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Programmable DC Power Supply

OPM Series

User Manual

Manual Part NO. 018OPM-2.0

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Waste Electrical and Electronic Equipment

The affixed product label (see right) indicates that you must not discard this electrical/electronic product in domestic household waste. Do not dispose in domestic household waste. To return unwanted products, contact our local ODA distributors, or call us for more information.



Manual Editions

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Reprints of this manual containing minor corrections and updates may have the same printing date.
Revised editions are identified by a new printing date.

Safety Notices

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings or instructions elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. ODA Technologies assumes no liability for the customer's failure to comply with these requirements.

General

Do not use this product in any manner not specified by the manufacturer. The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

Ground the Instrument

This product is a Safety Class 1 instrument (provided with a protective earth terminal). To minimize shock hazard, the instrument chassis and cover must be connected to an electrical ground. The instrument must be connected to the ac power mains through a grounded power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

Before Applying Power

Verify that all safety precautions are taken. Make all connections to the unit before applying power. Note the instrument's external markings described under "Safety Symbols"

Fuses

The instrument contains an internal fuse, which is not customer accessible.

Do Not Operate in an Explosive Atmosphere

Do not operate the instrument in the presence of flammable gases or fumes.

Do Not Remove the Instrument Cover

Only qualified, service-trained personnel who are aware of the hazards involved should remove instrument covers. Always disconnect the power cable and any external circuits before removing the instrument cover.

Do Not Modify the Instrument

Do not install substitute parts or perform any unauthorized modification to the product. Return the product to an ODA Sales and Service Office for service and repair to ensure that safety features are maintained.

In Case of Damage

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.




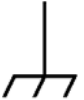

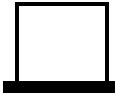

CAUTION









A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

WARNING

A **WARNING** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a **WARNING** notice until the indicated conditions are fully understood and met.

Safety Symbol

	Direct current
	Both direct and alternating current
	Earth (ground) terminal
	Frame or chassis terminal
N	Neutral conductor on permanently installed equipment
I	On supply
	Standby supply. Unit is not completely disconnected from ac mains when switch is off
	Out position of a bi-stable push switch
	Caution, hot surface

	Alternating current
	Three phase alternating current
	Protective earth ground terminal.
	Terminal is at earth potential.
L	Line conductor on permanently installed equipment.
	Off supply
	In position of a bi-stable push switch
	Caution, risk of electric shock
	Caution, refer to accompanying documents

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1. Product Outline

1-1. Product Characteristics

ODA Technologies OPM-Dual Output Series is high-precision, high-accuracy Programmable DC Power Supply with SCPI (Standard Commands for Programmable Instruments) Protocol GPIB(IEEE-488.2)와 RS-232C communication, and designed to be equipped in 3U*19inch Half-Rack. Capacity Extending or adding another Power Supply is simple and economical.

General Functional Characteristics

- Isolated Dual Output
- Rear Output Standard
- Tracking Output Operation
- Parallel Output Operation
- Simple Setting using Jog Shuttle
- Visual Convenience by high-intensity VFD
- Output Voltage, Current Shut-Off & Restore Function (Output ON/OFF)
- Alarm occurs in any events
- High-accuracy and high-precision
- Built-in Remote Sensing for Load Voltage(V-Sensing)
- Over Voltage Protection(O.V.P) / Over Current Protection(O.C.P) / (P.S.P)
- High performance Load Regulation & Line Regulation
- Store and Recall Operating Condition(Voltage,Current,OVP,OCP) up to 10
- Save and Display error message up to 10
- 3U * 19inch Half-Rack Compatible

Remote Interface Characteristics

- GPIB(IEEE-488.2) & RS232C Interface
- SCPI(Standard Commands for Programmable Instruments) Compatible
- High Speed Setting & Measurement
- Plentiful Commands Equipped
- Simple interface setting using I/O Config on front panel
- Realized isolation and floating logic
- Equipped SCPI programming grammar mistake check function

Calibration Characteristics

- Internal calibration is unnecessary because of Software Calibration
- Save Calibration in range separately

Factory Function Characteristic

- Output ON/OFF printing independently function
- Tracking Key Protection
- Parallel Key Protection
- Recall/Store Setting independent channel function
- Recall/Store memory reset function
- Restore & Disable Last States condition function
- ADC Sampling Mode setting function
- Calibration Data restore function
- Calibration Data back-up function
- Calibration Data reset(default) function
- Factory Setting Reset

Self Test Characteristics

- Front Panel Test
- Remote Interface Test
- Memory Data Verification Test
- Auto Search connected power module
- ADC H/W Error Test
- UnRegulated Condition Test
- ADC/DAC Calibration Verification Test

1-2. Accessories & Product Option

Accessories

- One Power Cord
- Output Cable (+), (-) 2pcs each(Part Number : OE-LW-BCW-2.0)
- One User's Manual
- Demo Software & Windows Application Manual (Web Free Download)

Product Option

- OPM Power Module(Voltage:0V~500V Current:0A~6.4KA Wattage:30W ~ 250KW)
- Windows Application(Document & Report, Agenda Total Solution)
- GPIB Module
- GPIB Calbe 1M, 2M, 4M
- RS232C Cable 1M, 2M, 4M, 10M
- Cable for voltage sensing 1M, 2M, 4M, 10M
- 100V \pm 10% , 50~60Hz Input Power
- 115V \pm 10% , 50~60Hz Input Power
- 230V \pm 10% , 50~60Hz Input Power
- Rack Mount Support

1-3. Product Inspection

Please check below features after opening box. If a problem occurs please ask service center or main office about A/S Service. Please pack the product fully with box package. Also, check our website Q&A for further information.

Equipment Check

- Check if KEY, Encoder Switch, Power Switch are damaged.
- Check Scratches on the Name Plate.
- Check Scratches on the product body.
- Check Scratches and Dot shatter on VFD.

Biographic Check

- Check Alarms when the Power is ON.
If there is an alarm, there might be error in the self-test.
Press ERR Key to check the Error Code.
Find Reference "7. Error Messages" for further details.

Reference 1-6 check after power on for self-test

- Company Name & Model Name will be displayed when the power is ON.
- If "P1-OUTPUT OFF Message is displayed without any problem,
read reference Specifications to continue.

If Last State function is enabled, it will return to condition before Power OFF.

Read reference 『1-6. Factory mode』 for further information.

Note

Service Center : 82-32-623-5454

Home Page : www.odacore.com

1-4. Working Condition

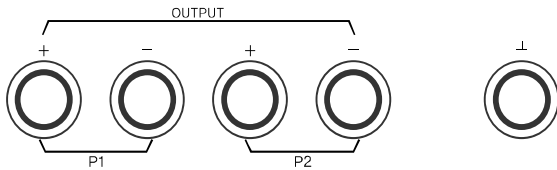
This product is appropriate in below circumstances.

- Ambient Temperature : 0 ~ 40℃
- Humidity : Less than 80%
- Altitude : Less than 2000m
- Place where has no vibration
- Place not be effected by magnetic field

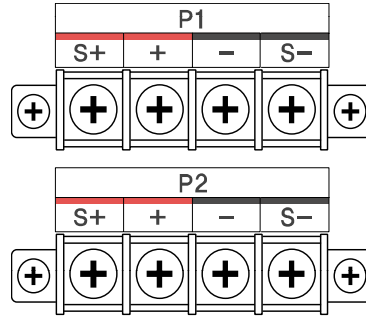
1-5. Check Before Input Power

Check Output Terminal

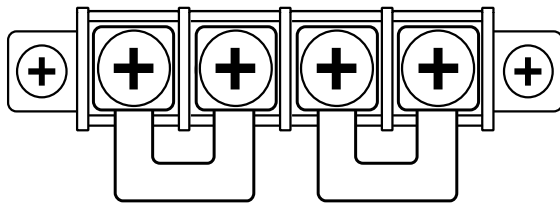
- Check front & rear output terminal is structured as below.



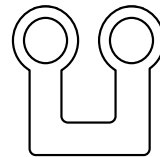
Front Output Terminal
<Diagram 1-1>



Rear Output Terminal
<Diagram 1-2>



<Diagram 1-3>



Short Bar
<Diagram 1-4>

Note

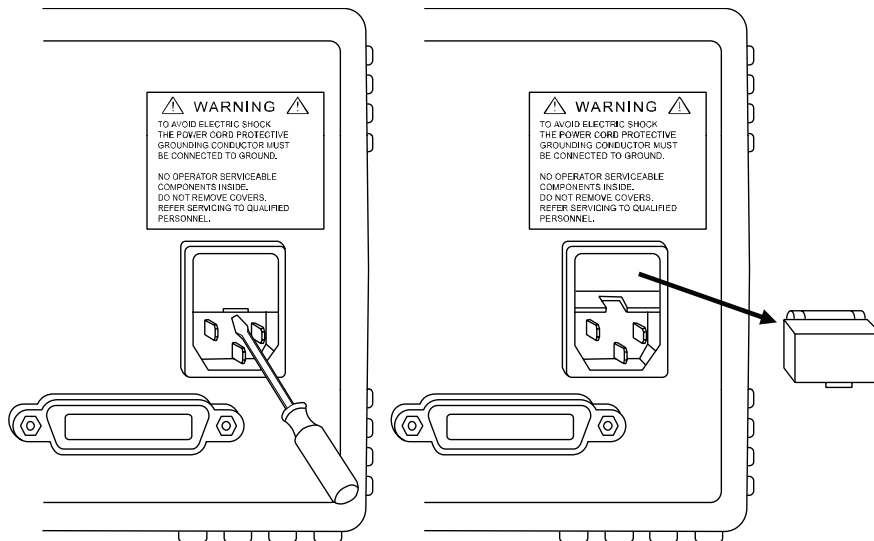
Please read 26 page for further information of V-Sensing

Check Power Cord

- Supplied power cord is 3-wire Ground Type. If you like to use separate power cord, please use Ground type. Also, Connect power line Earth and products GND before using the goods.

Check AC Input Power Switch

- The product is designed single phase with AC100V / AC200V $\pm 10\%$ / 50~60Hz. We set AC200V when the good is released, the switch is located at the bottom of the product. *Read reference "1-2. Accessories & Product Option" "Option" Part.*
- Fuse is equipped to protect the product when the product is overloaded. When the power is OFF even the switch is ON, please check Rear Panel Inlet Fuse Holder. If the Fuse is damaged, please change with same capacity fuse.



<Diagram 1-4>

1-6. Check After Input Power

When Power Supply is ON, it will start setting & self-testing. Also, it maintains previous Remote Interface Setting. Output voltage is 0V, output current is maximum. (When the product is released, last state setting is disabled).

Read Reference "1-2. Factory mode" "Last State" Part.

Check Sequence

- "WWW.ODACORE.COM" will be displayed.
If you visit our website, you will able to download manual & software, upgrade information product information.
- Every lamp will be lighted.
- "INITIALIZING. . ." Message will be Displayed.
While above features are displaying, a reset will be done by fixed memory.
- Also front lamp(CV, CC, OVP, OCP, RMT, TRK, PAR) will be lighted out.
- "i/f - gpib" OR "i/f - rs232c" will be Displayed.
It will automatically search power module when commutation interface is done.
- The Product will activate Self-Test. Descriptions are below

Front panel Test	Check whether Front panel is connected
Analog Power Module Test	Check OPM Power Module
Remote Interface Test	Check Remote Interface for PC Communication
Memory Data Verification Test	Check product information & setting
ADC H/W Error Test	Check ADC HardWare Error
UnRegulated Condition Test	Check Output Voltage Floating
ADC/DAC Calibration Test	Check ADC & DAC Calibration Data

If there is an error, alarm will occur and saves in fixed memory.

Press ERR Key to check the Error code.

Read reference "7. Error Messages" for more information.

Default Setting Value

- | | |
|--|--|
| ■ OVP : OVP Maximum, OVP ON | ■ Output ON/OFF : OFF |
| ■ OCP : OCP Maximum, OCP ON | ■ Remote Interface : Maintain Previous Setting |
| ■ Output Voltage : 0V | ■ Display after Self-Testing : "P1-OUTPUT OFF**" |
| ■ Output Current : Limit Maximum Setting | ■ Cursor Location : Default Voltage |
| ■ Output Select : P1(Positive channel) | Voltage : 1V Unit |
| ■ Tracking : OFF | Current : Less than 5A, 100mA Unit |
| ■ Parallel : OFF | Less than 50A, 1A Unit |

Note1

If user did not order GPIB Option, RS232C will be selected after released, baud-rate will be 19200bp

If user ordered GPIB Option, GPIB will be selected after released, The address is 05.

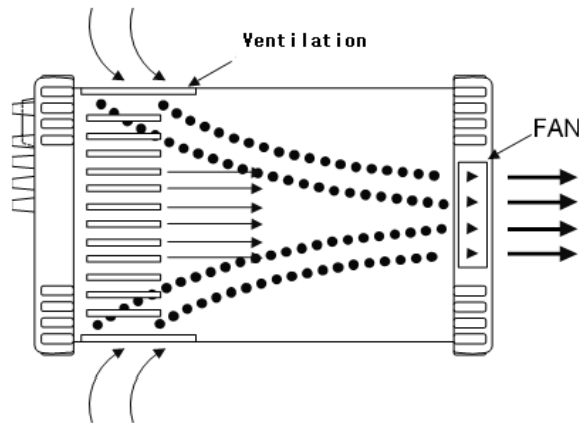
Note2

Default setting value can be different due to Last State Setting from Factory Mode.

1-7. Product Installation

Cooling

- The product is guaranteed in 0°C ~ 40°C condition. So please consider the place to use. In area 40°C ~ 55°C, reduce output current 0~70%.
When it is installed in Rack, please consider about ventilation.
Mount Support will solve above problems.



