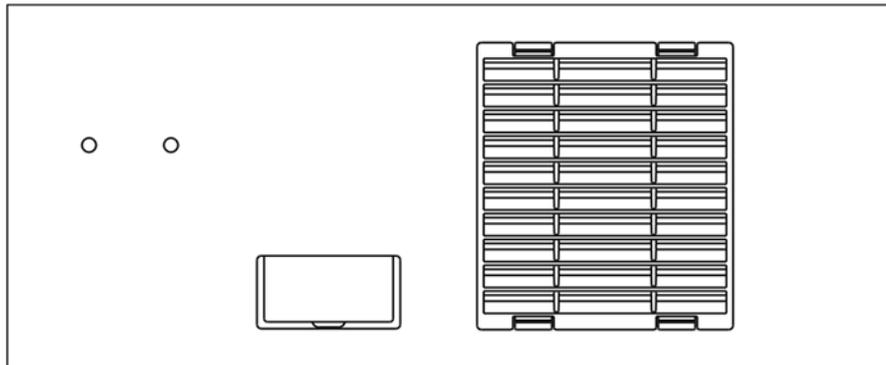
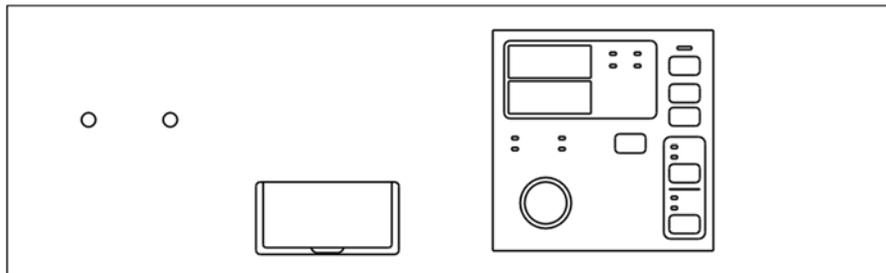




PROCESS ELECTRONICS CORPORATION

DC Power Supply MARC-A User's Manual



Thank you for purchasing our product.
Please read this User's Manual carefully for correct use.
After reading, store this User's Manual in a safe place for future
reference.

Be sure to read Safety Precautions before use.

November 04, 2016 Ver. 1



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Safety Precautions

- For safe use of the product, read the Safety Precautions carefully before use.
- For preventing any hazard to the user and other people and damage to property, instructions to be observed are classified as follows for explanation.

Warning indications

	Danger	Failure to observe instructions marked with this indication and mishandling may lead to death or serious injuries.
	Caution	Failure to observe instructions marked with this indication and mishandling may lead to moderate or minor injuries or property damage only.

Serious injuries mentioned above refer to loss of eyesight, wounds, (high- or low-temperature) burns, electric shocks, broken bones, intoxication, etc. that cause aftereffects or require hospitalization or long-term hospital visits for treatment. Moderate or minor injuries refer to wounds, burns, electric shocks, etc. that does not require hospitalization or long-term hospital visits for treatment. Property damage refers to damage to property or consequential damage related to damage to the device.

- For handling of the device, “what requires attention,” “what should not be done,” and “what must be done” are classified and explained by using the following symbols.

	This symbol indicates “attention,” or what requires attention.
	This symbol indicates “prohibition,” or what should not be done.
	This symbol indicates a “mandatory instruction,” or what must be done.

Instructions to follow on safety



Danger

For preventing serious accidents resulting in injury or death, be sure to observe the following.

- This switch mode rectifier has been designed and manufactured with due consideration to safety. Nevertheless, be sure to observe the precautions given in this User's Manual for using the device. Failure to observe them in use may cause serious accidents resulting in injury or death.
- For ensuring safety, operation of this switch mode rectifier must be performed by personnel with a good understanding of this User's Manual and sufficient knowledge and skills for safe handling.
- For ensuring safety, installation, wiring, maintenance, and repair of this switch mode rectifier must be performed by qualified personnel or those with a good understanding of switch mode rectifiers. Inadequate wiring may cause an electric shock or fire.



Danger

For preventing electric shocks, be sure to observe the following instructions.

- Before installation, wiring, maintenance, or repair of this switch mode rectifier, be sure to turn off all input power supplies with the switch of the switchboard and confirm that the power supply has been cut off.
- Turn off the power supply of the entire equipment when the switch mode rectifier is not used.
- While power is supplied, do not touch the power supply connection wires. It may result in an electric shock or burn.
- When operating the switch mode rectifier, do not use torn or wet gloves. It may result in an electric shock.



Caution

Be sure to use and store the switch mode rectifier in an appropriate environment.

- Never use or store the switch mode rectifier in environments as described below. It may cause a fire due to failure, damage or deterioration.
 - A place subject to high or low temperature or high humidity out of the ranges of the ambient environment requirements given in the catalog and User's Manual.
 - A place subject to direct sunlight
 - A place subject to direct heat from a heat source such as a drier.
 - A place subject to vibration or shock
 - A place in the vicinity of any device generating sparks
 - A place subject to dust, corrosive gas, salt, or flammable gas
 - Outdoors

Instructions on installation



Danger

- Be sure to insulate the power supply connection with an insulator. Any exposed connection may cause a fire due to an electric shock or power supply short circuit.
- Ensure that workers post a sign stating “No power-up” on the switch of the switchboard and the switch is not touched by other personnel. Failure to observe this instruction may cause an electric shock or injury.



Caution

- For input and output wires, be sure to select wire diameters suited for the switch mode rectifier. Insufficient wire diameters may cause heat generation or a fire.
- Use wires with a dielectric strength according to the circuit voltage. Use of any wire that does not have the dielectric strength required may cause an electric shock.
- Be sure to secure the input and output wires on a floor, wall, etc. Loose wires may cause an injury.
- When securing the input and output wires on a floor, etc., provide the wires with protectors. Failure to use protectors may cause an electric shock due to damage to wires.
- For connection to output terminals, be sure to use bus bars or solderless terminals. Inadequate connection may cause a fire.



Mandatory

Be sure to ground the grounding terminal.

- Securely connect the grounding terminal in the specified method. Ensure that a certified electrician performs grounding according to the law (Technical Standards concerning Electrical Equipment).

Instructions on use



Danger

- Never use or store the device in a place out of the ranges of the ambient environment requirements given in the User's Manual.
- Do not remove the equipment cover. It may result in an electric shock or burn.
- Do not pour water onto or bring fire close to this device. Do not put on a water-filled container, etc. on top. It may cause an electric shock, failure, or fire.
- Do not stand or sit on the equipment. It may cause deformation or toppling of the equipment, leading to an injury or electric shock.
- If any smoke or abnormal odor is detected, turn off the input switch.
Keep using the equipment as it is may result in a fire. Contact the distributor where the equipment was purchased.
- Do not put any metal bar or other foreign matter into openings. It may cause an electric shock or failure.



Caution

- Before starting the switch mode rectifier, confirm safety on the load side and operate according to the User's Manual. Inadvertent supply of power may cause a fire.
- Do not spray any flammable substance such as an insecticide. It may result in a fire.
- Do not touch with a wet hand or wipe with wet cloth. It may result in an electric shock.
- Do not wipe with cloth soaked with thinner, alcohol, benzine, or other chemical.
It may result in discoloration of the equipment or an electric shock.
- Do not put any finger or bar into openings. Any object put into openings may be caught in the cooling fan, causing an injury.
- Do not touch the input/output terminals of the switch mode rectifier with a metal bar or finger. It may cause an electric shock or injury.

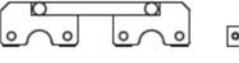
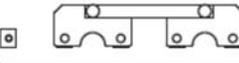
Instructions on maintenance

 Danger	<ul style="list-style-type: none"> • Be sure to wear clothes with adequate consideration given to safety when performing maintenance, repair, etc. Failure to observe this instruction may cause an electric shock or injury. • The device must not be repaired, remodeled, relocated, or scrapped by the user. It may cause a fire, electric shock or failure and lead to invalidation of guarantee of safety. For repair, remodeling, relocation, or scrapping, contact the distributor where the equipment was purchased.
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 Caution	<ul style="list-style-type: none"> • For repair or replacement of failure parts of the equipment, contact the distributor/servicing company where it was purchased. Opening the cover may cause an electric shock or injury. • After turning off the input switch, Er08 uur or Er 15 OPEN is shown on the touch panel for some time. <p style="margin-left: 20px;">Illumination of this indication shows that the power voltage is low and the live circuit in the power supply is still charged. While this indication is shown, do not touch the inside of the power supply or connection terminals. Failure to observe this instruction may cause an electric shock or injury.</p> <ul style="list-style-type: none"> • Before carrying out maintenance or repair work, read the User's Manual carefully. Inadequate work may cause an electric shock or fire. <ul style="list-style-type: none"> • Before starting work, take off any metallic object such as a watch. • Before starting work, post a sign stating "Entry only allowed for workers" to prevent any person other than the workers from readily entering the work area. • Use insulated tools. • After turning off the input switch, avoid touching the inside of the power supply and connection terminals for some time. The voltage charged in the capacitor may cause an electric shock. • Do not touch the transformers, radiating fins or other hot sections. • Ensure that replacement parts are of the same ratings and types as those replaced.
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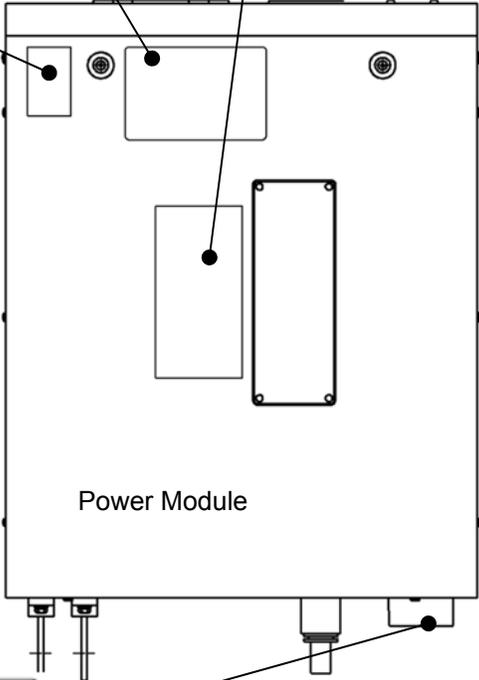
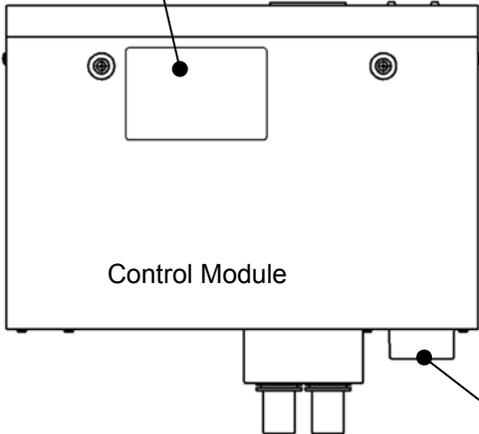
 Prohibition	<p>Maintenance and repair by any person other than those specified (specialized contractor) is prohibited.</p>
<ul style="list-style-type: none"> • Ensure that maintenance and repair work is carried out only by those specified (specialized contractor). Failure to observe this instruction may cause an electric shock or injury. 	

Content of safety and warning labels

	<p>WARNING</p> <p>Risk of Electric Shock could result in serious injury or death.</p> <ul style="list-style-type: none"> -Wait at least 5 minutes after removing power before performing service or touching the Voltage Tap Jumper Bar. -Verify that voltage between terminals is within safe limits before performing service.
<p>200/220/230/240V</p>  <p>380/400/440/480V</p> 	<p>CAUTION</p> <p>Position the Voltage Tap Jumper Bar for the incoming supply voltage as shown.</p> <ul style="list-style-type: none"> -Factory Setting is 380 to 480V. -For 200-240V Setting, consult User Manual or Contact Factory.

	<p>WARNING</p> <p>Risk of Electric Shock could result in serious injury or death.</p> <ul style="list-style-type: none"> -Only qualified personnel should service this unit. -Do not operate this unit with wet hands. -Do not insert rods, fingers, etc. into this unit. -When conducting maintenance or repair, turn unit off, switch off input power circuit breakers and verify that high voltage is not present at input terminals.
<p>CAUTION</p> <p>There is Risk of Injury.</p> <ul style="list-style-type: none"> -Do not lean on, sit on or get on top of this unit. -Read the Instruction Manual before installing, operating, doing maintenance or troubleshooting. Failure to do so may result in injury and void warranty. 	

	<p>CAUTION</p> <p>Heavy Object</p> <ul style="list-style-type: none"> -Can cause muscle strain or back injury. -Use lifting aids and proper techniques when removing or replacing. -Weight exceeds 50lbs.
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	<p>GROUNDING TERMINAL</p>
---	----------------------------------

Introduction

Thank you for purchasing the Direct Current Power Supply MARC-A.
Before use, read this User's Manual carefully for correct use of the device.
After reading, store this User's Manual in a safe place close at hand for future reference.

Be sure to read Safety Precautions before use.

Trademarks

- DeviceNet is a trademark of ODVA (Open DeviceNet Vendor Association).
- CC-Link is a trademark of CC-Link Partner Association (CLPA).

Major features

Various levels of output available

- Direct Current Power Supply MARC-A is composed of one control module and one or more power modules.
- Up to six power modules can be connected in parallel to allow selection of the output level (15 V 3000 A max.) according to the application.
- the power module can be used as a "stand alone" device.
 - The output is 15 V 500 A max.
 - External signals are used for setting and operation.
 - Communication, output sequence, and error indication are not available.

Simple configuration of various settings

- A touch panel and jog dial are employed for simple inputting and display of operation data.

Enhanced output sequence

- Soft start/low current start setting is available.

Support for analog signals such as external input/output

- The output voltage/current can be set by using an external analog command (0 to 5 V uninsulated circuit).
- The output voltage and current values can be output as analog signals (0 to 5 V uninsulated circuit).
- Insulation can be applied to the external analog input/output signal.
(*Optional)

Support for RS-485 communication/fieldbus protocols

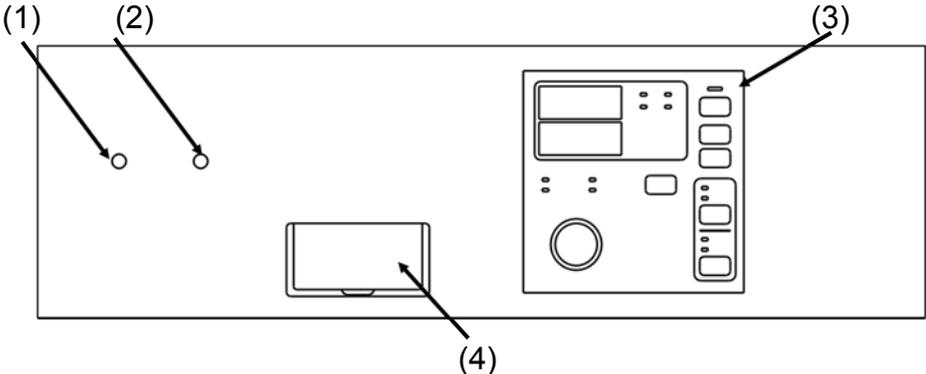
- Communication control using RS-485 is available.
The communication speed is up to 115200 bps.
- Fieldbus protocols (DeviceNet and CC-Link) are supported.
(*Optional)

Diagnosis of failure by error indication and alarm function

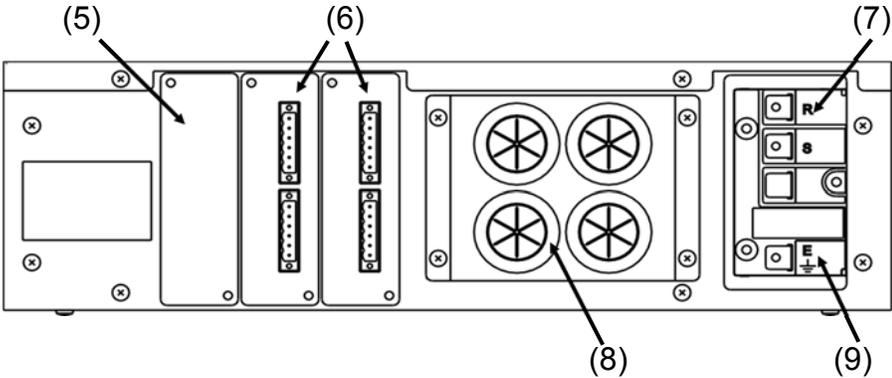
- Various problems are displayed individually on the touch panel.
- The output voltage and current can be monitored.
- If the fan stops during operation, the fan error can be detected.

