

Instruction Manual

MODEL EP series

 **Matsusada Precision**



For Safe Use

◆ Introduction














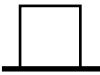


This product generates high voltage and energy.

In order to use the product safely and prior to using the product, please read the instruction manual to the end before use in order to use the product safely, because there is a danger of death or serious injury due to electric shock. Please use the product after fully understanding how to use the product properly. We are not responsible for any damages incurred by not observing the warnings and procedures stated in the instructions, so be forewarned.

Keep the instruction manual carefully so that you can view it whenever you need.

◆ Symbols

In order to use the product safely, the following symbols are displayed in the instruction manual and on the product. Understand the meaning of the symbols and observe each item. Depending on the product, some symbols may not be used.

 WARNING Indicates content that could cause death or serious injury.	 Frame or chassis terminal
 CAUTION Indicates content that could cause injury or damage to property.	 High temperature attention Touching it carelessly may cause burns.
 Indicates danger / warning / caution. Refer to the instruction manual when using the part with this symbol.	 Power On
 Indicates where high voltage is handled. Touching it may cause electric shock and result in death or serious injury.	 Power Off
 This symbol means "Prohibited".	 Power standby The product will not be completely disconnected from the power supply even if it is set to standby.
 Indicates that it must be performed in order to demonstrate the performance of the product.	 Bistable push button switch on
 Protective earth terminal (ground terminal for electric shock prevention)	 Bistable push button switch off
 Ground terminal	 Alternative Current



◆ **Understand the risk.**

Products generate high voltage and energy.

An electrician or equivalent knowledge must read the instruction manual to the end and familiarize yourself with the proper use and danger of the product.

If you want the product to be handled by another person, limit it to those with knowledge of electricity, and have people who are familiar with correct use and danger of the product conduct education and training before handling it, or handle the product under the supervision of those who are familiar with the proper use and danger of the product. Persons, with the exception of the above, must not handle the product.

◆ **Do not open the product case and panel.**

Do not disassemble, remodel, or repair by opening the product case and panel yourself. There is a high voltage area inside, which may possibly cause electric shock and fire.

Never remove the case and panel of the product, since the safety and function of the product will not be guaranteed.

◆ **It is not suitable for use in places where there is a possibility of a child being present.**

The product is designed assuming that it will be used in places where there are only adults, such as factories and laboratories. Do not use it where there is a possibility of a child being present.

◆ **Ensure that the product is handled only by a limited number of people.**

Only those who are familiar with the proper use and danger of the product, or those who are educated and trained by them should install the product. Any other person handling the product may cause electric shock, burns and injuries.

◆ **Ground it.**

When the product has a protective ground terminal or GND terminal, connect it to the ground.

If the input terminal of the product is an inlet type, connect to the power outlet with the ground using the supplied power cable or a power cable suitable for the area to be used. If it is not connected to the ground, there is a risk of electric shock and fire, which is extremely dangerous.

◆ **About power supply cable**

If there is a power supply cable attached to the package or product, it cannot be used for other products. In the case of a product that does not include a power supply cable, you must purchase an optional power supply cable suitable for the operating environment and the area, or you must prepare it yourself.

◆ **About the connection of the power supply cable**

Connection of the power cable should be done by an electrician or someone who has equivalent knowledge and is familiar with the correct usage and danger of the product. Refer to the page about connection of the input cable in the instruction manual and carry out work. For products that have acquired safety standards, also refer to the page that describing overvoltage categories.

◆ **About input voltage**

For the input voltage of the product, refer to the page describing the input terminal of the product and the input voltage in the instruction manual. Do not supply input exceeding the specifications of the product.

◆ **About the fuse**

The product contains a protective fuse. In the case of a product in which a fuse holder is arranged externally, it is possible to replace the fuse. For the replacement method, refer to the instruction manual.

If the product does not have a fuse holder externally, the user cannot replace the fuse. If the fuse blows out, do not open the case or panel. Please contact our sales representative.

◆ **Do not modify or damage the cable.**

It may cause electric shock and fire.



◆ **Designed for indoor use**

Use the product indoors. Do not use it outdoors or indoors where there is a possibility of water leakage, flooding, or crown.

