

EWS1500 Series

Instruction Manual

BEFORE USING THE POWER SUPPLY UNIT

Pay attention to all warnings and cautions before using the unit. Incorrect usage could lead to an electrical shock, damage to the unit or a fire hazard.

WARNING

- Do not touch the internal components, they may have high voltage or high temperature. You may get electrical shock or burned.
- When the unit is operating, keep your hands and face away from it, you may get injured by an accident.

CAUTION

- This power supply is primarily designed and manufactured to be used and enclosed in other equipment. Stick the WARNING label for users on the system equipment and describe the notice in the instruction manual.
- Input Voltage must be switched manually according to the service voltage (AC100/200V). Confirm it before turn-on. It could result in damage to the unit or a fire hazard.

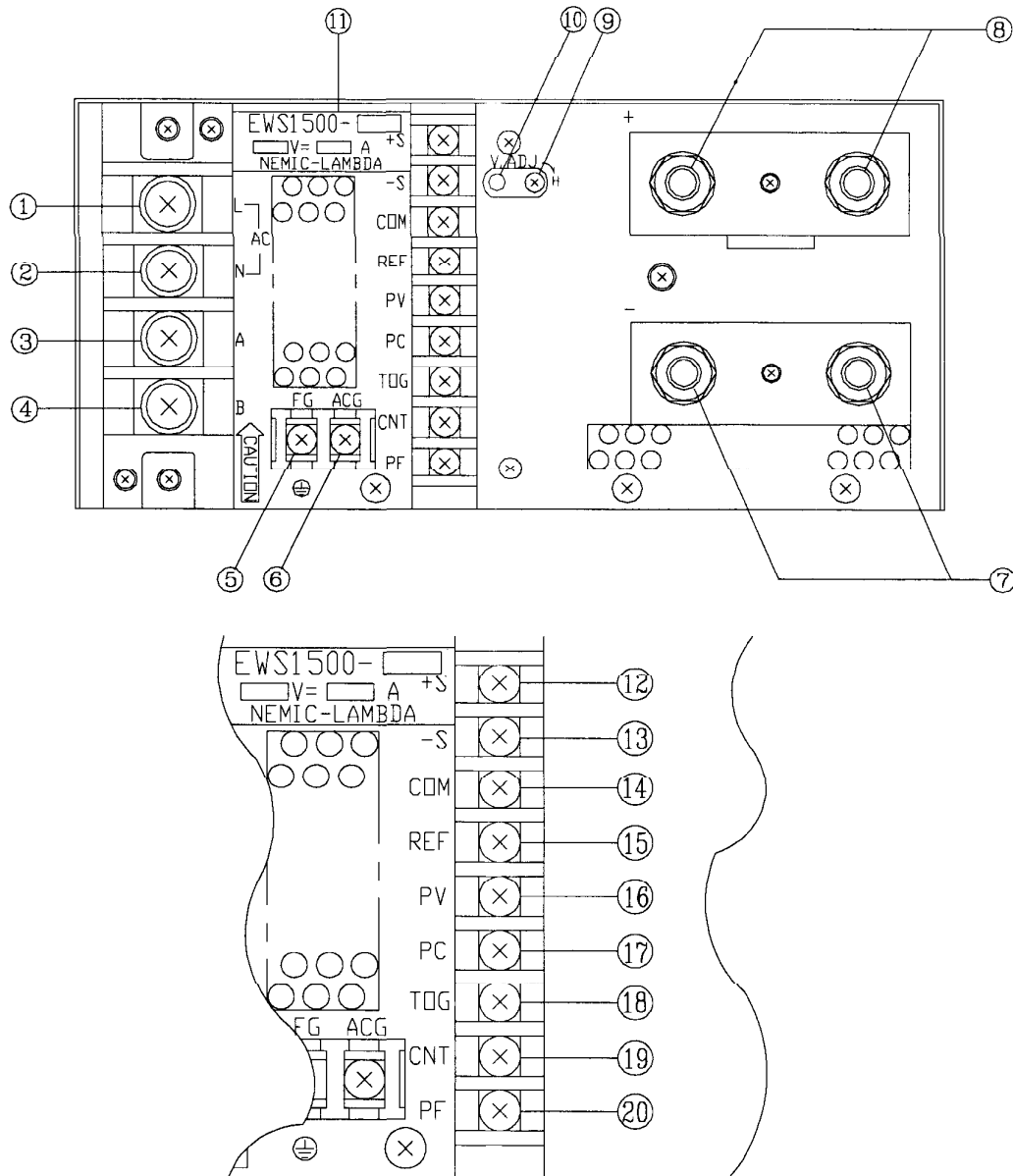
Note: CE MARKING

CE Marking, when applied to a product covered by this handbook indicates compliance with the low voltage directive (73/23/EEC) as modified by the CE Marking Directive (93/68/EEC) in that it complies with EN60950.

DWG NO. : A115-04-01A		
APPD	CHK	DWG
T. SUMIYAMA 22. Aug. '96	Y. BANBA 22. Aug. '96	Miwa Kuroki 22. Aug. '96

1 Front Panel Explanation

EWS1500 Panel



- | | |
|--|---|
| <p>① AC Input Terminal (L)
 L: Live Line
 Built in fuse.</p> <p>② AC Input Terminal (N)
 N: Neutral Line</p> <p>③④ 100/200 VAC Input Select Terminals (A,B)
 100VAC Input: A and B Terminals Shorted</p> | <p>⑤ 200VAC Input: A and B Terminals Opened
 Frame Ground Terminal
 This terminal is connected with chassis for grounding.</p> <p>⑥ Line Filter Ground Terminal (ACG Terminal)
 This terminal is connected to the internal line filter ground</p> |
|--|---|

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This terminal is connected to the internal line filter ground

- ⑦ — Output Terminal (M8 Bolt×2)
- ⑧ + Output Terminal (M8 Bolt×2)
- ⑨ Output voltage Adjust Trimmer (V.ADJ).

