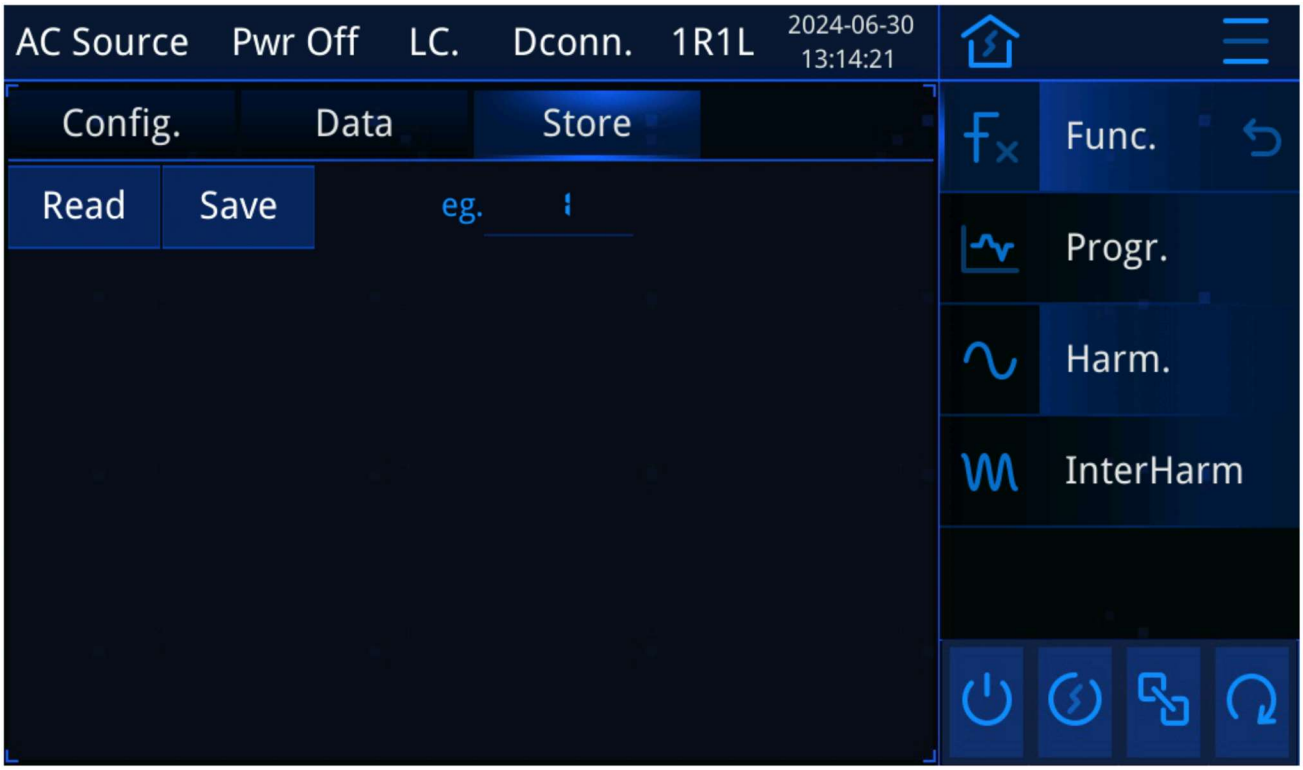


Figure 5-36 Function Harmonic Programming Storage Interface

5.4.3.Interharmonics

Function Interharmonic programming in source mode has three interfaces: Configuration, Data, and Storage.

The Function Interharmonic Programming Configuration Interface is detailed in Figure 5-37 and Parameter Function Table 5-19.

The Function Interharmonic Programming Data Interface is detailed in Figure 5-38, Parameter Function Table 5-20, and Button Function Table 5-21.

The Function Interharmonic Programming Storage Interface is detailed in Figure 5-39 and Button Function Table 5-22.

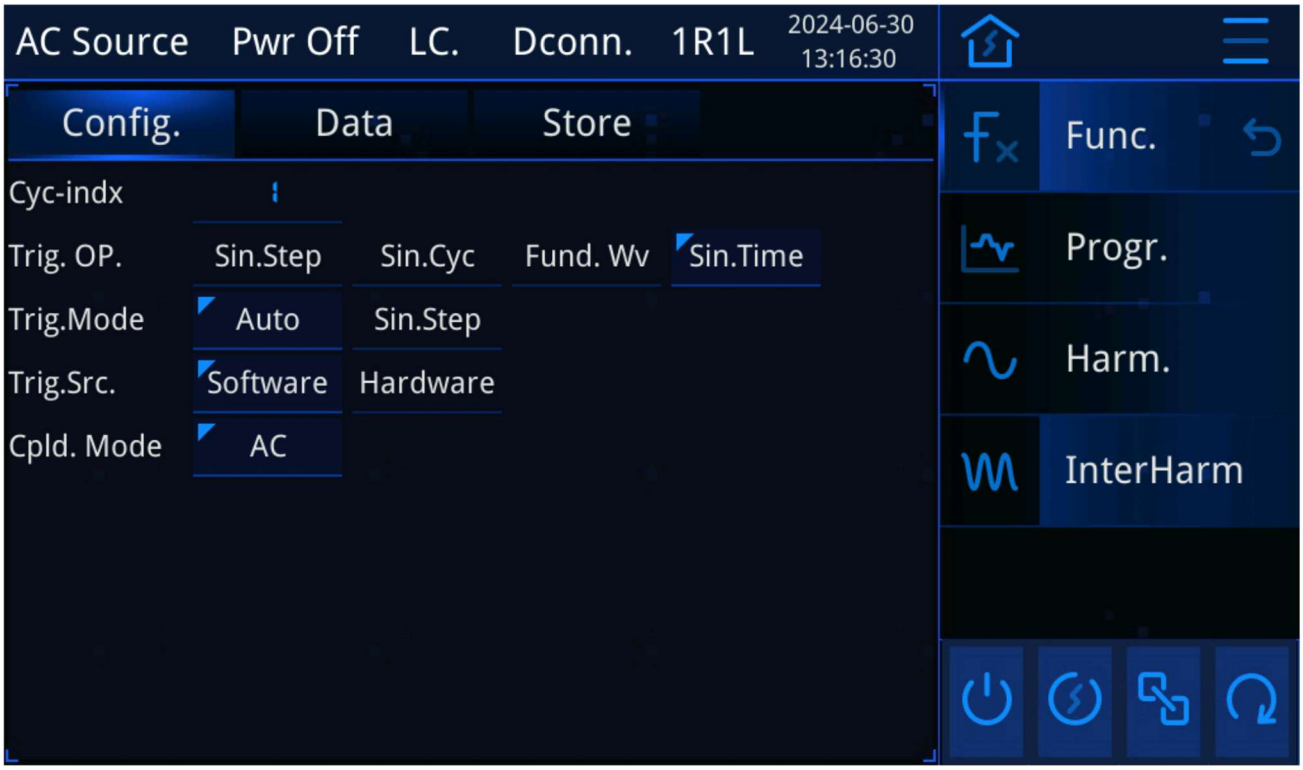


Figure 5-37 Function Interharmonic Programming Configuration Interface

Table 5-19 Function Interharmonic Programming Configuration Interface Parameter Function Table

Parameter	Function
Number of Cycles	Number of Cycles for List Data Run. Supports setting from 0-1000; 0 indicates an Infinite loop.
Trigger output	This function is used with an oscilloscope to detect the Programming Trigger. In Single mode, a Trigger signal is output at the first step of the entire Programming Experiment. In Single Step mode, when used with Trigger Enable in the List, a Trigger signal is output for each programming step. In Single Cycle mode, a Trigger signal is output once per List cycle. In Fundamental Wave mode, the Trigger signal is output based on the Fundamental Wave, starting from the beginning of the Experiment.
Trigger mode	In Automatic mode, a single click triggers the execution of the experiment list until completion. In Single Step mode, a single click triggers one step.
Trigger source	The List Event Output Waveform can be triggered by either local software or external hardware. Local software triggering is generally preferred.
Coupling Method	——

Figure 5-38 Interharmonic Function Programming Data Interface

Table 5-20 Interharmonic Function Programming Data Interface Parameter Function List

Parameter	Function
Sequence	——
Start Frequency [Hz]	Set the starting Frequency value.
End Frequency [Hz]	Set the ending Frequency value.
Execution Time [s]	Execution time after increasing/decreasing the frequency in steps.
Interval Time [s]	The time interval between the end of the execution time and the next frequency change.
Step [Hz]	The frequency increment/decrement value for each change from the start frequency to the end frequency.
Content [%]	Set the interharmonic content value.