◆ **About operating temperature and humidity**

Use within the range of operating temperature and humidity stated in the instruction manual.

Do not use it in a place where the ambient temperature becomes higher than the operation temperature of the product or in a narrow closed place.

◆ **Do not install in places that cause condensation.**

Do not install it in places that cause condensation, where it is exposed to steam or water vapor.

Insulation deteriorates, causing breakdown, electric shock, or fire.

◆ **Do not place anything on top of the product.**

Falling or collapsing is dangerous.

◆ **Do not put any objects on or in the product.**

Do not put any objects such as metal or liquid in the product through the inlet etc. Failure, electric shock, fire may result.

◆ **Operate the product with your right hand.**

In case of electric shock when manipulating the product, in order to reduce the risk of current flowing through important organs of the body. Keep your left hand off from the product and operate with your right hand.

◆ **Do not touch the wiring or load connected to the output terminal or output terminal during operation or immediately after output stop.**

Very high voltage is applied to the terminals during normal operation and trial operation.

Touching it will result in electric shock.

In addition, since a capacitor is connected to the terminal, high voltage remains on the terminal even immediately after stopping the output. To avoid electric shock, do not touch the terminals.

◆ **Turn off the power when touching the terminal.**

Before touching the terminals of the product, turn off the power and check that the power has actually turned off.

There is a capacitor at the terminal, and it is particularly dangerous to touch it immediately after turning off the power supply. Be careful of the electric charge of these capacitors and connect it to earth to discharge it completely. Remove input line (AC line) during work.



◆ **Install horizontally.**

Do not install the product in the reverse direction and the lateral direction. Internal heat dissipation becomes insufficient, parts deteriorate, there is a risk of smoke and fire.

◆ **Do not install in the place where cool air blows directly.**

There is a danger of condensation, leakage current and burnout.

◆ **Do not install the product in places around corrosive gas or liquid and places where chemicals handled.**

There is a danger of parts being deteriorated, smoking and burning.

◆ **Avoid using it in a place with much dust.**

If dust accumulates in the air inlet, remove it promptly.

If dust accumulates in the air inlet, cooling of the product is hindered and it may cause malfunction.

◆ **Do not block intake port and exhaust port.**

Secure more than 30cm space on the front and back of the product.

If the intake port and exhaust port are blocked, the specified performance of the product cannot be demonstrated and parts are deteriorate, which may cause smoke and fire.

◆ **When work such as welding is conducted near the product, disconnect all the wires from the product.**

◆ **Do not wipe with chemicals (thinner etc.) or wet cloth.**

There is a danger of electric shock, electric leakage, burnout from chemicals or water entering the inside of the product.

◆ **About fan replacement**

In the case of products with air-cooling fans, the fan has a lifetime part. As wear, deterioration, etc. progress with the lapse of use time, operation may become unstable. Also note that the lifetime of fan varies greatly depending on the environment where it is used (temperature, humidity, dust, etc.). In order to use the product for a longer time, it is necessary to replace the fan periodically. For replacement, please contact our sales office (replacement require separate repair charges). Do not exchange fans with other users because there is a danger of electric shock, etc.

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1 Introduction

1-1 Introduction

Thank you very much for your purchase of our product, HIGH VOLTAGE POWER SUPPLY. We have done our best for the quality control of our products. Please handle this unit properly according to this instruction manual so that you can use the full performance of this unit safely for long.

We have carefully prepared this instruction manual, but if you find any doubtful or unclear point or any omission, please kindly contact us shortly.

1-2 Unpacking the power supply

When unpacked the unit, you will please check the following accessories are enclosed with the amplifier main body.