Part Names

MARC-A CONTROL MODULE

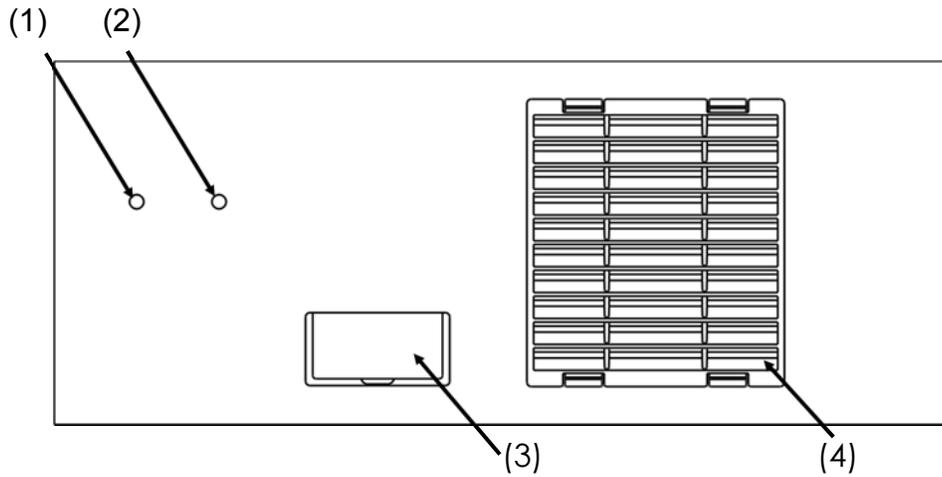


- (1) Power lamp (POWER)
- (2) Alarm lamp (ALARM)
- (3) Touch panel
- (4) Maintenance port

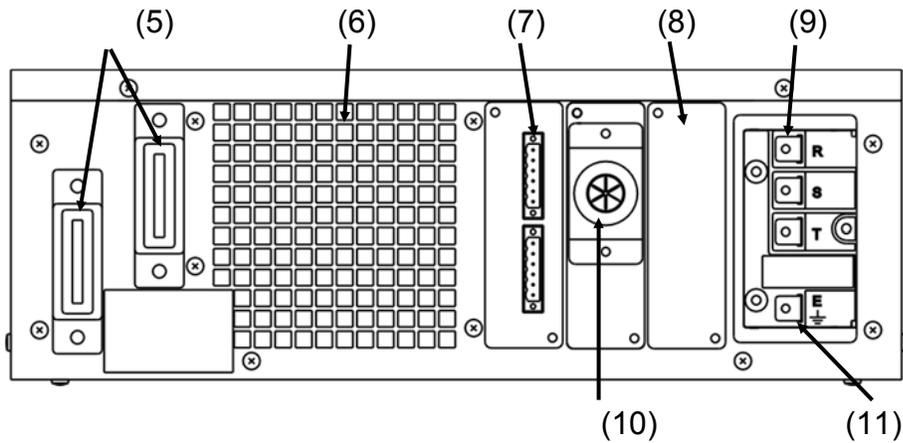


- (5) Optional card slot
- (6) Control terminals
- (7) Input terminal (R, S)
- (8) Module control terminal
- (9) Grounding terminal (E)

MARC-A POWER MODULE

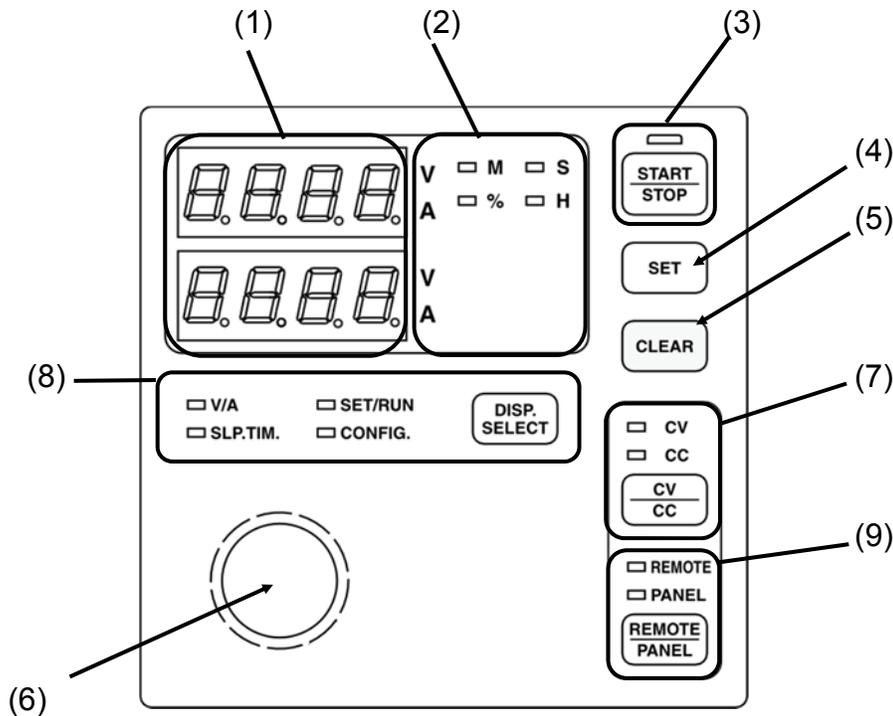


- | | |
|------------------------|------------------------------------|
| (1) Power lamp (POWER) | (3) Maintenance port |
| (2) Alarm lamp (ALARM) | (4) Intake vent (cooling fan door) |



- | | |
|---|------------------------------|
| (5) Output terminal (right: +, left: -) | (9) Input terminal (R, S, T) |
| (6) Optional card slot | (10) Module control terminal |
| (7) Exhaust vent | (11) Grounding terminal (E) |
| (8) Control terminal | |

Touch panel and jog dial



- (1) **Voltage display (top)/Current display (bottom)**
Various data are displayed including the output voltage and current values.
- (2) **Display unit lamps**
Indicate the units for the data shown in the voltage and current displays.
- (3) **START key and START lamp**
The key is used for starting and stopping this device.
During operation, the START lamp is illuminated.
- (4) **SET key**
Confirms the data being changed and goes to the next data.
- (5) **CLEAR key**
Clears the data being changed and goes back to the previous data.
This key is also used for stopping the buzzer sound for the error generated.
This allows "display of the rating" on the setting confirmation screen for the connection number.
- (6) **Jog dial**
Mainly used for inputting numerical data.
Turning the jog dial right increments the value.
Turning the jog dial left decrements the value.
Pressing the jog dial moves the input digit to the left by one.
- (7) **CV/CC key and CV lamp/CC lamp**
This key is used to switch between the CV (constant voltage control) and CC (constant current control) modes.
When the CV mode is selected, the CV lamp is illuminated.
When the CC mode is selected, the CC lamp is illuminated.

ISP SELECT key and display mode lamps

This key is used for switching between data items of operation data.

It is also used for CONFIG mode switching.

The output voltage and current values are shown while the V/A lamp is illuminated.

The output set value is shown while the SET/RUN lamp is illuminated.

The slope time is shown while the SLP.TIM. or SLOPE TIME lamp is illuminated.

When the CONFIG mode is selected, the CONFIG lamp is illuminated.

(8) REMOTE/PANEL key and REMOTE lamp/PANEL lamp

This key is used for switching between the panel mode (local operation) and remote mode (remote operation).

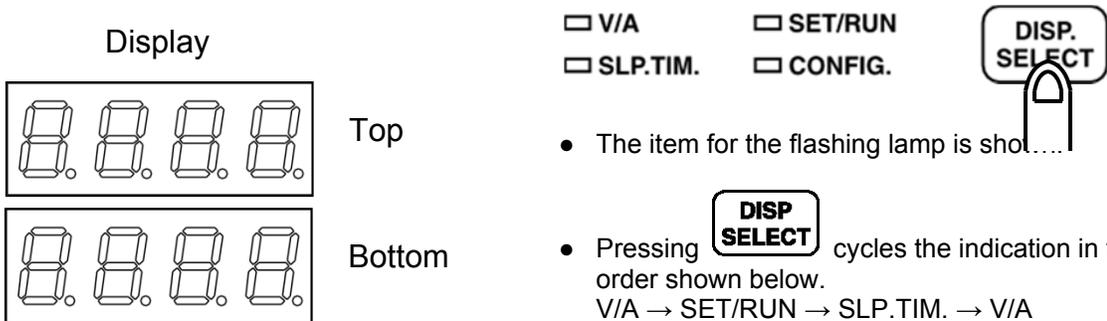
When the panel mode is selected, the PANEL lamp is illuminated.

When the remote mode is selected, the REMOTE lamp is illuminated.

Display

- The display shows operation data as shown in the table below.

- The indication changes every time **DISP SELECT** is pressed.



- Holding down **OPR MODE** (for 2 seconds) switches the mode to the CONFIG mode.

For the details about the CONFIG mode, see “Changing the configuration settings.” (P.32)

Indication		
V/A (Output value) *Used only during operation	Top	Voltage value
	Bottom	Current value
SET/RUN (Output set value)	Top	Output set value
	Bottom	
SLP.TIM. (Slope time set value)	Top	Slope time
	Bottom	
CONFIG. (Parameter set value)	Top	Parameter No.
	Bottom	Parameter value

Installation

Installation location

Regarding the installation location of the switch mode rectifier main unit, pay special attention to the following points.

■ Operating environment

- Installation location : Indoors (place not subject to wind and rain or direct sunlight)
- Ambient temperature : 0~40°C
(For over 40°C, up to 50°C is permitted by derating)
- Relative humidity :30 to 85%RH (no condensation)
- Altitude :1000 m max.
- Airborne dust :Normal
- Atmosphere :No explosive or corrosive gas

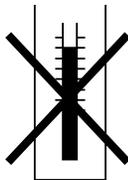
 This device uses an inverter circuit. Do not use a TV, radio, etc. in the vicinity of this device. It may cause disturbed TV screen images or radio sound with noise.

■ Install in a shady, well-ventilated place.

 Strictly avoid installation in a place subject to direct sunlight, high temperature or humidity, or direct falling of drops of rainwater, etc., which may not only significantly reduce the service life of this device but also cause accidents.



Direct
sunlight



Over 40°C

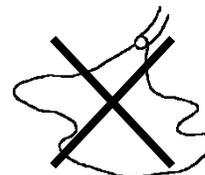
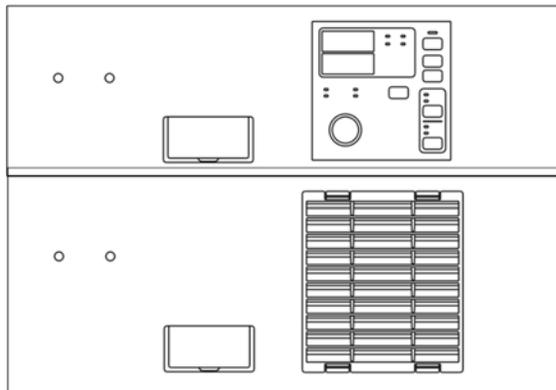
The allowable
temperature range
is 0 to 40°C.



Rain



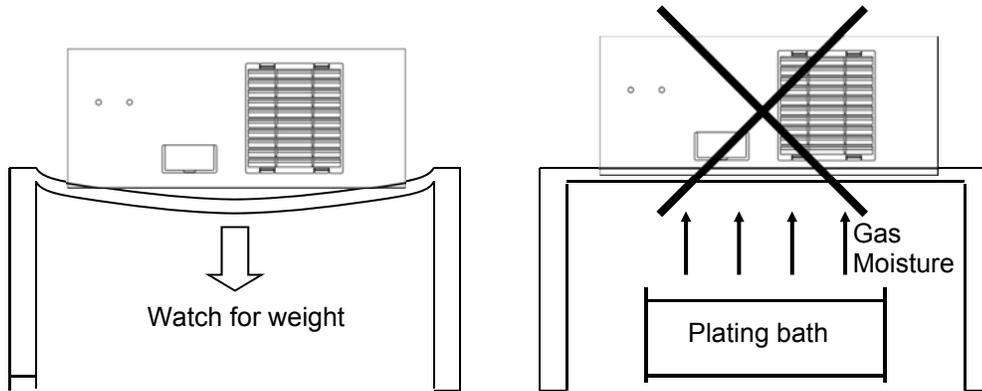
Fire



Moist

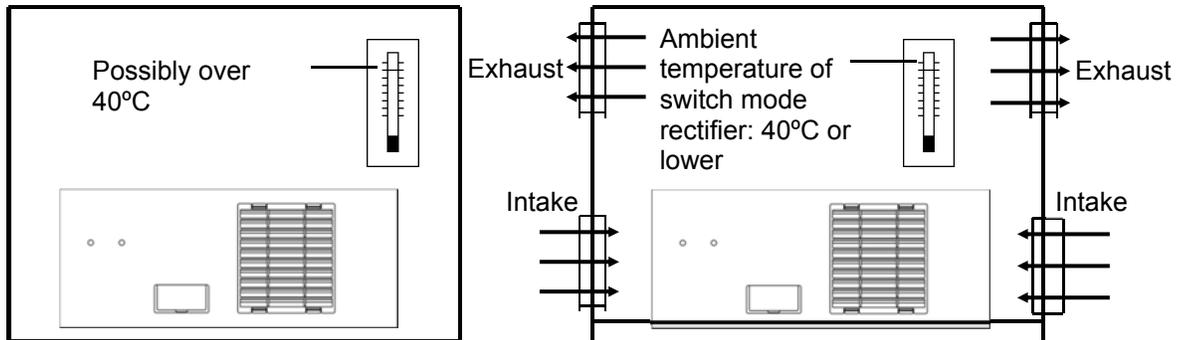
- When installing this device at an elevated place such as on a platform or the mezzanine, pay attention to the following points.

⚠ When installing or moving this device for a layout change, etc., loss of a balance may lead to injuries. Ensure a secure footing and use utmost caution for installation or moving. Never place the device directly above a plating bath.

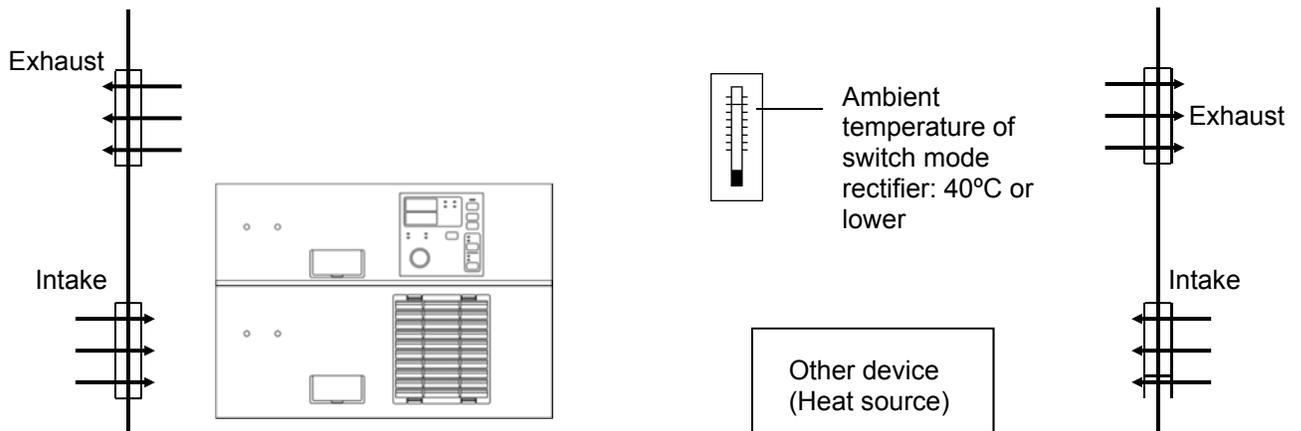


- When running two or more switch mode rectifiers (including the heat source of other device) simultaneously in the same factory, or installing in a closed space such as a rack, heat generated from the switch mode rectifiers may increase the ambient temperature to over 40°C. In such a case, be sure to ventilate the space.

When using in rack or other closed space



When running two or more units simultaneously (including heat source of other device)



Installation

Module weight

- The weight of the respective module is as shown below.
When stacking more than one unit for installation, watch for the weight.



Ensure that installation or replacement (drawing out) of the switch mode rectifier is carried out by two or more workers.

The unit is a heavy load and failure to observe this instruction may cause an injury.

Dimensions: See the dimensional drawing separately provided.

Weight: Power module 56 lbs max.
 Control module 16 lbs max.

MARC-A CONTROL MODULE SETTING

Setting the connection number (changing by parameter)

■ MARC-A CONTROL MODULE

This section describes how to change the connection number by changing the parameter using the touch panel.

To change the parameter setting, see “Changing the Configuration Settings” (p. 32).

After changing this parameter, cycling of the input power is required.

The new connection number setting takes effect after a restart.

- Set the number of P.M. connected in parallel with parameter No. 63 (P.M. Parallel connection number).
- The connection number must be set when the power is turned on for the first time and the connection number has been changed.
- The output ratings automatically change according to the connection number set by using the parameter.
- The rotary switch setting is enabled when it is “0” or “9.”

Setting the connection number (changing by rotary switch)

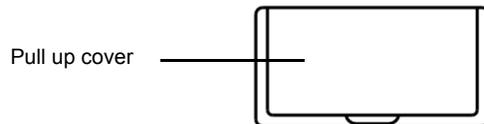
■ MARC-A CONTROL MODULE

This section describes how to change the connection number using the rotary switch in the maintenance port.

- The connection number must be set when the power is turned on for the first time and the connection number has been changed.
- This operation changes parameter No. 63 (P.M. Parallel connection number).

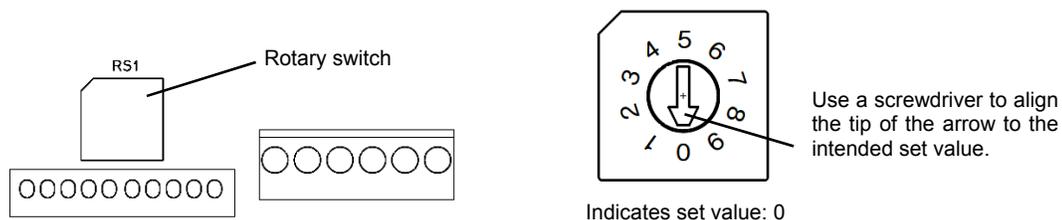
(1) When the input terminals are connected with the input power supply, separate the switch mode rectifier from the input power supply by using the input switch of the switchboard.

(2) Open the cover of the maintenance port by pulling up.



(3) Set the rotary switch according to the total number P.M. connected.
Set value 1 to 6: Set the connection number for the power module.

Example When the connection number of P.M. is 3 Set “3” as the set value of the rotary switch.



(4) Make sure that the set value of the rotary switch matches the number of P.M. units connected with the C.M. and turn on the input switch of the switchboard to supply power to the switch mode rectifier.

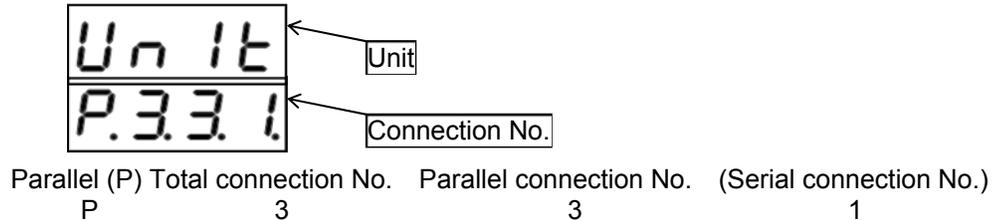
(5) The POWER and ALARM LED lamps on the front of the C.M. flash at the same time for about 3 seconds. The flashing indicates that the connection number of the P.M. is being set and stored in the C.M.

