



In s t r u c t i o n M a n u a l
f o r
A C P o w e r S u p p l y
A A - F S e r i e s

TAKASAGO, LTD.

SAFETY WARNINGS AND PRECAUTIONS



This symbol may be marked on the instrument where you must refer to the instruction manual for the sake of safety. Be sure to observe the safety instructions given in the manual.



This symbol marked on the instrument indicates hazardous voltages (higher than 650V DC). Be extremely careful when handling the instrument.

- Be sure to operate the instrument on a AC line which fully meets the AC line requirements of the instrument.
- Be sure to ground the instrument to the earth, for the sake of safety.
- When using a 2P-3P conversion adaptor, be sure to ground the green wire.
- Be sure to use an AC input power cable whose rated current (wire gauge) fully meets the input current requirement of the instrument.
- Before replacing the fuse, be sure to turn off the power switch and disconnect the AC input power cable from the power distribution panel.
- When replacing the fuse, be sure to use the specified type of fuse, in order to guard against fire hazards.
- If the instrument is of a forced air cooling type, do not obstruct the flows of air near the air inlet and outlet ports. The ambient conditions must be temperature 0 to 40°C, humidity 10 to 90% RH, and without corrosive gases.
- The internal circuits of the instrument generates hazardous high voltages. Never operate the instrument with its cover removed. When you need to remove the cover to clean the instrument inside, be sure to turn off the power switch and disconnect the AC input power cable from the power distribution panel or from the AC line outlet.
- Do not operate the instrument in a place where it may subject to vibration.
- The instrument has been designed and intended to be used only by persons well versed and qualified in the corresponding field of engineering. Note that hazardous high output voltages are delivered to the control terminals on the rear panel.
- Before making wiring to the control terminals on the rear panel, be sure to turn off the power switch of the instrument. Be sure to observe the safety instructions given in the manual.
- The series-control type of DC power supply can deliver overvoltages should its internal transistor fail. If your power supply is of a type without any overvoltage protection provision, you may add a overvoltage protection adaptor to you instrument. (For details, please consult your Takasago Agent.)
- When operating the AA/F Series instrument with its output voltage set at 125V or higher, do not operate it on a receptacle type of AC line outlet.

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§ 1. GENERAL

The AA-F Series AC Power Supplies operate on a 50 or 60Hz commercial AC line power and provide a 45 to 66Hz and 360 to 440Hz signal-phase AC power which is frequency- and Voltage-regulated against input voltage change and load current change.

The output frequency is selectable between the QUARTZ LOCK mode , and the VARIABLE mode. When in the QUARTZ LOCK mode, the output frequency is selectable for one of the 50 Hz , 60 Hz and 400 Hz which are controlled with a crystal oscillator. When in the VARIABLE mode, the output frequency is adjustable continuously variably for a range of $\pm 10\%$ of each of the nominal frequencies.

The output voltage is adjustable finely and continuously variably for a range of 1% to 120% of the nominal output voltage. The rated output current can be delivered for a range of 1% to 100% of the nominal output voltage.

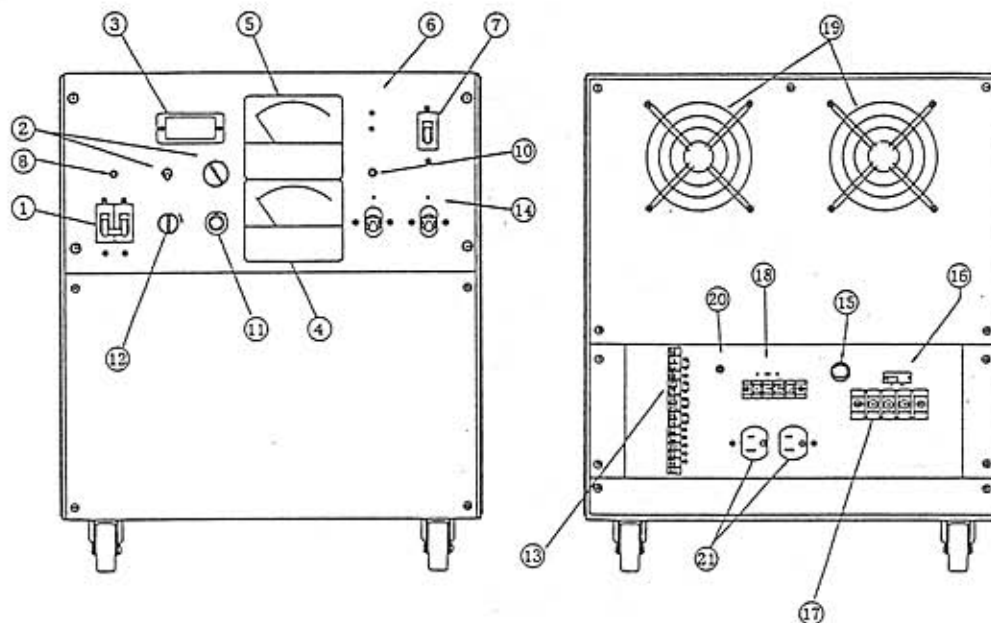
Each of the AC Power Supplies is incorporated with four fold protective circuits, namely, peak current limiter, average current limiter, overvoltage protector, and overheat protector. Thus, the AC Power Supply can provide a peak current of 2.5 times of the rated current for such load as an electronic equipment which employs a capacitor input type of rectifier circuit.

As options, a waveform control function, a Three-phase output system, and a GP-IB system for output voltage and frequency control are available.

Before starting using the AC Power Supply, be sure to fully consult with this instruction manual to operate it correctly in order to make the best use of its high performance and multiple functions.

[Overall Views of Front and Rear Panels]

AA1000F



- ① Input Power Switch
- ② Output Frequency Setting Switch
- ③ Output Frequency Counter
- ④ Output currentmeter
- ⑤ Output Voltmeter
- ⑥ Output Voltmeter Range Lamp
- ⑦ Output Switch
- ⑧ Input Power Pilot Lamp
- ⑨ Over Load Lamp
- ⑩ Output Voltage Adjustment Dial
- ⑪ Output Frequency Adjustment Dial
- ⑫ Remote Control Terminals

- ⑬ Output Voltage Range Select Switch
- ⑭ Input Fuse (Control Circuit Diagram)
- ⑮ Nominal Input Voltage Marking
- ⑯ AC Input Power Terminals
- ⑰ Rear Output Terminals
- ⑱ Cooling Fans
- ⑲ Amplification Adjuster
- ⑳ Rear output connector

SPEC		MODEL					
		AA150F	AA330F	AA500F	AA660F	AA1000F	AA2000F
Frequency characteristics		Within $\pm 0.2\text{dB}$ (For 45 ~ 440Hz, with rated output)					
Allowable output shortting time		Indenfinite					
Input line voltage		100V $\pm 15\%$ 50/60Hz single-phase AC 200V $\pm 15\%$ [230V $\pm 15\%$] Can be modified to 115, 200, or 230V by TAKASAGO or its agents.					
Input power (VA)		Approx. 510VA	Approx. 900VA	Approx. 1.4kVA	Approx. 1.9kVA	Approx. 3.0kVA	Approx. 5.8kVA
Efficiency		50% or better					
Indicating meters		150V/300V full scale, rectifier type, JIS					
Output voltmeter Class2.5		2.5A FS 5A FS 7.5A FS 10A FS 15A FS 30A FS					
Output ammeter Class2.5		4-digit digital counter, auto-range type					
Frequency counter							
Cooling system		Forced air cooling with fan motor					
Protective circuit		Peak current protector, average current protector, overvoltage protector, and overheat protector					
Operating environments		Ambient temperature 0 to 40°C, humidity 10% to 90%, (Without freezing, dew, or corrosive gas)					
External dimension	(W)mm	425(435)	425(435)	425(435)	425(435)	430	430
	(H)mm	147(165)	147(165)	147(165)	200(222)	449(500)	549(610)
	(D)mm	350(430)	450(530)	500(580)	500(580)	493(498)	550
Weight		Approx. 18.5kg	Approx. 30kg	Approx. 36kg	Approx. 46kg	Approx. 70kg	Approx. 110kg
Rack mount accessory		MI-N	MI-N	MI-N	MI-U	MI-K	

§ 3. OPERATING PRINCIPLE

The AC Power Supply consists of a digitally controlled oscillator and a large linear power amplifier. A block diagram of the AC Power Supply is shown in Figure 1, and Figure 2.