〈Accessories〉

- AC input cord (1 pc.)
- Instruction manual
- Output cable

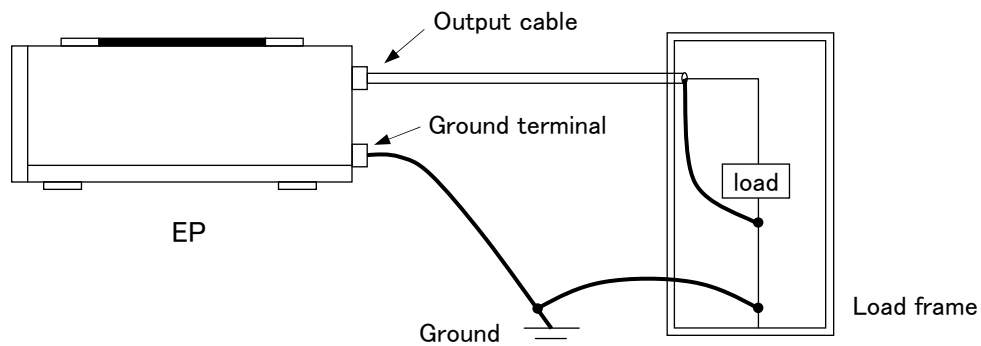
1-3 Environmental Requirements

- Place and use the high voltage amplifier horizontally.
- Never place any object on the high voltage power supply.
- There are air suction and exhaust holes for cooling at upper part and sides of the high voltage power supply. Provide an ample space to the high voltage power supply, and use it at the place where the ventilating condition is good.
- Avoid using the unit at such places where it is very dusty or there is corrosive gas.

1-4 Points to be careful about in handling

- For your safety connect the ground terminal of the chassis to EARTH securely
- Use thicker (5SQ or thicker) and short wire for chassis grounding or load grounding, and ground at one point of the ground.
- Connect the shield wire of the output cable to the chassis side of the load.
(It will protect power supply or prohibit electrical shock from discharge at load)
- DON'T TOUCH the load immediately after turning the output OFF. Before touching the load, make sure that the Power ON/OFF switch of the unit is turned off and output voltage is zero with power supply's voltage monitor or another HV voltmeter.