 Do not turn off the input power of the switch mode rectifier while LEDs are flashing.

- (6) The flashing of the LED lamps automatically switches to illumination.
 When the setting and storing of the P.M. connection number in the C.M. have been completed, the LED lamps stop flashing and remain illuminated.
 At this time, the touch panel shows the connection number that has been set.

 This setting operation is the mode for setting the connection number and does not allow running of the device.
 For the serial connection number, "1" is the only available set value.

- Console display screen (after setting) (Reference: 3 units connected in parallel)



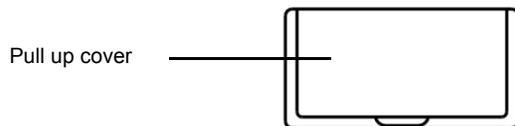
- (7) Turn off the input switch of the switchboard to cut off the power supply to the switch mode rectifier.
- (8) Set the operation in the remote mode of the C.M. by using the rotary switch again.
 (For the setting procedure, see Remote operation setting: Control Module)
- (9) Close the cover of the maintenance port.

Remote operation setting (setting by rotary switch)

■ MARC-A CONTROL MODULE

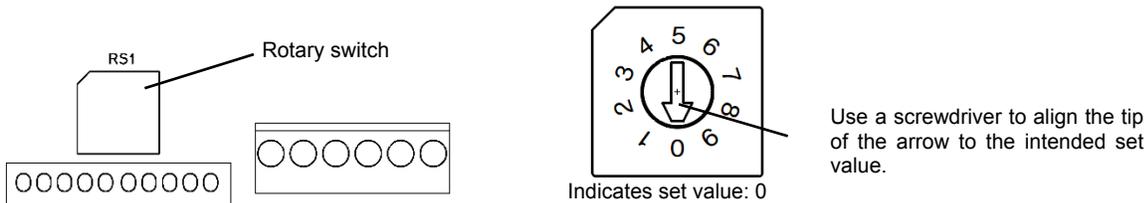
Use the rotary switch in the maintenance port of MARC-A CONTROL MODULE to set the operation in the remote mode.

- (1) When the input terminals are connected with the input power supply, cut off the input power supply of the switch mode rectifier by using the input switch of the switchboard.
- (2) Open the cover of the maintenance port by pulling up.



- (3) There is a rotary switch inside. Set the set value of the rotary switch.
 Set value 0: "Set for operation by external analog input signals in the remote mode"
 Set value 9: "Set for operation by external communication or remote control in the remote mode"

 Regardless of whether the remote operation is used, the rotary switch of the C.M. must be set to "0" or "9."



- (4) Close the cover of the maintenance port.

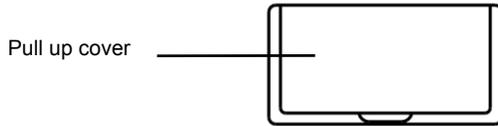
MARC-A POWER MODULE SETTING

P.M. address setting

■ MARC-A POWER MODULE

Use the rotary switch in the maintenance port of MARC-A POWER MODULE to set the address.

- (1) When the input terminals are connected with the input power supply, cut off the input power supply of the switch mode rectifier by using the input switch of the switchboard.
- (2) Open the cover of the maintenance port by pulling up.



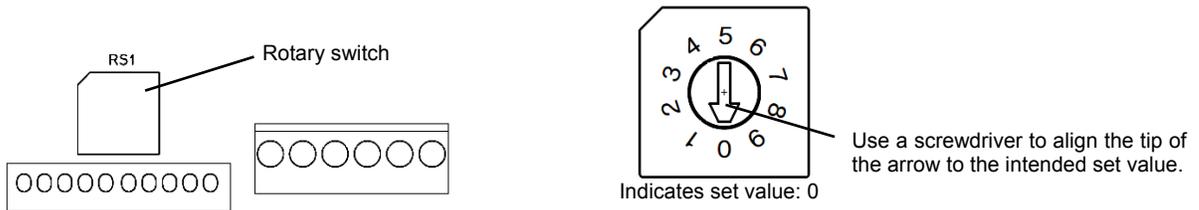
- (3) There is a rotary switch inside.
Set the P.M. address by using the rotary switch.

Set value 1 to 6: Set the P.M. address when connecting with MARC-A POWER MODULE.
Match the address with the CON No. of the MARC-A POWER MODULE control terminal.
For the CON Nos., see the module cable connection (p. 22).

 Set the address of MARC-A POWER MODULE starting from "1" in the ascending order.

 If the set address has already been used, an address overlap error `Er47` `CLAdr` is shown. If the address and CON No. connection do not match, a connector joint error `Er48` `CLIn` is shown.

If any error is indicated, make sure that the C.M. connection number setting is correct and the P.M address matches the CON No. of the C.M. module control terminal.



Set value 0: "Set for operation by external analog input signals in the remote mode (standalone)"
Set value 9: "Set for operation by external communication or remote control in the remote mode (standalone)"

- (4) Close the cover of the maintenance port.

200 V/400 V internal switching setting

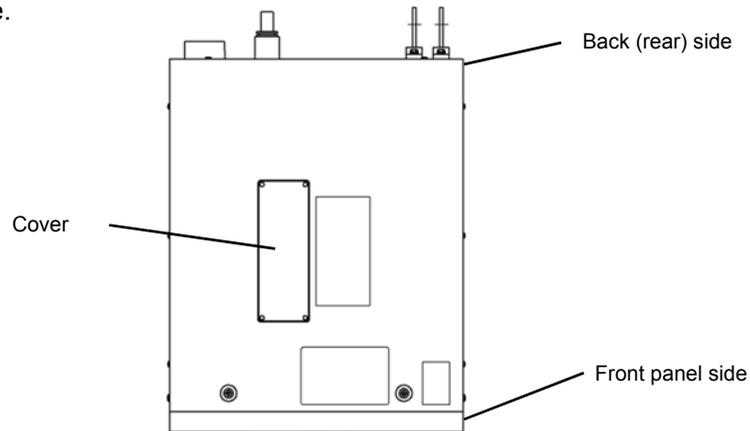
The factory setting is 400 V system input.

To use 200 V system input, follow the instruction given below.

- (1) When the input terminals are connected with the input power supply, cut off the input power supply of the switch mode rectifier by using the input switch of the switchboard. Wait at least 5 minutes before carrying out the next work.

 The inside of the power supply is still charged with a high voltage immediately after separating from the input power supply. To prevent an electric shock or injury, wait at least 5 minutes before carrying out any work.

- (2) Remove the cover on the top side.



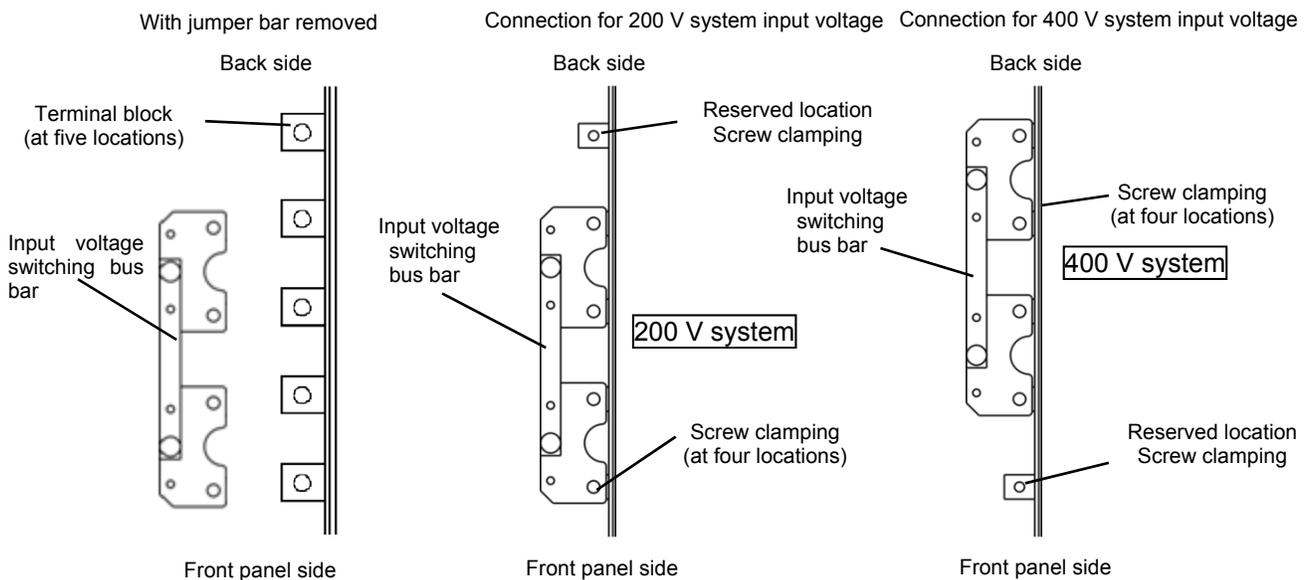
- (3) Loosen four screws of the terminal block to remove the jumper bar.

- (4) Place the jumper bar to match the input voltage and tighten the four screws of the terminal block. Be sure to tighten the one screw in a reserved location.

- Screw: M4 x 8 Hex upset metric screw thread

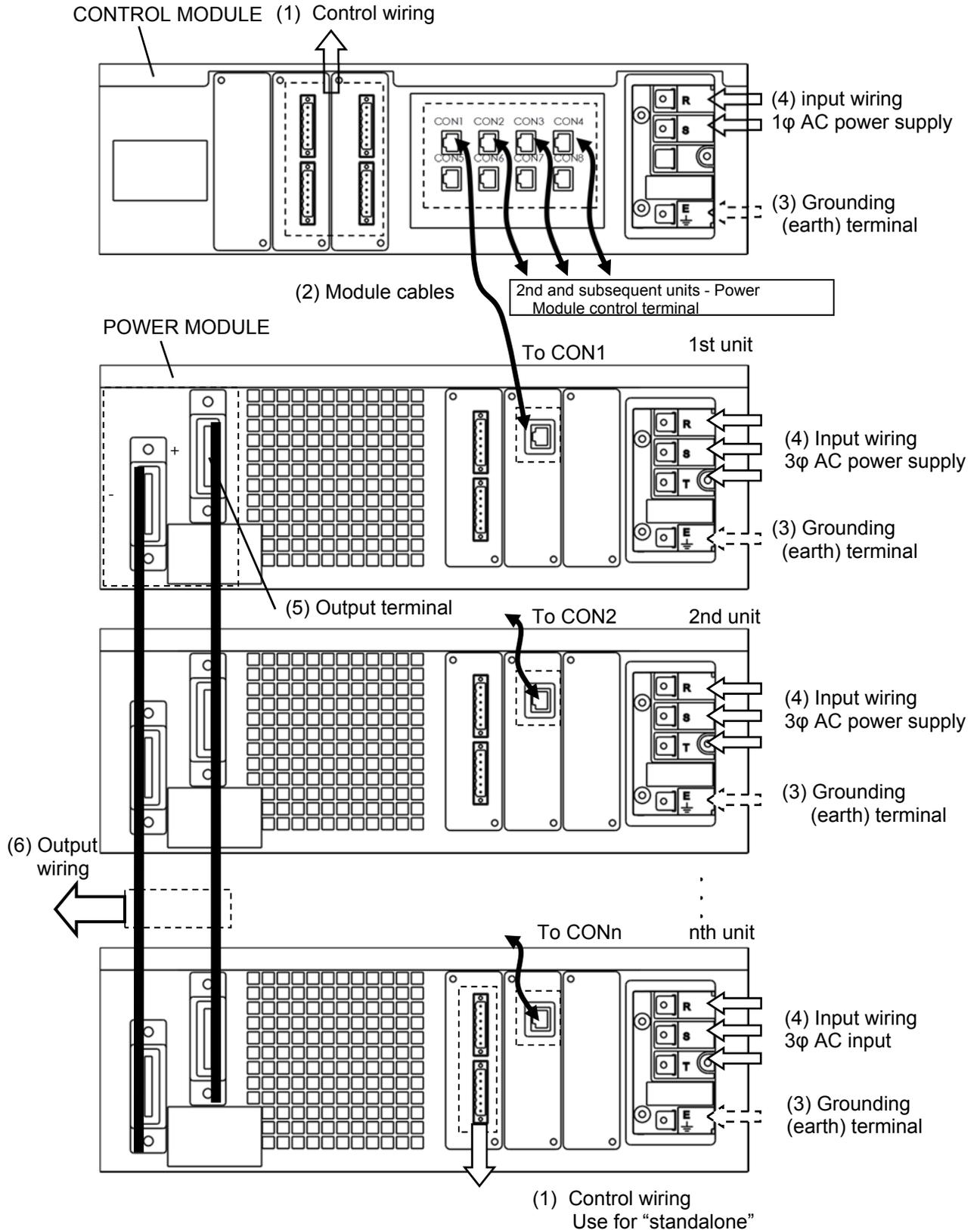
- Tightening torque: 1.5 to 1.8 [N · m]

 Tighten all screws securely. Loosening of any screw may lead to heat generation or a fire.



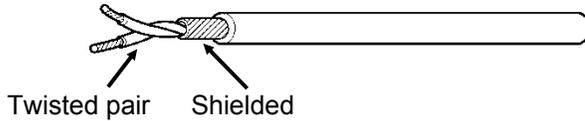
- (5) Mount the cover.

Connection



Control wires

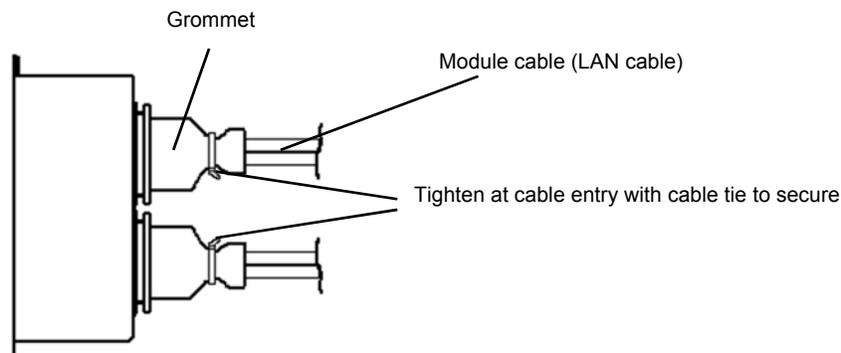
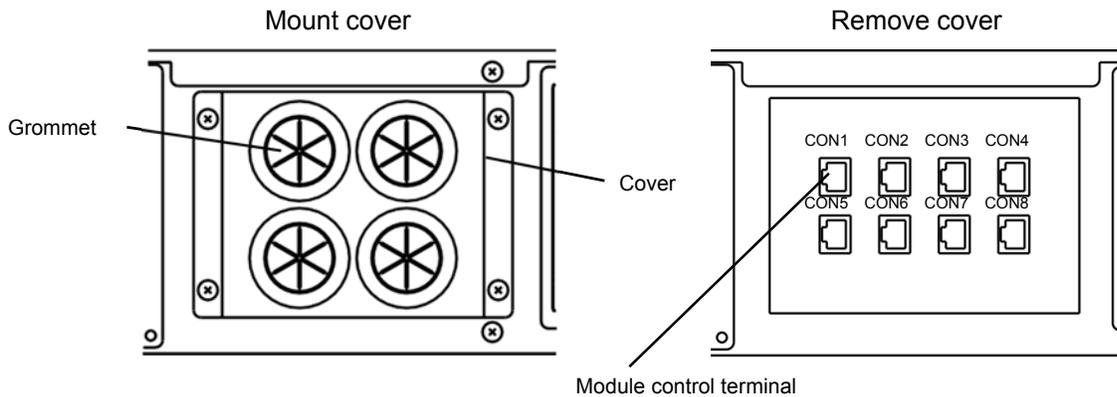
- Use wires of 0.75 mm² or larger to connect with the control terminals. (P.53)
- The wire length shall be 30 m max.
- For prevention of faulty operation due to noise, shielded twisted pair cables are recommended.



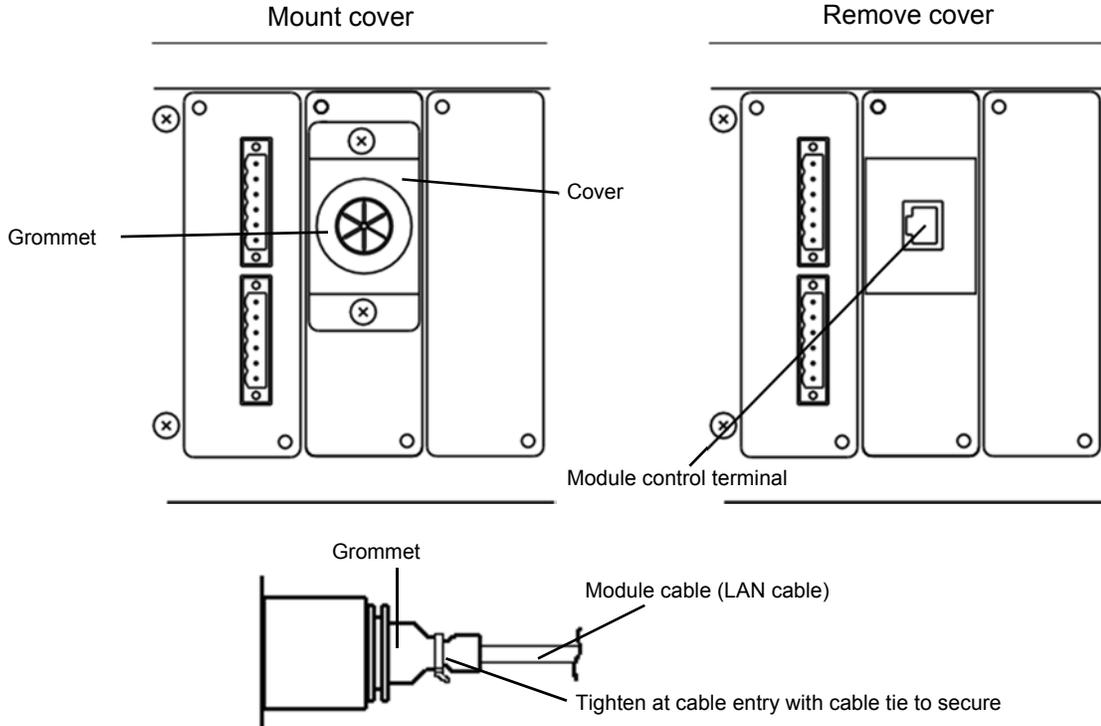
Module cables

- As the module cables, use LAN straight cables (RJ45, 8P8C). Category 5e (Cat 5e) or higher LAN cables are recommended.
- The wire length shall be 2 m max.
For preventing faulty operation due to noise, use of short wires is recommended.
- Use the module control terminals of control module starting from CON1 in the ascending order.
Example) For connecting 3 units of the power module
C.M. connection point: CON1, CON2, CON3
P.M. address : 1, 2, 3
- Run the module cables through the cable entries of the grommets to connect with the respective module control terminals. After connecting the cables, use cable ties to tighten over the grommet sleeves to secure the cables.
This is required for preventing entry of external air through the module wiring in order to protect the inside of the power supply.
- Do not connect power wiring (input and output cables) and module cables in a single bundle; connect them separately.