The output voltage rises when a trimmer is turned clockwise.

- ⑩ Output (Power On) Indicator (Green LED)

This indicator turns on when the power supply's output is in normal operating condition.

- ⑪ Model Identification

The model name, rated output voltage and current are displayed.

- ⑫⑬ Remote Sensing Terminals (+S, -S)

These terminals are for the remote sensing function which compensates for the line drop between the power supply terminals and the load terminals.

- ⑭⑮ Output Voltage Control Terminal (COM, PV)

These terminals are used to control the output voltage by an external signal. The

ground of the PV terminal ⑮ is the COM terminal ⑭.

- ⑮ Reference Terminal (REF)

This terminal, a reference voltage point for an output voltage control, is used for output voltage control or master-slave operation. When a fixed output voltage power source is to be used, connect this terminal with the PV terminal ⑮, using the short piece supplied. The ground for the REF terminal ⑮ is the COM Terminal ⑭.

- ⑯ Current Balance Terminals (PC)

This terminal is used for current balancing in the case of parallel operation.

- ⑰⑱ ON/OFF Control Terminals (TOG, CNT)

These terminals are used to turn the power supply output on and off using an external signal. The ground for the CNT terminal ⑱ is the TOG terminal ⑰.

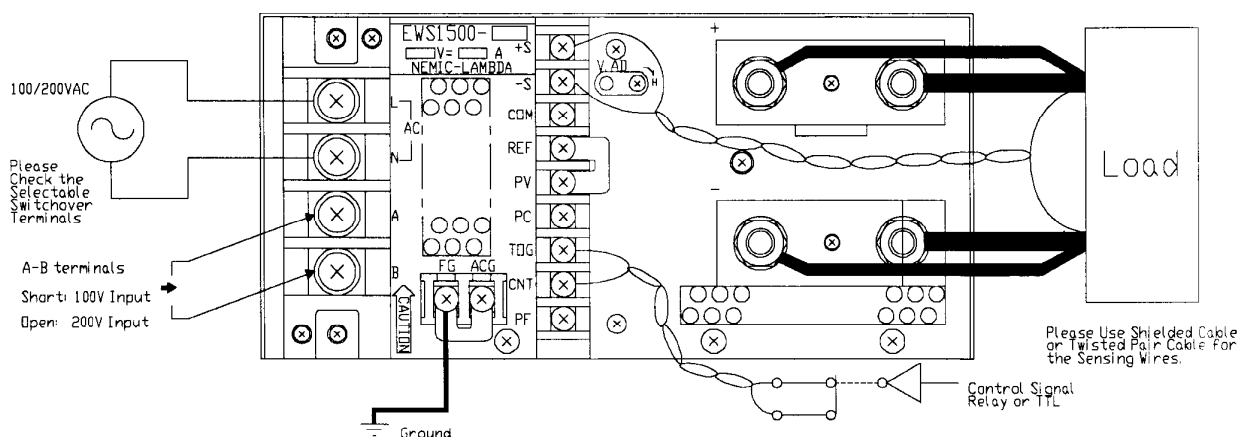
- ⑳ PF Signal Output Terminal

In the case that the output voltage drops, this "Power Fail" terminal will output "High". The ground for the PF terminal ⑳ is the TOG terminal ⑰.

2 Connection Method

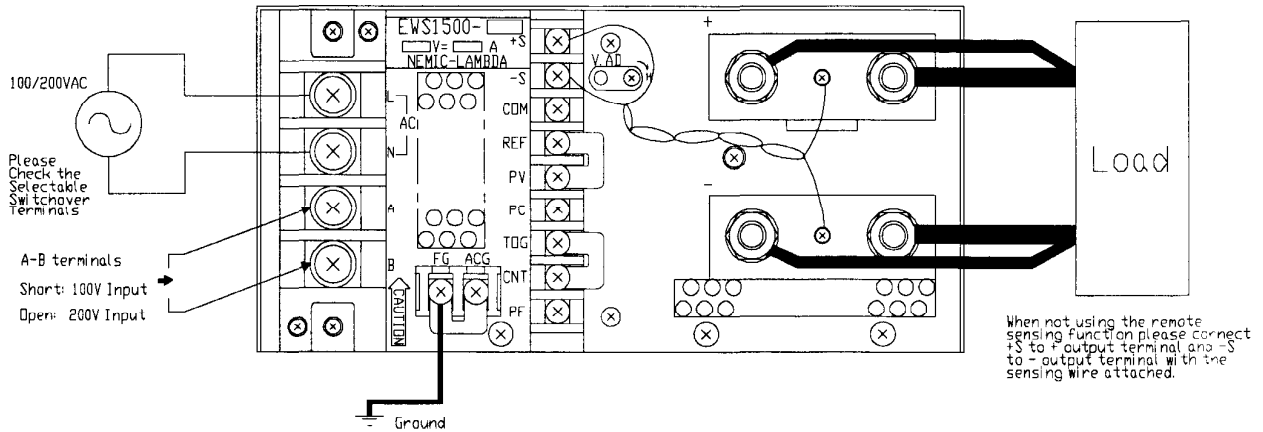
EWS1500 Panel Side

■ Remote Sensing and ON/OFF Control Required



* When the unit is used as a fixed voltage power supply, the REF and PV terminals should be shorted together using the short piece supplied. (A short piece has been inserted between the REF and PV terminals prior to shipment.)