1. Phase-controlled Rectifier

This circuit converts the AC line power into a DC power, in order to minimize the power loss of the power amplifier.

2. Digital Oscillator

The oscillating frequency is crystal-controlled and it is converted by a PLL system. With this very stable frequency, the waveform data (sine wave) stored in the ROM (read only memory) is read and converted into an analog signal by the D/A converter.

The remaining memory space of the ROM can be used to store data for any other required waveform than the sine wave. (Such data writing is optional. Please order Takasago or its agent.)

3. Power Amplifier

The power amplifier is a low-distortion high-reliability linear amplifier. It employs power MOS FET's for its main control section.

4. Overload Protective Circuits.

These circuits are comprised of a high-speed peak current protector which guards the power amplifier against peak current and an average current protector which operates with respect to the average output current.

When the average output current has exceeded the rated output current, the OVERLOAD lamp on the front panel turns on and output current is limited to within the rated output current. When this has occurred, the output waveform is with its top and bottom crests clipped off.

When the load is restored to within the rated value, the protector is automatically reset.

5. Overvoltage Protector and Overheat Protector

The input switch is turned off when the rectifier output voltage has become abnormally high or when the cooling package temperature has exceeded $100\text{ }^{\circ}\text{C} \pm 5^{\circ}\text{C}$.

6. Frequency Counter

A 4-digit floating-point frequency counter. It displays the signal frequency even when the AC Power Supply is controlled with an external signal.

[BLOCK DIAGRAMS] (AA150F~AA2000F)

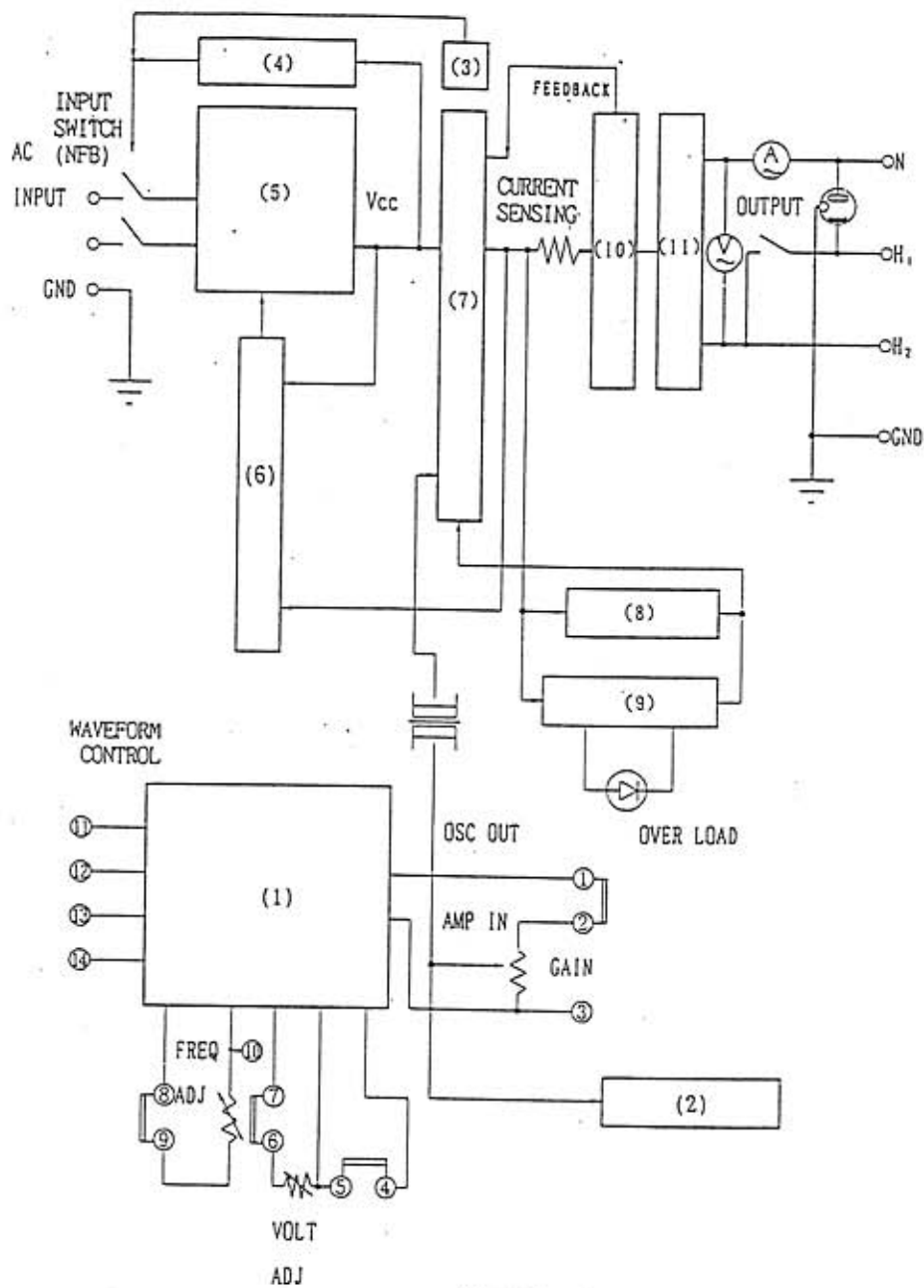


Figure 1

- | | |
|----------------------------|--|
| (1). DIGITAL OSCILLATOR | (7). LINEAR POWER AMPLIFIER |
| (2). FREQUENCY COUNTER | (8). PEAK CURRENT LIMITER |
| (3). OVERHEAT PROTECTOR | (9). AVERAGE CURRENT LIMITER |
| (4). OVERVOLTAGE PROTECTOR | (10). OUTPUT TRANSFORMER |
| (5). CHOKE INPUT RECTIFIER | (11). TRANSFORMER RATIO SELECTOR |
| (6). PHASE CONTROL CIRCUIT | (100V/115V, $\times 1/\times 2$, OUTPUT ON/OFF) |

S 4. INSTALLATION AND OPERATION

4-1. INSTALLATION

The AC Power Supply employs a forced air cooling system for its semiconductors. Provide an open space of 30 cm or over from the back of the AC Power Supply for free air exit. Do not block the front and side air in take ports.

For the input cable, be sure to use a cable of a sufficient current capacity to cope with the input power mentioned in Section 2.

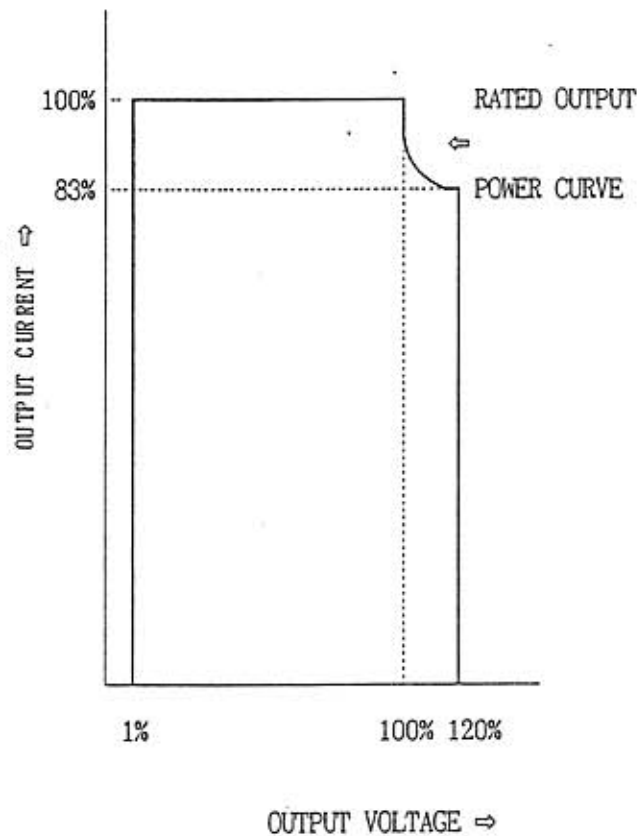
Note: Be sure to ground the G terminal in order to guard against electric shocks and to prevent introduction of noise. For the input and output power cables, recommended used are as shown in the following table.

Recommended maximum current (A)	5	8	10	15	20	30	40	70
Nominal cross section(mm ²)	0.75	1.28	2.0	3.5	5.5	8	14	22
AWG	18	16	14	12	10	8	6	4

4-2. OPERATION

1. Select an output voltage range with the output voltage range selector switch.
For the range of 100% to 120% of the nominal rated output voltage, the output current is limited by the rated output power.