- Control Module



● MARC-A POWER MODULE



Grounding (earth) terminal

- Control Module
Use wire of 0.8 mm² or larger to connect with the grounding terminal (E).
- Power Module
Use wire of 5.5 mm² or larger to connect with the grounding terminal (E).

* Grounding resistance: 10 Ω max.: (Class C grounding) recommended.

Input wires

- CONTROL MODULE (standalone)
For input wiring, use wires of 0.8 mm² or larger with a withstand voltage in accordance with the input voltage.
- POWER MODULE (standalone)
For input wiring, use wires of 5.5 mm² or larger with a withstand voltage in accordance with the input voltage.
- For connecting more than one P.M. units, use wires of the size shown in the table below or larger to connect with the input terminals of the power receiving section of the switch mode rectifier.
When the input wire length is long, pay attention to voltage drop due to loss in input wires.

Recommended input wire diameter
(For 200 V input)

Output current	Input current (Reference)	Input wiring
[A]	[A]	[mm ²]
500	27	5.5
1000	54	14
1500	81	22
2000	108	38
3000	135	60

(For 400 V input)

Output current	Input current (Reference)	Input wiring
[A]	[A]	[mm ²]
500	14	3.5
1000	28	8
1500	32	14
2000	46	22
3000	60	38

Output terminals

- For connecting more than one unit of MARC-A POWER MODULE, connect the respective output terminals with the specified bus bars.

Output wires

- For output wiring, use wires of the size shown in the table below or larger to connect with the output terminals.

Output current	Main circuit wiring	Parallel number
[A]	[mm ²]	[pcs]
500	250	1
1000	250	2
1500	250	3
2000	250	4
3000	250	6

Input switch

- In connecting a switch on the input side, use a switch that exceeds the rated current and breaking capacity indicated below.
A fuse to protect the input system is built in the product, but an ON/OFF switch for the input power supply is not built in the product.
Connect a switch featuring an appropriate voltage resistance, according to the input voltage.

Recommended

Output current	Rated current	Breaking capacity
[A]	[A] Min.	[KA] Min.
500	50	50
1000	100	100
1500	150	150
2000	200	200
3000	300	300

Operation

Power-on/off

Power ON

- Turn ON the input power supply to the rectifier by operating the input switch on the switchboard, etc. The touch panel us illuminated.
Turn on the input power supplies to C.M. and P.M. at the same time.
If input power supplies to modules are not turned ON simultaneously, errors such as connector joint error could be detected.

Power OFF

- Turn OFF the input power supply to the rectifier by operating the input switch on the switchboard, etc. or is shown on the touch panel for a while, but the mark is not for warning of error.

If input voltage is different from internal setting

- If the input voltage is different from the internal setting for MARC-A POWER MODULE, error message appears on the touch panel.



Input voltage link error



Turn OFF the input power supply and check the input voltage.



As for MARC-A POWER MODULE with error LED, check the internal setting for switching between 200 V/400 V. (P.21)

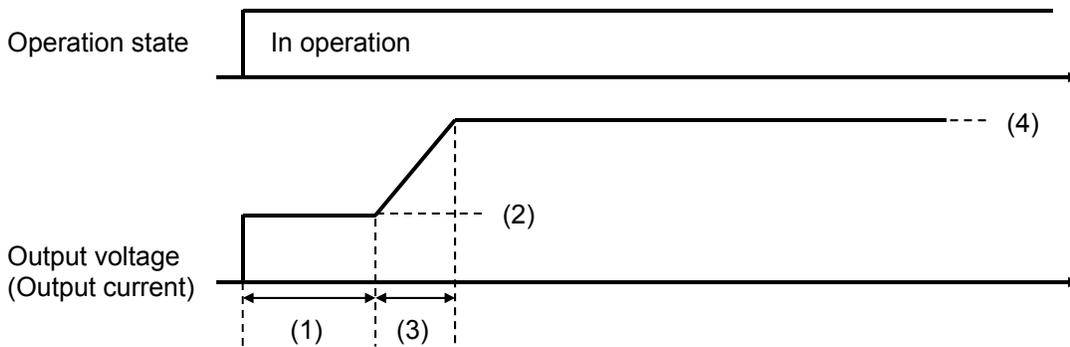
Using DC Output

DC output

- The operation for use is easy.
- Supports crossover control where output voltage and output current can be controlled respectively. There are two modes for the output control, CV mode (constant voltage) and CC mode (constant current).
 - Output voltage is set in CV mode, while output current is set by CC mode.
 - When set at CV mode, set voltage is output. The current varies depending on the load. When the current reaches the current value (upper limit) set in CC mode, operation is done in CC mode.
 - When set at CC mode, set current is output. The voltage varies depending on the load. When the voltage reaches the voltage value (upper limit) set in CV mode, operation is done in CV mode.
- Operation data can be changed/adjusted during operation.
 - Output setting value to be changed can be changed by selecting an operation mode (CC/CV).

Output sequence (low current start/soft start)

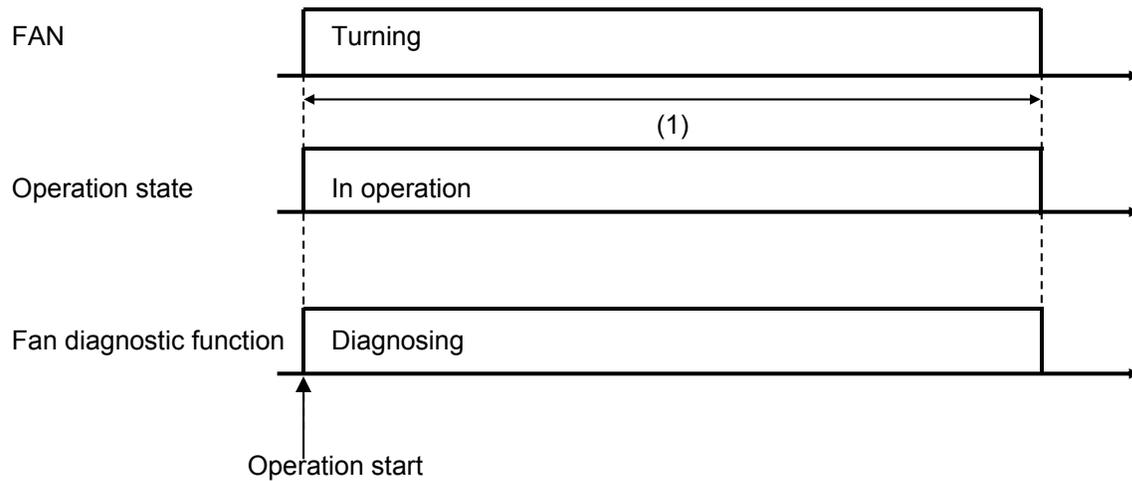
Output sequence consists of low current start/soft start.



- (1) Low current time at start
Time of low current operation at start of operation. Set by parameter No.2 (low current time at start)
The unit for time of low current at start can be set by parameter. (P.33)
- (2) Set value for low current at start
Output setting value for low current at start.
When parameter No.3 (startup weak current mode) is 0 : ratio
The ratio against the output setting value is set by parameter No.4 (low current ratio at start).
(Setting value for low current at start = (Output setting value) x (low current ratio at start))
When parameter No.3 (startup weak current mode) is 1: value
The output current at low current at start in CC mode is set in parameter No.4 (low current value at start).
The output voltage at low current at start in CV mode is set in parameter No.5 (low voltage value at start).
- (3) Slope time/soft start time
Soft start time after low current at start.
Set by operation data slope time or parameter No.7 (soft start time). If slope time is set at 0, parameter No.7 (soft start time) is used.
- (4) Output set value
Output setting value under steady state.

Fan diagnostic function

- The product has a fan diagnostic function.
The fan diagnostic function monitors the state of FAN turning and the state of power supply to FAN.
- The sequence of the fan diagnostic function is as follows.



(1) Fan diagnostic function

- The fan diagnostic function is constantly valid during operation.
- The fan diagnostic function is invalid during stop.
- In the event of error in fan, FAN error message appears. (P.48)

Inputting operation data (CC mode)

1 Select CV mode or CC mode.

- Press  and select CV mode.

CV Mode → 

CC mode → 



2 Setting of output voltage.
(Setting of output voltage upper limit)

- Press  and select "SET/RUN."




- The output setting value for CV mode blinks in the upper space.




15.3

Output set value

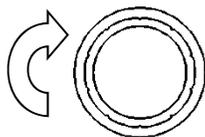
VA



VA

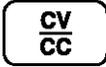
Example) If the output voltage upper limit at CV mode is 15.3 V

- Turn the jog dial to set the output value.



- The range of output voltage setting is 0 - (rated voltage x 102%).

3 Setting of output current.

- Press  and select CC mode.

- The output setting value for CC mode blinks in the upper space.

400

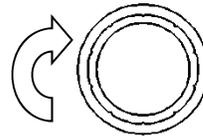
Output set value

VA

VA

Example) If the output setting at CC mode is 400 A

- Turn the jog dial to set the output value.



- The range of output current setting is 0 - (rated current x 102%).

4 Setting of slope time.

- Press  and select "SLP.TIM."






- The slope time blinks in the upper space.

10

Slope time



M

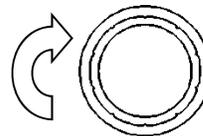
S

%

H

Example) If the slope time is 10 seconds

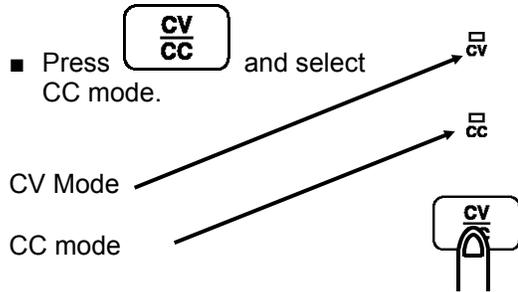
- Turn the jog dial to set the slope time.



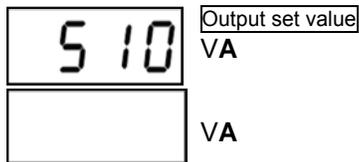
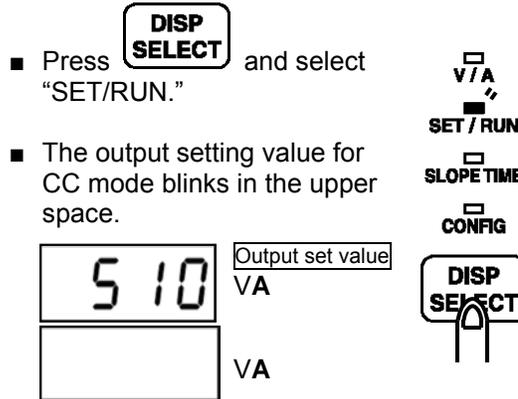
- The range of slope time setting is
0 - 9999 seconds
(when parameter No.6 is 0: second),
0 - 9999 minutes
(when parameter No.6 is 1: minute).

Inputting operation data (CV mode)

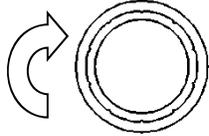
1 Select CV mode or CC mode.



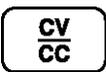
2 Setting of output current.
(Setting of output current upper limit)



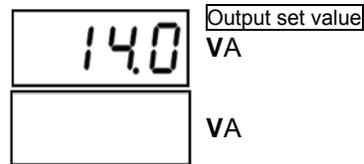
Example) If the output current upper limit at CC mode is 510 A

- Turn the jog dial to set the output value.
- 
- The range of output current setting is 0 - (rated current x 102%).

3 Setting of output voltage.

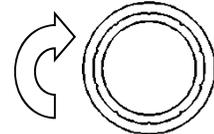
- Press  and select CV mode.

- The output setting value for CV mode blinks in the upper space.



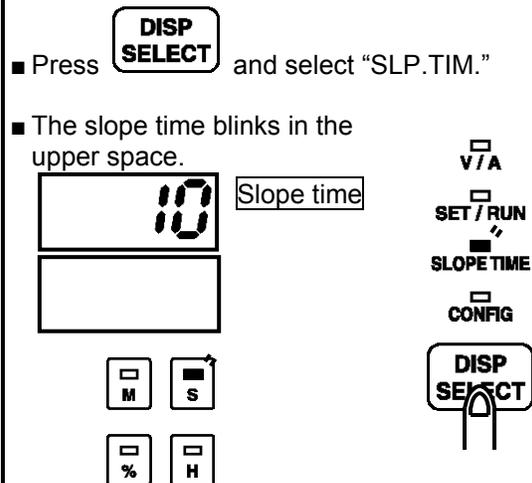
Example) If the output setting value at CV mode is 14.0 V

- Turn the jog dial to set the output value.



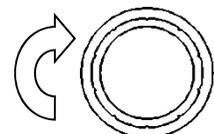
- The range of output voltage setting is 0 - (rated voltage x 102%).

4 Setting of slope time.



Example) If the slope time is 10 seconds

- Turn the jog dial to set the slope time.

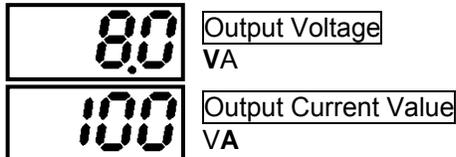


- The range of slope time setting is 0 - 9999 seconds (when parameter No.6 is 0: second), 0 - 9999 minutes (when parameter No.6 is 1: minute).

Starting/stopping

Starting (operation start)

- Press  to turn ON and start operation.
- At the start of operation, the screen is switched to the “V/A” screen. In the “V/A” screen, output voltage is indicated in the upper space. Output current is indicated in the lower space.



Example) If output voltage is 8.0 V and output current is 100 A

- Operation data items can be changed during operation.
- In the “V/A” screen, the output setting can be changed by turning the jog dial. During this operation, measured output value remains indicated. For changing output setting while monitoring the output setting, use the “SET/RUN” screen. Set according to inputting operation data (P.29).
- During operation, the START lamp is illuminated.
- During operation, CC lamp or CV lamp of the current mode is illuminated.

Stopping (operation stop)

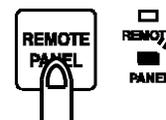
- Press  again to turn OFF and stop operation.
- At the stop of operation, the screen is switched to the “SET/RUN” screen. The screen at operation stop can be selected via parameter. (P.34)
- During stop, the START lamp is OFF.



Switching between local and remote operation

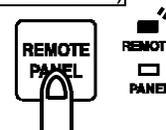
Main unit operation via touch panel (panel mode)

- Press  2 times and select “PANEL.”



Remote operation using external signals and external communication (remote mode)

- Press  2 times and select “REMOTE.”



Changing the Configuration Settings

Parameters

- Configuration settings (parameters) are stored in the internal memory of the product.
- Parameter number is allotted to each item.
In changing configuration settings, change the parameter value of the applicable parameter number.

Changing parameters

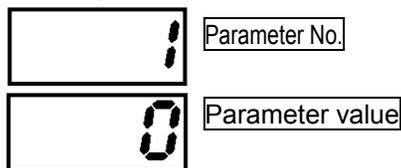
1 Switch the operation mode to CONFIG mode.

- Hold down **DISP SELECT** (for 2 seconds) and select "CONFIG."



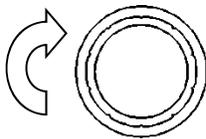
2 Select parameter number/parameter value.

- The parameter number blinks in the upper space.
- The parameter value is indicated in the lower space.



Example) If parameter number is 1 and parameter value is 0

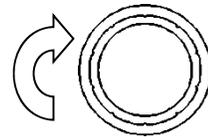
- Turn the jog dial to select the parameter number to be edited.



- The figure in the lower space blinks if

SET is pressed.

Turn the jog dial and input the parameter value.



- Press **SET** to determine the input parameter value and move on to the next parameter number.
- The figure in the upper space blinks again if **CLEAR** is pressed, allowing selection of the parameter number to be edited. On this occasion, existing parameter value is destroyed.
- Press **DISP SELECT** to end the CONFIG mode.

3 Saving parameters

- Hold down **SET** (for 2 seconds) after completion of parameter input.

Parameter is saved in the internal memory by this operation.

⚠ If the input switch is turned OFF without this operation, the parameter data returns to the data before editing.

⚠ Parameter cannot be saved during operation.