How to GROUND



1-5 Troubleshooting

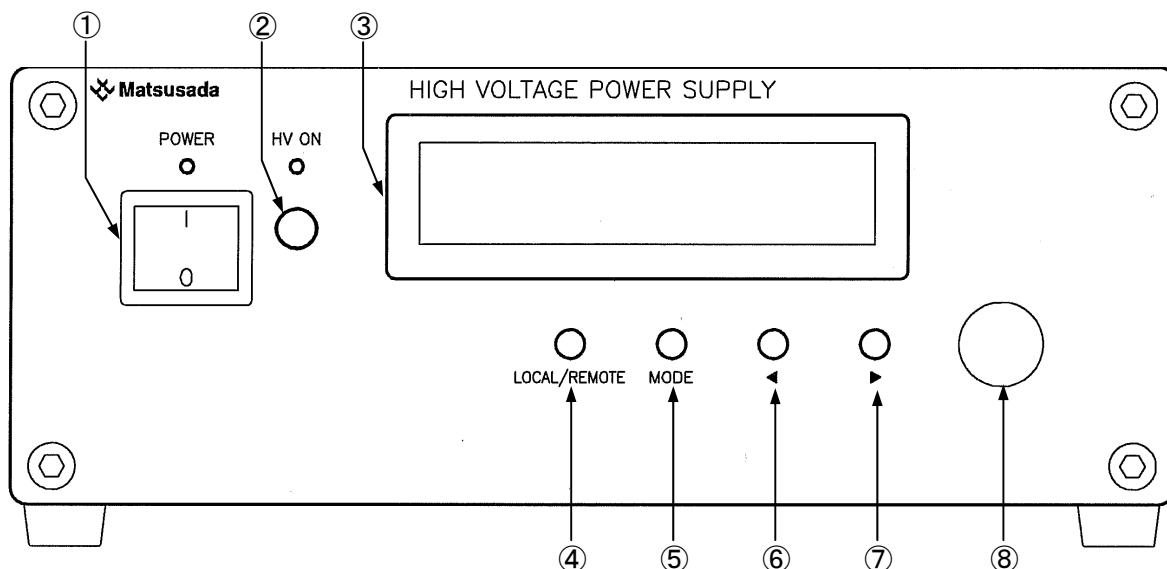
- In case there is no output voltage

1. Check if the proper input voltage is supplied to the power supply.

- Power supply input voltage, 100—240V AC $\pm 10\%$, 50/60Hz single phase

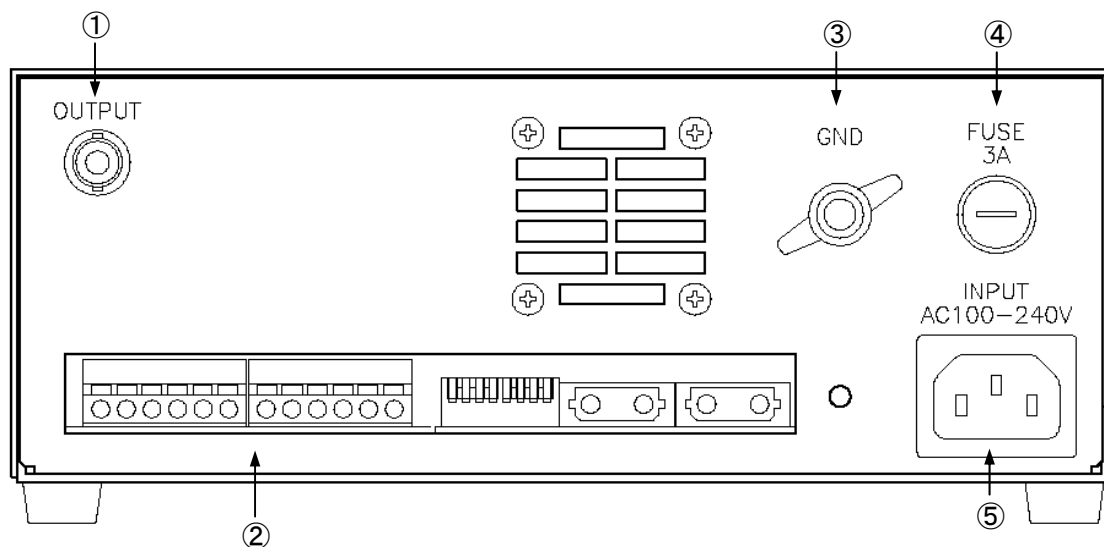
2 Exterior view diagram

Front panel



- | | |
|------------------------------------|---------------------------------|
| ① POWER ON/OFF switch | ⑤ Mode selector switch (option) |
| ② HV ON/OFF switch | ⑥ Left cursor key |
| ③ Display | ⑦ Right cursor key |
| ④ LCL/RMT selector switch (option) | ⑧ Output voltage setting dial |

Rear panel



- | | |
|--|----------------------|
| ① HV output connector | ④ FUZE (3A) |
| ② Output connector for preamplifier power supply | ⑤ AC input connector |
| ③ Ground terminal | |

3 Operation manual

3-1 Outline

EP series is high performance high voltage power supply for PMT application. Ultra compact size of just 8.35-inch(212mm) width integrated HV power supply and power supply for preamplifier $\pm 15V$ and $\pm 5V$. The ultra low ripple noise is suitable for PMT and various other applications.

3-2 Operation method

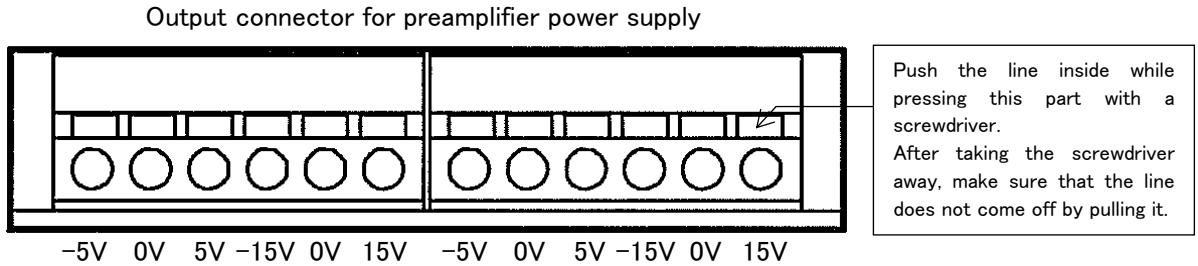
1. Upon confirming the connection made with this unit as specified (P.2 [HOW TO GROUND]), operate it. Be sure to connect the earth with the ground terminal of the unit.
2. Connect the attached AC input cord with AC input connector.
3. Turn on the POWER Switch. The unit gets in stand-by mode.
4. Turn the output voltage setting dial to adjust the voltage as desired.
When the HV is OFF, value of each digit can be set with cursor key.
When the HV is ON, the output voltage can be set each 1V.
5. When the HV is OFF, the set voltage on the display.
When the HV is ON, the output voltage and current on the display.
6. For ending the operation of the power supply, turn off the POWER ON/OFF switch. The set value is returned to 0V.

