

APS-50000 Series AC Power Source

User Manual

MATRIX TECHNOLOGY INC.

CHECK AND REGULATION STATEMENT

We specially announce that the specifications and features of the listed instrument and equipment in this manual entirely compliance with the one listed in our general directory. The instrument already has passed our check before leaving our factory and the checking procedures measure up to the regulations and standards of the Electronics Testing Center.

(Following the strategy of the sustainable development, we hold the authority of the modification for contents of the manual and without informing prior to it.)

Catalog

CHECK AND REGULATION STATEMENT	2
CHAPTER I SAFETY REQUIREMENT	1
1.1 Safety Instructions	1
1.2 Maintenance	1
User's Maintenance	1
CHAPTER II KEY POINTS TO INSTALLATION	2
2.1 Unpacking and Examination	2
2.2 Preparation before Use	2
1、 Temperature: 0°C-40°C	3
2.3 Storage and Shipment	3
Circumstances	3
4、 Seal box properly	3
CHAPTER III FEATURES AND CAPACITY	4
CHAPTER IV TECHNICAL SPECIFICATION	9
4.1 Direction for Operation Panel	9
4.2 The guide to back panel	10
2、 non-fuse input switcher	10
CHAPTER V OPERATION GUIDE	11
5.1 Operation method of single-phase AC power supply (APS-51000 series)	11
4. Voltage setting	11
5. Frequency Setting	12
7. Current Limiting Setting	12
8. P / PF Option key	12
9. ON/OFF	12
11. MENU	13
5.2 Operation method of three-phase AC power supply (APS-53000 series)	13
CHAPTER VI Communication protocol	18
6.1 Communication protocol for APS-51000 series	18
6.2 Communication protocol for APS-53000 series	25
CHAPTER VII APPENDIX	27
7.1 Troubleshooting	27
Warranty Card	28

CHAPTER I SAFETY REQUIREMENT

The regulations and items should be noticed before use!!!

Safety Signs



1.1 Safety Instructions

·For safety reasons, please read the safety signs which are used in the machine before using our AC variable frequency power supply.

·Please select the correct standard input voltage before turning on the input power switcher of this machine.

To prevent causing accidental injury or death, please observe the machine condition carefully before using or moving.

1.2 Maintenance

User's Maintenance

To avoid getting an electric shock, please do not open the cover of the instrument. All of the internal spare parts of the instrument do not need the maintenance from the user. If there are any errors, please refer to our company or our assigned agents. The attached circuit drawings or block diagrams are only for reference.

Schedule Maintenance

To protect the safety and the accuracy of the instrument, the following items should be examined and checked carefully at least one time per annum: AC power supply, input power cords and other relative auxiliaries.

User's Modification

User does not allowed to change the circuit or the spare parts of the machine, or, the guarantee would

became invalid automatically and we are irresponsible for it, even the spare parts or the accessories recognized by our company. The electric circuit or spare parts of the machine, which are sent back for overhauling and has been modified will be restored to the original condition and charged for the repairing.

CHAPTER II KEY POINTS TO INSTALLATION

This chapter will introduce the rules of product unpacking, examination, preparation of pre-use and storage, etc.

2.1 Unpacking and Examination

1. Unpack the AC variable frequency power supply and check the enclosed attachments which include manual and certification.
2. The product is sealed in a packing case which is protected by pearl brocade. If there are any damages with the packing case, please check the machine whether the exterior deformation, scratch, or panel damaged, etc.
3. Please inform us or our agents immediately if there are any damages and keep the packing case and the pearl brocade. Our service center will maintain it or replace a new one for you, but please do not return it without informing us or our agents.

2.2 Preparation before Use

Demand for the Input Voltage and Selection

The power applied to the APS50000 series AC variable frequency power supply, for single phase is $220V \pm 10\%/50Hz \pm 10\%$, for tri-phase is $380V \pm 10\%/50Hz \pm 10\%$. Please select the proper power before turn on the power switcher of the machine, and use standard fuse (original) at the same time. The specification for the use of fuse has been presented in the backboard of the machine.

Input power must be turned off for avoiding danger before changing the fuse.

Input Requirement

Please make sure the grounding wire of the power cord has been connected to the earth meanwhile to the earth terminal of the instrument. The power plug of the instrument only can be plugged in the socket with grounding wire. Please be sure the extension line with grounding wire if use extension cord. This AC variable frequency power supply applies to tri-core power cord. The grounding is finished when the power cable is plugged in an earthing socket.

Application Circumstances

- 1、 Temperature: 0°C -40°C
- 2、 Relative Humidity: Between 10—90%
- 3、 Height: Below 2000 meters altitude.
- 4、 In the installation sites, there is no gas which can affect the machine badly, steam, chemical deposition, dust, dirt and other explosive and etching medium.
- 5、 No violently vibration or shake in installation sites.

2.3 Storage and Shipment**Circumstances**

APS50000series AC variable frequency power supply can be stored and shipped by the flowing conditions:

Temp.....-20°C to 55°C

Height.....7620 meters

This instrument must avoid the temperature extreme change for drastic changes in temperature may cause water vapor condensing on the inside.

Packing**Original Packing**

Please keep all of the original packing materials and packing the instrument if it must be send back to us for repairing and contact with our maintenance center before sending. All of the accessories including the power cord must be returned with the instrument and demonstrate the error performance and reasons. In addition, please marked the packing with the label read as fragile handle with care.

Other Packing

If the original packing materials are lost, please packing follow below items:

- 1、 Packing the instrument with bubble plastic bag or pearl brocade first.
- 2、 Then packing it by putting it in a multi-layer box which can withstand 150 KG.
- 3、 Shockproof materials must be filled around the instrument and the thickness is about 70 to 100mm.
- 4、 Seal box properly.
- 5、 Marked as fragile handle with care.

CHAPTER III FEATURES AND CAPACITY

Product features:

- Output frequency: 40Hz-250Hz continuously adjustable (special frequency can be customized);
- Output phase voltage: withstand 1V-150V, high-grade 151V-300V, automatic gear 1V-300V, line voltage 1V-520V (special voltage can be customized);
- Voltage, frequency, current, power, power factor meter adopts 4-digit LED display, simple, easy to read and high resolution;
- Voltage (V), frequency (Hz), current (a), power (W) and power factor (P) can be measured and displayed simultaneously without switching;
- No radiation interference, small harmonic component, and special treatment, no interference, pure and stable sine wave output;
- Under the output state, the voltage, frequency, high and low gear switching can be adjusted without shutdown, which can meet the online test of different voltages;
- Large capacity, small size, light weight, high efficiency, silent device, high reliability;
- Provide standard voltage, frequency, analog test of all kinds of electric products in the world;
- Strong overload capacity, instantaneous current can withstand 3 times of rated current;
- With over-current, over-temperature, over-voltage, short-circuit, instantaneous power-off protection and warning devices;
- It is suitable for resistive, capacitive, inductive and other nonlinear loads.