List of parameters

No.	Item	Setting range	Initial value
1	Unit of low current time at start	0: second/1: minute	0
2	Low current time at start	0~9999	0
3	Low current mode at start	0: ratio/1: value	0
4	Ratio of low current at start (low current value at start)	(*1)	0
5	Low voltage value at start	(*2)	0
6	Unit of slope time	0: second/1: minute	0
7	Soft start time	0~9999	0
8	(System reservation)		0
9	(System reservation)		0
10	(System reservation)		1
11	(System reservation)		0
12	Unit of conduction time	0: second/1: minute	0
13	(System reservation)		1
14	(System reservation)		0
15	(System reservation)		0
16	(System reservation)		10
17	Standard on output error detection	0: Setting value/1: Rated value	0
18	Ratio of output error detection	0 - 99% (0: Detection prohibited)	0
19	Time limit for output error detection	0 - 99 seconds (0: instantaneous)	5
20	Output operation at output error	0 - 2 (*3)	1
21	Detection range at output error	0 - 1 (*4)	0
22	(System reservation)		0
23	Ratio of excessive output error detection	0 - 102% (0: Detection prohibited)	0
24	Ratio of insufficient output error detection	0 - 102% (0: Detection prohibited)	0
25	Time limit for excessive/insufficient output error detection	0 - 99 seconds (0: Instantaneous)	5
26	Output operation at excessive/insufficient output error	0 - 2 (*3)	1
27	Detection range of excessive/insufficient output error	0 - 1 (*4)	0
28	(System reservation)		0
29	Output operation at recovery from abnormal temperature	0: stop/1: automatic recovery	0
30	Output operation at recovery from abnormal input voltage	0: stop/1: automatic recovery	1
31	Holding of error indications	0: No/1: Yes	0
32	(System reservation)		0
33	(System reservation)		0
34	(System reservation)		0
35	(System reservation)		0
36	(System reservation)		0
37	(System reservation)		0
38	(System reservation)		0
39	(System reservation)		120
40	(System reservation)		1

(Continued on next page)

No.	Item	Setting range	Initial value
41	Output control at power ON	0: continued/1: stopped	0
42	How to use external operation signals	0 - 1 (*5)	0
43	Buzzer output control	0 - 2 (*6)	0
44	V/A indication at stop	0:V/A/1:SET/RUN	0
45	(System reservation)		0
46	Communication address	0 - 31 (0: for remote controller)	0
47	Communication transmission speed	6 - 15 (*11)	8
48	Communication mode setting	6 - 11 (*12)	8
49	Addition of communication data CR code	0: No/1: Yes	0
50	Communication data BCC check	0: No/1: Yes	1
51	Reception time out duration	100~9999 mS	500
52	(System reservation)		0
53	Transmission standby time	0~999 mS	0
54	Communication data byte order	0:LSB/1:MSB	0
55	(System reservation)		1
56	(System reservation)		0
57	(System reservation)		0
58	Operation at fan error	0: stopped/1: continued	1
59	Operation at fan power supply error	0: stopped/1: continued	1
60	(System reservation)		0
61	(System reservation)		0
62	(System reservation)		0
63	Number of parallel connection P.M. units	1~6	1
64	(System reservation)		1
65	Upper limit of voltage setting value	10~102	102
66	Upper limit of current setting value	10~102	102

- *1 ■ When parameter No.3 (low current mode at start) is 0 : ratio, the parameter is used as low current ratio at start. The setting range for low current ratio at start is 0 - 99%.
 ■ When parameter No.3 (low current mode at start) is 1: value, the parameter is used as low current value at start. The setting range for low current value at start is shown below.

Unit of output current	Setting range
1 A	0~9999 A

- *2 When parameter No.3 (low current mode at start) is 1: value, the parameter is used as low voltage value at start. The setting range for low voltage value at start is shown below.

Unit of output voltage	Setting range
0.1 V	0.0~999.9 V

- *3 0: stopped/1: continued/2: continued (no error indication)
 *4 0: steady state only/1: Constantly (including transient state)
 *5 0: edge signal (constant)/1: edge signal/2: system reservation/3: system reservation /4: systemreservation
 *6 0: rumbling/1: continuous sound only is silenced/2: silenced
 *11 6: 2400 bps/7: 4800 bps/8: 9600 bps/9: system registration/
 10: 19200 bps/11: system registration/12: 38400 bps/13: 57600 bps/
 14: 76800 bps/15:115200 bps
 *12 6: Start bit: 1 bit, data length bit: 8 bits, no parity, stop bit: 1 bit
 7: Start bit: 1 bit, data length bit: 8 bits, odd parity, stop bit: 1 bit
 8: Start bit: 1 bit, data length bit: 8 bits, even parity, stop bit: 1 bit
 9: Start bit: 1 bit, data length bit: 8 bits, no parity, stop bit: 2 bits
 10: Start bit: 1 bit, data length bit: 8 bits, odd parity, stop bit: 2 bits
 11: Start bit: 1 bit, data length bit: 8 bits, even parity, stop bit: 2 bits

Description of parameters

■MARC-A CONTROL MODULE

Set by parameter No.1: Unit of low current time at start

(Contents) Unit of parameter No.2 (low current time at start) is set.
(Setting) 0: second/1: minute

Parameter No.2: Low current time at start

(Contents) Low current time at start is set.
(Setting) 0 - 9999 seconds (When parameter No.1 (Unit of low current time at start) is 0: second)
0 - 9999 minutes (When parameter No.1 (Unit of low current time at start) is 1: minute)

Set by parameter No.3: Low current mode at start

(Contents) Calculation method of set value for low current at start is set.
(Setting) 0: ratio/1: value

Parameter No.4: Ratio of low current at start (low current value at start)

(Contents) Ratio of low current at start or low voltage value at start is set.
(Setting) When parameter No.3 (low current mode at start) is 0 : ratio, the parameter is used as low current ratio at start. The setting range for low current ratio at start is 0 - 99%.
When parameter No.3 (low current mode at start) is 1: value, the parameter is used as low current value at start. The setting range for low current value at start is shown below.

Unit of output current	Setting range
1 A	0~9999 A

Parameter No.5: Low voltage value at start

(Contents) Low voltage value at start is set.
(Setting) When parameter No.3 (low current mode at start) is 1: value, the parameter is used as low voltage value at start. The setting range for low voltage value at start is shown below.

Unit of output voltage	Setting range
0.1 V	0.0~999.9 V

Parameter No.6: Unit of slope time

(Contents) Unit is set for slope time/parameter No.7 (soft start time).
(Setting) 0: second/1: minute

Parameter No.7: Soft start time

(Contents) Soft start time is set.
(Setting) 0 - 9999 seconds (When parameter No.6 (Unit of slope time) is 0: second)
0 - 9999 minutes (When parameter No.6 (Unit of slope time) is 1: minute)

Parameter No.8: (System reservation)

Parameter No.9: (System reservation)

Parameter No.10: (System reservation)

Parameter No.11: (System reservation)

Parameter No.12: Unit of conduction time

(Contents) Unit of conduction time (communication data) is set.
Can be used in communication data.
(Setting) 0: second/1: minute

Parameter No.13: (System reservation)

Parameter No.14: (System reservation)

Parameter No.15: (System reservation)

Parameter No.16: (System reservation)

Parameter No.17: Standard on output error detection

(Contents) Calculation method is set for output error detection.
(Setting) 0: Setting value/1: Rated value

Parameter No.18: Ratio of output error detection

(Contents) Ratio is set for output error detection.
(Setting) 0 - 99% (0: Detection prohibited)

Parameter No.19: Time limit for output error detection

(Contents) Time limit is set for output error detection.
(Setting) 0 - 99 seconds (0: Instantaneous)

Parameter No.20: Output operation at output error

(Contents) Output operation at output error is set.
(Setting) 0: Stopped
In the event of output error, operation is stopped and error message appears on the touch panel.
1: Continued
In the event of output error, operation is continued and error message appears on the touch panel.
2: Continued (no error indication)
In the event of output error, operation is continued and error message does not appear.

Parameter No.21: Detection range at output error

(Contents) Output operation at output error is set.
(Setting) 0: Steady state only
Output error is not detected during low current at start and slope (soft start).
1: Constantly (including transient state)
Output error is also detected during low current at start and slope (soft start).

Parameter No.22: (System reservation)

Parameter No.23: Ratio of excessive output error detection

(Contents) Ratio is set for excessive output error detection
(Setting) 0 - 102% (0: Detection prohibited)

Parameter No.24: Ratio of insufficient output error detection

(Contents) Ratio is set for insufficient output error detection
(Setting) 0 - 102% (0: Detection prohibited)

Parameter No.25: Time limit for excessive/insufficient output error detection

(Contents) Time limit for excessive/insufficient output error detection is set.
(Setting) 0 - 99 seconds (0: Instantaneous)

Parameter No.26: Output operation at excessive/insufficient output error

(Contents) Output operation at excessive/insufficient output error is set.

(Setting) 0: Stopped

In the event of excessive/insufficient output error, operation is stopped and error message appears on the touch panel.

1: Continued

In the event of excessive/insufficient output error, operation is continued and error message appears on the touch panel.

2: Continued (no error indication)

In the event of excessive/insufficient output error, operation is continued and error message does not appear.

Parameter No.27: Detection range of excessive/insufficient output error

(Contents) Output operation at excessive/insufficient output error is set.

(Setting) 0: Steady state only

Excessive/insufficient output error is not detected during low current at start and slope (soft start).

1: Constantly (including transient state)

Excessive/insufficient output error is also detected during low current at start and slope (soft start).

Parameter No.28: (System reservation)

Parameter No.29: Output operation at recovery from abnormal temperature

(Contents) Output operation at recovery from abnormal temperature is set.

(Setting) 0: Stopped

Operation remains stopped after recovery from abnormal temperature.

1: Automatic recovery

Operation is restarted after recovery from abnormal temperature.

Parameter No.30: Output operation at recovery from abnormal input voltage

(Contents) Output operation at recovery from abnormal input voltage (or input phase loss) is set.

(Setting) 0: Stopped

Operation remains stopped after recovery from abnormal input voltage (or input phase loss).

1: Automatic recovery

Operation is restarted after recovery from abnormal input voltage (or input phase loss).

Parameter No.31: Holding of error indications

(Contents) Holding of error indications is set

(Setting) 0: No

Holding of error indications is done after recovery from error.

1: Yes

Holding of error indications is also done after recovery from error.

Parameter No.32: (System reservation)

Parameter No.33: (System reservation)

Parameter No.34: (System reservation)

Parameter No.35: (System reservation)

Parameter No.36: (System reservation)

Parameter No.37: (System reservation)

Parameter No.38: (System reservation)

Parameter No.39: (System reservation)

Parameter No.40: (System reservation)

Parameter No.41: Output control at power ON

(Contents) Output control at recovery from power failure is set.

(Setting) 0: Continued

In the event of power failure during operation, operation is restarted after recovery from power failure.

1: Stopped

In the event of power failure during operation, operation remains stopped after recovery from power failure.

Parameter No.42: How to use external operation signals

(Contents) Use method is set for external operation signals.

(Setting) 0: Edge signals (constant)

Operation is started when external operation signal changes from OFF to ON.

Operation is stopped when external operation signal changes from ON to OFF.

External operation signals are valid in both panel mode and remote mode.



Changes in external operation signals are detected, and if external operation signals change during power failure, external operation signals are ignored.

1: Edge signals

Operation is started when external operation signal changes from OFF to ON.

Operation is stopped when external operation signal changes from ON to OFF.

External operation signals are valid only in remote mode.



Changes in external operation signals are detected, and if external operation signals change during power failure, external operation signals are ignored.

2: (System reservation)

3: (System reservation)

4: (System reservation)

Parameter No.43: Buzzer output control

(Contents) Buzzer activation/no-activation is set.

(Setting) 0: rumbling/1: continuous sound only is silenced/2:silenced

Parameter No.44: V/A indication at stop

(Contents) Indication mode is set for start/stop.

(Setting) 0: "V/A" screen

At the start of operation, the screen is switched to the "V/A" screen.

At the stop of operation, the screen is switched to the "SET/RUN screen."

1: "SET/RUN" screen

At the start/stop of operation, the screen is switched to the "SET/RUN" screen.

Parameter No.45: (System reservation)

Parameter No.46: Communication address

(Contents) Communication address is set.

(Setting) 0 - 31 (address 0 is for remote controller box.)

Parameter No.47: Communication transmission speed

(Contents) Communication transmission speed is set.

(Setting) 6: 2400 bps/7: 4800 bps/8: 9600 bps/9: system registration/

10: 19200 bps/11: system registration/12: 38400 bps/13: 57600 bps/

14:76800 bps/15:115200 bps

Parameter No.48: Communication mode setting

- (Contents) Communication mode is set.
(Setting) 6: Start bit: 1 bit, data length bit: 8 bits, no parity, stop bit: 1 bit
7: Start bit: 1 bit, data length bit: 8 bits, odd parity, stop bit: 1 bit
8: Start bit: 1 bit, data length bit: 8 bits, even parity, stop bit: 1 bit
9: Start bit: 1 bit, data length bit: 8 bits, no parity, stop bit: 2 bits
10: Start bit: 1 bit, data length bit: 8 bits, odd parity, stop bit: 2 bits
11: Start bit: 1 bit, data length bit: 8 bits, even parity, stop bit: 2 bits

Parameter No.49: Addition of communication data CR code

- (Contents) Presence/no-presence is set for communication data CR code.
(Setting) 0: Not present(No)/1: Present(Yes)

Parameter No.50: Communication data BCC check

- (Contents) Presence/no-presence is set for communication data BCC check
(Setting) 0: Not present(No)/1: Present(Yes)



0: Even if not present is selected, BCC transmission is required.

Parameter No.51: Reception time out duration

- (Contents) Time out duration is set for data reception.
(Setting) 100~9999 mS

Parameter No.52: (System reservation)

Parameter No.53: Transmission standby time

- (Contents) Data transmission standby time is set.
(Setting) 0~999 mS

Parameter No.54: communication data byte order

- (Contents) Transmission data byte order is set.
(Setting) 0: LSB/1: MSB

Parameter No.55: (System reservation)

Parameter No.56: (System reservation)

Parameter No.57: (System reservation)

Parameter No.58: Operation at fan error

- (Contents) Output operation at fan error is set.
(Setting) 0: Stopped
In the event of fan error, operation is stopped and error message appears on the touch panel.
1: Continued
In the event of fan error, operation is continued and error message appears on the touch panel.

Parameter No.59: Operation at fan power supply error

- (Contents) Output operation at fan power supply error is set.
(Setting) 0: Stopped
In the event of fan power supply error, operation is stopped and error message appears on the touch panel.
1: Continued
In the event of fan power supply error, operation is continued and error message appears on the touch panel.

Parameter No.60: (System reservation)

Parameter No.61: (System reservation)

Parameter No.62: (System reservation)

Parameter No.63: P.M. parallel connection number

(Contents) Number of connected power modules (P.M.) is set for parallel operation.
(Setting) : 1~6



If the number of connected units is changed, be sure to turn OFF the rectifier and then turn it ON.

Setting change on the number of connected units is not enabled unless power is turned OFF.



The parameter is automatically changed also when the number of connected units is set via setting of connected units (change via rotor switch).

Parameter No.64: (System reservation)

Parameter No.65: Upper limit of voltage setting value

(Contents) Upper limit is set for output voltage setting range.
Setting of output voltage exceeding the upper limit becomes impossible.
(Setting) : 10~102%

Parameter No.66: Upper limit of current setting value

(Contents) Upper limit is set for output current setting range.
Setting of output current exceeding the upper limit becomes impossible.
(Setting) : 10~102%

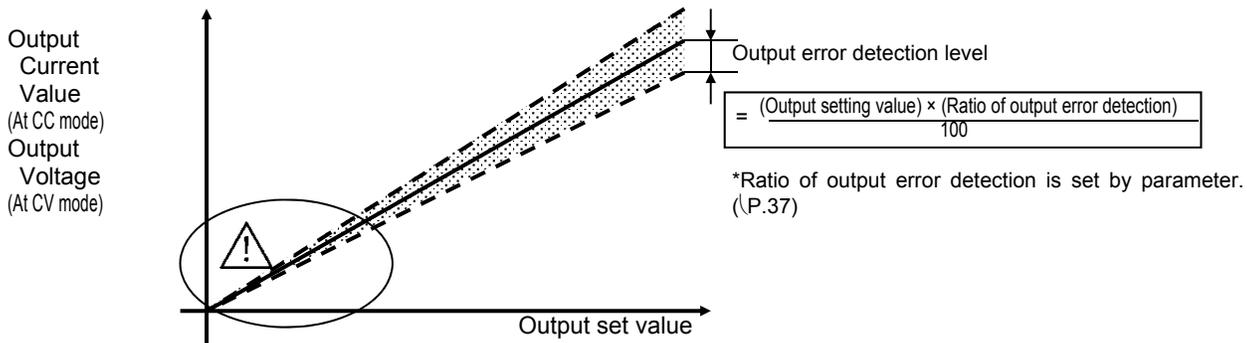
Alarm Function

Using output error detection

- In output error detection, the error between output setting value and output current value is monitored in CC mode.
The error between output setting value and output voltage value is monitored in CV mode.
- For output error detection level, ratio against set value or ratio against rated value can be selected.

In case of ratio against set value (parameter 17 is 0: set value)

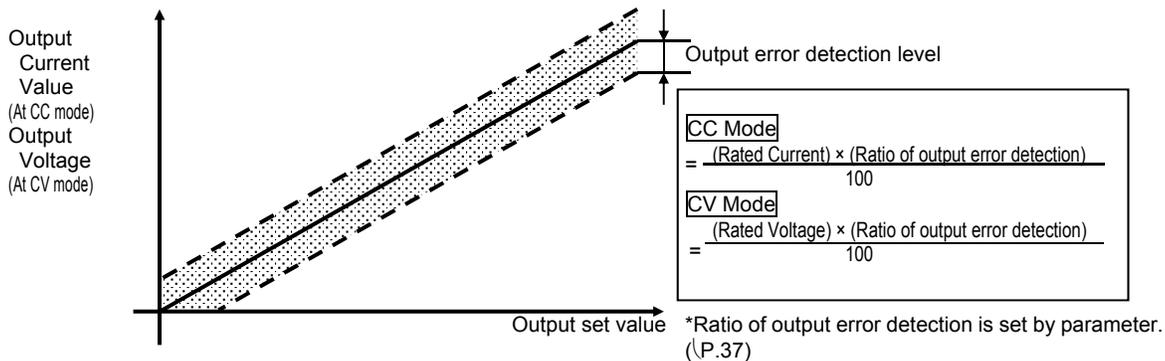
- If output voltage value (output current value) remains outside the  range for 5 seconds, output error occurs.



- ⚠ If ratio against set value is selected for output error detection, detection error could occur because output error detection level becomes very low in the low output range. If detection error occurs, increase the ratio of output error detection or select ratio against rated value for output error detection.