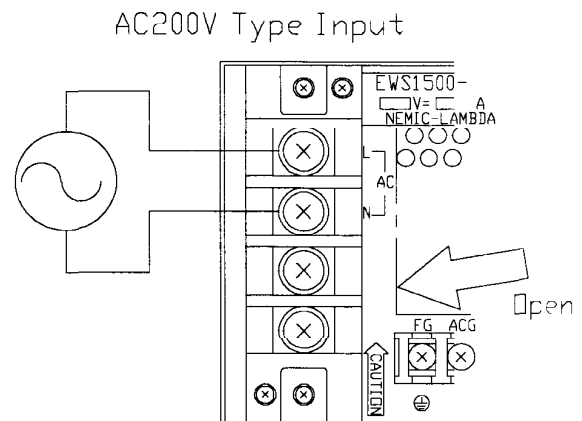
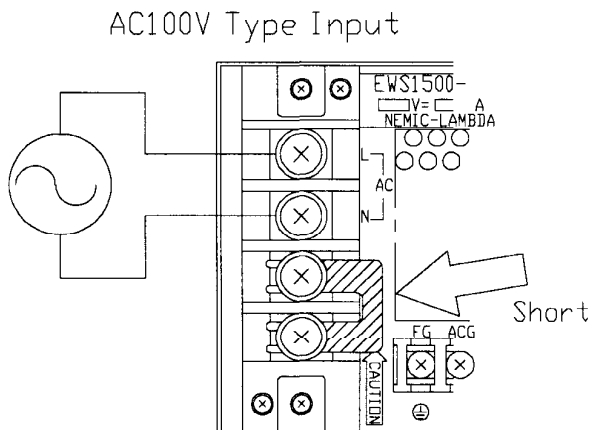
■ Remote Sensing and ON/OFF Control Not Required



- * If the remote sensing terminals are not connected the overvoltage protection circuit will trigger and the output will be shut off. Please make sure that these terminals are connected.
- * When the unit is used as a fixed voltage power supply, the REF and PV terminals should be shorted together using the short piece supplied. (A short piece has been inserted between the REF and PV terminals prior to shipment.)

■ Input Switchover Method

Both AC100V and AC200V input types are possible. The switchover method is accomplished by shorting or opening the A-B terminals with the attached short piece. **When switching over the input, be sure to turn off the input power before switchover.**



3 Explanation of Functions and Precautions

3.1 Input Voltage Switchover Method

Both AC100V and AC200V input types are possible. The switchover method is accomplished

by shorting or opening the A-B terminals with the attached short piece. **When switching over the input, be sure to turn off the input power before switchover.**

Input Voltage Range	Terminal A~B
85~132VAC	Short
170~265VAC	Open

3.2 Output Voltage Range

By means of the V.ADJ trimmer on the front panel, output voltage can be adjusted within the range of $\pm 20\%$ of nominal voltage. Turning the trimmer clockwise will increase the output voltage.

3.3 Remote Sensing

This function is used to compensate for the voltage drop of the wiring from the output terminals to the load terminals. Connect the “+S” terminal to the “+” output terminal, and the “-S” terminal to the “-” output terminal, with the sensing wires if remote sensing is not required.

Remote sensing can compensate for a line drop of up to 20% of the rated output voltage. Please use the power supply within the maximum output power specification. Please use shielded cable or twisted pair cable for the remote sensing cable.

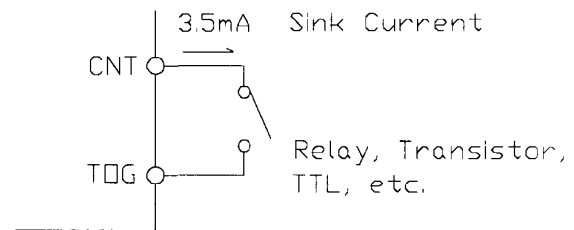
3.4 ON/OFF Control

Using this function allows the user to turn the output on and off without having to turn the AC input on and off. Shorting the TOG and CNT terminal turns the output on, and opening these terminals turns the output off. When not using this function, please short the TOG and CNT terminals with the attached short piece. The standards for this function are as follows.

1. TTL compatible. The maximum input voltage to the CNT terminal is 30V and the maximum allowable reverse voltage is $-0.7V$. The sink current of the CNT terminal is 3.5mA.
2. A switch and relay or a transistor can be used for the ON/OFF switch.
3. This circuit is isolated from the input and output by a opto coupler and can be controlled regardless of the output potential (+ or -). Please connect the

TOG terminal to the control signal's ground. The control mode is shown below.

CNT Level vs. TOG Terminal	Output Condition
H (Higher than 2.0V)	OFF
L (Lower than 0.8V)	ON



3.5 Overcurrent Protection (Delay Shutdown OCP)

For the protection of the power supply, as well as the load apparatus, the power supply will shut down the output when an overload or output short is detected for over 5 seconds. The output will automatically recover if the overload condition is canceled within this time. In the case that the output is shut down, the input must be momentarily removed, and then re-inputted for the output to recover. (The timing of the OCP detection circuit is from the PF signal)

3.6 Overvoltage Protection (OVP)

There is a overvoltage protection function built into these models. When the OVP triggers the output will be shutdown. The input must be momentarily removed, and then re-inputted for the output to recover. The OVP setting is fixed and cannot be adjusted externally.

The OVP detection point is based on the automatic tracking system in which the OVP trigger point is set according to the set output voltage. At this appropriate over voltage condition, the OVP function will trigger. In the specification value $[V_o + \alpha]$ (For the 5V type: $5V + 1.0 \sim 2.0$ means the OVP will trigger between 6~7V), the value α is fixed. If the output

voltage is set at V_1 , then the OVP trigger point will automatically be set at $[V_1 + \alpha]$.

