INTEPRO SYSTEMS

Intepro Systems

AFV-P Series

Programmable AC Power Supply

USER MANUAL

If you encounter any problems, please seek assistance from Intepro Systems support or customer assistance. Intepro Systems pursues a policy of continual product development and reserves the right to change the equipment design without prior notice.

Version 1

Safety Notice

Danger 

Beware the high temperature of AFV(the equipment). Do not **open the chassis without permission except the technical staff of our company or knowledgeable technician** in case of electric shock.

When AFV(the equipment) needs to be removed or rewired, the input must be cut off, and we should ensure that AFV(the equipment) must be **shut down for more than 20 minutes**. Because the DC bus capacitors inside of AFV(the equipment) are still active with high voltage, and you might get an electric shock;

In order to ensure the personal safety of users, this series of power products must be grounded before use.

In case of a fire, use dry chemical fire extinguisher. If you use liquid fire extinguishers, you might get an electric shock;

Do not allow liquid or other foreign objects to enter the equipment chassis.

Attention 

Environment condition and storage methods affect the product life and reliability of the equipment. Therefore, prevent the following working environments:

Abnormal temperature and humid environment what do not meet the technical indicator requirements (temperature: 0°C ～45°C; relative humidity: 0～90%);

Places affected by direct sunlight or near heat source;

Places affected by vibrations or bumps;

Places with dust, corrosive substances, salt or combustible gases;

Please keep the air inlet and outlet unobstructed. The obstructed ventilation of air inlet or outlet may cause temperature rise inside the AFV(the equipment) and shorten the service life of the equipment components, and thus affect the service life of the equipment;

If the machine is placed and not used for a long period, AFV(the equipment) must be stored in a dry environment. The storage temperature range should be between: - 40°C ～ + 70°C.

Attention 

Considering properly protect the equipment, only the personnel of our company are allowed to open the front door or side cover. If the quality assurance seal is broken, services going to be charged.

Danger: conditions that may cause serious equipment damages or human casualties.

Attention: Conditions that may cause moderate injuries or damages of equipment.

Contents

Chapter 1 Product Introduction

Power supplies of AFV-P Series are our company's newest generation of city power-simulated, programmable power supply products. Through the adoption of advanced SPWN technology and Direct Digital Synthesis (DDS) of frequency waveform technology, the AFV-P Series power supplies are capable of providing highly stable output frequency and continuous, stable and pure sine-waved output voltage.

With the application of the newest version of inverter circuitry on the products, the range of output frequency can be reached to 15~1000Hz, response to transients is much faster, loading capacity is larger, total harmonic distortion (THD) is much lower and is capable of providing DC voltage output.

In terms of programmable functions, there are 50 sets of Memory, each has 24 steps for setting. The functions include the setting of starting and ending phase angle, voltage and frequency ramp up /down, and variation of voltage transient. Through internal circuitry and communication modules, the power supply can be controlled locally or remotely on a PC at client site. The internal circuitry enables fast diagnosis of over current, over loading, over voltage, under voltage, output shortage, over temperature, reverse current, and fan failures. Once an abnormal condition is identified, the output will be interrupted to protect the machine and an alarm will be initiated. Displays and controls are available on the touch screen, which makes the operation easier.

Major attributes of AFV-P series Frequency Converter Power Supply include:

- AC Output Voltage: 0-310V; DC Output Voltage: 0-420V.
- Standard Output Frequency: 40-500Hz, with an option of 15-1000Hz.
- Inrush Current: 4.5 times; Crest Factor > 3 times.
- Extremely low output distortion: <100Hz THD <0.3%.
- Output starting & ending phase angle setting: 0-359 degree.
- Ramp-Up/Down setting range: 0-999.9s.
- 50 sets of memories in Advanced Mode, each memory has 24 steps. 50 sets of memories in Basic Mode.
- Transient function enables a simulation of instant rise and down at the power supply.
- Metering functions include: Current, Watt, VA, VAR, Frequency, A-Peak, Crest Factor, and PF.
- Protective functions include: OCP, OPP, OVP, LVP, RCP, OTP, and Fan Fail.
- Fans are controlled by intelligent digital linear temperature control system, which effectively reduces fan noise and prolongs fan's life.

- Back panel includes: output terminal boards, multi-purpose receptacles, and Remote Sense input for line voltage drop compensation.
- Synchronized output signal functions have ON and Event modes.
- Interfaces include: USB+RS232+RS485+Ethernet, Remote Input/Output, GPIB (opt.), Analogy Control (opt.). These interfaces are compatible with computer software.
- Color TFT LCD + Touch Panel + Rotary knob Adjustment.
- Various capacities of the AFV-P Series Power Supply are available: 600VA, 1250VA, 2500VA, 5000VA. For power supply with capacity of 2500VA and below, the height is 2U; for power supply with capacity of 5000VA, the height is 5U.

Chapter 2 Principles of Operation

2.1 Functional Block Diagram

The control system of AFV-series Frequency Converter Power Supply is constituted by functional blocks as shown in the order from input to output in Figure 2-1 below:

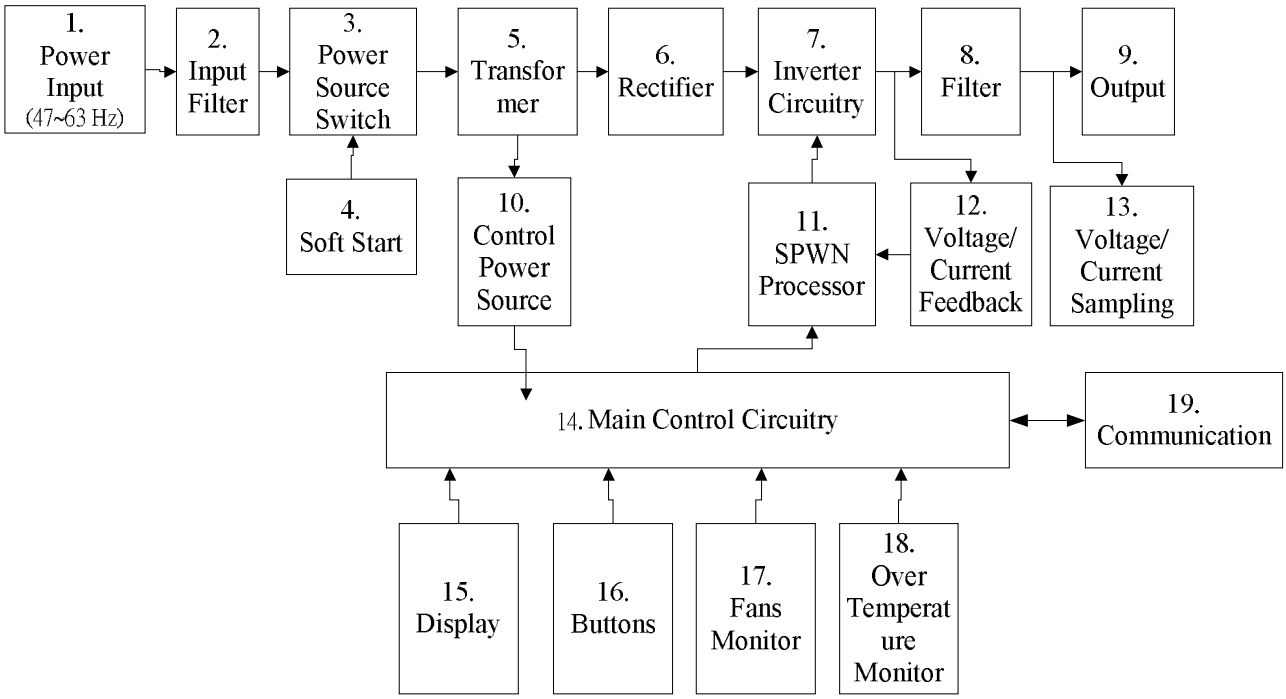


Figure 2-1: Functional Block Diagram of AFV-series Frequency Converter Power Supply