In case of ratio against rated value (parameter 17 is 1: rated value)

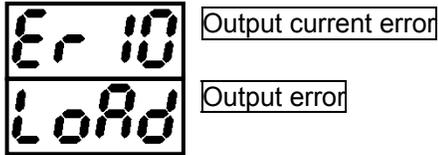
- If output voltage value (output current value) remains outside the  range for 5 seconds, output error occurs.



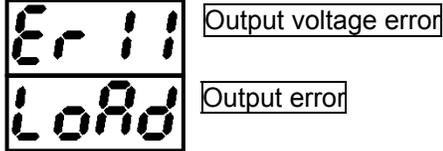
- When output voltage (output current) returns to the  range, the output error is cancelled.
- Output error detection is done only during steady operation.
Note that parameters can be set so that output error detection is conducted during low current at start or slope (soft start). (P.33)
- The time limit for output error detection can be changed via parameters. (P.33)
- Because output voltage value (output current value) contains an error of ± 1 dgt, output error sometimes occurs in the vicinity of threshold values (inside dotted lines).

If output error occurs

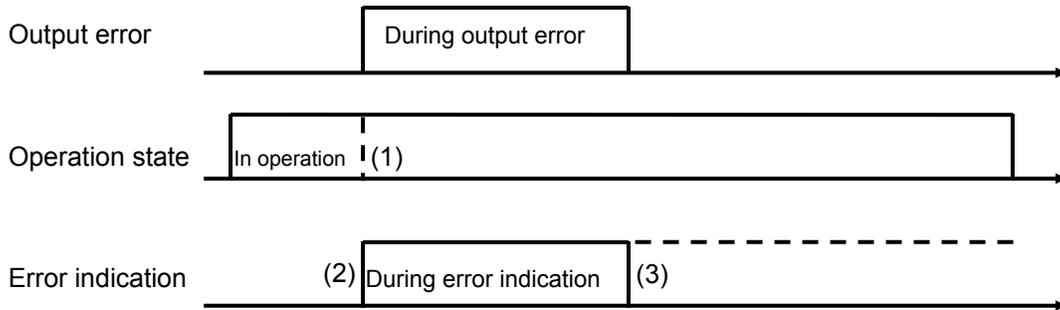
- The following error message appears on the touch panel if set at CC mode.



- The following error message appears on the touch panel if set at CV mode.



Output sequence for any output error generated



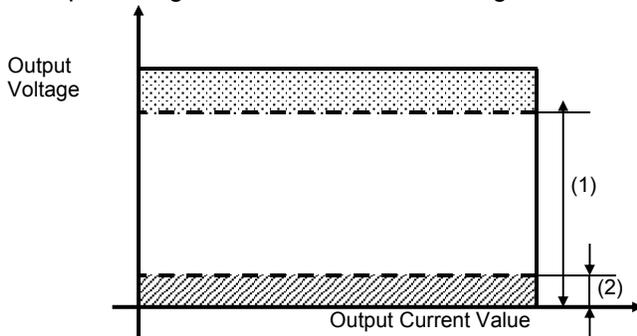
- (1) Operation is continued even if output error occurs.
It is possible to change so that operation is stopped responding to error via parameter. (P.33)
- (2) In the event of output error, error message appears and buzzer is activated.
It is possible to stop error indication and buzzer activation via parameter. (P.34)
- (3) When output error is cancelled, error indication is reset.
It is possible to change so that error indication is held after recovery from error via parameter. (P.33)

Using output over/under error detection

- In excessive/insufficient output error detection, excessive/insufficient output voltage is monitored in CC mode.
Excessive/insufficient output current is monitored in CV mode.

CC Mode

- If output voltage remains in the  range for 5 seconds, an excessive output error occurs.
- If output voltage remains in the  range for 5 seconds, an insufficient output error occurs.



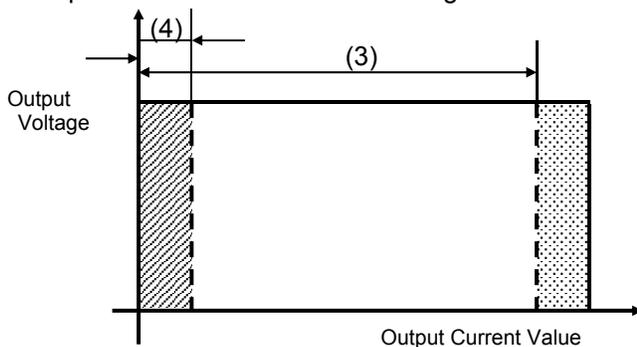
$$(1) \text{ Excessive output error detection level} = \frac{(\text{Rated voltage}) \times (\text{Ratio of excessive output error detection})}{100}$$

$$(2) \text{ Insufficient output error detection level} = \frac{(\text{Rated voltage}) \times (\text{Ratio of insufficient output error detection})}{100}$$

* The ratios for output over error detection and output under error detection is set in the parameters.
(P.37)

CV Mode

- If output current enters the  range and remains for 5 seconds, an output over error occurs.
- If output current enters the  range and remains for 5 seconds, an output under error occurs.



$$(3) \text{ Output Over Error Detection Level} = \frac{(\text{Rated Current}) \times (\text{Output Over Error Detection Ratio})}{100}$$

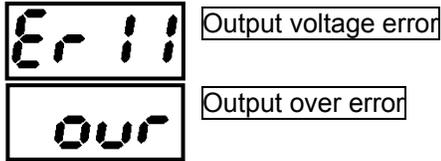
$$(4) \text{ Output Under Error Detection Level} = \frac{(\text{Rated Current}) \times (\text{Output Under Error Detection Ratio})}{100}$$

*The ratios for output over error detection and output under error detection is set in the parameters.
(P.37)

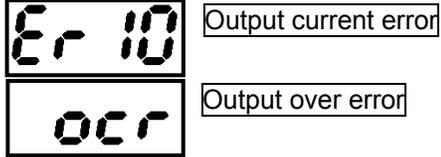
- When output is no longer in the   range, the output over/under error is canceled.
- Output over/under error detection is done only during normal operation.
Note that parameters can be set so that output over/under error detection is conducted during low current start or during a sloping start (soft start). (P.33)
- The time limit for output over/under error detection can be changed via parameters. (P.33)
- Because output voltage value (output current value) contains an error of ± 1 dgt, output over/under error sometimes occurs in the vicinity of threshold values (along dotted lines).

When an output over error occurs

- The following error message appears on the touch panel if set at CC mode.

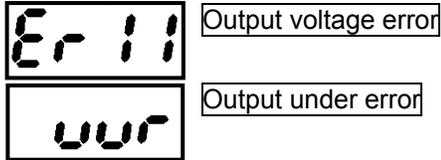


- The following error message appears on the touch panel if set at CV mode.

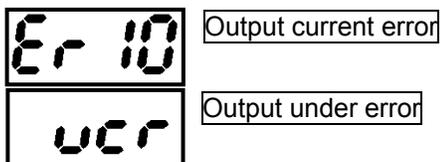


When an output under error occurs

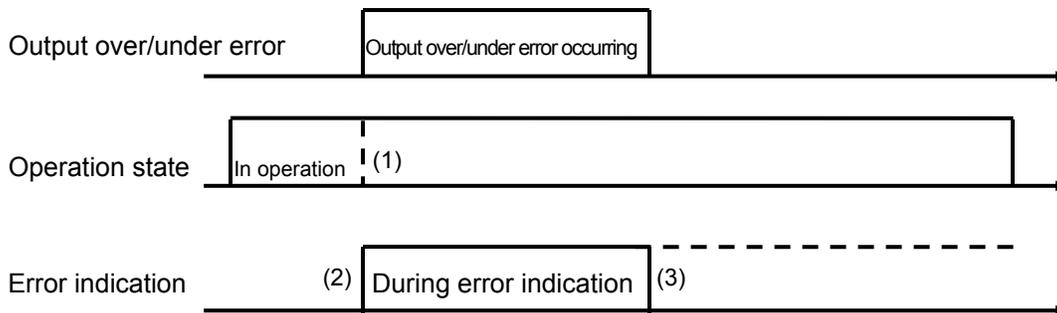
- The following error message appears on the touch panel if set at CC mode.



- The following error message appears on the touch panel if set at CV mode.



Output sequence for any output over/under error generated



- (1) Operation is continued even if output over/under error occurs.
It is possible to change so that operation is stopped responding to error via parameter. (P.33)
- (2) In the event of an output error, an error message appears and buzzer is activated.
It is possible to stop error indication and buzzer activation via parameter. (P.34)
- (3) When an output over/under error is cancelled, error indication is reset.
It is possible to change so that error indication is held after recovery from error via parameter. (P.33)

Input voltage and input open phase errors

This product constantly monitors input voltage and where input voltage exceeds the input voltage range, or where there is an open phase, the product suspends operation and displays an error message.

Input voltage range

- If set to 200 V system, range is set as 180 VAC to 264 VAC.
- If set to 400 V system, range is set as 342 VAC to 528 VAC.

Where voltage exceeds the upper limit of the input voltage range (input voltage over)

- The following error message appears on the touch panel.

Er 08 Input voltage error

o u r Input voltage over

Where voltage is under the lower limit of the input voltage range (input voltage under)

- The following error message appears on the touch panel.

Er 08 Input voltage error

u u r Input voltage under

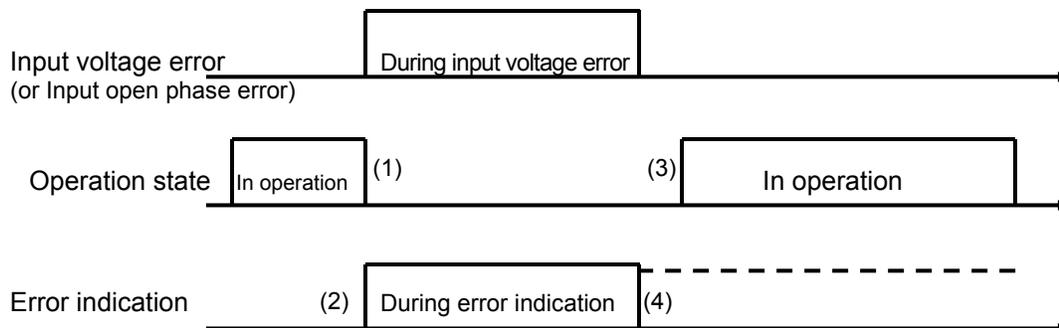
Where input voltage has open phase (input open phase)

- The following error message appears on the touch panel.

Er 15 Input open phase error

O P E n Input open phase error

Output sequence for any input voltage or input open phase error generated



- (1) If an input voltage error (or input open phase error) occurs during operation, operation will be suspended.
- (2) In the event of an input voltage error (or an input open phase error), an error message appears and a buzzer is activated.
- (3) Once input voltage returns to normal, operation will be resumed if machine was in operation prior to error.
It is possible to change parameters so that operation remains suspended even after recovering from the error state. (P.33)
- (4) When input voltage returns to normal, error display is reset.
It is possible to change so that error indication is held after recovery from error via parameter. (P.33)

Fan errors

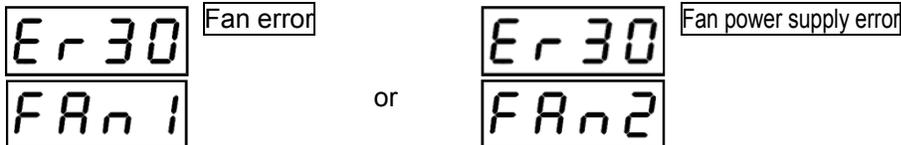
During fan operation, the fan diagnostic function monitors the state of FAN.
In the event of error in the fan, the fan stops and an error message appears.



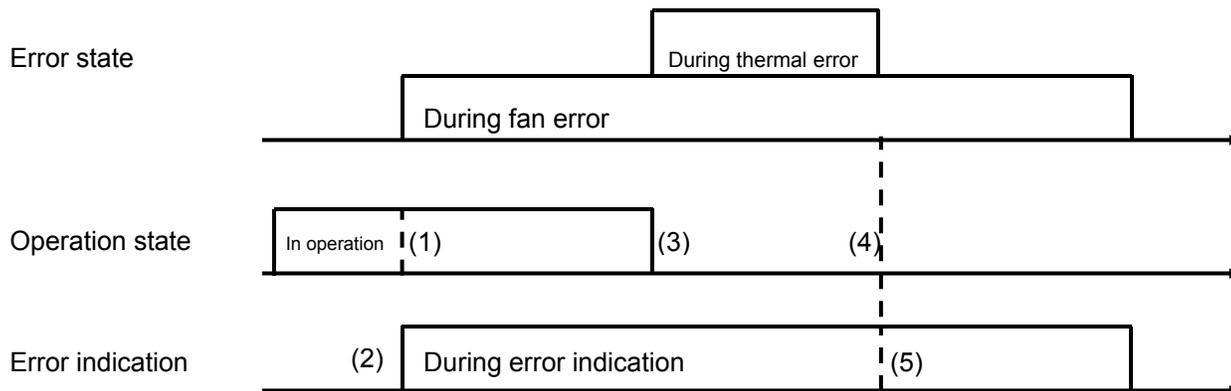
- In the event that a fan error message is displayed, contact the manufacturer.

When a Fan error occurs

- The following error message appears on the touch panel.



Output sequence for any fan error generated



- (1) In the event of a fan error, operation will be continued if product was in operation.
- (2) In the event of a fan error, an error message appears and the buzzer is activated.
- (3) Due to the fan stopping, internal temperature will exceed specified levels, and a thermal error will occur. In the event of a thermal error, operation will be suspended if product was in operation.
- (4) Even after internal temperatures returns to normal, operation will remain suspended.
Note that Parameter No. 29 can be changed so that operation can be resumed after recovering from error state if the product was in operation prior to the error. (P.33)
- (5) Once internal temperatures return to the correct level and the error indication for the thermal error is reset, if the fan error continues, a fan error message will be displayed.
Parameter No. 31 can be changed so that error indication is retained even after recovery from an error state.
(P.33)

Error messages

About error messages

■ In the event of an error, the product displays an error message and the buzzer is activated.

■ Even during an error, you can press **CLEAR** to stop buzzer activation.

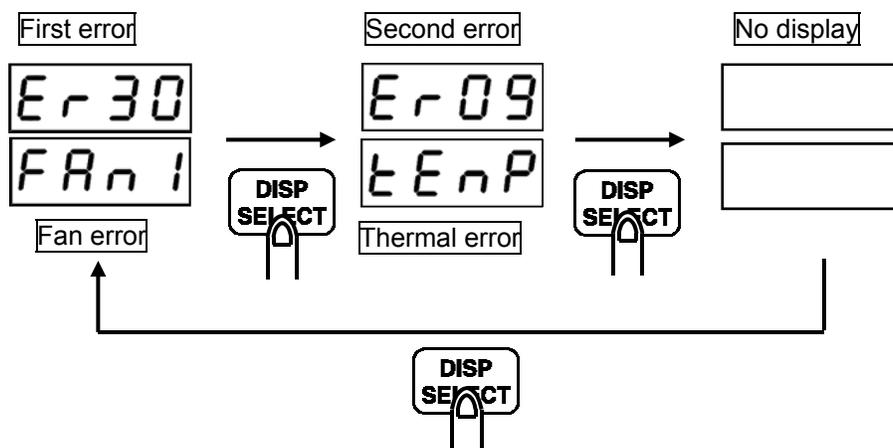
■ If Parameter No 43 is set to 1, buzzer activation can be set to null during errors. (P.34)

■ Parameter No 31 can be changed so that error indication is retained. (P.33)

■ Operation will be suspended if any of the following errors occur: WDT detection (Er01), Abnormal interruption (Er94), Primary power supply overcurrent (Er16), Input voltage error (Er08), Input open phase error (Er15), Thermal error (Er09), Internal power supply error (Er31), CAN communication error (Er22), or PWM sync timing error (Er46).

■ During multiple errors, you can press **DISP SELECT** to toggle between error messages.

Ex) During a fan error and a thermal error



List of error messages

Type of alarm	Error messages		Description	Measure
	Top	Bottom		
WDT detection	Er01	Wudt	When the main CPU hangs up and the watchdog timer is activated.	Turn the input switch OFF, then ON. If this occurs frequently, contact the manufacturer.
Thermal open error	Er04	thnc	When temperature detection errors occur	Contact the manufacturer
Circuit not adjusted	Er05	Adj	When circuit adjustment data is damaged	Contact the manufacturer
Input voltage over	Er08	our	Voltage exceeds the upper limit of the input voltage range	Check the input voltage
Input voltage under	Er08	uur	Voltage is lower than the lower limit of the input voltage range	Check the input voltage
Input open phase error	Er15	OPEN	Input voltage has an open phase, input fuse is blown	Check the input voltage Check whether the fuse is blown
Thermal error	Er09	tEnP	Where internal temperature rises above the specified level	Check whether the intake or exhaust area is clogged or if the fan is malfunctioning.
Output current error (Output over error)	Er10	ocr	During CV mode, output current goes over the output over detection level	Check the output setting and the load-side equipment.
Output current error (Output under error)	Er10	ucr	During CV mode, output current goes under the output under detection level	Check the output setting and the load-side equipment.
Output current error (Output error)	Er10	LoAd	During CC mode, the difference between output setting value and output current exceeds the output error detection level	Check the load-side equipment.
Output voltage error (Output over error)	Er11	our	During CC mode, output voltage goes over the output over detection level	Check the output setting and the load-side equipment.
Output voltage error (Output under error)	Er11	uur	During CC mode, output voltage goes under the output under detection level	Check the output setting and the load-side equipment.
Output voltage error (Output error)	Er11	LoAd	During CV mode, the difference between output setting value and output voltage exceeds the output error detection level	Check the load-side equipment.
EEPROM initialized	Er12	Pini	When EEPROM is initialized	Contact the manufacturer
EEPROM error	Er13	PErr	Where abnormal data exists in the EEPROM	Contact the manufacturer
EEPROM write error	Er14	PErr	Failed to write onto the EEPROM	Repeat the operation. If this occurs frequently, contact the manufacturer.
Primary power supply overcurrent	Er16	DCr1	When excess current flows through the internal inverter	Contact the manufacturer
Input voltage link error	Er17	LinH	Where input voltage differs from internal setting	Check the input voltage and internal setting.
Communication card error	Er20	Conn	If error is detected in the Fieldbus card.	Refer to the signaling specification document.