FOR PREVENTION OF DANGER, BE SURE TO CONNECT GND TERMINAL TO THE EARTH

4 Standard functions

4-1 Power supply for preamplifier

This unit outputs $\pm 5V$ 500mA and $\pm 15V$ 200mA.



- Allowable range for use Single wire : AWG26~16
 Twisted wire : AWG24~16
- Standard stripping length 10mm
- Tool for operating the button Screwdriver (shaft diameter $\phi 3$, nose width 2.6)

4-2 Over current protection (O.C.P.)

This unit has incorporated an over current protection, and the output is to be cutoff when the current reach to approx. 105% of maximum rated current.

When O.C.P is effective display shows "OVER CURRENT".

Push the HV switch twice to reset.

4-3 Over Voltage Protection (O.V.P.)

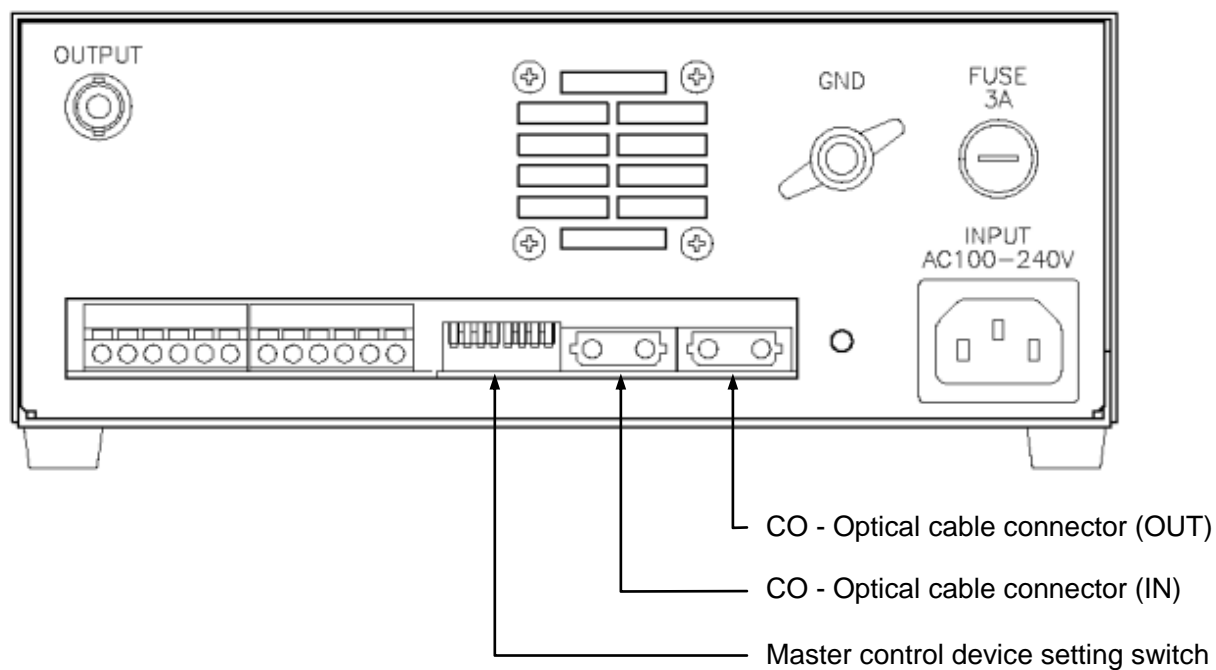
This unit has incorporated an over voltage protection, and the output is to be cutoff when the voltage reach to approx. 105% of maximum rated voltage even if any abnormality occurs.