SWITCH		VOLTAGE
100V	× 1	AC 1~120Vrms
115V	× 1	AC 1~138Vrms
100V	× 2	AC 2~240Vrms
115V	× 2	AC 2~276Vrms



(a) Rated Output Current Dependent on Output Voltage Range

The rated output current depends on the rated output wattage and the selected output voltage range, and it is expressed as follows:

$$\text{Rated output current} = (\text{Rated output power}) / (\text{Output voltage range})$$

Of Model AA330FF, for examples, the relationship between the output voltage range and the rated output current is as tabulated below.

Output voltage range	Rated output current
100 V	3.3 A rms AC
115 V	2.9 A rms AC
200 V	1.7 A rms AC
230 V	1.4 A rms AC

(b) Output Current when Output Voltage is 100% to 120% of Range Voltage

When the output voltage is set at 100% to 120% of the range voltage, the output current is expressed as follows:

$$\text{Output current} = \text{Rated output power} \div \text{Output voltage}$$

If you operate Model AA330F in the 100 V range with its output voltage set at 110 V (110%), for example, the output current is as follows:

$$\text{Output current} = 330 \text{ [VA]} \div 110 \text{ [V]} = 3.0 \text{ [A]}$$

Note: The allowable maximum output current is up to the rated output current corresponding to the voltage range. For example, if you operate Model AA330F with its output voltage set at 110 V (110%), for example, the output current will be,

- ① in the 100 V range, 3.0 A as shown in the example of (b),
- ② in the 115 V range, 2.9 A as shown in the example of (a), or
- ③ in the 200 V range, 1.7 A as shown in the example of (a).

2. As you turn ON the POWER switch, the equipment starts operating and its frequency counter and METER RANGE lamp light. The rush current is suppressed by the function of the soft-start circuit.

The three-phase AC input type of equipment (Models AA3000F-AA20000F) is incorporated with a missing phase detector circuit. If its POWER switch is turned ON with its AC input having a missing phase, no voltage is supplied to the main circuit. Check it with the LINE lamp.

3. Set the output voltage at the required value with the VOLT ADJ control (10-turn dial).

For meter reading, refer to the meter range lamp indicating either 150V full scale range or 300V full scale range.

4. Set the output frequency with the QUARTZ LOCK/VARIABLE switch and the CENTER FREQ switch. When in the VARIABLE mode, the output frequency is adjustable for a range of approximately $\pm 10\%$ of the nominal center frequency with the FREQ control (10-turn potentiometer).

The QUARTZ LOCK/VARIABLE switch is a lock switch and it should be pulled out to your side to operate it.

5. As you turn ON the OUTPUT switch, the output is delivered to the output terminals (between N and H1 terminals) on the front and rear panels. The output between terminals N and H2 is delivered irrespective of setting of the OUTPUT switch.

Precaution: The AC outlet receptacles are rated for 125V AC.

They cannot be used for 200V AC.

Of Models AA3000F-AA20000F, as you turn ON the OUTPUT switch, the output is delivered to between terminals N and H on the rear panel.

4-3. Output Isolation and Polarity

1. Input/Output Isolation and Output Grounding

The output is isolated from the input and is floating. If you want to ground the output, you may connect either one of the output terminals to the GND terminal.

2. Output Polarity Indication Marks

The output terminals are marked by H (or, H₁ and H₂) and N. If you control the AC Power Supply with an external AC input signal, the N line of the output is in phase with the ground line (COM-a line) of the input signal.

Of the output receptacles of Models AA150F through AA1000F, the pin that is marked with "•" is in phase with the H₁ terminal.

4-4. Output Current Limiters

The AC Power Supply has a peak current limiter and an average current limiter for protection.

Peak current limiter: Trips when the peak output current has become higher than 250% of the rated output current.

Average current limiter: Trips when the average output current has become larger than 110% of the rated output current. The OVERLOAD lamp illuminates when this limiter has tripped.

When either one of the limiters has tripped, the positive and negative crests of the output current waveform are truncated.

4-5. Load

The AC Power Supply can provide a stable AC power either for a linear or a non-linear load. Pay attention, however, to the following.

- (a) For a pure-resistance load or a linear load of power factor $\cos \theta = 0.85$ or over, rated output power A is applicable. When overloading is caused with this type of load, the red OVERLOAD lamp turns on and the output voltage is reduced to within the rated output voltage. When this state has occurred, the output voltage waveform is with its top and bottom crests clipped off as shown in Figure 3.

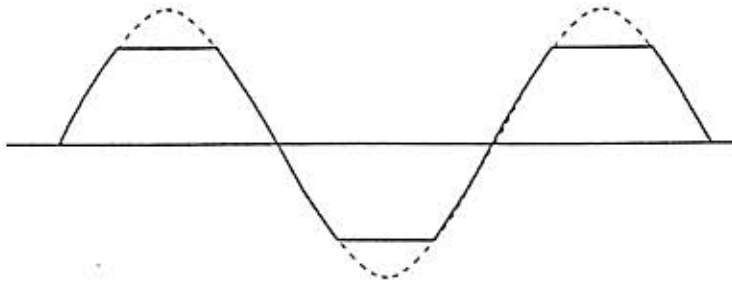
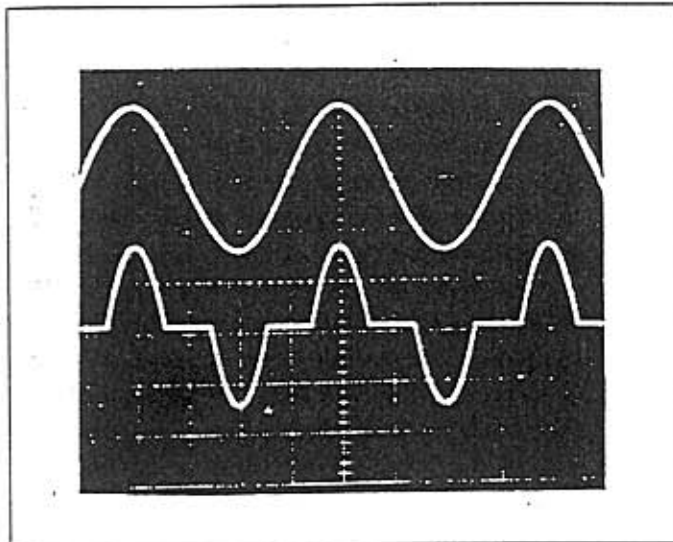


Figure 3. Output voltage waveform
when in overload

(b) In the case of a non-linear load such as a capacitor-input rectifier circuit (most of electronic equipments are of this type), the largest load current flows the phase of the input voltage is at approximately 90° . For this type of load, the AC Power Supply is capable of providing a peak current of up to 2.5 times of the rated output current.



Top:
Voltage waveform, 100V/div

Bottom:
Current waveform, 10A/div

Time axis:
5ms/div

Model:
AA660F

Figure 4. Waveforms for a capacitor-input load

When the AA300-F is operated with the 100V range, since the rated output current is 3.3A, the maximum available peak current is calculated as follows:

$$I_p \leq 3.3 \times 2.5 = 8.25A$$

Moreover, as the efficiency is improved as above, the apparent output power (VA) is increased and rated output power B is applicable.

For a load with a wave factor of (peak value I_p)/(effective value I_{rms})=2 as shown in Figure 5 for example, an output power of 1.2 times of the rated output power can be delivered. When an overpower state is caused, the crested of the waveform are clipped off and the OVERLOAD lamp turns on as is the case with a linear load.

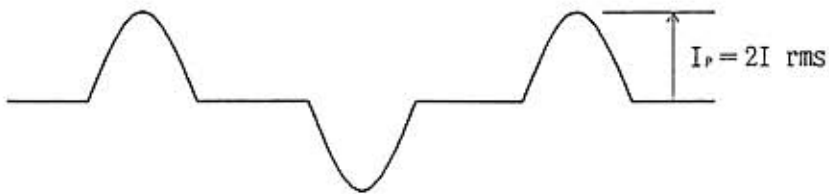


Figure 5

(C) If the load of the equipment is a coil or other low power factor device ($\cos \theta < 0.85$), the power loss of the internal power amplifier of the equipment increases and the equipment is driven into the overload state. Thus, the allowable output current of the equipment is limited by the power factor of factor of the load. For the allowable range, see Figure 6.