2.2 Explanation of Functional Blocks

1) Power Input: connection from incoming power source terminals to machine input terminals.

2) Input Filter: includes inductors and capacitors for filtering the incoming power.

3) Power Source Switch: turns on or off the incoming city power to the machine.

4) Soft Start: charges the DC capacitors gradually to reduce inrush current.

5) Transformer: isolates the primary and the secondary sides, and converts the voltage for operation.

6) Rectifier: converts transformer's secondary AC power to DC power.

7) Inverter Circuitry: converts DC power to AC power.

8) Filter: receives Inverter output voltage for LC filtering.

9) Output: Output voltage passes through contactors to the output terminals and multi-purpose receptacles.

10) Control Power Source: provides power source from Transformer for powering the Main Control Circuitry.

11) SPWN Processor: processes Main Control Circuitry's sine-wave output for converting to SPWN signals.

12) Voltage/Current Feedback: for stabilizing Output Voltage and Current.

13) Voltage/Current Sampling: takes samples of output voltage and current for metering.

14) Main Control Circuitry: processes all input and output signals for sequential control.

15) Display: the displays on Touch Screen.

16) Buttons: provides input signal for testing and rotary knob control.

17) Fans Monitor: monitors fan conditions and transmits fan failure signal to the control circuitry for protective tripping.

18) Over Temperature Monitor: transmits over temperature signal to the control circuitry for protective tripping.

19) Communication: allows upper computer to control machine outputs through interface cards.

2.3 Composition of Main Control Circuits

Main Control Circuits are composed by three parts: Sampling Module, Main Control Module, and the Display Control Module, as shown below:

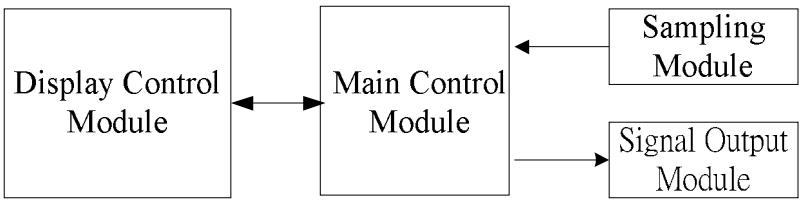


Figure 2-2: Main Control Circuits Block Diagram

Chapter 3 Transportation and Installation

3.1 Cautions for Transportation

The machine shall be tightly fixed inside the vehicle for transportation so to prevent sliding or falling. Although anti-vibration has been considered during packaging, additional anti-vibration measures should be provided for transporting the machine on rough roads.

3.2 Unpacking Inspection

- Open the machine packaging box, remove PE pads and bubble papers. As the machine is heavy, special attention shall be made in moving the machine so to prevent falling or flip-over.
- Inspect for any signs of damage on the machine from transportation. If found, do NOT power the machine but to notify our Customer Service or technical personnel for checkup.
- Check all accessories in the package against the inventory list for completeness. If any shortage found, notify our Customer Service or technical personnel.

3.3 Environmental Requirements for Installation

The environment for installation of the machine shall meet the following requirements:

1) The machine shall be installed indoor with adequate ventilation. No dust settled at ventilation inlets and outlets.

2) Ensure adequate supporting strength and surface flatness for installing the machine on a desk or inside a cabinet.

3) If the machine is installed inside a cabinet, it shall be firmly fixed to prevent movement after installation.

4) Adequate spacing around the machine shall be reserved for ventilation, heat dissipation and repair & maintenance. Do not obstruct the ventilation inlets on machine's front panel as the obstruction could cause insufficient heat dissipation thus leading to temperature rise at machine's interior.

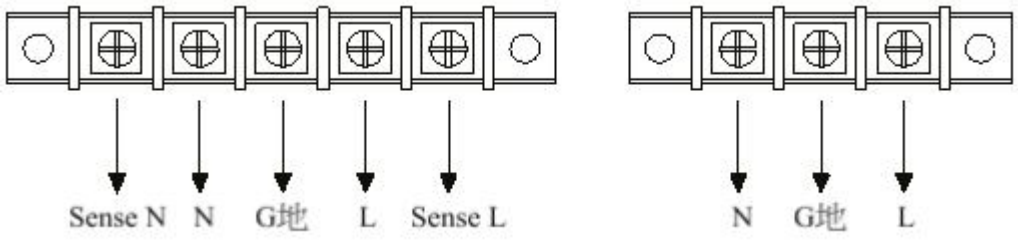
5) The environment shall be free of dust, volatile gases, salty mist or corrosive substances, which impact to machine's service life.

6) The machine shall not be installed in an environment where high temperature or high humidity exists. Avoid installing the machine where water, flammable gases, or corrosive agents are in the area. Stay away from heat sources and avoid direct exposure to sunlight.

7) Cabling to the machine shall be connected correctly for reliable frequency converter power supply and machine safety.

3.4 Instructions for Cable Connection

Cable connections at input & output terminal boards:



AC or DC Output AC Input

Figure 3-3: Cable connections at Terminal Boards

3.5 Cabling and Wiring

1) Use a voltmeter to confirm no voltage reading at AC power input.
2) Confirm the Frequency Converter Power Source Switch is in “OFF” position.
3) The specifications of the input and output cables shall be in accordance with Table 3-1 and Table 3-2 below:

Model No.	Max. Input Current (A	Input Cable Specifications (AWG)		
		N	G	L
AFV-P-600	115V：10A 230V：5A	14AWG	14AWG	14AWG
AFV-P-1250	115V：20A 230V：10A	14AWG	14AWG	14AWG
AFV-P-2500	230V：20A	14AWG	14AWG	14AWG
AFV-P-5000	230V：40A	10AWG	12AWG	10AWG

Table 3-1

Model No.	Output Current (A)	Output Cable Specifications (AWG)				
		SN	N	G	L	SL
AFV-P-600	Lo：5A Hi：2.5A	20AWG	14AWG	16AWG	14AWG	20AWG
AFV-P-1250	Lo：10A Hi：5A	20AWG	14AWG	16AWG	14AWG	20AWG
AFV-P-2500	Lo：20A Hi：10A	20AWG	14AWG	16AWG	14AWG	20AWG
AFV-P-5000	Lo：40A Hi：20A	20AWG	10AWG	12AWG	10AWG	20AWG

Table 3-2

The cables in the above tables are of multiple-wire flexible copper cables. Customers may select appropriate cables based on the input/output currents. It is recommended that the cable be selected to the next higher size, if the length of the input or output cable is longer than 20 meters.

