

# INSTRUCTION MANUAL

## Multi-output wide range DC power supply PSW-Multi Series

PSW-M720L11  
PSW-M720L44  
PSW-M720L55  
PSW-M720H66  
PSW-M720H88

PSW-M1080L111  
PSW-M1080L444  
PSW-M1080L555  
PSW-M1080H666  
PSW-M1080H888



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■ About the manual.

In order to be environmentally friendly and reduce waste, we are gradually discontinuing the use of paper or CD manuals that come with our products. Even if there is a description attached to the instruction manual, it may not be attached. The latest version of the instruction manual is posted on our website (<https://www.texio.co.jp/download/>).

■ About firmware version

The contents described in this document apply to PSW-Multi series main unit firmware version 1.07 or higher.

# USING THE PRODUCT SAFELY

## ■ Preface

To use the product safely, read this instruction manual to the end. Before using this product, understand how to correctly use it.




If you read this manual but you do not understand how to use it, ask us or your local dealer. After you read this manual, save it so that you can read it anytime as required.

## ■ Notes on reading this instruction manual

- ◆ The contents of this instruction manual include technical terms in part of their explanation. If you do not understand those terms, do not hesitate to ask us or your local dealer.

## ■ Pictorial indication and warning character indication

This instruction manual and product show the warning and caution items required to safely use the product. The following pictorial indication and warning character indication are provided.

<p>&lt;Pictorial indication&gt;</p> 	<p>Some part of this product or the instruction manual may show This pictorial indication. In this case, if the product is incorrectly used in that part, a serious danger may be brought about on the user's body or the product. To use the part with this pictorial indication, be sure to refer to this instruction manual.</p>
<p>&lt;Warning character Indication&gt;</p>  <p><b>WARNING</b></p>  <p><b>CAUTION</b></p>	<p>If you use the product, ignoring this indication, you may get killed or seriously injured. This indication shows that the warning item to avoid the danger is provided.</p> <p>If you incorrectly use the product, ignoring this indication, you may get slightly injured or the product may be damaged. This indication shows that the caution item to avoid the danger is provided.</p>

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## USING THE PRODUCT SAFELY

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### WARNING

#### ■ Do not remove the product's covers and panels

Never remove the product's covers and panels for any purpose. Otherwise, the user's electric shock or a fire may be incurred.

#### ■ Warning on using the product

The warning items given below are to avoid danger to the user's body and life and avoid the damage and deterioration of the product.

Use the product, observing the following warning and caution items.

#### ■ Warning items on power supply

- Power supply voltage

As the rated power supply voltage of the product, the range from 100 to 240 VAC can be used without being switched.

- Power cord

**Important: The attached power cord set can be used for this device only.**

- Protection fuse

If an input protection fuse is blown, the product does not operate. When the fuse is blown, the user can replace it. However, replace it correctly, observing the warning and caution items that are provided in the section of the instruction manual where the fuse replacement is explained. If the fuse is incorrectly replaced, a fire may occur.

- Changing the power supply voltage

The rated power supply voltage cannot be changed. Use the product only at the rated power supply voltage indicated on the product. Otherwise, a fire may occur. The product's rated power supply voltage is from 100 to 240 VAC. Use the product in this range. (For use at a voltage higher than 125 VAC, Please confirm the voltage ratings of the power cord.)

#### ■ Warning item on grounding

The product has the GND terminal on the panel surface to protect the user from electric shock and protect the product. Be sure to ground the product to safely use it.

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## USING THE PRODUCT SAFELY

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### WARNING

#### ■ Warning item on installation environment

- Operating temperature  
Use the product within the operating temperature indicated in the rating column. If the product is used with the vents of the product blocked or in high ambient temperatures, a fire may occur.
- Operating humidity  
Use the product within the operating humidity indicated in the rating column. Watch out for condensation by a sharp humidity change such as transfer to a room with a different humidity. Also, do not operate the product with wet hands. Otherwise, an electric shock or fire may occur.
- Use in a gas  
Use in and around a place where an inflammable or explosive gas or steam is generated or stored may result in an explosion and fire. Do not operate the product in such an environment.  
Also, use in and around a place where a corrosive gas is generated or spreading causes a serious damage to the product. Do not use the product in such an environment.
- Do not let foreign matter in  
Do not insert metal and flammable materials into the product from its vent and spill water on it. Otherwise, an electric shock and fire may occur.

#### ■ Warning item on abnormality while in use

If smoke or fire is generated from the product while in use, stop using the product, turn off the switch, and remove the power cord plug from the outlet. After confirming that no other devices catch fire, call the company or each sales office.

#### ■ Front Panel

Please do not lift up the product, while touching the front grille.

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## USING THE PRODUCT SAFELY

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### CAUTION

#### ■ Input/output terminal

Maximum input to the input terminals is specified to prevent the product from being damaged. Do not supply input, exceeding the specifications that are indicated in the "Rating" or "Caution on use" column in the instruction manual of the product. Otherwise, a product failure is caused. Also, do not supply power to the output terminals from the outside. Otherwise, a product failure is caused.

#### ■ When the product is left unused for a long time

Be sure to remove the power plug from the outlet.

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#### (Calibration)

Although the performance and specifications of the product are checked under strict quality control during shipment from the factory, they may aging rate because of aging rate in its parts. It is recommended to periodically calibrate the product so that it is used with its performance and specifications stable. For consultation about the product calibration, call the dealer or the company or each sales office where you bought the product.

#### (Daily maintenance)

When you clean off the dirt of the product covers, panels, and knobs, avoid solvents such as thinner and benzene. Otherwise, paint may peel off or the resin surface may be affected.

To wipe off the covers, panels, and knobs, use a soft cloth with neutral detergent in it. During cleaning, be careful that water, detergents, and other foreign matters do not get into the product.

If a liquid or metal gets into the product, an electric shock and fire are caused.

During cleaning, remove the power cord plug from the outlet.

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Use the product correctly and safely, observing the above warning and caution items. Because the instruction manual indicates caution items even in individual items, observe those caution items to correctly use the product.

If you have questions or comments about the content of the instruction manual, ask us or E-Mail us.

# 1. GETTING STARTED

This chapter describes this product in a nutshell, including its main features and front / rear panel introduction. After going through the overview, please read the theory of operation to become familiar with the operating modes, protection modes and other safety considerations.

## 1.1. PSW-Multi Series Overview

### 1.1.1. Series lineup

This product series has five types of power modules with different rated output voltages mounted in two types of housings of different sizes. There are a total of 10 models in the product lineup.

The rated output power of the power module is 360W, and there are five types of rated voltage output: 30V (36A), 80V (13.5A), 160V (7.2A), 250V (4.5A), 800V (1.44A). The output terminals of power modules with rated voltage outputs of 30V, 80V, and 160V are busbars. In this instruction manual, it is referred to as a low voltage module. The output terminals of power modules with rated voltage outputs of 250V and 800V are connectors. In this instruction manual, it is referred to as a high voltage module.

There are two types of chassis: a 720W type with two power modules and a 1080W type with three power modules. The 720W type is a 2-channel product, and the 1080W type is a 3-channel product.



Note

Each channel of This product series doesn't support serial or parallel operation.

This product model name is expressed by the chassis power and the installed power module.

Model name: **PSW-MWVXXX**

**PSW-M**: This is the series name of this product.

**W**: The 720 means a 720W case, and the 1080 means a 1080W case.

**V**: In the power module, L is a low voltage module and H is a high voltage module.

**XXX**:

X represents the voltage of the power module.

X=1: 30V, X=4: 80V, X=5: 160V, X=6: 250V, X=8: 800V

In addition, the number of X indicates the number of power modules installed.

XX: 2-channel, XXX: 3-channel

### 2-channel model

Model name	Output	Voltage rating	Current rating	Output terminal
PSW-M720L11	CH1	0-30V	0-36A	Bus Bar
	CH2	0-30V	0-36A	Bus Bar
PSW-M720L44	CH1	0-80V	0-13.5A	Bus Bar
	CH2	0-80V	0-13.5A	Bus Bar
PSW-M720L55	CH1	0-160V	0-7.2A	Bus Bar
	CH2	0-160V	0-7.2A	Bus Bar
PSW-M720H66	CH1	0-250V	0-4.5A	Connector
	CH2	0-250V	0-4.5A	Connector
PSW-M720H88	CH1	0-800V	0-1.44A	Connector
	CH2	0-800V	0-1.44A	Connector

### 3-channel I model

Model name	Output	Voltage rating	Current rating	Output terminal
PSW-M1080L111	CH1	0-30V	0-36A	Bus Bar
	CH2	0-30V	0-36A	Bus Bar
	CH3	0-30V	0-36A	Bus Bar
PSW-M1080L444	CH1	0-80V	0-13.5A	Bus Bar
	CH2	0-80V	0-13.5A	Bus Bar
	CH3	0-80V	0-13.5A	Bus Bar
PSW-M1080L555	CH1	0-160V	0-7.2A	Bus Bar
	CH2	0-160V	0-7.2A	Bus Bar
	CH3	0-160V	0-7.2A	Bus Bar
PSW-H1080H666	CH1	0-250V	0-4.5A	Connector
	CH2	0-250V	0-4.5A	Connector
	CH3	0-250V	0-4.5A	Connector
PSW-M1080H888	CH1	0-800V	0-1.44A	Connector
	CH2	0-800V	0-1.44A	Connector
	CH3	0-800V	0-1.44A	Connector



### 1.1.2. Main Features

Performance	<ul style="list-style-type: none"><li>● High performance/power</li><li>● Power efficient switching type power supply</li><li>● Low impact on load devices</li><li>● Fast transient recovery time of 1ms</li><li>● Fast output response time</li></ul> <hr/>
Features	<ul style="list-style-type: none"><li>● OVP, OCP, OHP (OTP) and tUVP protection</li><li>● Adjustable voltage and current slew rates</li><li>● Operates in three modes: CV, CC, CP</li><li>● Equipped with a bleeder circuit that can be controlled on/off</li><li>● Extensive remote monitoring and control options</li><li>● Equipped with data logger function</li><li>● Supports test mode</li><li>● Supports operation from a web server</li></ul> <hr/>
Interface	<ul style="list-style-type: none"><li>● Ethernet port(LAN)</li><li>● Analog connector for analog voltage and current monitoring</li><li>● USB host and device port</li></ul>

### 1.1.3. Accessories

Please check the contents before using this product.

#### Standard Accessories

Part number	Description
Power cord	Varies by region and TYPE.
PSW-009 *	Output terminal covers for low voltage modules: Quantity: Number of voltage modules
PSW-011 *	Output terminal covers for high voltage modules: Quantity: Number of voltage modules
PSW-012 *	Output terminals for high voltage modules: Quantity: Number of voltage modules
GTL-123 *	Test leads for low voltage modules: 1x red, 1x black Quantity: Number of voltage modules
GTL-240	USB Cable
PSW-004 *	Accessory kit for low voltage modules: Quantity: Number of voltage modules M4 terminal screws and washers x2, M8 terminal bolts, nuts and washers x2, Air filter x1, Analog control protection dummy x1, Analog control lock level x1
PSW-008 *	Accessory kit for high voltage modules: Quantity: Number of voltage modules Air filter x1, Analog control protection dummy x1, Analog control lock level x1

\* : Standard accessory items and numbers vary depending on the number and type of power modules (low voltage or high voltage).

#### Optional Accessories

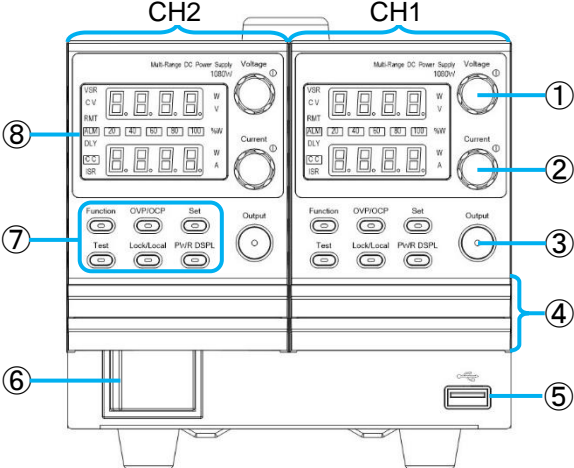
Part number	Description
GET-001	Extended terminal with max. 30A
GET-002	Extended European terminal with max. 10A
PSW-001	Accessory Kit: Pin contact x10, Socket x1, Protection cover x1
GRA-410-J	Rack mount adapter (JIS)
GRA-410-E	Rack mount adapter (EIA)
GUG-001	GPIB to USB adapter
GUR-001B	RS-232C to USB adapter with #4-40 UNC rivet nut
GTL-130	Test leads for high voltage modules: 1x red, 1x black
GTL-246	USB Cable

Download Name	Description
Manual	User manual, Programming manual
Test Data	Test mode Data (*.csv,*.tst) It can be obtained from a web browser.

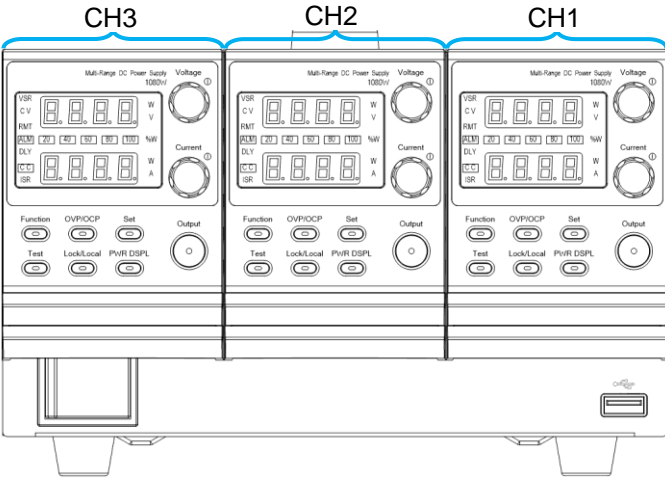
# 1.2. Appearance

## 1.2.1. Front Panel

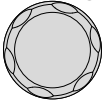
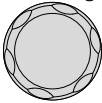
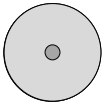
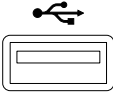
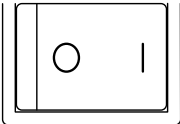


720W type







1080W type



## Front panel description

No.	Name	Symbol	Description
1	Voltage Knob	<p>Voltage ①</p> 	<p>Sets the voltage.</p> <p>When pressed, the variable digit changes. Variable digits are displayed brighter than other digits.</p>
2	Current Knob	<p>Current ①</p> 	<p>Sets the current.</p> <p>When pressed, the variable digit changes. Variable digits are displayed brighter than other digits.</p>
3	Output Button	<p>Output</p> 	<p>Press to turn on the output. The Output key will light up when the output is active.</p>
4	Cover panel		It is an air intake port.
5	USB		USB A port for data transfer, loading test mode etc.
6	Power Switch		Used to turn the power on/off.
7	Function Keys	The Function keys along with the Output key will light up when a key is active.	
	Function key	<p>Function</p> 	The Function key is used to configure this product.
	OVP/OCP key	<p>OVP/OCP</p> 	Set the over current or over voltage protection levels.

Set key	Set 	Sets the current and voltage limits.
Test key	Test 	Used to run customized scripts for testing.
Lock/Local key	Lock/Local 	Panel key lock and unlock. Locks prevent accidental changes to panel settings.
PWR DSPL key	PWR DSPL 	Switch the display between V/A and V/W or A/W. For V/W, press the voltage knob; for A/W, press the current knob.

8 Display Indicators Displays the operating status of this product.

VSR	Voltage slew rate function enabled
C V	CV operation status
RMT	Remote control status
<b>ALM</b>	Alarm occurrence status
DLY	Output delay function enabled
<b>CC</b>	CC operation status
ISR	Current slew rate function enabled

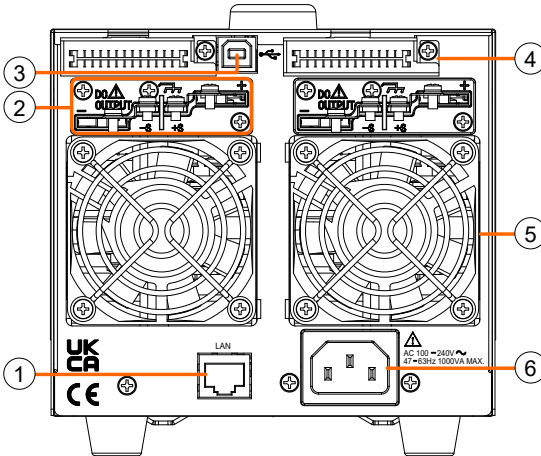
<b>20</b>	<b>40</b>	<b>60</b>	% W
<b>80</b>	<b>100</b>		

Displays power output as a bar.

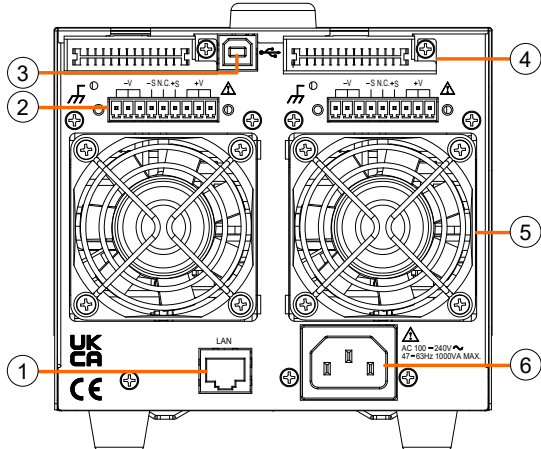
1.2.2. Rear Panel

720W type

low voltage modules

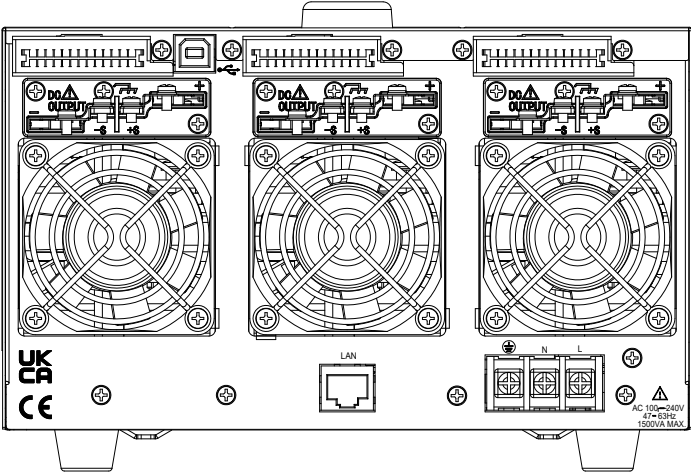


high voltage modules

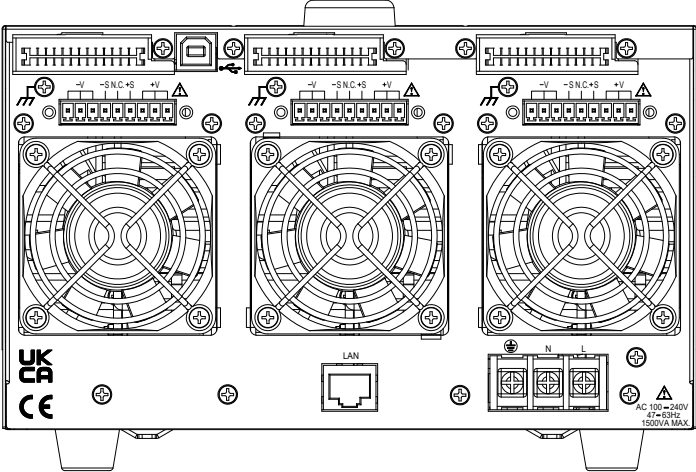


1080W type

low voltage modules

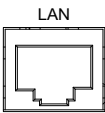
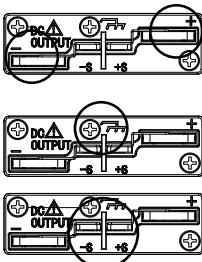
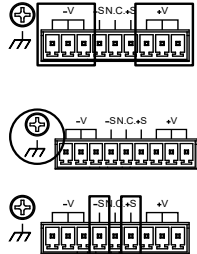
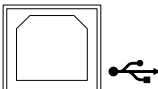




high voltage modules

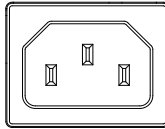




## Rear panel description

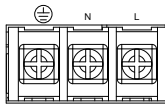
No.	Name	Symbol	Description
1	Ethernet Port		The ethernet port is used for remote control and digital monitoring from a controller.
2	Output Terminals (Low-volt module)		Positive (+) and negative (-) output terminals. Chassis ground Sense (-S) and Sense (+S) terminals.
	Output Terminals (High-volt module)		High voltage modules use 9-pin connectors and plugs to connect output and sense terminals. Positive (V+) and negative (V-) output terminals (3 of each). Chassis ground Sense (-S) and Sense (+S) terminals.
3	USB B port		The USB B port is used for remote control.
4	Analog control connector		Standard 26 pin MIL connector For wiring to this connector, use the included analog control connector (OMRON XG5 26 pin). For usage instructions, refer to page 93.
	 Note		When this connector is not used, please keep this connector cover attached.
5	Fans		Temperature controlled fans

6 Line Voltage Input  
(720W type)



Voltage Input: 100~240  
VAC  
Line frequency: 50Hz/60  
Hz

Line Voltage Input  
(1080W type)



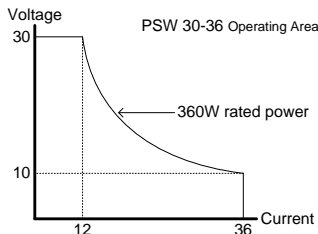
### 1.3. Theory of Operation

The theory of operation chapter describes the basic principles of operation, protection modes and important considerations that must be considered before use.

#### 1.3.1. Operating Area Description

This product is regulated DC power supplies with a high voltage and current output. These operate in CC or CV mode within a wide operating range limited only by the output power.

The operating area of each power supply is determined by the rated output power as well as the voltage and current rating. For example, the operating area and rated power output for the PSW 30-36 is shown below.



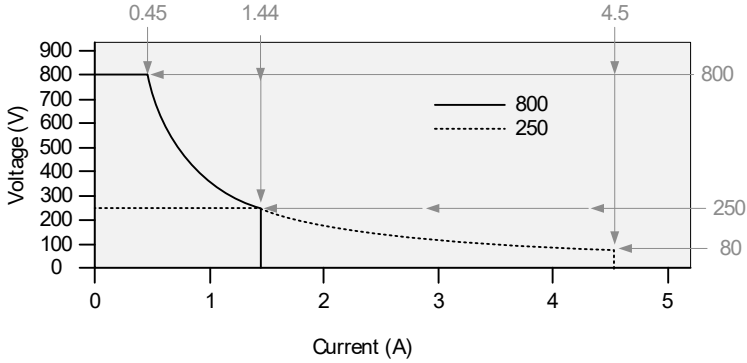
When the output power (output voltage x output current) of this product is less than the rated power, it operates as a general constant voltage, constant current power supply.

When the output power (output voltage x output current) of this product is greater than the rated power, the output of the power supply is limited to the rated power. In this case, the output voltage and output current depend on the load.

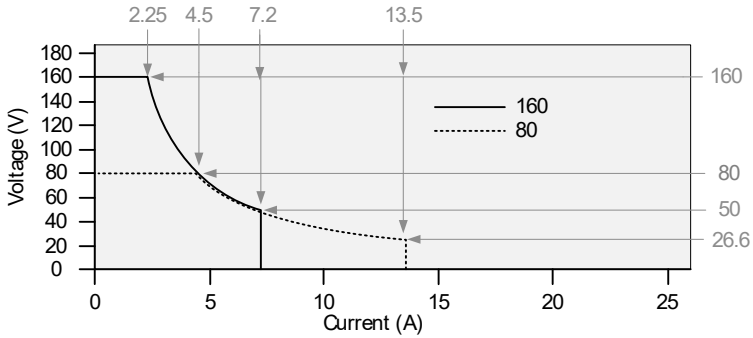
The power limit value can be set within the rated power for this product. This allows the output of this product to operate within the set power limit value.

Below is a comparison of the operating areas of each power supply.

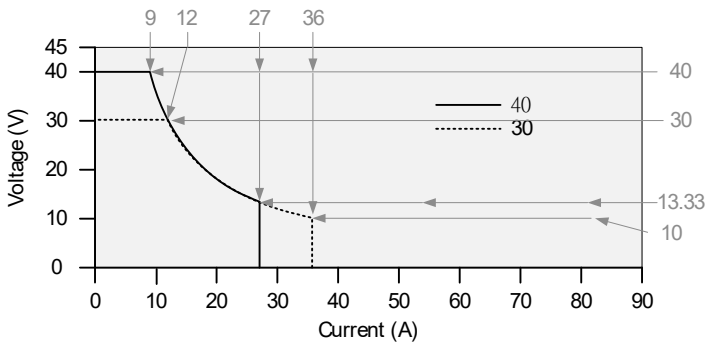
### 250V, 800V voltage module operating area



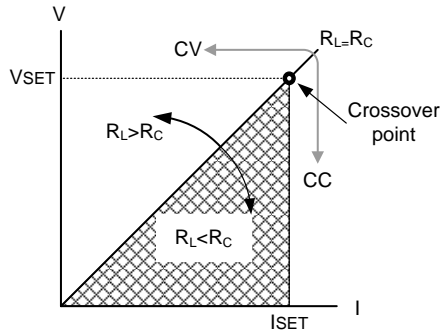
### 80V, 160V voltage module operating area



### 30 V, 40V voltage module operating area



### 1.3.2. CC and CV Mode



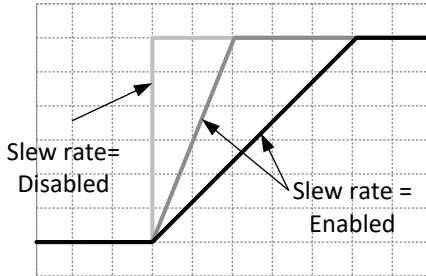
When the power supply is operating in constant current mode (CC) a constant current will be supplied to the load. When in constant current mode the voltage output can vary, whilst the current remains constant. When the load resistance increases to the point where the current limit (ISET) can no longer be sustained the power supply switches to CV mode. The point where the power supply switches modes is the crossover point.

When the power supply is operating in CV mode, a constant voltage will be supplied to the load, whilst the current will vary as the load varies. At the point that the load resistance is too low to maintain a constant voltage, the power supply will switch to CC mode and maintain the set current limit.

The conditions that determine whether the power supply operates in CC or CV mode depends on the set current (ISET), the set voltage (VSET), the load resistance (RL) and the critical resistance (RC). The critical resistance is determined by  $V_{SET}/I_{SET}$ . The power supply will operate in CV mode when the load resistance is greater than the critical resistance. This means that the voltage output will be equal to the VSET voltage but the current will be less than ISET. If the load resistance is reduced to the point that the current output reaches the ISET level, the power supply switches to CC mode.

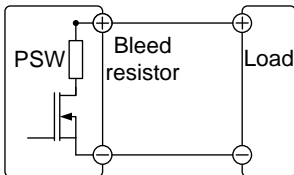
Conversely the power supply will operate in CC mode when the load resistance is less than the critical resistance. In CC mode the current output is equal to ISET and the voltage output is less than VSET.