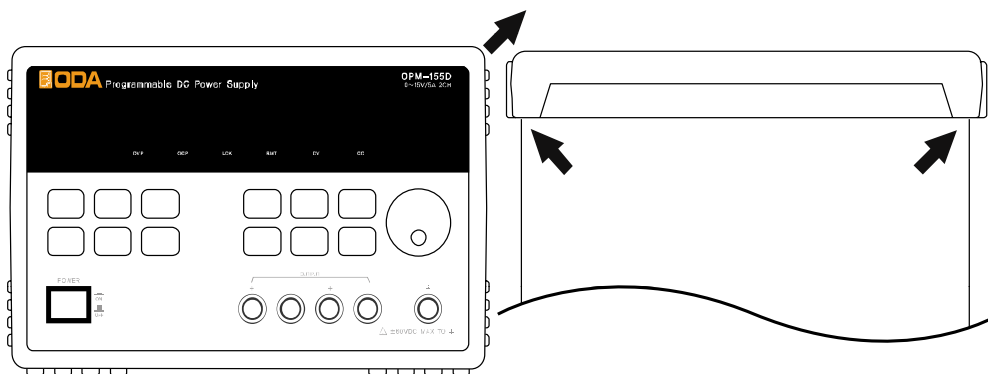
<Diagram 1-4 Bottom view>

Bench Operation

- There should be spare spaces on products side, front, rear for ventilation. Bottom has no ventilating opening, can be used directly.

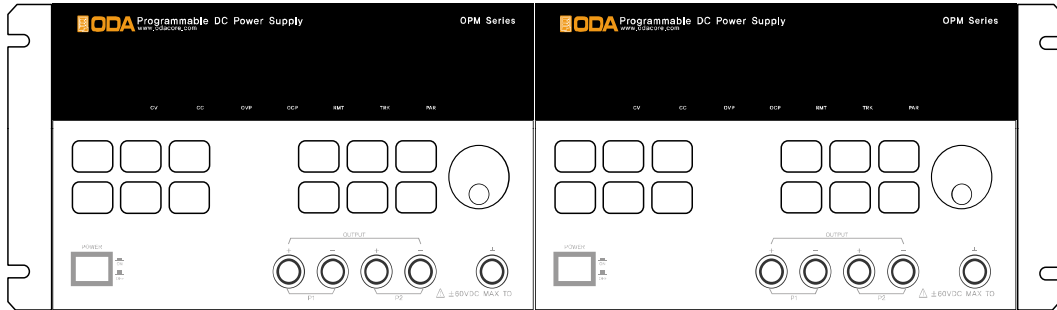
Rack Mounting

- It is designed to be used in 3U * 19inch, please expand bumper as below diagram and equip on the product.



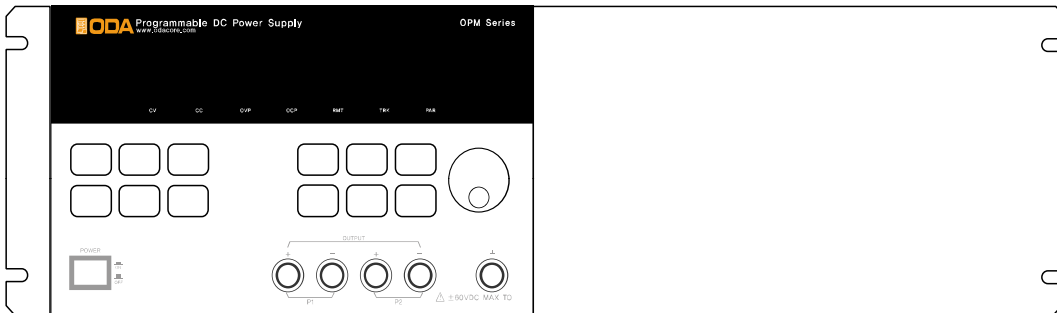
<Diagram 1-5>

- It fast and convenient when user use Power Supply in Rack independently, with support OM-3U19(Option).



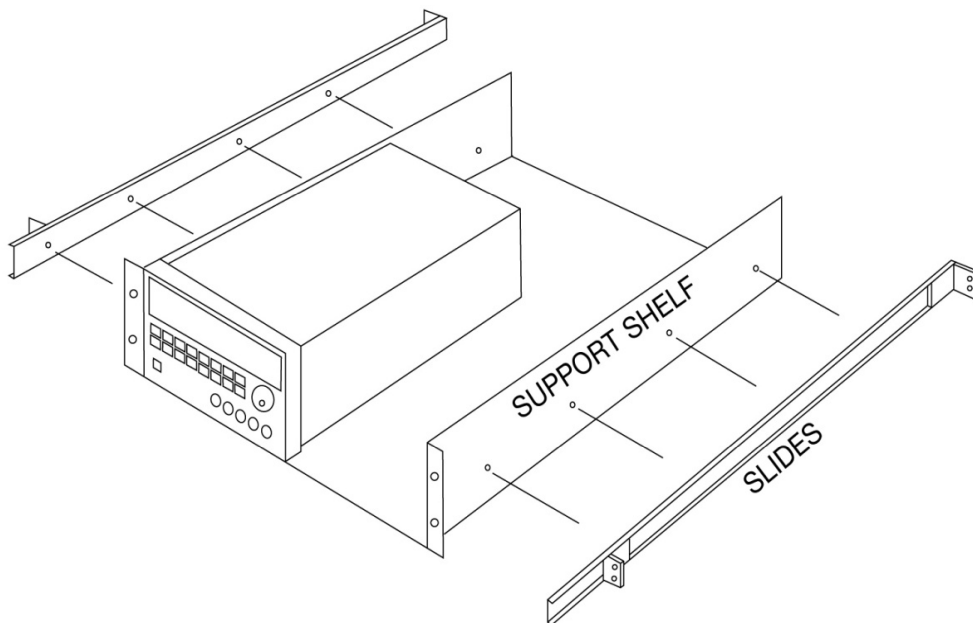
<Diagram 1-6>

- It is fast and convenient when user use power supply in Rack Dual with support OM3U19FD(Option).



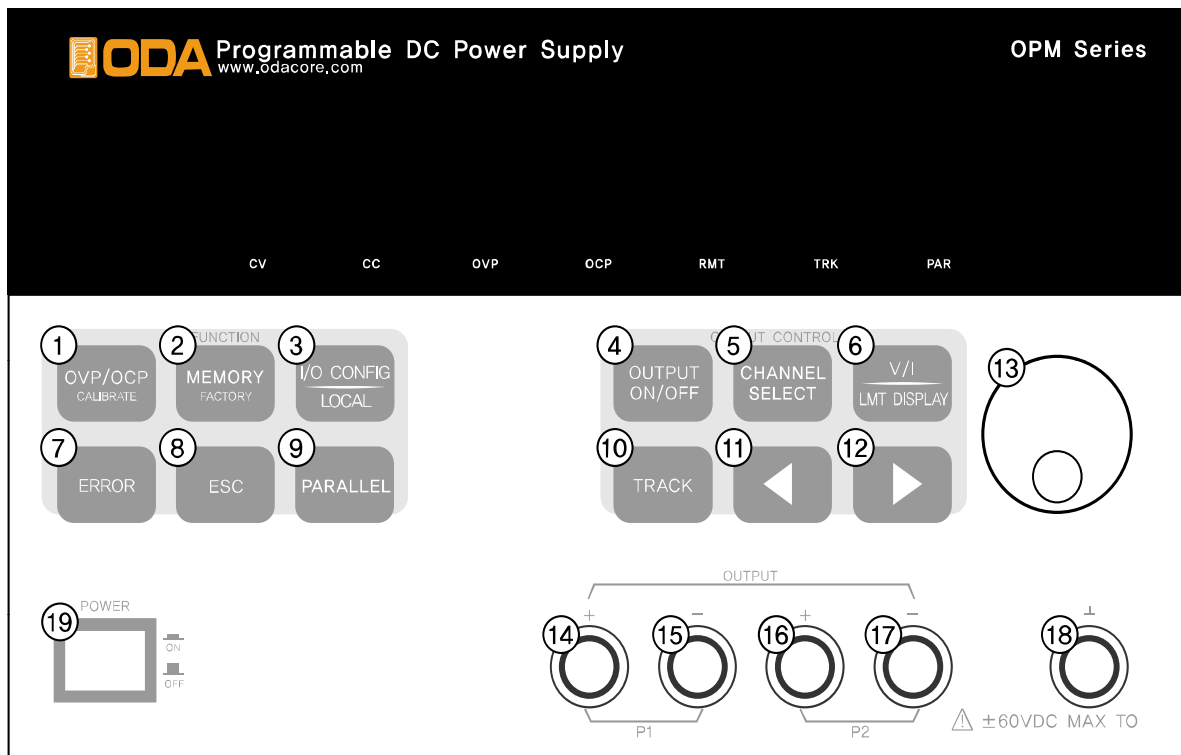
<Diagram 1-7>

- If user order OM-3U19-SS(Option), will able to use power supply easier.



<Diagram 1-8>

2. Front Panel, Rear Panel Structure & Function



1	OVP/OCP Setting or Calibration Key	11	Voltage/Current Cursor or Menu Key
2	Memory Setting or Factory Setting Key	12	Voltage/Current Cursor or Menu Key
3	I/O CONFIG or LOCAL Key	13	Voltage/Current Value Encoder Switch
4	Output voltage & current ON/OFF	14	P1 + Output Voltage Measure Terminal
5	Channel Select Key	15	P1 - Output Voltage Measure Terminal
6	Voltage/Current selection or Limit Display Key	16	P2 + Output Voltage Measure Terminal
7	Error Message Display Key	17	P2 - Output Voltage Measure Terminal
8	Menu Escape Key	18	Earth GND Terminal
9	Parallel Output Key	19	Main Power ON/OFF Switch
10	Tracking Output Key		

1. OVP/OCP Setting Key or Calibration Key

OVP/OCP Protection can be selected ON/OFF and Level value can be changed. If user turn on the power while holding this key, it will move on to calibration mode, which able to activate caalibration setting.

2. Memory Setting or Factory Setting Key

It restores present voltage, current, OVP, OCP setting condition & Level value, Also the OUTPUT ON/OFF condition. (*Track Mode & Parallel Mode will not be restored.*) If user input power while holding this key, it will move on to Factory Mode, and able to use 11 factory mode functions.

3. I/O CONFIG or LOCAL Key

It is Remote Interface setting key, able to select RS232C or GPIB and change Baud-rate and GPIB Address. If it is Remote Interface condition, it will be operated by LOCAL Key.

4. Output Voltage & Current ON/OFF

Print or Shut-off output voltage / current from output terminal.

5. Channel Select Key

This key selects P1 and P2 control. By pressing once, the control moves from P1 to P2. If user add power module additionally, it will automatically control the number of channels in OPM Series.

6. Voltage/Current Select or Limit Display Key

This key selects voltage or current in Limit Display condition. In Readback Voltage or Current Display condition, it is Limit Display Key.

7. Error Message Display Key

This key checks error messages of hardware or system error, communication error from self-testing.

8. Menu Escape Key

This key can be used to enter Menu cancel or if user wants previous condition.

9. Parallel Output Key

This key allows all channels to be parallel for current, and P1 channel will be master channel.

10. Tracking Output Key

This key allows all the output to be tracked.

11. Voltage/Current Cursor or Menu change Key

If limit setting of voltage/current is changed, the cursor key will be operate to the Left. In Menu condition, this key can be used to change the menu.

12. Voltage/Current Cursor or Menu change Key

If limit setting of voltage/current is changed, the cursor key will be operate to the Left.
In Menu condition, this key can be used to change the menu.

13. Voltage/Current Numerical change encoder switch

Switch which changes voltage / current numerical.

14. P1 + Output Voltage Measuring Terminal

P1 + Output terminal able to measure power from +.

P1 – Output terminal is a pair.

The terminal which supplies to the load is located at the rear side.

15. P1 – Output Voltage Measuring Terminal

P1 – Output terminal able to measure power from –.

P1 + Output terminal is a pair.

The terminal which supplies to the load is located at the rear side.

16. P2 + Output Voltage Measuring Terminal

P2 + Output terminal able to measure power from +.

P2 – Output terminal is a pair.

The terminal which supplies to the load is located at the rear side.

17. P2 – Output Voltage Measuring Terminal

P2 – Output terminal able to measure power from –.

P2 + Output terminal is a pair.

The terminal which supplies to the load is located at the rear side.

18. Earth GND Terminal

It is connected with product chassis, also with ground which supplied from AC Power.

19. Main Power ON/OFF Switch

Mechanical switch which input, shut-off AC Main Power.

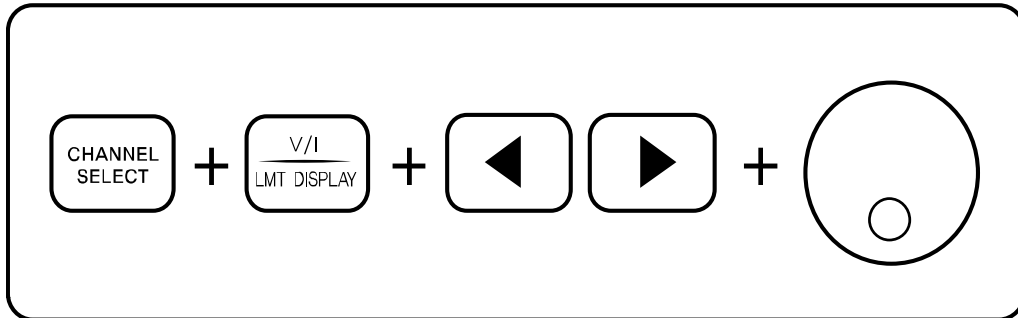
WARNING







Do not connect load with output measuring terminal on the front panel.
The actual Output terminal is on the rear side.

If there is a electric on front panel, it can be damaged seriously.


2-1. Front-Panel Voltage Current Setting

Read below description to change Limit Setting Value of Voltage and Current.




1. After power ON, check "P1-OUTPUT OFF" is displayed on VFD.
2. To select output channel, press  Key to move on to the channel.
3. Press V/I & LMT DISPLAY  Key to move on to Limit Mode.
4. Press  Key to select Voltage and Current.
5. To increase or decrease the value, press   to move digit location.
6. To increase the Limit value, rotate encoder switch clockwise. To decrease, rotate encoder switch anti-clockwise.
7. Check whether the value is changed on VFD Display.
8. To print setting voltage & current, press OUTPUT ON/OFF .

Note1

If an error occurred while 『Self-test』, press  button to check.
Read "7. Error Messages" for more information about Error Code.