4) Connect the wires of the input cable to the corresponding input terminals of the Frequency Converter Power Supply. The wires of the output cable (loading side) are to be connected to the corresponding output terminals of the Frequency Converter Power Supply.

Note: It is strictly prohibited to perform cable connection when the machine is powered. The effect of voltage drop from extra length of input or output cables shall be compensated by using a cable of larger size.

Chapter 4 Product Specifications

4.1 Technical Specifications

Model No.			AFV-P-600	AFV-P-1250	AFV-P-2500	AFV-P-5000
Output Capacity (VA)			600VA	1250VA	2500VA	5000VA
Type of Circuitry			IGBT/PWM IGBT/PWM Pulse Width			
AC Input	Phase		Modulation Single Phase			
	Voltage		115V 230V 115V or 230V		230V	
	Voltage Range		±15%			
	Frequency Range		47~63Hz			
	Power Factor		0.7			
	Max. Full Load Current (A)		10A	20A	20A	40A
AC output	Phase		Single phase			
	Waveform		Standard Sine Wave			
	Voltage	Low Range	0~155.0V, Resolution: 0.1V			
		High Range	0~310.0V, Resolution: 0.1V			
	Frequency		40~500Hz (Optional: 15~1000Hz); <100Hz: Resolution is 0.1Hz; ≧100Hz: Resolution is 1Hz			
	Frequency Regulation		≦0.01%			
	Max. Current	Voltage Low Range	5A	10A	20A	40A
		Voltage High Range	2.5A	5A	10A	20A
	Max. Peak Current	Voltage Low Range	22.5A	45A	90A	180A
		Voltage High Range	11.3A	22.5A	45A	90A
	Max. Power (W)		500W	1000W	2000W	4000W
	DC Offset		≦±5mV			
DC Output	Voltage	Voltage Low Range	0~210.0V			
		Voltage High Range	0~420.0V			
	Max. Current	Voltage Low Range	2.5A	5A	10A	20A
		Voltage High	1.25A	2.5A	5A	10A

Model No.			AFV-P-600	AFV-P-1250	AFV-P-2500	AFV-P-5000
		Range				
	Max. Power (W)		300W	600W	1250W	2500W
	Ripple & Noise	Voltage Low Range	≦400mV			≦600mV
		Voltage High Range	≦600mV			≦1000mV
		Peak Voltage	≦2Vp-p			≦3Vp-p
Integrated Performance	Line Regulation		≦±0.1V			
	Load Regulation		≦±0.2V (Linear Loading)			
	Total Harmonic Distortion (THD)		≦100Hz: ≦0.3%; 101~500Hz: 0.5%; ≧501Hz: 0.8% (Linear Loading)			
	Efficiency		≧80%			
	Response Time		≦300us			
	Crest Factor		3:1			
	Protects		OVP (Over Voltage Protection), LVP (Low Voltage Protection), OCP (Over Current Protection), OPP (Over Power/Load Protection), OTP (Over Temperature Protection), RCP (Reverse Current Protection), Fan Fail, AMP Fail (Inverter Abnormal). Fast Protection with fault isolation, alarm buzzer and abnormal status displays.			
System	Advanced Mode		50 sets of memories, each has 24 Steps			
	Basic Mode		50 sets of memories			
	Operation		Touch screen + Rotary knob + Output buttons			
Measurement	Display Interface		4.3 inch color screen			
	Frequency (F)		Range: 15～1000Hz, Resolution: 0.1Hz, Accuracy: ≦500Hz ±0.1Hz, >500Hz ±0.2Hz			
	Voltage (V rms)		Range: 0～420.0V, Resolution: 0.1V, Accuracy: 0.2%+5Count			
	Current (Arms)	Low Range	Range: 0.005~1.200A, Resolution: 0.001A, Accuracy: ≦500Hz ±1%+5Count, >500Hz ±1%+10Count	Range: 0.005~2.400A, Resolution: 0.001A, Accuracy: ≦500Hz ±1%+5Count, >500Hz ±1%+10Count		
		High Range	Range: 1.00~12.00A, Resolution: 0.01A, Accuracy: ≦500Hz ±1%+5Count, >500Hz ±1%+10Count	Range: 1.00~12.00A, Resolution: 0.01A, Accuracy: ≦500Hz ±1%+5Count, >500Hz ±1%+10Count		Range: 0.05~48.00A, Resolution: 0.01A, Accuracy: ≦500Hz ±1%+5Count, >500Hz ±1%+10Count

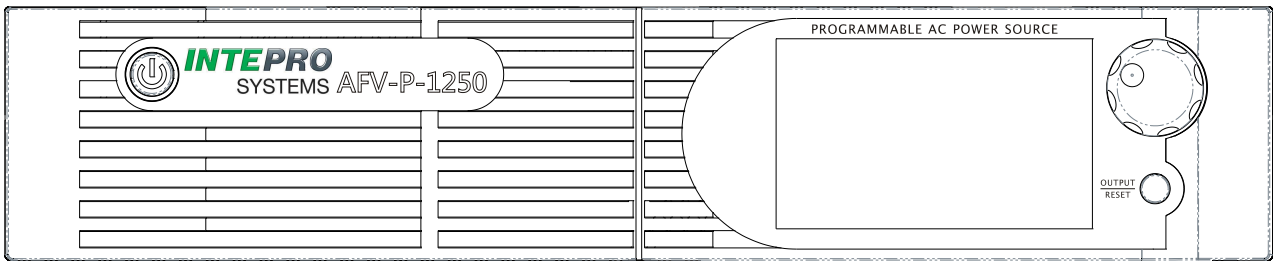
Model No.			AFV-P-600	AFV-P-1250	AFV-P-2500	AFV-P-5000
	Peak Current (A_{peak})		Range: 0.0~45.0A, Resolution: 0.1A, Accuracy: ≦500Hz ±1%+5Count, >500Hz ±1%+10Count		Range: 0.0~90.0A, Resolution: 0.1A, Accuracy: ≦ 500Hz ±1%+5Count, >500Hz ±1%+10Count	Range: 0.0~180.0A, Resolution: 0.1A, Accuracy: ≦500Hz ±1%+5Count, >500Hz ±1%+10Count
	Active Power (W)	Low Range	Range: 0.0~120.0W, Resolution: 0.1W, Accuracy: ≦500Hz ±2%+10Count, >500Hz ±2%+15Count		Range: 0.0~240.0W, Resolution: 0.1W, Accuracy: ≦500Hz ±2%+10Count, >500Hz ±2%+15Count	
		High Range	Range: 100~1200W, Resolution: 1W, Accuracy: ≦500Hz ±2%+10Count, >500Hz ±2%+15Count		Range: 200~2400W, Resolution: 1W, Accuracy: ≦ 500Hz ±2%+10Count, >500Hz ±2%+15Count	Range: 0~4800W, Resolution: 1W, Accuracy: ≦ 500Hz ±2%+10Count, >500Hz ±2%+15Count
	Power Factor (PF)		Range: 0.000~1.000, Resolution: 0.001, Accuracy = W÷VA			
Measurement	Apparent Power (VA)	Low Range	Resolution: 0.1VA, Accuracy = V×A			
		High Range	Resolution: 1VA, Accuracy = V×A			
	Reactive Power (Q)	Low Range	Resolution: 0.1VAR, Accuracy = $\sqrt{(VA)^2-(W)^2}$			
		High Range	Resolution: 1VAR, Accuracy = $\sqrt{(VA)^2-(W)^2}$			
	Crest Factor		Range: 0.00~10.00, Resolution: 0.01, Accuracy = Apeak÷Arms			
Environment	Insulation Resistance		≧DC500V 10MΩ			
	Insulation Withstand Voltage		AC 1800V 10mA/ minute			
	Cooling Device		Fan cooling			
	Operating Temperature		0℃～40℃			
	Relative Humidity		0～90% (Non-condensate state)			
	Altitude		Below 1500m			