Table 5-21 Interharmonic Function Programming Data Interface Button Function List

Button	Function (displayed in white when Enabled, displayed in gray when Disabled)
Load	When running, the “Load” button is enabled. Click to Load Programming Data. When not running, the “Load” button is disabled. After loading is complete, the “End” button is enabled. Click to End Programming.
Trigger	After loading is complete, the button is enabled. Click to Trigger Programming. The button is disabled when loading is incomplete.
Add	When the total number of sequences is less than 100, the button is enabled. Click to add a sequence. When the total number of sequences is greater than or equal to 100, the button is disabled.
Delete	When the total number of sequences is greater than 1, the button is enabled. Click to delete a sequence. When the total number of sequences is equal to 1, the button is disabled.
Previous Page	When the current page is greater than 1, the button is enabled. Click to switch to the previous page; when the current page is equal to 1, the button is disabled.
Next Page	When the current page is less than the total number of pages, the button is enabled. Click to switch to the next page; when the current page is equal to the total number of pages, the button is disabled.

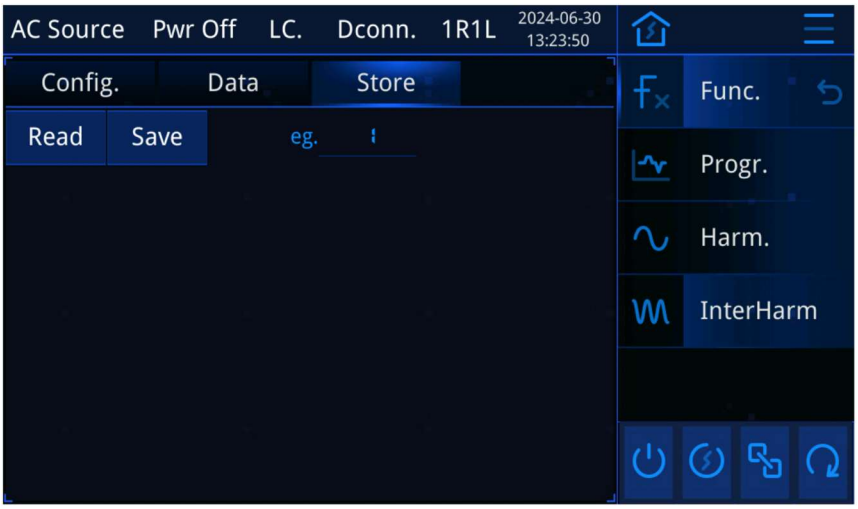


Figure 5-39 Interharmonic Function Programming Storage Interface

5.5.Settings

The setting function is shown in Figure 5-40. The user can configure the AGS operating mode, parameter settings for each mode, and power supply protection features.

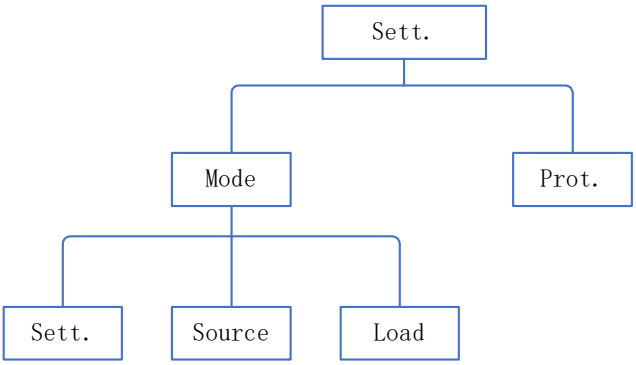


Figure 5-40 Setting Tree Diagram

Click the first-level menu “Setting” to access the second-level menu, Setting, as detailed in Figure 5-41.

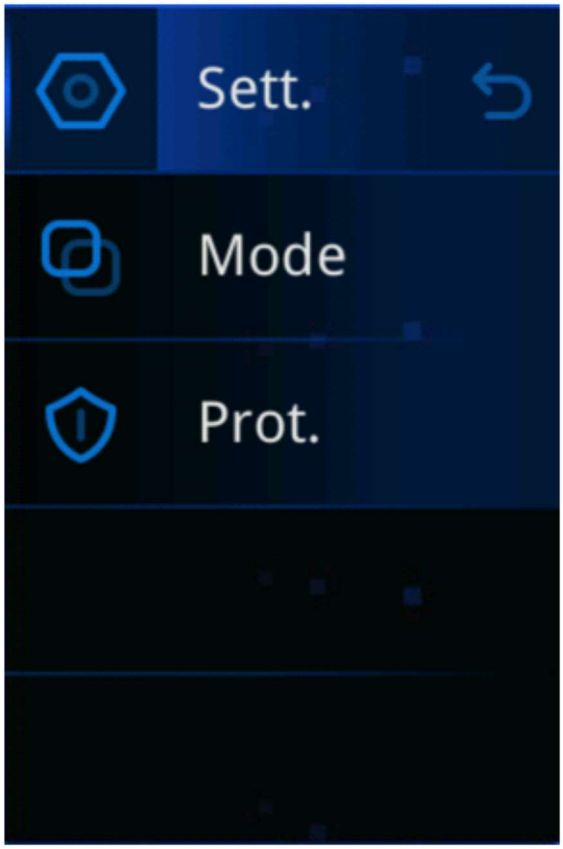


Figure 5-41 Second-Level Menu- Setting

In Run mode, the second-level menu item “Mode” under Setting is grayed out, and the button is disabled.

5.5.1.Mode

The Mode menu contains three interfaces: Source, and Load. When Source mode is selected, the Load interface is inaccessible. Conversely, when Load mode is selected, the Source interface is inaccessible.

5.5.1.1.Settings

See Figure 5-42 and Parameter Function Table 5-43 for details on the Mode Setting interface.