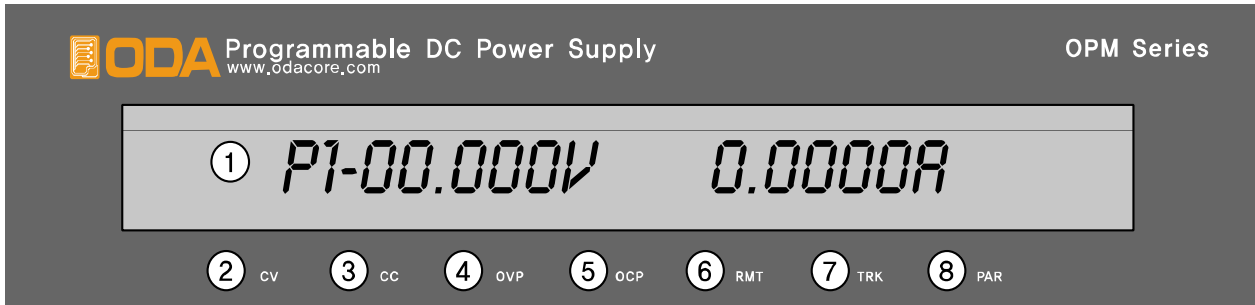
Note2

If user press V/I & LMT DISPLAY KEY, "P1-OUTPUT OFF" message will be disappeared, and moves on to limit display condition. If there is no command until 5seconds, it will return to  "P1-OUTPUT OFF".

Note3

If it is Remote Interface condition, Front Panel Keys and encoder switch will not work.
After quitting Remote Interface, press  key to return to Local condition.

2-2. Display & Condition Indicating LAMP

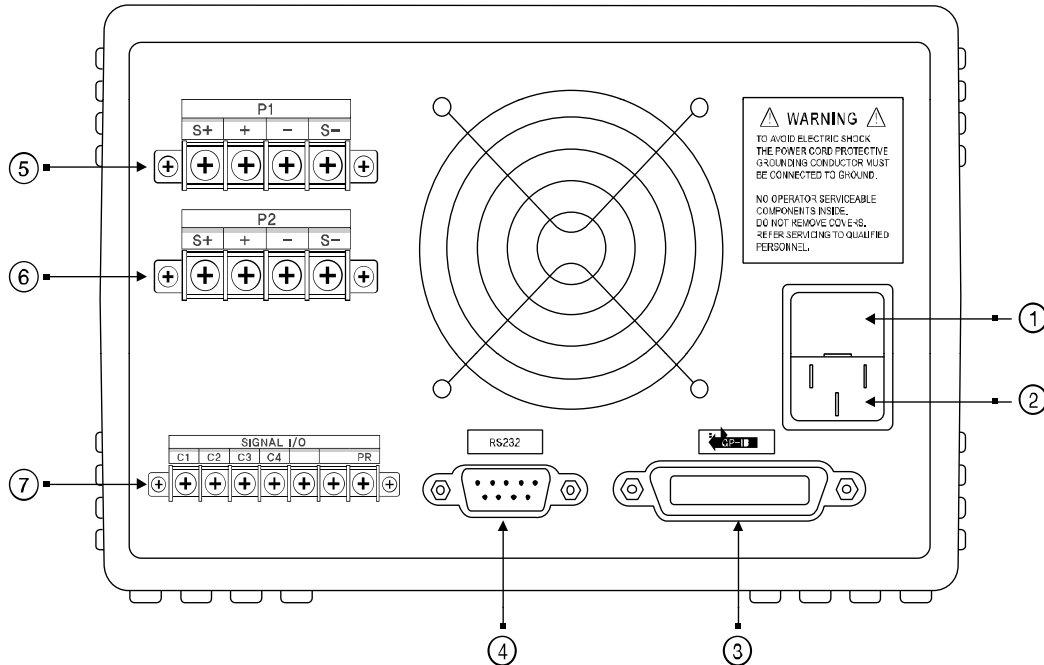


1	VFD	Voltage/Current & Message Display Module
2	CV	If selected output port is Constant Voltage Mode, will be lighted.
3	CC	If selected output port is Constant Current Mode, will be lighted.
4	OVP	If selected output port is OVP setting, will be lighted.
5	OCP	If selected output port is OCP setting, will be lighted.
6	RMT	It will be lighted in Remote Interface condition, and by pressing I/O Config/Local Key, It will move on to Local Mode.
7	TRK	It will be lighted when output channels are Tracking Mode.
8	PAR	It will be lighted when output channels are Parallel Mode.

Note

When the power is ON, every lamp will be lighted for 300ms.

2-3. Rear Panel Structure



1	Fuse Holder	Power-line Module
2	AC Inlet	
3	GPIB (IEEE-488) Interface Connector	
4	RS-232C Interface Connector	
5	P1 Output Terminal & Sensing Input Terminal	
6	P2 Output Terminal & Sensing Input Terminal	
7	Signal Input/Output Terminal	

1. Fuse Holder

Time Fuse is equipped, which protects the product.

If you would want to change the Fuse, read 『1-5. Check Before Input Power』 .


2. AC inlet

Products standard input power is AC220 / 60Hz.

If user changed this input power by option, input the correct power.

3. GPIB (IEEE-488) Interface Connector

GPIB Interface connector.(Parallel communication method)

Press  key on Front Panel to set-up PC Interface.

(Read 『3-6. I/O Config & LOCAL』 for more information)

4. RS-232C Interface Connector

1:1 series communication method. RS-232C Interface Connector.

Press  Key on Front Panel to set-up PC Interface.

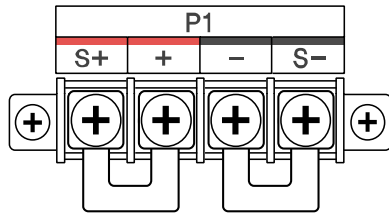
(Read 『3-6. I/O Config & LOCAL』 for more information)

5. P1 Output Terminal & Sensing Input Terminal

It is Channel P1 Output Terminal and Sensing Input Terminal.

Output +, - Terminal is a connector which supplies power to actual load,

S+, S- Terminal is to sense supplying voltage.

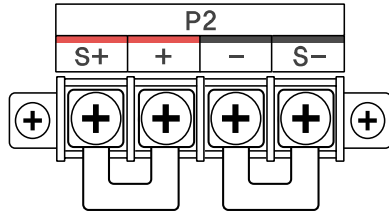


6. P2 Output Terminal & Sensing Input Terminal

It is Channel p2 Output Terminal and Sensing Input Terminal.

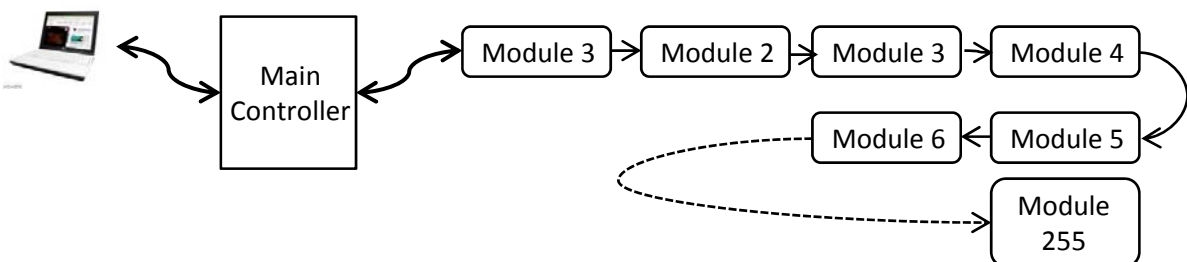
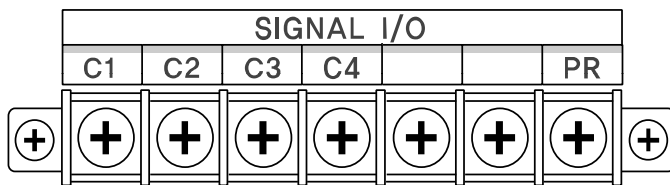
Output +, - Terminal is a connector which supplies power to actual load,

S+, S- Terminal is to sense supplying voltage.



7. Signal Input/Output Terminal

OPM-Series has Terminal which connects Power Module and Terminal which enables to contro Power Module with current parallel. It can be connected maximum 253 Module.









2-4. Output Check

It is safe to check voltage & current output condition before connecting load.
Below are method to check the voltage & current output condition.












Voltage Output Check

■ Check the sequence below.


1. Input Power ON
2. When self-testing is done, wait for "P1 – OUTPUT OFF" is displayed.
3. To measure voltage, connect DVM on output terminal.
4. Press  Key to print voltage from the output terminal.
5. Press  Key to move cursor location to voltage.
6. Press   Key to change cursor location in voltage digit.
7. To increase or decrease, rotate encoder switch clockwise or anti-clockwise .
8. Compare voltage value on VFD and DVM.
9. Press  Key and select P2 and repeat 3~8 sequence to check Channel 2.

Current Output Check

■ Check the sequence below.

1. Input Power ON
2. When self-testing is done, wait for "P1 – OUTPUT OFF" is displayed.
3. Press  Key to print voltage from the output terminal.
4. Press  Key to move cursor location to voltage.
5. Press   Key to change cursor location in voltage digit.
6. Set-up 5V by using encoder switch .
7. Press  Key to move cursor location to current.
8. Press   Key to change cursor location in current digit.
9. Press  Key to change condition to "P1 – OUTPUT OFF".
10. To measure current, connect appropriate DAM to output terminal.
11. Press  Key to print current from output terminal.
12. Compare current value on VFD and DAM.
13. Press  Key and select P2 and repeat 3~12 sequence to check channel 2.

3. Operating Front-Panel

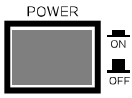

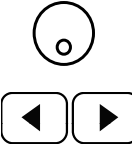

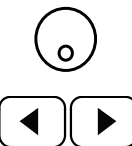

To escape from any functions or in any condition, press  Key.
Menu select & check key provides simple and convenience to users.

Overview

1. **Constant Voltage (CV)**
Explanation of Constant Voltage Output Mode.
2. **Constant Current (CC)**
Explanation of Constant Current Output Mode.
3. **Remote Voltage Sensing**
Explanation of Load Voltage Sensing.
4. **OPM-Series Power Module Connection**
Explanation of Load Voltage Sensing.
5. **Programming OVP OCP / CALIBRATE**
Explanation of Over Voltage Protection.
6. **MEMORY(STORE/RECALL) / FACTORY**
Explanation of Over Current Protection.
7. **I/O Config & LOCAL**
Explanation of Remote Interface Setting & Local Mode Switching.
8. **OUTPUT ON/OFF**
Explanation of Printing or Shutting-off output voltage.
9. **CHANNEL SELECT**
Explanation of output channel panelling and selecting.
10. **V/I & LMT DISPLAY**
Explanation of selecting voltage/current and Limit Display.
11. **ERROR**
Explanation of Front Panel Key Lock and Unlock.
12. **PARALLEL MODE**
Explanation of current parallel control.
13. **TRACKING MODE**
Explanation of tracking voltage and current in each channel.

3-1. Constant Voltage Operating (CV)

Operating sequence about P1 output port are below.

	<ul style="list-style-type: none"> Power Switch ON After input power ON, check whether "P1 – OUTPUT OFF" is displayed. Connect load with output terminal.
	<ul style="list-style-type: none"> To set-up the limit, press LMT DISPLAY Key.
	<ul style="list-style-type: none"> At first it is selected on the voltage, use cursor key and encoder switch to change voltage value.
	<ul style="list-style-type: none"> Press V/I Key once more to move cursor to current.
	<ul style="list-style-type: none"> Use cursor and encoder switch to set-up current value.
	<ul style="list-style-type: none"> When all the set-up is done, press OUTPUT ON/OFF Key to allow output. Then, it will automatically move on to ReadBack Display condition.
	<ul style="list-style-type: none"> Check CV lamp is lighted, CC lamp is off. If it is on and off opposite, please check whether there is enough current flowing, and raise current limit value.

» Related Remote Interface Command

```

INSTrument:[SElect] {OUT1|OUT2} .. |OUT255}
[SOURce:]VOLTag{<voltage>|UP|DOWN}
[SOURce:]CURRent{<current>|UP|DOWN}
OUTPut[:STATe] {OFF|ON|0|1}

```

```

Refer: OUTPUT OFF  Output OFF
       INST OUT1   Channel P1 Select
       VOLT 10     P1 Voltage 10V Setting
       CURR 5      P1 Current 5A Setting
       OUTPUT ON   Voltage & Current Output ON



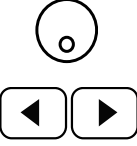

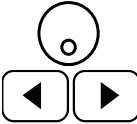

```

Note

1. Use cursor key to select voltage/current increasing, decreasing scale.
2. What is ReadBack Display? It is condition which displays voltage and current printing.

3-2. Constant Current Operating(CC)

It is CC output mode, and sequence are below :

	<ul style="list-style-type: none"> ■ Power Switch ON ■ After Power ON, Check whether "P1 – OUTPUT OFF" is displayed. ■ Connect load with rear output terminal.
	<ul style="list-style-type: none"> ■ To set-up the limit, press LMT DISPLAY Key.
	<ul style="list-style-type: none"> ■ At first it is selected on the voltage, use cursor key and encoder switch to change voltage value.
	<ul style="list-style-type: none"> ■ Press V/I Key once more to move cursor to current.
	<ul style="list-style-type: none"> ■ Use Cursor Key and Encoder Switch to set-up the current.
	<ul style="list-style-type: none"> ■ When all the set-up is done, press OUTPUT ON/OFF Key to allow to print. It will automatically turn into ReadBack Display condition.
	<ul style="list-style-type: none"> ■ Check CC Lamp is ON, CV Lamp is OFF. ■ If it is ON and OFF opposite, check whether suppling voltage is enough, and raise the voltage limit value.

» Related Remote Interface Command

```

INSTrument:[SElect] {OUT1|OUT2| .. |OUT255}
[SOURce:]VOLTage{<voltage>|UP|DOWN}
[SOURce:]CURRent{<current>|UP|DOWN}
OUTPut[:STATe] {OFF|ON|0|1}

```

Application:

<i>OUTPUT OFF</i>	<i>Output shut-off</i>
<i>INST OUT1</i>	<i>Channel P1 selected</i>
<i>VOLT 10</i>	<i>P1 Voltage 10V Setting</i>
<i>CURR 5</i>	<i>P1 Current 5A Setting</i>
<i>OUTPUT ON</i>	<i>Allow Voltage & Current Output</i>

3-3. Remote Voltage Sensing

Voltage Regulation will be caused when a load is connected with output terminal of power supply. Therefore, for accurate voltage, Remote Voltage Sensing (V-Sensing) could be used.