Application range:

Ate automation testing, home appliances, motors, power tools, switching power supply, power adapter, UPS, information communication, photovoltaic, lamps, electronic transformers, electronic components, low-voltage power distribution, aerospace, national defense and military industry and other industries.

APS50000 series single phase programmable variable frequency power supply.

Power	3KVA	5KVA	10KVA	15KVA	20KVA	30KVA	45KVA	
Working	SPWM							
INPUT								
Phase	1φ2W			3φ4W				
Voltage	220V±10%			380V±10%				
Frequency	47Hz - 63Hz							
OUTPUT								
Phase	1φ2W							
Voltage	Low range 1-150VAC, high range 151V-300V, auto range1-300VAC							
Frequency	40-500Hz(0.01Step)							
Maximum Current	L=120V	25A	42A	84A	126A	168A	252A	378A
	H=240V	12.5A	21A	42A	63A	84A	126A	189A
Load Regulation	1%							
T.H.D	2%(low range120V,high range240V,with Resistive load)							
Fre Regulation	0.01%							
LED Display	Voltage Vrms、 Current Arms、 Fre、 Wattage、 PF							
Voltage Resolution	0.01V							
Fre Resolution	0.01Hz							
Current Resolution	0.001A		0.01A			0.1A		
Memory	M1 (V_F_A) 、 M2 (V_F_A) 、 M3 (V_F_A)、 M4 (V_F_A)、 M5 (V_F_A)							
I-LIM Set	O-Max Current							
Protection	Over Current Over Temp Over Load Short Circuit							
Weight(Kg)	40	50	80	100	130	200	280	
W×H×D(mm)	425*620Including casters*430		480*760Including casters*700			600*800Including casters*900		
Environment	0-40℃ 20-80%RH							

Power	50KVA	75KVA	100KVA	150KVA	
Working	SPWM				
INPUT					
Phase	3φ4W				
Voltage	380V±10%				
Frequency	47Hz - 63Hz				
OUTPUT					
Phase	1φ2W				
Voltage	Low range1-150VAC , high range151V-300V, auto range1-300VAC				
Frequency	40-500Hz(0.01Step)				
Maximum Current	L=120V	420A	630A	840A	1250A
	H=240V	210A	315A	420A	625A
Load Regulation	1%				
T.H.D	2%(low range120V,high range240V, with resistive load)				
Fre Regulation	0.01%				
LED Display	Vrms、Arms、Fre、Wattage、PF				
Voltage Resolution	0.01V				
Fre Resolution	0.01Hz				
Current Resolution	0.1A		1A		
Memory	M1 (V_F_A)、M2 (V_F_A)、M3 (V_F_A)、M4 (V_F_A)、M5 (V_F_A)				
I-LIM Set	O-Max Current				
Output Protection	Over Current Over Temp Over Load Short Circuit				
Weight(Kg)	320	380	430	600	
W×H×D(mm)	750*1040Including casters*1040				
Environment	0-40℃ 20-80%RH				

APS50000 series three phase programmable variable frequency power supply.

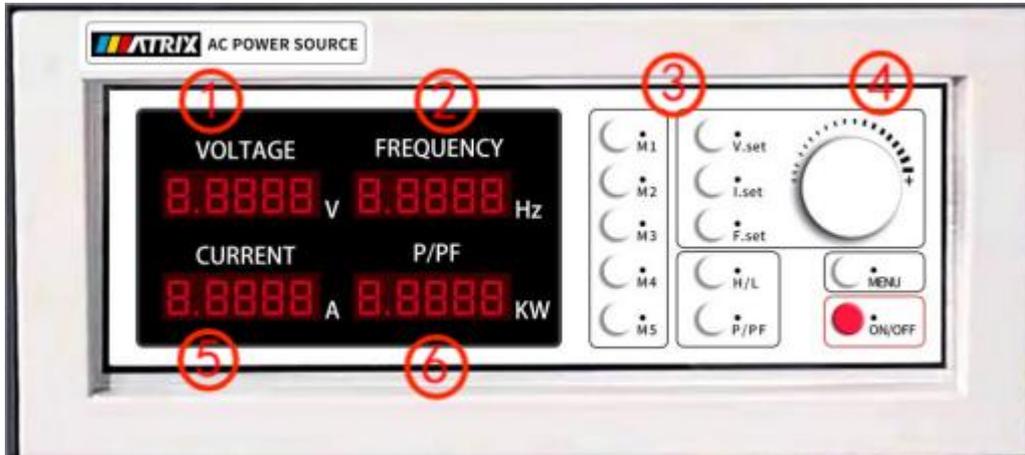
Power	6KVA	9KVA	12KVA	15KVA	20KVA	
Working	SPWM					
INPUT						
Phase	1 ϕ 2W			3 ϕ 4W		
Voltage	220V \pm 10%			380V \pm 10%		
Frequency	47Hz - 63Hz					
OUTPUT						
Phase	3 ϕ 4W					
Voltage	Low range1-150V , high range151V-300V, auto range1-300V (line voltage1-520V)					
Frequency	40-500Hz(0.01Step)					
Maximum Current	L=120V	16.8A	25A	33A	42A	56A
	H=240V	8.4A	12.5A	17A	21A	28A
Load Regulation	1%					
T.H.D	2%(low range120V,high range240V,with resistive load)					
Fre Regulation	0.01%					
LED Display	Vrms、Arms、Fre、Wattage、PF					
Voltage Resolution	0.01V					
Fre Resolution	0.01Hz					
Current Resolution	0.01A					
Memory	M1 (V_F_A) 、 M2 (V_F_A) 、 M3 (V_F_A)、 M4 (V_F_A)、 M5 (V_F_A)					
I-LIM Set	O-Max Current					
Protection	Over Current Over Temp Over Load Short Circuit					
Weight(Kg)	80	90	100	120	160	
W×H×D(mm)	480×760including caters*700			550×800including caters*700		
Environment	0-40°C 20-80%RH					