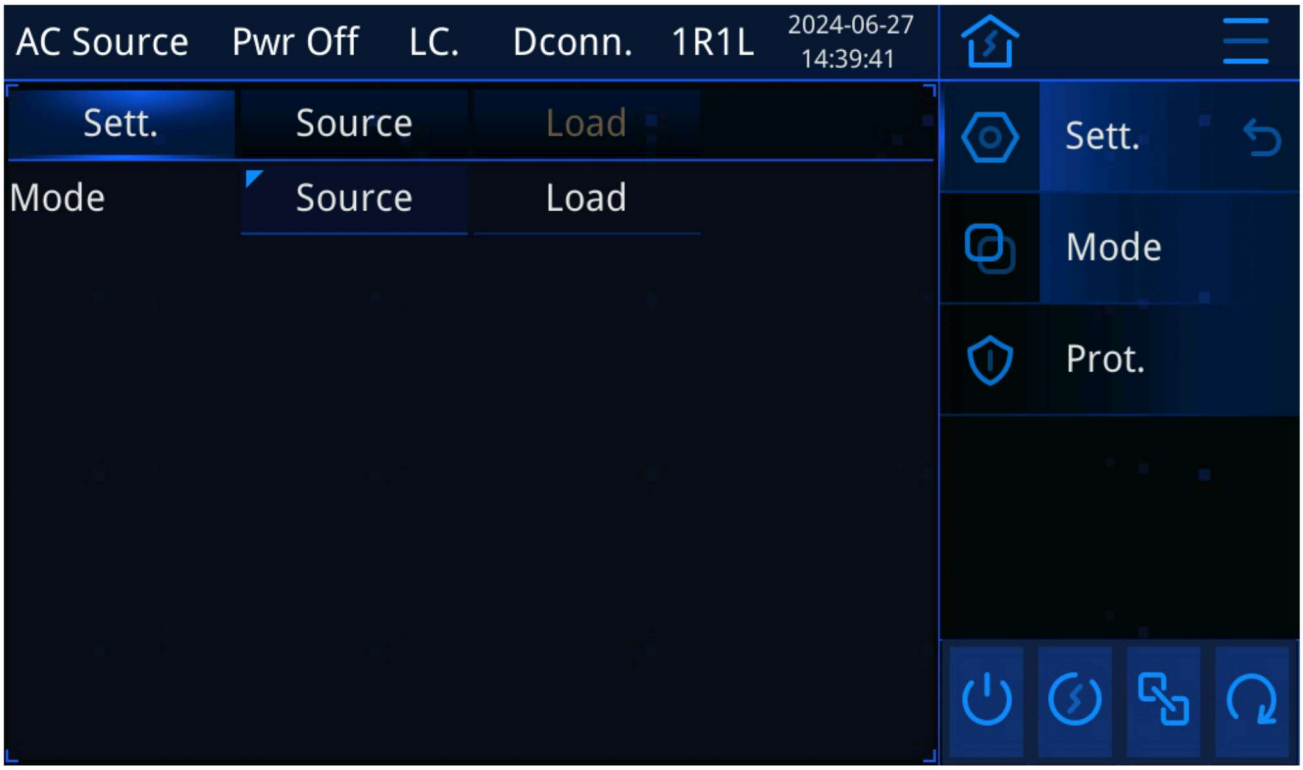


Figure 5-43 Mode Setting Interface

Table 5-22 Parameter Function Table for the Mode Setting Interface

Parameter	Function
Mode	When the mode is set to "Source", the "Load" interface button is grayed out and disabled. Conversely, when the mode is set to "Load", the "Source" interface button is grayed out and disabled.

5.5.1.2.Source

The mode source interface is detailed in Figure 5-43, and the parameter function table is in Table 5-23.

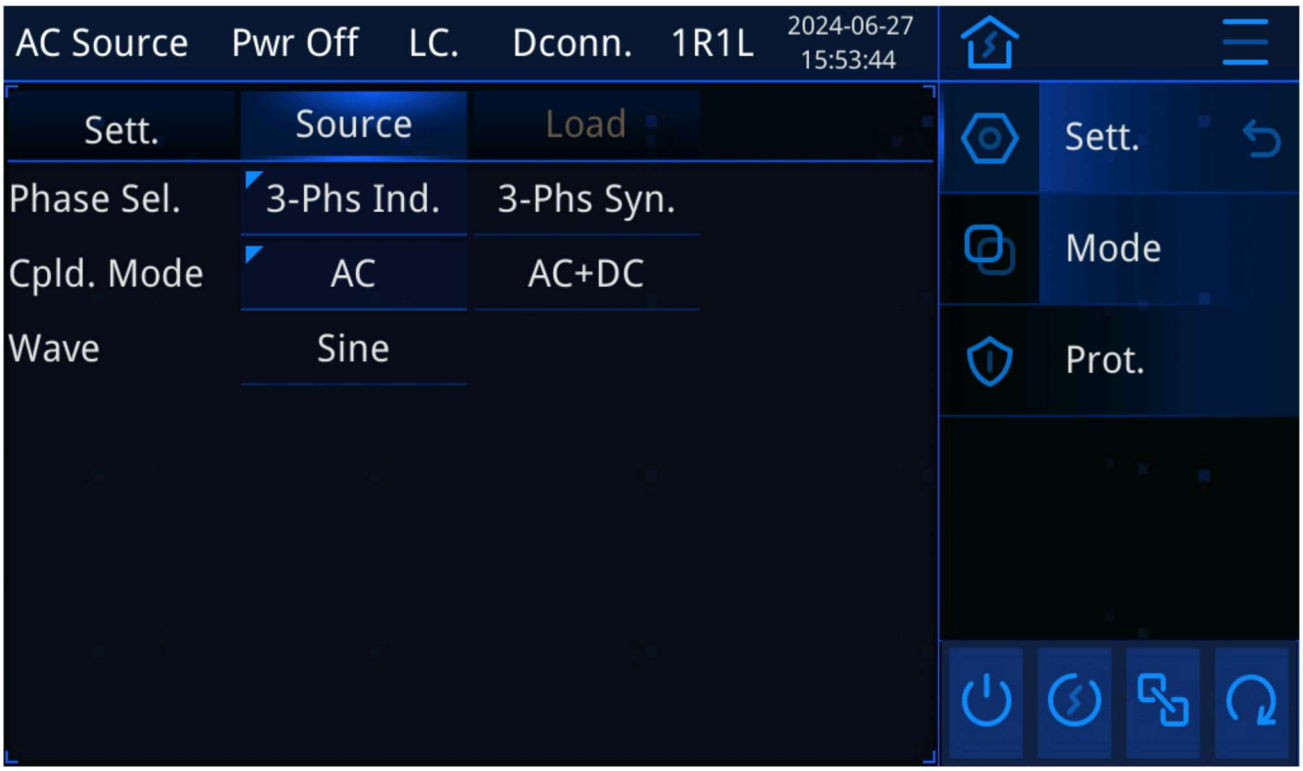


Figure 5-43: Mode Source Interface

Table 5-23: Mode Source Interface Parameter Function Table

Parameter	Function
Phase Number Selection	——
Coupling Method	When the coupling method parameter is set to AC, “AC+DC” is grayed out, and the button is disabled.
Waveform	When the model parameter coupling is set to AC, the waveform defaults to a non-configurable sine wave.

5.5.2.Protection

See Figure 5-45 for the protection settings interface, where various protection values and protection Time can be configured.

Figure 5-45 Protection Settings Interface

5.6.Configuration

The Configuration function is shown in Figure 5-46. Users can configure the AGS communication mode, parallel operation, and expansion functions.

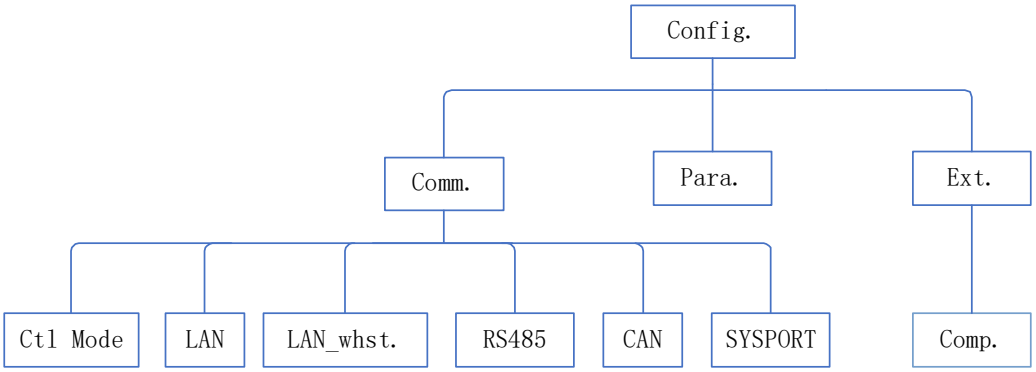


Figure 5-46 Configuration Tree Diagram

Click the first-level Menu “Configuration” to access the second-level menu- Configuration, as detailed in Figure 5-47.