To use V-Sensing, please check below :

CV Regulation

About the factors of Specification Voltage Load Regulation, please check below.

While V-Sensing, users must add 5mV about +S point and + output terminal.

Load current change. Because sensing lead line is part of power supply feedback.

User will be able to maintain output value when sensing lead line resistance is 0.5Ω or less.

Output Rating

About specification's voltage and current output rating, please check below :

When using V-Sensing, sum of dropped voltage and actual supplied voltage will be total output value from power supply.

Therefore, if maximum voltage is higher than the limit, V-Sensing function will not be guaranteed, and the power supply will turn into UnRegulated condition. Also, when a load current is over the limit, it will automatically turn into UnRegulated condition.

Note

UnRegulated condition? It is a condition caused when supplied voltage & current is more than the limit.

Output Noise

Noise caused from power supply output may bring serious damage in voltage load regulation. Therefore, please check the below method.

Check diagram <3-1>.

- Twist sensing lead line to reduce noise from external.
- Connect sensing lead line straight with load lead line.
- Cover sensing lead line when it is exposed to noise.
- Connect GND with noise covering device in the shortest way.
- Connect load lead line & sensing lead line to power supply in the shortest way.

Stability

When using V-sensing with long load lead line and high-capacity load, may cause problem because it is a part of voltage feedback loop as a filter.

This may reduce power supply stability and supplying voltage & current will be unstable. This unstable loop can be another feedback which cause another problem in power supply. To protect this problem, please follow below sequence.

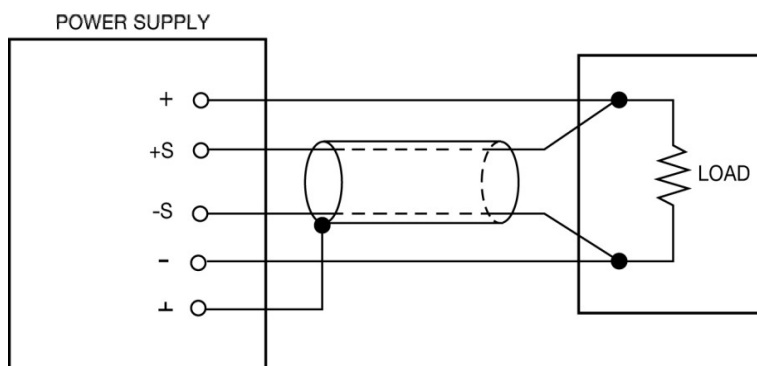
- Connect load lead line and sensing lead line in the shortest way.
- Twist load lead line.
- Connect sensing lead line safely.
It is part of power supply programming feedback loop, may cause problems while activating.
- DO NOT connect load lead line with sensing terminal.

Remote Voltage Sensing Connection & Usage

Connect V-Sensing from output terminal to load, and sensing terminal to load watching '+' and '-', If user connected load with sensing terminal, it may fall into UnRegulated condition. Displaying voltage and current is different with actual output voltage and current.

Note

Please remove metal short-bar from sensing terminal for V-Sensing Connection. When V-Sensing is not used, equip metal short-bar with sensing terminal.



*V-Sensing Connection
< Diagram 3-1 >

3-4. Connecting OPM-Series Power Module

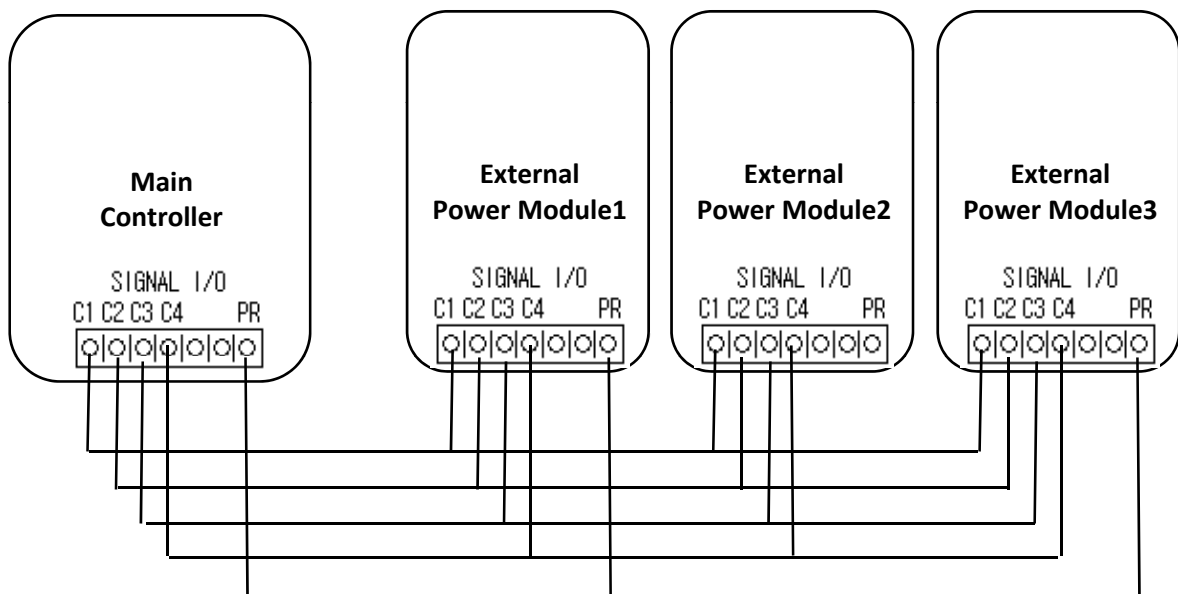
OPM-Series is dual output standard. (Main Controller included & Individual Analog Power Module). Analog Power Module cannot be used individually, needs main controller. Main controller can add Analog Power Module up to 255, in 250KW. These characteristics does not need controller repetitive, and reduces time & cost by connection only one connector.

Feature

- High-Quality power module additional equipping function
- Minimum 30W to Maximum 250KW available.
- Only 4 wires are connected parallel, which makes connection simple.
- Support individual Power Module Full-Function.
- Control 255 Channels using one interface(RS232C, RS485, GPIB).
- Support setting functions to control 255 Channels at once.
- Reduce cost & time while system composition.
- Support parallel mode about added power module.

Signal & Parallel Function Connection

To add Analog Power Module, connect as below :















* Power Module Connection
< Diagram 3-2 >

3-5. Programming OVP OCP / CALIBRATE

Function which shut-off output voltage & current when it is higher than set-up value to protect the power supply. It is method to set-up OVP Level below.

Value below can be different.

Please check "4. CALIBRATION" for more information about Calibrating function.

	<p>■ Power Switch ON Check whether "p1 - OUTPUT OFF" is displayed.</p>
	<p>■ Press OVP Key to select OVP Menu. VFD Display Description PROTECTION</p>
	<p>■ To set-up level and setting, press OVP Key once more. VFD Display Description OVP ON</p>
	<p>■ Press OVP Button once more in "OVP ON" Condition. VFD Display Description OVP-LEVEL 32.0V</p>
	<p>■ Use cursor key to select wanted digit.</p>
	<p>■ Rotate encoder switch to change Level value.</p>
	<p>■ Press OVP Key when setting is done. VFD Display Description CHANGED Check whether OVP Lamp is lighted. After displaying above message, it will turn to previous page.</p>
	<p>■ To cancel, press ESC Key. There will be no message for canceling, it will return to previous page.</p>
	<p>■ To clear OVP, press OVP Key to "OVP ON" Condition. VFD Display Description OVP ON</p>
	<p>■ Press Left or Right cursor key in "OVP ON" condition. VFD Display Description OVP OFF</p>
	<p>■ To apply changed setting, press OVP key in "OVP OFF" condition. VFD Display Description CHANGED Check whether OVP Lamp is OFF. After displaying above message, it will return to previous page.</p>
	<p>■ To cancel, press ESC Key. There will be no message for canceling, it will turn to previous page.</p>

» Related Remote Interface Command

*INST*ument:[SElect] {OUT1|OUT2| .. |OUT255}

[SOURce:]VOLTage:PROTection{<voltage>}

[SOURce:]VOLTage:PROTection:STATe {0|1|OFF|ON}

Refer: *INST* OUT1 P1 Controller condition
VOLT:PROT 20 OVP Level set-up for P1
VOLT:PROT:STAT ON or, OVP ON for P1
VOLT:PROT:STAT OFF OVP OFF for P1

Note

Read reference "1-6. Check after Power ON" "Default Setting Value" for earliest OVP setting

When actual output is higher than OVP Level value, "OVP TRIPPED" message will be displayed. It will shut-off all the power.

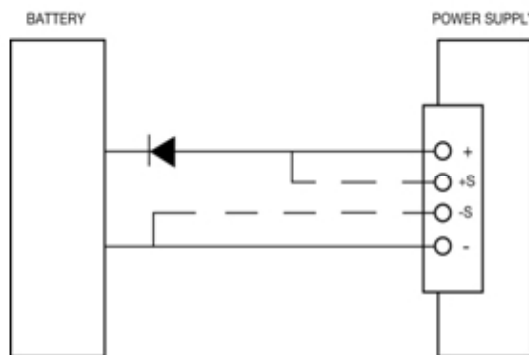
If the power supply is in Tracking Mode or Parallel condition, please check whether voltage is supplying to the channel safely. To print voltage and current, remove load and clear the trip using method below. The cause of trips are :

First Mistaken OVL Level setting value may cause tripping. Therefore, raise Level value to solve.

Second Load which makes counter-electro motive force such as coils and motors may cause the trip. Insert UF-diode in right capacity to prevent this problem.

Third When source one is used as load. When battery is run out, it may cause Trip.









Insert Diode as below diagram to prevent from tripping.



< Diagram 3-2 >

Note

For example, when OVP trip occurs in P2 while users are controlling channel P1, it will maintain controlling P2. In PC Interface condition, trip commands can care, control all the channels.

OVP TRIPPED	<p>■ If OVP Trip occurs, "OVP TRIPPED" Message will be displayed.</p>
	<p>■ To clear OVP Trip, raise OVP Level first. Press OVP Key twice to set-up OVP Level in OCP Menu. VFD Display Description PROTECTION</p>
	<p>■ Press OVP Key once more in "OVP ON" condition. VFD Display Description OVP-LEVEL 10.0V</p>
	<p>■ Use cursor key to select wanted digit.</p>
	<p>■ Rotate encoder switch to change Level value.</p>
	<p>■ Press OVP Key when setting is done. VFD Display Description CHANGED After displaying above message, it will return to previous page.</p>
	<p>■ Another method to clear OVP Trip. To clear, press OVP Key twice to move on to OVP Menu. VFD Display Description PROTECTION</p>
	<p>■ Press Left or Right key in "OVP ON" condition. VFD Display Description OVP OFF</p>
	<p>■ To apply changed setting, press OVP Key in "OVP OFF" condition. VFD Display Description CHANGED After displaying above message, it will return to previous page.</p>

» Related Remote Interface Command

```

INSTrument:[SElect] {OUT1|OUT2| .. |OUT255}
[SOURce:]VOLTage:PROTection{<voltage>}
[SOURce:]VOLTage:PROTection:STATe {0|1|OFF|ON}
[SOURce:]VOLTage:PROTection:TRIPped?
[SOURce:]VOLTage:PROTection:CLEAr

```

Refer: Method to raise Level value when Trip occurred.

```

INST OUT1           P1 Controller Setting
VOLT:PROT:TRIP? Return value "1" Check P1 OVP trip
VOLT:PROT 32       Set-up P1 OVP Level
VOLT:PROT:CLE      Clear P1 OVP Trip

```













Method to clear OVP Trip

```

INST OUT1           P1 Controller Setting
VOLT:PROT:TRIP? Return value "1" Check P1 OVP Trip
VOLT:PROT:STAT OFF Clear P1 OVP
VOLT:PROT:CLE      OVP Trip Clear

```

Below is description about OVP Level setting & ON/OFF Setting.
 OCP is one of protection with OVP, it shut-off over flowing current.
Below OCP Level value can be different.

	<p>■ Power Switch ON Check "P1 – OUTPUT OFF" is displayed after power ON.</p>
	<p>■ To select OCP Menu, press OCP Key and press cursor key once. VFD Display Description PROTECTION</p>
	<p>■ Press OCP Key to set-up OCP Level. VFD Display Description OCP ON</p>
	<p>■ Press OCP Key once more in "OCP ON" condition. VFD Display Description OCP-LEVEL 3.20A</p>
	<p>■ Use cursor key to select wanted digit.</p>
	<p>■ Rotate encoder switch to change Level value.</p>
	<p>■ When setting is done, press OCP Key. VFD Display Description CHANGED Check OCP Lamp is lighted. After displaying above message, it will return to previous page.</p>
	<p>■ To cancel, press ESC Key. There will be no canceling message, it will return to previous page.</p>
	<p>■ To clear OCP, press OCP Key to move on to "OCP ON" condition. VFD Display Description OCP ON</p>
	<p>■ Press left or right cursor key in "OCP ON" condition. VFD Display Description OCP OFF</p>
	<p>■ To save changed setting, press OCP Key in "OCP OFF" condition. VFD Display Description CHANGED Check OCP lamp is OFF. After displaying above message, it will return to previous condition.</p>
	<p>■ To cancel, press ESC Key. There will be no message for canceling, it will return to previous condition.</p>

>> Related Remote Interface Command
INSTrument:[SElect] {OUT1|OUT2| .. |OUT255}
[SOURce:]CURRent:PROTection{<current>}
[SOURce:]CURRent:PROTection:STATe {0|1|OFF|ON}
 Refer: *CURR:PROT 6* *OCP Level Setting*
 CURR:PROT:STAT ON or, *OCP ON*
 CURR:PROT:STAT OFF *OCP Cleared*

Note


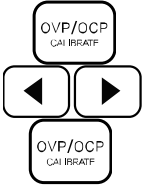




About the default OCP Setting, read reference "1-6. Check after Power ON" "Default Setting Value".