### 1.3.3. Slew Rate



This product has selectable slew rates for CC and CV mode. Slew rate settings are divided into High-Speed Priority and Slew Rate Priority. High-Speed Priority mode disables slew rate settings for CC or CV mode. Slew Rate Priority mode allows for user adjustable slew rates for CC or CV mode. The rising and falling slew rate can be set independently. Please refer to page 49 for the setting method.

### 1.3.4. Bleeder Control



The output section of this product is equipped with a bleeder circuit that includes a bleed resistor, and this circuit can be turned on/off.

Please refer to page 51 for the setting method.

The bleeder circuit is designed to dissipate power from the power supply filter capacitor when the power supply is turned off and the load is disconnected. Without a bleeder circuit, power will remain charged to the filter capacitor for some time, potentially creating a dangerous condition.

In addition, the bleeder circuit acts as a minimum voltage load, allowing smoother voltage variation of the power supply.

The bleeder circuit can be turned on or off using this product settings.

It sinks current from an external voltage source depending on the settings of the bleeder circuit.



Note

By default, the bleeder circuit is on. For battery charging applications, be sure to turn off the bleeder circuit as it can discharge the connected battery when the unit is off.

### 30V power module sink current

Vout (V)	Bleeder ON (A)	Bleeder OFF (mA)
1	1.455	0.000
3	1.733	0.000
5	1.559	0.002
10	1.123	0.009
15	0.715	0.014
20	0.471	0.021
25	0.353	0.031
30	0.267	0.038

### 80V power module sink current

Vout (V)	Bleeder ON (A)	Bleeder OFF (mA)
5	0.640	0.002
10	0.589	0.009
20	0.488	0.015
30	0.387	0.026
40	0.292	0.032
50	0.224	0.045
60	0.188	0.058
80	0.140	0.084

### 160V power module sink current

Vout (V)	Bleeder ON (A)	Bleeder OFF (mA)
10	0.173	0.009
20	0.164	0.017
40	0.146	0.034
60	0.128	0.057
80	0.112	0.076
100	0.101	0.095
130	0.093	0.128
160	0.088	0.207

### 250V power module sink current

Vout (V)	Bleeder ON (A)	Bleeder OFF (mA)
10	0.158	0.031
30	0.143	0.098
50	0.129	0.164
80	0.107	0.267
100	0.092	0.333
150	0.061	0.508
200	0.463	0.697
250	0.035	0.961

### 800V power module sink current

Vout (V)	Bleeder ON (A)	Bleeder OFF (mA)
20	0.061	0.056
50	0.058	0.138
100	0.054	0.274
200	0.046	0.550
300	0.037	0.823
400	0.029	1.097
600	0.020	1.653
800	0.015	2.214

### 1.3.5. Internal Resistance

This product can set the internal resistance of the output. (Internal Resistance Setting, refer to page [45](#)).

When the internal resistance is set it can be seen as a resistance in series with the positive output terminal. This allows this product to simulate power sources that have internal resistances such as lead acid batteries.

Power module	Internal Resistance Range ( $\Omega$ )
30V	0.000 ~ 0.833
80V	0.000 ~ 1.481
160V	0.000 ~ 5.926
250V	0.000 ~ 22.222
800V	0.00 ~ 55.55

### 1.3.6. Protection function

This product has many protection features. When any protection function is activated, the ALM icon on the display lights up. For details on how to set up protection functions, refer to

OVP	Overvoltage protection (OVP) prevents a high voltage from damaging the load. Refer to page <a href="#">35</a> .
OCP	Overcurrent protection (OCP) prevents high current from damaging the load. Refer to page <a href="#">35</a> .
OHP (OTP)	Overheat (Over temperature) protection protects this product from overheating.
tUVP	Output voltage tracking low voltage protection prevents load damage due to voltage drop. Refer to page <a href="#">75</a> .
Alarm output	Alarms are output via the analog control connector. The alarm output is an isolated open-collector photo coupler output. Refer to page <a href="#">106</a> .

### 1.3.7. Considerations

The following situations should be taken into consideration when using this product.

Inrush current	When the power supply switch is first turned on, an inrush current is generated. Ensure there is enough power available for the power supply when first turned on, especially if a number of units are turned on at the same time.
----------------	--



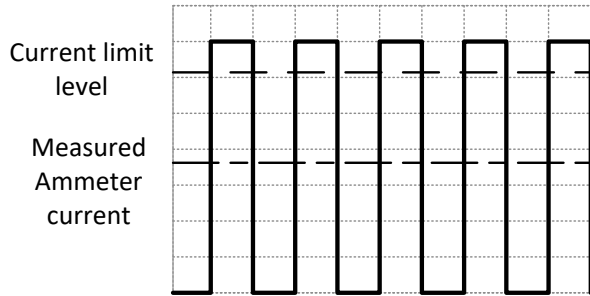
Caution

Please wait at least 15 seconds between turning the power on/off using the power switch, shutdown function, or external breaker. Continuously turning the power switch on and off will cause the inrush current protection circuit to fail and shorten the life of the input fuse and power switch.

Pulsed or Peaked loads	When the load has current peaks or is pulsed, it is possible for the maximum current to exceed the mean current value. This product ammeter only indicates mean current values, which means for pulsed current loads, the actual current can exceed the indicated value. For pulsed loads, the current limit must be increased, or a power supply with a greater capacity must be chosen. As shown below, a
------------------------	---



pulsed load may exceed the current limit and the indicated current on the power supply ammeter.

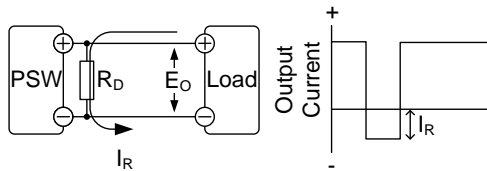


Reverse Current:  
Regenerative load

When the power supply is connected to a regenerative load such as a transformer or inverter, reverse current will feed back to the power supply. This product cannot absorb reverse current. For loads that create reverse current, connect a resistor in parallel (dummy load) to the power supply to bypass the reverse current.

To calculate the resistance for the dummy resistor,  $R_D$ , first determine the maximum reverse current,  $I_R$ , and determine what the output voltage,  $E_O$ , will be.

$$R_D(\Omega) \leq E_O(V) \div I_R(A)$$



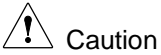
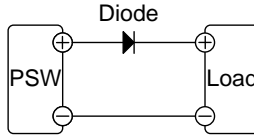
 Note

The current output will decrease by the amount of current absorbed by the dummy resistor.

Ensure the resistor used can withstand the power capacity of the power supply/load.

Reverse Current:  
Accumulative energy.

When the power supply is connected to a load such as a battery, reverse current may flow back to the power supply. To prevent damage to this product, use a reverse-current-protection diode in series between this product and load.



Caution

Ensure the reverse withstand voltage of the diode is able to withstand 2 times the rated output voltage of the power supply and the forward current capacity can withstand 3 to 10 times the rated output current of the power supply.

When the diode is used to limit reverse voltage, remote sensing cannot be used.

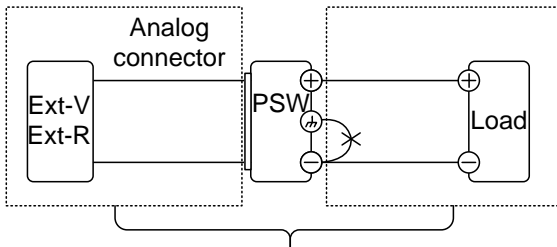
When connecting a charged load, be careful of electric shock and sparks.

### 1.3.8. Output grounding

The output terminals of this product are isolated with respect to the protective grounding terminal. The insulation capacity of the load, the load cables and other connected devices must be taken into consideration when connected to the protective ground or when floating.

Floating

As the output terminals are floating, the load and all load cables must have an insulation capacity that is greater than the isolation voltage of this product.



(.....) Insulation capacity  $\geq$  isolation voltage of power supply



WARNING

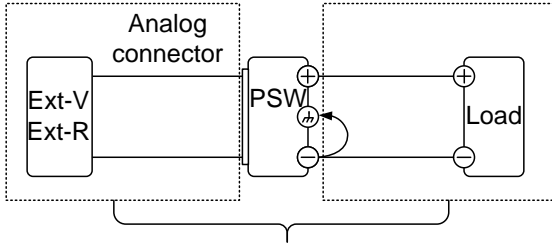
When the insulation capacity of the load and load cables is not greater than the isolation voltage of this product, electric shock may occur.

When analog controlling this device using external voltage control, external resistance control, etc., the control signal should be floating instead of grounded.

If it is grounded, the output will short-circuit and cause an accident.

### Grounded output terminal

When the positive or negative terminal is connected to the protective ground terminal, the insulation capacity needed for the load and load cables is greatly reduced. The insulation capacity only needs to be greater than the maximum output voltage of this product with respect to ground.



(.....) Insulation capacity  $\geq$  voltage of power supply with respect to ground



### Caution

When using external voltage control, do not ground the external voltage terminal as this will create a short circuit.

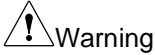
When output floating is not required, connect either output terminal to GROUND for safety.

# 2. OPERATION

## 2.1. Set Up

### 2.1.1. Line Voltage Connection: 1080W Models

The 1080 models use a universal power input that can be used with 100 and 200 VAC systems. To connect or replace the power cord, use the procedure below:



Warning

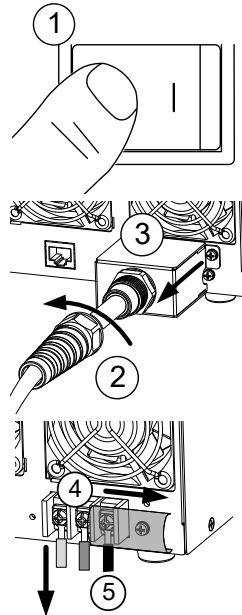
The following procedure should only be attempted by competent persons.

Ensure the AC power cord is not connected to this product.

#### How to remove AC cord

steps	Removal instructions
-------	----------------------

- |   |   |
|---|---|
| 1 | Turn off the power switch.  |
| 2 | Remove the cover protecting the AC cord.  |
| 3 | Remove the screws (2 places) that secure the cover protecting the power terminal. |
| 4 | Slide the cover off the AC terminals.   |
| 5 | Remove the AC power cord wires.   |



## How to attach the AC cord

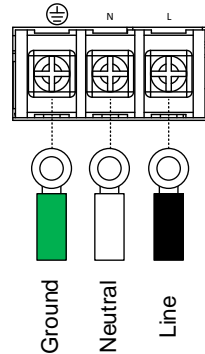
### steps Installation procedure

- 1 Connect the AC power cord wires to the AC input terminals.

White/Blue → Neutral (N)

Green/Green-yellow → GND (⊕)

Black/Brown → Line (L)



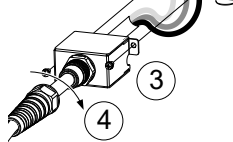
- 2 Set the cover back over the AC terminals.



- 3 Secure the AC terminal protection cover with screws.



- 4 Rotate the AC cord cover to secure it in place.



### 2.1.2. Filter Installation

This product has a small filter that must first be inserted under the control panel before operation. The small filter must be inserted for all power modules.

#### steps Step instructions

- 1 Insert the small filter in the open area under the control panel.



- 2 The unit is now ready to power up.

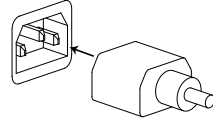


The small filter may be installed at the time of shipment.

### 2.1.3. Power Up

steps	Step instructions
-------	-------------------

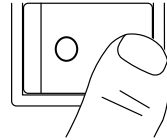
- |   |   |
|---|---|
| 1 | <p>720W type Model:<br/>Connect the power cord to the AC inlet on the back panel.</p> |
|---|---|



- |  |   |
|--|---|
|  | <p>1080W type Model:<br/>Connect the power cord to the AC input terminal on the back panel.</p> |
|--|---|

Refer to page [22](#).

- |   |   |
|---|---|
| 2 | <p>Press the POWER switch. If used for the first time, the default settings will appear on the display, otherwise this product recovers the state right before the power was last turned OFF.</p> |
|---|---|



For default configuration settings, refer to page [135](#).



#### Caution

When turned off, it takes approximately 15 seconds for the power to completely turn off.

Before turning on the power again, please wait until the display disappears and this product is completely turned off (about 15 seconds).

#### 2.1.4. Regarding load line selection

Before connecting the output terminals to a load, the wire gauge of the cables should be considered.

It is essential that the current capacity of the load cables is adequate. The rating of the cables must equal or exceed the maximum current rated output of this product.

Recommended wire gauge		
Wire Gauge	SQ size / mm <sup>2</sup>	Allowable current
AWG 26	0.12 / 0.128	3 A
AWG 24	0.2 / 0.205	5 A
AWG 22	0.3 / 0.324	7 A
AWG 20	0.5 / 0.519	11 A
AWG 18	0.75 / 0.823	14 A
AWG 16	1.25 / 1.31	19 A
AWG 14	2 / 2.08	27 A
AWG 12	3.5 / 3.31	37 A
AWG 10	5.5 / 5.26	49 A
AWG 8	8 / 8.37	61 A
AWG 6	14 / 13.3	88 A
AWG 4	22 / 21.15	115 A
AWG 2	38 / 33.63	162 A
AWG 1	38 / 42.41	162 A
AWG 1/0	60 / 53.49	219 A
AWG 2/0	60 / 67.42	219 A
AWG 3/0	80 / 85.3	269 A
AWG 4/0	100 / 107.2	298 A

The maximum temperature rise of the wire is no more than 60 °C above ambient temperature. Keep the ambient temperature below 30°C.

#### 2.1.5. Output Terminals: Low voltage module

Before connecting the output terminals to the load, first consider whether voltage sense will be used, the gauge of the cable wiring and the withstand voltage of the cables and load.

The output terminals can be connected to load cables using M4 sized screws or M8 sized bolts.



Warning

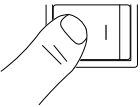
Dangerous voltages:

Before wiring the output terminals of this product, be sure to make sure that the power is turned off.

Failing to do so may lead to electric shock.

**steps Step instructions**

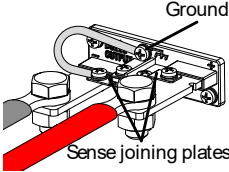
1 Turn the power switch off.



2 Remove the output terminal cover.

Refer to page 27.

3 If necessary, screw the chassis ground terminal to either the positive or negative terminal. Refer to the grounding chapter for details. (Refer to page 20.)



4 Choose a suitable wire gauge for the load cables.

Refer to page 25.

5 Choose a suitable crimp terminal for the terminals.

6 When using voltage sense, remove the sense terminal joining plates and connect sensing wires to the load(s).

Refer to page 42.

7 Connect the positive load cable to the positive output terminal and the negative cable to the negative output terminal.

8 Reattach the output terminal cover.

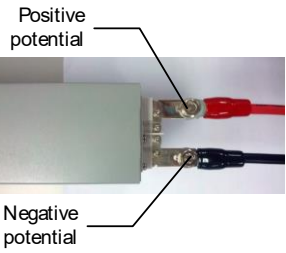
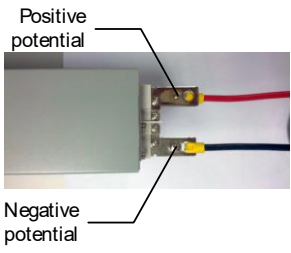
Refer to page 27.

**voltage sense wiring**

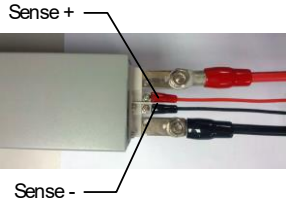
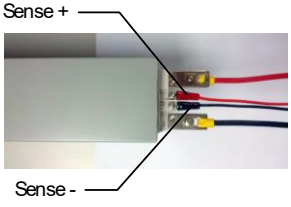
**Using M4 screws**

**Using M8 bolts**

Connection with local sense wiring



Connection with voltage sense wiring

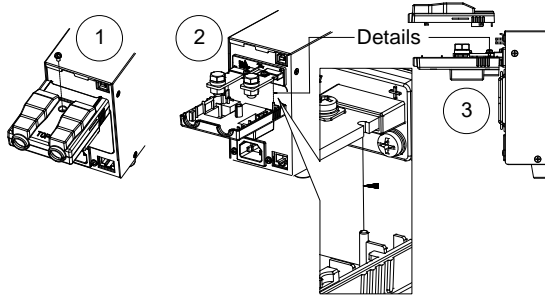




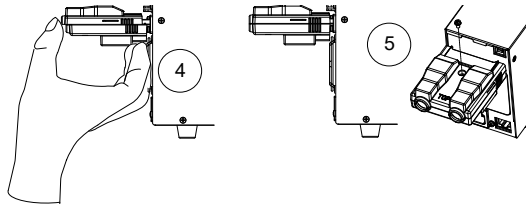
### 2.1.6. Attaching output terminal cover: Low voltage module

steps	Step instructions
-------	-------------------

- |   |  |
|---|--|
| 1 | Remove the screws securing the top and bottom covers. Slide the top cover to separate the top and bottom covers. |
| 2 | Align the tab on the bottom cover with the U-shaped notch at the base of the output terminal.                    |
| 3 | Place the top cover on top of the bottom cover by sliding it backwards.  |



- |   |   |
|---|---|
| 4 | Slide the top cover to integrate with the bottom cover.                                   |
| 5 | When the top and bottom covers are flush, re-insert the screw that was removed in step 1. |



Note

Reverse the procedure to remove the terminal covers.

### 2.1.7. Output Terminals: High voltage module

High voltage module models use the supplied 9-pin socket for output voltage and sense connections.

Before connecting the output terminal to the load, first check whether you use voltage sensing, the gauge of the cable wiring, and the withstand voltage of the cable and load.

 Warning

Dangerous voltages. Ensure that the power to the instrument is disabled before handling this product output terminals. Failing to do so may lead to electric shock.

Please note the wire gauge used and the capacity of the plug/socket. If necessary, connect multiple cables to the connector.

Output Connector Overview

When using the output connector make sure the wires that are used follow the following guidelines:

Wire gauge: AWG 26 to AWG 16

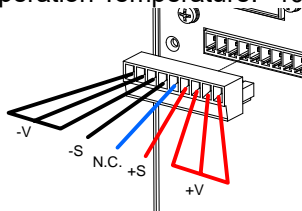
Strip length: 6.5mm // 0.26 in.

Current rating: 10A

Insulation withstand voltage: >2000MΩ DC500V

Operation Temperature: -40°C to +105°C

Output Connector Pinout



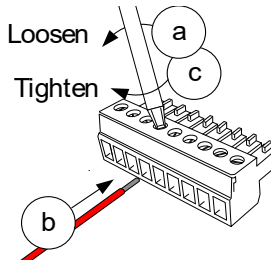
- V: -V terminals (x3)
- S: -Sense terminal
- NC: Not connected
- +S: +Sense terminal
- +V: +V terminals (x3)

Wiring the Connector Plug

a: Loosen the terminal you want to use counterclockwise and open the output terminal opening.

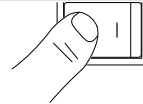
b: Strip at least 7mm of the insulation off the wire and insert it into the output terminal opening.

c: Tighten the output terminal opening by turning the terminal clockwise.



steps Step instructions

1 Turn the power switch off.



2 Remove the output terminal cover.

Refer to page 30.

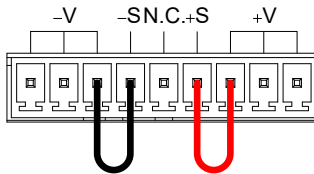
3 Choose a suitable wire gauge for the load cables.

Refer to page 25.

4 Strip ~7mm from one end of each load cable.

5 Connect the positive load cable to one of the +V pins and the negative cable to one of the -V pins.

6 When using local sense, connect the -S pin to a -V pin, and connect the +S pin to a +V pin.

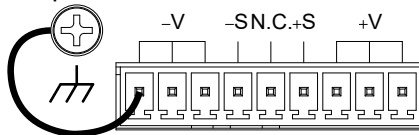


7 When not using local sense, see the remote sense section to wire the sense terminals for remote sensing.

Refer to page 42.

8 If necessary, connect the chassis ground terminal to either the -V or +V pin. See the grounding chapter for details.

Refer to page 20.

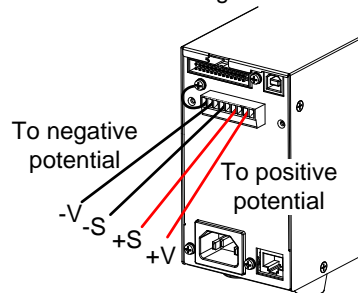
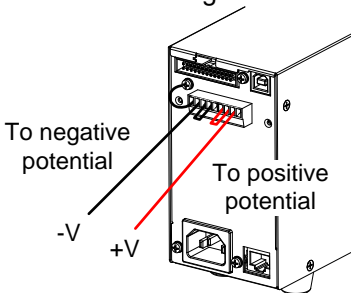


9 Reattach the output terminal cover.

Refer to page 30.

Local sense wiring

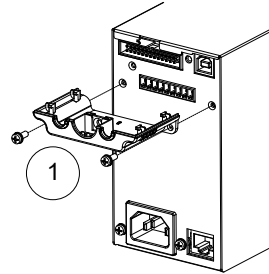
Remote sense wiring



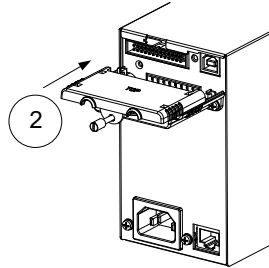
## 2.1.8. Using the Output Terminal Cover PSW 250/800

steps	Step instructions
-------	-------------------

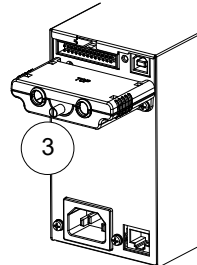
- |   |   |
|---|---|
| 1 | Screw the bottom cover onto the rear panel using the two M4 screws. |
|---|---|



- |   |  |
|---|--|
| 2 | Slide the top cover over the bottom cover. |
|---|--|



- |   |   |
|---|---|
| 3 | Finally, secure the top and bottom covers using the screw in the center of the top cover. |
|---|---|



Reverse the procedure to remove the terminal covers.



Note

Reverse the procedure to remove the terminal covers.

## 2.1.9. Using the Rack Mount Kit

This product has an optional Rack Mount Kit.

Part number: [JIS] GRA-410-J, [EIA] GRA-410-E

One rack mount kit can hold three 720W models or two 1080W models.

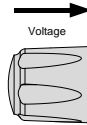
### 2.1.10. Using the Voltage and Current knob

This product use voltage or current knobs to set parameter values. Press the voltage or current knob to select the setting digit of the parameter value.

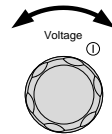
**Example** Use the Voltage knob to set a voltage of 10.05 V.

**steps** Step instructions

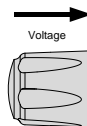
- 1 Press the voltage knob repeatedly until the 0.01 V digit is highlighted.



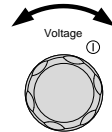
- 2 Turn the voltage knob and set 0.05V.



- 3 Press the voltage knob repeatedly until the 10.00 V digit is highlighted.



- 4 Turn the voltage knob and set 10.05V.









Note

While the Set key on the front panel is lit, the voltage/current display shows the set value.



When the output is on, press the Set key to display the set value and operate.

### 2.1.11. Reset to Factory Default Settings

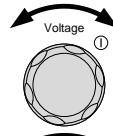
This product can be reset to factory default settings. For factory default settings, see page [135](#).

steps	Step instructions	
1	Press the Function key. The Function key will light up.	<p>Function</p> 
2	The display should show F-01 on the top and the configuration setting for F-01 on the bottom.	
3	Rotate the Voltage knob to change the F setting to F-88 (Factory Set Value).	<p>Voltage</p> 
4	Use the Current knob to set the F-88 setting to 1 (Return to factory settings).	<p>Current</p> 
5	Press the voltage knob to determine the setting. When the settings are confirmed, "ConF" will be displayed.	<p>Voltage</p> 
6	Press the Function key again to exit. The function key light will turn off.	<p>Function</p> 

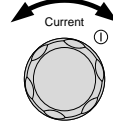
### 2.1.12. Verifying firmware version and system information

steps	Step instructions	
1	Press the Function key. The Function key will light up.	<p>Function</p> 
2	The display should show F-01 on the top and the configuration setting for F-01 on the bottom.	

- 3 Rotate the Voltage knob to change the F setting to F-89 (Show Version).



- 4 Turn the current knob to display the firmware version and system information.



F-89	0-XX	Firmware version number
	1-XX	Firmware version number
	2-XX	Firmware build: Year
	3-XX	Firmware build: Year
	4-XX	Firmware build: Month
	5-XX	Firmware build: Day
	6-XX	Keyboard CPLD version number
	7-XX	Keyboard CPLD version number
	8-XX	Analog control CPLD version number
	9-XX	Analog control CPLD version number
	A-XX	Control Board Version number
	B-XX	Reserved
	C-XX	Kernel build: Year
	D-XX	Kernel build: Year
	E-XX	Kernel build: Month
	F-XX	Kernel build: Day
	G-XX	Test Command Version number
	H-XX	Test Command Version number
	I-XX	Test Command build: Year
	J-XX	Test Command build: Year
	K-XX	Test Command build: Month
	L-XX	Test Command build: Day
	M-XX	USB Driver version number
	N-XX	USB Driver version number

- 5 Press the Function key again to exit. The function key light will turn off.



Example	Firmware information: Ver1.50, 2014/01-13	
0-01	Version number	1.50
1-50		
2-20	Build: Year	2014
3-14		
4-01	Build: Month - Day.	01-13
5-13		
Example	Keyboard CPLD information: 0x030c	
6-03	Version number	030c
7-0c		
Example	Analog control CPLD information: 0x0427	
8-04	Version number	0427
9-27		
Example	Control Board information: XX	
A-XX	Version number	XX
Example	Kernel information: 2013/03-22	
C-20	Build: Year	2023
D-13		
E-03	Build: Month - Day.	03-22
F-22		
Example	Test Command information: V01:00, 2011/08-01	
G-01	Version number	1.00
H-00		
I-20	Build: Year	2011
J-11		
K-08	Build: Month - Day.	08-01
L-01		
Example	USB Driver information: V02.01:	
M-02	Version number	2.01
N-01		



## 2.2. Basic Operation

This section describes the basic operations required to operate this product.

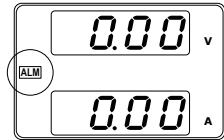
Before operating this product, please refer to the Getting Started chapter (page 1).

### 2.2.1. Setting OVP/OCP Levels

For most models the OVP level has a selectable range of approximately 10% to 110% of the rated output voltage. Likewise, the OCP level for most models has a selectable range of approximately 10%~ 110% of the rated output current. The OVP and OCP level is set to the maximum by default. The OCP level can also be turned off.

Note that the actual setting range differs for each model.

When either protection function is activated, ALM will be displayed on the panel display.



Before setting the OVP or OCP level:

Ensure the load is not connected.

Ensure the output is set to off.

#### How to set the OVP/UVP values

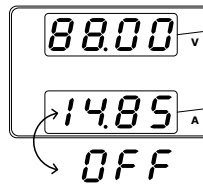
##### steps Step instructions

- 1 Press the OVP/OCP key.  
The OVP/OCP key lights up.

OVP/OCP



- 2 The OVP setting will be displayed on the top and the OCP setting (or OFF) will be displayed on the bottom.