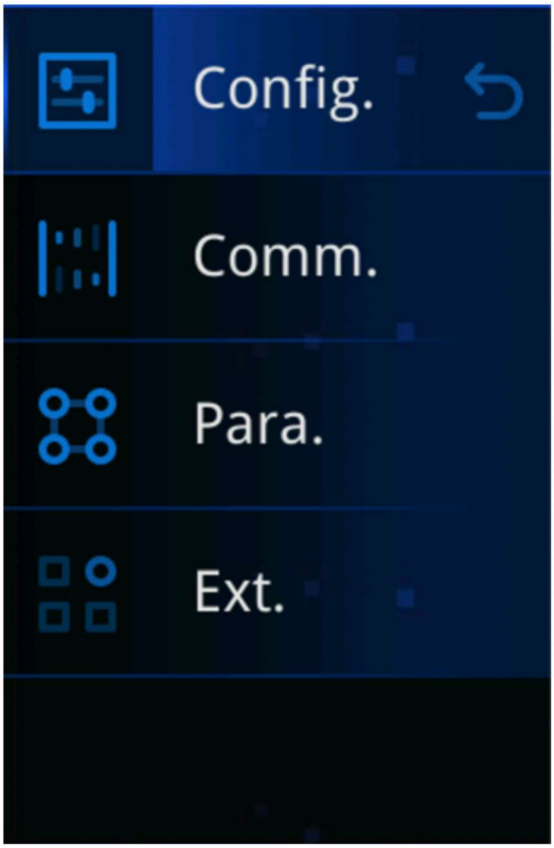


Figure 5-47 Second-level Menu- Configuration

In remote control mode, the “Parallel” and “Expansion” options in the second-level Configuration menu are grayed out, and the corresponding buttons are disabled.

5.6.1.Communication

The Communication menu includes five interfaces: Control Mode, LAN, LAN Whitelist, RS485, and SYSPORT.

5.6.1.1.Control Mode

The Communication Control Mode interface is shown in Figure 5-48, allowing the selection of the communication control mode.

Figure 5-48 Communication Control Mode Interface

5.6.1.2.LAN

The Communication LAN interface is shown in Figure 5-49, allowing configuration of the IP address.

Figure 5-49: Communication LAN Interface

Note: After configuring the parameters on the LAN interface, click the OK button to apply all data on this page. A restart is required for the parameters to take effect. The OK button is enabled when data has been modified and disabled after the data has been applied.

5.6.1.3.LAN Whitelist

The communication LAN whitelist interface is shown in Figure 5-50, where a whitelist can be configured.

Figure 5-50: Communication LAN Whitelist Interface

5.6.1.4.RS485

The communication RS485 interface is shown in Figure 5-51, where the baud rate and address can be configured.

Figure 5-51: Communication RS485 Interface

5.6.1.5.SYSPORT

The communication SYSPORT interface is shown in Figure 5-52, where the IP address can be configured.

Figure 5-52: Communication SYSPORT Interface

Note: After configuring the parameters on the SYSPORT interface, click the OK button to apply all data on this page. A restart is required for the parameters to take effect. The OK button is enabled when data has been modified and disabled after the data has been applied.

5.6.2.Parallel Connection

Parallel Operation settings can be achieved by configuring two ports. See Figure 5-53 for the Parallel Operation interface and Parameter Function Table 5-25.

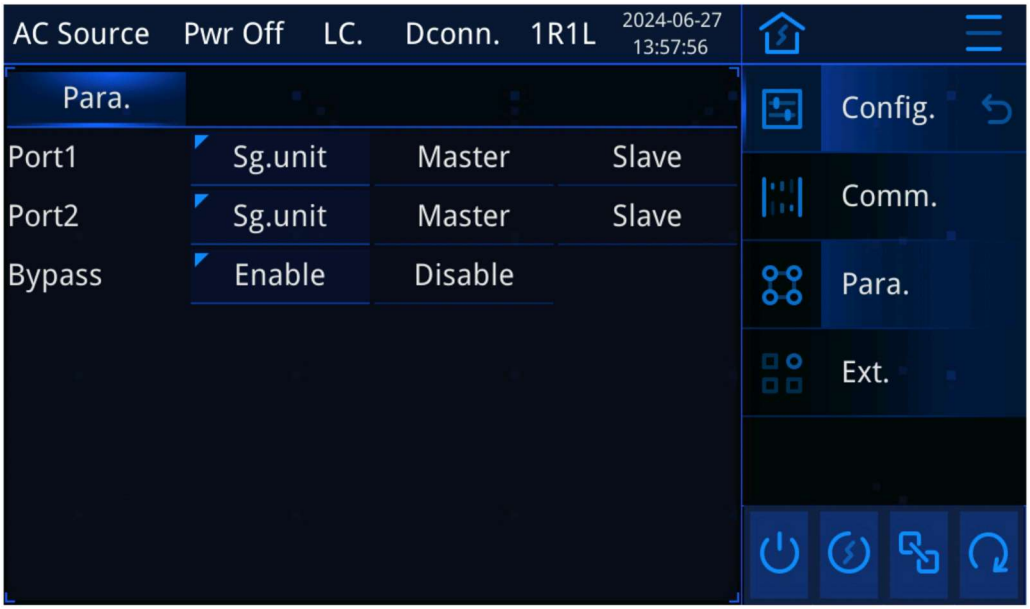


Figure 5-53 Parallel Operation Configuration Interface

Table 5-25 Parameter Function Table for Parallel Operation Configuration Interface

Parameter	Function
Port 1	When Port 2 is configured as the master or slave, the "Slave" option for Port 1 is grayed out, and the button is disabled.
Port 2	When Port 1 is configured as the slave, the "Master" and "Slave" options for Port 2 are grayed out, and the button is disabled.
Parallel Operation Transparent Transmission	When the device is in a Parallel Operation system and needs to be used as a standalone unit, Enable Parallel Operation Transparent Transmission. When neither Port 1 nor Port 2 is configured for standalone operation, the "Enable" option for Parallel Operation Transparent Transmission is grayed out, and the button is disabled.

5.6.3.Expansion

The extended menu contains two interfaces: Compensation and Trigger.

5.6.3.1.Compensation

Refer to Figure 5-54 for the extended compensation interface and Table 5-26 for the parameter function table.

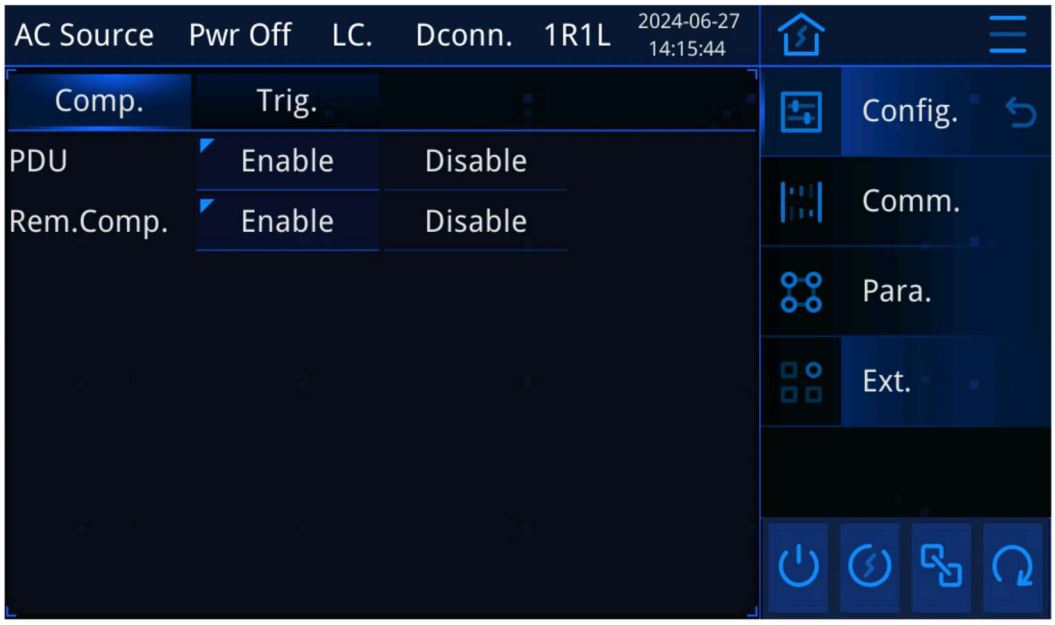


Figure 5-54 Extended Compensation Interface

Table 5-26 Parameter Function Table for Extended Compensation Interface

Parameter	Function
PDU	You can configure PDU Enable and Remote Compensation Enable to implement

	remote voltage compensation.
Remote Compensation	When the PDU is disabled, the remote compensation “Enable” option is grayed out and the button is disabled.