Power	30KVA	50KVA	60KVA	75KVA	100KVA	150KVA	300KVA	450KVA	
Working	SPWM								
INPUT									
Phase	3φ4W								
Voltage	380V±10%								
Frequency	47Hz - 63Hz								
OUTPUT									
Phase	3φ4W								
Voltage	Low range1-150V , high range151V-300V, auto range1-300V (line voltage1-520V)								
Frequency	40-500Hz(0.01Step)								
Maximum Current	L=120V	84A	140A	168A	210A	278A	420A	840A	1250A
	H=240V	42A	70A	84A	105A	139A	210A	420A	625A
Load Regulation	1%								
T.H.D	2%(low range120V,high range240V,with resistive load)								
Fre Regulation	0.01%								
LED Display	Vrms、Arms、Fre、Wattage、PF								
Voltage Resolution	0.01V								
Fre Resolution	0.01Hz								
Current Resolution	0.01A	0.1A					1A		
Memory	M1 (V_F_A) 、 M2 (V_F_A) 、 M3 (V_F_A)、 M4 (V_F_A)、 M5 (V_F_A)								
I-LIM Set	O-Max Current								
Output Protection	Over Current Over Temp Over Load Short Circuit								
Weight(Kg)	280	360	470	510	660	710	1200	1800	
Volume W×H×D(mm)	730*1040including caters*1040				1200*1600 including caters*1500		1500*1800 including caters*1800		Customized machine casing
Environment	0-40℃ 20-80%RH								

CHAPTER IV TECHNICAL SPECIFICATION

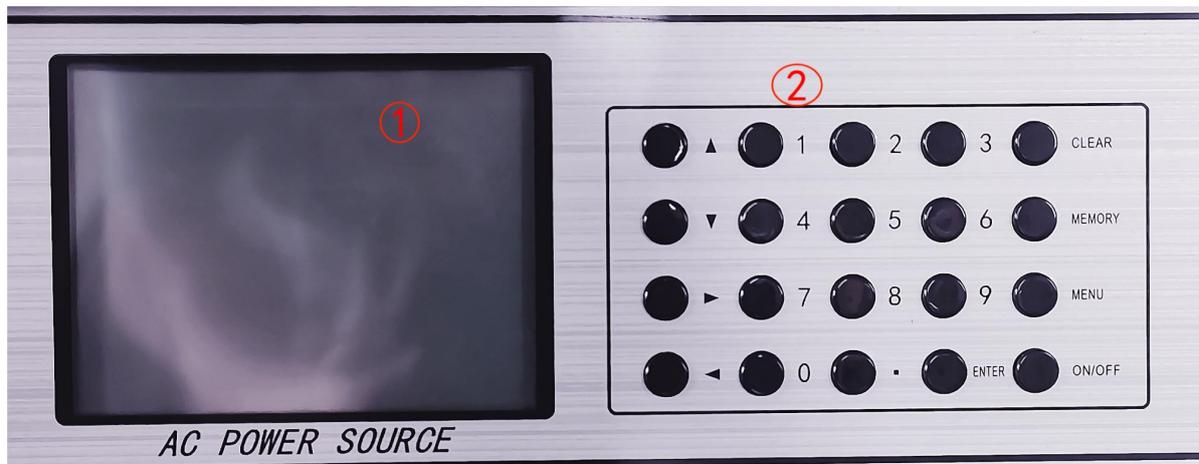
4.1 Direction for Operation Panel

Introduction to the front panel of single-phase programmable variable frequency power supply.



1. Voltage Display: RMS Digital voltmeter with digital RMS value.
2. Frequency Display: Digital voltmeter
3. Operating keys display area
4. Knob operation key
5. Current Display: RMS Digital voltmeter with digital RMS value
6. P/PF Display: Digital active power voltmeter

Introduction to the front panel of three-phase programmable variable frequency power supply.



1. LCD display screen: used for displaying parameter settings and monitoring work status.
2. Button area: used for parameter settings, start and stop.

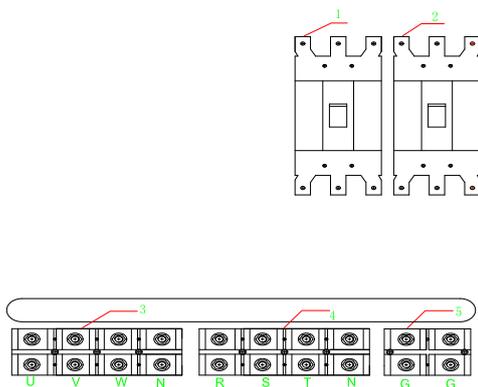
4.2 The guide to back panel

4.2.1 The guide to grounding panel for APS50000 series single phase 10KVA-20KVA.



- 1、 Output line contact bank(L-Live wire, N-Null line, G-Grounding)
- 2、 Input line contact bank(L-Live wire, N-Null line, G-Grounding)

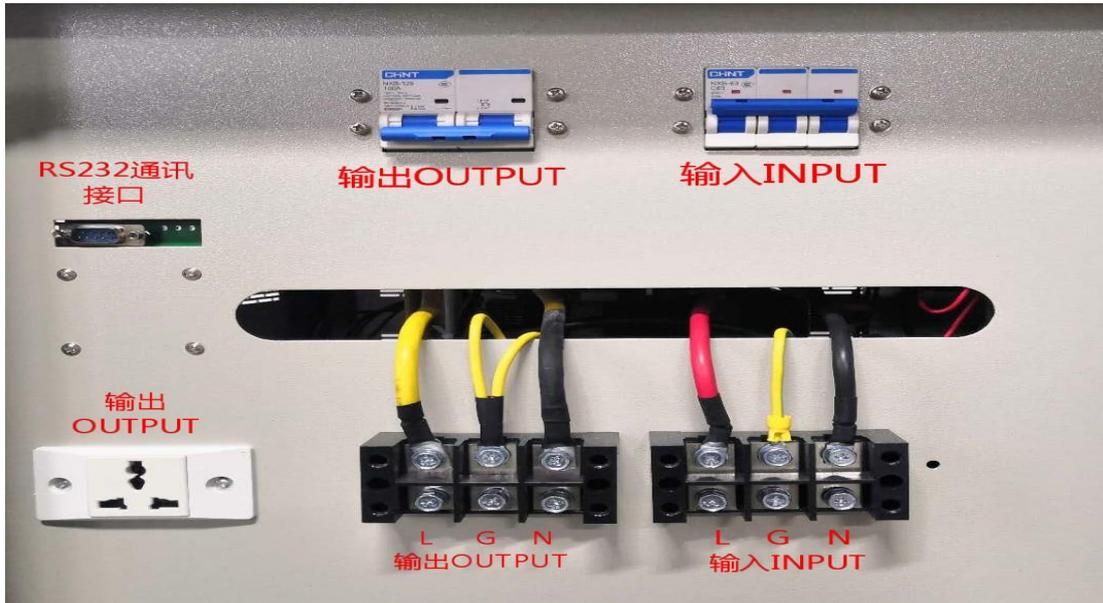
The guide to grounding panel for APS50000 series tri-phase 30KVA-450KVA.