When O.V.P is effective display shows "OVER VOLTAGE".

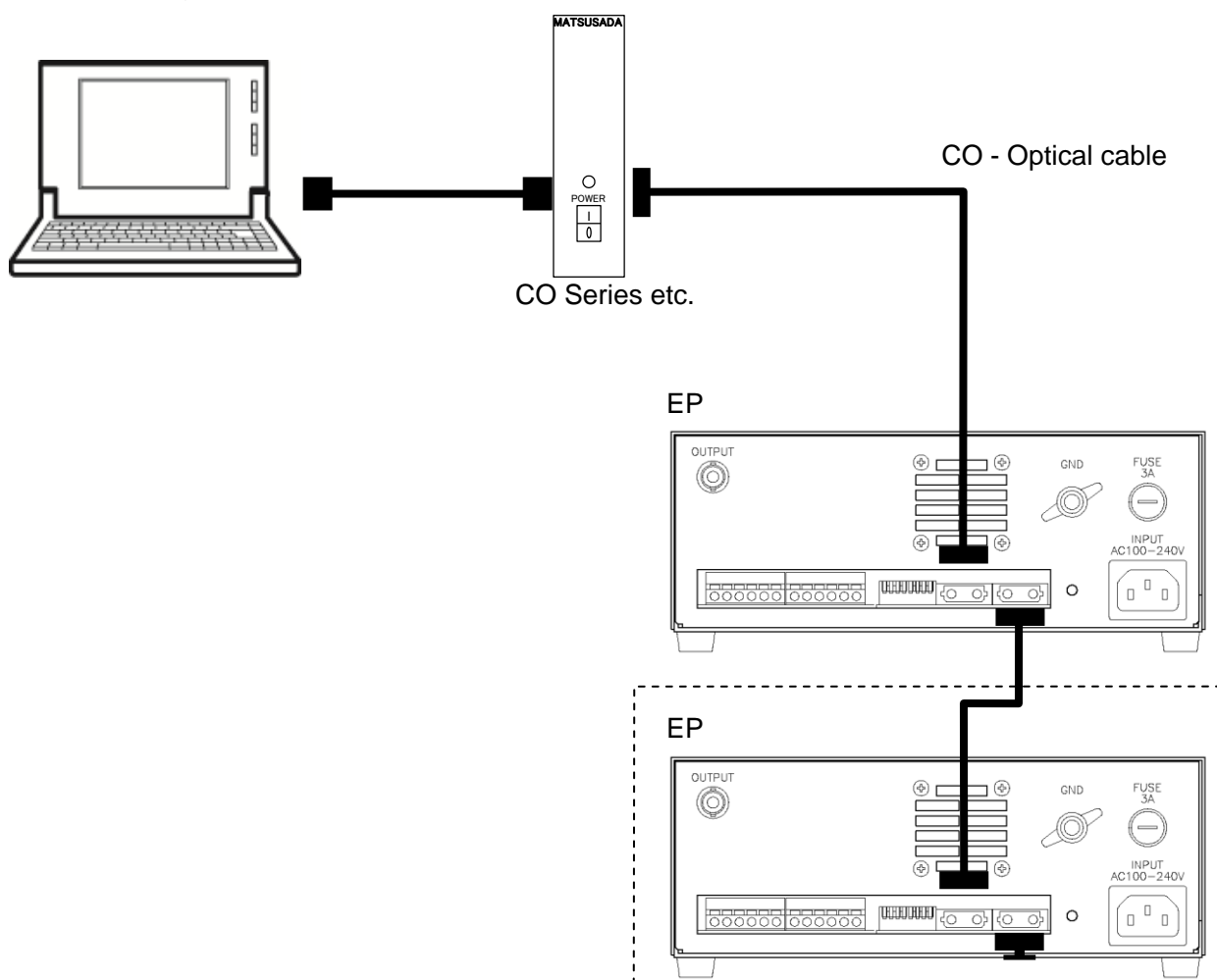
Push the HV switch twice to reset.