4.2 Product Dimensional Outlines

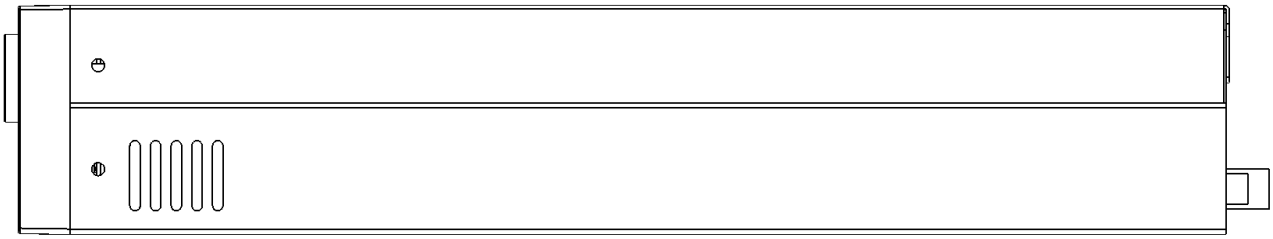
The dimensional outlines of AFV-P Series products are as in Table 4-1 below:

Model No.	Dimension		
	Width (mm)	Depth (mm)	Height (mm)
AFV-P-600	442	474	89
AFV-P-1250	442	474	89
AFV-P-2500	442	624	89
AFV-P-5000	442	624	222.5