- 1、 non-fuse output switcher
- 2、 non-fuse input switcher
- 3、 Output line contact bank (U-U phase、 V-V phase、 W-W phase、 N-null line、 G-Grounding)
- 4、 Input line contact bank (R-R phase、 S-S phase、 T-T phase、 N-null line、 G-Grounding)

4.2.2 The guide to grounding panel for APS50000 series single phase 10KVA-20KVA.

Input and output wiring (LGN, LGN) RS232 interface: computer communication interface.



CHAPTER V OPERATION GUIDE

5.1 Operation method of single-phase AC power supply (APS-51000 series)

1. Make sure connect to the required power of the instrument and all switchers in the position OFF. Please follow the tags to make the connection well.
2. Please make sure all connections in a right way before the operation.
3. Press the POWER ON button, the screen will show the model and version, then CPU will refer to the last setting because the setting value will be memorized in the EEPROM each time after leaving each setting mode.

4. Voltage setting

In the off / on standby or output mode, press Vset key and "knob" key to adjust the voltage value. In the output mode, when the low range voltage can be set to 0-150V, the high-grade voltage can be set to 0-300V; if you want to adjust the voltage above the low gear, remember to switch the voltage to the gear, otherwise the voltage will be displayed with the highest voltage of the low gear. (first, press Vset to select the voltage. After setting the voltage, the light will be on for a long time. After selecting the knob key, the

number of the display position will always flash when you move a position of the display value after you press it down once. You can adjust the value size by adjusting the direction of the knob, or you can always turn the knob to adjust the value size). After adjusting to the set value, press the Vset key to determine the setting value. If the voltage setting value is not changed for about 4 seconds, the voltmeter will flash once, and the new voltage value after the change will be memorized, and the output will automatically leave the setting screen.

Variation: each time the knob is rotated, a digit is adjusted, and a digit is displayed when the knob is pressed.

5. Frequency Setting

Press fset and knob key in off / on standby or output mode to adjust the frequency value. In the range of 45-500hz, the variation of fine tuning is 0.01hz/step (others are the same as voltage setting mode).

6. H/L High and Low Voltage Switch

The switch keys of high or low voltage. In low output mode, the output rated current is higher and in high output mode, the output rated current is halved(reference to chapter III product specification).High/low switch does not influence the setting voltage value, but it will cause short electrical outage (at least 20mS) if make the switch on the output ON mode. Try to avoid it. Improper switch will not be accepted by Model Version (such as switch to low mode in the setting 300V voltage).

7. Current Limiting Setting

In the reset standby or output state, press aset and knob key once to display the preset current limit value. If the knob key is pressed again, the value can be adjusted. If the current limit setting is not changed within 4 seconds, it will automatically jump out of the current limit setting screen and return to the original setting screen.

When the output current exceeds the set value, the output stops and the output / reset LED flashes.

8. P / PF Option key

Press P / PF to chose the key any time, but the choice should base on power meter or power factor meter.

9. ON/OFF

The on / off state of the output can be switched. When the on / off light is on, it means there is output, and when the light is off, it means no output. When the output is abnormal, the output will be turned to off state, and the on / off led will flash. If you press the first button, the buzzer alarm will be relieved; if you press the second button, you can reset the error message; and then press the third time to restore the output.

10. M1, M2, m3, M4 and M5 memory modes can store the set state of voltage, current and frequency in any group of memory modes. If you want to remember / press any key M1, M2, m3, M4, M5 for more than three seconds, you can save it in the memory. If you want to call / press any key M1, M2, m3, M4, M5, you

can call the stored memory mode.

11. MENU

Press the MENU key in the stopped state to try entering the system, including BUS baud rate, ADD-ID address, DLY start time, PLC communication protocol selection, and adjust the required values through the shuttle

12. Connect load to output terminal, turn on the power output switcher after all things done correctly.

13. The overload or short circuit protecting device will start immediately when overloading or short circuit happen (cut off the output power, buzzer is humming and alarm indicator is lighting). Turn off the output switcher, checking if overloading (if it does, please lighten it). Reset, all come back to normal and can work again.

14. If overload or short circuit, please do not press RESET immediately after alarm. The correct operation is that turn off the switcher before reset, or impact the machine life. Make sure the load is right before turn on the switcher again.

15. Please inform us if there are any other situations cannot be handled, we will send technician to deal with.

5.2 Operation method of three-phase AC power supply (APS-53000 series)

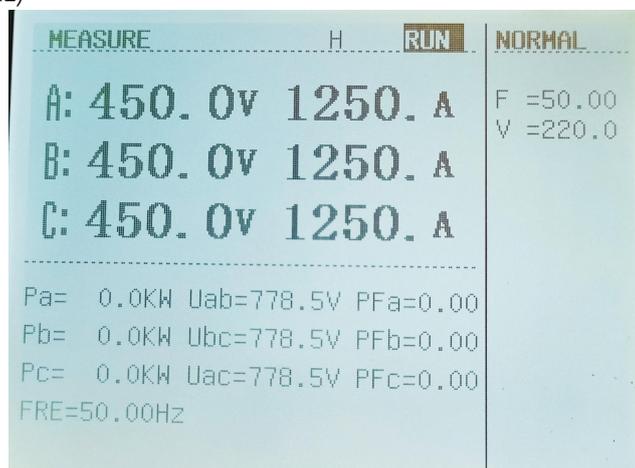
1. Before wiring, please confirm whether the input power supply is required by the machine, and all switches should be placed in the off position. Hold the wiring according to the label.