5.6.3.2.Trigger

Refer to Figure 5-55 for the extended trigger interface, where you can set the trigger signal type.

Figure 5-55 Extended Trigger Interface

5.7.System

The system functions are shown in Figure 5-65. Users can configure display screen information and query the version number.

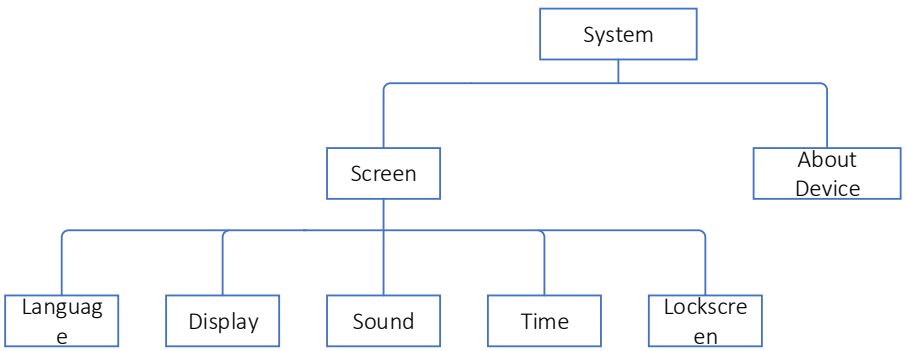


Figure 5-56 System Tree Diagram

Click the first-level menu “System” to enter the second-level menu- System; see section 5-57 for details.

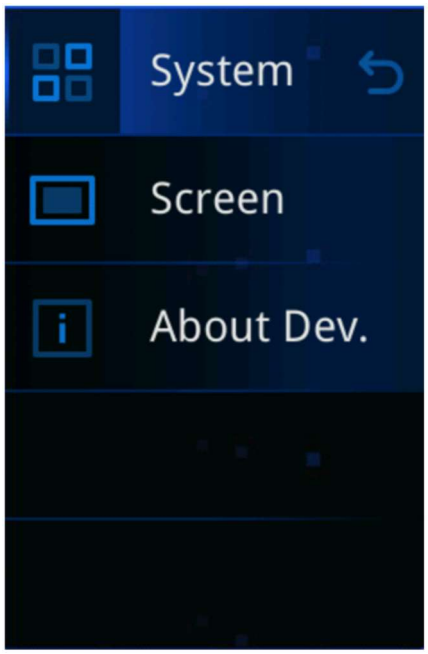


Figure 5-57 Secondary Menu - System Diagram

5.7.1.Screen

The screen menu contains four interfaces: Language, Display, Sound, and Time.

5.7.1.1.Language

The screen language interface is detailed in Figure 5-58 and can be set to Chinese or English.

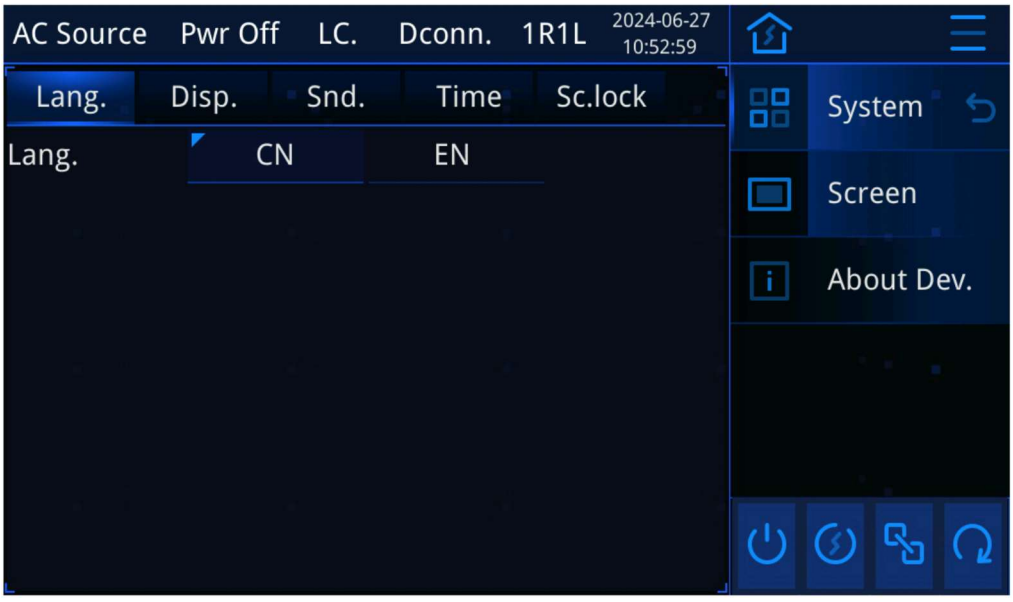


Figure 5-58 Screen Language Interface Function Menu

5.7.1.2.Display

The screen display interface is detailed in Figure 5-59, parameter function table 5-27.

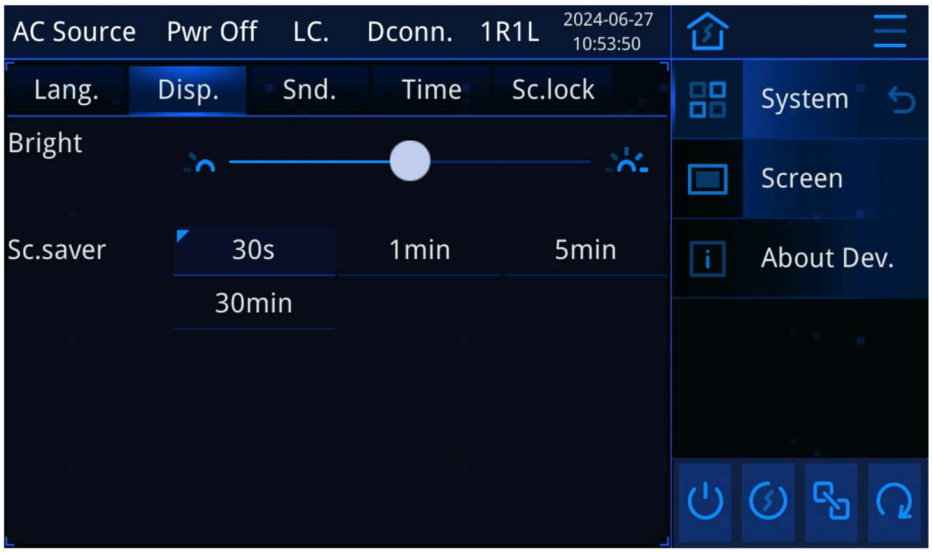


Figure 5-59 Screen Display Interface

Table 5-27 Screen Language Interface Parameter Function Table

Parameter	Function
Brightness	Display brightness. Move the slider to adjust the display brightness.
Screen Saver	Set the inactivity time before the screen saver activates. For example, setting it to 30s means the screen saver will activate if the display is not touched for 30 seconds.

5.7.1.3.Sound

Refer to Figure 5-60 for the screen sound interface and Parameter Function Table 5-28.

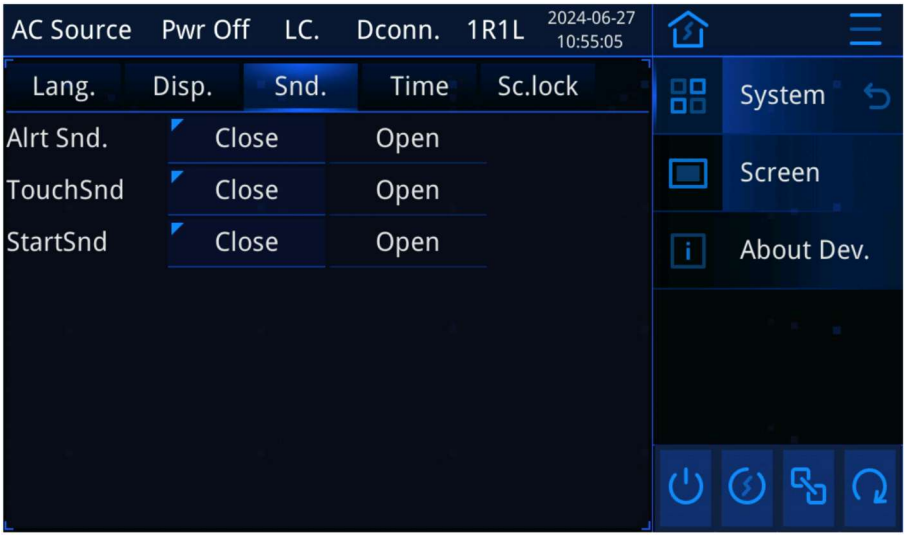


Figure 5-60 Screen Sound Interface

Table 5-28 Screen Sound Interface Parameter Function Table

Parameter	Function
Alarm Sound	The display screen will beep an alarm upon a fault.
Touch Sound	The display screen will beep upon each touch.
Power-On Sound	The display screen will beep when powered on.