Table 4-1: Dimensions of AFV-P Series Products



(a) Front View



(b) Right-Side View

Figure 4-1: Exterior Views of AFV-P Series Products

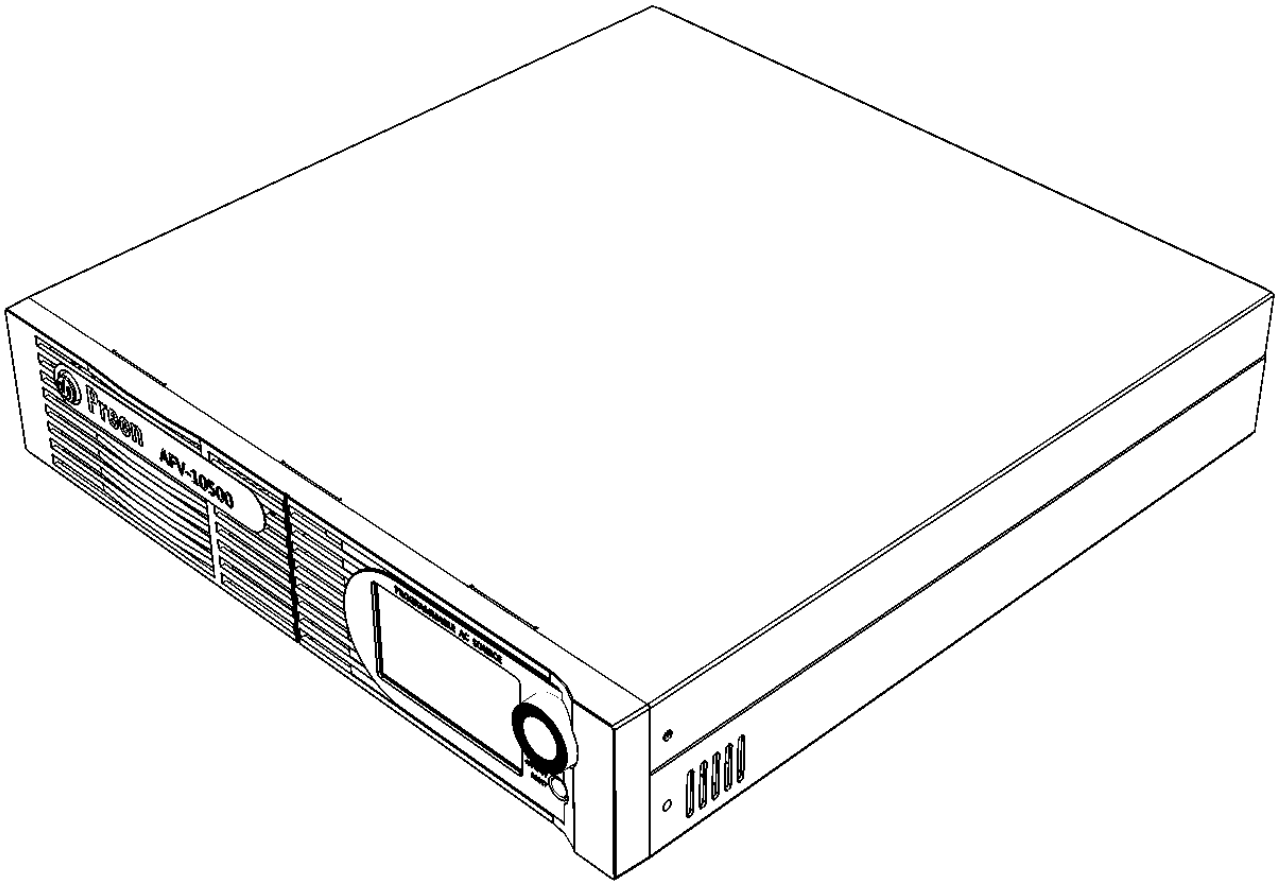


Figure 4-2: Exterior Angle View of AFV-P Series Products

4.3 Explanation of Product Exteriors

Figure 4-3: Explanation of Front Panel

1. Power switch
2. Touch screen HMI
3. Rotary knob
4. Output & Reset

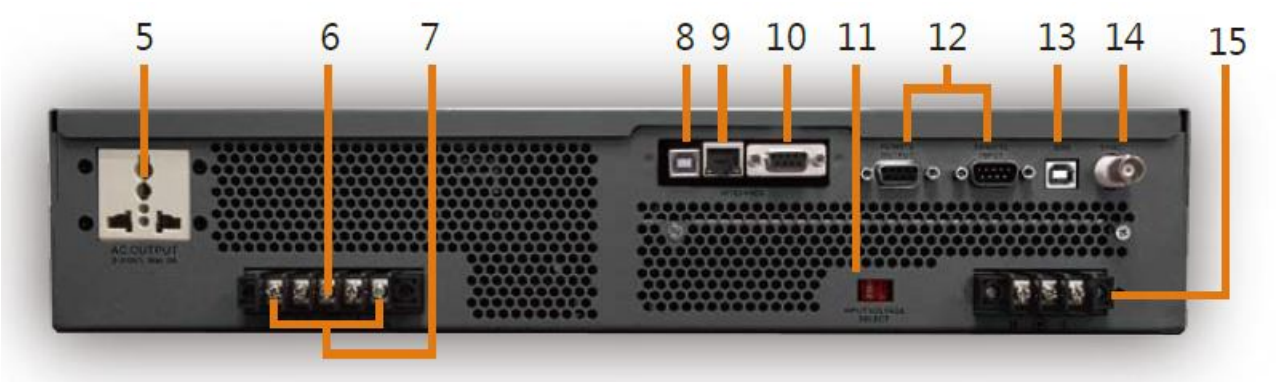


Figure 4-4: Explanation of Back Panel

5. AC output terminal
6. Terminals for AC and DC output
7. Remote Sense
8. USB port
9. Socket for RJ-45 Ethernet
10. Socket for RS232 and RS485
11. 115V/230V input voltage selector (only for Model AFV-P-600 and AFV-P-1250)
12. PLC Remote In/Out
13. USB port (for firmware update)
14. Socket for Synchronized signal output
15. Input terminal

Chapter 5 Operation

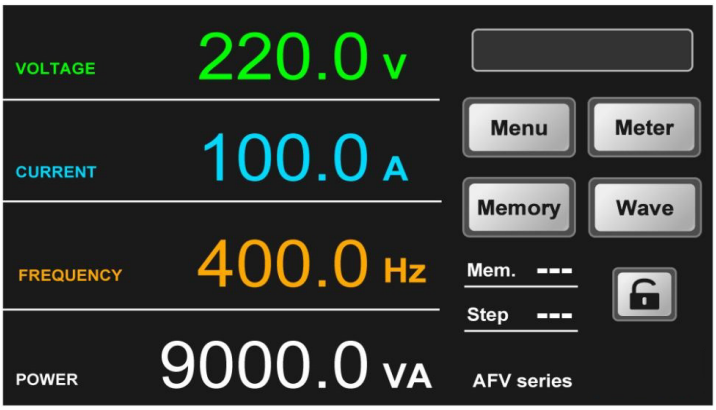
5.1 System Initial Power-ON

Confirm the voltage of incoming power is within the voltage range of the machine. For AFV-P-500 and AFV-P-1250 models, make sure the 115V/230V selection switch on back panel is switched to the position matching with the voltage of incoming power.

Confirm the cables are connected in accordance with the instructions in Subsection 3.4. Press the power source switch to turn on the power, then the fan starts. When the display touch screen on the front panel is illuminated showing the main interface page, proceed with setting up the parameters of the machine.

5.2 Explanation of Displays

5.2.1 Main Page



VOLTAGE, CURRENT, FREQUENCY, POWER: display the setting values and measurement readings for Voltage, Current, Frequency and Power.

 : the block at the upper right corner of the screen shows the current status and abnormal information for protection.

Menu: enter into menu page

Meter: displays the measurement readings

PGM / Memory: enter into Programming Editing Page (in Advanced mode, the block shows ‘‘PGM”; in Basic mode, the block shows “Memory”)

Wave: enter into waveform display page.

: in Advanced operation mode, it shows the number of executing Memory Sets and steps; in Basic mode, it shows the number of executing Memory Sets.

 : Lock and unlock.

5.2.2 Menu Page

SETTING: enter into Setting Page

PROGRAMMBLE: enter into Programming Editing

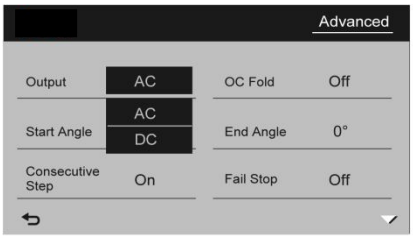
Page COMM: Setting of the Interface card

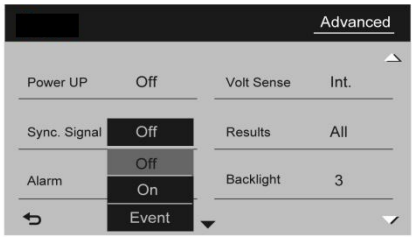
HOME: return to the Main Page

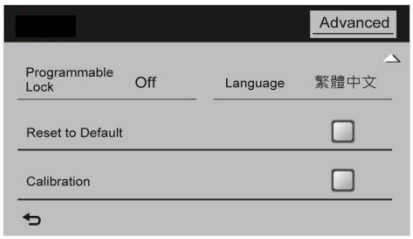
INFO: Information

RESULTS: testing results

5.2.3 Setting Page and Functions







Mode (Advanced/Basic): located at the upper right corner. “Advanced” indicates Advanced Operation setting mode, “Basic” indicates Basic Operation setting mode.

In the “Advanced” mode, the settable items are:

- Output (AC; DC): for the setting of AC or DC output.
- OC Fold (ON; OFF): turn on or off for constant current output. When turn on, the value of constant current is set by A-HI.
- Start Angle (0°~359°): for the setting of the starting phase angle for the start of step execution.
- End Angle (0°~359°): for the setting of the ending phase angle for the last step execution.
- Consecutive Step (ON; OFF): for the setting of whether a next step will follow or not at the end of the executing step.
- Fail Stop (ON; OFF): for the setting of whether the machine will stop or not when the measurement readings exceed Hi/Lo limits.