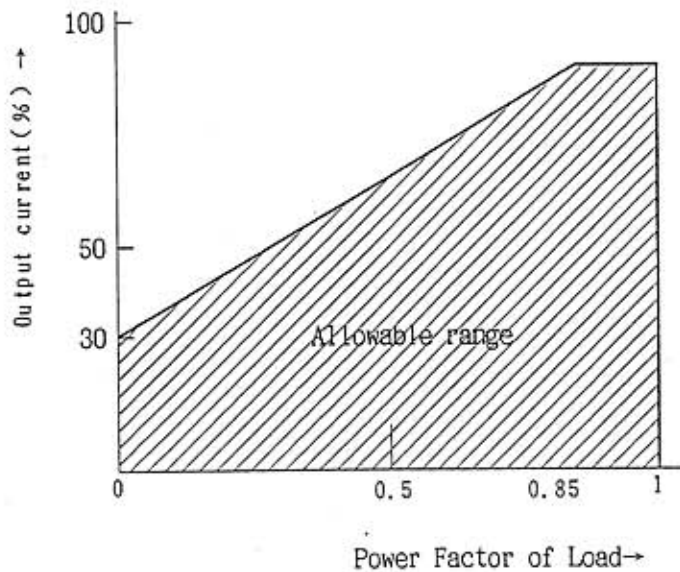


Figure 6

(d) A motor or other device of a similar type draws a large rush current which is several times to several tens times of its steady-state current. For this type of load, the equipment acts as follows:

- ① The current which flows when the system is started up is limited by the maximum allowable peak current of the equipment.
- ② The output current is limited by the function of the average current protector.
- ③ As the revolutionary speed of the load motor increases, the output current of the equipment increases.
- ④ As the output current reaches the preset value, the equipment becomes operating in the steady state.

The above actions are shown with photos in Figures 7 and 8.

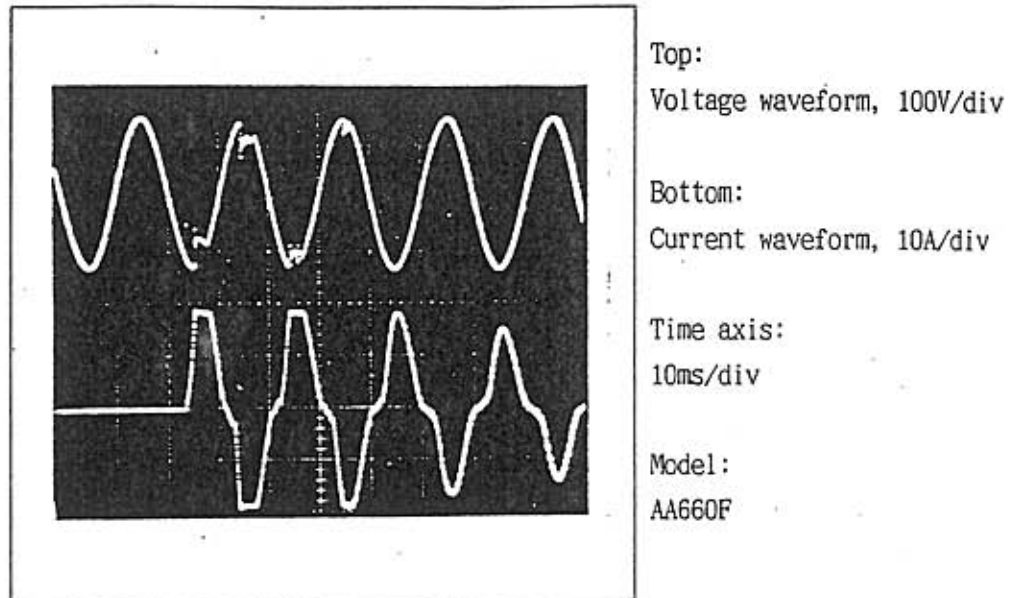


Figure 7. Start up of a motor (a load with smaller rotary mass)

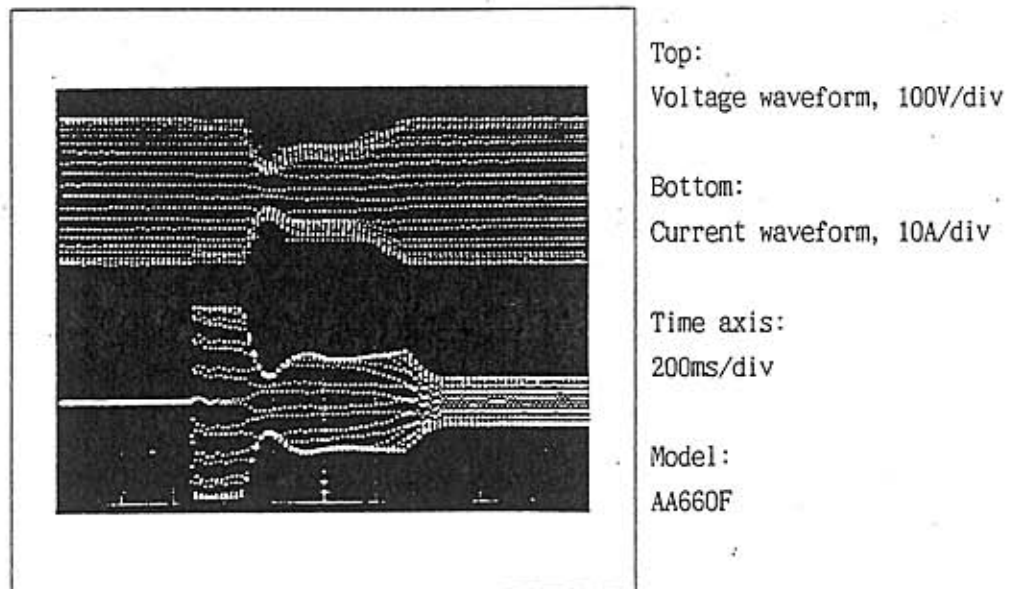


Figure 8. Start up of a motor (a load with larger rotary mass)

The larger the rush current and the larger the rotary mass of the motor, the longer is the time needed before the motor reaches the steady revolutionary speed. Note that a motor which requires a rush current greater than the greater than the rated output current of the equipment may not be able to the started up with the equipment.

(e)The equipment employs a transformer in its output circuit. If the load is a half-wave rectifier or other device whose positive current and negative current are unbalanced, the transformer may be saturated and the equipment may be driven into the overload state. The larger the output voltage and the lower the output frequency, this state is apt to occur more readily. Avoid using the equipment for this type of loads.

§ 5. REMOTE CONTROL

Also be sure to turn off the AC input power before touching the control terminals for wire connection or disconnection.

5-1. Remote Control of Output Voltage

(a) Remote Control by Resistance

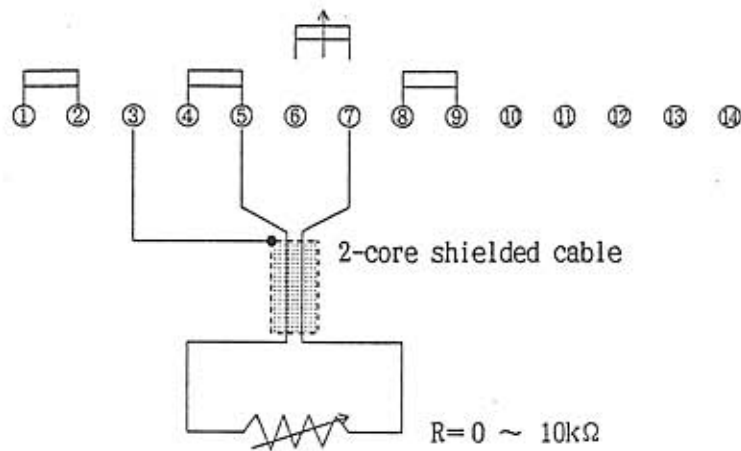


Figure 9

As shown in Figure 9, disconnect the jumper wire from between terminals ⑥ and ⑦, and connect a potentiometer between terminals ⑤ and ⑦. The output voltage (V_o) is proportional to the resistance of the potentiometer as expressed with the following equation, where V_R denotes the rated output voltage of the range, (When in this mode of operation, the VOLT ADJ control on the front panel remains idle.)

$$V_o \approx V_R \times R \times 1.2 \times 10^{-4} \text{ (V)}$$

Note: V_R is rated voltage of set range.