2. Make whether all wiring is correct before starting up.

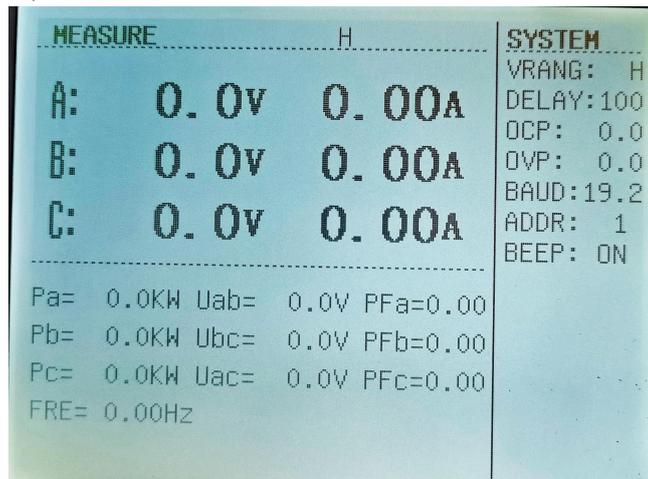
3. After the LCD will show its model and version, the CPU will call the final setting value before shutdown, because the setting value has been remembered in the EEPROM of this machine.

4. MENU: In the standby state, press the MENU to switch between the normal mode and the system setting, as shown in the figure:

1): Normal mode (NORMAL)



2): System setting: DELAY: Start time 100 is equal to 1S, OCP: Current alarm, OVP: Voltage alarm, BAUD: Port rate, ADDR: AD address, BEEP: Communication switch.



5. Parameter setting and operation for normal mode:



(1) V voltage setting

In standby state, press "▲" or "▼" then to move the cursor to the voltage setting window, can directly press the number key for the voltage setting value input, confirm the value is correct, press "ENTER" return key, if the value is wrong, press "CLEAR" key to clear the input; press "◀" or "▶" key to directly adjust the original voltage value.

In the output state, press "▲" or "▼" then to move the cursor to the voltage setting window, press "◀" or "▶" to directly adjust the original voltage value.

(2) F-frequency setting

In standby state, press "▲" or "▼" then to move the cursor to the frequency setting window, directly press the number key to enter the frequency value, confirm the value is correct, press "ENTER" return key, if the value is wrong, press "CLEAR" to clear the input; press "◀" or "▶" to directly adjust the original frequency value.

In the output state, press "" or "then" to move the cursor to the frequency setting window, press "◀" or "▶" to directly adjust the original frequency value.

(3) ON / OFF output and stop key

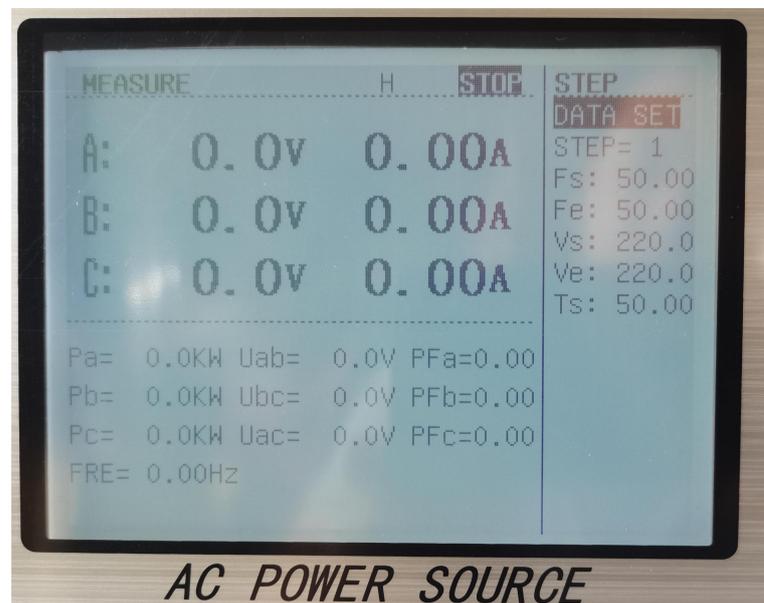
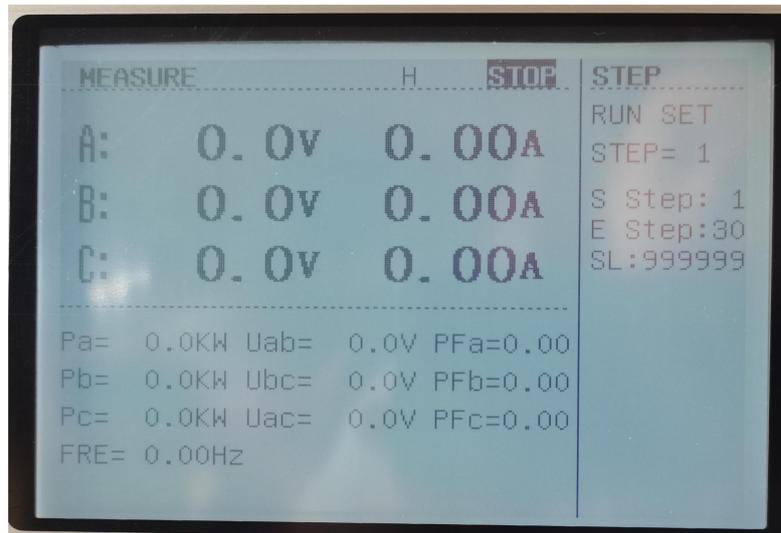
After confirming that all settings and wiring are correct, press "ON, OFF" key and the machine is in the stop state;

(4) ON / OFF output and stop key

When the machine is stopped, press the ON / OFF key to run the machine,

When the machine output is abnormal, the output will turn to OFF state. "FAULT" will appear in the upper right corner of the LCD screen and the buzzer will alarm. Press once can remove the buzzer alarm (Alarm).

6. Parameter setting operation for programmable mode:



(1) The PG data group is set to PG data set

In standby state, press "▲" or "▼" then move the cursor to the data group setting window, press "◀" or "▶" key to directly adjust the original data group value.

In standby mode, press "▲" or "▼" to move the cursor to the data group setting window, and press "◀" or "▶" to directly adjust the original data group value.