(Continued on next page)

Type of alarm	Error messages		Description	Measure
	Top	Bottom		
Panel CPU Communication Error	Er21	PCon	If an error is detected in signaling between the main CPU and the panel CPU	Turn the input switch OFF, then ON If this occurs frequently, contact the manufacturer.
CAN communication error	Er22	CCon	If error is detected between data communication between C.M. and P.M.	Check the module cable. Check there are no errors in the address settings and connection numbers. Turn the input switch OFF, then ON If this occurs frequently, contact the manufacturer.
Fan error	Er30	FAn1	Fan over load occurs and lock sensor activates.	Check that there are no foreign objects in the fan. If you cannot find foreign objects in the fan, contact the manufacturer.
Fan power supply error	Er30	FAn2	When a fan power supply error occurs	Contact the manufacturer
Internal power supply error	Er31	Each Power supply Error is displayed	If an internal power supply error occurs	Turn the input switch OFF, then ON If this occurs frequently, contact the manufacturer.
Clock Error	Er32	CLH	If an internal clock error occurs	Turn the input switch OFF, then ON If this occurs frequently, contact the manufacturer.
Bus Voltage correction error	Er45	bus	If a great difference occurs in the balance between the DC current in the primary power circuit (400 V system)	Turn the input switch OFF, then ON If this occurs frequently, contact the manufacturer.
PWM sync timing error	Er46	Sync	If the timing signal for syncing the PWM pulse between PMs cannot be detected.	Check the module cable. Turn the input switch OFF, then ON If this occurs frequently, contact the manufacturer.
Address overlap error	Er47	CAdr	If the address setting for the PM is overlapping	Check the address setting for the PM(s) Turn the input switch OFF, then ON If this occurs frequently, contact the manufacturer.
Connector Joint error	Er48	CLin	If the CON terminal number and the PM address setting do not match, If the connection number setting and the PM connection number setting do not match	Check the wiring and points of connection. Turn the input switch OFF, then ON If this occurs frequently, contact the manufacturer.
WDT detection	Er93	wudt	When the panel CPU hangs up and the watchdog timer is activated.	Turn the input switch OFF, then ON If this occurs frequently, contact the manufacturer.
Abnormal interruption occurs	Er94	intr	If the panel CPU detects an abnormal interruption	Turn the input switch OFF, then ON If this occurs frequently, contact the manufacturer.
Key depression error	Er95	Displays the key code being depressed	If key switch or jog dial remains depressed, or if either malfunctions	Turn the input switch OFF, then ON If this occurs frequently, contact the manufacturer.
Main CPU Signaling Error	Er99	Con	If an error is detected in signaling between the main CPU and the panel CPU	Turn the input switch OFF, then ON If this occurs frequently, contact the manufacturer.

External Signals

Connection

Control terminals

■ We recommend using solderless terminal (pin terminal or blade terminal) for connecting control terminals to control wiring.
 Select solderless terminals that match the size of the control terminal.

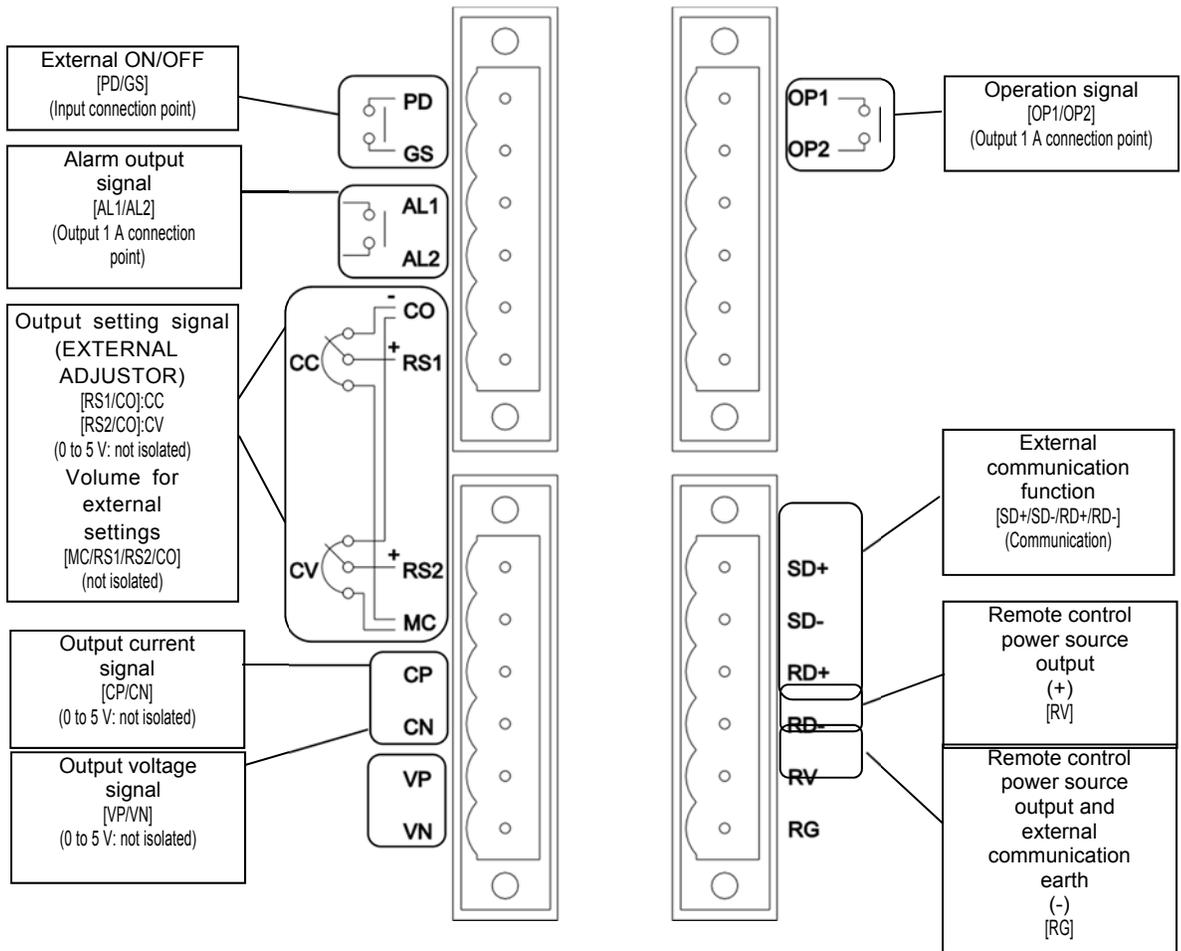
■ Turn the screw clockwise with a flat-head screwdriver to connect the control terminal to the control wiring.
 Use an M3 flat-head screwdriver.

⚠ If you do not use the appropriate flat-head screwdriver, the control wiring may detach from the control terminal.

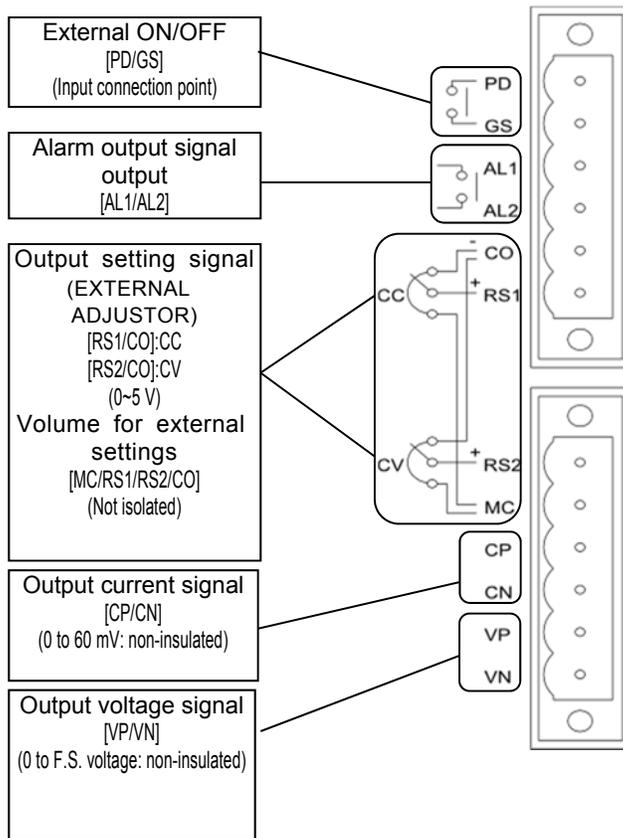
Socket: Model 'MSTB2.5/6-GF-5.08'
 (Manufacturer PHOENIX CONTACT GmbH & Co. KG)

Plug (recommended): Model 'MSTB2.5/6-STF-5.08'
 (Manufacturer PHOENIX CONTACT GmbH & Co. KG)

Control terminal for MARC-A CONTROL MODULE



Control terminal for MARC-A POWER MODULE



Control wires

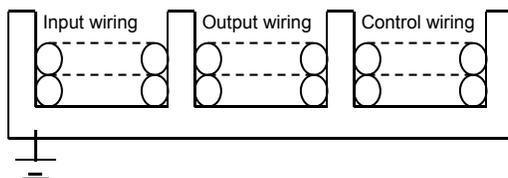
- Connection Refer to the page on control wiring. (P.23)

Solderless terminals

- We recommend using insulated solderless terminals for connections to control wiring.

Noise measures

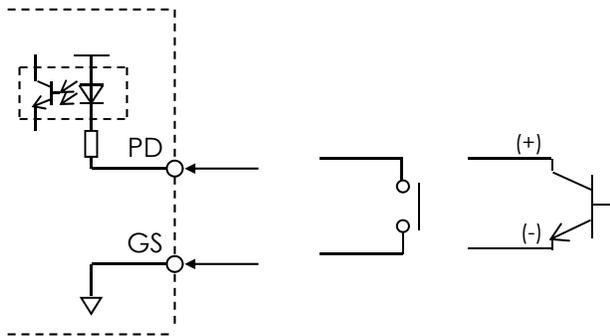
- Do not connect power wiring (input and output cables) and control wiring in a single bundle; connect them separately.



Description of external signals

External on/off (external operation signal)

CONTROL MODULE, POWER MODULE

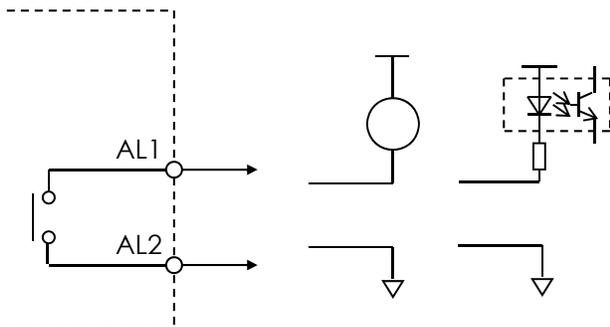


Relay outputs and transistor outputs that can open/close 30 VDC/20 mA can be connected. If using transistor outputs, take note of polarity.

- Operation is started when external operation signal changes from OFF (OPEN) to ON (SHORT).
Operation is started when external operation signal changes from ON (SHORT) to OFF (OPEN).
- ⚠ Changes in external operation signals are detected, and if external operation signals change during power failure, external operation signals are ignored.
- External operation signals are valid in both panel mode and remote mode.
- The method of using external operation signals can be changed via Parameter No 42. (P.34)

Alarm output signal

POWER MODULE, CONTROL MODULE



Maximum open/close load:
125 VAC 0.4 A
30 VDC 0.5 A
(Resistance load)

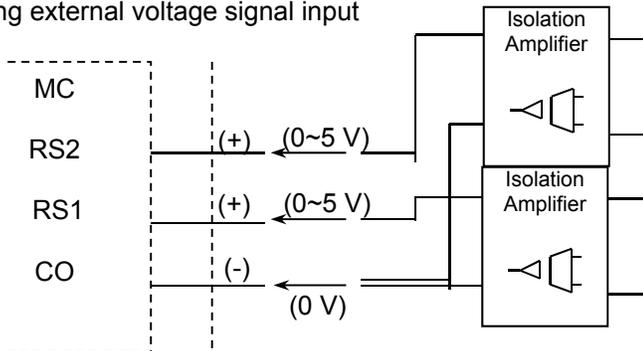
Relay inputs or photocoupler inputs can be connected.

- If an error occurs, the error signal output changes to ON (SHORT).
Once error is cancelled, the error signal output changes to OFF (OPEN).
- Error output signals are valid in both panel mode and remote mode.

Output setting signal

CONTROL MODULE, POWER MODULE

(1) During external voltage signal input

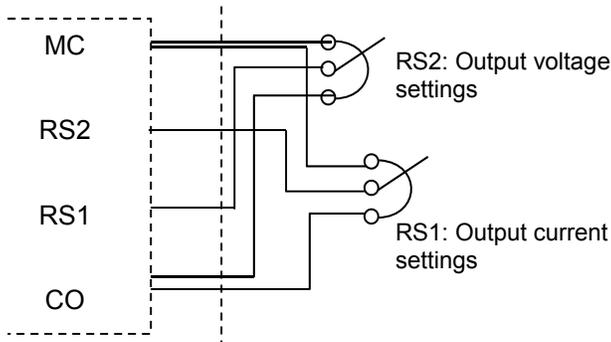


Input signal specification: 0~5 VDC
Drive capacity is 10 mA or more.
* Input the isolated signal.

⚠ Output setting signal is not isolated, so if multiple switch mode rectifiers are connected to the PLC, be sure to attach an isolation amplifier.

- By externally inputting 0 V to 5 V, you can adjust output of the switch mode rectifier. RS1 is the output current setting signal and RS2 is the output voltage setting signal.
* This signal is valid only when the rotary switch in the maintenance port is set to '0' and it is set to remote mode.
- Signal specifications have a drive capacity of 0 VDC to 5 VDC/10 mA or more.
* Input isolated signals only.

(2) While connected to volume for external settings



*Connect a volume that is about 5 k Ω (0.5 W)

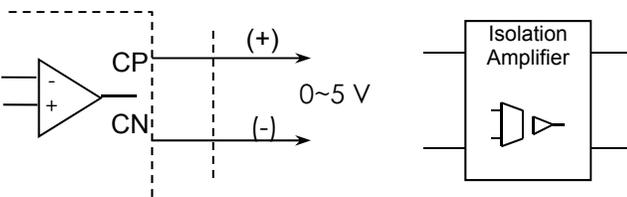
MC signal specification: 5.1 VDC, Max 5 mA

*This is a non-isolated signal.

- By connecting an external volume, you can adjust output of the switch mode rectifier.
*This signal is valid only when the rotary switch in the maintenance port is set to '0' and it is set to remote mode.
- Connect an external volume that is about 5 k Ω (0.5 W)

Output current signal

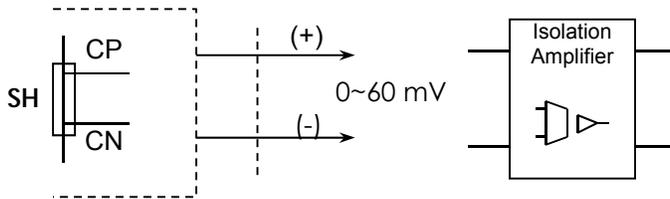
CONTROL MODULE



Output current signal is not isolated, so if multiple switch mode rectifiers are connected to the PLC, be sure to attach an isolation amplifier.

- Output via 0 VDC to 5 VDC relative to the DC output current.
* This is a non-isolated signal. When connecting external equipment, isolate before use.
- Signal specification is 0 V to 5 V/5 mA or less

POWER MODULE

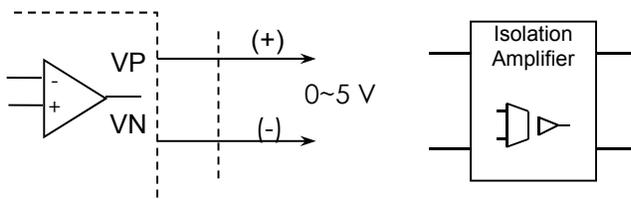


Output current signal is not isolated, so if multiple switch mode rectifiers are connected to the PLC, be sure to attach an isolation amplifier.

- Output via 0 VDC to 60 mV, relative to the DC output current.
- * This is a non-isolated signal. When connecting external equipment, isolate before use.
- Signal specification is 0 V to 60 mV/5 mA or less

Output voltage signal

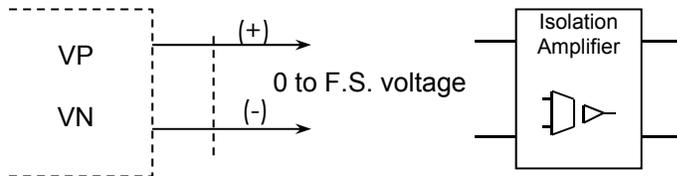
CONTROL MODULE



Output voltage signal is not isolated, so if multiple switch mode rectifiers are connected to the PLC, be sure to attach an isolation amplifier.

- Output via 0 VDC to 5 VDC relative to the DC output voltage.
- * This is a non-isolated signal. When connecting external equipment, isolate before use.
- Signal specification is 0 V to 5 V/5 mA or less

POWER MODULE

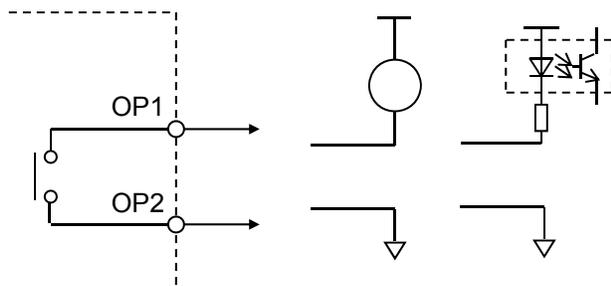


Output voltage signal is not isolated, so if multiple switch mode rectifiers are connected to the PLC, be sure to attach an isolation amplifier.