Example: When set at 100V range and R is $4k\Omega$,

$$V_o \approx 100 \times 4 \times 10^3 \times 1.2 \times 10^{-4} (V) \\ \approx 48V$$

Note: Do not raise the output voltage to higher than 120% of the rated output voltage.

If the control signal circuit is made open (infinite resistance), an overvoltage will result. When resistances are to be charged using a switch, use a shorting type of switch.

(b) ON-OFF Control of Output with Contact Signal

Keeping the jumper wires intact, connect a contact (10 VDC, 10mA) between terminals ⑤ and ⑥. As the contact is made, the output is turned off; as the contact is broken, the output is delivered.

When in this mode of operation, the rise up time of the output voltage is as shown in Figure 10. Wait until the output voltage is built up.

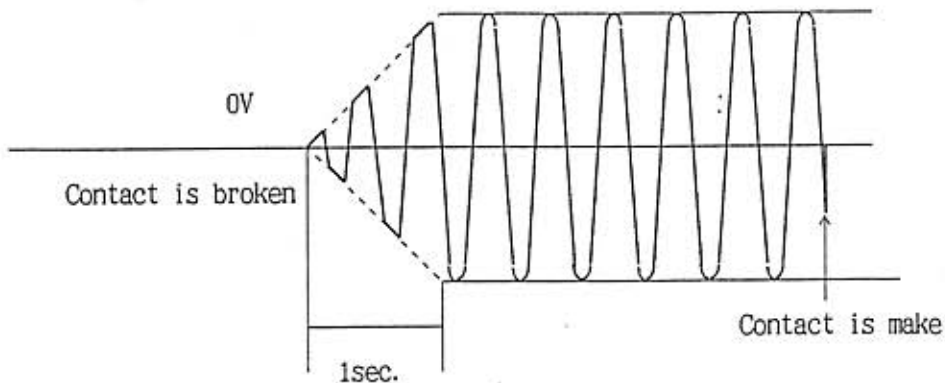


Figure 10 The rise up time of the output voltage

(c) Remote Control With an External DC Voltage Signal (VCA)

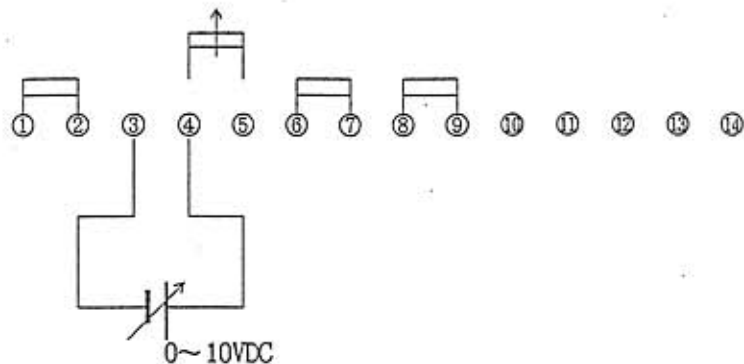


Figure 11

Disconnect the jumper wires from between terminals ④ and ⑤, and connect a DC control voltage between terminals ③ and ④. With a control voltage of approximately 10VDC, an output voltage of 120% of the nominal rated output voltage can be delivered.

The input impedance of the control circuit (between terminals) is approximately $5k\Omega$ (minimum). If ripple or noise is involved in the control signal, it will be reproduced in the output circuit thereby causing beat and distortion. Use a DC control voltage which does not involve ripple or noise.

The VCA Gain is finely adjustable with the GAIN control on the rear panel.

Note: The maximum allowable voltage which can be applied between the terminals is $\pm 15V$.

The rise up time and fall down time of the output voltage are identical with that shown in Figure 10.

Option: By using a Takasago AP1228T Adaptor, the output voltage can be controlled through a GP-IB through a GP-IB line.

(d) Remote Control by External AC Signal

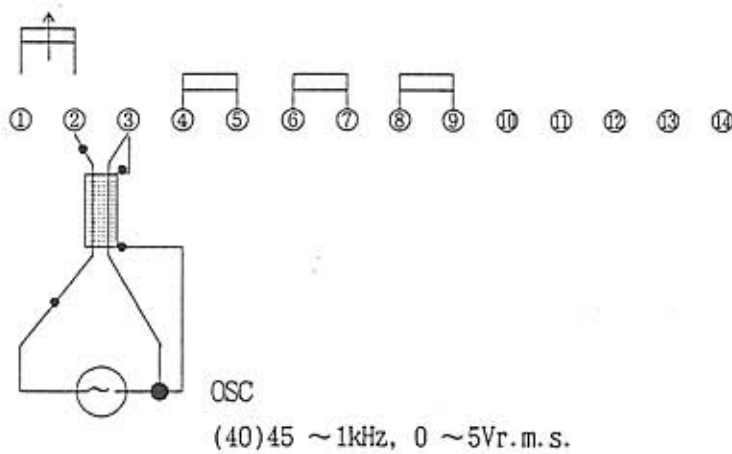


Figure 12

The AC Power Supply can be operated as a large power AC amplifier to amplify the output signal of an audio signal generator or a function generator.

For this mode of operation, disconnect the jumper wire from between terminals ① and ② and connect an external AC control signal (0-5Vrms) between terminals ② and ③. With a control signal of approximately 5V rms, an output voltage of 120% of the nominal rated output voltage can be delivered.

The gain is adjustable with the GAIN control on the rear panel. (The VOLT ADJ control on the front panel remains idle.)

The applicable control signal frequency is 40Hz to 1kHz. For a frequency range of 40Hz to 45Hz, the output voltage is limited to 100% of the nominal rated output voltage. Do not apply any frequency higher than 1kHz.

The input impedance of the control circuit (between terminals) is approximately 10k Ω .

Other waveforms than the sine wave is applicable. Note, however, that the harmonic frequency components and low frequency components of such waveforms will be restricted by the frequency response of the AC Power Supply.

The peak voltages which exceed 1.7 times of the nominal rated output voltage are clipped off.

Precautions: The output voltmeter is a rectifier type (mean value scale).

Note that it does not indicate accurate values for only sine wave voltages.

Options: By using a Takasago FOA-1MG Adaptor, the frequency is adjustable continuously

By using a Takasago FVC-20A Adaptor and a TC-801A GP-IB Converter, the frequency can be digitally controlled for a range of 40Hz to 999Hz in 0.1Hz steps and the output voltage for a range of 0 to 120% in 0.1% steps.

5-2. Remote Control of output Frequency

For this mode of operation, disconnect the jumper wire from between terminals ⑧ and ⑨, and connect a potentiometer of $2k\Omega$ between terminals ⑧ and ⑩. Set the QUARTZ LOCK/VARIABLE switch to the VARIABLE state. With this setup, the output frequency is adjustable with the potentiometer for a range of $\pm 10\%$ of the frequency selected by the CENTER FREQ switch on the front panel. The FREQ ADJ control remains idle.

(a) Remote Control with Resistance

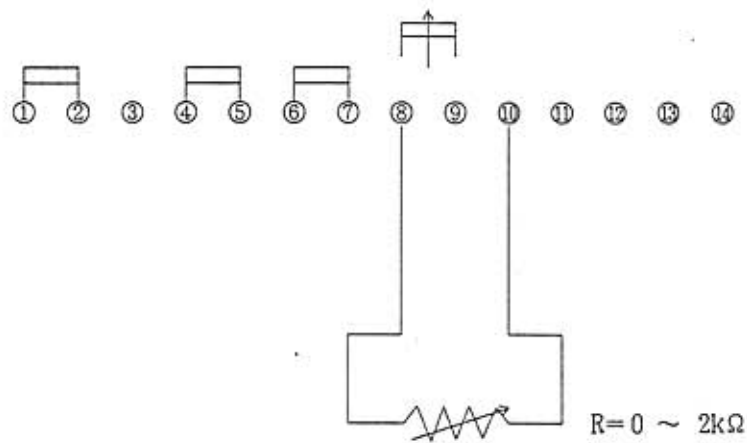


Figure 13

(b) Current Balance Adjustment

For the parallel master-slave mode of operation, adjust the balancing of the currents among individual units at the start of this mode of operation.

1. Parallel Operation of 2 Units

For current balance adjustment of 2 units operated in parallel, proceed as follows:

- ① Connect the PARALLEL OUTPUT connector of the master unit to the PARALLEL INPUT connector of the slave unit, with the parallel operation signal cable.
- ② Connect in parallel the outputs of both master and slave units, and connect the total output to the load.