(2) The V voltage setting is Voltage setting

In standby state, press "▲" or "▼" then to move the cursor to the voltage setting window, can directly press the number key for voltage setting value input, confirm the value is correct, press "ENTER" return key, if the value is wrong, press "CLEAR" key for input; press "◀" or "▶" key can directly adjust on the original voltage value.

In one set of settings (VS is the starting voltage value and VE is the stop voltage value), two values need to be set the same without rising slope.

(3) F, frequency set Frequency setting

In standby state, press "▲" or "▼" then to move the cursor to the frequency setting window, directly press the number key to enter the frequency value, confirm the value is correct, press "ENTER" return key, if the value is wrong, press "CLEAR" to clear the input; press "◀" or "▶" to directly adjust the original frequency value.

In the output state, press "▲" or "▼" then to move the cursor to the frequency setting window, press "◀" or "▶" to directly adjust the original frequency value.

In one set of settings (FS is the starting frequency and FE is the stop frequency), two values should be set to the same without the rising slope.

(4) T (Time Run) running time is set to Running time setting

In standby state, press "▲" or "▼" then to move the cursor to the running time setting window, press the number key to enter the running time setting, press the "ENTER" return key, enter the "CLEAR" if the value is wrong, press "◀" or "▶" to directly adjust the original running time value.

(5) The SL running times are set to Run number of times setting

In standby state, press "▲" or "▼" then to move the cursor to the running number setting window, you can directly press the number key to set the number of running value input, confirm the value, press "ENTER" return key, if the value is wrong, press "CLEAR" key after input;

(6) S step / E step Number of start and stop groups set Start and stop group number setting

In standby state, press "▲" or "▼" then to move the cursor to the running number setting window, can directly press the number key to start and stop the group set value input, confirm the value, press "ENTER" return key, if the value is wrong, press "CLEAR" key after the input;

7. System parameter setting and operation:

(1) RS232, Porter rate setting

In standby state, then press "▲" or "▼" move the cursor to the port rate setting window, press "◀" or "▶" to enter the selection of parameter item set, press the key will turn a parameter set item, in order: 4,8,9,6,19,2.

(2) The ADDR address setting

In standby state, then press "▲" or "▼" to move the cursor to the address setting window, press "◀" or "▶" key to enter the selection of parameter item setting, press the key will turn a parameter setting item, in order: 1,2,3,..... 30.

(3)The OVP / OCP outputs the alarm setting

In standby state, press "▲" or "▼" then to move the cursor to the high and low level setting window, press "◀" or "▶" key to enter the selection of parameter item setting, press the key will turn a parameter

set item, set the default to 0 (need to set the alarm, set should be greater than the output value).

(4)The DELAY output time

In standby state, press " ▲ " or " ▼ " then move the cursor to the output time setting window, press " ◀ " or " ▶ " key to enter the selection of parameter item setting, press the key will turn a parameter setting item, in order: the default time is 100MS.

(6) The BEEP communication switch setting

In standby state, press " ▲ " or " ▼ " then key to move the cursor to the output time setting window, press " ◀ " or " ▶ " key to enter the selection of parameter item setting, press the key will turn a parameter setting item, ON on. OFF close.

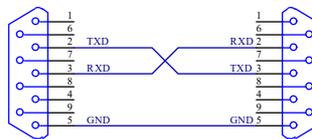
8. Protection instructions:

This machine is equipped with an overload or short circuit protection device, and the protection circuit starts immediately (if the output power is cut off, "FAULT" appears in the upper right corner of the LCD screen and the buzzer alarm is normal). Start the output switch OFF and check for overload.(If sometimes, please reduce the load) reset (ALARM sound, indicating cut off) everything returns to normal, can continue to use.

9. Instructions for the serial port for use

APS8000 You can choose the communication serial port. This product provides: the most common interface mode of RS232. Customers should choose the appropriate interface mode according to their needs (instructions when ordering). The hardware of the serial port is the D-type 9-pin interface, and the pin is defined as follows:

RS232: 2---TXD、 3---RXD、 5---GND;



10. If there is any impossible fault in the machine, please inform the after-sales service department of the company, which will provide you with good after-sales service.

CHAPTER VI Communication protocol

6.1 Communication protocol for APS-51000 series

PLC communication protocol selection, (adjust the required value through shuttle.) (1 is the CPIP protocol, 4 is the Modbus protocol,)

1. CPIP protocol

All commands with "?" in all the commands indicates that the device is being read and there is a response string when the command is completed correctly.

Commands without "?" in the command means write device, when the command is completed correctly, there is no response string, when the command is not completed correctly, the response string is the reason for the error.

All commands end with carriage return line feed, support RS-232 and RS-485 interfaces, each command interval is recommended to be more than 150ms.

?MODE, Reads the current line operating mode and returns NORMAL or STEP mode.

M_NORMAL, Set to NORMAL mode.

M_STEP, Set to STEP mode.

?STATE, Reads the machine operation status and returns ON or OFF.

ON, Output.

OFF, Turn off the output, in the alarm state for clearing the alarm and reset.

?FR, Read the measured frequency and return the current frequency value.

?VOA, Read the measured voltage and return the measured voltage value.

?IA, reads the measured current and returns the measured current value.

?PA, reads the power and returns the power value.

?PFA, Read PF value.

VRANG_L, Set to low level.

VRANG_H, Set to high level.

? VRANG, Read the current gear position

SET_OCP, Set OCP to 2A SET_OCP 2.000

SET_OVP, Set OVP to 200V SET_OVP 200.0

DELAY, Set power-on start-up time, Set voltage output time to 2S (unit is 100MS) DELAY 200

?DELAY, Reads the power-on start-up time.

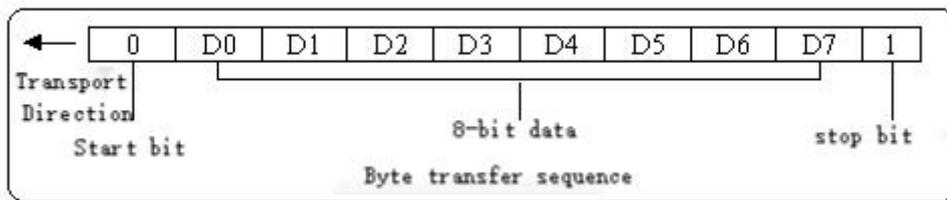
SFR, Set frequency, Set frequency to 45HZ SFR 45.00

SVOA, Set voltage Set voltage to 222.2V SVOA 222.20

2. Modbus protocol

Overview: This communication adopts the Modbus protocol RTU mode, and its communication driver is fully compatible with the Modicon Modbus RTU format.