When actual output current is higher than OCP Level value, "OCP TRIPPED" will be displayed. It is condition which shut-off all the source from relevant channel. If it is in Tracking Mode or Parallel condition, please check. To print voltage and current again, remove load first and clear trip please follow below sequence. The cause of trips are :

First Mistaken OCP Level setting value may cause tripping. Therefore, raise Level value

Second Load which makes counter-electro motive force such as coils and motors may

Third When source one is used as load. When battery is run out, it may cause Trip.

	<p>■ When OCP trip occurs, "OCP TRIPPED" message will be displayed on VFD.</p>
	<p>■ To clear OCP Trip, raise OCP Level first. To set-up OCP level, Press OCP ->Cursor Key -> OCP Key. VFD Display Description OCP ON</p>
	<p>■ Press OCP Key once more in "OCP ON" condition. VFD Display Description OCP-LEVEL 3.20A</p>
	<p>■ Use cursor key to select wanted digit.</p>
	<p>■ Use encoder switch to raise the Level value.</p>
	<p>■ When setting is done, press OCP Key. VFD Display Description CHANGED After displaying above message, it will return to previous page.</p>

	<p>■ Second method to clear OCP Trip. To clear OCP, press OCP Key → Cursor Key → OCP Key. VFD Display Description OCP ON</p>
	<p>■ Press Left or Right cursor in "OCP ON" condition. VFD Display Description OCP OFF</p>
	<p>■ To save changed setting, press OCP Key in "OCP OFF" condition. VFD Display Description CHANGED After displaying above message, it will return to previous page.</p>

» Related Remote Interface Command

```

INSTrument:[SElect] {OUT1|OUT2} .. |OUT255}
[SOURce:]CURRent:PROTection{<current>}
[SOURce:]CURRent:PROTection:STATe {0|1|OFF|ON}
[SOURce:]CURRent:PROTection:TRIPped?
[SOURce:]CURRent:PROTection:CLEAr
  
```

Refer: Method to raise Level value when trip occurred.

```

INST OUT1                P1 Controller Setting
CURR:PROT:TRIP? Return Value "1"  Check P1 OCP Trip
CURR:PROT 10            P1 OCP Level Setting
CURR:PROT:CLE           P1 OCP Trip Clear
  
```

Method to clear OCP Trip

```

INST OUT1                P1 Controller Setting
CURR:PROT:TRIP? Return Value "1"  Check P1 OCP Trip
CURR:PROT:STAT OFF      Clear P1 OCP
CURR:PROT:CLE           Clear P1 OCP Trip
  
```

Note

When OCP Trips while using Tracking Mode, tracking mode will be disabled, and channel will be automatically selected.

3-6. MEMORY(STORE/RECALL) / FACTORY

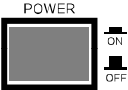






Function which saves power supply current condition in 『User Memory』. 『User Memory』 is divided into 10 part, and stores & recall voltage, current, OVP, OCP Level & setting value. Also, There is Factory Mode which enables to change setting of power supply.

Parallel & Tracking cannot be stored and recalled.

Read "5. FACTORY" for more information about factory function.

STORE Setting

It is sequence to save in 『User Memory』 below :

	<p>■ Power Switch ON After Power ON, check whether "P1 - OUTPUT OFF" is displayed</p>
	<p>■ To save power supply condition, press MEMORY KEY. VFD Display Description memory - recall</p>
 	<p>■ The first menu will be Recall menu. Therefore, press cursor key once to select STORE. Press MEMORY Key once more. VFD Display Description STORE (01)</p>
 OR 	<p>■ Use encoder switch to select slot 01 ~ 10. For example, to save in 02 slot, rotate encoder switch and select (02) VFD Display Description STORE (02)</p>
	<p>■ To save, press MEMORY Key once. VFD Display Description DONE</p>
	<p>■ After "DONE" message is displayed, it will return to previous condition.</p>

» Related Remote Interface Command

*SAV {1/2/3/4/5/6/7/8/10}




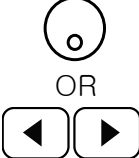

Refer: *SAV 4 Saves in 04 slot of 『User Memory』

Note

To reset 『User Memory』, check "5-4. USER-MEM CLEAR".

RECALL Set-up

It is sequence applying by calling 『User Memory』 Data.

	<p>■ Power Switch ON After Power ON, check whether "P1 - OUTPUT OFF" is displayed.</p>
	<p>■ To apply saved description, press MEMORY Key. VFD Display Description memory - recall</p>
	<p>■ To activate RECALL, press MEMORY Key once more. VFD Display Description RECALL (01)</p>
	<p>■ Select 01 ~ 10 using encoder switch. For example, select 02 slot to save in 02 using encoder switch. VFD Display Description RECALL (02)</p>
	<p>■ To apply saved description, press MEMORY Key once more. VFD Display Description DONE</p>
	<p>■ When "DONE" message is displayed, it will return to previous page.</p>

» Related Remote Interface Command

*RCL {1/2/3/4/5/6/7/8/10}

Refer: *RCL 4 Apply in 4th slot of 『User Memory』

3-7. I/O Config & LOCAL

I/O Config key enables remote interface, and set-up RS232C & GPIB.

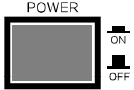





Before using PC Interface, product must be set-up first. When it is released with GPIB option, GPIB is selected and the address is 05. If it is RS232C standard, RS232C is selected and Baud Rate is 19200bps. GPIB & RS232C setting must be done only in Front Panel.

- Set-up description from I/O Config will be saved in fixed memory. It will not change even the power is On/Off.
- When Remote Interface is done, RMT Lamp will be lighted and front panel keys will not operate.
- End Remote Interface to control only from the front panel.

Press  Key.

RS232C Setting

RS232C Setting sequence below :

	<ul style="list-style-type: none"> ■ Power Switch ON Check whether "P1 - OUTPUT OFF" is displayed after Power ON.
	<ul style="list-style-type: none"> ■ To set-up RS232C, press I/O CONFIG Key. VFD Display Description <input type="text" value="I/O - RS232C"/> or <input type="text" value="I/O - GPIB"/>
 	<ul style="list-style-type: none"> ■ It will display RS232C or GPIB following previous communication setting. If "I/O - GPIB" is displayed, press cursor key to display "I/O - RS232C". VFD Display Description <input type="text" value="I/O - GPIB"/> and press cursor key to change display to <input type="text" value="I/O - RS232C"/> When "I/O - RS232C" is displayed, press I/O CONFIG Key. VFD Display Description <input type="text" value="BAUD-RATE 4800"/> this could be different
	<ul style="list-style-type: none"> ■ Baud Rate has 2400bps, 4800bps, 9600bps, 19200bps, and must be same as PC Interface Baud Rate. For example, to select 9600bps, press left cursor key. VFD Display Description <input type="text" value="BAUD-RATE 9600"/>
	<ul style="list-style-type: none"> ■ To complete setting, press I/O CONFIG Key. VFD Display Description <input type="text" value="CHANGE SAVED"/> Now, interface is RS232C, and Baud Rate is 9600.

Note

What is BPS? It is stand for Bit Per Second, a scale which data can be sent in a second.

RS232C Install Set-up

- RS232C is Fixed as below.

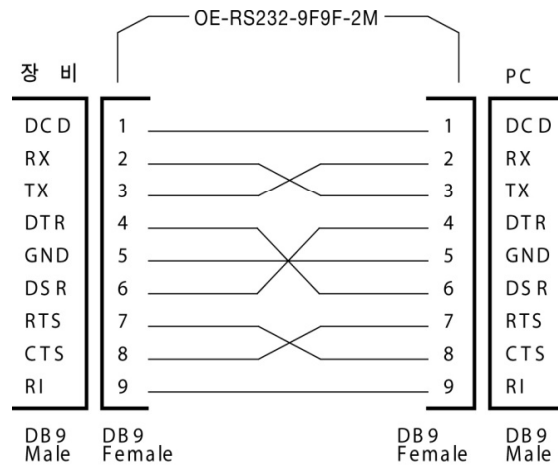
Data Bit : 8
 Stop Bit : 1
 Parity Bit : None

- RS232C Data Frame Scale



- To connect product and PC, Female type standard cross cable is required. Below is explanation if it is all Female type standard cross cable.

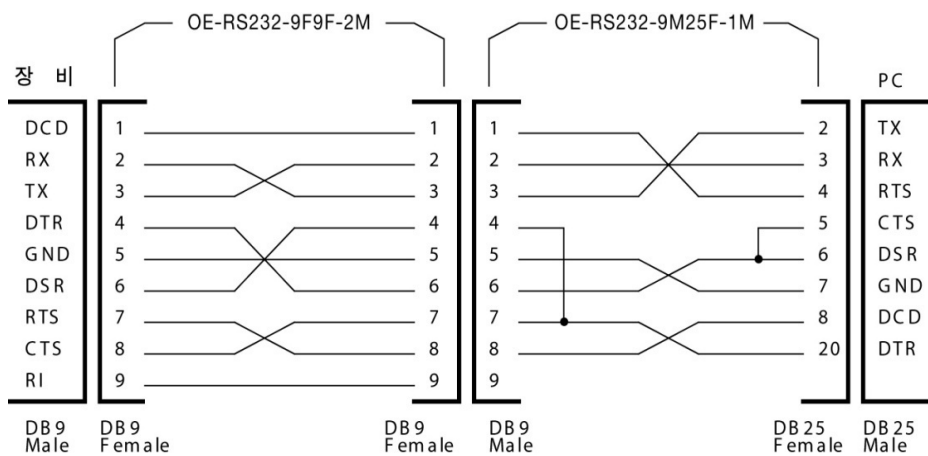
Check "1-2. Accessories & Product Option" about length of the cable.



< Diagram 3-3 >

- It is convenient when user use adaptor cable providing DB25PIN from PC.

Check "1-2. Accessories & Product Option" about length of the cable.

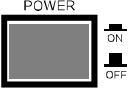








< Diagram 3-4 >

GPIB Setting

Channels can be controlled up to 15 (PC included) and speed of communication is fast which amplifies production.

GPIB Setting sequence below.

	<p>■ Power Switch ON Check whether "P1 - OUTPUT OFF" is displayed.</p>
	<p>■ To set-up GPIB, press I/O CONFIG Key. VFD Display Description I/O - RS232C or I/O - GPIB</p>
 	<p>■ It displays RS232C or GPIB as previous communication. If "I/O - RS232C" is displayed, press cursor key once to display "I/O - GPIB". VFD Display Description I/O - RS232C Press cursor key it will display I/O - GPIB If "I/O - GPIB" is firstly displayed, press I/O CONFIG Key. VFD Display Description ADR-SELECT 05 Can be different as previous condition</p>
 or 	<p>■ There are 00 to 30 address of GPIB. It must be same as PC Interface. To select address 04, press left cursor key or rotate encoder switch. VFD Display Description ADR-SELECT 04</p>
	<p>■ To save, press I/O CONFIG Key. VFD Display Description CHANGE SAVED Now GPIB is selected as Interface, and address is 04.</p>

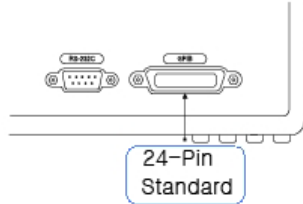
Note

RS232C port is Female type, and should be cross type.

Check "1-2. Accessories & Product Option" to check length of the cable.

GPIB Installation Set-Up

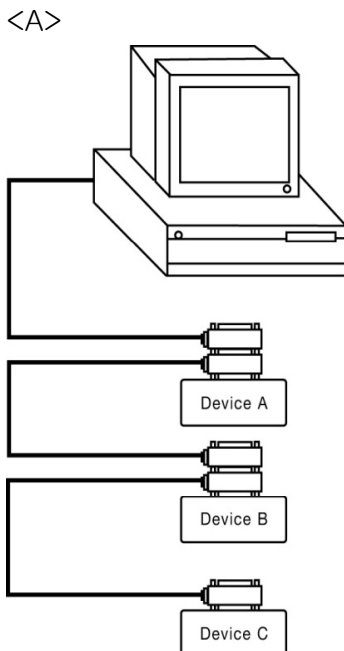
GPIB connector is 24pin standard, and located at the rear panel of power supply.
 GPIB is Optional.



< Diagram 3-5 >

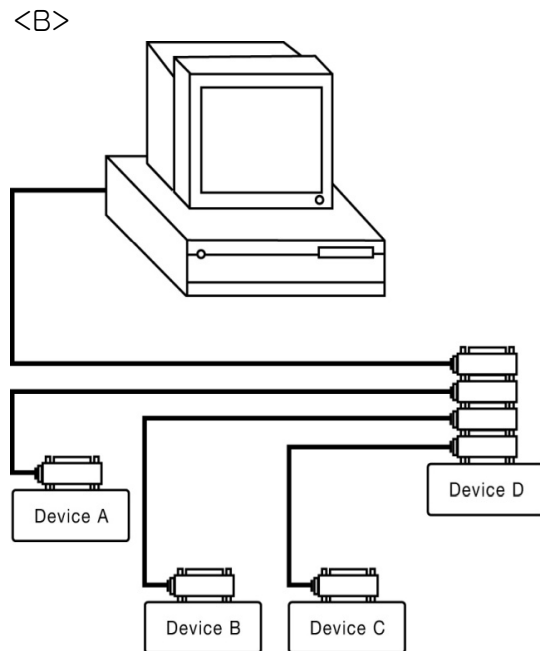
■ GPIB PC Interface Installation

To connect the equipment, cables should be protected and shorter than 2M.
 Also, total length should not be longer than 20M.
 Do not connect more than 15 devices (Including PC).
 IEEE488.2 Connector block should not be more than 3 piece.