OVP Setting

OCP Setting

- 3 Use the Voltage knob to set the OVP level.

Voltage



- 4 Use the Current knob to set the OCP level, or to turn OCP off.

Current




- 5 Press OVP/OCP again to exit.  
The OVP/OCP indicator will turn off.

OVP/OCP



### Clear OVP/OCP

steps	Step instructions	
1	To clear protection activity notifications, press and hold the OVP/OCP key for 2 seconds.	OVP/OCP 



Note

Only applicable when the power switch trip setting (F-95: 1) is disabled.

### 2.2.2. Set to CV Mode



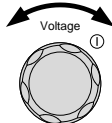
When setting the power supply to constant voltage mode, a current limit must also be set to determine the crossover point. When the current exceeds the crossover point, the mode switches to CC mode. For details about CV operation, refer to page 14.

CC and CV mode have two selectable slew rates: High Speed Priority and Slew Rate Priority. High Speed Priority will use the fastest slew rate for this product while Slew Rate Priority will use a user-configured slew rate.

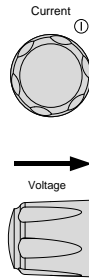
Before setting this product CV mode, please ensure the following:

The output is off.

The load is connected.

steps	Step instructions	
1	Press the Function key. The Function key will light up.	Function 
2	The display should show F-01 on the top and the configuration setting for F-01 on the bottom.	
3	Rotate the Voltage knob to change the F setting to F-03 (V-I Mode Slew Rate Select).	

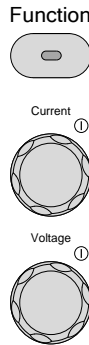
- 4 Use the Current knob to set the F-03 setting.  
Set F-03 to 0: CV High Speed Priority  
Set F-03 to 2: CV Slew Rate Priority
- 5 Press the Voltage knob to determine the configuration setting.  
When the settings are confirmed, "ConF" will be displayed.



- 6 When CV Slew Rate Priority was chosen as the operating mode (Set F-03 to 2), repeat steps 3~5 to set F-04 (Rising Voltage Slew Rate) and the F-05 (Falling Voltage Slew Rate) and save.

Power module	Slew rate setting range
30V	0.1V/s ~ 60V/s
80V	0.1V/s ~ 160V/s
160V	0.1V/s ~ 320V/s
250V	0.1V/s ~ 500.0V/s
800V	1V/s ~ 1600V/s

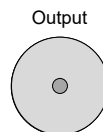
- 7 Press the Function key again to exit the configuration settings.  
The function key light will turn off.
- 8 Use the Current knob to set the current limit (crossover point).
- 9 Use the Voltage knob to set the voltage.



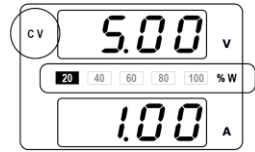
Note

When the set value is displayed on the display, the Set key lights up.  
If the knob does not respond when turned, check the Set key.

- 10 Press the Output key.  
The Output key becomes illuminated.



The display indicator's CV display and power bar will light up.



Note

When the output is turned on, the display becomes the output value. When the Set key is pressed, the display will show the set value.

For more information on the Normal Function Settings (F-00 ~ F-61, F-88~F-89) refer to page 49.



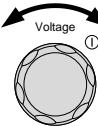
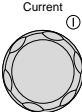
### 2.2.3. Set to CC Mode

When setting the power supply to constant current mode, a voltage limit must also be set to determine the crossover point. When the voltage exceeds the crossover point, the mode switches to CV mode. For details about CC operation, refer to page 14. CC and CV mode have two selectable slew rates: High Speed Priority and Slew Rate Priority. High Speed Priority will use the fastest slew rate for this product while Slew Rate Priority will use a user-configured slew rate.

Before setting this product CC mode, please ensure the following:

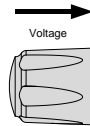
The output is off.

The load is connected.

steps	Step instructions	
1	Press the Function key. The Function key will light up.	
2	Press the Function key. The Function key will light up.	
3	Rotate the Voltage knob to change the F setting to F-03 (V-I Mode Slew Rate Select).	
4	Use the Current knob to set the F-03 setting. Set F-03 to 1: CC High Speed Priority Set F-03 to 3: CC Slew Rate Priority	

- 5 Press the Voltage knob to determine the configuration setting.

When the settings are confirmed, "ConF" will be displayed.



- 6 When CC Slew Rate Priority was chosen as the operating mode (Set F-03 to 3), repeat steps 3~5 to set F-06 (Rising Current Slew Rate) and the F-07 (Falling Current Slew Rate) and save.

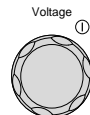
Power module	Slew rate setting range
30V	0.01A/s ~ 72.00A/s
80V	0.01A/s ~ 27.00A/s
160V	0.01A/s ~ 14.40A/s
250V	0.001A/s ~ 9.000A/s
800V	0.001A/s ~ 2.880A/s

- 7 Press the Function key again to exit the configuration settings.

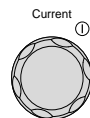
The function key light will turn off.



- 8 Use the Voltage knob to set the current limit (crossover point).



- 9 Use the Current knob to set the voltage.

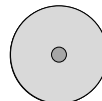


Note

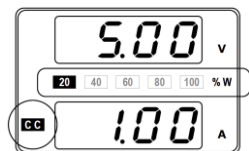
Notice the Set key becomes illuminated when setting the current or voltage. If the Voltage or Current knobs are unresponsive, press the Set key first.

- 10 Press the Output key.  
The Output key becomes illuminated.

Output



The display indicator's CC display and power bar will light up.





Note

When the output is turned on, the display becomes the output value. When the Set key is pressed, the display will show the set value.

For more information on the Normal Function Settings (F-00 ~ F-61, F-88~F-89) refer to page 49.


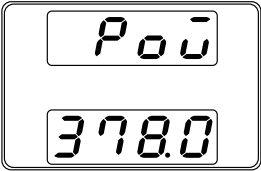
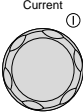
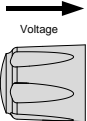
### 2.2.4. Set to CP Mode

This product can operate in constant power (CP) mode within the rated power. This allows the output of this product to operate at the set power value.

Before setting this product CP mode, please ensure the following:

The output is off.

The load is connected.

steps	Step instructions	
1	Press the Set key twice to display the constant power value.	
		
2	Use the current knob to set the constant power value. While setting the constant power value, the Set key is flashing. Setting range: 0.1W~378.0W Setting resolution: 0.1W	
3	Press the Voltage knob to determine. When the settings are confirmed, "ConF" will be displayed.	



Caution


The constant power value is not initialized even when initializing with F-88 or using the \*RST command.

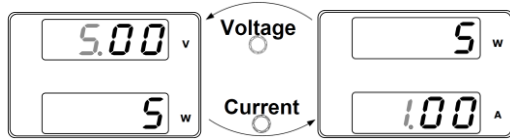
Operation may become unstable if the constant power value is less than 10% of the rated power or the current output value is less than 10% of the rated current.

### 2.2.5. Display Modes

This product can display output in three different modes: voltage and current, voltage and power, or current and power.

steps	Step instructions
-------	-------------------


- |   |  |   |
|---|--|---|
| 1 | Press the PWR DSPL key.<br>The PWR DSPL key lights up.   | PWR DSPL<br> |
| 2 | The display changes to voltage and power (V/W).  |   |
| 3 | To switch between displaying A/W and V/W, simply press the corresponding Voltage or Current knob.<br><br>For example: when in A/W mode, press the Voltage knob to display V/W. Conversely when in V/W mode, press the Current knob to display A/W. |   |



Note

When V/W is displayed, the Voltage knob can still be used to change the voltage level.

When A/W is displayed, the Current knob can still be used to change the current level.

- |   |   |   |
|---|---|---|
| 4 | Press the PWR DSPL key again to return to normal display mode.<br>The PWR DSPL light will turn off. | PWR DSPL<br> |
|---|---|---|

### 2.2.6. Panel Lock

The panel lock feature prevents settings from being changed accidentally. When activated, the Lock/Local key will become illuminated and all keys and knobs except the Lock/Local key and Output key will be disabled.

When this product is remotely controlled via the USB/LAN interface, the panel lock is automatically enabled.

Activate the panel lock

Press the Lock/Local key to activate the panel lock. The key will become illuminated.

Lock/Local



Disable the panel lock

Hold the Lock/Local key for ~3 seconds to disable the panel lock. The Lock/Local light turns off.

Lock/Local





Note

When panel lock is enabled, the output key operation content changes depending on the setting status of basic function "F-19".  
In F-19: 0 setting, output off operation is possible.  
In F-19: 1 setting, output off/off operation is possible.

### 2.2.7. Remote Sense

Remote sense is used to compensate for the voltage drop seen across load cables due to the resistance inherent in the load cables. The remote sense terminals are connected to the load terminals to determine the voltage drop across the load cables.

The remote sense compensation voltage is maximum 0.6 volts for low voltage module and 1V maximum for high voltage module. The load cable should be selected with a voltage drop less than the compensation voltage.



Warning

Ensure the output is off before connecting any sense cables.  
Use sense cables with a voltage rating exceeding the isolation voltage of this product.  
Never connect sensing cables when the output is on. Electric shock or damage to this product could result.

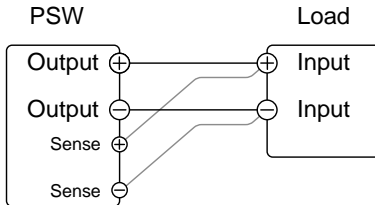


Note

Disconnect the +S terminal and +V output terminal, and the -S terminal and -V output terminal so that this product does not become local sensing. For the constant voltage model, remove the metal plate (2 pieces), and for the high voltage model, remove the red and black wires from this product.

#### steps Step instructions

- 1 Connect the Sense+ terminal to the positive potential of the load. Connect the Sense- terminal to the negative potential of the load.



Refer to page [25](#), [27](#)

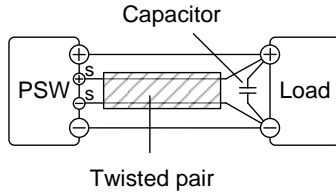
- 2 Operate this product as normal. Refer to the Basic Operation chapter for details (page [35](#)).



### Wire Shielding and Load line impedance

To help to minimize the oscillation due to the inductance and capacitance of the load cables, use an electrolytic capacitor in parallel with the load terminals.

To minimize the effect of load line impedance, use twisted wire pairing.



## 3. Function settings

The function settings of this product include various function settings, digital communication settings, external analog settings, power-on settings, calibration settings, multi-channel function settings, etc. External analog settings can only be set when the power switch is on. Other settings can be configured while operating this product.

### 3.1. Function settings list

When setting the function, there are the following restrictions.



Note

\*1: Only configure from CH1

\*2: Power on configuration settings only can be set during power up.

Entering configuration settings by channel allows you to have different settings for each channel. Under normal operation they only can be viewed.

\*3: Need to be used together with GUG-001.

\*4: Need to be used together with GUR-001B.

#### 3.1.1. Normal Function

Item	Setting	Setting Range
Output ON delay time	F-01	0.00s ~ 99.99s
Output OFF delay time	F-02	0.00s ~ 99.99s
V-I mode slew rate	F-03	0: CV high speed priority 1: CC high speed priority 2: CV slew rate priority 3: CC slew rate priority
Rise voltage slew rate	F-04	The setting range varies depending on the power module. Refer to page 49 for details.
Fall voltage slew rate	F-05	The setting range varies depending on the power module. Refer to page 49 for details.
Rise current slew rate	F-06	The setting range varies depending on the power module. Refer to page 49 for details.

Fall current slew rate	F-07	The setting range varies depending on the power module. Refer to page 49 for details.
Internal resistance	F-08	The setting range varies depending on the power module. Refer to page 50 for details.
Bleeder circuit control	F-09	0: OFF, 1: ON, 2: AUTO
Buzzer ON/OFF control*1	F-10	0: OFF, 1: ON
Measurement Average	F-17	0: Low, 1: Middle, 2: High
Output key operation (In panel lock active)	F-19	0: allow output off 1: allow output on/off

### 3.1.2. USB & GP-IB

Settings for this item have \*1 restrictions.

Item	Setting	Setting Range
Front Panel USB State (Only for confirmation)	F-20	0: Absent 1: USB memory exists
Rear Panel USB State (Only for confirmation)	F-21	0: Not used 2: USB-CDC 3: GP-IB-USB adapter 5: RS-232C-USB adapter
Rear Panel USB state	F-22	0: Disable 1: USB Host 2: USB CDC (Auto detect speed) 3: USB CDC (Full speed)
GP-IB Address	F-23	0 ~ 30

### 3.1.3. LAN

Settings for this item have \*1 restrictions.

Item	Setting	Setting Range
MAC Address-1 ~ 5	F-30~35	0x00 ~ 0xFF
LAN	F-36	0: Disable, 1: Enable
DHCP	F-37	0: Disable, 1: Enable
IP Address-1 ~ 4	F-39~42	0 ~ 255

Subnet Mask-1 ~ 4	F-43~46	0 ~ 255
Gateway-1 ~ 4	F-47~50	0 ~ 255
DNS address-1 ~ 4	F-51~54	0 ~ 255
Sockets active	F-57	0: Disable, 1: Enable
Web Server active	F-59	0: Disable, 1: Enable
Web password active	F-60	0: Disable, 1: Enable
Web setting password	F-61	0000~9999

### 3.1.4. UART (RS-232C)

Settings for this item have \*1 and \*4 restrictions.

Item	Setting	Setting Range
UART Baud Rate (Unit: bps)	F-71	0: 1200, 1: 2400, 2: 4800, 3: 9600 4: 19200, 5: 38400, 7: 115200
UART Data Bits (Unit: bit)	F-72	0: 7, 1: 8
UART Parity	F-73	0: None, 1: Odd, 2: Even
UART Stop Bit (Unit: bit)	F-74	0: 1, 1: 2

### 3.1.5. Cooling fan stop function

Please refer to page [61](#) for how to set this function.

Item	Setting	Setting Range
Enabling/disabling setting of fan stop function	F-80	0: Fan stop function disabled state 1: Execute one action 3: Executing automatic actions
Fan stop time setting	F-81	1s ~ 120s

### 3.1.6. Logging function

Please refer to page [63](#) for how to set this function.

Item	Setting	Setting Range
Starting and stopping the logging function	F-82	0: Stop 1: Start (USB memory) 2: Start (digital communication)
Logging time interval settings	F-83	0.1s ~ 999.9s
Logging data storage folder select	F-84	0000 ~ 9999

### 3.1.7. Set value digit fixed function

Please refer to page 74 for how to set this function.

Item	Setting	Setting Range
Voltage set value fixed	F-85	0: Set digit operation disabled 1: Set digit operation enabled
Current set value fixed	F-86	0: Set digit operation disabled 1: Set digit operation enabled

### 3.1.8. tUVP function

Please refer to page 75 for how to set this function.

Item	Setting	Setting Range
Enable/ Disable	F-A0	0: Disable 1: Enable, compare by instantaneous value voltage 2: Enable, compare by average value voltage
Delay time	F-A1	0.1s ~ 60.0s
Voltage drop value	F-A2	0.01 or 0.1V ~ Rated voltage

### 3.1.9. System setting

Item	Setting	Setting Range
Factory Set Value	F-88	0: No effect 1: Return to factory settings 2: All channels return to factory settings*1
Show Version (Only for confirmation)	F-89	0, 1: PSW Main Program Version 2, 3, 4, 5: PSW Main Program Build Y/M/D 6, 7: Keyboard CPLD version 8, 9: Analog CPLD version A: Control Board Version B: Reserved C, D, E, F: Kernel build Y/M/D G, H: Test command version I, J: Test command build year K, L: Test command build month/ day

## 3.1.10. Power On Configuration

Settings for this item have \*2 restrictions.

Item	Setting	Setting Range
Voltage settings	F-90	0: Panel control (local) 1: External voltage control 2: External resistance control 1 (Ext-R $\searrow$ 10k $\Omega$ = V ratings) 3: External resistance control 2 (Ext-R $\swarrow$ 10k $\Omega$ = 0V)
Current settings	F-91	0: Panel control (local) 1: External voltage control 2: External resistance control 1 (Ext-R $\searrow$ 10k $\Omega$ = I ratings) 3: External resistance control 2 (Ext-R $\swarrow$ 10k $\Omega$ = 0A)
Power-ON Output	F-92	0: OFF at startup 1: ON at startup T001 ~ T010: Run test mode TXX at start up
External Out Logic	F-94	0: High ON, 1: Low ON

## 3.1.11. Multi-Channel Function

Item	Setting	Setting Range
Output Synchronize	F130	0: Disable 1: Enable 2: All Channel Enable*1 3: All Channel Disable*1
Protection Trigger Synchronous	F131	0: Disable 1: Enable 2: All Channel Enable*1 3: All Channel Disable*1
Key Lock/ Local Synchronize*1	F132	0: Disable 1: Enable

### 3.1.12. Calibration

Item	Setting	Setting Range
Calibration	F-00	0000 ~ 9999



Note

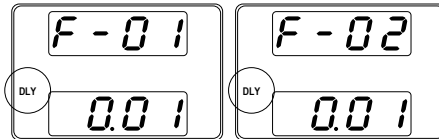
The settings for this item are not public.

## 3.2. Normal Function Settings

### 3.2.1. Output ON/OFF Delay Time

Delays turning the output on or off for the specified amount of time.

Item	Setting	Setting Range
Output ON Delay Time	F-01	0.00s ~ 99.99s
Output OFF Delay Time	F-02	0.00s ~ 99.99s



The “DLY” indicator will light when the Delay time is not 0.



Note

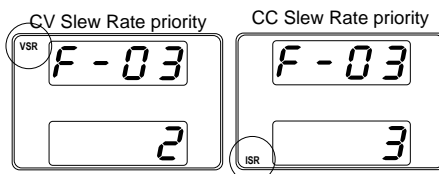
The Output ON/OFF Delay Time setting has a maximum deviation (error) of 20ms.

When the voltage setting or current setting is set to external control, the output on/off delay time setting will be disabled.

### 3.2.2. V-I mode slew rate setting

Sets High Speed Priority or Slew Rate Priority for CV or CC mode. The voltage or current slew rate can only be edited if CC/CV Slew Rate Priority is selected.

Item	Setting	Setting Range
V-I mode slew rate setting	F-03	0: CV high speed priority 1: CC high speed priority 2: CV slew rate priority 3: CC slew rate priority



The VSR indicator will be lit for CV SleW Rate Priority and the ISR indicator will be lit for CC SleW Rate Priority.

The voltage sleW rate can be set when the V-I mode sleW rate is set to “CV sleW rate priority” (F-03: 2).

Item	Setting	Power module	Setting Range
Rising voltage sleW rate	F-04	30V	0.01V/s ~ 60.00V/s
		80V	0.1V/s ~ 160.0V/s
		160V	0.1V/s ~ 320.0V/s
		250V	0.1V/s ~ 500.0V/s
		800V	1V/s ~ 1600V/s
Falling voltage sleW rate	F-05	30V	0.01V/s ~ 60.00V/s
		80V	0.1V/s ~ 160.0V/s
		160V	0.1V/s ~ 320.0V/s
		250V	0.1V/s ~ 500.0V/s
		800V	1V/s ~ 1600V/s

The current sleW rate can be set when the V-I mode sleW rate is set to “CC sleW rate priority” (F-03: 3).

Item	Setting	Power module	Setting Range
Rising current sleW rate	F-06	30V	0.01A/s ~ 72.00A/s
		80V	0.01A/s ~ 27.00A/s
		160V	0.01A/s ~ 14.40A/s
		250V	0.001A/s ~ 9.000A/s
		800V	0.001A/s ~ 2.880A/s
Falling current sleW rate	F-07	30V	0.01A/s ~ 72.00A/s
		80V	0.01A/s ~ 27.00A/s
		160V	0.01A/s ~ 14.40A/s
		250V	0.001A/s ~ 9.000A/s
		800V	0.001A/s ~ 2.880A/s

### 3.2.3. Internal resistance setting

Set the internal resistance of this product output.

Item	Setting	Power module	Setting Range
Internal resistance setting	F-08	30V	0.000Ω ~ 0.833Ω
		80V	0.000Ω ~ 5.926Ω
		160V	0.000Ω ~ 22.222Ω
		250V	0.00Ω ~ 55.55Ω
		800V	0.0Ω ~ 555.5Ω



### 3.2.4. Bleeder circuit control

Bleeder circuit control turns the bleeder circuit ON/OFF. When set to AUTO, the bleeder circuit turns on when the output is on and turns off when the output or power is turned off. Refer to page 15 for usage details.

Item	Setting	Setting Range	Bleeder circuit setting		
			Output ON	Output OFF	Power OFF
Bleeder circuit control	F-09	0: OFF	OFF	OFF	OFF
		1: ON	ON	ON	ON
		2: AUTO	ON	OFF	OFF

### 3.2.5. Buzzer ON/OFF control

Turns the buzzer sound on/off. The buzzer sound is generated when an alarm occurs and when the panel is operated.

Buzzer ON/OFF control can only be set from CH1.

Item	Setting	Setting Range
Buzzer ON/OFF control*1	F-10	0: OFF 1: ON

### 3.2.6. Measurement Average Setting

Configure the averaging settings for measured values.

Item	Setting	Setting Range
Measurement Average Setting	F-17	0: Low 1: Middle 2: High

### 3.2.7. Output key operation settings

Set the operation of the Output key when the panel is locked.

Item	Setting	Setting Range
Output key operation settings	F-19	0: allow output off 1: allow output on/off

### 3.3. USB/GPIB/UART/LAN Settings

USB/GPIB/UART/LAN Settings can only be set from CH1.

#### 3.3.1. USB setting

Displays the usage status of the front and rear panel USB A ports and configures the rear panel USB.

Front Panel USB State	Setting	Setting Range
Displays the front panel USB-A port state. (Only confirmation)	F-20	0: Absent 1: USB memory exists
Rear Panel USB State	Setting	Setting Range
Displays the rear panel USB-B port state. (Only for confirmation)	F-21	0: Not used 2: USB-CDC 3: GPIB-USB adapter 5: RS-232C adapter
Rear Panel USB Mode	Setting	Setting Range
Sets the rear panel USB mode.	F-22	0: Disable 1: USB Host 2: USB CDC (Auto detect speed) 3: USB CDC (Full speed)



Note

When there is an interference source in the operating environment, setting "F-22: 3" and lower the data transfer rate, can reduce the influence of the interference source.

#### 3.3.2. GP-IB Address setting

Sets the GP-IB address.

Item	Setting	Setting Range
GP-IB Address	F-23	0 ~ 30

#### 3.3.3. UART communication setting

Sets the UART (RS-232C) communication settings.

Settings can be made when GUR-001 or GUR-001A is connected to this product.

UART Baud Rate	Setting	Setting Range
Set baud rate (Unit: bps)	F-71	0: 1200 1: 2400 2: 4800 3: 9600 4: 19200 5: 38400 6: 57600 7: 115200
UART Data Bits	Setting	Setting Range
Set data bits (Unit: bit)	F-72	0: 7 1: 8
UART Parity	Setting	Setting Range
Set parity	F-73	0: None 1: Odd 2: Even
UART Stop Bit	Setting	Setting Range
Set stop bit (Unit: bit)	F-74	0: 1 1: 2

### 3.3.4. LAN Settings

Sets the LAN communication settings.

Confirm MAC Address	Setting	Setting Range
MAC Address-1	F-30	0x00 ~ 0xFF
MAC Address-2	F-31	0x00 ~ 0xFF
MAC Address-3	F-32	0x00 ~ 0xFF
MAC Address-4	F-33	0x00 ~ 0xFF
MAC Address-5	F-34	0x00 ~ 0xFF
MAC Address-6	F-35	0x00 ~ 0xFF
Can only be checked, cannot be configured.		
Turns Ethernet on or off	Setting	Setting Range
LAN	F-36	0: Disable 1: Enable

DHCP	F-37	0: Disable 1: Enable
------	------	-------------------------

Sets the IP address	Setting	Setting Range
---------------------	---------	---------------

IP Address-1	F-39	0 ~ 255
IP Address-2	F-40	0 ~ 255
IP Address-3	F-41	0 ~ 255
IP Address-4	F-42	0 ~ 255

Set arbitrary values for IP addresses-1~4.

Sets the subnet mask	Setting	Setting Range
----------------------	---------	---------------

Subnet Mask-1	F-43	0 ~ 255
Subnet Mask-2	F-44	0 ~ 255
Subnet Mask-3	F-45	0 ~ 255
Subnet Mask-4	F-46	0 ~ 255

Set arbitrary values for Subnet Mask-1~4.

Sets the gateway	Setting	Setting Range
------------------	---------	---------------

Gateway-1	F-47	0 ~ 255
Gateway-2	F-48	0 ~ 255
Gateway-3	F-49	0 ~ 255
Gateway-4	F-50	0 ~ 255

Set arbitrary values for Gateway-1~4.

Sets the DNS address	Setting	Setting Range
----------------------	---------	---------------

DNS address-1	F-51	0 ~ 255
DNS address-2	F-52	0 ~ 255
DNS address-3	F-53	0 ~ 255
DNS address-4	F-54	0 ~ 255

Set arbitrary values for DNS address-1~4.

Web socket connection settings.	Setting	Setting Range
---------------------------------	---------	---------------

Sockets active	F-57	0: Disable 1: Enable
----------------	------	-------------------------

Web server control settings.	Setting	Setting Range
Socket connection status	F-59	0: Disable 1: Enable
Turns a web password on/off.	Setting	Setting Range
Web password active	F-60	0: Disable 1: Enable
Sets the Web password	Setting	Setting Range
Web password	F-61	0000~9999

### 3.4. System Settings

#### 3.4.1. Factory Set Value

Returns this product to the factory default settings. Refer to page [135](#) for a list of the default settings.

Item	Setting	Setting Range
Sets factory value	F-88	0: No effect 1: Return to factory settings 2: All channels return to factory settings



Note

“F-88: 2” can only be set from CH1.

#### 3.4.2. Show Version

Displays this product version number, build date, keyboard version, analog-control version, kernel build, test command version and test command build date.

Can only be checked, cannot be configured.

Item	Setting	Range
Show Version	F-89	0, 1: Firmware version number 2, 3: Firmware build: Year 4, 5: Firmware build: Month - Day 6, 7: Keyboard CPLD version number 8, 9: Analog control CPLD version number

- A: Control Board version number
- B: Reserved
- C, D: Kernel build: Year
- E, F: Kernel build: Month - Day
- G, H: Test Command Version number
- I, J: Test Command build: Year
- K, L: Test Command build: Month - Day
- M, N: USB Driver version number

### 3.5. Function settings at power-on

Power on configuration settings only can be set during power up. By setting the functions in order starting from CH1, different settings can be made for each channel.

#### 3.5.1. Voltage setting Control

Set voltage setting control using either panel control or external voltage/resistance control. For external voltage control, refer to page [96](#) (External Voltage Control of Voltage Output) and page [99](#) (External Resistance Control of Voltage Output).

Item	Setting	Setting Range
Voltage settings	F-90	0: Panel control (local)
		1: External voltage control
		2: External resistance control 1 (Ext-R $\searrow$ 10k $\Omega$ = V ratings)
		3: External resistance control 2 (Ext-R $\swarrow$ 10k $\Omega$ = 0V)

#### 3.5.2. Current setting Control

Set current setting control using either panel control or external voltage/resistance control. For details on external voltage control, refer to page [97](#) (External Voltage Control of Current Output) and page [100](#) (External Resistance Control of Current Output).