1. Byte format:



Each byte contains 8 bits of binary code, with a start bit (0) and a stop bit (1) added during transmission, totaling 10 bits. The transmission sequence is shown in the above figure, where D0 is the least significant bit of the byte and D7 is the most significant bit of the byte. Pass low first, then high.

2. Communication data format:

During communication, data is sent back in the form of a word (WORD-2 bytes). In each returned word, the high byte comes first and the low byte comes last. If two words are continuously sent back (such as floating-point or long integer), the high word comes first and the low word comes last.

Data Type	Number of registers	Byte	Explanation
Byte data	1	1	
Integer data	1	2	Send back once, high byte before low byte after
Long integer data	2	4	Divide into two characters for feedback, with high characters before and low characters after
Floating point data			

3. Frame format:

3.1 Read the content of the power register (function code 03H)

3.1.1 Frame format sent by upper computer:

Sequence	Code	Illustration	Explanation
1	Power address	01H	The communication address of the power supply (between 1-255)
2	03H	03H	Function code
3	Starting register address high byte	20H	Register Start Address
4	Starting register address low byte	00H	
5	Register count high byte	00H	Number of registers
6	Register count low byte	02H	
7	CRC16 Verify low bytes	CFH	CRC Verify data
8	CRC16 Verify high bytes	CBH	

3.1.2 Frame format for power feedback (data normal)

Sequence	Code	Explanation
1	Power address	The communication address of the power supply (between 1-255)
2	03H	Function code
3	Bytes of feedback data field	
4	First register data	
.....	
	Nth register data	
M+4	CRC Verify low bytes	
M+5	CRC Verify high bytes	

3.1.3 If the starting register address or number of registers is incorrect, the power supply will send back:

Sequence	Code	Illustration	Explanation
1	Power address	1	The communication address of the power supply (between 1-255)
2	83H	83H	Function code
3	02H	02H	Error code
4	CRC Verify low bytes	C0H	
5	CRC Verify high bytes	F1H	

3.2 Set the content of the power register (function code 10H)

3.2.1 Frame format sent by upper computer

Sequence	Code	Illustration	Explanation
1	Power address	1	The communication address of the power supply (between 1-255)
2	10H	10H	Function code
3	Starting register address high byte	15H	Register address 1520H
4	Starting register address low byte	20H	
5	Register count high byte	00H	00H
6	Register count low byte	02H	Byte data, integer data: 01H Floating point data, long integer: 02H
7	Number of bytes (M)	4	Byte data: 01H Integer data: 02H Floating point data、long integer data: 04H
8	Data high byte	42H	The set floating-point data is100
	Data second highest byte	C8H	
	Data second low byte	00H	
	Data low byte	00H	
M+8	CRC Verify low bytes	96H	CRC Verify data
M+9	CRC Verify high bytes	A1H	

3.2.2 Power feedback: (write successful)

Sequence	Code	Illustration	Explanation
1	Power address	01H	The communication address of the power supply (between 1-255)
2	10H	10H	Function code
3	Starting register address high byte	15H	Register address 1520H
4	Starting register address low byte	20H	
5	Register count high byte	00H	Number of registers 2
6	Register count low byte	02H	
7	CRC Verify low bytes	44H	CRC Verify data
8	CRC Verify high bytes	0EH	

3.2.3 Power Feedback: (Register Address or Data Error)

Sequence	Code	Explanation
1	Power address	The communication address of the power supply (between 1-255)
2	90H	Function code
3	03H	Error code
4	CRC Verify low bytes	
5	CRC Verify high bytes	

Note: The CRC check in the above introduction is 16 bits, with low bytes first and high bytes last.

4. Communication Baud Rate:

The communication baud rate can be selected, as shown in the manual. When leaving the factory, the power supply has been set to a certain baud rate.

5. Power address:

The instrument address can be selected between 1-63, as shown in the manual. When the power supply leaves the factory, a certain address has been set.

6. Communication function code:

03H (call test data) 10H (data setting)

7. Communication data CRC verification:

7.1 Verification polynomial: $X^{16}+X^{12}+X^5+1$

7.2 CRC verification code calculation routine can be found in the appendix.

7.3 CRC check starts from the first byte and ends with the byte data before the CRC check high byte.

8. Power data register address:

Among them, floating-point data is single precision four byte floating-point

Table 1

Register address	Data Name	Unit	Data format	Note
Measurement data, read-only Function code 03H reading; A maximum of 248 consecutive bytes or 124 consecutive words can be read at once;				
2000H	A-phase measurement voltage	V	Floating point	In a four wire system, it refers to UAN, UBN, and UCN respectively, while in a three wire system, it refers to UAB, UAC, and UCB respectively;
2002H	B-phase measurement voltage	V	Floating point	
2004H	C-phase measurement voltage	V	Floating point	
2006H	A-phase measurement current	A	Floating point	
2008H	B-phase measurement current	A	Floating point	
200AH	C-phase measurement current	A	Floating point	
200CH	A-phase measurement power	W	Floating point	

200EH	B-phase measurement power	W	Floating point	
2010H	C-phase measurement power	W	Floating point	
2012H	Measurement Frequency	Hz	Floating point	
2014H	Total active power	W	Floating point	
2016H	Total power factor		Floating point	
2018H	Total reactive power	Var	Floating point	
201EH	A-phase power factor		Floating point	
2020H	B-phase power factor		Floating point	
2022H	C-phase power factor		Floating point	
2026H	A-phase reactive power	Var	Floating point	
2028H	B-phase reactive power	Var	Floating point	
202AH	C-phase reactive power	Var	Floating point	
203EH	AB phase current phase angle	Angle	Floating point	
2040H	AB Phase voltage phase angle	Angle	Floating point	
2042H	BC phase current phase angle	Angle	Floating point	
2044H	BC Phase voltage phase angle	Angle	Floating point	
2046H	CB phase current phase angle	Angle	Floating point	
2048H	CB Phase voltage phase angle	Angle	Floating point	

Table 2

Register address	Data Name	Unit	Data format	Note
Set data, read-write Function code 03H reading; Function code: 10H write				
3000H	A-phase voltage	V	Floating point	In a four wire system, it refers to UAN, UBN, and UCN respectively, while in a three wire system, it refers to UAB, UAC, and UCB respectively;
3002H	B-phase voltage	V	Floating point	
3004H	C-phase voltage	V	Floating point	