[A Recommendable Example of Output Wiring]

Connect the output terminals to the load (or to a junction terminal box) by using output cables of the same wire gauge and uniform lengths.

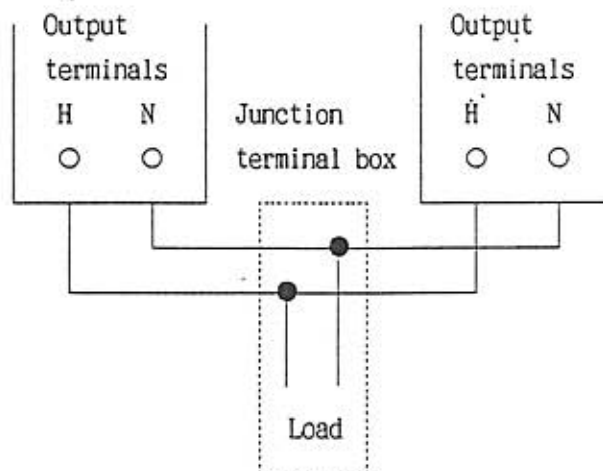


Figure 15

[An Unrecommendable Example of Output Wiring]

In this unrecommendable example, the output terminals of both units are directly connected and the cables for the load are run from the output terminals of one of the units.

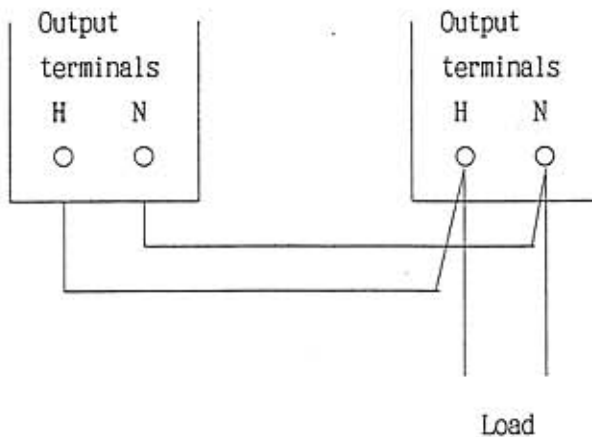


Figure 16

- ③ Turn off (or disconnect) the load.
- ④ Turn the VOLT ADJ dial of the master unit to the zero position (fully counterclockwise position).
- ⑤ Turn the AC input power of both units on.
- ⑥ Gradually turn clockwise the VOLT ADJ dial of the master unit.
At this stage of the procedure, the output ammeters may indicate a small current in spite of the fact that the load is not turned on yet (or not connected yet). The cause of this is the difference between the output voltage of the two units. Due to the difference, a small current flows from one unit into the other unit. To nullify the current, perform the procedure of Step ⑦.
- ⑦ Adjust the BALANCE control of the slave unit so that the ammeters indicate zero. Do not turn the BALANCE control of the master unit.
- ⑧ Raise the output voltage to the maximum. Adjust the ammeter indication to zero.

⑨ Set the output voltage at a value you may require and turn the load on (or connect the load). Adjust the readings of the ammeters of both units to the same value with the BALANCE control of the slave unit.

⑩ Turn the load off (or disconnect it) once more, and be sure that the readings of the ammeters are approximately zero.

Note: The home position of the BALANCE control (10-turn potentiometer) is at its mid-range position (5-turn position).

2. Parallel Operation of 3 to 5 Units

For current balance adjustment when 3 to 5 units are operated in parallel, proceed as described here.

(The basic current balance adjustment procedure in this case is identical with that in the case of 2 units. Refer to Item 2 "Parallel Operation of 2 Units as required.)

① Connect the PARALLEL OUTPUT/INPUT connectors of the units with the parallel operation cables as shown here.

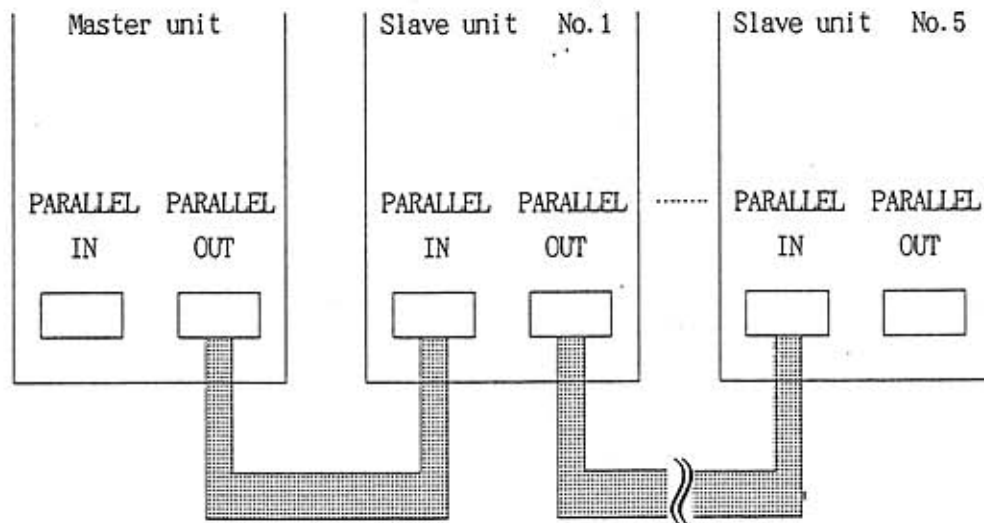


Figure 17

② Connect in parallel the outputs of all units, and connect the total output to the load. (Refer to Item 1.)

③ Turn off (or disconnect) the load.

- ④ Turn the VOLT ADJ dial of the master unit to the zero position (fully counterclockwise position).
- ⑤ Turn on the AC input power of the master unit and that of slave unit NO.1.
- ⑥ Gradually turn clockwise the VOLT ADJ dial of the master unit. Adjust the BALANCE control of the slave unit No.1 so that the ammeters indicate zero.
- ⑦ Raise the output voltage to the maximum. Adjust the ammeter indication to zero.
- ⑧ Lower the output voltage to zero once. Turn on the AC input power of Slave unit No.3 slave unit No.3 also. Balance the currents in the same manner as above.
- ⑨ For slave units 4 and 5 also, perform the current balance procedure the same as above. Make sure that the all ammeters read zero.
- ⑩ Set the output voltage at a value you may require and turn the load on (or connect the load). Check that the readings of the ammeters are uniform. if they are not uniform, adjust them with the BALANCE controls of the slave units.
- ⑪ Turn the load off (or disconnect it) once more, and be sure that the readings of the ammeters are approximately zero.

Note: The home position of the BALANCE control (10-turn potentiometer) is at its mid-range position (5-turn position).

§ 6. OPTIONS

THE AC Power Supply can be used for various purposes by incorporating the various optional features and using adapters.

6-1. Modification of Input AC Line Voltage

The input AC line voltage of the AC Power Supply can be modified in the following table.

INPUT AC LINE VOLTAGE	MODEL
115V, 200V, 230V \pm 15% 50/60Hz single-phase	AA150F~ AA1000F
220V, 240V \pm 15% 50/60Hz single-phase	AA150F~ AA1000F
220V, 230V, 240V \pm 15% 50/60Hz single-phase	AA2000F
220V \pm 15% 50/60Hz three-phase	AA3000F, AA20000F

For modification, please order TAKASAGO or its agent.

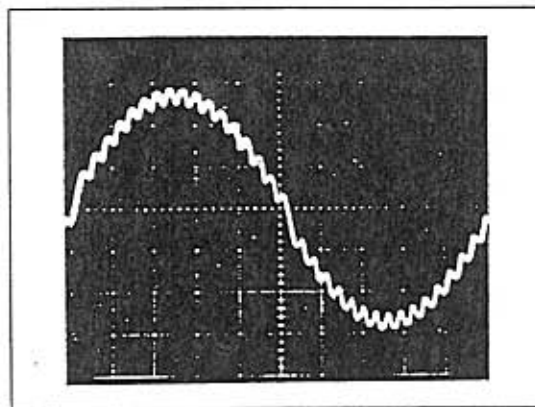
6-2. Waveform Other Than Sine wave

Data for various output voltage waveform (symmetrical between positive cycles and negative cycles) can be obtained by storing data for such waves in the ROM (read only memory). Data for up to eight types of waveforms can be stored. For example, these waveforms may be used for test of electronic equipment using distorted signals.