Item	Setting	Setting Range
Current settings	F-91	0: Panel control (local) 1: External voltage control 2: External resistance control 1 (Ext-R $\searrow$ 10k $\Omega$ = I ratings) 3: External resistance control 2 (Ext-R $\swarrow$ 10k $\Omega$ = 0A)

### 3.5.3. Power-ON Output

Configures this product to do one of the following at startup.

Item	Setting	Setting Range
Power-ON Output	F-92	0: OFF at startup 1: ON at startup T001 ~ T010: Run test mode TXX at start up

### 3.5.4. External Out Logic

Set the logic for turning on the output using an external control.

The output is turned on by either active high (open) or active low (short).

Item	Setting	Setting Range
External Out Logic	F-94	0: Active high 1: Active low

## 3.6. Multi-Channel Function Setting

### 3.6.1. Output Synchronize

Output synchronization settings can be made. Each channel can be used with different settings.

Item	Setting	Setting Range
Output Synchronize	F130	0: Disable 1: Enable 2: All Channel Enable 3: All Channel Disable



Note

“F130: 2, 3” can only be set from CH1.

Output synchronization can be operated using the Output key of any CH set to F130:1.

### 3.6.2. Protection Trigger Synchronous

Protection trigger synchronization settings are possible. Each channel can be used with different settings.

Item	Setting	Setting Range
Protection Trigger Synchronous	F131	0: Disable
		1: Enable
		2: All Channel Enable*1
		3: All Channel Disable*1



Note

\*1 "F131: 2, 3" can only be set from CH1.

### 3.6.3. Key Lock/ Local Synchronize

Key Lock/Local Synchronize setting. Only configure from CH1.

Item	Setting	Setting Range
Key Lock/ Local Synchronize	F132	0: Disable
		1: Enable

## 3.7. Calibration

The calibration password is used to access the local mode calibration or other special functions. The password used determines which function is accessed.

The settings for this item are not public.

Item	Setting	Setting Range
Calibration	F-00	0000 ~ 9999

## 3.8. Setting Normal Function Settings

The normal function settings (F-01 ~ F-61, F88 ~ F89 and F130 ~ F132) can be easily configured with the Function key.

Before operation, please check the following.

Ensure the load is not connected.

Ensure the output is off.

steps Step instructions

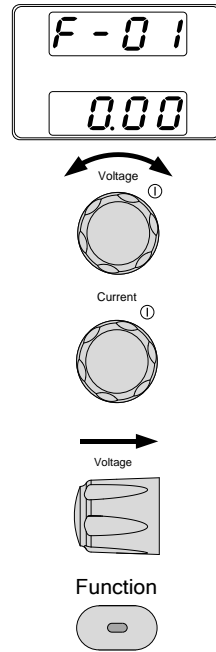
- 1 Press the Function key.  
The function key will light up.

Function





- 2 The display will show F-01 on the top and the configuration setting for F-01 on the bottom.
- 3 Rotate the Voltage knob to change the F-XX setting.  
F-XX: F-00 ~ F-61, F-88 ~ F-89 and F130 ~ F132
- 4 Use the Current knob to set the parameter for the chosen F-XX setting.
- 5 Press the voltage knob to determine configuration settings.  
When the settings are confirmed, "ConF" will be displayed.
- 6 Press the Function key again to exit the configuration settings.  
The Function key turns off.



### 3.9. Setting Power on Configuration Settings

Power-on configuration settings can only be set at power-on to prevent configuration settings from being changed inadvertently.

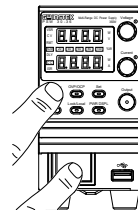
Before operation, please check the following.

Ensure the load is not connected.

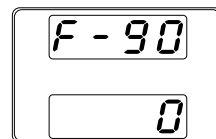
Ensure the output is off.

steps	Step instructions
-------	-------------------

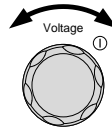
- 1 Hold the Function key of CH1 whilst turning the power on.



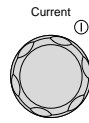
- 2 The display of all channel will show F-90 on the top and the configuration setting for F-90 on the bottom.



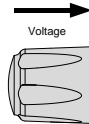
3 Rotate the Voltage knob to change the F-XX setting.  
F-XX: F-90~ F-95



4 Use the Current knob to set the parameter for the chosen F setting.



5 Press the voltage knob to determine configuration settings.  
When the settings are confirmed, "ConF" will be displayed.



6 Turn the power off and then on again.

# 4. Special functions

## 4.1. Cooling fan stop function

This function temporarily stops the operation of the cooling fan. Use this when there is a problem with fan operation.

Continuous operation with the cooling fan stopped is not possible. After the cooling fan is stopped, the cooling fan stop function is disabled for the fan stop time. If the cooling fan stop function is disabled, "2" will be displayed on the current display.



**Caution** If the cooling fan remains stopped for a long time, it may cause a malfunction.  
Please use the minimum amount necessary.


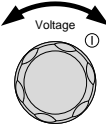
### 4.1.1. Fan stop time setting


Before executing the fan stop function, set the fan stop time.

steps	Step instructions	
1	Press the Function key. The Function key will light up.	<p>Function</p>
2	Rotate the Voltage knob to change the F setting to F-81. F-81: Fan stop time setting	
3	Use the Current knob to set the F-81 setting. Setting Range: 1s ~ 120s	
4	Press the voltage knob to determine the fan stop time. When the settings are confirmed, "ConF" will be displayed.	
5	Press the Function key to finish setting the fan stop time. The Function key turns off.	

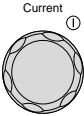
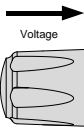
#### 4.1.2. Executing the fan stop function


The fan stop function can be selected from two types of operation: Execute one action and executing automatic actions.

steps	Step instructions	
1	Press the Function key. The Function key will light up.	 <p>Function</p>
2	Rotate the Voltage knob to change the F setting to F-80. F-80: Enabling/disabling setting of fan stop function	 <p>Voltage</p>

 **Note** "0" is displayed at the bottom of the display. "0" means the fan stop function is disabled state.

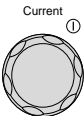
#### Execute one action

- Turn the current knob and set the lower part of the display to "1".  

- Press the voltage knob to execute the fan stop function.  
"ConF" (→"1") will be displayed at the bottom of the display and the fan will stop for the set time.  

- When the set fan stop time has elapsed, the bottom of the display will display "1" → "2" and the fan will start operating.

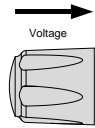
 **Note** If "2" is displayed at the bottom of the display, the fan stop function cannot be executed. The fan stop function execution disabled time is the same time as the fan stop time.

- When the fan stop function execution disabled time has elapsed, the lower part of the display changes from "2" to "0".  
The fan stop function can be executed from step 3.

#### Executing automatic actions

- From step 2, turn the current knob and set the bottom of the display to "3".  


- 8 Press the voltage knob to execute the fan stop function.  
"ConF" → "3" is displayed at the bottom of the display, and the fan stops and operates repeatedly at the set time interval.



Note

If the fan stop function is executed automatically, the automatic execution will not stop even if finish setting the fan stop time.

### 4.2. Logging function

The logging function is a function that records and saves the output status (output voltage value, output current value, status) of this device at set time intervals (0.1sec to 999.9sec).

8000 pieces of logging data can be saved in the internal memory of the device. Logging data stored in this device can be output to a controller (PC, etc.) via an external USB memory or digital communication while the logging function is in operation.

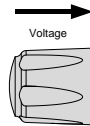
If the logging data stored in this product's internal memory exceeds 8000 items, the data will be deleted. Please output the saved logging data before the saved logging data exceeds 8000 pieces.

#### 4.2.1. Logging time interval settings

Set the logging time interval before starting the logging function.

steps	Step instructions	
1	Press the Function key. The Function key will light up.	
2	Rotate the Voltage knob to change the F setting to F-83. F-83: Logging time interval settings	
3	Use the Current knob to set the F-83 setting. Setting Range: 0.1s ~ 999.9s	

- 4 Press the voltage knob to determine the logging time interval.  
When the settings are confirmed, "ConF" will be displayed.



- 5 Press the Function key to finish setting the logging time interval.  
The Function key turns off.



Note

When outputting logging data via digital communication, you can use the logging time interval setting command (SENSe:DLOG:PERiod).



Caution

The logging time interval cannot be set while the logging function is in operation.

#### 4.2.2. Logging function operation: USB memory

this product can store up to 8000 pieces of logging data in its internal memory. While the logging function is in operation, logging data is output in units of 1000 to an external USB memory in CSV file format.

Additionally, when the logging function is stopped, the logging data (less than 1000 pieces) that has not been output to the USB memory will be output to the USB memory in CSV file format.



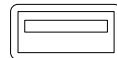
Caution

Before starting the logging function, ensure that the logging time interval is set. Refer to page 63.

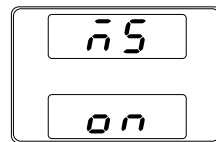
##### steps Step instructions

#### Insert USB memory

- 1 Insert the USB memory into the USB-A slot on the front panel.



When the USB memory is recognized (after a few seconds), "MS (Mass Storage) on" will appear on the display.



Note

Even while the logging function is operating, it is possible to remove/insert the USB memory as long as data is not being output to the USB memory.



Caution

If the USB memory is removed while logging data is being output to the USB memory, the logging data may be destroyed. Please use a USB memory with an access LED so that you can check the output operation to the USB memory.

### Logging data storage folder selection operation

- 2 Press the Function key.  
The Function key will light up.
- 3 Rotate the Voltage knob to change the F setting to F-84.  
F-84: Logging data storage folder select
- 4 Use the Current knob to set the F-84 setting.  
Setting Range: 0000 ~ 9999
- 5 Press the voltage knob to determine the logging data storage folder.  
When the settings are confirmed, "ConF" will be displayed.

Function



Current ①



Voltage



Note

Logging data will be output to the storage folder of the USB memory (the folder selected in step 2-5).



Note

When outputting logging data via digital communication, this data storage folder selection is disabled.



Caution

This operation cannot be performed while the logging function is in operation.

### Logging function start operation

- 6 Rotate the Voltage knob to change the F setting to F-82.  
F-82: Starting and stopping the logging function
- 7 Rotate the current knob and set it to "1".



Current ①



Note

When outputting logging data using digital communication, set "2".

- 8 Press the voltage knob.  
"ConF" will be displayed and the logging function will start.  
The voltage display blinks while the logging function is in operation.



Voltage





Note

In step 8, press the Function key to turn off the key and complete the logging function settings. At this time, the logging function is still operating even if the logging function settings have been completed.

This product can be operated while the logging function is in operation (voltage display blinking).



Note

If 1000 pieces of logging data are saved in this product's internal memory while the USB memory is installed and the logging function is operating, the 1000 pieces of logging data will be output to the USB memory in CSV file format.



Note

After the power is turned on, the first logging data name output to the USB memory is "0000.csv". Each time logging data is output to the USB memory, the file name increases by one, up to a maximum of "9999.csv".



Caution

When outputting logging data from this product to a USB memory, if a file with the same name exists in the folder on the USB memory (the folder selected in step 2-5), it will be overwritten.



Caution

If the USB memory is not installed and the logging data exceeds 8000 in this product's internal memory, the oldest 1000 logging data stored in this product's internal memory will be deleted.

### Logging function stop operation

- 9 Press the Function key.  
The Function key will light up.
- 10 Rotate the Voltage knob to change the F setting to F-82.  
F-82: Starting and stopping the logging function
- 11 Rotate the current knob and set it to "0".
- 12 Press the voltage knob.  
"ConF" will be displayed and the logging function will stop.

Function



Current







Note

When the logging function stop, the logging data (less than 1000 pieces) saved in this product's internal memory that is not output to the USB memory will be output.



Caution

If the logging function is stopped without the USB memory installed, the logging data saved in this product's internal memory that is not output to the USB memory will be deleted.

#### 4.2.3. CSV file output to USB memory

Logging data saved to the USB memory using the logging function is saved in the logging data storage folder (0000 ~ 9999) of a folder in the USB memory.

Example of USB  
memory contents

20011361\_000  
0000  
0000.csv

“20011361\_000” folder:

This folder is automatically created when logging data is output to a USB memory. The folder name is undefined and cannot be specified. A folder is created for each channel.

”0000” folder:

This is the folder where logging data is storage. This will be the folder name set in the logging data storage folder selection.

“0000.csv” file:

This is logging data. When the logging function starts after this product is turned on, the data will be stored sequentially starting from "0000.csv".



Caution

This product has no clock function. Therefore, the timestamp on a folder or file is not the date the folder or file was created or updated.

## Logging data content

The following contents are saved in the logging data CSV file.

Sample Period: Logging time interval (seconds)

Number: Data number

Vmeas(V): Measured voltage value (V)

Imeas(A): Measured current value (A)

States(Hex): Device status during logging

### Contents of States: Bit0=LSB, Bit31=MSB

Bit 0	Calibration mode	Bit 16	OVP
Bit 1	Locked state	Bit 17	OCP
Bit 2	(Unused)	Bit 18	(Unused)
Bit 3	Output OFF/ON	Bit 19	AC power OFF
Bit 4	Remote state	Bit 20	OTP
Bit 5	Waiting for trigger	Bit 21	WDOG
Bit 6	(Unused)	Bit 22	(Unused)
Bit 7	(Unused)	Bit 23	(Unused)
Bit 8	CV mode	Bit 24	Voltage limit
Bit 9	CP mode	Bit 25	Current limit
Bit 10	CC mode	Bit 26	(Unused)
Bit 11	Output ON delay	Bit 27	Shutdown
Bit 12	Output OFF delay	Bit 28	Power limit
Bit 13	(Unused)	Bit 29	(Unused)
Bit 14	TEST mode	Bit 30	UVP
Bit 15	(Unused)	Bit 31	(Unused)

When operating under CP mode, Bit 8 (CV mode) is also set at the same time as Bit 9.

Data example: The two types of data examples have the same content.

Data example: For Excel

	A	B	C	D
1	Sample Period : 1.0 sec			
2	Number	Vmeas(V)	Imeas(A)	State(Hex)
3	0	0	0	0x00000010
4	1	0	0	0x00000010
5	2	0	0	0x00000010
6	3	0	0	0x00000010
7	4	4.982	0.242	0x00000118
8	5	4.982	0.242	0x00000118
9	6	4.982	0.242	0x00000118
10	7	4.982	0.242	0x00000118
11	8	4.982	0.242	0x00000118
12	9	0	0	0x00000010
13	10	0	0	0x00000010
14	11	0	0	0x00000010
15	12	9.982	0.489	0x00000118
16	13	9.982	0.489	0x00000118
17	14	9.982	0.489	0x00000118
18	15	9.982	0.489	0x00000118
19	16	9.982	0.489	0x00000118

Data example: For CSV data

Sample Period : 1.0 sec

Number,Vmeas(V),Imeas(A),State(Hex)

0,0,0,0x00000010

1,0,0,0x00000010

2,0,0,0x00000010

3,0,0,0x00000010

4,4.982,0.242,0x00000118

5,4.982,0.242,0x00000118

6,4.982,0.242,0x00000118

7,4.982,0.242,0x00000118

8,4.982,0.242,0x00000118

9,0,0,0x00000010

10,0,0,0x00000010

11,0,0,0x00000010

12,9.982,0.489,0x00000118

13,9.982,0.489,0x00000118

14,9.982,0.489,0x00000118

15,9.982,0.489,0x00000118

16,9.982,0.489,0x00000118

#### 4.2.4. Logging function operation: digital communication

This product can store up to 8000 pieces of logging data in its internal memory. When the logging function is in operation, logging data is output to the controller via digital communication. To output logging data to the controller, use the logging data return request command (FETCh:DLOG?). The maximum number of logging data output is 1000 pieces/time, and it is output in IEEE-488.2 binary block format.



Caution

Before starting the logging function, ensure that the logging time interval is set. Refer to page 63.

##### steps Step instructions

##### Digital communication method selection

- 1 Set the digital communication method used for logging data output. Refer to page 52, 109

##### Logging function start operation

- 2 Send the logging function start command (SENSE:DLOG:STATe 2) from the controller to this product. Refer to programming manual



Note

When outputting logging data to USB memory, send the "SENSE:DLOG:STATe 1" command.

- 3 The logging function starts when the logging function start command is sent to this product.  
The voltage display blinks while the logging function is in operation.



Note

While the logging function is in operation (voltage display flashing), commands can be sent to this product and the device can be operated manually. Manual operation can be performed by placing this product in local mode.

##### Logging data output to controller

- 4 When the controller sends the logging data return request command (FETCh:DLOG?) to this product, the logging data is output to the controller. Refer to programming manual



Note

The maximum number of logging data output is 1000 pieces/time, and it is output in IEEE-488.2 binary block format.

Logging data output to the controller will be deleted from this product's internal memory.



Note

While the logging function is in operation, logging data can be output to the controller any number of times.



Logging data cannot be output to the controller while the logging function is stopped.



If the amount of logging data in the internal memory of this product exceeds 8000, the oldest 1000 logging data stored in the internal memory of this product will be deleted. Perform the logging data output operation before 8000 pieces of logging data are saved in the internal memory of this product.

#### Logging function stop operation

- 5 Send the logging function stop command (SENSe:DLOG:STATe 0) from the controller to this product. Refer to programming manual
- 6 When the logging function stop's command is sent to this product, the logging function stop. The voltage display will change from blinking to lit.



The logging function is stop by setting "F-82: 0" in this product local state.



When the logging function stop, the logging data saved in this product's internal memory will be deleted.

#### 4.2.5. Logging data output to controller

Logging data output to the controller is output in IEEE-488.2 binary block format (number of data: max. 1000 pieces/time). Make sure the controller is in a state where it can receive this data format.

When logging data is output multiple times while the logging function is in operation, please save and manage the data on the controller side.

#### Logging data content

The following contents are output with one logging data output. Data is output consecutively without being separated by spaces or ",". "X" in the data content is the amount of data. One data amount (X=1) is one 2-digit hexadecimal value. If X=2, there will be two 2-digit hexadecimal numbers.

**<Start code: 1><Number digits in data count: 1><Data count: 8>**  
**<Reserved: 2><Checksum: 4><Start number: 4>**  
**<Sample period: 4><Number of log data: 4>**  
**{Cell-0: 12} ... {Cell-999: 12}<End code: 1>**  
**{Cell-N} = <StateN: 4><VmeasN: 4><lmeasN: 4> (N: 0, ..., 999)**

As a data example, in the case of "1 logging count, CV mode OUTPUT on, 24.988V, 0A", the following continuous data will be output.

**233830303030303030303030000061020000000000060EA000001000000  
180100009C610000000000000A**

**<Start code: 1> Example data: 23**

It means the beginning of data. This is a fixed value, expressed as "#" in ASCII notation.

**<Number digits in data count: 1> Example data: 38**

This is the number of digits data when "Data count" is converted to a decimal number. In ASCII notation, it is "8". The number of digits in "Data count" will be 8 digits.

**<Data count: 8> Example data: 3030303030303330**

This is the amount of data between "Data count" and "End code". In ASCII notation, it is "00000030". The total amount of data means 30 items (X=30).

**<Reserved: 2> Example data: 0000**

It's a reservation number and doesn't mean anything.

Fixed value data (X=2).

**<Checksum: 4> Example data: 61020000**

This is the sum of the data values between "Checksum" and "End code".

$$00+\dots+60+EA+\dots+01+\dots+18+01+\dots+9C+61+\dots+00 = 00000261$$

The data will be output starting from the lowest digit and will be "61020000".

**<Start number: 4> Example data: 00000000**

The logging data output count data since the logging function started is output starting from the lowest digit.

When written as a decimal number, the number of times data is 0 to 1,999,999,999. After starting the logging function, the first logging data output count data will be "0". The number of times the logging data is output increases by one each time the logging data is output. If the number of logging data output exceeds "1,999,999,999" or if the logging function is "stopped → restarted", the output number data will return to "0".

"00000000" in the data example is "0", so it will be the first logging data output.

Other examples of output times

When the output count data is "12000000"

$$18(12h) \times 256^0 + 0(00h) \times 256^1 + 0(00h) \times 256^2 + 0(00h) \times 256^3$$

$$= 18 + 0 + 0 + 0 = 18 = 19\text{th logging data output}$$

When the output count data is "FF933577"

$$255(FFh) \times 256^0 + 147(93h) \times 256^1 + 53(35h) \times 256^2 + 119(77h) \times 256^3$$

$$= 255 + 37,632 + 3,473,408 + 1,996,488,704 = 1,999,999,999$$

$$= 2,000,000,000\text{th logging data output}$$

**<Sample period: 4> Example data: 60EA0000**

Outputs the set logging time interval starting from the lower digits.

Unit: ms

The data example "60EA0000" has the following time.

$$96(60h) \times 256^0 + 234(EAh) \times 256^1 + 0(00h) \times 256^2 + 0(00h) \times 256^3 \\ = 96 + 59,904 + 0 + 0 = 60,000\text{ms} = 60\text{s}$$

**<Number of log data: 4> Example data: 01000000**

"Number of log data" is the number of pieces of logging data.

Outputs the number of "Cell-N" to be output starting from the lower digit.

Unit: pieces

The data example "01000000" has the following number.

$$1(01h) \times 256^0 + 0(00h) \times 256^1 + 0(00h) \times 256^2 + 0(00h) \times 256^3 \\ = 1 + 0 + 0 + 0 = 1 = 1 \text{ piece}$$

**{Cell-0: 12} ... {Cell-999: 12}** (N: 0, ..., 999)

**Example data: 180100009C61000000000000** (X=12)

"Cell-X" is measurement data. Outputs the measurement data stored in the main unit's internal memory in order from oldest to newest. The amount of measurement data for one item is 12 items (X=12).

**<StateN: 4><VmeasN: 4><lmeasN: 4>** (N: 0, ..., 999)

**Example data: 180100009C61000000000000**

The measurement data consists of three types of continuous data: output status (StateN), voltage measurement value (VmeasN), and current measurement value (lmeasN).

**<StateN: 4> Example data: 18010000**

"StateN" is the instrument state data during logging. The data is 32Bit data and is output in the following order.

(Bit 7~Bit 1), (Bit 15~Bit 8), (Bit 23~Bit 16), (Bit 31~Bit 24)

In the example data, the contents are as follows.

Bit 7~Bit 1, 18: 00011000, Bit 15~Bit 8, 01: 00000001

Bit 23~Bit 16, 00: 00000000, Bit 31~Bit 24, 00: 00000000

The contents of each bit are the same as the CSV file output to the USB memory. (Refer to page 67)

**<VmeasN: 4> Example data: 9C610000**

"VmeasN" is the voltage measurement value data during logging.

Data is output from the lower digits. Unit: mV

The data example "9C610000" has the following voltage value.

$$156(9Ch) \times 256^0 + 97(61h) \times 256^1 + 0(00h) \times 256^2 + 0(00h) \times 256^3 \\ = 156 + 24,832 + 0 + 0 = 24,988\text{mV} = 24.988\text{V}$$

**<lmeasN: 4> Example data: 00000000**

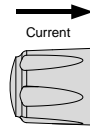
"lmeasN" is current measurement value data during logging.





- 3 Press the current knob and select the setting digit.

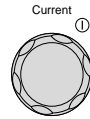
The setting digit (one "X" of the setting digit "X.X.X") is highlighted.



- 4 Turn the current knob to set the digit.

0: Set digit operation disabled

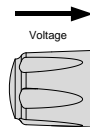
1: Set digit operation enabled



- 5 Repeat steps 3 and 4 to set other digits.

- 6 Press the voltage knob to determine whether setting digit operation is enabled or disabled.

When the settings are confirmed, "ConF" will be displayed.



- 6 Press the Function key to finish this function setting.

The Function key turns off.



Note

If "0.0.0" is set on F-85, voltage cannot be set during normal operation. Press the voltage knob and "MSG F-85" will be displayed.



Note

If "0.0.0" is set on F-86, current cannot be set during normal operation. Press the current knob and "MSG F-86" will be displayed.

#### 4.4. tUVP function

The tUVP (Tracking under voltage protection) function is a function that turns off the output of this product if the next measured output voltage value (approximately 20ms later) is lower than the set voltage value compared to the currently measured output voltage value.

##### 4.4.1. Setting method of the tUVP function

The tUVP function sets the following items.

Enable or disable this function: Set whether to enable or disable this function.

Delay time: Set the time for this function to become effective after the output is turned on.

Voltage drop value: Set the voltage drop value between two output voltage measurements.

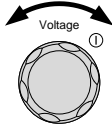
**steps Step instructions**

- 1 Press the Function key.  
The Function key will light up.

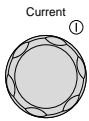


**Function enable/disable setting**

- 2 Rotate the Voltage knob to change the F setting to F-A0.  
F-A0: tUVP function enable/disable setting

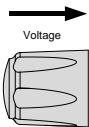


- 3 Rotate the current knob to set enable/disable of this function.  
0: Disable  
1: Enable, compare by instantaneous value voltage  
2: Enable, compare by average value voltage



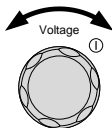
**Note** When "F-A0: 2" is set, the measured value of output voltage will be the value set in measurement averaging (F-17).

- 4 Press the voltage knob to determine enabled or disabled.  
When the settings are confirmed, "ConF" will be displayed.

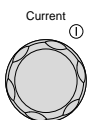


**Delay time setting**

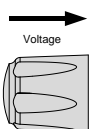
- 5 Rotate the Voltage knob to change the F setting to F-A1.  
F-A1: tUVP function delay time setting



- 6 Rotate the current knob to delay time setting.  
Setting Range: 0.1s ~ 60.0s

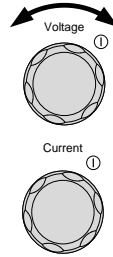


- 7 Press the voltage knob to determine delay time setting.  
When the settings are confirmed, "ConF" will be displayed.



### Voltage drops value setting

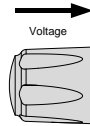
- 8 Rotate the Voltage knob to change the F setting to F-A2.  
F-A2: tUVP function voltage drops value setting
- 9 Rotate the current knob to delay time setting.  
Setting Range: 0.01 or 0.1V ~ Rated voltage



Note

The setting range varies depending on the minimum digit of the power module voltage display. Models with a minimum digit of 10mV will have a value of ``0.01," and models with a minimum digit of 100mV will have a value of ``0.1."

- 10 Press the voltage knob to determine voltage drops value.  
When the settings are confirmed, "ConF" will be displayed.
- 11 Press the Function key to finish this function setting.  
The Function key turns off.

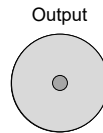


### 4.4.2. Output on/off operation when UVP function is enabled

If the tUVP function is enabled and the output voltage drops when the output of this product is on, the output of this product will be turned off and "UVP" will be displayed on the display.

steps	Step instructions
-------	-------------------

- 1 Set the tUVP function to enabled. Press the output key to turn on the output of this product.  
The output key will light up.



Note

After the output is turned on, the tUVP function is disabled for the set delay time.

- 2 If a voltage drop that exceeds the set voltage drop value occurs between two output voltage measurements, this product output will turn off and "UVP" will be displayed at the top of the display.





Note

If "UVP" is displayed on the display, this product cannot be operated.