3.7 Overtemperature Protection (OTP)

There is a overtemperature protection function built into these models. When the ambient or internal temperature rises abnormally, this function will shut down the output (Detection Temp.: $120^\circ\text{C} \pm 10\%$). After shut down, please remove the input and allow to cool before re-inputting the input. From the shutdown, the PF signal will be outputted.

3.8 Built in Fan Stop Detection Function

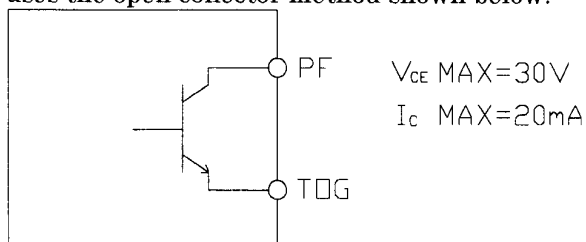
The two cooling fans incorporated in the power supply are monitored for proper operation. Even if one of the fans stops, the output will be shut off. Due to the shutdown, the PF signal will be outputted.

3.9 Undervoltage Lockout

There is a undervoltage lockout function built in to these models. When the input voltage becomes less than $70 \sim 83/140 \sim 165\text{VAC}$, the output will be shut down. The output voltage will automatically recover when the input voltage recovers.

3.10 Low Output Detection Circuit

There is a low output detection circuit built in to these models. The PF signal will turn "High" level to indicate the abnormal status when the output voltage becomes less than $75 \sim 80\%$ of rated value caused by the drop or brown out of the input voltage, or by the OCP function operation. The PF signal is insulated by an opto coupler. It uses the open collector method shown below.



3.11 Output Ripple

The standard specification for maximum ripple is value measured at the output terminals. In the case that the load lines are long, ripple will become larger and a electrolytic capacitor, film capacitor, etc. placed across the load terminals may be necessary. Further, when measuring output ripple, if the oscilloscope probe's ground lead is long, and accurate measurement cannot be made.

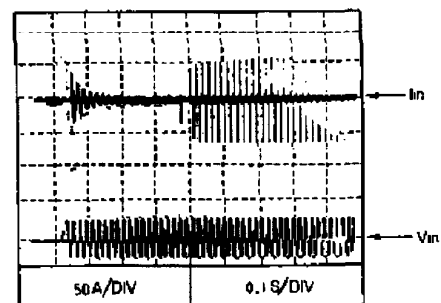
3.12 Inrush Current Limiting Function

This series is provided with a thyristor based built in inrush current limiting circuit. If the input power is removed and reapplied within five seconds, this function will not work due to the retention characteristics of the thyristor.

When using multiple power supplies, please select the input switch, fuse, etc. carefully.

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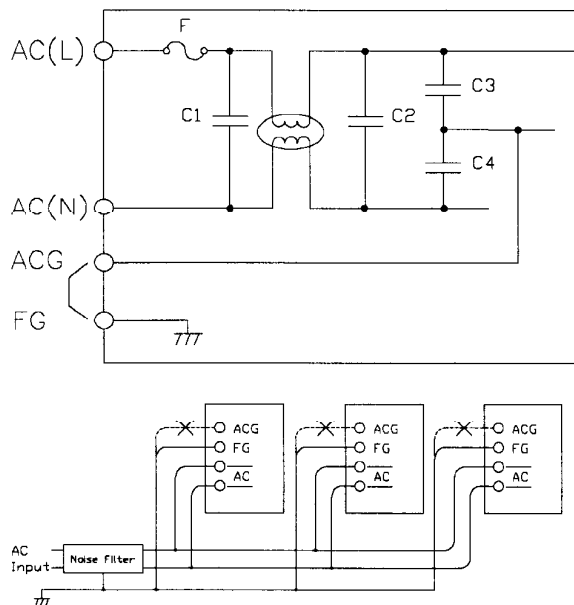
(Input: 200VAC, Input Phas Angle: 90° , Load: 100%, Ambient Temp.: 25°C)



3.13 Line Filter Ground (ACG Terminal)

The ACG terminal is internally connected to a the line filter ground. When using only one power supply model, please short the ACG terminal and FG terminal together using the attached short piece. When more than one power supply are being used, the leakage current will increase by the number models being used. If this is a problem, remove the short piece from the ACG and FG terminals. Further, to reduce noise,

please attach a noise filter to the input lines.



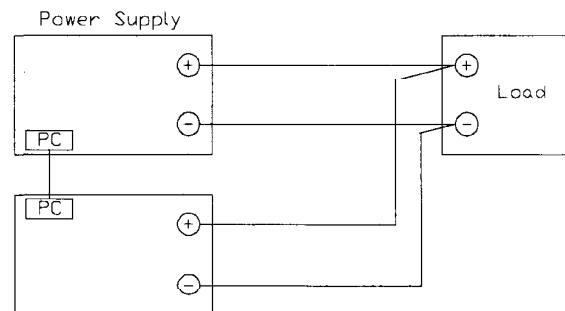
3.14 Parallel Operation

In parallel operation there are two modes of operation (shown below).

(A) To Increase the Output Current

There is a current balancing function built in to these models. From the current balance function the paralleled models (max.: five pcs.) monitor each other's output current to keep the balance of current equal between the paralleled models.