< Diagram 3-6 >

or

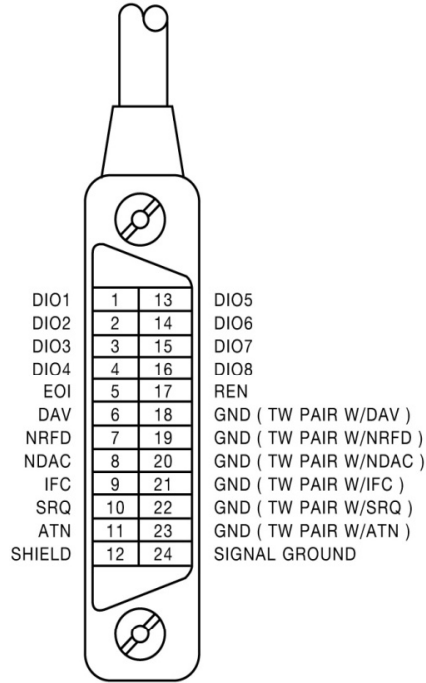


< Diagram 3-7 >

Note

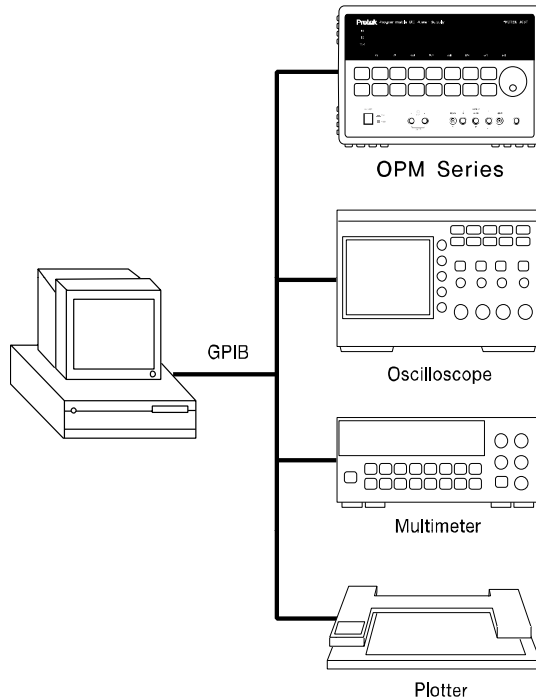
When connecting cable is longer than 4M, please check IEEE488.2 warning.

- GPIB standard 24pin shield cable
Read Accessories to check length of the cable.



< Diagram 3-8 >

- Power supply and test measuring devices can be structured as below diagram.

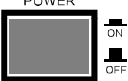




< Diagram 3-9 >

3-8. OUTPUT ON/OFF

Function which supply, or shut-off source, with voltage 0V and current 20mA. Therefore, it can shut-off supplying voltage without removing the load.

Explanation below :

	<p>■ Power Switch ON After Power ON, check whether "p1 - OUTPUT OFF" is displayed.</p>
	<p>■ To allow print voltage and current, press OUTPUT ON/OFF Key once.</p>
	<p>■ To shut-off output, press OUTPUT ON/OFF Key once more.</p>

» Related Remote Interface Command

OUTPut[:STATe] {OFF|ON|0|1}

OUTPut[:STATe]?

Refer: Check Output condition, and ON/OFF

OUTP? Return value "0" Checks output condition




OUTP ON Allows to print

3-9. SELECT CHANNEL

There are 2 Power Module in OPM-Series standard.

User can select P1/P2 alternately. If power module is added, it will relize automatically and able to control the added channel. Channel number will be displayed in the VFD.

Explanation below :

	<p>■ Power Switch ON After power ON, check whether "p1 - OUTPUT OFF" is displayed.</p>
	<p>■ To select P2 channel, press CHANNEL SELECT Key.</p>
	<p>■ To select P1 channel again, press CHANNEL SELECT Key.</p>

» Related Remote Interface Command

INSTrument:[SElect]?

INSTrument:[SElect] {OUT1|OUT2} .. |OUT255}

Refer: Select P1 or P2 channel

INST? Return Value "OUTP1" Check output condition

INST OUT2 P2 Channel selected

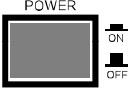



Note

Channels can be changed while Output ON or OFF, Tracking Mode, Parallel Mode, Limit Display.





3-10. V/I & LMT DISPLAY

Key which select voltage or current to set-up the limit.
Also, displaying limit value of voltage/current function is included.

V/I Function

	<ul style="list-style-type: none"> Power Switch ON After Power ON, check whether "P1 - OUTPUT OFF" is displayed.
	<ul style="list-style-type: none"> Press OUTPUT ON/OFF Key to set-up voltage current Limit.
	<ul style="list-style-type: none"> Press V/I Key once to move on to Limit Display condition, and press V/I key to change digit to current.
	<ul style="list-style-type: none"> To change digit to voltage, press V/I Key once more. Above setting should take less than 5 seconds to active V/I function.

LMT DISPLAY Function

	<ul style="list-style-type: none"> Power Switch ON After power ON, check whether "P1 - OUTPUT OFF" is displayed.
	<ul style="list-style-type: none"> To display voltage, current limit, press OUTPUT ON/OFF Key.
	<ul style="list-style-type: none"> Press LMT DISPLAY Key. set-up voltage and current will be displayed.
	<ul style="list-style-type: none"> Wait for 5 seconds to move on to ReadBack mode, and actual printing voltage and current will be displayed.
	<ul style="list-style-type: none"> Press LMT DISPLAY ket to change condition to Limit Display Mode.

Note

If there is no active commands for 5 seconds in Limit Display Mode, it will turn back to previous condition.





3-11. ERROR

Errors found while self-testing, error related to Calibration, SCPI program error will be saved in fixed memory up to 10.

Read "7. Error Messages" for more information.

- ERROR memory is stack structure, and latest error will be accessed.
- It will be saved maximum 10, from 11 the first message will be deleted.
- Press ERROR Key to check, and delete from the stack.
- There will be an alarm when an ERROR occurs.

ERROR Check

	<ul style="list-style-type: none"> ■ Power Switch ON After Power ON, check whether "P1 - OUTPUT OFF" is displayed.
	<ul style="list-style-type: none"> ■ To check ERROR, press ERROR Key. If there is no Error, display description will same as below, and return to previous condition after few seconds. VFD Display Description NO ERROR If there is an Error, error code will be displayed. VFD Display Description ERROR NO, -200
	<ul style="list-style-type: none"> ■ To check next ERROR, press ERROR Key. If there is an Error, error code will be displayed. VFD Display Description ERROR NO, -10
	<ul style="list-style-type: none"> ■ To check next error code, press ERROR Key.

» Related Remote Interface Command

SYSTem:ERRor?

Refer: Check Error

SYST:ERR? Return value :-222, "Out of data"

Check Error code and description

Note

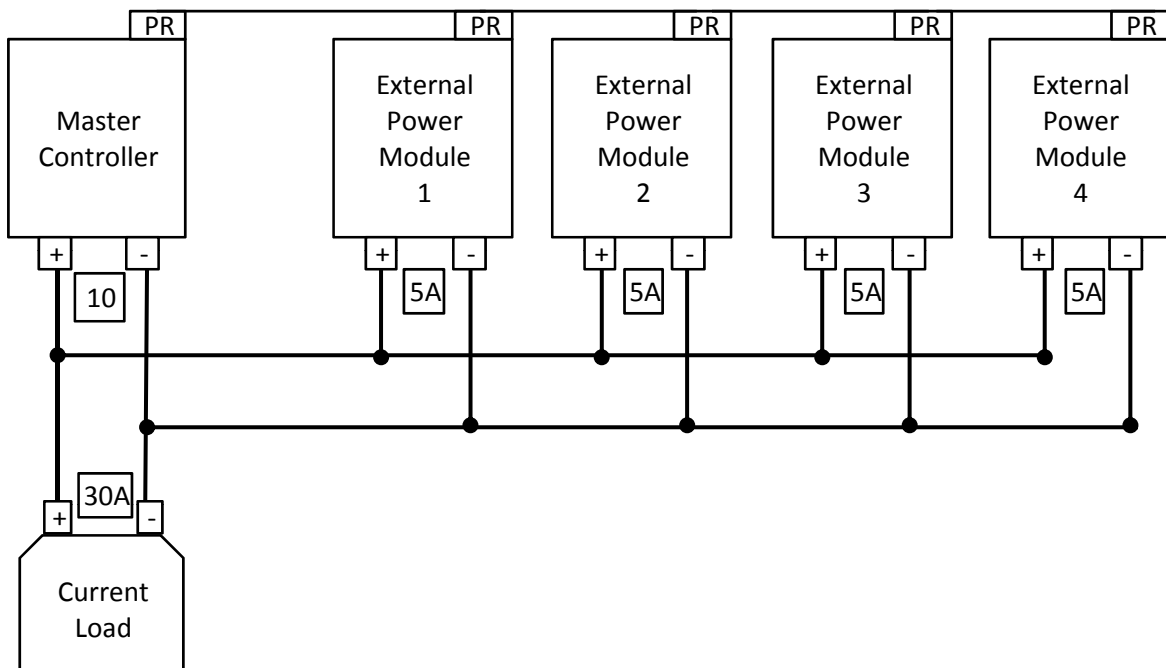
1. In front panel, can only check error code. While remote interface, user can check also the description.
2. What is Stack Memory? It is a FILO(First In Last Out) structure, which means when the box is fully filled, first item must be taken out.

3-12. PARALLEL MODE




Parallel Mode enables to raise maximum current of the power supply. It adds current value of two channels. If current of one channel is not enough, user can add more current by adding more power module.

In Parallel mode, master controller is main controller, and power modules will be operated from master controller commands. All operation will be operated by master controller.

Connection



Parallel Mode Operating

	<p>■ Power Switch ON After Power ON, check whether "p1 - OUTPUT OFF" is displayed.</p>
	<p>■ To operate, press PARALLEL Key. Lamp will be lighted.</p>
	<p>■ To celar, press PARALLEL Key. Lamp will be OFF.</p>

» Related Remote Interface Command

OUTPut:PARAllel[:STAtE] {OFF|ON|0|1}

OUTPut:PARAllel[:STAtE]?


Refer: To clear Parallel Mode

OUTP:PAR? Return Value : 1


OUTP:PAR OFF Checks Error Code and description

3-13. TRACKING MODE

Function which set-up P1 and P2 voltage & current value to be same.

By using tracking mode, if user variate selected channel voltage or current value, other channel will follow the channel. Press  key to enter Tracking Mode, press once more to cancel. Below is description which users should percept.

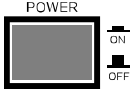


- ▷ OVP & OCP Related
 - ◆ While using Tracking Mode, channel which OVP or OCP was tripped will not be printed. However, changing voltage & current setting value will be changed.

- ▷ Channel Select Related
 - ◆  Key will operate in Tracking Mode. This allows to check information about readback voltage/current, CV, CC, OVP, OCP.
 - ◆ User may control P2 while using Tracking Mode.

- ▷ Recall Related
 - ◆ Recalling while Tracking Mode will clear the mode.

- ▷ In ****OUTPUT OFF**** condition
 - ◆ Tracking Mode will operate in Output OFF Mode, please check whether TRK lamp is on or off.

Tracking Mode Operation

	<ul style="list-style-type: none"> ■ Power Switch ON After Power ON, check whether "p1 - output OFF" is displayed.
	<ul style="list-style-type: none"> ■ Press TRACK Key.
	<ul style="list-style-type: none"> ■ Check whether TRK Lamp is lighted.
	<ul style="list-style-type: none"> ■ To clear Tracking Mode, press TRACK Key once more.
	<ul style="list-style-type: none"> ■ Check whether TRK Lamp is OFF.

» Related Remote Interface Command

OUTPut:TRACK[:STATe] {OFF|ON|0|1}

OUTPut:TRACK[:STATe]?

Refer: To clear Tracking Mode

OUTP:TRACK? Return Value : 1

OUTP:TRACK OFF Checks Error code and description

4. CALIBRATION

Warning

DO NOT use Calibrate function without a technical manager.
Calibration should be done in specific period

> Accurate : In every 180 days
> Proper Operating : In every 365 days

There can be functional error because of aging, and circumstances such as humidity around the power supply. Therefore, Calibrating should be done in every 365 days to work in proper condition.

4-1. Characteristics

- Calibration without opening product case
- Calibration using Front Panel Key
- Applied Sequence Calibration Method
- Saves data in fixed memory
- Support Calibration Data Backup & Restore Default Value
- Simple Panelling by insertung 1:1 Instrument Meter value

4-2. Preparing Accuracy Calibration

- Test Measuring equipment should be higher than Power Supply Spec.
- Power Supply should be warmed up for 1 hour in circumstance 20°C ~ 30°C
- Humidity should be less than 80%.
- Connect power supply output terminal and measuring instrument.
- Connect AC input GND with Measuring Instrument Earth terminal and Power Supply GND.
- There should not be instrument which make magnetic field around the power supply

4-3. Performance of Measuring Instrument for Accurate Calibration

Use below measuring instrument for power supply specification.

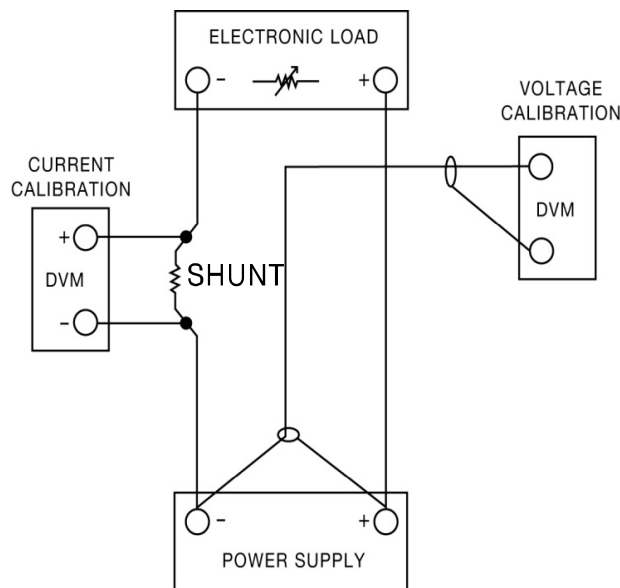
Measuring Instrument	Required Performance	Recommended	Usage
Digital Voltmeter	Resolution: 0.1 mV Accuracy: 0.01%	Agilent 34401A	Voltage Calibration
Electronic Load	Voltage Range: 50 Vdc Current Range: 10 Adc Open and Short Switches Transient On/Off	Agilent 6063B	Current Calibration Power Supply Protection
Current Monitoring	0.01Ω , 0.01%		Voltage Monitoring while Current Calibration
Oscilloscope	100 MHz With 20MHz Bandwidth	Tektronix TDS3014	to measure Ripple & Noise

4-4. Measuring Technique

Technical Description about Calibration below :

Connection

- Connect Power Supply output terminal and load as below diagram.
- In voltage Calibration, remove electronic load.
- It is acceptable to use general load resistor rather than electronic load.