Note

When tUVP operates, the output voltage of this product will drop at the fastest slew rate time. Additionally, if tUVP operates during test mode operation, the output voltage of this product will drop at the set slew rate time.

- 3 To enable operation of this product from step 2, press the OVP/OCP key for 3 seconds or more.

OVP/OCP



## 4.5. Test mode function

This section describes how to use the Test mode function to run, load and save test mode for automated testing.

The test mode feature is useful for automatically running large numbers of tests. The test mode function can store ten test mode in memory.

In the test mode function, the settings (voltage, current, etc.) are updated according to the set time.

Each test mode data file can be created in CSV format and read from a USB memory.

USB memory formatted in FAT format can be used. Please use the USB memory after deleting all files other than the test mode data file.

### 4.5.1. Test mode File Format

The test mode data consists of a pair of CSV format files (tXXX.csv) and TST format files (tXXX.tst). The file name is "tXXX". "XXX" indicates file number 001-010.

The test mode function runs data from a CSV file. Create a test mode data file by editing the CSV file.

CSV format files (tXXX.csv) and TST format files (tXXX.tst) can be downloaded from our website.

### 4.5.2. Test mode setting items

**Test Run**      Runs the selected test mode data from the internal memory of this product. Test mode must be loaded into the product's internal memory before they can be run. Refer to the test function "Test Load", below. Execute and stop the test mode function by operating the Output key. Refer to page 81 for operating instructions.

T-01


1~10

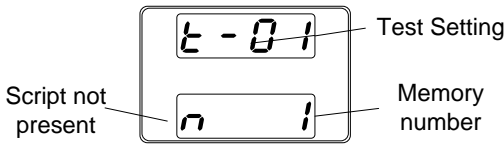
Test Load	Load the test mode data from the USB memory into the internal memory of this product. Refer to page 80 for operating instructions. T-02                      1~10 (USB → PSW)
Test Export	Exports the specified test mode data in this product's internal memory to a USB memory. Refer to page 83 for operating instructions. T-03                      1~10 (PSW → USB)
Test Remove	Delete the selected test mode data from the internal memory of this product. Refer to page 84 for operating instructions. T-04                      1~10, ALL
Test Memory	Displays the available internal memory capacity of this product in kilobytes (1024 bytes). Refer to page 84 for operating instructions. T-05                      Max: 1852 k bytes

#### 4.5.3. Setting the Test mode Settings

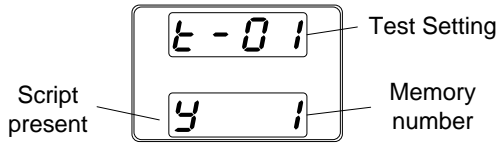
Press the Test key and configure the test mode items settings (T-01 to T-05).

steps	Step instructions
-------	-------------------

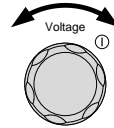
- 1 Press the Test key.  
The Test key will light up. 
- 2 Test mode setting items (Test Setting) are displayed at the top of the display. In the explanatory diagram, it is "T-01 (Test Run)".  
The product's internal memory number is displayed on the bottom right side of the display. In the explanatory diagram, the memory number is "1".  
If there is no test mode data in this product's internal memory number, "n" will be displayed at the bottom left of the display. This means that the script is not present.



If there is test mode data in this product's internal memory number, "y" will be displayed at the bottom left of the display. This means that the script is present.



- 3 Rotate the Voltage knob to change the test mode setting items (Test setting).

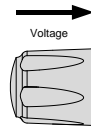


Refer to page 78

T-01: Test Run, T-02: Test Load  
T-03: Test Export, T-04: Test Remove  
T-05: Test Memory

- 4 Rotate the Current knob to choose a memory number.
- 5 Press the voltage knob to determine the setting.  
When the settings are confirmed, "ConF" will be displayed.

Range: 1~10



- 6 Press the Test key again to exit the Test settings.  
The Test key light will turn off.



#### 4.5.4. Load test mode from USB memory

Before loading the test mode data into the internal memory of this product, confirm that there is at least one test mode data file (up to 10 data) in the USB memory.

Before loading the test mode data into the internal memory of this product:

Ensure that the test mode data file (paired "tXXX.csv" and "tXXX.tst" files) is in the root directory of the USB memory.

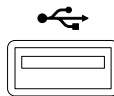
Ensure that the file name number corresponds to the memory number on this product side.

For example:

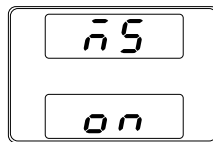
A test mode data file named t001 can only be saved to memory number 01 of this product, and a t002 file can only be saved to memory number 02.


steps	Step instructions	
-------	-------------------	--

1 Verify that the test mode data file is in the root directory of the USB memory. Insert the USB memory into the front panel USB-A slot.




2 When the USB memory is recognized (after a few seconds), "MS (Mass Storage) on" will be displayed at the display.

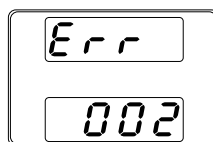


 **Note** If the USB memory is not recognized, check to see that the function settings for F-20: 1 (page 45). If not, reinsert the USB memory.

3 Select "T-02" with the Voltage knob, and select the memory number (1 - 10) with the current Knob.  
After selecting the memory number, press Voltage Knob.

Refer to page 78

 **Note** Error messages:  
When selected a file number that does not exist on the USB memory, "Err 002" will appear on the display.



#### 4.5.5. Run Test mode manual operation

The test mode selects and executes one of the 10 test mode data stored in this product's internal memory.

steps	Step instructions	
-------	-------------------	--

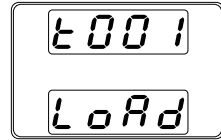
1 Before running a test mode, save at least one test mode data file to one of the ten memories in this product's internal memory.

Refer to page 80

2 Select "T-01" with the voltage knob, and select the test mode number (1 to 10) in this product's internal memory to be executed with the current knob. Confirm that "y" is displayed at the bottom left of the display.

Refer to page 79

- 3 Press the voltage knob to begin loading test mode data from the USB memory into this product's internal memory. The internal memory number of this product will be displayed at the top of the display, and "LOAD" will be displayed at the bottom.



Note

When the test mode data is very small, the loading screen may not appear on the screen for very long.

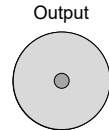
When press the Test key while loading data, loading will be canceled.

- 4 Once the test mode data has been loaded, the test mode will be in a waiting state. The internal memory number of this product will be displayed at the top of the display, and "WAIT" will be displayed at the bottom.



Wait state

- 5 To run the test mode, press the Output key. The Output key becomes illuminated. When the mode is running, the measurement results will display as normal. The Test key will flash.



Note

When the test mode is running, press the Output key again to return the test mode to the wait state.

When the test mode is running, press the Test key to abort the execution of the mode and return to normal operating mode. The Test key will led turn off after the test mode has been aborted.



Note

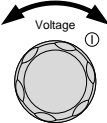
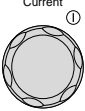
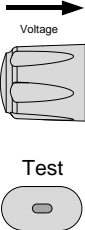
Error messages:  
When run a test mode on an internal memory number of this product that has no test mode data loaded, "Err 003" will appear on the display.




### Automatically at Startup

This product can be configured to automatically run test mode when the power switch is turned on.



steps	Step instructions	
1	Before running a test mode, save at least one test mode data file to one of the 10 memories in the product's internal memory.	Refer to page 80
2	Turn off power switch of this product.	
3	While holding down the Test key, turn on this product's power switch.	Refer to page 59
4	Rotate the Voltage knob to set the top of the display to "F-92". "F-92": Power-ON Output	
5	Rotate the Current knob to select the test mode number that will be run when this product is powered on. Range: T001~T010	
6	Press the voltage knob to determine the setting. The next time turn on the power switch of this product, the selected test mode will be automatically runed. Press the Test key again to exit the Test settings. The Test key light will turn off.	

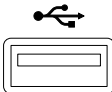
 **Note** Setting F-92 to 0 or 1 will not run test mode at startup. Refer to the power on configuration settings for details, page 48.

#### 4.5.6. Export Test mode to USB

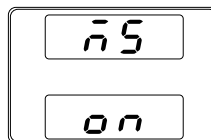
The test mode export function saves the test mode data as a file in the root directory of the USB memory.

Files will be saved as tXXX.tst where XXX is the memory number 001~010 from which the test mode was exported from.

Files of the same name on the USB memory will be written over.

steps	Step instructions	
1	Insert the USB memory into the front panel USB-A slot.	

- When the USB memory is recognized (after a few seconds), "MS (Mass Storage) on" will be displayed at the display.



Note

If the USB memory is not recognized, check to see that the function settings for F-20: 1 (page 45).  
If not, reinsert the USB memory.

- Select "T-03" with the Voltage knob, and select the memory number (1 - 10) with the current Knob. Refer to page 79
- Press Voltage Knob.

The selected test mode data will be copied to the USB memory.



Note

Error Message:  
If there is no test mode data in the selected memory number, "Err 003" will be displayed on the display.



#### 4.5.7. Remove test mode data

The Delete test mode function deletes test mode data from this product internal memory.

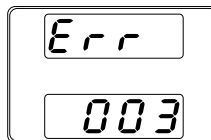
steps	Step instructions
-------	-------------------

- |   |   |
|---|---|
| 1 | Select "T-04" with the Voltage knob, and select this product internal memory number (1 – 10, ALL) with the current Knob. Refer to page 79 |
| 2 | Press Voltage Knob.<br>The test mode data is deleted from this product internal memory.   |



Note

Error Message:  
If there is no test mode data in the selected this product internal memory number, "Err 003" will be displayed on the display.



#### 4.5.8. Checking the Available Memory

Displays the amount of remaining memory in this product to load the test mode file. The display unit is kilobytes.

steps	Step instructions	
1	Select "T-05" with the Voltage knob. The available memory in kilobytes is displayed.	Refer to page <a href="#">79</a>

#### 4.5.9. The test mode data file

The test mode data file consists of a pair of CSV format files (tXXX.csv) and TST format files (tXXX.tst). The file name is "tXXX". "XXX" indicates file number 001-010.

CSV format files (tXXX.csv) and TST format files (tXXX.tst) can be downloaded from our website.

The test mode function executes the settings present in the CSV file. Edit the CSV file to create any test mode data. Use the contents of the TST file without changing it.

##### Test mode data file structure

In CSV files, items can be omitted if the settings are the same as in the previous line. Please note that step 1 cannot be omitted. If memo is written in the first column, that line will not be executed as a test mode.

The two examples below are test mode data with the same content.

## Example 1 data: Cycle action in excel

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	
1	memo	Sequence Example																		
2	CycleItem	Number	Start Step	End Step																
3	Cycle	2	3	11																
4	DisplayItem	VI																		
5	Step	Point	Output	Time	Voltage	Current	OVP	OCp	Bleeder	IV Mode	Vsr up	Vsr down	Isr up	Isr down	IR	Beeper	Sense Av	Jump to	Jump Cnt	
6	1	START	OFF	0.05	0	MAX	MAX	MAX	ON	CVHS	MAX	MAX	MAX	MAX	MIN	OFF	LOW			
7	2	LOG1		0.05																
8	3			0.05																
9	4	UVP2			1	1														
10	5	P10W	ON		1	1														
11	6				1	2														
12	7	P30W		0:00:01	3															
13	8				1	4														
14	9	P50W			1	5														
15	10	UVPO			1	1														
16	11		OFF	0.05	MIN															
17	12	LOG0																		
18	13	END	OFF	0.05	0															

## Example 1 data: Cycle action in CSV data

memo,Sequence Example,,,,,,,,,,,,,,,,,,,,,  
 CycleItem,Number,Start Step,End Step,,,,,,,,,,,,,,,,,,,,,  
 Cycle,2,3,11,,,,,,,,,,,,,,,,,,,,,  
 DisplayItem,VI,,,,,,,,,,,,,,,,,,,,,  
 Step,Point,Output,Time,Voltage,Current,OVP,OCp,Bleeder,IV Mode,Vsr up,  
 Vsr down,Isr up,Isr down,IR,Beeper,Sense Average,Jump to,Jump Cnt  
 1,START,OFF,0.05,0,MAX,MAX,MAX,ON,CVHS,MAX,MAX,MAX,MAX,MIN,OFF,  
 LOW,,  
 2,LOG1,,0.5,,,,,,,,,,,,,,,,,,,,,  
 3,,,0.05,,,,,,,,,,,,,,,,,,,,,  
 4,UVP2,,,1,1,,,,,,,,,,,,,,,,,,,,,  
 5,P10W,ON,1,1,,,,,,,,,,,,,,,,,,,,,  
 6,,,1,2,,,,,,,,,,,,,,,,,,,,,  
 7,P30W,,0:00:01,3,,,,,,,,,,,,,,,,,,,,,  
 8,,,1,4,,,,,,,,,,,,,,,,,,,,,  
 9,P50W,,1,5,,,,,,,,,,,,,,,,,,,,,  
 10,UVPO,,,1,1,,,,,,,,,,,,,,,,,,,,,  
 11,,OFF,0.05,MIN,,,,,,,,,,,,,,,,,,,,,  
 12,LOG0,,,,,,,,,,,,,,,,,,,,,  
 13,END,OFF,0.05,0,,,,,,,,,,,,,,,,,,,,,

## Example 2 data: Jump action in excel

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	memo	Sequence	Example																
2	CycleItem	Number	Start Step	End Step															
3	Cycle																		
4	DisplayItem	VI																	
5	Step	Point	Output	Time	Voltage	Current	OVP	OC	Bleeder	IV Mode	Vsr up	Vsr down	Isr up	Isr down	IR	Beeper	Sense Av	Jump to	Jump Cnt
6	1	START	OFF	0.05	0	MAX	MAX	MAX	ON	CVHS	MAX	MAX	MAX	MAX	MIN	OFF	LOW		
7	2	LOG1		0.05															
8	3			0.05															
9	4	UVP2			1	1													
10	5	P10W	ON		1	1													
11	6				1	2													
12	7	P30W		0:00:01	3														
13	8				1	4													
14	9	P50W			1	5													
15	10	UVP0			1	1													
16	11		OFF	0.05	MIN													3	1
17	12	LOG0																	
18	13	END	OFF	0.05	0														

## Example 2 data: Jump action in CSV data

```

memo,Sequence Example,,,,,,,,,,,,,
CycleItem,Number,Start Step,End Step,,,,,,,,,,,,,
Cycle,,,,,,,,,,,,,
DisplayItem,VI,,,,,,,,,,,,,
Step,Point,Output,Time,Voltage,Current,OVP,OC,Bleeder,IV Mode,Vsr up,
Vsr down,Isr up,Isr down,IR,Beeper,Sense Average,Jump to,Jump Cnt
1,START,OFF,0.05,0,MAX,MAX,MAX,ON,CVHS,MAX,MAX,MAX,MAX,MIN,OFF,
LOW,,
2,LOG1,,0.5,,,,,,,,,,,,,
3,,0.05,,,,,,,,,,,,,
4,UVP2,,1,1,,,,,,,,,,,,,
5,P10W,ON,1,1,,,,,,,,,,,,,
6,,1,2,,,,,,,,,,,,,
7,P30W,,0:00:01,3,,,,,,,,,,,,,
8,,1,4,,,,,,,,,,,,,
9,P50W,,1,5,,,,,,,,,,,,,
10,UVP0,,1,1,,,,,,,,,,,,,
11,,OFF,0.05,MIN,,,,,,,,,,,,,3,1
12,LOG0,,,,,,,,,,,,,
13,END,OFF,0.05,0,,,,,,,,,,,,,

```

## Test mode setting items

Item	Unit	Value
------	------	-------

Cycle items setting: The title name is "Cycle"

Number: Loop count		0(Infinity), 1 – 1000000000, Blank
--------------------	--	------------------------------------

Start Step: Loop start Step		1 – 19999, Blank
-----------------------------	--	------------------

End Step: Loop end Step		2 – 20000, Blank
-------------------------	--	------------------



Note

The test mode runs from the step set to "START" to the step set to "END" in Point.

When all three types of Cycle items are blank, the START Step to END Step will be executed once.

To set test mode to cycle operation, set all three types of cycle items. A Cycle action can be performed on a whole Step or on a partial Step.



Caution

Do not set Start Step and End Step to Step where LOG or UVP is set to Point. A problem occurs when executing the previous and subsequent steps.

Cycle action and Jump action in test mode cannot be used together. When using Cycle action in test mode, leave Jump action items (Jump to, Jump Cnt) blank.

Display Items setting: The title name is "DisplayItems"

Displays voltage and current		VI
------------------------------	--	----

Displays power and current		PI
----------------------------	--	----

Display voltage and power		VP
---------------------------	--	----

Setting Values	Unit	Value
----------------	------	-------

Step (mandatory): Script run order		integer between 1 - 20000
---------------------------------------	--	---------------------------

Point: Multiple items cannot be set here.

START/END Step (mandatory)

Start and End		START: Start Step, usually "1" END: Last Step
---------------	--	--

Step between START and END: Condition settings

No conditions		Blank
---------------	--	-------

Constant power value setting:  
P<value>W

P10.05W: 10.05W setting  
Pmax: Maximum value setting  
Pmin: Minimum value setting



Note

The constant power value is set in the Point term.  
When setting the constant power value in the Point section, set Time(sec) to 0.05s or more. Other items can be omitted.

Logging function start/stop settings

LOG1: Logging function start  
LOG0: Logging function stop



Note

When setting LOG1,0 to the Point term, leave the terms in the Step line blank except for "Time".

Set the time interval for log recording in "Time" of Step in the LOG1 setting. When setting LOG0, Time can be left blank.



Note

The logging function start/stop settings are only available when logging data is output to a USB memory.



Caution

Set LOG1 (logging start) in the Point item of the Step before LOG0 (logging stop).

In one test mode execution, please execute Steps with LOG1 and LOG0 set only once each. Executing the logging function multiple times will cause problems in saving logging data.

tUVP function setting

UVP0: Function disabled  
UVP1: Function enabled,  
instantaneous voltage  
UVP2: Function enabled,  
average value voltage



Note

When setting the tUVP function in the Point section, leave the Step line sections except for "Voltage" and "Current" blank.



Note

Set the delay time in the Voltage term and the voltage drop value in the Current term.

When setting UVP0 (tUVP function stop), if the delay time and voltage drop value are left blank, these values will be indefinite. It is recommended that you also set the delay time and voltage drop value when setting UVP0.

Pause setting

PAUSE



Note

When "PAUSE" is set in the Point section, the Step for which "PAUSE" is set will be executed and the test mode will be temporarily stopped. In this state, the panel display shows "PAUS E." Press the PEW DSPL key to resume the test mode.

Exit Setting

EXIT



Note

When "EXIT" is set in the Point section, the Step for which "EXIT" is set will be executed and the test mode will end.

Output: Step output status

ON: Output on

OFF: Output off



Note

Test mode starts and ends with the device's output off. To turn on the device's output in test mode, set the Output items to "ON" in any step.

Time:  
Step running time  
or the logging time interval

Sec Step running time  
Rang: 0.05 - 1728000.00  
Resolution: 0.01  
Logging time interval  
Rang: 0.1 - 999.9  
Resolution: 0.1

Time Step running time  
0:00:01(1 second) - 23:59:59  
(23 hours 59 minutes 59  
seconds)



Note

Two types of setting methods (seconds, time) can be used to set the step running time.



Note

The Step running time cannot be set to 0 seconds. Set it to the minimum setting (0.05s) or higher.

When Point is set to LOG1,0, Time is the logging time interval.

When set UVP0, 1, or 2 for Point, leave Time blank.

Voltage:  
Voltage value setting  
or tUVP function delay time  
setting

V Voltage value setting  
Value or MAX/MIN (See ratings)  
s tUVP function delay time setting  
Range: 0.1 - 60.0

Current:  
Current value setting

A Current value setting  
Value or MAX/MIN (See ratings)



or tUVP function voltage drop value setting	V	tUVP function voltage drop value setting Range: 0.01 or 0.1 - Rated Voltage
---	---	---



Note

When Point is set to UVP0, 1, or 2, Voltage and Current will set the delay time and voltage drop value for the tUVP function.

OVP: OVP value setting	V	Value or MAX/MIN (See ratings)
OCP: OCP value setting	A	Value or MAX/MIN (See ratings)
Bleeder: Bleeder circuit control		ON: Circuit ON OFF: Circuit OFF
IV Mode: V-I mode slew rate setting		CVHS: CV High speed priority CCHS: CC High speed priority CVLS: CV slew rate priority CCLS: CC slew rate priority
Vsr up: Rise voltage slew rate setting	V/s	Value or MAX/MIN (See ratings)
Vsr down: Fall voltage slew rate setting	V/s	Value or MAX/MIN (See ratings)
Isr up: Rise current slew rate settings	A/s	Value or MAX/MIN (See ratings)
Isr down: Fall current slew rate setting	A/s	Value or MAX/MIN (See ratings)
IR: Internal resistance setting	$\Omega$	Value or MAX/MIN (See ratings)
Beeper: Buzzer sound setting during step execution		OFF: No buzzer sound ON: Buzzer sound available
Sense Average: Measurement averaging level setting for voltage and current measurements		0 / LOW: Low level setting 1 / MID: Middle level setting 2 / HIGH: High level setting
Jump to: Set the Step number to jump to		Range: 1 - 20000
Jump Cnt: Set the number of times to repeat "Jump to"		Range: 1 – 10000 Blank: Infinite number of times



In test mode, Jump action items (Jump to, Jump Cnt) can be set to multiple Steps.



Do not set a Jump to Step number to a Step that has LOG or UVP set as its Point. A problem occurs when executing the previous and subsequent steps.

Cycle action and Jump action in test mode cannot be used together. When using Jump action in test mode, leave Cycle action items (Number, Start Step, End Step) blank.



Settings for non mandatory items can be omitted if they are the same as in the previous step.

When items (Voltage, Current, ...) other than Time and Output are blank, the device will operate as set before starting test mode.

Please delete any line blank.

The number of steps is limited to free memory area, but it is up to step up to 20000.

The time can be set in 0.01 second increments and the shortest is 0.05 seconds, but please note that setting followability may be limited depending on load conditions and setting values.

# 5. ANALOG CONTROL

The Analog Control chapter describes how to control voltage or current outputs using external voltages or resistors, how to monitor voltage or current outputs, and how to turn off or turn off outputs remotely. This product has a number of analog control options. The Analog Control connectors are used to control output voltage and current using external voltage or resistance. The power supply output and power switch can also be controlled using external contacts.

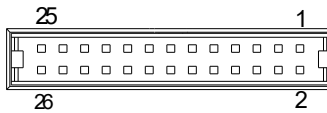
## 5.1. Analog Control Connector Overview

The Analog Control Connector is a standard Mil 26 pin connector (OMRON XG4 IDC plug). The connector is used for all analog remote control. The pins used determine what remote-control mode is used.



**WARNING** To prevent electric shock, always use the connector cover when the analog control connector is not in use.

Pin Assignment



Pin name	No.	Description
Current Share	1	Not used in this product.
D COM	2	This is a COM terminal for OUT ON/OFF CONT (Pin 24) and SHUTDOWN (Pin 12) using external contacts.  Electrically connected to the sensing negative pole (-S). It is also connected to the 16-pin A COM.
CURRENT SUM OUT	3	Not used in this product.
EXT-V CV CONT	4	Used for external voltage control of voltage output and applies voltage based on A COM (Pin 16).  The applied voltage (0 to 10V) sets this product's full-scale voltage output (0% to 100%).

EXT-V CC CONT	5	Used for external voltage control of current output and applies voltage based on A COM (Pin 16). The applied voltage (0 to 10V) sets this product's full-scale current output (0% to 100%).
EXT-R CV CONT PIN1	6	These are terminals for external resistance control of the output voltage. Connect external resistance to pins 6 and 7.
EXT-R CV CONT PIN2	7	The rated output voltage is set from 0% to 100% or from 100% to 0% with an external resistor (0Ω to 10kΩ).
EXT-R CC CONT PIN1	8	These are terminals for external resistance control of the output current. Connect external resistance to pins 8 and 9.
EXT-R CC CONT PIN2	9	The rated output current is set from 0% to 100% or from 100% to 0% with an external resistor (0Ω to 10kΩ).
V MON	10	It is this product output voltage monitor. Voltage is output based on A COM (Pin 16). The output voltage (0V to 10V) is proportional to this product's full-scale voltage (0 to 100%).
I MON	11	It is this product output current monitor. Voltage is output based on A COM (Pin 16). The output voltage (0V to 10V) is proportional to this product's full-scale current (0 to 100%).
SHUTDOWN	12	Turn off the output of this product by setting SHUTDOWN to "Low" for D COM (pin 2). (Refer to page <a href="#">104</a> ) The shutdown signal is pulled up to 5V internal to this product with a 10kΩ pullup resistor.
CURRENT_SUM_1	13	Not used in this product.
CURRENT_SUM_2	14	Not used in this product.
FEEDBACK	15	Not used in this product.
A COM	16	These are COM terminals for EXT-V CV CONT (Pin 4), EXT-V CC CONT (Pin 5), V MON (Pin 10), and I MON (Pin 11).

		Electrically connected to the sensing negative pole (-S) and D COM (Pin 2).
STATUS COM	17	Common terminal for status signals CV (Pin 18), CC (Pin 19), ALM (Pin 20), OUTPUT ON (Pin 21), and POWER OFF (Pin 22). Connected to the emitter of the photocoupler. It is isolated from D COM (Pin 2), A COM (Pin 16) and the case.
CV STATUS	18	This is a photocoupler open collector output. Turns on when this product is in CV mode.
CC STATUS	19	This is a photocoupler open collector output. Turns on when this product is in CC mode.
ALM STATUS	20	This is a photocoupler open collector output. It turns on when this product 's protection function (OVP, OCP) is activated or a shutdown signal is input.
OUTPUT ON STATUS	21	This is a photocoupler open collector output. It is turned on when this product is OUTPUT ON.
POWER OFF STATUS	22	This is a photocoupler open collector output. Turns on when this product is POWER OFF.
N.C.	23	Not connected
OUT ON/OFF CONT	24	Output on control is possible by setting OUT ON/OFF CONT to “High” or “Low” based on D COM (2 pin). (Refer to page <a href="#">102</a> ) The OUT ON/OFF CONT signal is pulled up to 5V inside this product using a 10kΩ pull-up resistor.
SER SLV IN	25	Not used in this product.
N.C.	26	Not connected

### 5.1.1. External Voltage Control of Voltage Output

External voltage control of the voltage output uses a MIL-26 connector on the back panel. External voltage (0-10V) is used to control the full-scale voltage of this product.

Output voltage = full scale voltage × (external voltage / 10V)

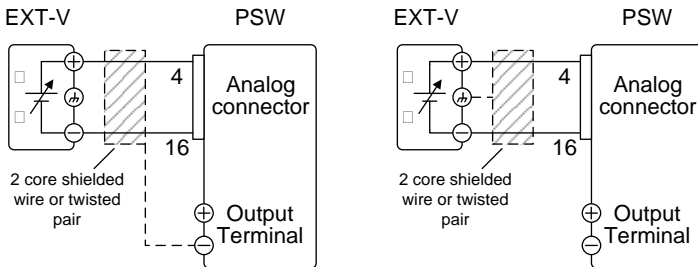
Connection Pin16 → EXT-V (-), Pin4 → EXT-V (+)

When connecting the external voltage source to the MIL connectors, use shielded or twisted paired wiring.