3006H	Frequency	Hz	Floating point	
3008H	AB Phase voltage phase angle	Angle	Floating point	
300AH	BC Phase voltage phase angle	Angle	Floating point	

Table 3

System parameter		function code 03H reading; Function code 10H write		
1000H	Power output switch		Integer	FF00H: ON, 0000H: OFF
1001H	High and low gear switches		Integer	FF00H: High, 0000H: Low
1002H	Alarm status		Integer	FF00H: ON, 0000H: OFF
1003H	Communication baud rate setting		Integer	9600----115200
1004H	Hardware version		Four Bytes	<Read Only>The high bit is an ASCII code character, and the last two digits form an integer. When read by the upper computer and divided by 100, it is the version number
1006H	Software version		Four Bytes	<Read Only>The high bit is an ASCII code character, and the last two digits form an integer. When read by the upper computer and divided by 100, it is the version number

Note: 1. The address of the power output switch. In the power output state, it is switch output, and in the alarm state, it is clear alarm and turn off output.

2. The alarm status address written as FF00H is invalid, and only the clear alarm 0000H is valid.

Example: Set the device address to 1

1. Open output 01 10 10 00 00 01 02 FF 00 F6 61

Return: 01 10 10 00 00 01 05 09

2. Off output 01 10 10 00 00 01 02 00 00 B7 91

Return: 01 10 10 00 00 01 05 09

3. Set the voltage to 110V: 01 10 30 00 00 02 04 42 DC 00 00 72 2C

Return: 01 10 30 00 00 02 4E C8

4. Set the frequency to 60Hz: 01 10 30 06 00 02 04 42 70 00 32 27

Return: 01 10 30 06 00 02 AE C9

5. Read and measure voltage 01 03 20 00 00 02 CF CB

Return 110V measurement value: 01 03 04 42 DC 00 00 00 2F B1

6. Read measurement current 01 03 20 06 00 02 2F CA
Return 0.0A measurement value: 01 03 04 00 00 00 00 00 FA 33

7. Reading measurement power 01 03 20 0C 00 02 0F C8
Return 0.0A measurement value: 01 03 04 00 00 00 00 00 FA 33

8. Read measurement frequency 01 03 20 12 00 02 6F CE
Return 60Hz measurement value: 01 03 04 42 70 00 00 EF 90

9. Read measurement PF value 01 03 20 1E 00 02 AF CD
Return measurement value: 01 03 04 00 00 00 00 00 FA 33

6.2 Communication protocol for APS-53000 series

6.2.1. RS232C / 4 85 instruction sheet:

Of all the instructions included "?" A read device with a response string when the command completes correctly.

No in the command "?" The write device, no response string when the command completes correctly, and the response string is the error cause when the command cannot complete correctly.

All commands end with a return line change, support 232 and 485 interfaces, and the time interval of each instruction is recommended to be above 150ms.

? STATE Read the machine running state and return to the ON or OFF
ON output,
OFF off the output, in the alarm state is to clear the alarm and reset

? The FR reads the measured frequency and returns the current frequency value
? The VOA reads the measured voltage and returns the measured voltage value
? IA reads the measured current and returns the measured current value
? The PA will read the power, and return the power value
? The PFA reads are used for the PF value

? The VOB reads the measured voltage and returns the measured voltage value
? IB reads the measured current and returns the measured current value
? PB reads the power and returns the power value
? PFB was read the PF values

? The VOC reads the measured voltage and returns the measured voltage value
? The IC reads the measured current and returns the measured current value
? The PC reads the power and returns the power value
? PFC read the PF value
? The UAB reads the AB phase line voltage values
? The UAC reads the AC phase line voltage value
? The UBC reads the BC phase line voltage value

SET _ OCP is set OCP is set OCP is 2 A SET _ OCP 2.00

SET _ OVP set OVP set OVP is 200 VSET _ OVP 200.0

DELAY Set the start time set the voltage output time is 2S (in 100MS) DELAY 200
? DELAY Read the boot and start time

Set the frequency and voltage commands in the normal mode
SFR frequency is set to 45HZ SFR 45.00
SVOA set voltage is 222.2V SFR 222.2

High and low gear setting
VRANG _ L is set to low gear
VRANG _ H is set as high-scale
VRANG _ A is set as automatic gear
? VRANG, read the current gear position

CHAPTER VII APPENDIX

7.1 Troubleshooting

1、 Phenomenon: No voltage output, all the panel indicators are out.

Reason: No power supply input

Clean: A. Make sure the switcher is turned on. B. Make sure the fuse is not fused.

C. Make sure input cord is plugged in socket correctly or check whether the power is out.

2、 Phenomenon: No voltage output but the frequency meter is working. Voltage turns into 0 with humming.

Reason: A. Overload or abnormal load. B. Load with over starting current.

Clean: Turn off the switcher, press RESET, turn on the output switcher after lightening or checking loading.

3、 Please inform our maintenance center if there are any obstacles cannot be cleaned. We will provide excellent after-service.

7.2 Check for serial port communication failure

1. Check whether the mailing address and messaging rate of the machine are the same as those of the upper computer, and modify the setting if different.

2. Disconnect the connection between the machine and the upper machine, and measure the serial port signal line of the machine and the upper machine. The TXD of instrument and host shall be -8 V to -12V. If the above test signal is not normal, it is an interface or connection problem.

3. Serial port communication can receive data but the data is often wrong, check whether the contact between the instrument and the upper machine is intact, if the interference of the environment is large, the serial port line should use shielding line and ground the shielding layer.

Warranty Card

What the warranty covered:

If the machine break down due to its defectiveness, MATRIX will provide free maintenance during warranty period. If the machine break down due to wrong operation or carelessness, then Matrix provide paid service within warranty period.

How long does this warranty last:

This warranty lasts for 1 years from the date of original purchase of all MATRIX branded products.

Who is covered:

This warranty covers only the original purchaser of this product. This warranty is not transferable to subsequent owners or purchasers of this product.

What do customers need to do to get repairs/service under the warranty policy?

If the machine get problem, please contact our local distributor. If you cannot find the local distributor, you can contact us directly, our email is service@szmatrix.com, our telephone No. is 0086 755 2836 4276.

What information do customers need to supply?

Model No.	
Serial No.	
Problem description	
Picture	
Video if necessary	