< Diagram 4-1 >

Electronic Load

- Electronic Load should variate Resistor to be used in power supply current calibration.
- Load should have ON/OFF function, also with short function for the test.
- While Current Calibration, connect Power supply (+) output terminal with Load (+) terminal and Load (-) output terminal with current monitoring shunt lead with opposite side of power supply (-) output terminal.

Current-Monitoring Resistor(Shunt)

- Use Current Monitoring Resistor, because general current measuring instrument is not appropriate for high current.
- Select less than TCR 10ppm.
- Use high-precision of 0.01% Standard resistor.

DVM(Digital Volt Meter)

- DVM can be used for voltage calibration & current monitoring.
- Use performance with Resolution: 0.1 mV , Accuracy: 0.01%.

Programming

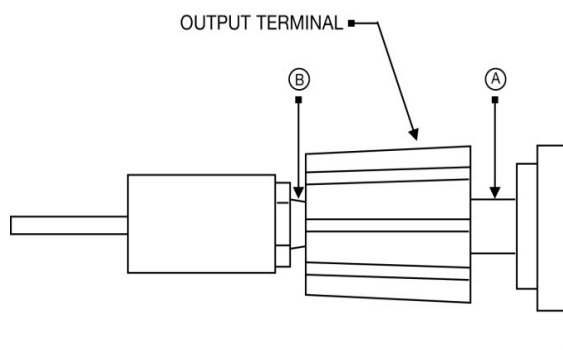
This product support PC Interface based Calibration.

Calibrating using GPIB connecting DVM, Ammeter, Load will be very accurate, and measures calibration data safely.

GPIB Connection below :

Measuring Area Selection

To obtain accurate result from Load regulation, peak to peak Voltage, and response time, follow diagram [4-3] below.



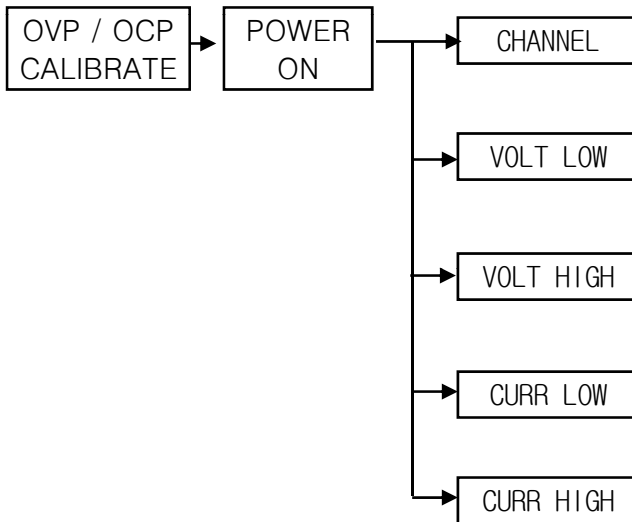
Front Panel Terminal Connections (Side View)

< Diagram 4-3 >

4-5. Calibration Using Front Panel

Explanation about manual calibration using Front Panel CALIBRATE Key.

CALIBRATE KEY Structure









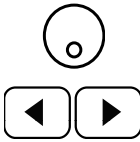



CALIBRATE Setting Range





- Voltage & Current Calibration is divided into LOW range and HIGH range.
- Below is standard power module model range chart.

MODEL		LOW		HIGH		MAX Output
		Low	High	Low	High	
OPM-95	Voltage	0.00V	0.90V	8.70V	9.60V	9.45V
	Current	0.00A	0.50A	4.80A	5.30A	5.25A
OPM-97	Voltage	0.00V	0.90V	8.70V	9.60V	9.45V
	Current	0.00A	0.70A	6.80A	7.50A	7.35A
OPM-910	Voltage	0.00V	0.90V	8.70V	9.60V	9.45V
	Current	0.00A	1.00A	10.00A	11.00A	10.5A
OPM-915	Voltage	0.00V	0.90V	8.70V	9.60V	9.45V
	Current	0.00A	1.50A	14.50A	16.20A	15.75A
OPM-920	Voltage	0.00V	0.90V	8.70V	9.60V	9.45V
	Current	0.00A	2.00A	19.50A	21.50A	21A
OPM-930	Voltage	0.00V	0.90V	8.70V	9.60V	9.45V
	Current	0.00A	3.00A	29.00A	32.00A	31.5A
OPM-183	Voltage	0.00V	1.80V	17.70V	19.50V	18.9V
	Current	0.00A	0.30A	2.90A	3.20A	3.15A
OPM-185	Voltage	0.00V	1.80V	17.70V	19.50V	18.9V
	Current	0.00A	0.50A	4.80A	5.30A	5.25A
OPM-187	Voltage	0.00V	1.80V	17.70V	19.50V	18.9V
	Current	0.00A	0.70A	6.80A	7.50A	7.35A






OPM-1810	Voltage	0.00V	1.80V	17.70V	19.50V	18.9V
	Current	0.00A	1.00A	10.00A	11.00A	10.5A
OPM-1815	Voltage	0.00V	1.80V	17.70V	19.50V	18.9V
	Current	0.00A	1.50A	14.50A	16.20A	15.75A
OPM-302	Voltage	0.00V	3.00V	29.00V	32.00V	31.5V
	Current	0.00A	0.20A	2.00A	2.20A	2.1A
OPM-303	Voltage	0.00V	3.00V	29.00V	32.00V	31.5V
	Current	0.00A	0.30A	2.90A	3.20A	3.15A
OPM-305	Voltage	0.00V	3.00V	29.00V	32.00V	31.5V
	Current	0.00A	0.50A	4.80A	5.30A	5.25A
OPM-307	Voltage	0.00V	3.00V	29.00V	32.00V	31.5V
	Current	0.00A	0.70A	6.80A	7.50A	7.35A
OPM-3010	Voltage	0.00V	3.00V	29.00V	32.00V	31.5V
	Current	0.00A	1.00A	10.00A	11.00A	10.5A
OPM-501	Voltage	0.00V	5.00V	48.00V	53.00V	52.5V
	Current	0.00A	0.10A	1.00A	1.10A	1.05A
OPM-502	Voltage	0.00V	5.00V	48.00V	53.00V	52.5V
	Current	0.00A	0.20A	2.00A	2.20A	2.1A
OPM-503	Voltage	0.00V	5.00V	48.00V	53.00V	52.5V
	Current	0.00A	0.30A	2.90A	3.20A	3.15A
OPM-505	Voltage	0.00V	5.00V	48.00V	53.00V	52.5V
	Current	0.00A	0.50A	4.80A	5.30A	5.25A
OPM-801	Voltage	0.00V	8.00V	77.00V	85.00V	84V
	Current	0.00A	0.10A	1.00A	1.10A	1.05A
OPM-802	Voltage	0.00V	8.00V	77.00V	85.00V	84V
	Current	0.00A	0.20A	2.00A	2.20A	2.1A
OPM-803	Voltage	0.00V	8.00V	77.00V	85.00V	84V
	Current	0.00A	0.30A	2.90A	3.20A	3.15A
OPM-1001	Voltage	0.00V	10.00V	96.00V	107.00V	105V
	Current	0.00A	0.10A	1.00A	1.10A	1.05A
OPM-1002	Voltage	0.00V	10.00V	96.00V	107.00V	105V
	Current	0.00A	0.20A	2.00A	2.20A	2.1A
OPM-1003	Voltage	0.00V	10.00V	96.00V	107.00V	105V
	Current	0.00A	0.30A	2.90A	3.20A	3.15A
OPM-1501	Voltage	0.00V	15.00V	144.00V	160.00V	157.5V
	Current	0.00A	0.10A	1.00A	1.10A	1.05A
OPM-1502	Voltage	0.00V	15.00V	144.00V	160.00V	157.5V
	Current	0.00A	0.20A	2.00A	2.20A	2.1A
OPM-2001	Voltage	0.00V	20.00V	192.00V	215.00V	210V
	Current	0.00A	0.10A	1.00A	1.10A	1.05A
OPM-3001	Voltage	0.00V	30.00V	288.00V	320.00V	315V
	Current	0.00A	0.10A	1.00A	1.10A	1.05A


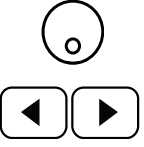



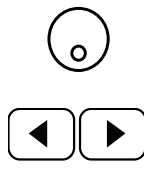

Voltage CALIBRATION *Channel P1 is example.*

	<ul style="list-style-type: none"> Before calibrating, connect power supply. >Connect Power Supply P1 (+) output terminal with DVM (+), Power Supply P1 (-) output terminal with DVM (-). >To Calibrate P2, connect Power Supply COM output terminal with DVM (+), power supply P2 (-) output terminal with DVM (-).
	<ul style="list-style-type: none"> Power Switch ON while holding CALIBRATE Key.
	<ul style="list-style-type: none"> Release the key when it moves in to Calibration Mode after self-testing.
	<ul style="list-style-type: none"> To select channel, press CALIBRATE Key in "CAL-CHANNEL" condition. VFD Display Description CHANNEL P-00
	<ul style="list-style-type: none"> Channel shown in Calibration Mode is P1 Channel. To Calibrate P1 channel, press CALIBRATE Key. VFD Display Description DONE
	<ul style="list-style-type: none"> To select LOW range of voltage, press right cursor key once. VFD Display Description CAL - VOLT LOW
	<ul style="list-style-type: none"> For Calibration, press CALIBRATE Key. VFD Display Description v-low 00.280v <i>Previous Calibration value is shown</i>
	<ul style="list-style-type: none"> Input voltage value shown on DVM Meter, using power supply cursor key and encoder switch. For example, if the value is 154.1mV, input as below. VFD Display Description V-LOW 00.154V
	<ul style="list-style-type: none"> When it is done, press CALIBRATE Key to save the data. VFD Display Description ADC-LO 00001B DONE
	<ul style="list-style-type: none"> To select HIGH range of voltage, press right cursor key once. VFD Display Description CAL - VOLT high
	<ul style="list-style-type: none"> For Calibration, press CALIBRATE Key. VFD Display Description v-high 31.280v <i>Previous Calibration is shown</i>

 	<ul style="list-style-type: none"> Input voltage value shown on DVM Meter, using power supply cursor key and encoder switch. For example, if the value is 30.123V, input as below. <p>VFD Display Description V-LOW 30.123V</p>
	<ul style="list-style-type: none"> When input is done, press CALIBRATE Key to save the data. <p>VFD Display Description ADC-HI 01FF1C DONE</p>
	<ul style="list-style-type: none"> To apply in the system, power switch must be OFF and ON again. Proceed other channel voltage as above instruction. To cancel Calibration. Press  Key.

Current Calibration *Channel P1 is example.*

	<ul style="list-style-type: none"> Before Calibration, connect power supply first. >Connect power supply P1 (+) output terminal with load (+) input, load input terminal (-) with current monitoring resistor, and connect opposite side lead line with power supply P1 (-) output terminal. >Connect DVM input terminal(+) with current monitoring resistor load, input terminal (-) with current monitoring resistor opposite side.
	<ul style="list-style-type: none"> Power Switch ON while pressing CALIBRATE Key.
	<ul style="list-style-type: none"> After Self-Testing mode, release CALIBRATE Key.
	<ul style="list-style-type: none"> To select channel, press CALIBRATE when "CAL-CHANNEL" is displayed. <p>VFD Display Description CHANNEL P-00</p>
	<ul style="list-style-type: none"> Channel shown in Calibration Mode is P1 Channel. To Calibrate P1 channel, press CALIBRATE Key. <p>VFD Display Description DONE</p>
	<ul style="list-style-type: none"> To select LOW range of current, press right cursor key 3 times. <p>VFD Display Description CAL - curr LOW</p>

	<ul style="list-style-type: none"> For Calibration, press CALIBRATE Key. <i>Previous value will be shown</i> VFD Display Description a-low 0.0603a
	<ul style="list-style-type: none"> Input current value shown on DVM Meter using cursor key and encoder switch. For example, if the value is 154.1mA, input as below. VFD Display Description a-LOW 0.1541a
	<ul style="list-style-type: none"> When it is done, press CALIBRATE Key to save the data. VFD Display Description ADC-LO 00001B DONE
	<ul style="list-style-type: none"> To select HIGH range of current, press right cursor key once. VFD Display Description CAL - curr high
	<ul style="list-style-type: none"> For Calibration, press CALIBRATE Key. <i>Previous value will be shown</i> VFD Display Description a-high 3.1078a
	<ul style="list-style-type: none"> Input current value shown on DVM Meter using cursor key and encoder switch. For example, if the value is 3.1235A, input as below. VFD Display Description a-LOW 3.1235a
	<ul style="list-style-type: none"> When it is done, press CALIBRATE Key to save the data. VFD Display Description aDC-HI 01FF1C DONE
	<ul style="list-style-type: none"> To apply in the system, power switch must be OFF and ON again. Proceed other channel current as above instruction. To cancel Calibration. Press ESC Key.