Please use the external voltage in a floating state to prevent this product output from shorting.

Wire shield connection 1:  
-Output terminal

Wire shield connection 2:  
EXT-V ground (GND)



### Panel operation

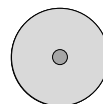
steps	Step instructions
-------	-------------------

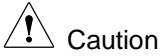
- 1 Connect the external voltage according to the connection diagrams above.
- 2 Set the F-90 power on configuration setting to 1 (Voltage settings: External voltage control). Refer to page [59](#)  
Be sure to cycle the power after the power on configuration has been set.
- 3 Press the Function key and confirm the new configuration settings.  
F-90: 1
- 4 Press the Output key.  
The voltage can now be controlled with the External voltage.

Function



Output





Caution

External voltage control Do not apply a voltage higher than 10.5V to the input terminal. Be sure to wire the external voltage source correctly so as not to mistake the polarity.

The input impedance for external voltage control is 10kΩ.

Use a stable voltage supply for the external voltage control.



Note

When using external voltage control, Output ON/OFF Delay Time (F-01, 02) and V-I mode slew rate select (F-03) are disabled. Refer to Normal Function Settings on page 49.



Caution

Check the isolation voltage specifications of the external voltage before use.

### 5.1.2. External Voltage Control of Current Output

External voltage control of the current output uses a MIL-26 connector on the back panel. External voltage (0-10V) is used to control the full-scale current of this product.

Output current = full scale current × (external voltage / 10V)

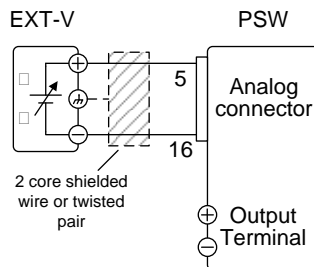
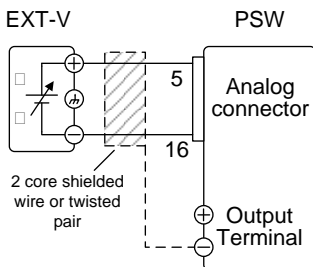
Connection Pin16 → EXT-V (-), Pin5 → EXT-V (+)

When connecting the external voltage source to the MIL connectors, use shielded or twisted paired wiring.

Please use the external voltage in a floating state to prevent this product output from shorting.



Wire shield connection 1:  
-output terminal

Wire shield connection 2:  
EXT-V ground (GND)



## Panel operation

steps	Step instructions
-------	-------------------

- |   |   |   |
|---|---|---|
| 1 | Connect the external voltage according to the connection diagrams above.  |   |
| 2 | Set the F-91 power on configuration setting to 1 (Current settings: External voltage control).<br>Be sure to cycle the power after the power on configuration has been set. | Refer to page 59  |
| 3 | Press the Function key and confirm the new configuration settings.<br>F-91: 1   |  |
| 4 | Press the Output key.<br>The current can now be controlled with the External voltage.   |  |



### Caution

External voltage control Do not apply a voltage higher than 10.5V to the input terminal. Be sure to wire the external voltage source correctly so as not to mistake the polarity.

The input impedance for external voltage control is 10kΩ.

Use a stable voltage supply for the external voltage control.



### Note

When using external voltage control, Output ON/OFF Delay Time (F-01, 02) and V-I mode slew rate select (F-03) are disabled. Refer to Normal Function Settings on page 49.



### Caution

Check the isolation voltage specifications of the external voltage before use.



### 5.1.3. External Resistance Control of Voltage Output

External resistance control of the voltage output is accomplished using the MIL-26 connector on the rear panel. A resistance of 0kΩ~10kΩ is used to control the full-scale voltage of this product.

There are two ways to set the output voltage (0V to rated voltage).

External resistance control 1 (Ext-R  $\swarrow$  10kΩ = V ratings):

Output voltage = full scale voltage × (external resistance / 10kΩ)

External resistance control 2 (Ext-R  $\searrow$  10kΩ = 0V):

Output voltage = full scale voltage × (1 – (external resistance / 10kΩ))



Note

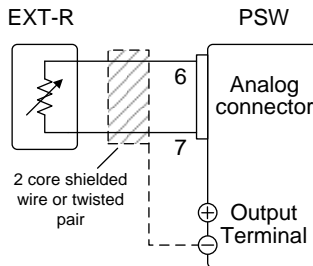
For safety reasons, external resistance control 2 is recommended. In the event that the cables become accidentally disconnected, the voltage output will drop to zero. Under similar circumstances using external resistance control 1, an unexpected high voltage would be output.

When switches are used to switch between fixed resistances, use switches that avoid creating open circuits. Use short-circuit or continuous resistance switches.

Connection Pin6 → EXT-R, Pin7 → EXT-R


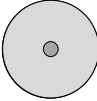
When connecting the external resistance to the MIL connectors, use shielded or twisted paired wiring.

Wire shield connection: -Output terminal



## Panel operation

steps	Step instructions
-------	-------------------

- |   |   |   |
|---|---|---|
| 1 | Connect the external resistance according to the connection diagrams above.   |   |
| 2 | Set the configuration setting when powering on the F-90 to 2 or 3. (Voltage setting: external resistance control 1 or 2)<br>Be sure to cycle the power after the power on configuration has been set. | Refer to page 59  |
| 3 | Press the Function key and confirm the new configuration settings.<br>F-90: 2 or 3  |  |
| 4 | Press the Output key.<br>The voltage can now be controlled with the External resistance.  |  |



### Caution

Ensure the resistor(s) and cables used exceed the isolation voltage of the power supply. For example: insulation tubes with a withstand voltage higher than the power supply can be used.

When choosing an external resistor ensure the resistor can withstand a high degree of heat.



### Note

When using external resistance control, Output ON/OFF Delay Time (F-01, 02) and V-I mode slew rate select (F-03) are disabled. Refer to Normal Function Settings on page 49.

### 5.1.4. External Resistance Control of Current Output

External resistance control of the current output is accomplished using the MIL-26 connector on the rear panel. A resistance of  $0\text{k}\Omega\sim 10\text{k}\Omega$  is used to control the full-scale current of this product.

There are two ways to set the output current (0V to rated current).

External resistance control 1 (Ext-R  $\searrow$   $10\text{k}\Omega = I$  ratings):

Output current = full scale current  $\times$  (external resistance /  $10\text{k}\Omega$ )

External resistance control 2 (Ext-R  $\triangleleft$   $10\text{k}\Omega = 0\text{A}$ ):

Output current = full scale current  $\times$  (1 - (external resistance /  $10\text{k}\Omega$ ))



Note

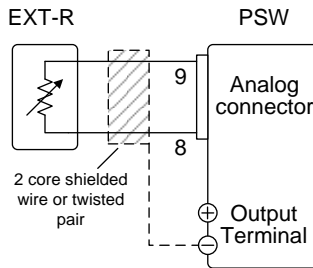
For safety reasons, external resistance control 2 is recommended. In the event that the cables become accidentally disconnected, the current output will drop to zero. Under similar circumstances using external resistance control 1, an unexpected high current would be output.

When switches are used to switch between fixed resistances, use switches that avoid creating open circuits. Use short-circuit or continuous resistance switches.

Connection Pin8 → EXT-R, Pin9 → EXT-R

When connecting the external resistance to the MIL connectors, use shielded or twisted paired wiring.

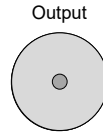
Wire shield connection: -Output terminal



### Panel operation

steps	Step instructions	
1	Connect the external resistance according to the connection diagrams above.	
2	Set the configuration setting when powering on the F-91 to 2 or 3. (Current setting: external resistance control 1 or 2) Be sure to cycle the power after the power on configuration has been set.	Refer to page 59
3	Press the Function key and confirm the new configuration settings. F-91: 2 or 3	Function

- 4 Press the Output key.  
The current can now be controlled with the External resistance.



Caution

Ensure the resistor(s) and cables used exceed the isolation voltage of the power supply. For example: insulation tubes with a withstand voltage higher than the power supply can be used.

When choosing an external resistor ensure the resistor can withstand a high degree of heat.



Note

When using external resistance control, Output ON/OFF Delay Time (F-01, 02) and V-I mode slew rate select (F-03) are disabled. Refer to Normal Function Settings on page 49.

#### 5.1.5. External output on

Output on control is possible by setting OUT ON/OFF CONT (24 pin) to "High" or "Low" based on D COM (2 pin).

OUT ON/OFF CONT is pulled up internally to 5V with a 10kΩ pull-up resistor relative to D COM. When OUT ON/OFF CONT and D COM are open, OUT ON/OFF CONT becomes "High". When OUT ON/OFF CONT and D COM are shorted, OUT ON/OFF CONT becomes "Low".

Set "F94" and select whether the output will be turned on at "High" or "Low". (Refer to page 57)

Set F94 to "0": OUT ON/OFF CONT is "High" and output is on.

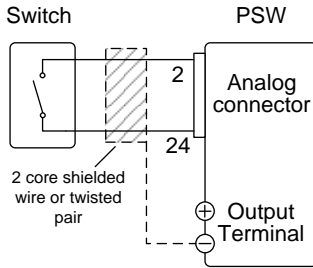
Set F94 to "1": OUT ON/OFF CONT is "Low" and output is on.

Connection	Switch	Open collector	TTL level signal
Pin24	Switch	Collector	TTL output
Pin2	Switch	Emitter	TTL GND

A TTL level signal can also be input to OUT ON/OFF CONT.

When connecting the external contacts (Switch), etc. to the MIL connectors, use shielded or twisted paired wiring.

Wire shield connection: -Output terminal



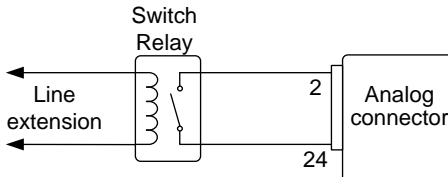
Panel operation

steps	Step instructions	
1	Connect the external resistance according to the connection diagrams above.	
2	Set F-94 (External output logic) in the power on configuration settings to 0 (High = On) or 1 (Low = On). Be sure to cycle the power after the power on configuration has been set.	Refer to page 59
3	Press the Function key and confirm the new configuration settings. F-94: 0 or 1	Function 
The external control is now ready to set the output on or off.		



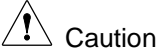
Note

When using a switch over long distances, please use a switch relay to extend the line from the coil side of the relay.



Caution

D COM (pin 2) is electrically connected to the sensing negative electrode. If multiple external contacts are controlled by one external contact, the sensing negative electrode of each device will short-circuit. When controlling with external contacts, basically connect one insulated floating external contact per unit.



Caution

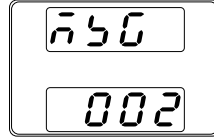
Ensure the cables used and the switch exceed the isolation voltage of this product. For example: insulation tubes with a withstand voltage higher than this product can be used.



Note

If F-94 = 0 (High = on) and the pin 24 is low (0) "MSG 001" will be displayed on the display.

If F-94 = 1 (Low = on) and the pin 24 is high (1) "MSG 002" will be displayed on the display.



### 5.1.6. Output off by external control

The output status of this product can be turned off using an external switch.

Turn off the output of this product by setting SHUTDOWN (pin 12) to "Low" for D COM (pin 2) as the reference.

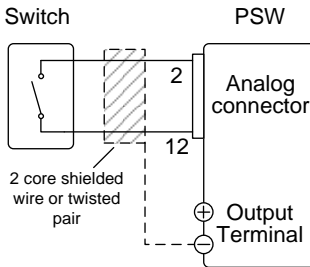
SHUTDOWN is pulled up internally to 5V with a 10kΩ pull-up resistor relative to D COM.

Connection	Switch	Open collector	TTL level signal
Pin12	Switch	Collector	TTL output
Pin2	Switch	Emitter	TTL GND

A TTL level signal can also be input to SHUTDOWN.

When connecting the external contacts (Switch), etc. to the MIL connectors, use shielded or twisted paired wiring.

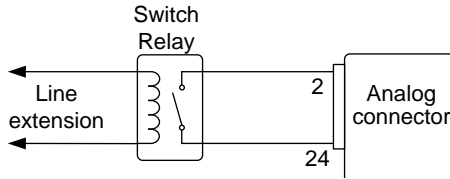
Wire shield connection: -Output terminal





Note

When using a switch over long distances, please use a switch relay to extend the line from the coil side of the relay.



Caution

D COM (pin 2) is electrically connected to the sensing negative electrode. If multiple external contacts are controlled by one external contact, the sensing negative electrode of each device will short-circuit. When controlling with external contacts, basically connect one insulated floating external contact per unit.



Caution

Ensure the cables used and the switch exceed the isolation voltage of this product. For example: insulation tubes with a withstand voltage higher than this product can be used.

## 5.2. Monitor output

This product is equipped with an output current/voltage monitor signal and a status signal that indicates the output status.

### 5.2.1. Output voltage and output current monitor signals

Output voltage monitor signal (V MON) and output current monitor signal (I MON) are output from the MIL-26 connector on the rear panel.

The monitor signal outputs a voltage of 0V to 10V for the 0 to rated output value.

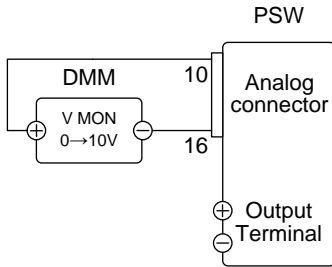
$$VMON = (\text{Output voltage} / \text{full scale voltage}) \times 10V$$

$$IMON = (\text{Output current} / \text{full scale current}) \times 10V$$

Monitor signals do not require configuration settings to be enabled.

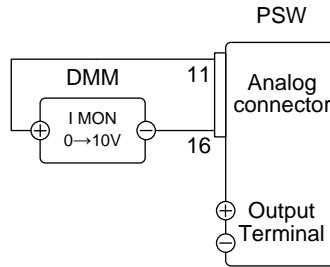
## Connection

### VMON



Pin10: DMM (+)  
Pin16: DMM (-)

### IMON



Pin11: DMM (+)  
Pin16: DMM (-)



#### Note

VMON and IMON specifications  
Output impedance: 1kΩ.  
Maximum output current: 10mA.

Each monitor output is a signal output for monitoring the average value of each output. Transient response, ripple & noise, etc. cannot be monitored accurately.



#### CAUTION

Do not short VMON and IMON.  
It may cause damage to this product.

### 5.2.2. Operating status signal

Outputs the operating status of this product from the MIL-26 connector on the rear panel.

Each terminal is isolated from the product's internal circuitry by a photocoupler. Status Com (Pin 17) is a photo coupler emitter output, whilst pins 18~22 are photo coupler collector outputs.

Operation specifications of each pin

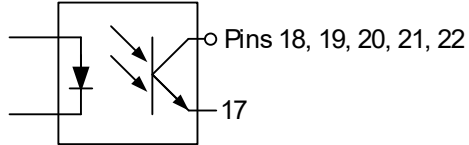
Maximum applied voltage: 30V, Maximum current: 8mA

It is isolated from D COM (Pin 2), A COM (Pin 16) and the case.

Pin name	No.	Description
STATUS COM	17	Common terminal for CV (Pin 18), CC (Pin 19), ALM (Pin 20), OUTPUT ON (Pin 21), and POWER OFF (Pin 22).
CV STATUS	18	Turns on when this product is in CV mode.
CC STATUS	19	Turns on when this product is in CC mode.

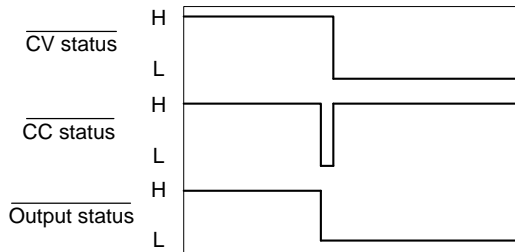


ALM STATUS	20	It turns on when this product's protection function (OVP, OCP) is activated or a shutdown signal is input.
OUTPUT ON STATUS	21	It is turned on when this product is OUTPUT ON.
POWER OFF STATUS	22	Turns on when this product is POWER OFF.

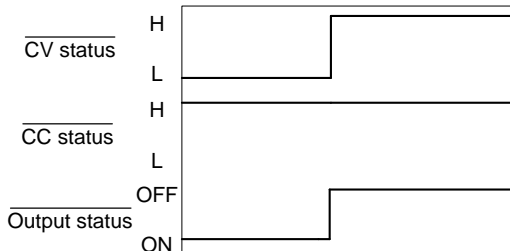


Timing diagrams Examples of timing diagrams for various statuses are shown below. Pins 18-22 are active low.

CV MODE:  
Output turned on The timing diagram shows when operating in CV mode when the output is on.



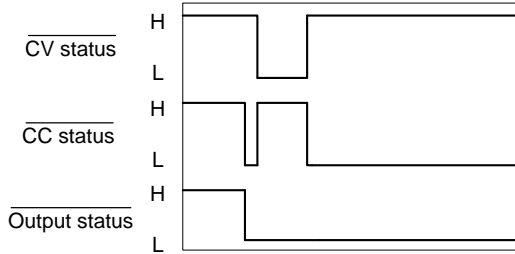
CV MODE:  
Output turned off The timing diagram shows the case when the output is turned off while operating in CV mode.



---

CC MODE:  
Output turned on

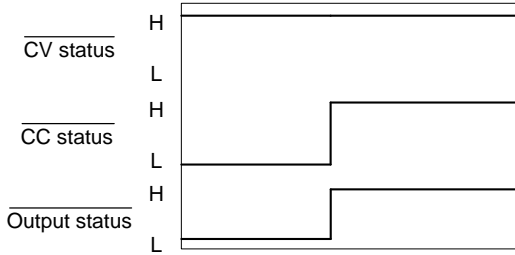
The timing diagram shows when operating in CC mode when the output is on.



---

CC MODE:  
Output turned off

The timing diagram shows the case when the output is turned off while operating in CC mode.



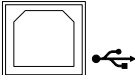
# 6. COMMUNICATION INTERFACE

This chapter describes basic configuration of IEEE488.2 based remote control. For a command list, please refer to the programming manual, which can be downloaded from the TEXIO homepage.

## 6.1. Configure USB Remote Interface

USB configuration	PC side connector	Type A, host
	This product side connector	Rear panel Type B, slave
	Speed	1.1/2.0 (full speed/high speed)
	USB Class	CDC (communications device class)

### Panel operation

steps	Step instructions	
1	Connect the USB cable to the rear panel USB B port.	
2	Press the Function key for the Normal configuration settings. Set the rear panel USB port to USB-CDC. F-22: 2	

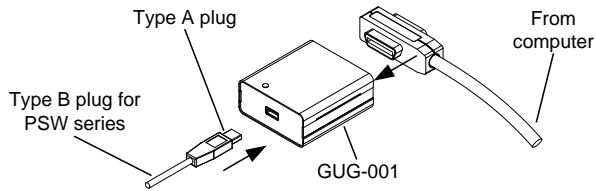
## 6.2. Configure GP-IB Interface

To use GPIB, the optional GP-IB to USB (GUG-001) adapter must be used. The GPIB to USB adapter must be connected before this product is turned on. Only one GP-IB address can be used at a time.

### GUG-001 connection and GP-IB settings

steps	Step instructions
1	Ensure this product is power off before proceeding.
2	Connect the USB cable to the rear panel USB B port.

- 3 Connect the USB cable type A plug to the USB A port of GUG-001.  
Connect the GP-IB cable from the GP-IB controller to the GP-IB port of GUG-001.



- 4 Turn this product on.
- 5 Press the Function key to enter the Normal configuration settings.

Set the real panel USB port to USB Host. F-22: 1

Set the GP-IB address. F-23: 0~30

**GP-IB constraints** The maximum number of devices connected in one system is 15, including the controller (PC).  
The cable length between each device is 2m or less, and the maximum total cable length in one system is 20m or less.

Loop connections and parallel connections of GP-IB cables are prohibited.

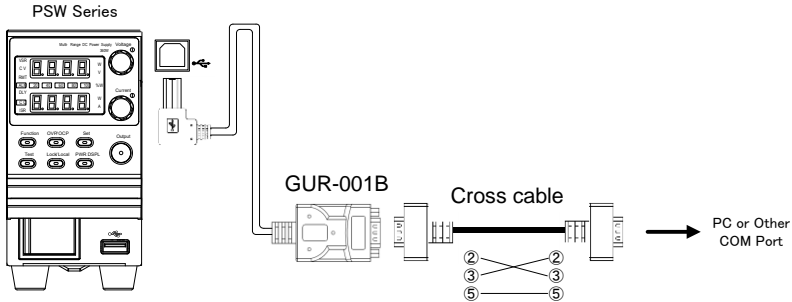
Only one address will be assigned to each device; duplication is prohibited. Also, turn on power to 2/3 of all connected devices.

### 6.3. Configure RS-232C Interface

RS-232C control is possible by using the optional GUR-001B (RS-232C to USB) adapter.

#### GUR-001B connection and RS-232C settings

steps	Step instructions
1	Ensure this product is power off before proceeding.
2	Connect the GUR-001B adapter to the USB-B port on the rear panel of this product. Connect to the controller using a cross cable.



- 3 Turn on the power of this product.
- 4 Press the Function key to make various RS-232C settings.
  - Set the real panel USB port to USB Host. F-22: 1
  - Set the communication baud rate. F-71: 0 - 7
  - Set the data length. F-72: 0 / 1
  - Set the parity. F-73: 0 / 1 / 2
  - Set the stop bit. F-74: 0 / 1

RS-232C constraints Use "LF" as the delimiter.

## 6.4. Configure Ethernet (LAN) Connection

The Ethernet interface can be configured for several different applications. Ethernet can be configured for basic remote control or monitoring using a web server or it can be configured as a socket server. This product supports both DHCP connections so this product can be automatically connected to an existing network or alternatively, network settings can be manually configured.

### Ethernet configuration Parameters

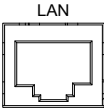
MAC Address (display only)	LAN
DHCP	IP Address
Subnet Mask	Gateway
DNS Address	Sockets Active
Web Server Active	Web Password Active
Web set password	0000~9999 (default 0000)
Port number: 2268 (fixed)	

### Web Server Configuration


This configuration example will configure the PSW as a web server and use DHCP to automatically assign an IP address to the PSW.

**steps Step instructions**

- 1 Connect the Ethernet cable from the network to the Ethernet port on the rear panel.
 


  
- 2 Press the Function key for the Normal configuration settings.  
 Set the following LAN settings:
 

Enable LAN	F-36: 1
Turn DHCP to enable	F-37: 1
Turn the web server on	F-59: 1

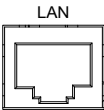
 **Note** It may be necessary to cycle the power or refresh the web browser to connect to a network.

**Sockets Server Configuration**

This configuration example will configure the PSW sockets server. The configuration settings instructions will manually assign an IP address to the PSW and enable the socket server. The socket server port number is 2268 (fixed) and cannot be set.

**steps Step instructions**

- 1 Connect the Ethernet cable from the network to the Ethernet port on the rear panel.
 


  
- 2 Press the Function key for the Normal configuration settings.  
 Set the following LAN settings:
 

Enable LAN	F-36: 1
Turn DHCP to disable	F-37: 0
IP Address part 1 of 4	F-39: 172
IP Address part 2 of 4	F-40: 16
IP Address part 3 of 4	F-41: 5
IP Address part 4 of 4	F-42: 133
Subnet Mask part 1 of 4	F-43: 255
Subnet Mask part 2 of 4	F-44: 255
Subnet Mask part 3 of 4	F-45: 128
Subnet Mask part 4 of 4	F-46: 0
Gateway part 1 of 4	F-43: 172
Gateway part 2 of 4	F-44: 16
Gateway part 3 of 4	F-45: 21

## 6.5. USB Remote Control Function Check

Functionality check

Invoke a terminal application such as Realterm. This product will appear as a COM port on the PC.

To check the COM port No, see the Device Manager in the PC.



Note

For more information about sending and receiving remote commands using the Terminal application over a USB connection, refer to page [113](#).

Run this query command via the terminal after this product has been configured for USB remote control.

```
*idn?
```

This will return the manufacturer, model number, serial number, and firmware version.



Note

Please refer to the programming manual for details.

## 6.6. Using Realterm to Establish a Remote Connection

Realterm is a terminal program that can be used to communicate with a device attached to the serial port of a PC or via an emulated serial port via USB.

The following instructions apply to version 2.0.0.70. Even though Realterm is used as an example to establish a remote connection, any terminal program can be used that has similar functionality.



Note

Realterm can be downloaded for free on the Internet.

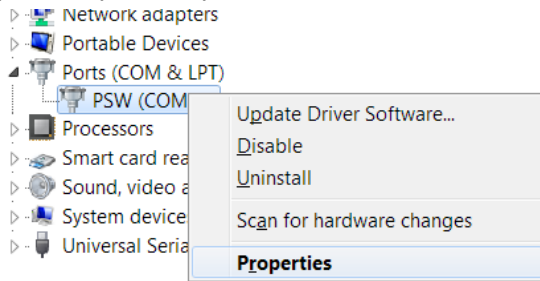
steps	Step instructions
-------	-------------------

- |   |  |
|---|--|
| 1 | Download Realterm and install according to the instructions on the Realterm website. |
| 2 | Connect this product via USB.  |

- 3 Find the COM port number to which this product is connected from Windows Device Manager.

Double click the Ports icon to reveal the connected serial port devices and the COM port for each connected device.

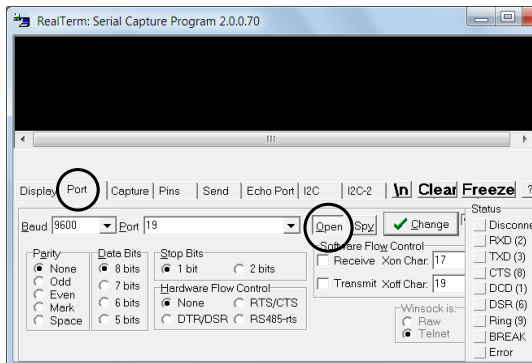
The baud rate, stop bit and parity settings can be viewed for the virtual COM port by right-clicking connected device and selecting the Properties option.



- 4 Start Realterm on the PC as an administrator.  
Tip: to run as an administrator, you can right click the Realterm icon in the Windows Start menu and select the Run as Administrator option.

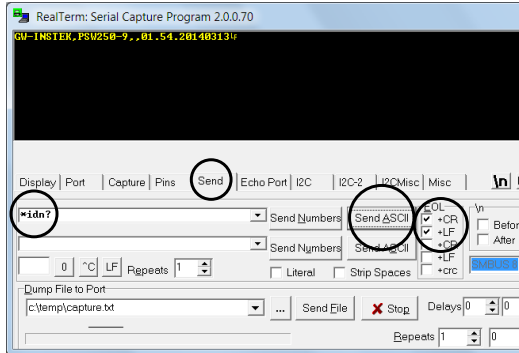
- 5 After Realterm has started, click on the Port tab.  
Enter settings for the connection's baud rate, parity, data bits, stop bits, and port number.  
The Hardware Flow Control, Software Flow Control options can be left at the default settings.

Press Open to connect to this product.





- 6 Click on the Send tab.  
In the EOL configuration, check on the +CR and +LF check boxes.  
Enter the query:  
\*idn?  
Click on Send ASCII.



- 7 The terminal display will return the following:  
manufacturer, model, serial number, version
- 8 If Realterm fails to connect to this product, please check all the cables and settings and try again.