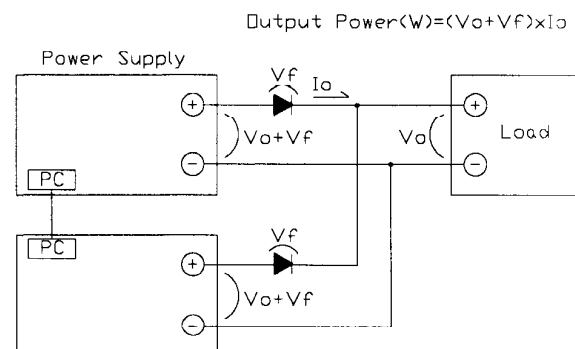
1. When using the current balancing function, please attach the PC terminals together (as close as possible)..
2. Please adjust the output voltage of each power supply to be the same.
3. Please use the same type of wires for all load lines.
4. Please use with an output current of less than 80% of rated output current for all paralleled models.



(B) To Use as a Backup Power Supply

In order to improve the reliability of the load apparatus, there is a method of using two power supplies (one backup power supply) to deliver power to one load.

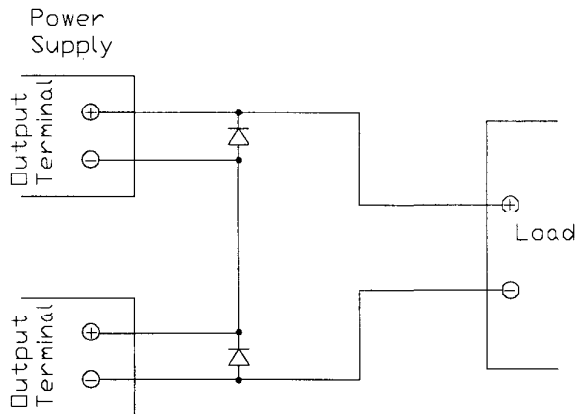
- 1.. Please adjust the output voltage of each power supply to be the same.
2. Please use the same type of wires for all load lines.
3. Set the power supply voltage higher by the amount of forward voltage drop of the diode.
4. Please use within the specifications for output voltage and output current.



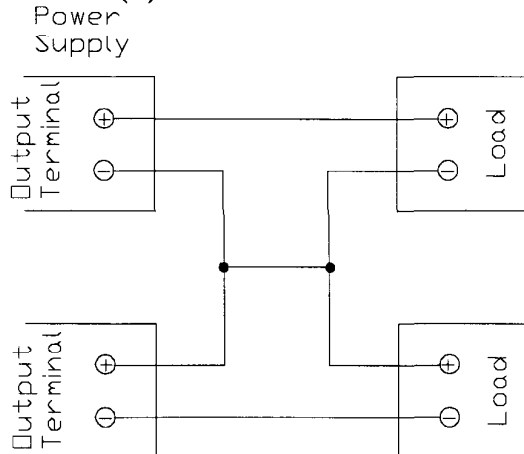
3.15 Series Operation

With series operation, two modes of operation are possible shown below. In the case of method (A), a higher output voltage can be obtained. In the case of method (B), a \pm power supply can be obtained.

Method (A)



Method (B)

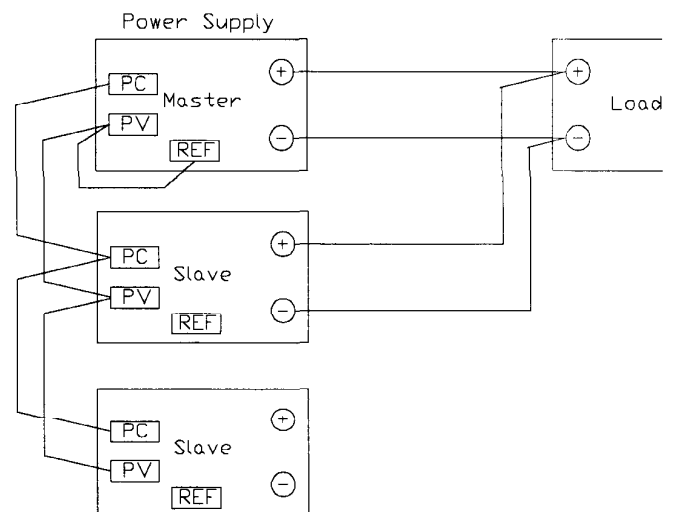


3.16 Master/Slave Operation

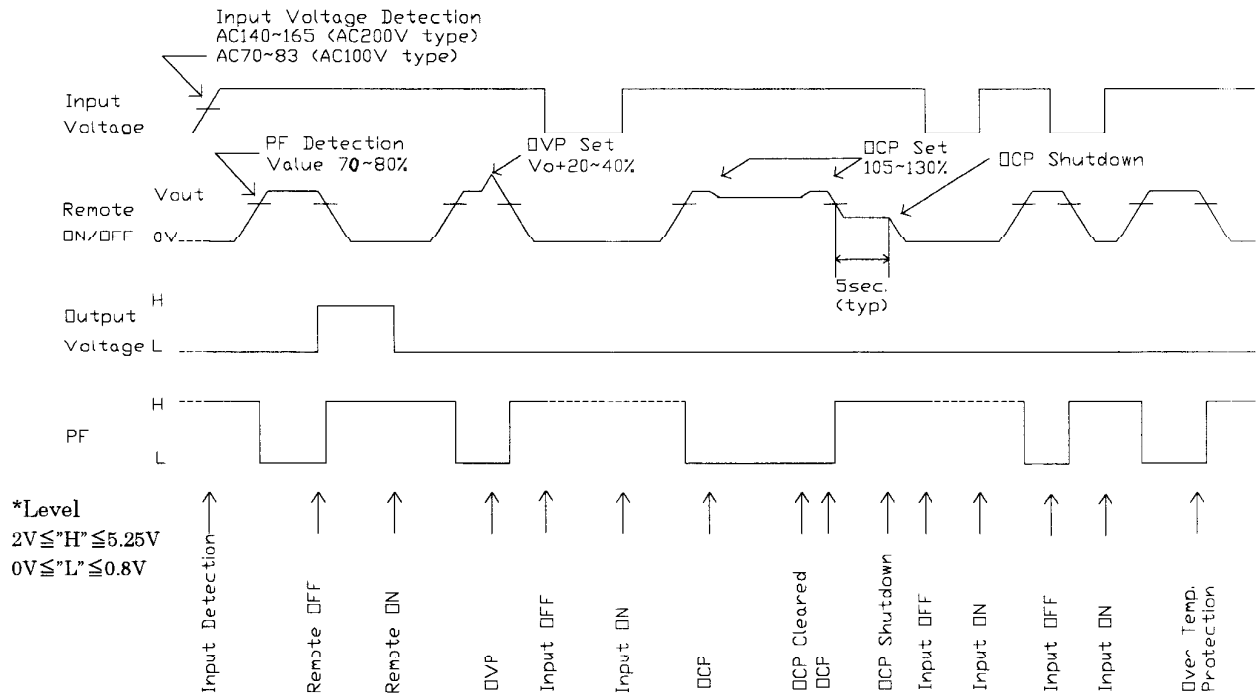
The parallel operation of using one power supply (master power supply) to control the output voltage of other power supplies (slave power supplies) is possible. However, the