- Power UP (ON; OFF): for the setting of the output status after the machine is powered up. When set at “ON”, the machine sends out output signals directly after the machine is powered up; when set at “OFF”, the machine does not send out output signals even after the machine is powered up.
- Volt Sense (INT; EXT): for the setting of the voltmeter measurement points. “INT” indicates the measurement points are inside the machine; “EXT” indicates the measurement points are at the Remote Sense terminals.
- Sync Signal (ON; EVENT): for the setting of the status of synchronized output signals. When set at “ON”, the output is Low if the machine does not send out sync signal and the output is Hi if the machine sends out sync signal; when set at “EVENT”, the machine sends out a pulse signal at the occurrence of variation in output voltage or current.
- Results (ALL; P/F; LAST): for the setting of testing result displays. When set at “ALL”, the result display is a table showing Pass or Fail for each step tested; when set at “P/F”. the result display shows the entire testing process is Passed or Failed; when set at “LAST”, the screen display remains as the last display at the end of the testing.
- Alarm (0~9): for the setting of the sound level of buzzer at the occurrence of abnormal situations. The higher the value, the louder the buzzer sound.
- Backlight (1~9): for the setting of the LCD backlight level. The higher the value, the brighter the backlight.
- Programmable Lock (ON; OFF): Lock or unlock the programming setting.
- Language (English, Traditional Chinese, Simplified Chinese, Japanese): for the setting of the language used.
- Reset to Default (YES; NO): reset to the default values.
- Calibration: enter into METER page for calibration by meter.

In the “Basic” mode, the settable items are:

- Output (AC; DC): for the setting of AC or DC output.
- OC Fold (ON; OFF): turn on or off for constant current output. When turn on, the value of constant current is set by A-HI.
- V Hi-Lmt (AC 0.0~310.0V; DC 0.0~420.0V): for the setting of limiting the maximum voltage range.
- V Lo-Lmt (AC 0.0~310.0V; DC 0.0~420.0V): for the setting of limiting the minimum voltage range.
- F Hi-Lmt (40.0~500Hz; Option 15~1000Hz): for the setting of limiting the maximum settable frequency range.
- F Lo-Lmt (40.0~500Hz; Option 15~1000Hz): for the setting of limiting the minimum frequency range.

- Power UP (ON; OFF): for the setting of the output status after the machine is powered up. When set at “ON”, the machine sends out output signals directly after the machine is powered up; when set at “OFF”, the machine does not send out output signals even after the machine is powered up.
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- Backlight (1~9): for the setting of the LCD backlight level. The higher the value, the brighter the backlight.
- Memory Lock (ON; OFF): Lock or unlock the programming setting.
- Language (English, Traditional Chinese, Simplified Chinese, Japanese): for the setting of the language used.
- Reset to Default (YES; NO): reset to the default values.
- Calibration: enter into METER page for calibration by meter.

5.2.4 Meter Page

VOLTAGE: indicates the voltage setting value at no output signal; indicates the effective value

of the measured voltage reading with output signals.

CURRENT: indicates the effective value of measured current reading.

FREQUENCY: indicates the frequency setting value at no output signals; indicates the effective value of the measured frequency reading with output signals.

POWER: indicates the measured value of active power.

CREST FACTOR: indicates the calculated value of crest factor.

PEAK: indicates the measured value of peak current.
POWER FACTOR: indicates the calculated value of power factor. APPARENT POWER: indicates the calculated value of apparent power. TIME: indicates the execution time of the current step.
REACTIVE POWER: indicates the calculated value of reactive power.

: in Advanced mode, it shows the number of executing Memory Sets and steps; in Basic mode, it shows the number of executing Memory Sets.

 : return to the previous page.

5.3 Instructions for Advanced Operation

"Advanced" stands for the advanced operation setting mode, which allows the setup of multiple steps.

There are 50 sets of memories, each has 24 settable Steps. Each step can be independently set up for output voltage, frequency, and execution time. The measurement range limits can also be set for the assessment of abnormal loading circumstances. In addition, the output voltage can be set up for transient increase or decrease.

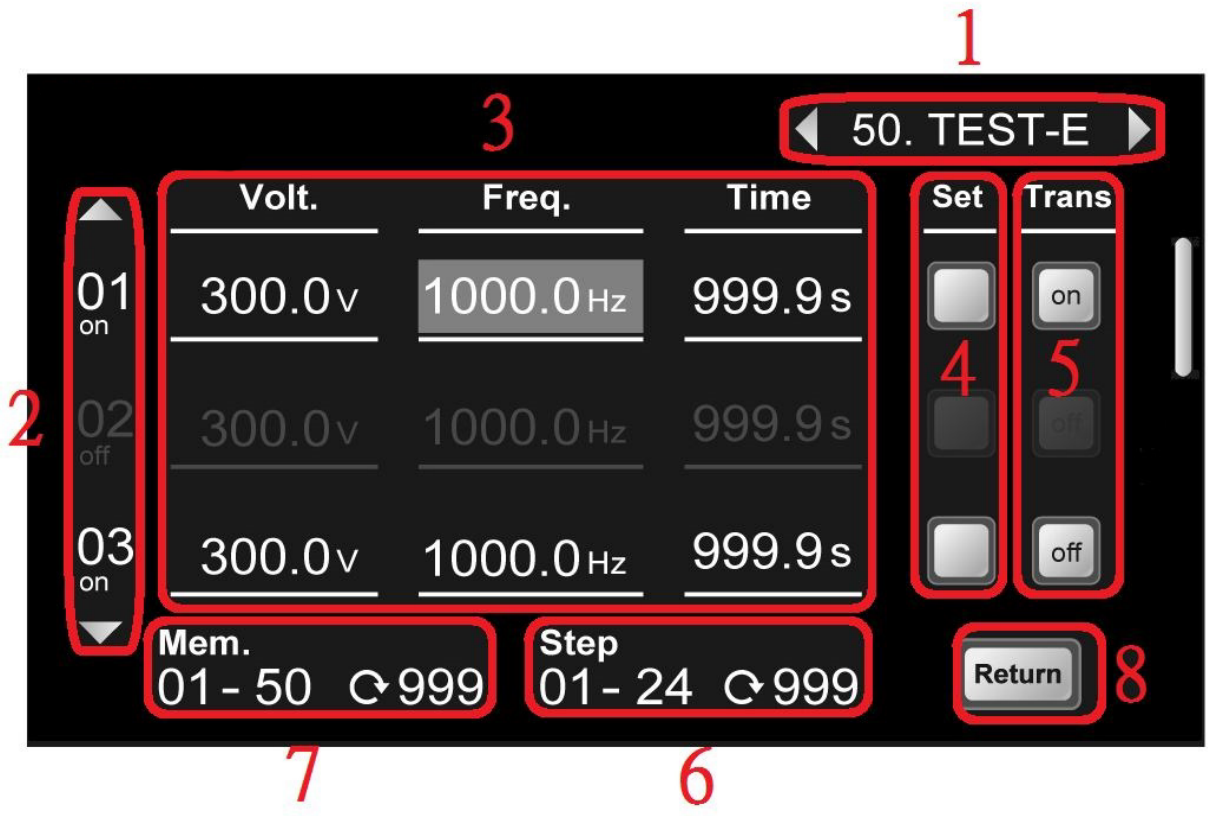
The user may set up which set of memory will be put into execution and the time for execution. In each set of memory, the user may also set up which step is to put into execution and the number of execution cycles for those steps.