## 6.7. GP-IB Remote Control Function Check

Its possible use National Instruments Measurement and Automation Explorer (NI MAX) to check if GP-IB connection is working properly. Use of NI MAX requires NI-VISA to be installed.

After installing NI-VISA, download NI-488.2 and complete the installation. NI-488.2 can be downloaded from the NI website [www.ni.com](http://www.ni.com). Find it on the NI website by searching for "NI-488.2 Download."

The following feature checks are based on version 2022 Q3.



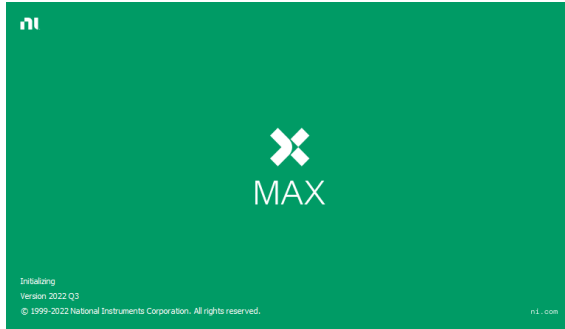
Note

NI-VISA can be downloaded from the NI website [www.ni.com](http://www.ni.com). Find it on the NI website by searching for "NI-VISA Download."

steps Step instructions

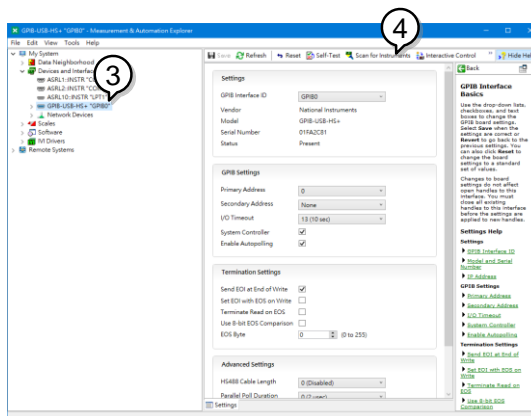
- 1 Complete the setup steps above.

- 2 Start the Measurement and Automation Explorer (MAX) program.  
When using Windows, click in the following order:  
Start > All Programs >  
National Instruments > NI MAX

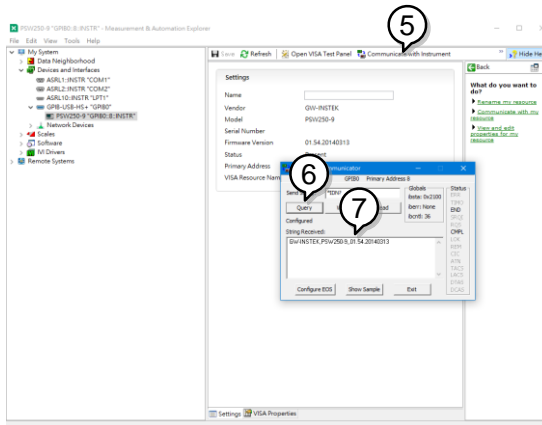


The Measurement & Automation Explorer initial splash screen.

- 3 From the Configuration panel access;  
My System>Devices and Interfaces>GPIB0(GPIB-USB-HS+)
- 4 Press the Scan for Instruments button.



- 5 Click on Communicate with Instrument.
- 6 In the NI-488.2 Communicator window, enter "\*IDN?" in the Send String text box.  
Click on the Query button to send the \*IDN?
- 7 The String Received text box will display the query return:  
manufacturer, model, serial number, version



8 The function check is complete.

## 6.8. Socket Server Function Check

Its possible use National Instruments Measurement and Automation Explorer (NI MAX) to check if socket server connection is working properly. Use of NI MAX requires NI-VISA to be installed.

The following feature checks are based on version 2022 Q3.

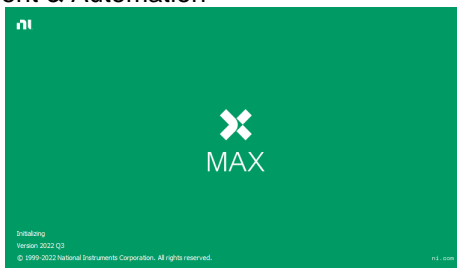


Note

NI-VISA can be downloaded from the NI website [www.ni.com](http://www.ni.com). Find it on the NI website by searching for "NI-VISA Download."

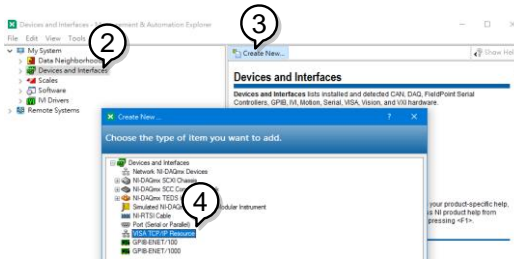
### steps Step instructions

- 1 Start the NI Measurement and Automation Explorer (MAX) program.  
When using Windows, click in the following order:  
Start > All Programs > National Instruments > Measurement & Automation

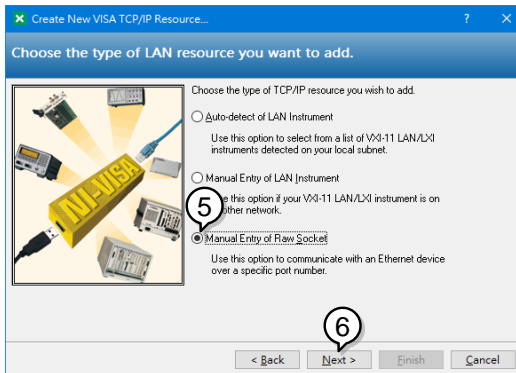


- 2 From the Configuration panel access;  
My System > Devices and Interfaces > Network Devices

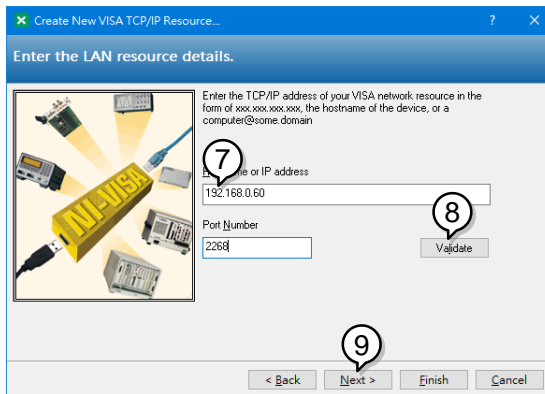
- 3 Click Create New... .
- 4 Select VISA TCP/IP Resource.



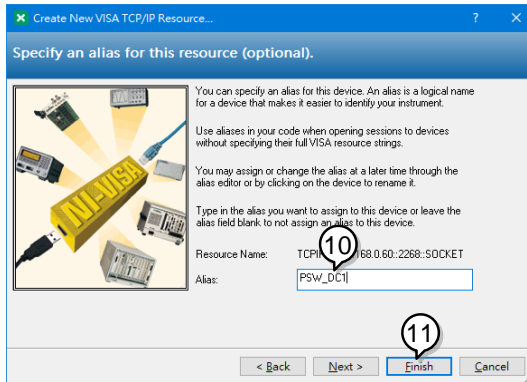
- 5 Select Manual Entry of Raw Socket from the popup window.
- 6 Click Next.



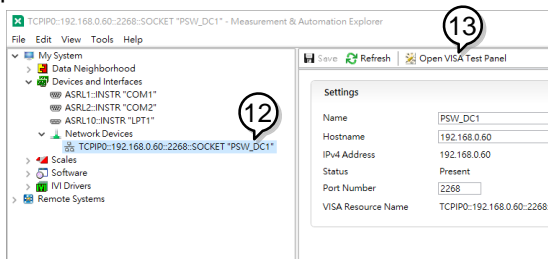
- 7 Enter the IP address and the port number of this product. The port number is fixed at 2268.
- 8 Click the Validate button. A popup box will appear when successful.
- 9 Click Next.



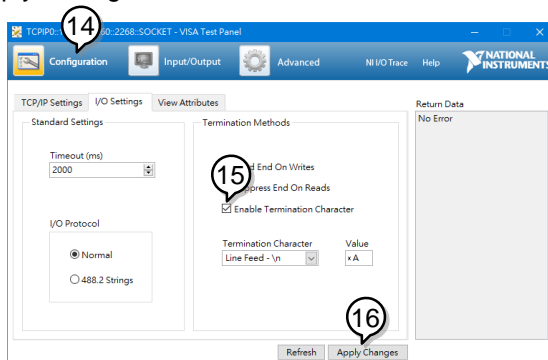
- 10 Next configure the Alias (name) of this product connection. In this example the Alias is: PSW\_DC1
- 11 Click finish.



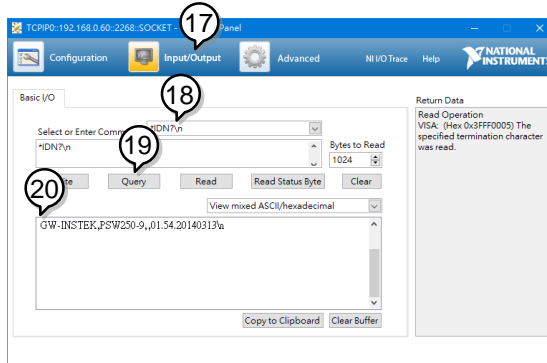
- 12 The IP address of this product will now appear under Network Devices in the configuration panel. Select this icon.
- 13 Press Open VISA Test Panel.



- 14 Click Configuration icon.
- 15 In the I/O Settings tab, select the Enable Termination Character check box. Ensure Line Feed - : \n is selected as the line feed character.
- 16 Click Apply Changes.



- 17 Click the Input/Output icon.
- 18 Ensure \*IDN? : \n is selected in the Select or Enter Command dropdown text box.
- 19 Click the Query button.
- 20 The \*IDN? query should be returned to the buffer area:



Note

Please refer to the programming manual for more information.

# 7. MAINTENANCE

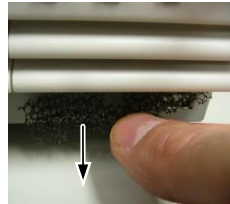
This product filters should be replaced on a periodic schedule to maintain performance and specification characteristics.

## 7.1. Replacing the Dust Filter

The dust filter should be replaced at least 2 times a year. Not replacing the filter on a regular basis will reduce performance and may cause the unit to overheat.

steps	Step instructions
-------	-------------------

- |   |   |
|---|---|
| 1 | Turn this product off.                                  |
| 2 | Pull the filter out from the bottom of the front panel. |



- |   |                     |
|---|---------------------|
| 3 | Replace the filter. |
|---|---------------------|

## 8. FAQ

### ◆ Question

This product operation mode (CV mode ⇔ CC mode) cannot be changed.

### ◇ Answer

this product's operating mode (CV and CC) is determined by the set voltage, set current, and load condition connected to this product. Refer to page [14](#).

### ◆ Question

OVP operates at a voltage lower than the OVP setting.

### ◇ Answer

When setting OVP, consider the voltage drop from the load line. Since the OVP level is set from the output terminal rather than the load terminal, the voltage at the load terminal may be slightly lower.

### ◆ Question

Is it possible to combine cables in parallel for output wiring?

### ◇ Answer

Yes. Cables can be used together (in parallel) if the current capacity of a single cable is insufficient. However, the withstand voltage should also be taken into account. Ensure the cables are twisted together and are the same length.

### ◆ Question

Accuracy does not meet the specifications.

### ◇ Answer

Make sure the ambient temperature is between +20°C and +30°C and the product is powered on for at least 30 minutes. This is a necessary warm-up for the product to meet specifications.



# 9. APPENDIX

## 9.1. PSW-Multi Web Control Description

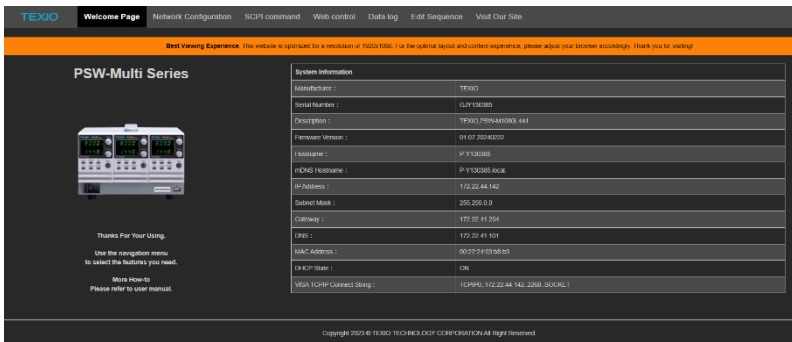
Open the web browser and input the IP address of PSW-M and then push “Enter key” to move over to Web Control server.

There are seven tabs on the top of the Web Control Page. Select the tab you desire on the top of the Web control page by clicking the mouse so that you can control the PSW-M or get more information about it.

### 9.1.1. Tab Welcome Page

On the Welcome Page, users can get the system information of this PSW-M.

The system information includes all information about Manufacturer, Serial Number, Description, Firmware Version, Web setting, and Web information.



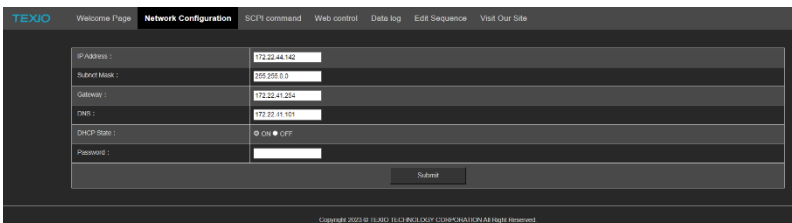
The screenshot shows the 'Welcome Page' of the PSW-Multi Series web control interface. The page features a navigation menu at the top with tabs for 'Welcome Page', 'Network Configuration', 'SOP command', 'Web control', 'Data log', 'Edit Sequence', and 'Visit Our Site'. A banner below the navigation menu reads 'Best Viewing Experience' and includes a note about resolution. The main content area is titled 'PSW-Multi Series' and features an image of the device. Below the image, there is a 'Thank You For Your Using' message and a 'More How-to' link. To the right, a 'System Information' table displays the following data:

System Information	
Manufacturer :	TEXIO
Serial Number :	GLY13030
Description :	TEXIO_7094M100K_164
Firmware Version :	01.07.20240202
Hardware :	P-Y130303
IP/MQ Hostname :	P-Y130303.0038
IP Address :	172.22.44.142
Subnet Mask :	255.255.0.0
Gateway :	172.22.41.254
DNS :	172.22.41.101
MAC Address :	00:22:14:03:00:03
DHCP State :	ON
Web Control Setting :	TCMPW:172.22.44.142:2261:300001

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### 9.1.2. Tab Network Configuration

On the Network Configuration page, user can change the IP Address, Subnet Mask, Gateway, DNS address or set password or set DHCP enable to get all network settings from router.



The screenshot shows the 'Network Configuration' page of the PSW-Multi Series web control interface. The page features a navigation menu at the top with tabs for 'Welcome Page', 'Network Configuration', 'SOP command', 'Web control', 'Data log', 'Edit Sequence', and 'Visit Our Site'. The main content area contains a form with the following fields:

- IP Address : 172.22.44.142
- Subnet Mask : 255.255.0.0
- Gateway : 172.22.41.254
- DNS : 172.22.41.101
- DHCP State :  ON  OFF
- Password :

A 'Submit' button is located at the bottom of the form. Copyright 2023 © TEXIO TECHNOLOGY CORPORATION All Right Reserved.

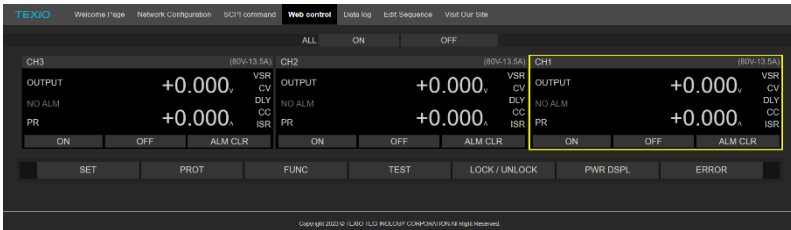
### 9.1.3. Tab SCPI command

On SCPI command page, user can use SCPI command to remote control PSW-M. For usage of remote control, please refer to programming manual for a command list.



### 9.1.4. Tab Web control

There are 7 function (SET, PROT, ..., ERROR) tables here, and all channels can be set independently. Select any channel and use these functions to remotely control the PSW-M online. All control methods and operations are the same as manual operation.



#### All channel module output on/off switch



Click the ON switch to turn on output for all channel modules.



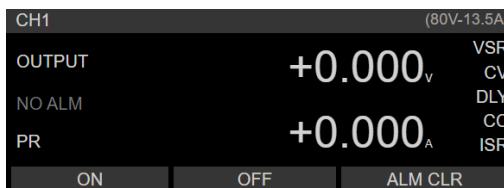
Click the OFF switch to turn off the output of all channel modules.



When click the channel indicator of any channel, the clicked channel indicator will be displayed with a yellow frame.

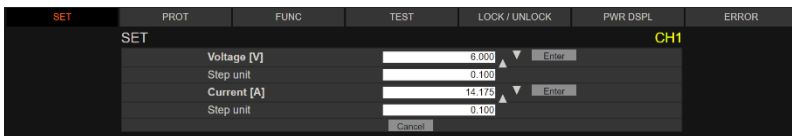
The channel modules enclosed in yellow frames can be controlled by various tables (SET, PROT, ..., ERROR).

#### Channel Indicator



- CHX** The channel displayed in the upper left is the device channel number. In the image, it is displayed as "CH1".
- (XXV-XXA)** The voltage and current values displayed at the top right are the power module types. In the image, it is an 80V, 13.5A power supply module.
- OUTPUT** When the power supply module is in output on state, it turns green.
- NO ALM** When a protection or alarm occurs, the details are displayed in red.
- PR** When the test mode data has been loaded and the test mode is in standby mode, it will be displayed in green. When test mode is running, it will be displayed in orange.
- +0.000<sub>V</sub>**  
**+0.000<sub>A</sub>** Displays the output voltage and output current values of the power supply module. The setting value will not be displayed.
- VSR** When the Output delay time V-I mode is set to "CV slew rate priority", it turns green.
- CV** It turns green when the power module is operating in CV mode.
- DLY** When the Output delay time ON [s] or OFF [s] is set to anything other than "0", it turns green.
- CC** It turns green when the power module is operating in CC mode.
- ISR** When the Output delay time V-I mode is set to "CC slew rate priority", it turns green.
- ON** Click the ON switch to turn on the power module output.
- OFF** Click the OFF switch to turn off the power module output.
- ALM CLR** Click the ALARM CLS switch to clear the protection or alarm.

### SET table

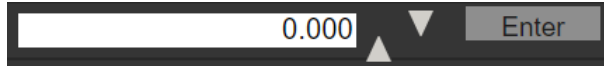


SET

When click the SET tab, the word "SET" will turn orange and the SET table will be displayed. The output voltage and current of the channel module surrounded by the yellow frame can be set.

Voltage [V]

Current [A]



The set voltage value and set current value are displayed in the text box on the right, and it is possible to enter numerical values.

Clicking the  $\Delta$ / $\nabla$  buttons to the right of the text box will increase or decrease each setting value. The setting value can be increased or decreased using the number displayed in the Step unit.

Click the Enter switch to set the set or increased or decreased voltage and current values.

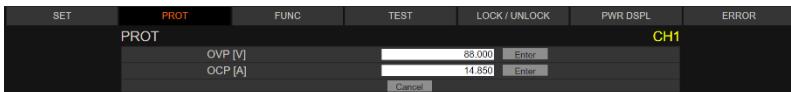
Step unit

The increase/decrease in the set voltage/current value by operating the  $\Delta$ / $\nabla$  buttons is displayed. The increase or decrease value can be entered in the text box on the right.

Cancel

When click the Cancel switch will cancel any increase or decrease in the voltage or current settings or any numerical input settings.

### PROT table



PROT

When click the PROT tab, the word "PROT" turns orange and the PROT table is displayed. The OVP value and OCP value of the channel module surrounded by the yellow frame can be set.

OVP [V]

OCP [A]



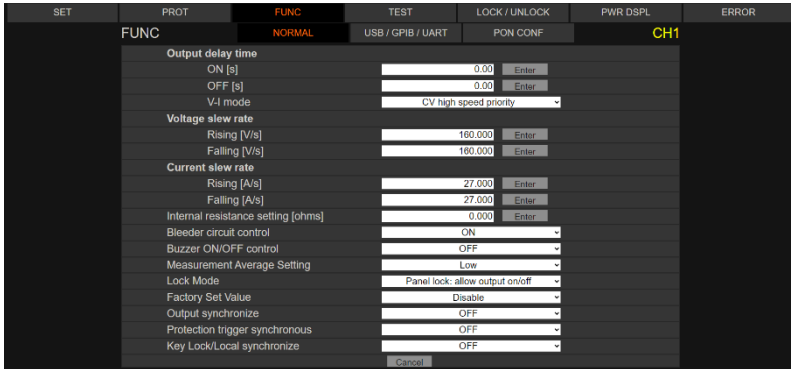
The OVP and OCP values are displayed in the text boxes on the right, and numerical input is possible.

Click the Enter switch to set the configured OVP and OCP values.

Cancel

When click the Cancel switch cancels the numerical input setting of the OVP/OCP value.

## FUNC - NORMAL table



**FUNC**

Click the FUNC tab and then the NORMAL tab. The words "FUNC" and "NORMAL" turn orange and the FUNC - NORMAL table is displayed. The basic functions and multi-channel functions of the channel modules surrounded by yellow frames can be set.

**NORMAL**

For the text box type, enter a value directly and click the Enter switch to set the input value.

Setting

20.000	Enter
--------	-------

**Cancel**

Click the Cancel switch before clicking the Enter switch cancels the numerical input settings.

For the pull-down type, click the box on the right and use the mouse pointer to select a menu from the pull-down menu.

Example:  
V-I mode

V-I mode	CV high speed priority	▼
slew rate	CV high speed priority	
Rising [V/s]	CC high speed priority	
Falling [V/s]	CV slew rate priority	
	CC slew rate priority	
V-I mode	CV slew rate priority	▼

When select and click a menu with the mouse pointer, the menu clicked will be displayed in a box.

## FUNC – USB/GPIB/UART table

SET	PROT	FUNC	TEST	LOCK / UNLOCK	PWR DSPL	ERROR
	FUNC	NORMAL	USB / GPIB / UART	PON CONF		CH1
		USB State				
		Front panel	Absent			
		Rear panel	Absent			
		Rear panel USB MODE	Disable			
		GPIB address	8	Enter		
		UART				
		Baud Rate	115200			
		Data Bits	8 bits			
		Parity	None			
		Stop Bit	1 bit			
			Cancel			

**FUNC**

Click the FUNC tab and then the USB/GPIB/UART tab.

**USB / GPIB / UART**

The words "FUNC" and "USB/GPIB/UART" will turn orange and the FUNC - USB/GPIB/UART table will be displayed. Able to check the USB port status of the channel module enclosed in a yellow frame, and set the GP-IB address and UART communication settings. These settings only take effect after a power cycle.

### USB State

Displays the status of the front panel USB-A port and the rear panel USB-B port. This item is for confirmation only.

### Rear panel USB MODE

Use the mouse pointer to select the rear panel USB mode from the pull-down menu.

### GPIB address

Enter the GP-IB address in the text box and click the Enter switch to set it. Click the Cancel switch to cancel the GP-IB address setting.

### UART

Select each communication setting (Baud Rate, Data Bits, Parity, Stop Bit) from the pull-down menu. Click the Cancel switch to cancel each communication setting.

## FUNC – PON CONF table

SET	PROT	FUNC	TEST	LOCK / UNLOCK	PWR DSPL	ERROR
	FUNC	NORMAL	USB / GPIB / UART	PON CONF		CH1
		CV control	Panel control			
		CC control	Panel control			
		Power-ON Output	OFF at startup			
		External Out Logic	High ON			
			Cancel			

**FUNC**

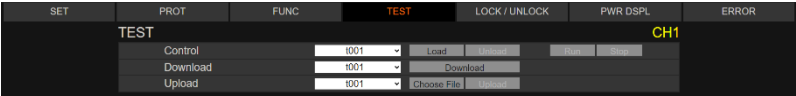
Click the FUNC tab and then the PON CONF tab. The words "FUNC" and "PON CONF" will turn orange and the FUNC - PON CONF table will be displayed. The power-on function settings of the channel module surrounded by the yellow frame can be configured.

**PON CONF**

The words "FUNC" and "PON CONF" will turn orange and the FUNC - PON CONF table will be displayed. The power-on function settings of the channel module surrounded by the yellow frame can be configured. These settings only take effect after a power cycle.

Select the power-on function setting (CV control, CC control, Power-ON Output, External Out Logic) from the pull-down menu. Click the Cancel switch to cancel various settings.

**TEST table**



Click the TEST tab, the word "TEST" will turn orange and the SPTEST table will be displayed. The test mode run setting for the channel modules enclosed in the yellow frame is now available.

Load test mode data into test mode memory number  
 This is not necessary if the test mode data has been loaded into the equipment's test mode memory number.



Select the test mode memory number (t001-t010) to be used from the pull-down menu.  
 Click the Choose File button and select the test mode data (.csv) on the computer.  
 Click the Upload button to load the test mode data into the selected test mode memory number.  
 When importing test mode data using a web browser, a ".tst" file is not required.

Test mode memory number Load data into test mode memory



Select the test mode memory number (t001-t010) to which the test mode data has been loaded from the pull-down menu.  
 Click the Load switch, the selected test mode memory number data is loaded into the test mode memory of the device, and the device enters the test mode run standby state.  
 Click the Unload switch to cancel the test mode run standby state.

Running the test mode

## Control



Click the Run switch to run test mode of run standby state.

Click the Stop switch to put the running test mode into standby state.

## Exporting a Test Mode Data File

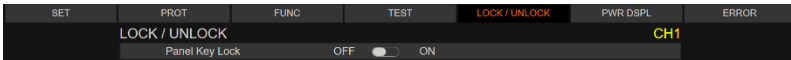
### Download



Select the test mode memory number (t001-t010) to which the test mode data has been loaded from the pull-down menu.

Click the Download switch to export the test mode data (.csv) of the test mode memory number to the download folder. If the test mode data contains ".tst" data, ".tst" format data will also be exported.

## LOCK/UNLOCK table



### LOCK / UNLOCK

Click the LOCK/UNLOCK tab, the word "LOCK/UNLOCK" will turn orange and the LOCK/UNLOCK table will be displayed. Panel lock settings can be made for channel modules surrounded by a yellow frame.

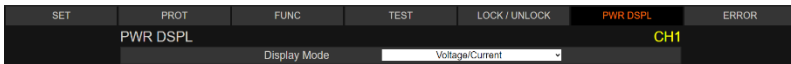
## Panel Key Lock



Panel Lock Disabled (OFF) Panel Lock Enabled (ON)

Each click of the ON/OFF slide switch will enable or disable the panel lock.

## PWR DSPL table



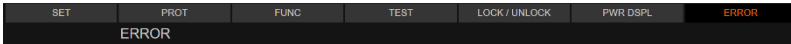
### PWR DSPL

Click the PWR DSPL tab, the words "PWR DSPL" will turn orange and the PWR DSPL table will be displayed. Switches the display output value (Voltage/Current, Voltage/Watt, Watt/Current) of the channel module surrounded by a yellow frame.