paralleled models must be the same model and the total number of pieces is limited to five max

1. When using the current balancing function, please attach the PC terminals together (as close as possible)..
2. Please attach all the power supplies PV terminals together..
3. Connect the master power supply's PV and REF terminals together.
4. Please use the same type of wires for all load lines.
5. Please use with an output current of less than 80% of rated output current for all paralleled models.



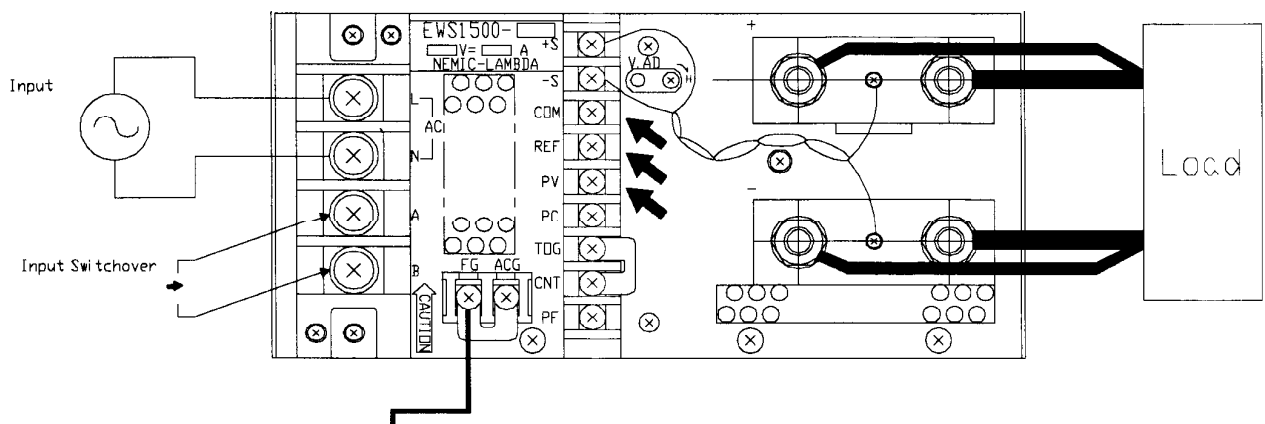
3.17 Sequence Chart



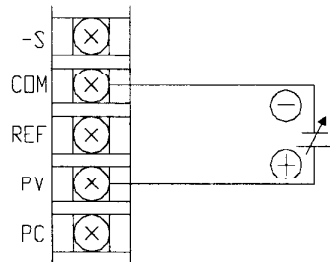
* After OCP Shutdown, in order for the output to recover, the input must be re-inputted.

4 Output Voltage Variation

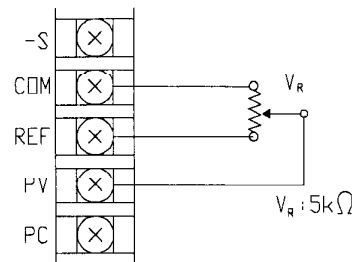
4.1 Terminal Connection Method



- * Please remove the short piece from the PV-REF terminals.
- * Please user shielded cable or twisted pair cable for the control wires.



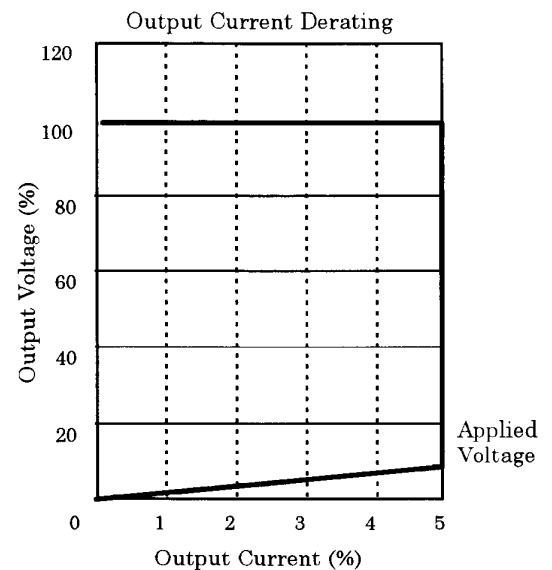
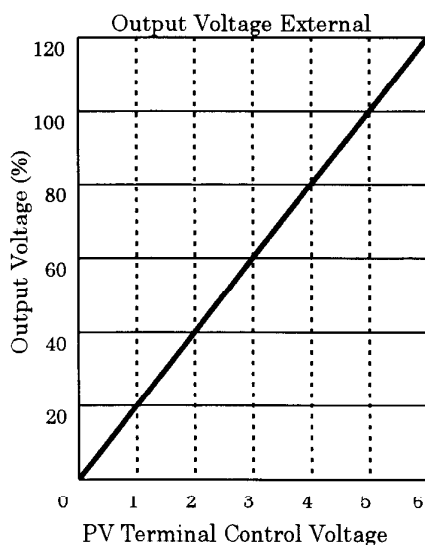
(A) Control with External Voltage