5.7.1.4.Time

Refer to Figure 5-61 for the screen time interface, where the screen display Time can be set.

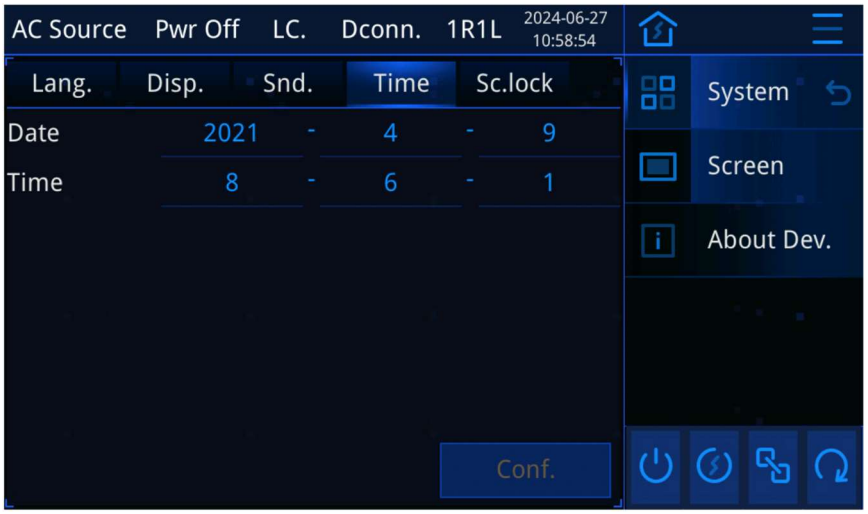


Figure 5-61 Screen Time Interface

5.7.1.5.Lockscreen

Refer to Figure 5-62 for the screen lock interface, where the lock screen password can be set.

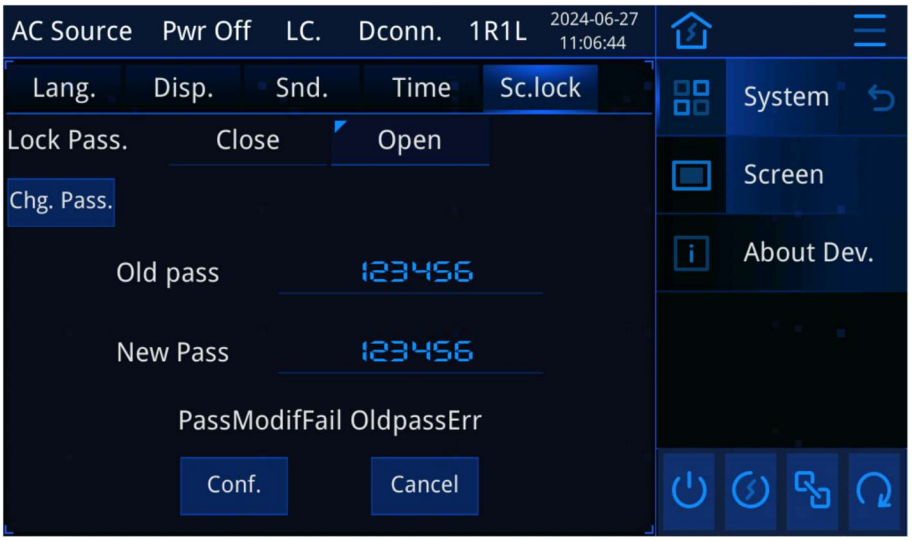


Figure 5-62 Screen Lock Interface

5.7.2 **About Device**

Refer to Figure 5-63 for the system 'About Device' interface, which displays the program version numbers for each component of the device.

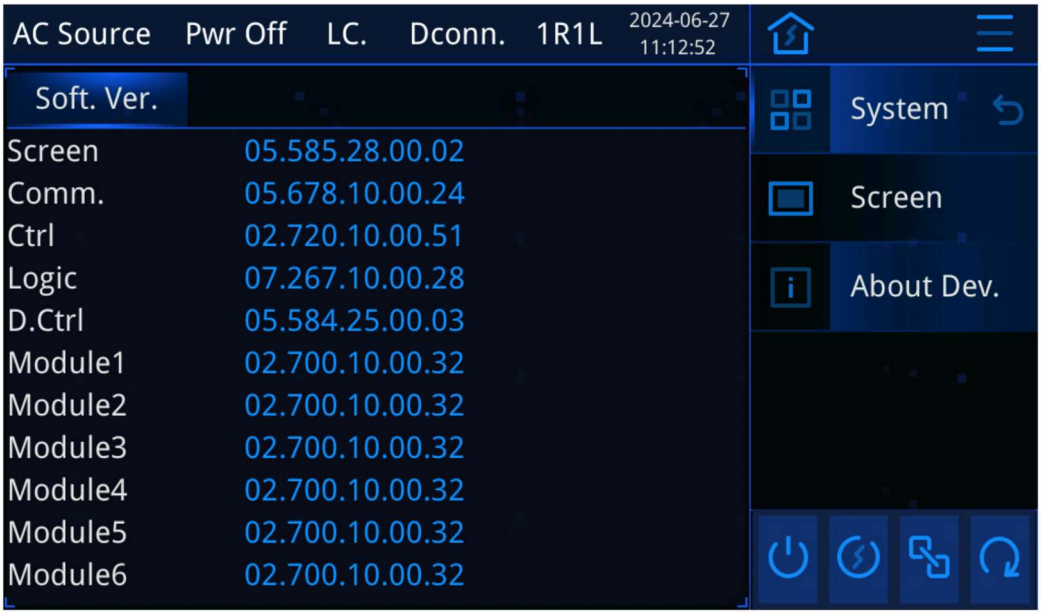


Figure 5-72 System Device Interface

5.8.Record

The recording function is shown in Figure 5-63. Users can query fault records and monitor front-stage/rear-stage temperatures.

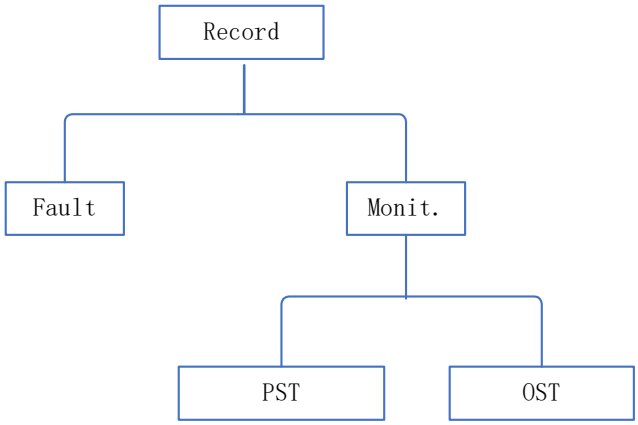


Figure 5-63 Record Tree Diagram

Click the first-level Menu “Record” to enter the second-level Menu “Record”. See Figure 5-64 for details.