5.3.1 Entry into Setting Interface

There are two paths of entry into the Setting Interface:

1. Enter by clicking "PGM" on the Main Page.
2. Click "Menu" button on the Main Page to enter into Menu Page, then click "PROGRAMMBLE" button.

5.3.2 Instructions for Setting Interface

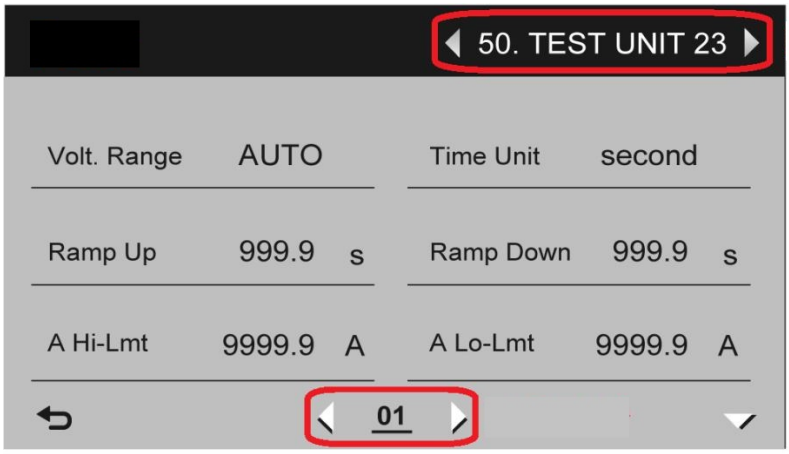


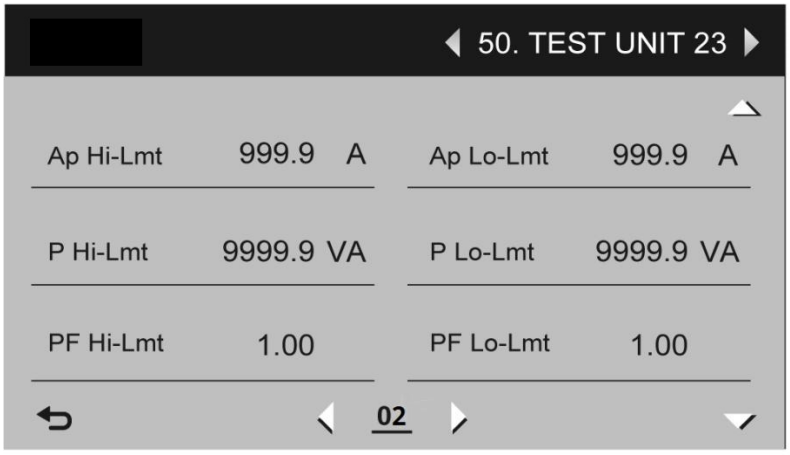
1. To set up the current memory set. Click the arrows at two sides of this block to get the number or select the number in the text then edit the name of the selected memory Set.
2. To set up the Step parameters. Click the arrows at the top and bottom of this block to select

the step number. To activate a certain step, click that step number then “on” is shown under the step number; if a certain step is deactivated, “off” is shown under the step number and the color turns grey.

3. Setting of voltage (Volt.), frequency (Freq.) and execution time (Time) for the corresponding Step.

4. If a certain step is to be set up for ramp-up, ramp-down, or limiting the measurement range, click the button under “Set” to enter into the page as shown below:





The upper right corner shows the current Memory Set. Click the arrow at either side of this block to get the desired Memory Set for setting. The number shown at the bottom of the display is the current Step. Click the arrow at either side of this block to select the desired Step for setting.

Setting items for Advanced Operation are described below:

- Volt. Range: the voltage range can be set at “High” or “Auto”. When Volt. Range is set at “Auto”, the volt. Range will be in “Low” if voltage setting is ≦155V; the Volt. Range will be in “High” if voltage setting is >155V. (PS: when Volt. Range is changed between High and Low, power source will be interrupted for a period of 45mS during transition).
- Time Unit: select the unit of execution time, in Second, Minute, or Hour.

- Ramp Up: the output voltage is increased gradually. The settable range is 0.1S~999.9S. “0” stands for the setting is closed.
- Ramp Down: the output voltage is decreased gradually. The settable range is 0.1S~999.9S. “0” stands for the setting is closed.
- A Hi-Lmt: for the setting of the maximum effective Current value. “0” stands for the setting is closed.
- A Lo-Lmt: for the setting of the minimum effective Current value. “0” stands for the setting is closed.
- Ap Hi-Lmt: for the setting of the highest peak Current value. “0” stands for the setting is closed.
- Ap Lo-Lmt: for the setting of the lowest peak Current value. “0” stands for the setting is closed.
- P Hi-Lmt: for the setting of the maximum Active Power. “0” stands for the setting is closed.
- P Lo-Lmt : for the setting of the minimum Active Power. “0” stands for the setting is closed.
- PF Hi-Lmt: for the setting of the maximum Power Factor. “0” stands for the setting is closed.
- PF Lo-Lmt: for the setting of the minimum Power Factor. “0” stands for the setting is closed.

5. If a certain Step is to be set up for Voltage Transient, click the 

button under "Trans" to set.

6. To set up the range of Steps for execution for the current Memory Set and the number of execution cycles for these Steps.

7. To set up the range of Memory Sets for execution, and the number of execution cycles for these Memory Sets.

8. Return to the previous page.

5.4 Instructions for Basic Operation

“Basic” stands for the Basic Operation setting mode, in which 50 sets of Memory without Step are available for setting. Each Memory Set can be independently set up for output voltage, frequency and limiting the maximum output current and power.

5.4.1 Entry into Setting Interface

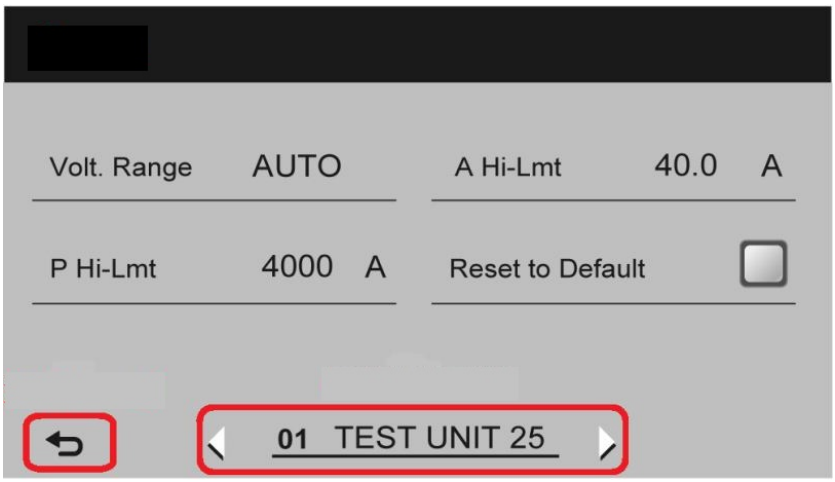
There are two paths of entry into the Setting Interface:

1. Enter by clicking “Memory” on the Main Page.
2. Click the “Menu” button on the Main Page to enter into Menu page, then click the “Memory” button.