Display Mode Click the box on the right and use the mouse pointer to select a menu from the pull-down menu.  
When select and click a menu with the mouse pointer, the menu clicked will be displayed in a box.

## ERROR テーブル

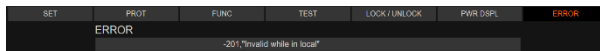


Click the ERROR tab, the word "ERROR" will turn orange and the ERROR table will be displayed.

Error example When the voltage setting operation is performed in the external voltage control setting of the voltage output.



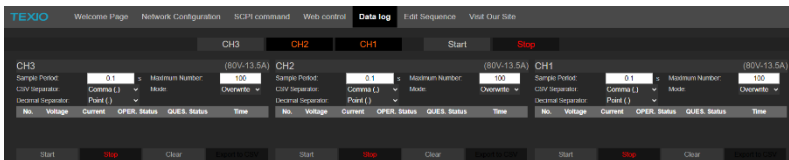
If an error occurs in a channel module surrounded by a yellow frame in Web Control, the ERROR table will be displayed in red.



Click the Errors tab to see the error that occurred (-201, "Invalid locally").

### 9.1.5. Tab Data log

By the web control, the output status of all output modules of the PSW-M can be recorded at set intervals and exported in CSV file format. The output status is recorded as the output voltage value, output current value, Operation Status register value, and Questionable Status register value.



Note

The maximum number of records for the logging function via Web control is 60000. Also, if click a tab other than the Data log tab while logging is in progress, logging will stop and the logged data will be lost.

If the number of logging operations exceeds 60,000 or if change the power supply module settings during logging is in progress, use the logging function that uses a USB

memory (4.2.2. Logging function operation: USB memory). The logging function using USB memory and the logging function using Web control can be used together.


### Logging function settings

The logging function can be set for each channel. The following items can be set.

- |                   |   |
|-------------------|---|
| Sample Period     | Enter the logging time interval into the text box to the right.<br>Range: 0.1 – 600s, Resolution: 0.1s, Default value: 0.1s   |
| Maximum Number    | Enter the number of logging records in the text box to the right.<br>Range: 100 – 60000, Resolution: 1, Default value: 100  |
| CSV Separator     | Select the CSV delimiter from the drop-down menu.<br>When “Comma (,)” is selected, Decimal Separator is automatically set to “Point (.)”.<br>When “Semicolon (;)” is selected, Decimal Separator is automatically set to “Comma (,)”.   |
| Decimal Separator | Select the decimal point separator from the pull-down menu.<br>When “Point (.)” is selected, CSV Separator is automatically set to “Comma (,)”.<br>When “Comma (,)” is selected, CSV Separator is automatically set to “Semicolon (;)”.   |
| Mode              | Select the method for recording the logging data from the pull-down menu.<br>By select "Overwrite", the log data will be cleared when the number of logging records reaches the number of logging records. After the data is cleared, data recording will start again. The data log counter number (No.) is counted without being cleared.<br>By select “Stop”, logging will stop when the logging count reaches the logging record count. The logging data is not cleared. |

### Start and stop logging

To start and stop logging, click the Start and Stop switches. Logging can be started and stopped in two ways: multiple channel operation and specified channel operation. For multiple channel operation, use the switches at the top of the Data log table, and for specific channel operation, use the switches at the bottom of the logging data for each channel.

Stop switch 

When click the Stop switch while logging is in progress, logging will stop and the word on the Stop switch will turn red.

When the Stop switch words are displayed in red, clicking the Stop switch is disabled.


Start switch 

When click the Start switch while logging is stopped, logging will start or resume and the Start switch will turn green.

When the Start switch is displayed in green, clicking the Start switch is disabled.

### Multiple Channel Selection

The channel selection switch is located at the top of the Data log table. When start and stop logging on multiple channels, click the CH switch to make the CH display orange.

Example 

In the image diagram, CH1 and CH2 are the channels that perform logging operations on multiple channels.

### Logging Data

No.	Voltage	Current	OPER. Status	QUES. Status	Time
1	+6.996	+0.000	280	0	07/29 10:19:18.5
2	+6.994	+0.000	280	0	07/29 10:19:19.5
3	+6.994	+0.000	280	0	07/29 10:19:20.6
4	+6.994	+0.000	280	0	07/29 10:19:21.6

The following six items of data are recorded:

- No.                               The number of data log counters.
- Voltage                         Measure voltage value.
- Current                         Measure current value.
- OPER. Status                 Operation Status register value.
- QUES. Status                 Questionable Status register value.



### Note

For register values, refer to the programming manual.

### Time

The time the data was logged (month/day hour/minute/second).

### Export logging data

Logging data can be exported while logging is stopped.



**Export to CSV** When the Export to CSV switch words is displayed in white, clicking the Export to CSV switch exports the logging data in CSV file format to the download folder on the PC.

### Clear logging data

The logging data can be cleared while logging is stopped.



### Clear

Click the Clear switch to clear the logging records on the Data log table, and the Export to CSV switch words will be displayed in black.



### Note

If logging stops by clicking a tab other than the Data log tab during logging, click the Clear switch for the channel for which logging was in progress. If this operation is not performed, logging may not function for that channel.

## 9.1.6. Tab Edit Sequence

It is possible to edit test mode data (CSV file), import/export data, and upload to PSW-Multi.

Step	Point	Output	Time(sec)	Voltage (V)	Current (A)	OV(PV)	OC(PV)	Diode	N Mode	Var up(V/s)	Var down(V/s)	Isr up(V/s)	Isr down(V/s)	R(Rollin)	Beeper	Sense Average	Jump to	Jump Cnt
1	ON	1	MIN	MIN	MAX	MAX	ON	-	CVIS+	MAX	MAX	MAX	MAX	MIN	OFF	+	LOW	+
2	ON	1	MIN	MIN	MAX	MAX	ON	-	CVIS+	MAX	MAX	MAX	MAX	MIN	OFF	+	LOW	+
3	ON	1	MIN	MIN	MAX	MAX	ON	-	CVIS+	MAX	MAX	MAX	MAX	MIN	OFF	+	LOW	+
4	ON	1	MIN	MIN	MAX	MAX	ON	-	CVIS+	MAX	MAX	MAX	MAX	MIN	OFF	+	LOW	+
5	ON	1	MIN	MIN	MAX	MAX	ON	-	CVIS+	MAX	MAX	MAX	MAX	MIN	OFF	+	LOW	+
6	ON	1	MIN	MIN	MAX	MAX	ON	-	CVIS+	MAX	MAX	MAX	MAX	MIN	OFF	+	LOW	+

### Editing test mode data (CSV file)

Click a cell to enter a parameter. For parameters, refer to “Test mode setting items: page 88”.

# Description

Step	Point	Output	Time(sec)	Voltage (V)	Current (A)	OVP(V)	OCP(A)	Bleeder
1		ON	1	MIN	MIN	MAX	MAX	ON

Click on a test mode data cell to see its description. Cells with a ▾ mark have fixed parameters that can be entered. Select from the parameters displayed in Description and enter them.

Add Row Del Row

The default number of rows (steps) in the Edit Sequence table is 6. Click the Add Row switch to add a row, or click Del Row to delete a row.

Import csv

Click the Import csv switch and select test mode data (.csv) on the computer to import the test mode data into the Edit Sequence table. By importing test mode data using a web browser, a ".tst" file is not required.

Export csv, tst

Click the Export csv, tst switch to export the test mode data (t00.csv and t00.tst) of the Edit Sequence table to the download folder.

## Load test mode data into test mode memory number

t001 ▾
t001
t002
t003
t004
t005
t006
t007
t008
t009
t010

To load the test mode data in the Edit Sequence table into a test mode memory number, click the box in the upper left corner of the table. Select the test mode memory number (t001-t010) to be used from the pull-down menu. The test mode memory number to which test mode data is loaded is displayed in black word.

Upload

Click the Upload switch to load the test mode data into the selected test mode memory number.



Note

When loading test mode data to a test mode memory number in the Edit Sequence table, the test mode data is loaded to the memory numbers of all CHs.

## 9.2. Factory default settings

The following settings are this product's factory configuration settings (functional settings/test settings).

For details on how to return to the factory default settings, refer to page 32.

Setting items	Initial settings	
Output	Off	
Panel lock	0 (Disabled)	
Voltage setting value	0V	
Current setting value	0A	
OVP setting value	Maximum	
OCP setting value	Maximum	
Normal Function Settings	Setting	Initial settings
Output ON delay time	F-01	0.00s
Output OFF delay time	F-02	0.00s
V-I mode slew rate select	F-03	0 = CV high speed priority
Rising voltage slew rate	F-04	Fastest value for each power module
Falling voltage slew rate	F-05	Fastest value for each power module
Rising current slew rate	F-06	Fastest value for each power module
Falling current slew rate	F-07	Fastest value for each power module rate.
Internal resistance setting	F-08	0.000Ω
Bleeder circuit control	F-09	1: ON
Buzzer ON/OFF control	F-10	1: ON
Measurement Average Setting	F-17	0: Low
Output key operation (In panel lock active)	F-19	0: allow output off
USB/GPIB setting	Setting	Initial settings
Rear Panel USB state	F-22	2: USB CDC
GPIB address	F-23	8
LAN setting	Setting	Initial settings
LAN	F-36	1: Enable
DHCP	F-37	1: Enable
Sockets active	F-57	1: Enable
Web Server active	F-59	1: Enable
Web password active	F-60	1: Enable
Web setting password	F-61	0000

UART setting	Setting	Initial settings
Baud rate	F-71	7: 115200 bps
Data bits	F-72	1: 8 bits
Parity	F-73	0: None
Stop bit	F-74	0: 1 bit
Fan stop function	Setting	Initial settings
Enabling/disabling	F-80	0: Function disabled state
Fan stop time	F-81	1s
Logging function	Setting	Initial settings
Starting/stopping	F-82	0: Stop
Time interval	F-83	1.0s
Storage folder	F-84	0000
Set value digit fixed function	Setting	Initial settings
Voltage set value fixed	F-85	0.1.1.1
Current set value fixed	F-86	0.1.1.1
Power On Configuration	Setting	Default Setting
Voltage settings	F-90	0: Panel control (local)
Current settings	F-91	0: Panel control (local)
Power-ON Output	F-92	0: OFF at startup
External Out Logic	F-94	0: High ON
Power Switch trip	F-95	0: Enable
tUVP function	Setting	Default Setting
Enable/ Disable	F-A0	0: Disable
Delay time	F-A1	0.1s
Voltage drop valu	F-A2	0.01V or 0.1V
Multi-Channel Function Setting	Setting	Default Setting
Output Synchronize	F130	0: Disable
Protection Trigger Synchronous	F131	0: Disable
Key Lock/ Local Synchronize	F132	0: Disable

### 9.3. Error Messages & Messages

The following error messages or messages may appear on this product's screen during operation.

Error Messages	Description
Err 001	USB Mass Storage is not present
Err 002	No (such)file in USB mass storage
Err 003	Empty memory location
Err 004	File access error
Err 901	Keyboard CPLD error
Err 902	Analog CPLD error
Err 920	The ADC is over range for calibration
Err 921	The DAC is over range for calibration
Err 922	Point invalid for calibration
Messages	Description
MSG 001	External control of output. Output off (F-94: 0, High: on)
MSG 002	External control of output. Output off (F-94: 1, Low: on)
MSG 003	F-93 is not zero. Unable to calibrate.
LOCK F-19	F-19 is zero. Unable to turn the output on.

### 9.4. LED Display Format

Use the following table to read the LED display messages.

0	1	2	3	4	5	6	7	8	9	A	B	C	D
0	1	2	3	4	5	6	7	8	9	A	b	C	d
E	F	G	H	I	J	K	L	M	N	O	P	Q	R
E	F	G	H	I	J	K	L	M	N	O	P	Q	R
S	T	U	V	W	X	Y	Z	(	)	+	-	,	
S	T	U	V	W	X	Y	Z	(	)	+	-	,	



## 10. Specifications

This specification applies when at least 30 minutes have elapsed after this product was turned on and the ambient temperature is between +18 °C~ +28 °C.

### 10.1. Power module output specifications

	Unit	30V	80V	160V	250V	800V
<b>Rated Output</b>						
Voltage	V	30	80	160	250	800
Current	A	36	13.5	7.2	4.5	1.44
Power	W	360	360	360	360	360
Power Ratio		3	3	3.2	3.125	3.2
<b>CV Mode</b>						
Line Regulation* <sup>1</sup>	mV	18	43	83	128	403
Load Regulation* <sup>2</sup>	mV	20	45	85	130	405
<b>Ripple and Noise*<sup>3</sup></b>						
p-p* <sup>4</sup>	mV	60	60	60	80	150
r.m.s * <sup>5</sup>	mV	7	7	12	15	30
Temperature coefficient	ppm /°C	100ppm/°C At rated output voltage after 30 minutes warm-up				
Remote sense compensation voltage (single wire)	V	0.6	0.6	0.6	1	1
<b>Rise Time*<sup>6</sup></b>						
Rated Load	ms	50	50	100	100	150
No Load	ms	50	50	100	100	150
<b>Fall Time*<sup>7</sup></b>						
Rated Load	ms	50	50	100	150	300
No Load	ms	500	500	1000	1200	2000
Transient response time* <sup>8</sup>	ms	1	1	2	2	2
<b>CC Mode</b>						
Line Regulation* <sup>1</sup>	mA	41	18.5	12.2	9.5	6.44

Load Regulation <sup>*9</sup>	mA	41	18.5	12.2	9.5	6.44
Ripple and Noise <sup>*3</sup>						
r.m.s <sup>*5</sup>	mA	72	27	15	10	5
Temperature coefficient	ppm /°C	200ppm/°C At rated output current after 30 minutes warm-up				
<b>Protection Function</b>						
Over voltage protection (OVP): Detect voltage using output terminal voltage						
Setting range	V	3-33	8-88	16-176	20-275	20-880
Setting accuracy	± (2% of rated output voltage)					
Over current protection (OCP)						
Setting range	A	3.6-39.6	1.35-14.85	0.72-7.92	0.45-4.95	0.144-1.584
Setting accuracy	± (2% of rated output current)					
Tracking under voltage protection (tUVP)						
Setting range	V	0.01-30	0.01-80	0.1-160	0.1-250	0.1-800
Setting accuracy	± (2% of rated output voltage)					
Overheat (Over temperature) protection (OHP (OTP))						
Operation	Turn the output off.					
Low AC input protection (AC-FAIL)						
Operation	Turn the output off.					
Power limit (POWER LIMIT)						
Operation	Over power limit.					
Value (fixed)	Approx. 105% of rated output power					
<b>Analog Control Function</b>						
External voltage control output voltage	Accuracy and linearity: ±0.5% of rated output voltage.					
External voltage control output current	Accuracy and linearity: ±1% of rated output current.					
External resistor control output voltage	Accuracy and linearity: ±1.5% of rated output voltage.					

External resistor control output current	Accuracy and linearity: ±1.5% of rated output current.					
Output voltage monitor						
Accuracy	%	±1	±1	±1	±2	±2
Output current monitor						
Accuracy	%	±1	±1	±1	±2	±2
Shutdown control	Turns the output off with a LOW (0V to 0.5V) or short-circuit.					
Output on control	<p>Logical selection possible:</p> <p>Active Low: Turn the output on using a LOW (0V to 0.5V) or short-circuit, turn the output off using a HIGH (4.5V to 5V) or open-circuit.</p> <p>Active High Turn the output on using a HIGH (4.5V to 5V) or open-circuit, turn the output off using a LOW (0V to 0.5V) or short-circuit.</p>					
CV/CC/ALM/PWR ON/OUT ON Status signals	Photocoupler open collector output; Maximum voltage 30V, maximum sink current 8mA.					
<b>Front Panel</b>						
Display, 4 digits						
Voltage accuracy: 0.1%reading +	mV	20	20	100	200	400
Current accuracy: 0.1% reading +	mA	40	20	5	5	2
Indications						
GREEN LED's	CV, CC, VSR, ISR, DLY, RMT, 20, 40, 60, 80, 100, %W, W, V, A					
RED LED's	ALM					
Buttons	Function, OVP/OCP, Set, Test, Lock/Local, PWR DSPL, Output					
Knobs	Voltage, Current					
USB port	Type A USB connector					

Programming and Measurement (USB, LAN, GP-IB, UART)						
Output voltage programming accuracy 0.1% +	mV	10	10	100	200	400
Output current programming accuracy 0.1% +	mA	30	10	5	5	2
Output voltage programming resolution	mV	1	2	3	5	14
Output current programming resolution	mA	1	1	1	1	1
Output voltage measurement accuracy 0.1% +	mV	10	10	100	200	400
Output current measurement accuracy 0.1% +	mA	30	10	5	5	2
Output voltage measurement resolution	mV	1	2	3	5	14
Output current measurement resolution	mA	1	1	1	1	1
Efficiency						
100Vac	%	77	78	79	79	80
200Vac	%	79	80	81	81	82
Note						
*1	At 85 ~ 132Vac or 170 ~ 265Vac, constant load.					
*2	From No-load to Full-load, constant input voltage. Measured at the sensing point in Remote Sense.					
*3	Measure with JEITA RC-9131B (1:1) probe					
*4	Measurement frequency bandwidth is 10Hz to 20MHz.					
*5	Measurement frequency bandwidth is 5Hz to 1MHz.					
*6	From 10% to 90% of rated output voltage, with rated resistive load.					
*7	From 90% to 10% of rated output voltage, with rated resistive load.					

- |    |  |
|----|--|
| *8 | Time for output voltage to recover within 0.1% + 10mV of its rated output for a load change from 50 to 100% of its rated output current. |
| *9 | For load voltage change, equal to the power module voltage rating, constant input voltage.   |

## 10.2. 720W model specifications

### Input Characteristics

Input rating	100Vac to 240Vac ± 10%, 50Hz~60Hz, single phase
Input voltage range	85Vac ~ 265Vac
Input frequency range	47Hz ~ 63Hz
Maximum input current	
100Vac	10A
200Vac	5A
Inrush current	Less than 50A.
Maximum input power	1000VA
Power factor (typ)	
100Vac	0.99
200Vac	0.97
Hold-up time	20ms or greater: At rated load

### Data input/output function

USB	Type A USB connector Available USB memory: FAT32 format, No Security, 8GB or less
-----	---

### Interface Capabilities

USB	Type B: Slave, Speed: 1.1/2.0, USB Class: CDC (Communications Device Class)
LAN	MAC Address, IP Address, Subnet Mask, Gateway, DNS address, Web password
GP-IB	Optional: GUG-001 (GP-IB to USB Adapter)
UART	Optional: GUR-001A (UART to USB Adapter)

### Environmental Conditions

Operating temperature	0°C to 50°C
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Storage temperature	-25°C to 70°C
Operating humidity	20% to 85% RH; No condensation
Storage humidity	90% RH or less; No condensation
Altitude	Maximum 2000m
<b>General Specifications</b>	
Weight (main unit only)	Approx. 5.4kg
Dimensions (W x H x D)	142 x 124 x 350 mm
Cooling	Forced air cooling by internal fan.
Safety	Complies with the European Low Voltage Directive and carries the CE-marking.
Withstand voltage	<p>Between input and chassis: No abnormalities at 1500 Vac for 1 minute.</p> <p>Between input and output: No abnormalities at 3000 Vac for 1 minute.</p> <p>Between output and chassis: No abnormalities at 500 Vdc for 1 minute for 30V, 40, 80V, 160V models.</p> <p>No abnormalities at 1500 Vdc for 1 minute for 250V, 800V models.</p>
Insulation resistance	<p>Between input and chassis: 500 Vdc, 100MΩ or more.</p> <p>Between input and output: 500 Vdc, 100MΩ or more.</p> <p>Between output and chassis: 500 Vdc, 100MΩ or more for 30V, 40V, 80V, 160V and 250V models. 1000Vdc, 100MΩ or more for 800V models.</p>

### 10.3. 1080W model specifications

<b>Input Characteristics</b>	
Input rating	100Vac to 240Vac±10%, 50Hz~60Hz, single phase
Input voltage range	85Vac ~ 265Vac
Input frequency range	47Hz ~ 63Hz
Maximum input current	
100Vac	15A
200Vac	7.5A

Inrush current	Less than 75A.
Maximum input power	1500VA
Power factor (typ)	
100Vac	0.99
200Vac	0.97
Hold-up time	20ms or greater: At rated load
<b>Data input/output function</b>	
USB	Type A USB connector Available USB memory : FAT32 format, No Security, 8GB or less
<b>Interface Capabilities</b>	
USB	Type B: Slave, Speed: 1.1/2.0, USB Class: CDC (Communications Device Class)
LAN	MAC Address, IP Address, Subnet Mask, Gateway, DNS address, Web password
GP-IB	Optional: GUG-001 (GP-IB to USB Adapter)
UART	Optional: GUR-001A (UART to USB Adapter)
<b>Environmental Conditions</b>	
Operating temperature	0°C to 50°C
Storage temperature	-25°C to 70°C
Operating humidity	20% to 85% RH; No condensation
Storage humidity	90% RH or less; No condensation
Altitude	Maximum 2000m
<b>General Specifications</b>	
Weight (main unit only)	Approx. 7.7kg
Dimensions (W x H x D)	214 x 124 x 350 mm
Cooling	Forced air cooling by internal fan.
Safety	Complies with the European Low Voltage Directive and carries the CE-marking.

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Withstand voltage	<p>Between input and chassis: No abnormalities at 1500 Vac for 1 minute.</p> <p>Between input and output: No abnormalities at 3000 Vac for 1 minute.</p> <p>Between output and chassis: No abnormalities at 500 Vdc for 1 minute for 30V, 40, 80V, 160V models.</p> <p>No abnormalities at 1500 Vdc for 1 minute for 250V, 800V models.</p>
Insulation resistance	<p>Between input and chassis: 500 Vdc, 100M<math>\Omega</math> or more.</p> <p>Between input and output: 500 Vdc, 100M<math>\Omega</math> or more.</p> <p>Between output and chassis: 500 Vdc, 100M<math>\Omega</math> or more for 30V, 40V, 80V, 160V and 250V models. 1000Vdc, 100M<math>\Omega</math> or more for 800V models.</p>

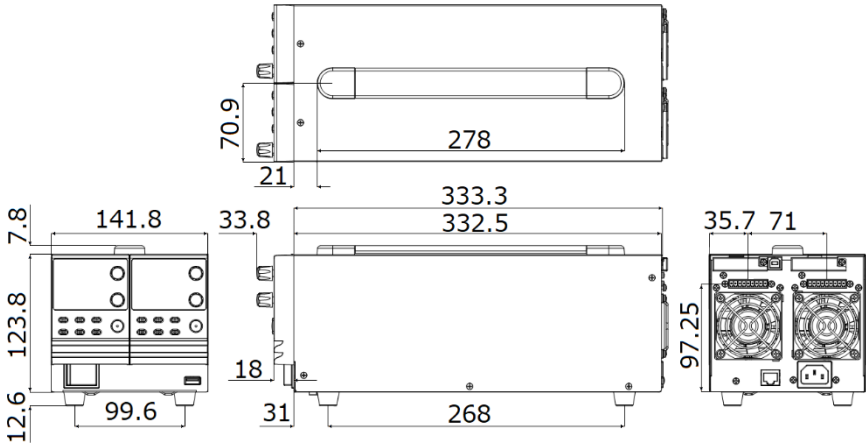
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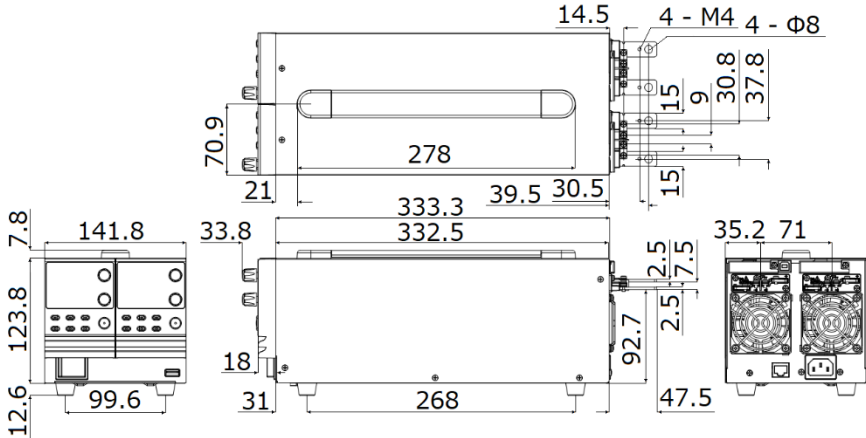
# 11. PSW-Multi Dimensions

## 11.1. 720W model

PSW-M720HXX (scale: mm)

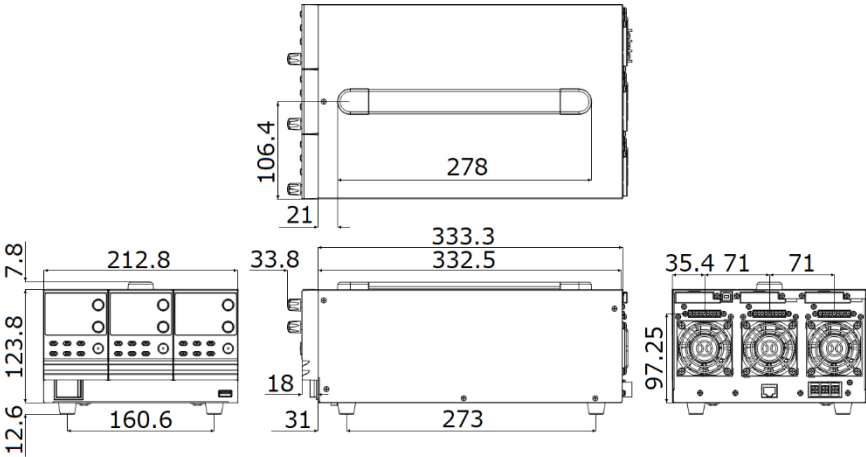


PSW-M720LXX (scale: mm)

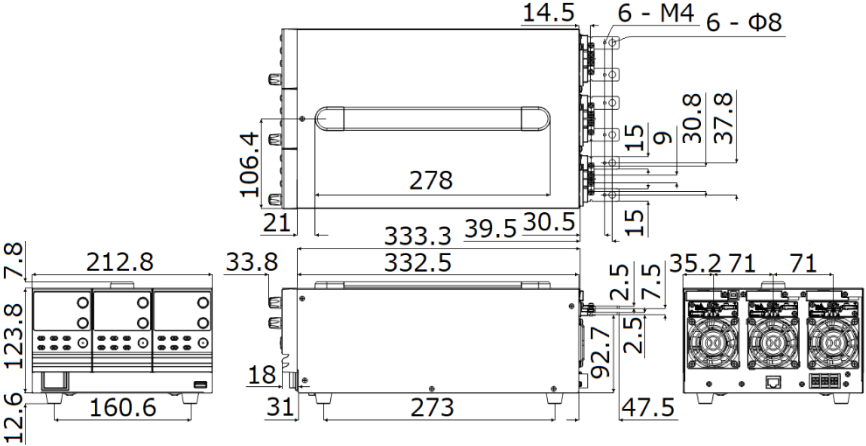


11.2. 1080W model

PSW-M720HXXX (scale: mm)



PSW-M720LXXX (scale: mm)





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