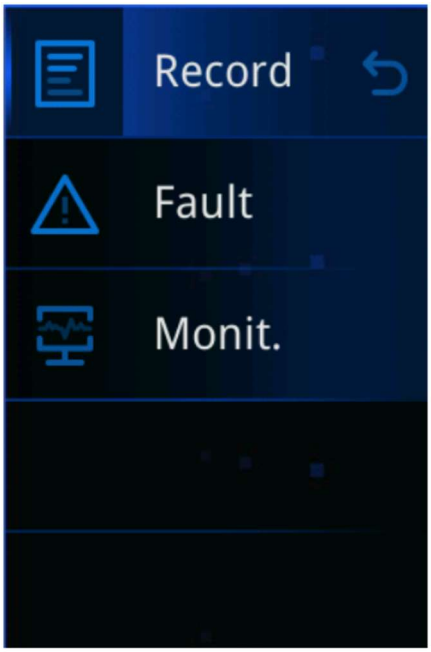


Figure 5-64 Second-level Menu “Record” Diagram

5.8.1.Fault

See Figure 5-65 for the fault recording interface and Table 5-29 for button functions.

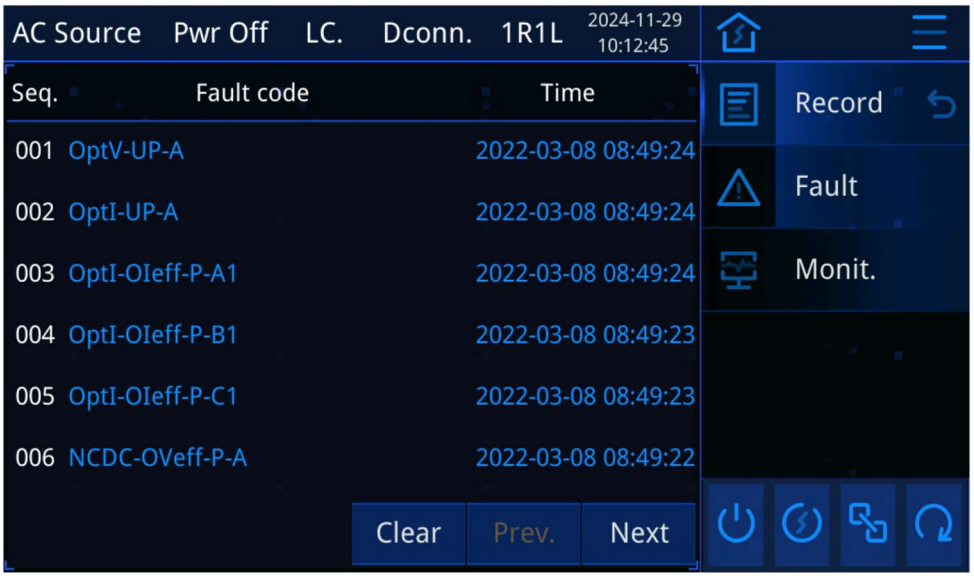


Figure 5-65 Fault Recording Interface

Table 5-29 Button Function Table for Fault Recording Interface

Parameter	Function
Clear	Enable when a fault record exists. Click to clear the fault record.
Previous Page	Enable based on the number of fault entries. Click to view fault records.
Next Page	Enable based on the number of fault entries. Click to view fault records.

5.8.2.Monitoring

The monitoring Menu includes front-stage and rear-stage temperature interfaces.

5.8.2.1.Pre-stage temperature

The front-stage temperature interface is detailed in Figure 5-66, displaying the front-stage IGBT temperature.

Figure 5-66: Front-stage Temperature Interface

5.8.2.2.Post-stage temperature

The rear-stage temperature interface is detailed in Figure 5-67, displaying the rear-stage IGBT temperature.

Figure 5-67: Rear-stage Temperature Interface

5.9.Screen saver interface

If the display screen remains inactive for the duration of the screen saver Time, it will transition to the screen saver interface. Clicking anywhere on the screen saver interface will Exit it. After Exiting the screen saver, if the lock screen password is enabled, the system will transition to the lock screen interface. Upon successful login at the lock screen, the system will return to the interface displayed prior to the screen saver activation. If the lock screen

password is disabled, the system will directly return to the interface displayed prior to the screen saver activation. See Figure 5-68 for the screen saver interface.

Figure 5-68: Screen Saver Interface

Note: The logo on the screensaver interface is displayed in each of the four corners and the center of the screen every 10 seconds.

6.Maintenance

Due to the effects of ambient temperature, humidity, dust, and vibration, the internal components of the TA Series Power Grid Simulator can age and wear, potentially leading to failures. Therefore, daily and regular maintenance of the TA Series Power Grid Simulator is necessary to ensure its normal operation and service life.

Maintenance Items		Maintenance Period
Item	Inspection Method	
Store Software Data	1. Read data from the data acquisition device. 2. Save run data, parameters, and logs to a floppy disk or file. 3. Verify all parameter settings. 4. Update the software.	1 month (depending on system size).
Operating status and Environmental monitoring	1. Inspect the TA Series Power Grid Simulator for any damage or deformation. 2. Check for any abnormal sounds during the TA Series Power Grid Simulator's operation. 3. Inspect all variables while the system is running. 4. Verify the functionality of the main components. 5. Check if the TA Series Power Grid Simulator's enclosure is heating up normally, and use thermal imaging equipment to monitor the system's thermal performance. 6. Observe whether the air intake and exhaust are functioning correctly. 7. Inspect the humidity and dust levels around the TA Series Power Grid Simulator, and verify the functionality of the control room's air inlet filter. 8. Attention! The ventilation of the air inlet and outlet must be checked. If the module is not effectively cooled, it will fail due to overheating.	6 months
System Cleaning	1. Inspect the circuit board and components for	6 months (depending

	excessive dust accumulation, dirt, moisture, and signs of external water leakage. 2. Inspect the heat sink temperature and dust accumulation. If necessary, use an air compressor and turn on the fan to clean the module. 3. Clean or replace the air filter. 4. Clean the insect screens at the air inlet and outlet.	on environmental quality)
Power circuit Connection check	1. Check for loose power cable connections and re-tighten to the specified torque. 2. Inspect the power and control cables for damage, paying particular attention to any cuts or abrasions on the outer jacket where it contacts metal surfaces. 3. Verify that the insulation tape on the power cable terminal connections is intact.	6 months after the initial Configuration, and then every 6-12 months thereafter.
Terminal and wiring connection check	1. Check the control terminal screws for looseness and tighten with a screwdriver. 2. Inspect the main circuit terminals for poor contact and signs of overheating around the screw locations. 3. Visually inspect equipment terminal connections and ribbon cable distribution.	12 months
Cooling Fan Function Test	1. Check all fans for functionality, running noise, and blade cracks. Replace any abnormal fans immediately.	12 months
Protection Function Test	1. Conduct a routine inspection for corrosion on all metal components. 2. Perform an annual inspection of contactors (auxiliary and micro switches): Check for leakage in current circuit breakers, line circuit breakers, overvoltage protectors, power switches, all fuses, and disconnect switches. Lubricate or replace contactors as needed to ensure proper mechanical operation. 3. Overheat Function Test: Verify the overheat safety circuit.	6-12 months
Safety Function Test	1. Inspect the warning labels and replace them immediately if necessary.	6 months

	2. Inspect the emergency stop button and the LCD's stop function. 3. Simulate a shutdown and verify the shutdown function and signal communication.	

The following table outlines the daily maintenance tasks and recommended maintenance intervals:

 Note:

1. When performing maintenance, do not leave metal components such as screws and washers inside the simulator, as this could damage the equipment and create a safety hazard.

2. Before performing hardware maintenance on the TA Series Power Grid Simulator, disconnect the upstream power supply to ensure that all parts to be contacted are de-energized. Deactivate all auxiliary circuits. Wait at least 15 minutes to allow the intermediate circuit capacitors to fully discharge. Open the cabinet door and measure the voltage at the input and intermediate circuit terminals to confirm the absence of hazardous voltage before proceeding with any operations.