(B) Control with Variable Resistor

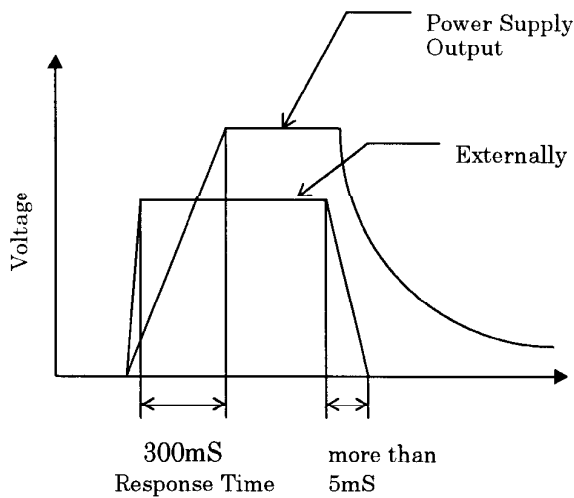
4.2 External Voltage Control

The output voltage can be externally controlled over the range between zero and the rated output voltage (100%) by applying an external control voltage to the PV terminal over the range of zero and 5VDC (external control voltage ground: COM terminal). If external control is required up to 120% of the rated output voltage, apply a voltage between zero and 6VDC to the PV terminal, and the output voltage can be controlled over the range between zero and its rated output voltage \times 120%. Under external control, the output voltage setting accuracy is within $\pm 2\%$. When the output voltage is less than 10% of the rated output voltage value, the allowable output current must be within the derating curve shown below. For use at a voltage higher than the rated output voltage, the current value is such that the maximum output power may not be exceeded.



* External Voltage Application Output Response Characteristics.

When the output voltage is set using an external control voltage, the time for the output voltage to rise from zero to the rated value is between 200ms and 300ms. This response time varies greatly depending on the load connected to the power supply. Therefore, there is a required "waiting time" (response time) necessary for the output voltage to rise to the rated output voltage. Due to the follow up time of the tracking OVP, if the external voltage is changed too rapidly, the overvoltage protection circuit could trigger. The external control voltage change time should be 1V/ms or more.



4.3 External Variable Resistor Control

The procedure for using the PV and COM terminals is the same as that described in Sect. 4.2. However, a control voltage should be supplied from the REF terminal. Connect a variable resistor between the REF and COM terminals, and connect the midpoint of the variable resistor with the PV terminal. When the output voltage is less than 10% of the rated output voltage value, the available output current is within the derating range shown in the previous section. The upper voltage limit in this control mode is the rated output voltage (100%). If external control is required up to 120% of the rated output voltage, please perform the following steps.

- 1) Short the PV and REF terminals together, using the short piece supplied.
- 2) Set the front panel voltage control to 120% of the rated output voltage.
- 3) Shut off the input, and then remove the short piece between the PV and REF terminals.
- 4) Connect the variable resistor between the REF and COM Terminals, and connect the midpoint of the variable resistor with the PV terminal.

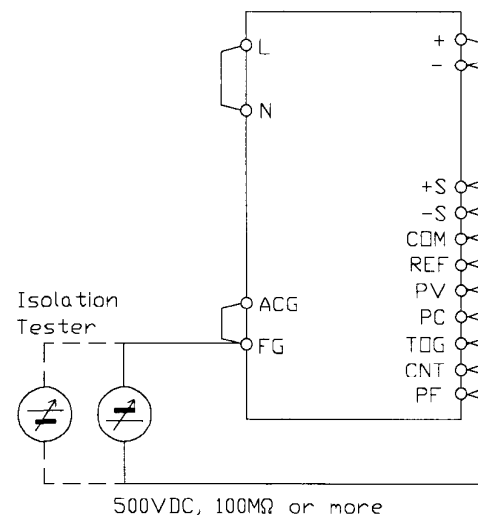
When the unit is used at a voltage higher than the rated output voltage, please be aware to stay

within the maximum output power.

5 Isolation/Withstand Voltage Test Method

5.1 Isolation Test

The isolation resistance is more than $100\text{M}\Omega$ at $500\text{VDC} \cdot 25^\circ\text{C} \cdot 70\%\text{RH}$ when tested with a DC isolation tester between the output and the chassis. Note when testing, some isolation testers can produce a high pulse when the applied voltage is varied. Ensure that the tester is fully discharged after the test.