Harmonic components of up to 2kHz can be provided for distorted signals. Components higher than 2 kHz fall at a rate of -12dB/octave.

The output waveforms can be changed using rear terminals ⑩ - ⑬ and by means of a rotary switch, a contact signal, or an open collector signal.

For data write in the ROM, please order Takasago or its agent.



Voltage axis:
50v/div

Time axis:
2ms/div

Figure 18. A Simulated Small-Generator Output Waveform

6-3. Three phase Output

(a) Three phase Output systems

By using three AC Power Supplies and one three-phase Output Adaptor FPA-3M, FPA-3MG, a three-phase output voltage of 2-240VAC can be obtained. the FPA-3M is a three-phase generator. A three-phase system be obtained by using the function described in Section § 5-1(d). The output should be connected in the star connection and the output voltage range should be set at 115V. The load should be of a three-phase three-wire type or of a three-phase four-wire type.

The output capacity is the sum of those of three units of AC Power Supplies.

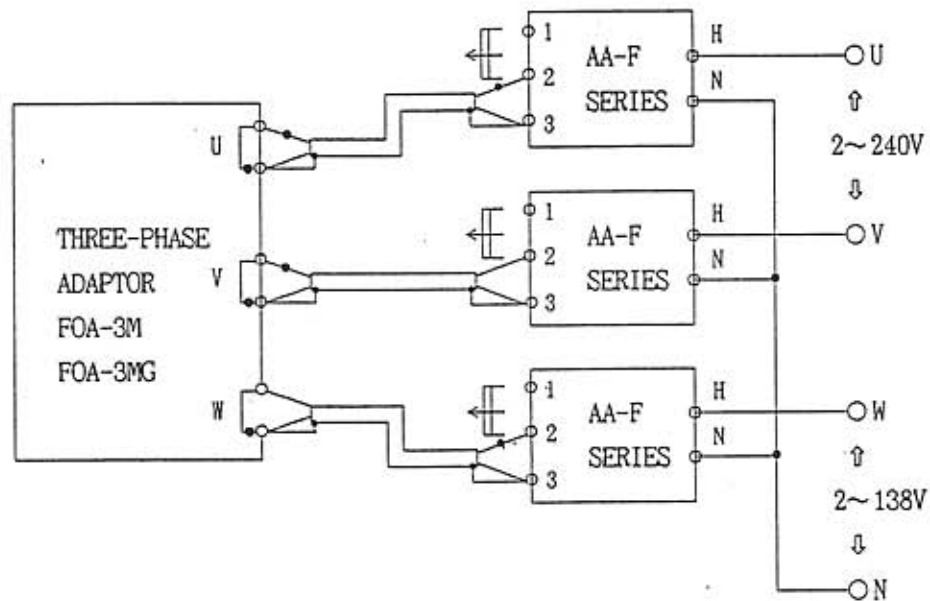


Figure 19. Three-phase output systems

(b) Master-slave Control for Range Selection of three-phase Output Systems

Of a three-phase AC output system made up of three units of one of Models AA3000F through AA20000F, by making use of the master-slave parallel operation control signal connectors, you can change the output ranges of all three units simply by changing that of the master unit alone.

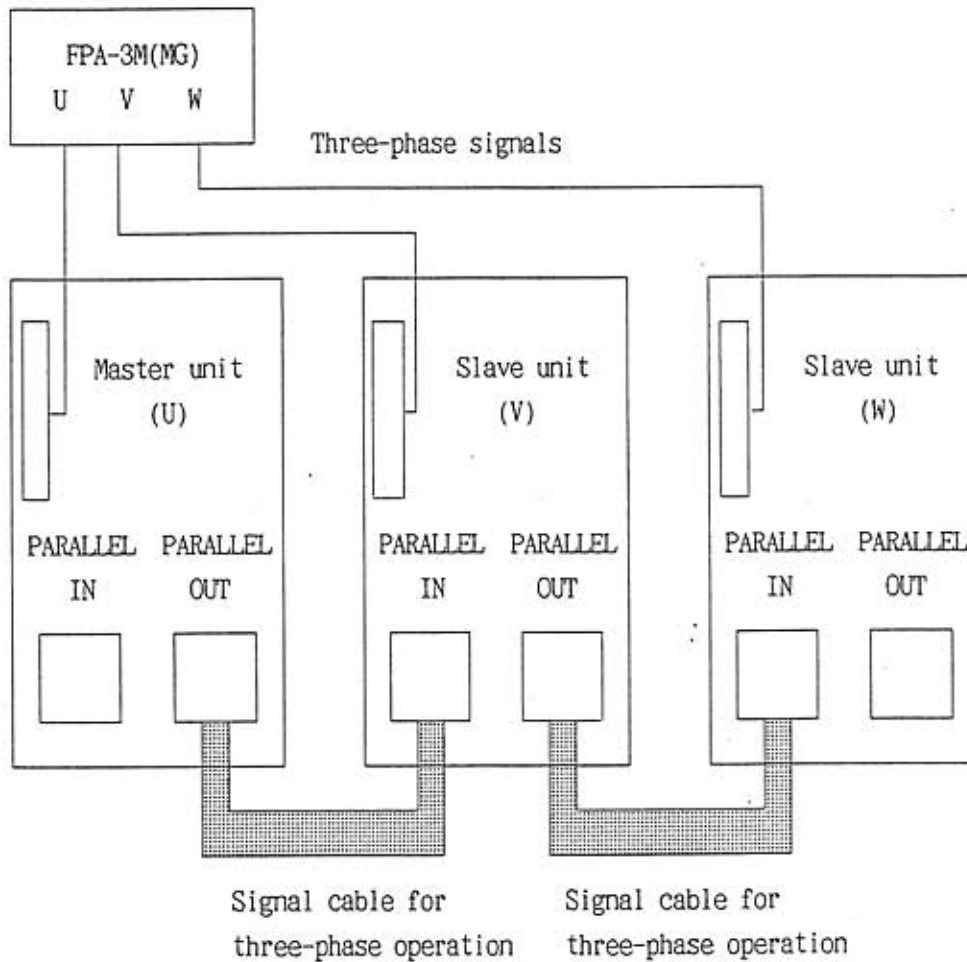


Figure 20. Master-slave Setup for Range Selection

Connect the PARALLEL IN/OUT connectors of the three units with signal cables for three-phase operation as shown in Figure 20. With this setup, you can change the voltage ranges of all three units simply by changing the voltage range of the master unit alone.

Remarks: The master-slave signal cables for three-phase operation are available upon special order (manufactured upon order).

6-4. Control Through GP-IB Bus, with FOA-1MG

(a) By using Takasago FOA-1MG Adaptor, the output voltage and output frequency of the equipment can be controlled through a GP-IB bus. For the operation procedure in this mode, see § 5-1(d). For the setup for operation in this mode, see Figure 21.

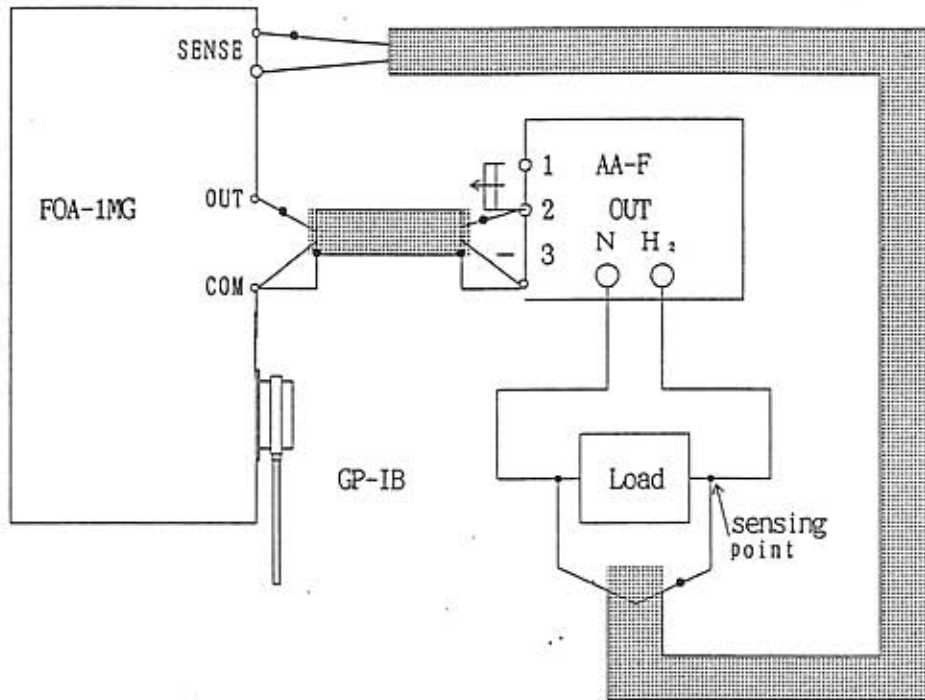


Figure 21. Control through GP-IB bus, with FOA-1MG

The output voltage is adjustable in 0.1%-steps for 0 - 120.0% of the selected voltage range; the output frequency is adjustable in 0.1Hz-steps for 40.0Hz - 999.9Hz. With the remote sensing function, the voltage regulation at the load at the load end can be maintained within 0.05% or better.