5.4.2 Instructions for Setting Interface

1. Select the desired Memory Set for setting by clicking the arrows at the top and bottom of this block. To activate a certain Memory Set, click that Memory number then “on” is shown under the Memory number; if a certain Memory Set is deactivated, “off” is shown under the Memory number and the color turns grey.
2. Edit the names of the Memory sets.
3. Setting of the voltage (Volt.), frequency (Freq.) for each Memory Set.
4. If a certain Memory Set is to be set up for Limiting Maximum Current or Power, click the 

button under “Set” to enter into the page as shown below:



The number and names shown at the bottom of the display is the current Memory Set. Click the arrow at either side of this block to select the desired Memory Set for setting. Click the return icon to return to the previous page. Settable items for Basic Operation are described below:

- Volt. Range: the voltage range can be set at “High” or “Auto”. When Volt. Range is set at “Auto”, the Volt. Range will be in “Low” if voltage setting is ≦155V; the Volt. Range will be in “High” if voltage setting is >155V. (PS: when Volt. Range is changed between High and Low, power source will be interrupted for a period of 45mS during transition).
- A Hi-Lmt: for the setting of the maximum effective Current value. “0” stands for the setting is closed.
- P Hi-Lmt: for the setting of the maximum Active Power. “0” stands for the setting is closed.
- Reset to Default: clicking the button, the setting will be reset to the default values.

Chapter 6 Repair and Maintenance

Because of the effects of ambient temperature, humidity, dust and vibration, aging and wear of components within the equipment as well as other reasons, potential faults may happen to the equipment. Therefore, it is necessary to conduct daily and regular repair and maintenance for the equipment.

Only trained, authorized and qualified professionals can maintain the equipment.

6.1 Daily repair and maintenance

Installation environment and operating environment of the equipment must meet the provisions of the user manual. During normal use, daily maintenance work should be done to ensure a good operating environment; daily operating data, parameter setting data, parameter change record and other data should be recorded to establish and improve equipment application files.

Through daily maintenance and inspection, various abnormal conditions can be timely detected, causes of abnormalities can be timely found out and hidden dangers of faults can be eliminated as soon as possible, so that the equipment can operate normally and its service life can be extended. Please refer to Table 6-1 for daily inspection items.

Table 6-1 Daily inspection description table

Inspection object	Main points of inspection			Evaluation criteria
	Inspection contents	Cycle	Inspection means	
Operating environment	(1)Temperature and humidity (2)Dust, moisture and leak (3) Gas	Anytime	(1) Thermometer and hygrometer (2) Observation (3) Observation and sniffing	(1)The ambient temperature should be lower than 40℃, or the equipment will operate with derated capacity. Humidity meets environmental requirements. (2)There are no dust bunnies, water leak traces or condensation. (3)There are no abnormal colors or odors.
Equipment	(1) Vibration (2) Cooling and heating (3) Noise	Anytime	(1)Comprehensive observation (2)Thermometer (3)Listening	(1)The equipment operates smoothly and reliably without vibration. (2)The fan operates normally, and wind speed as well as wind volume is normal. Detection is done in the wind hole at the top of the chassis. (3)There is no abnormal noise.

Operating state parameters	(1)Power input voltage (2)Frequency converter power output voltage (3)Frequency converter power output current	Anytime	(1) Voltmeter (2) Voltmeter (3) Ammeter	(1) Specifications are met. (2) Specifications are met. (3) Specifications are met.

6.2 Regular maintenance

According to the application environment, users can conduct a regular inspection of the equipment once every three to six months.

General inspection contents:

Clean air intake filter regularly.

Note: When removing or installing filter, there is no need to open the front door, and it only needs to remove the suction canal. Then the filter can be taken out.

Chapter 7 Troubleshooting and Solutions

Before seeking services, users can first do self-inspection and record fault phenomena in details according to tips in this section. When you need to seek services, please contact the dealer.

code	Fault type	Possible causes of faults	Solutions
OVP	Over Voltage Protection	**1. Vibration of load or problem from voltage feedback of the machine.** **2. Abnormal of control circuit of the machine.**	1. Disconnect load to check voltage output. 2. Contact service engineer.
LVP	Low Voltage Protection	1. Load vibration problem 2. Volt Sense set “EXT” but output voltage detects wire abnormally. 3. Abnormal of control circuit of the machine.	1. Disconnect load to check voltage output. 2. Check wires. 3. Contact service engineer.
OCP	Over Current Protection	Load capacity over designed or abnormal.	Disconnect load to check output.
OPP	Over Power/Load Protection	Load capacity over designed or abnormal.	Disconnect load to check output.
OTP	Over Temperature Protection	1. Machine ventilation is poor 2. High temperature environment	1. Check machine surrounding space for air flow, or using vacuum clears machine vents. 2. Machine surrounding temperature should not over 40℃.
RCP	Reverse Current Protection	Problem from load current.	Disconnect load to check voltage output.
Fan Fail	Fan Fail	Fan Abnormal	Contact service engineer.
AMP Fail	Inverter Abnormal	1. Vibration of load or problem from voltage feedback of the machine. 2. Inverter fault.	1. Disconnect load to check voltage output. 2. Contact service engineer.

Table 7-1 Alarm contents and solutions

Chapter 8 After Sale Service

Intepro Systems provides a full range of technical support to customers. Customers are encouraged to contact our branch office or our technical personnel when you have purchased our product.

For the details of warranty, please refer to the terms of warranty. We provide paid customization service packages at different levels, including fast response, preventive maintenance, and warranty renewal service. Please contact the local service centers of our company.

- Service Telephone
  USA: +1.714.953.2686
  UK/Europe: +44.1251.875600
  Asia: +86.755.86500020

- On-line technical service: www.InteproATE.com

- Intepro Systems America, LP
  14712-A Franklin Avenue
  Tustin, CA 92780 USA
  Tel: +1.714.953.2686
  Fax: +1.714.673.6567

Appendix Guarantee Card

Guarantee Card

Dear_____ :

Thanks for your support and patronage. This card is to ensure that if your purchasing variable frequency power supply product (Model:_____, serial number:_____) is in normal use, and the machine fails because of careless, mistake of program, or degradation of component, Intepro Systems LP bears full responsibility for after-sales service free of charge for one year.

Thank you for purchasing this frequency converter power supply (Model:_____, serial number:_____). This card provides you with our guarantee for equipment failure repairing service within one year under normal usage and proper care as described in this manual.

Notice:

Machine should be correctly installed and used. It cannot have been modified with respect to structure, circuit or spare parts by users.

1. If machine has failed, please call us or send the machine back to our company with proper packaging and indicating the fault. We will serve for you as soon as possible.

2. If continue to save the card after the warranty period, we will charge reasonable fees for after-completion maintenance.

The equipment should have been properly installed following sale.

Deputy：_____ Date：_____