5. Option

5-1. External Appearance



5-2 connection diagram



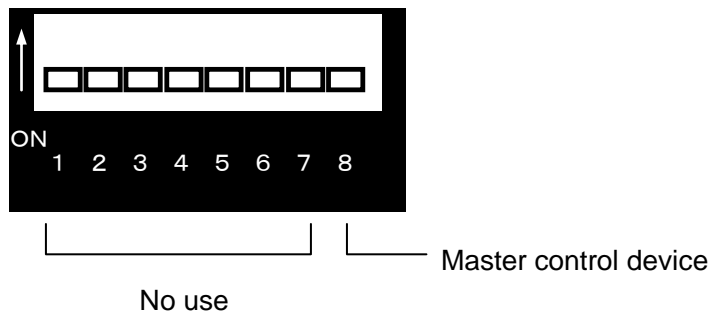
5-3 Setting Up Master Control Device

The master control device setup switch on the rear panel (switch 8) is to be used to set up the master control device. Set the switch 8 to the OFF side when the device connected to the optic fiber cable connection connector IN is a Matsusada Precision CO-G32, CO-RG, CO-HV, CO-U32, CO-E32 digital controller or a power supply with -LGob option.

If the device connected to IN is a CO-OPT2-9/CO-OPT2-25/CO-OPT4-25, set the switch to the ON side. Do not connect the other device.

At the factory setting, the master control device is set to the LGob option of CO-E32 / CO-U32 / CO-G32 / CO-RG / CO-HV / various power supplies.

Master control device	CO-E32 CO-U32 CO-G32 CO-RG CO-HV Power supply with -LGob option	CO-OPT2-9 CO-OPT2-25 CO-OPT4-25
Master control device Setting Switch 8	OFF	ON



Setting example
 • Master control device ... CO-E32/CO-U32/CO-G32/CO-RG/CO-HV/
 Power supply with LGob option

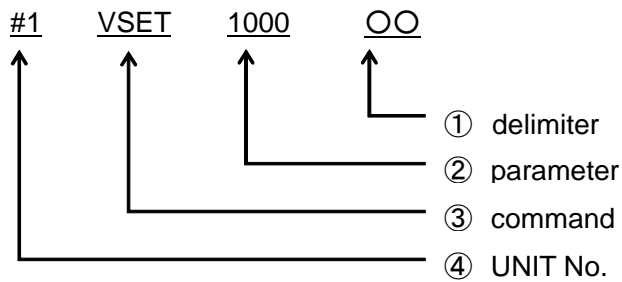
5-4 Setting of unit number

Select the UNIT number setting screen with the “MODE selector switch” on the front panel and set the UNIT number. After changing the UNIT number, press the “MODE switch” again to return to the voltage setting screen.

Any value from 0 to 31 can be assigned to the device as a UNIT number. The same address should not be set on different devices.

5-5 Command Syntax

For example, the following programming sets the output voltage of the power supply connected UNIT1 to 1000V:



① Enter a delimiter.

- RS-232C/RS-485 connection → CR(0D_H)
- LAN connection → CR(0D_H)
- USB connection → CR(0D_H)
- GPIB connection → GPIB delimiter

(Refer to instruction manual of CO series)

② Some commands require a parameter.

③ Wrong commands are ignored.

④ Specify the UNIT number. Use #0 to #31 or #AL.

NOTE

The number of characters for a command shall be less than **20**, including a delimiter.

5-6 Multi-command

Specifying "AL" for the UNIT number causes the command to be sent to all units connected.

(Format examples) ① `#AL VSET 1000` ← Set the output voltage of all devices to 1000V.

② `#AL SW1` ← Enable the output of all units.

(Remarks) Refer to the command description for commands that support multi-command execution.

5-7 Character set for commands

- Do not use the characters (codes) in the shaded cells of the following ASCII code table.
- Use LF (0A_H) and CR (0D_H) only for delimiter.
- Command characters are not case sensitive.
- Use a space (20_H) to punctuate "UNIT number", "command", and "parameter" in a command string.