3. Only qualified electrical engineers are authorized to perform the work described in this chapter.

7.Troubleshooting

Fault Unit and Type		Fault Analysis	Solution
	The "Power Supply" indicator is off.	Indicates that the TA Series Power Grid Simulator is not receiving power.	First, verify that the power supply and connections are correct. Check if the miniature circuit breaker inside the cabinet is closed. If the indicator light remains off, please contact us.
	The "Run" indicator is off.	The power supply is not in a normal operating state.	Check the cable connections. Use a multimeter to measure the input voltage to ensure it is within the specified input voltage range and that the parameters meet the operating requirements. If the above checks pass and the indicator light remains off, please contact us.
	The “Fault” indicator is illuminated.	A fault has occurred and has not been reset.	Check the detailed fault information on the touchscreen and take corresponding troubleshooting measures. If the indicator remains illuminated, please contact us.
Display fault log	Input overvoltage	The Power Grid Voltage is too high.	Check the Power Grid Voltage and ensure it operates within the range of 0.85 to 1.15 times the rated Voltage. If the Power Grid Voltage is normal and the problem persists, please contact us.
	Input undervoltage	The Power Grid Voltage is too low.	Check the Power Grid Voltage and ensure it operates within the range of 0.85 to 1.15 times the rated Voltage. If the Power Grid Voltage is normal and the problem persists, please contact us.
	Grid-side inductor overheating	Inductor over-temperature.	Check the fan on top of the cabinet. If the fan is functioning normally and the problem persists, please contact us.
	Bridge-side inductor overheating	Rectifier module inductor temperature is too high.	Check the fan on top of the cabinet. If the fan is functioning normally and the problem persists, please contact us.

	Input transformer overheating	Transformer temperature is too high.	Check the fan on top of the cabinet. If the fan is functioning normally and the problem persists, please contact us.
	Other	Other	Please contact us.
	Communication error	The display program on the monitor is experiencing a communication error with the central control.	Check the communication cable connections for any issues. If the problem persists, please contact us.
The machine is producing excessive noise during operation.		Abnormal transformer operation; cooling fan failure.	Check if the power is within the normal range and measure the output current and voltage waveforms. Abnormal waveforms often generate excessive noise. Check the cooling fan and replace it if necessary.
Host computer communication failure.		Host computer communication error.	Please refer to Appendix 2.

8.Legal Information

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Appendix 1: Preparation for Parallel Operation

Parallel Operation: Preparation

1) Parallel Operation fiber optic cable: Configure the cable length as needed.

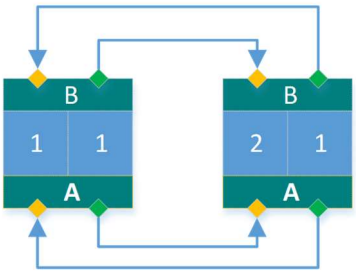
Parallel Operation

1. Cable Connection:

Parallel Operation fiber connection: Use one set of interfaces as shown in the figure.

2. Display Settings:

In the Power Supply's debugging parameters, select “Parallel Operation Settings.” Designate one unit as the master and the other as the slave.



Appendix 2: Ethernet Remote Connection Instructions

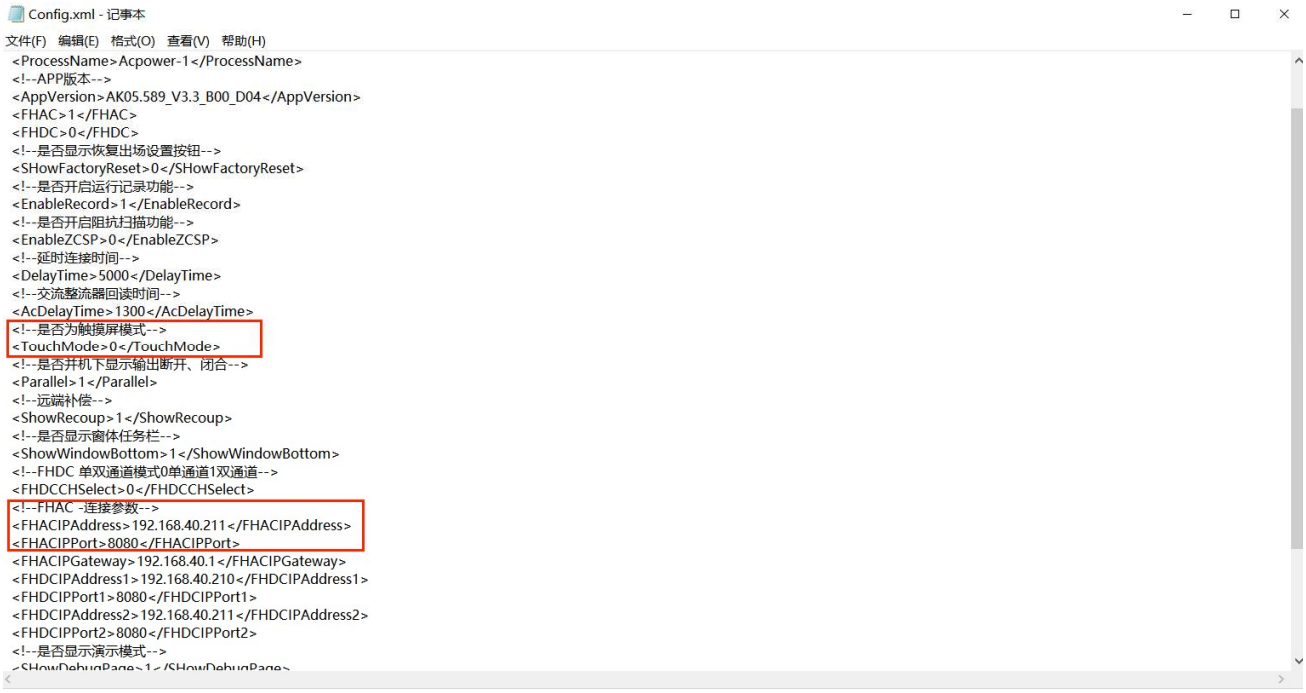
Step 1: Configure the display to LAN and change the IP address:

Note: The configured IP address must be on the same network segment as the user's Host computer.

Step 2:

Open the user's Host computer and locate the config.xml file in the Debug folder. Open the file and modify the values within the blue box as shown in the figure below, entering the IP address and port number configured on the display.

Change the value of “Touch Screen Mode” from 1 to 0. Save the file, and then open the Host computer application.



Config.xml - 记事本

文件(F) 编辑(E) 格式(O) 查看(V) 帮助(H)

```
<ProcessName>Acpower-1</ProcessName>
<!--APP版本-->
<AppVersion>AK05.589_V3.3_B00_D04</AppVersion>
<FHAC>1</FHAC>
<FHDC>0</FHDC>
<!--是否显示恢复出场设置按钮-->
<SHowFactoryReset>0</SHowFactoryReset>
<!--是否开启运行记录功能-->
<EnableRecord>1</EnableRecord>
<!--是否开启阻抗扫描功能-->
<EnableZCSP>0</EnableZCSP>
<!--延时连接时间-->
<DelayTime>5000</DelayTime>
<!--交流整流器回读时间-->
<AcDelayTime>1300</AcDelayTime>
<!--是否为触摸屏模式-->
<TouchMode>0</TouchMode>
<!--是否开机下显示输出断开、闭合-->
<Parallel>1</Parallel>
<!--远端补偿-->
<ShowRecoup>1</ShowRecoup>
<!--是否显示窗体任务栏-->
<ShowWindowBottom>1</ShowWindowBottom>
<!--FHDC 单双通道模式0单通道1双通道-->
<FHDCCHSelect>0</FHDCCHSelect>
<!--FHAC -连接参数-->
<FHACIPAddress>192.168.40.211</FHACIPAddress>
<FHACIPPort>8080</FHACIPPort>
<FHACIPGateway>192.168.40.1</FHACIPGateway>
<FHDCIPAddress1>192.168.40.210</FHDCIPAddress1>
<FHDCIPPort1>8080</FHDCIPPort1>
<FHDCIPAddress2>192.168.40.211</FHDCIPAddress2>
<FHDCIPPort2>8080</FHDCIPPort2>
<!--是否显示演示模式-->
<SHowDebugPage>1</SHowDebugPage>
```