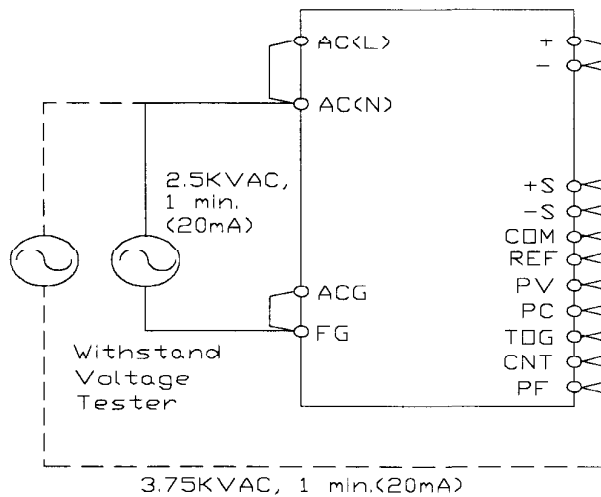
5.2 Withstand Voltage

This series is designed to withstand 2.5kVAC between the input and the chassis, and 3.75kVAC between the input and output for 1 minute. In the case that the withstand voltage is tested in the incoming goods test, etc., please set the limit of the withstand voltage test equipment to 20mA . Further, for output to chassis, 500VAC for 1 minute (Current Limit Value: 100mA). The applied voltage must be increased gradually from zero to the testing value, and then decreased gradually at shut down. Especially stay away from use of a timer, where a pulse of several times

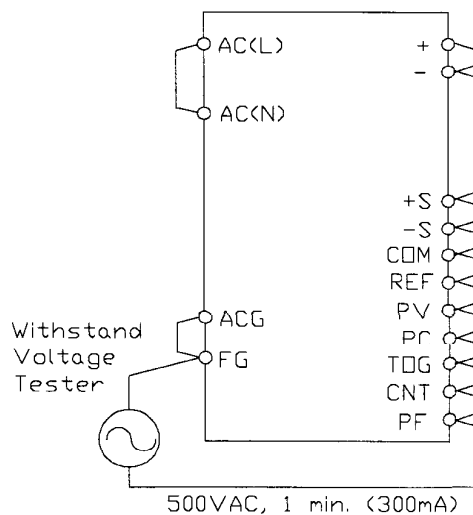
the applied voltage can be generated. This could cause damage to the model.

Applied Points	Withstand Voltage	Current Limit
Input-Output	3.75KVAC (1 min.)	20mA
Input-Chassis	2.5KVAC (1 min.)	20mA
Output-Chassis	500VAC (1 min.)	300mA

Input~Chassis (solid line)
 Input~Output (dotted line)

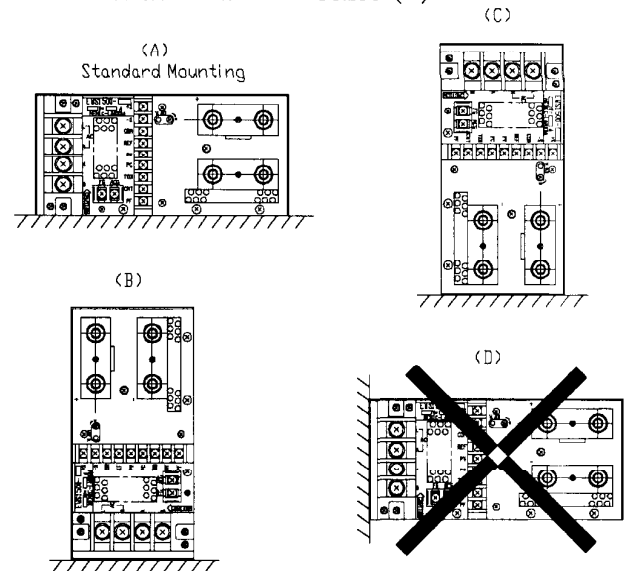


Output~Chassis



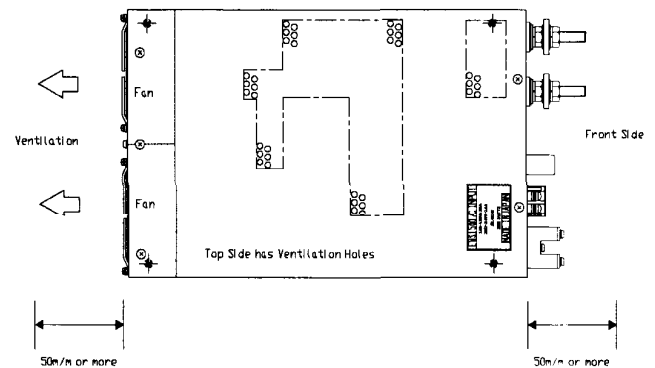
6 Mounting Directions

When mounting the power supply inside an apparatus, we recommend method (A) below. However, method (B) and (C) are also possible. Please refer to the derating shown below. Please do not use as shown in method (D)..



Model	EWS1500		
Ambient Temp.	A	B	C
40°C	100%	100%	100%
50°C	100%	100%	100%
60°C	70%	70%	70%

*The above values are considering 100% load.
 *Lining up models side by side is possible in the case of multiple model use.



This power supply has ventilating holes on the front, back, and top panels. Please keep these three areas as open as possible.

7 Wiring Method

- By keeping the output load lines and ON/OFF control line separate from the input lines, and twisting all line pairs separately the susceptibility to noise can be greatly improved.
- Make all lines as thick and short as possible.
- Noise can be eliminated by attaching a small capacitor to the load terminals.
- For safety and EMI considerations please connect the FG terminal to the mounting set apparatus ground terminal.
- The recommended torque for the input/output terminals is as follows.

Each Signal Terminal (M4 screw)	13kg · cm
Input Terminals (M6 screw)	46.5kg · cm
Output Terminals (M8 bolt)	110kg · cm

8 External Fuse Rating

In the case that an external fuse is going to be used, please refer to the chart below in selecting the fuse. Please stay away from fast blow fuse.

Model	Fuse (Nominal Current)
EWS1500	75A