Table: ASCII Code

Lower \ Upper	0 _H	1 _H	2 _H	3 _H	4 _H	5 _H	6 _H	7 _H
0 _H	NUL	DLE	SP	0	@	P	`	p
1 _H	SOH	DC1	!	1	A	Q	a	q
2 _H	STX	DC2	"	2	B	R	b	r
3 _H	ETX	DC3	#	3	C	S	c	s
4 _H	EOT	DC4	\$	4	D	T	d	t
5 _H	ENQ	NAK	%	5	E	U	e	u
6 _H	ACK	SYN	&	6	F	V	f	v
7 _H	BEL	ETB	'	7	G	W	g	w
8 _H	BS	CAN	(	8	H	X	h	x
9 _H	HT	EM	)	9	I	Y	i	y
A _H	LF	SUB	*	:	J	Z	j	z
B _H	VT	ESC	+	;	K	[	k	{
C _H	FF	FS	,	<	L	¥	l	|
D _H	CR	GS	-	=	M	]	m	}
E _H	SO	RS	.	>	N	^	n	~
F _H	SI	US	/	?	O	_	o	

5-8 Returned data

Sending a read command will result in a response string being returned with delimiters:

Example when an "STS" command is received: "#1 CO LO"

#	1	SP	C	O	SP	L	O	CR
23 _H	31 _H	20 _H	43 _H	4F _H	20 _H	4C _H	4F _H	0D _H

If the sent command does not require a response, nothing will be returned.

5-9 Command List

Category		Command	Features	Page	
Setting	Output	Voltage	VSET	Output voltage setting	10
	Output		SW	Setting of the output ON/OFF.	10
	Local/Remote		REN GTL	Remote setting Local setting	11 11
Measurement	Output	Voltage	VGET	Output voltage measurement	11
		Current	IGET	Output current measurement	11
	Status Checking		STS	Status Checking	12

5-10 Detail of command

VSET Command

Set output voltage.

Operating range	0 to Rated voltage
resolution	1
unit	V
Format examples	VSET 1234 ⇒ Set 1234V
Initial value	0
query	In response to "VSET?", the set voltage value is returned.
Remarks	<ul style="list-style-type: none"> • Settings out of the operating range are ignored as invalid commands. • This command supports multi-command execution.

SW Command

Sets the output ON/OFF.

Operating range	0 / 1 (0 is OFF, 1 is ON)
Format examples	SW0 SW1
Initial value	0
query	In response to "SW?", SW0 or SW1 is returned.
Remarks	<ul style="list-style-type: none"> • Faults are reset with SW0 command. • This command supports multi-command execution.

REN Command

Enable remote control.

Format examples	REN
Initial value	GTL
Remarks	<ul style="list-style-type: none"> ▪ When this command is received, all commands can be used. ▪ When this command is received, “RE” is displayed on the screen. This command supports multi-command execution.

GTL Command

Disable remote control.

Format examples	GTL
Initial value	GTL
Remarks	<ul style="list-style-type: none"> ▪ When this command is received, all commands other than REN, STS, and output measurement are ignored. ▪ When this command is received, the “RE” display on the screen turns off. This command supports multi-command execution.

Switching between local control and remote control is also possible with the “LCL / RMT switch” on the front panel.

VGET Command

Output voltage monitor.

Operating range	0 to Rated voltage
resolution	1
unit	V
Format examples	VGET
Return examples	VGET=1234 ⇒ output 1234V
Remarks	

IGET Command

Output current monitor.

Operating range	0 to rated current
resolution	0.001
unit	mA
Format examples	IGET
Return examples	IGET=1.234 ⇒ output 1.234mA
Remarks	

STS Command

Return the status of the power supply.

Format examples	STS					
Return	# (UNIT number) (Status)					
Return examples	#1 CO LO ⇒UNIT1 is output ON, local operaton #1 CF RM OVP ⇒UNIT1 is output status, remote control possible, CV operations status.					
Status display	Output status		Control status		Error status *Output when an error occurs.	
	CF	Output OFF	LO	Local control	OVP	Overvoltage protection
	CO	Output ON	RM	Remote control	OCP	Overcurrent protection
Remarks	Either CF / CO and either LO / RM is always output. SP (20 _H) is output to separate each status.					



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