- Output via 0 VDC to Full Scale (F.S.), relative to the DC output voltage.
- * This is a non-isolated signal. When connecting external equipment, isolate before use.
- Signal specification is 0 V to Full Scale (F.S.) voltage and 5 mA or less.

Operation output signal

CONTROL MODULE



Maximum open/close load:
125 VAC 0.4 A
30 VDC 0.5 A
(Resistance load)

Relay inputs or photocoupler inputs can be connected.

- During operation (output), the operation output signal changes to ON (SHORT). When operation stops, operation output signal changes to OFF (OPEN).
- Operation output signals are valid in both panel mode and remote mode.

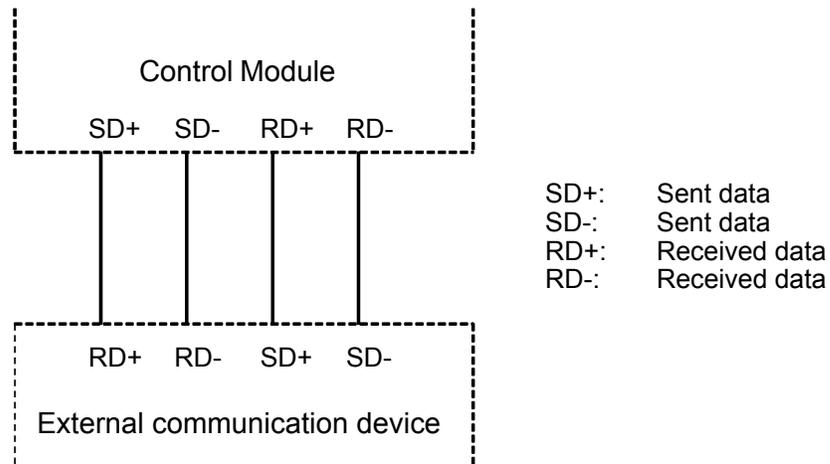
Using the RS-485 Communication Function

RS-485 communication function

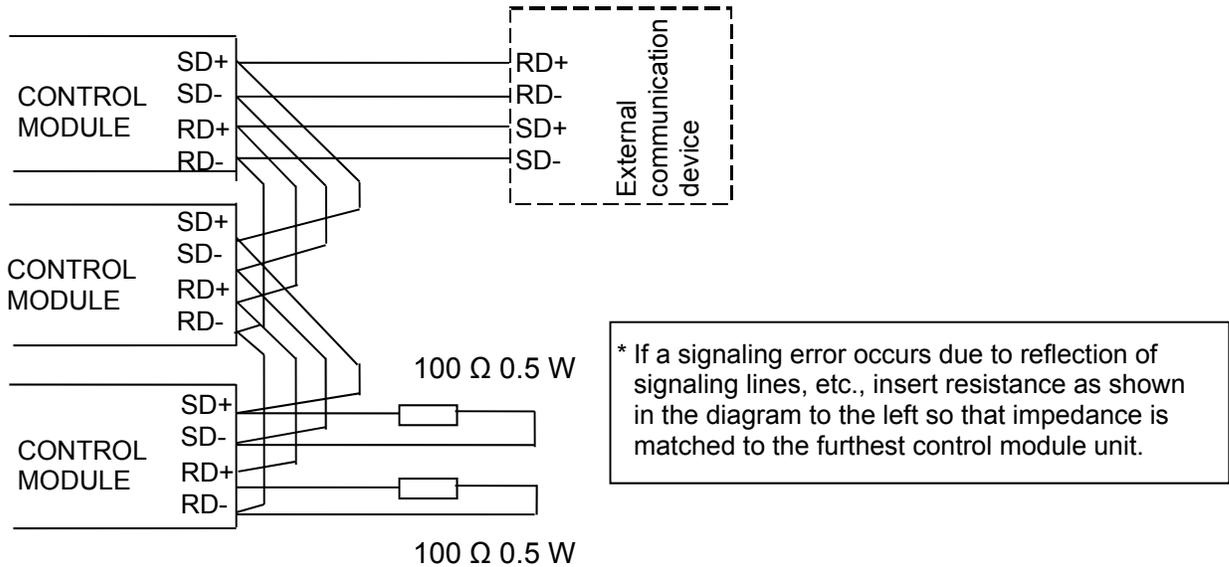
- This product (MARC-A Control Module) is compatible with the RS-485 standard
- This product uses RS-485 to send and receive data with external signaling devices.

Connection

CONTROL MODULE (standalone)



CONTROL MODULE (multiple units)



Settings

- Switches between local operation and remote operation.

Press  2 times to select "REMOTE."



- Function setting of Control Module during remote mode.
Set the rotary switch inside the maintenance port to '9.'
Refer to function setting during remote mode for detailed setting instructions. (P.19)

Communication procedure

- Refer to the signaling specification document for the MARC-A series.

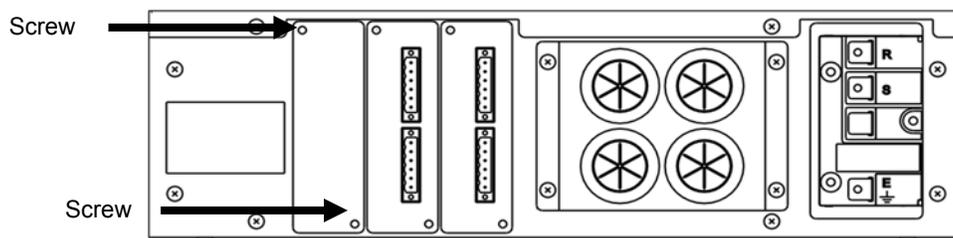
Using Fieldbus protocols (optional)

Fieldbus protocols

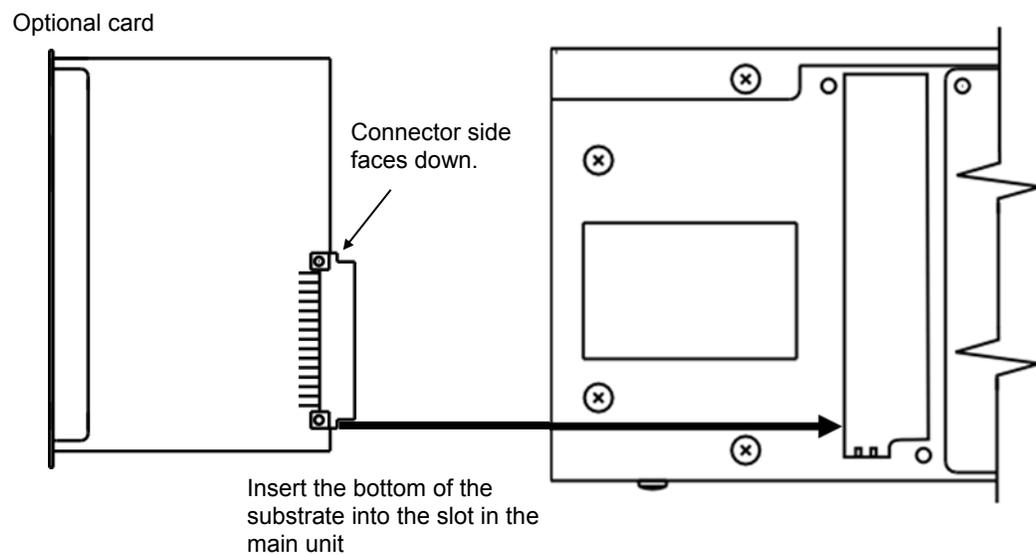
- This product (MARC-A) is compatible with Fieldbus protocols (DeviceNet and CC-Link).
- This product uses Fieldbus protocols to send and receive data with external signaling devices.
- Fieldbus protocols can be used by connecting an option card.

Connection

- Remove the cover for the option card slot.



- The option card is attached by inserting in the slot in the main unit.
Insert the optional card until you feel the card locking in to the connector.



- Secure the option card with two screws.

Settings

- Switches between local operation and remote operation.

Press  2 times and select "REMOTE."



- Set function setting for control module during remote mode.
Set the rotary switch inside the maintenance port to '9.'
Refer to function setting during remote mode for detailed setting instructions. (P.19)

Communication procedure

- Each Fieldbus has its own signal specification document. Refer to these.

Troubleshooting

When there is not output current

Symptom	What to check	Measure
The touch panel is not illuminated. (Fan does not spin either.)	Is the input switch OFF?	Turn the input switch to ON
	Is there a bad connection in the input wiring?	Check tightness of input terminals and tighten.
Input voltage error is occurring.	Is the voltage over the input voltage range?	Check input voltage.
Output voltage is up to the rated voltage.	Is there a bad connection in the wiring between the output terminal and the load?	Polish the connecting parts with sandpaper and then tighten sufficiently.
	Is there sufficient wiring capacity between the output terminal and the load?	Change the wiring to a sufficient gauge wire.
There is no output current.	Is the output voltage setting set to 0 V, limiting output via the voltage setting?	Check the output voltage and output current settings.

When there is output current.

Symptom	What to check	Measure
Output voltage is up to the rated voltage but output current is deficient.	Is there a bad connection in the wiring between the output terminal and the load?	Polish the connecting parts with sandpaper and then tighten sufficiently.
	Is there sufficient wiring capacity between the output terminal and the load?	Change the wiring to a sufficient gauge wire.
Both output voltage and output current is deficient.	Is there looseness in the output current connection?	Tighten sufficiently.
	Is there bad connection in the input switch?	Turn the input switch OFF, then ON, repeatedly.

When thermal errors occur

Symptom	What to check	Measure
Thermal error occurs some time after operation.	Fan blades are very dirty and fan spins slowly.	Fan needs to be cleaned or replaced. Contact the manufacturer.
	Fan is broken and stopped.	Fan needs to be replaced. Contact the manufacturer.
	Intake vent is clogged.	Use a cloth to clean the intake vent.
	Ambient temperature is above 40°C.	Ventilate area.
The product operates normally after recovering from a thermal error.	Any of the above four situations may be occurring.	Check for the above four situations.

- If the unit is not fixed after performing all of the above, contact the manufacturer.
- If you encounter any issues not described above, contact the manufacturer.

Maintenance

The product will operate normally as long as no abnormal operation occurs, but in order to ensure stable operation, please request a specialized vendor to perform the inspections below.

Intake and exhaust vents

Inspection item	Inspection description	Inspection period
Intake vent Exhaust vent	Intake vent is located in front, exhaust vent is in the back. If they are clogged, cooling capacity is diminished. If there is pronounced clogging or dirtiness, clean with a cloth.	Once every 3 months

Insulation resistance and voltage withstand tests

Insulation resistance test

At 500 VDC megger, the insulation resistance would be as shown below:

- (1) Control Module
 - Input terminal to Earth terminal: 5 MΩ or more

 - (2) Power Module
 - Input terminal to Output terminal: 5 MΩ or more
 - Input terminal to Earth terminal: 5 MΩ or more
 - Output terminal to Earth terminal: 5 MΩ or more
- When insulation resistance in the above tests result in less than 5 MΩ, avoid using a switch mode rectifier and contact the manufacturer.

Voltage withstand test

Insulation withstand voltage should be as shown below:

- (1) Control Module
 - Input terminal to Earth terminal: 2000 V 1 minute

(All based on 50/60 Hz sine wave AC voltage)
 - (2) Power Module
 - Input terminal to Output terminal: 2000 V 1 minute
 - Input terminal to Earth terminal: 2000 V 1 minute
 - Output terminal to Earth terminal: 500 V 1 minute

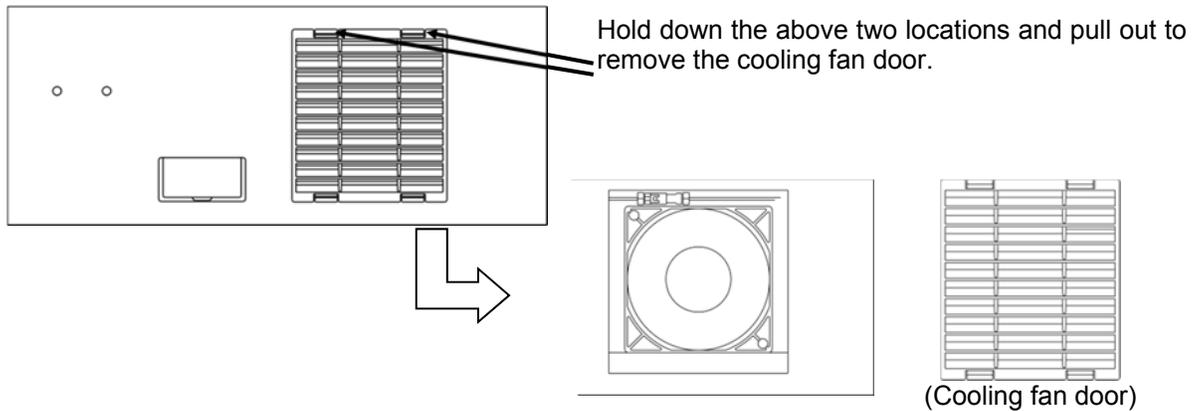
(All based on 50/60 Hz sine wave AC voltage)
- When insulation withstand voltage cannot be satisfied in the above voltage withstand tests, avoid using a switch mode rectifier and contact the manufacturer.

Fan replacement

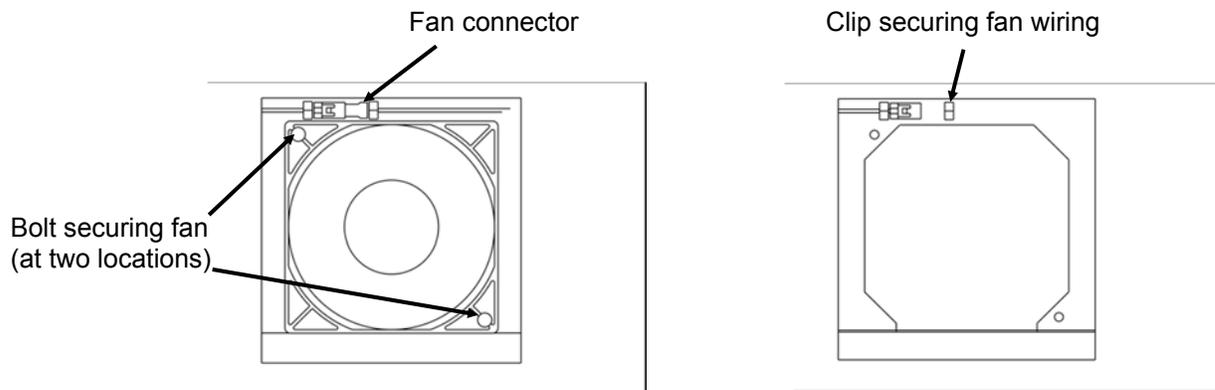
- The fan used in this product has a limited lifespan (about 3 years when ambient temperature is 25°C). Fan needs to be replaced periodically.
Order the model types below for replacement fans.

Name	Code
MARC-A Series Replacement Fan	A00A1232201

- Fan replacement procedure is shown below.
- 1 Remove cooling fan door on the front panel (intake vent area).

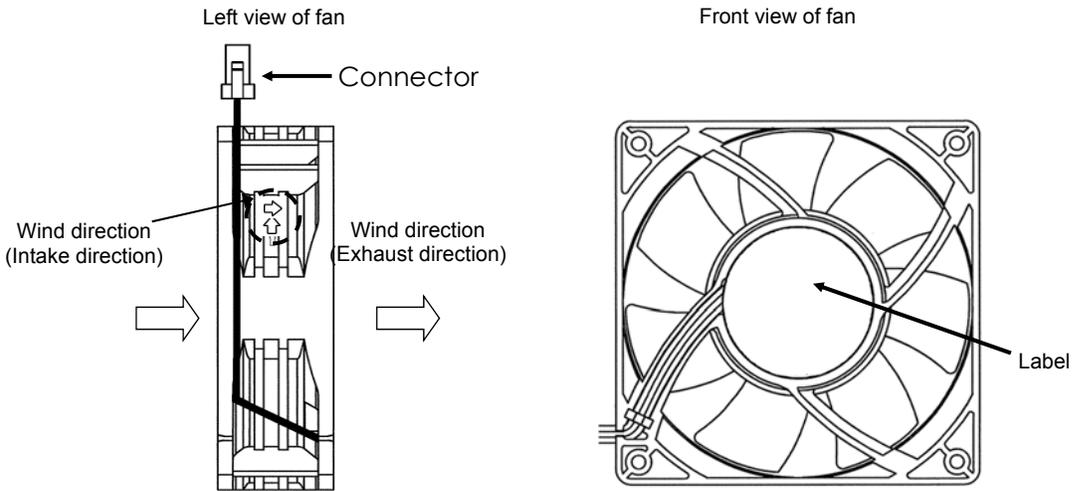


- 2 Remove old fan.
The fan is located inside the duct.
Remove the two bolts securing the fan using Philips-head screwdriver.
Pull out fan and remove the connector.



3 Prepare new fan.

Check wind direction of the fan.



*The connector is wired on the left side.

*There is a label on the front side of fan.

4 Attach new fan.

Install fan following the reverse procedures for removing fan.

Once fan is connected, fix connectors to the clips on the top side of the duct.

Fan should be inserted with the front side (side with label) facing the power module unit.

(After inserting the fan, the fan label will be hidden from view)

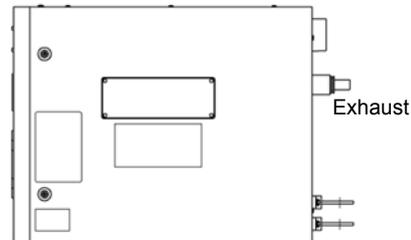
Attach the two bolts that secure the fan and ensure the fan is properly seated and affixed.

Then, attach the cooling fan door.

(The fan door should be inserted until the four locations give a clicking sound.)



Attach with due care to the wind direction of the fan.



Fuse

- The model type and rating of the fuses used in this product (MARC-A power module) are shown below. Do not replace fuses by yourself. It may cause a fire, electric shock or failure and lead to invalidation of guarantee of safety. Have a professional vendor replace the fuse.

Part name	Model type	Manufacturer
Fuse	----	PEC

Rated current	Rated voltage	Breaking capacity
100 A	660 VAC	50kA