(b)By using Takasago AP-1228T GP-IB Adaptor, the output voltage of the equipment can be controlled through a GP-IB bus.

For the operation procedure in this mode, refer to the VCA function of: § 5-1-c. the output voltage is adjustable in 1/2048 resolution, with the maximum rated output voltage of the equipment.

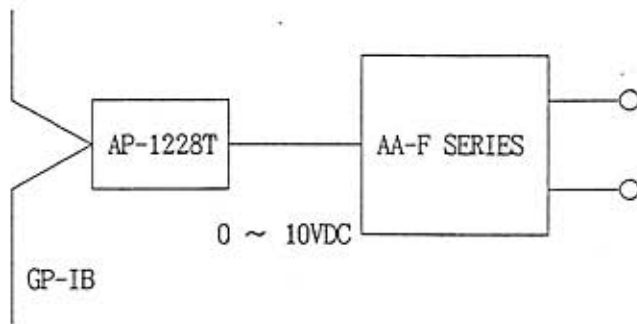


Figure 22. Output voltage control with GP-IB

(c) By employing Takasago GP-IB Converters TC-801A and FVC-20A, the output frequency and voltage can be controlled. In this case, the function described in Section 5-1-(d) is used.

The output voltage can be controlled for a range of 0~ 120% in 1% resolution with the maximum output voltage as 100%. The output frequency can be controlled for a range of 45 to 999 Hz in 1-Hz steps.

Up to fifteen units of equipment (DC power supplies, AC power supplies, electronic loads, etc.) can be hooked up to the Takasago bus system, making up an integral test system for electronic equipment.

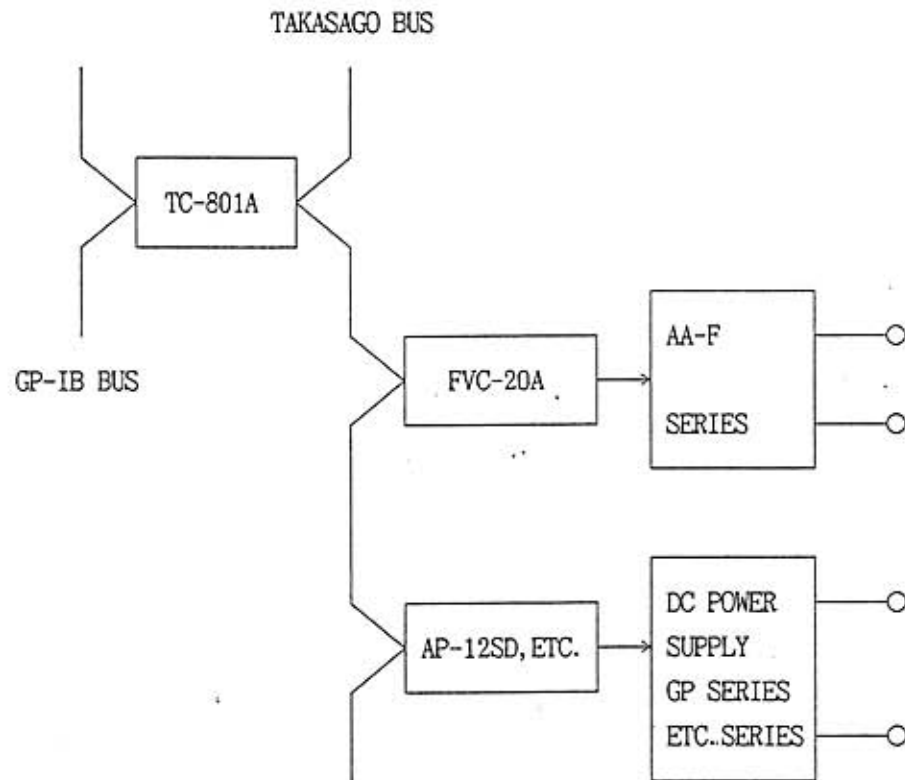


Figure 23. Test systems with Takasago GP-IB System

(d) Model FOA-3MG three-phase Adaptor allows you to control, on a GP-IB system, the output voltage and frequency and type (three-phase output, single-phase three-wire output, or two-phase output). The output voltage can be set within a range of 0 to 120.0% of the rated output voltage with a resolution of 0.1%; the output frequency can be set within a range of 40 to 999.9 Hz with a resolution of 0.1 Hz.

§ 7. Troubleshooting

A basic troubleshooting chart is shown here, indicating symptoms of troubles, probable causes, and remedies. Limit your troubleshooting activities within the items shown in the chart. Never attempt further troubleshooting or repair of the AC Power Supply for yourself--please order your Takasago agent for further service.

Symptom		Probable cause	Remedy
The AC input power switch will not turn on.	AC input power switch trips automatically and AC Power Supply is abnormally hot.	Trip of thermal switch due to overheat of Power Supply due to too small power factor of load	Wait until Power Supply cools off. Reduce the load. (Lower the output current.)
	When AC input power switch is turned on, it produces sparks and abnormal noise.	Short-circuiting within AC Power Supply	Order your Takasago agent for service.
	Although AC input power switch is turned on once, it soon trips automatically.	Failure of rectifier circuit	Order your Takasago agent for service.

The AC Power Supply does not deliver output. (Volt-meter does not deflect.)	Certain LINE lamp does not light. (AF3000F - AF20000F only)	Missing phase of AC input power	Check the AC input power source.
	Pilot lamp and frequency meter do not illuminate.	Blown out fuse	Replace the fuse. (If the fuse blows out again, order your Takasago agent for service.)
	Although pilot lamp lights, frequency meter reading remains "000.0"	Disconnected jumper wire of control terminal block	Check that jumper wires are connected between terminals ① and ② and between ④ and ⑤.
		Short-circuiting between ⑤ and ⑥ of control terminal block	Eliminate the short-circuiting.
		Too low setting of GAIN control on rear panel	Normally, set GAIN control fully clockwise.
	This trouble occurs when in remote control.	Disconnected remote control cable	Securely connect the remote control cable.

Output voltage is uncontrollable (remains delivered).	VOLT ADJ control is utterly ineffective.	Failed VOLT ADJ control potentiometer	Order your Takasago agent for service.
		Disconnected jumper wire of control terminal block	Check the jumper wire between ⑥ and ⑦.
	This trouble occurs when in remote control.	(If in remote control with resistance signal) Open-circuiting of control resistor or signal cable, or too large resistance	Check the control resistor. Check the control signal cable.
Output voltage drifts or fluctuates.	This trouble occurs when the Power Supply is vibrated.	Imperfect contacting of jumper wire of control terminal block	Securely connect the jumper wire.
		(If in remote control with DC voltage signal) Ripple noise superimposed on the DC voltage signal	Eliminate the ripple noise.
	This trouble occurs when in remote control.	(If in control with AC voltage signal) Jumper wire left undischonected	Disconnect jumper wire from between ① and ②.
		(If in remote control with resistance signal) Imperfect contacting of cable or switch	Check the cables and switch.

Output frequency is unadjustable.	VARIABLE control is ineffective.	Disconnected jumper wire of control terminal block	Securely connect the jumper wire between ⑧ and ⑨.
Insufficient output current	No sufficiently large output current is available. OVERLOAD lamp turns on.	Too high voltage range setting (for narrow voltage range)	Select appropriate voltage range. (Refer to chapters for rated output current ranges.)

OVERALL DIMENSIONS

AA1000F