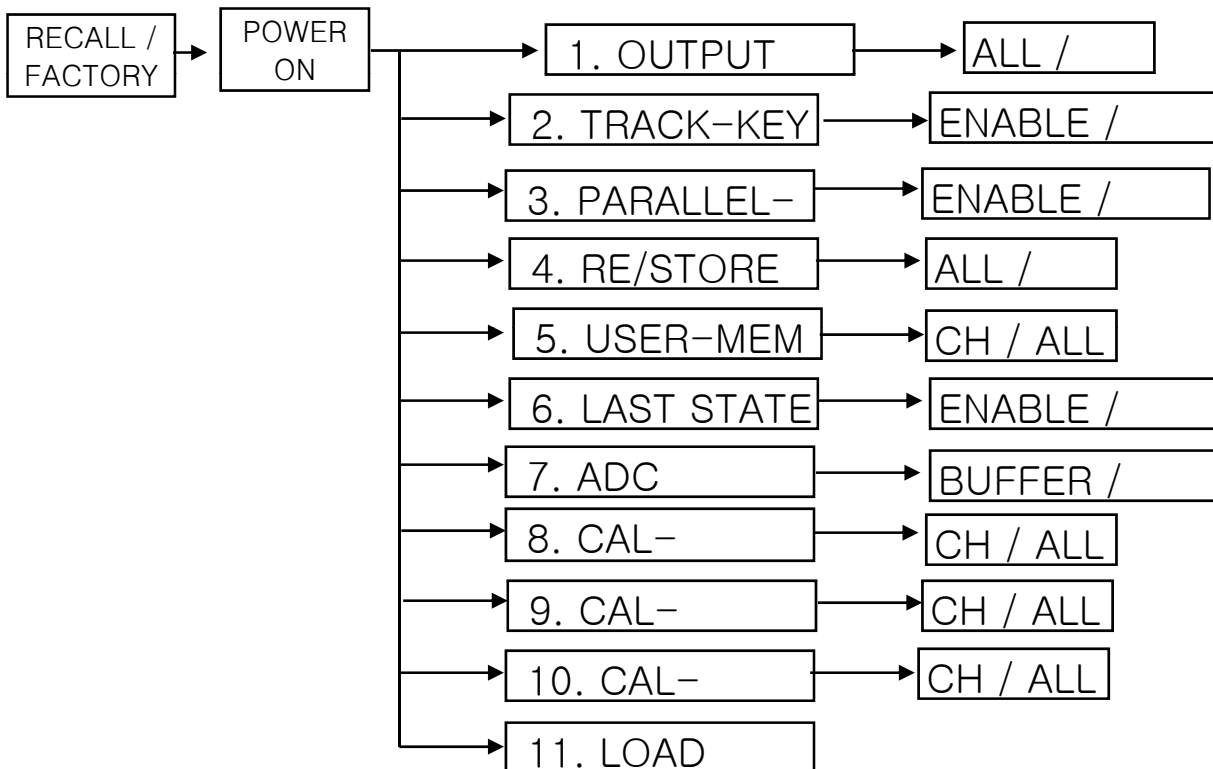
5. FACTORY

This product has plenty of system setting functions.

5-1. Characteristics

- Output ON/OFF can be activated individually, or at once.
- It may Enable or Disable Tracking Key.
- It may Enable or Disable Parallel Key.
- Recall / Store can be selected individually, or at once.
- Reset 10 Data in 『User Memory』 .
- It may select ADC Sampling method to obtain internal data.
- It can back-up or restore CALIBRATION Data.
- Default Calibration data can be restored.
- Reset Factory Mode setting value.
- Saves in fixed memory.

5-2. FACTORY KEY Structure








5-3. OUTPUT MODE

- Function which control Output ON/OFF individually or at once.
- It will maintain until set-up is changed.


Setting Description

- ▷ ALL All Channels will be Output ON/OFF.
It will control all the channels at once.
Ex) CH1 ≒ CH2 ≒ . . . ≒ CH255
- ▷ EACH It will select channel individually.
Ex) when P2 is selected, and ON/OFF command is sent, other channels will not be affected.

Instructions

	<ul style="list-style-type: none"> ■ Power Switch ON while holding FACTORY Key.
	<ul style="list-style-type: none"> ■ When "1. OUTPUT MODE" is displayed, release FACTORY Key.
	<ul style="list-style-type: none"> ■ Press FACTORY Key once more to set-up <p style="text-align: right;"><i>Previous condition will be displayed</i></p> <p>VFD Display Description <input type="text" value="all"/></p>
	<ul style="list-style-type: none"> ■ To control individual, press cursor key once. <p>VFD Display Description <input type="text" value="each"/></p>
	<ul style="list-style-type: none"> ■ To save description, press FACTORY Key once. <p>VFD Display Description <input type="text" value="done"/></p>
	<ul style="list-style-type: none"> ■ Saved set-up will be applied from next power ON. ■ To change to ALL mode, follow above method.

5-4. TRACK-KEY

- Function which enables & disables Tracking Mode when  key is pressed.
- It protects from entering Tracking Mode while using several Power Modules.
- It will maintain the setting until it is changed.







Setting Description

- ▷ ENABLE Enables Tracking function


- ▷ DISABLE Disables Tracking function.

Error will occur when command is received from Remote Controller.
For more information about the error, please check “7.Error Messages”

Instructions

	<ul style="list-style-type: none"> ■ Power Switch ON while pressing FACTORY Key.
	<ul style="list-style-type: none"> ■ When "1. OUTPUT MODE" is displayed, release FACTORY Key.
	<ul style="list-style-type: none"> ■ Use cursor key to find menu. VFD Display Description <input type="text" value="2. track-key"/>
	<ul style="list-style-type: none"> ■ To enter the menu, press FACTORY Key. <i>Previous condition will be displayed.</i> VFD Display Description <input type="text" value="enable"/>
	<ul style="list-style-type: none"> ■ To de-activate, press cursor key once. VFD Display Description <input type="text" value="disable"/>
	<ul style="list-style-type: none"> ■ To save changed description, press FACTORY Key once. VFD Display Description <input type="text" value="done"/>
	<ul style="list-style-type: none"> ■ Saved set-up will be applied from next power ON. ■ To make Enable Mode, follow above steps.

5-5. PARALLEL-KEY







- Function which enables & disables Parallel Mode when  key is pressed.
- It protects from entering Parallel Mode while using several Power Modules.
- It will maintain the setting until it is changed.

Set-Up Description


- ▷ ENABLE It enables the parallel mode.
- ▷ DISABLE It disables the parallel mode.

Error will occur when command is received from Remote Controller.
For more information about the error, please check “7.Error Messages”

Instructions

	<ul style="list-style-type: none"> Power Switch ON while pressing FACTORY Key.
	<ul style="list-style-type: none"> Release FACTORY Key when "1. OUTPUT MODE" is displayed.
	<ul style="list-style-type: none"> Press cursor key to find Menu. VFD Display Description 3. PARALLEL-key
	<ul style="list-style-type: none"> To enter menu, press FACTORY Key. <i>Previous condition will be displayed.</i> VFD Display Description enable
	<ul style="list-style-type: none"> To de-activate, press cursor key. VFD Display Description disable
	<ul style="list-style-type: none"> To save change description, press FACTORY Key. VFD Display Description done
	<ul style="list-style-type: none"> Saved set-up will be applied from next power ON. To make Enable Mode, follow above steps.




5-6. RE/STORE MODE




- It saves / restores all channel output setting by pressing  key.
- Remote Controller command can be used for this function.
- It will maintain the setting until it is changed.

Setting Description

- ▷ ALL It saves or restores all the channels output setting.
- ▷ EACH It saves or restores individual channel output setting.

Instructions

	<ul style="list-style-type: none"> Power Switch ON while holding FACTORY Key.
	<ul style="list-style-type: none"> When "1. OUTPUT MODE" is displayed, release FACTORY Key.
	<ul style="list-style-type: none"> Press cursor key to find menu. VFD Display Description 4. re/store mode

	<ul style="list-style-type: none"> To enter Menu, press FACTORY Key. <i>Previous condition will be displayed.</i> VFD Display Description <input type="text" value="all"/>
	<ul style="list-style-type: none"> To store & recall, press cursor key once. VFD Display Description <input type="text" value="each"/>
	<ul style="list-style-type: none"> To save changes description, press FACTORY Key. VFD Display Description <input type="text" value="done"/>
	<ul style="list-style-type: none"> Saved set-up will be applied from next power ON. To make Enable Mode, follow above steps.







5-7. USER-MEM CLEAR

- It clears all memories of set-up recall and store memory.
- It can be cleared individually or altogether.
- When clearing is done, it cannot be restored.

Set-Up Description

- ▷ Individual Clearing channel individually.
- ▷ All Clearing all the channels.

Instructions

	<ul style="list-style-type: none"> Power Switch ON while pressing FACTORY Key.
	<ul style="list-style-type: none"> Release FACTORY Key when "1. OUTPUT MODE" is displayed.
	<ul style="list-style-type: none"> Press cursor key to find Menu. VFD Display Description <input type="text" value="5. user-mem clear"/>
	<ul style="list-style-type: none"> To enter menu, press FACTORY Key. VFD Display Description <input type="text" value="channel p-00"/>
	<ul style="list-style-type: none"> For example, to reset P2 channel, use encoder switch to change. VFD Display Description <input type="text" value="channel p-01"/>
	<ul style="list-style-type: none"> To reset chosen channel data, press FACTORY Key once. VFD Display Description <input type="text" value="done"/>
	<ul style="list-style-type: none"> Once it is reset, recalling data is not possible. Other modes can be used as above method.







5-8. LAST STATE

- Function which restores condition before power OFF.
- Restores Voltage, Current, setting value & On/Off condition, Output On/Off condition.
- After last setting, it takes 10seconds to save in fixed memory.

Set-up Description

- ▷ ENABLE Even the power is OFF, it brings the last setting.
- ▷ DISABLE When the power is OFF, all the setting will be default.

Instructions

	■ Power Switch ON while pressing FACTORY Key.
	■ When "1. OUTPUT MODE" is displayed, release FACTORY Key.
	■ Press cursor key to find Menu. VFD Display Description 6. LAST STATE
	■ To enter menu, press FACTORY Key. VFD Display Description disable
	■ For example, to enable, press cursor key. VFD Display Description enable
	■ To save, press FACTORY Key. VFD Display Description done
	■ Saved set-up will be applied from next power ON. ■ To make Enable Mode, follow above steps.

Note2

Stay for 10seconds to activate Last State. After 10 seconds, the settings will be saved in fixed memory.







5-9. ADC SAMPLING

- ADC is equipped in OPM-Series internally for purpose of obtaining data.
- If user wants stable data, stats of average is better.

Setting Description

- ▷ BUFFER It updates average data from buffer.
While using remote interface, when it is updated, it also bring previous data
Therefore, it is not recommended.
- ▷ PRESENT This method enables users to check all the data, not the average.

Instructions

	■ Power ON while holding FACTORY Key.
	■ Release FACTORY Key when "1. OUTPUT MODE" is displayed.
	■ Press cursor key to find menu. VFD Display Description 7. adc sampling
	■ To enter menu, press FACTORY Key. <i>Previous condition</i> VFD Display Description buffer <i>will be displayed</i>
	■ For example, press cursor key to turn to PRESENT condition. VFD Display Description PRESENT
	■ Release FACTORY Key to save. VFD Display Description done
	<ul style="list-style-type: none"> ■ Saved description will be applied in the next Power On. ■ To turn to Buffer mode, save using above method.







5-10. CAL-RESTORE

- Function which restores calibration data saved using back-up function.
- It can be used to restore Calibration.

Setting Description

- ▷ Individual Channel Restores an individual channel.
- ▷ All Channel Restores all Power Module.

Instructions

	■ Power Switch ON while holding FACTORY Key.
	■ Release FACTORY Key when "1. OUTPUT MODE" is displayed.
	■ Press cursor key to find menu. VFD Display Description 8. CAL-RESTORE
	■ To enter menu, release FACTORY Key. VFD Display Description channel p-00
	■ For example, to restore P2 channel, use encoder switch to change. VFD Display Description channel p-01
	■ To restore chosen channel data, press FACTORY Key once. VFD Display Description done
	■ Saved description will be applied in the next Power On. ■ Other modes can be used as above instructions.




5-11. CAL-BACKUP




- Function which back-up data.
- Calibration backup should be done once a year. After one year re-back up the calibration.
- When backup is operated, previous description cannot be restored.
- It will backup to default data when it is released.

Setting Description

- ▷ Individual Back-up channels individually.
- ▷ All Back-up channels altogether.

Instructions

	■ Power Switch ON while holding FACTORY Key.
	■ When "1. OUTPUT MODE" is displayed, release FACTORY Key.
	■ Press cursor key to find menu. VFD Display Description 9. CAL-backup

	<ul style="list-style-type: none"> To enter menu, press FACTORY Key. VFD Display Description channel p-00
	<ul style="list-style-type: none"> To back-up P2 channel, use encoder switch to change. VFD Display Description channel p-01
	<ul style="list-style-type: none"> To confirm the back-up, press FACTORY Key once. VFD Display Description done
	<ul style="list-style-type: none"> It will be ReWrite in the previous description, other data will not be restored Other modes can be used as above method.







5-12. CAL-DEFAULT

- Function which restores as when the product was released.

Setting Description

- ▷ Individual Restores channels individually.
- ▷ All Restores channels altogether.

Instructions

	<ul style="list-style-type: none"> Power Switch ON while holding FACTORY Key.
	<ul style="list-style-type: none"> When "1. OUTPUT MODE" is displayed, release FACTORY Key.
	<ul style="list-style-type: none"> Press cursor key to find menu. VFD Display Description 10. CAL-DEFAULT
	<ul style="list-style-type: none"> To enter the menu, release FACTORY Key. VFD Display Description channel p-00
	<ul style="list-style-type: none"> For example, to restore P2 channel, use encoder switch to change. VFD Display Description channel p-01
	<ul style="list-style-type: none"> To confirm, press FACTORY Key once. VFD Display Description done
	<ul style="list-style-type: none"> Set-up description will be applied from next power ON. Other modes can be used as above method.





5-13. LOAD DEFAULT

- Function which set-up default value.
- Once it is activated, previous value will not be restored.

Restored Description

- ▷ OUTPUT MODE ALL
- ▷ TRACK-KEY ENABLE
- ▷ PARALLEL-KEY ENABLE
- ▷ RE/STORE ALL
- ▷ LAST STATE DISABLE
- ▷ ADC SAMPLING BUFFER

Instructions

	<ul style="list-style-type: none"> ■ Power Switch ON while pressing FACTORY Key.
	<ul style="list-style-type: none"> ■ When "1. OUTPUT MODE" is displayed, release FACTORY Key.
	<ul style="list-style-type: none"> ■ Press cursor key to find menu. VFD Display Description 11. LOAD DEFAULT
	<ul style="list-style-type: none"> ■ To operate menu, press FACTORY Key. VFD Display Description done

6. SCPI Commands

User could control using SCPI(Standard Commans for Programmable Instruments) commands. By using GPIB, several power supply & measuring instruments can be connected. It will be adequate users who are using many instruments.

6-1. Commands Syntax

- Capital/small letters can be skipped.
- Capital/small letters both can be used.
- Only one command will be affected.
- Rectangle bracket([]) is an option or parameters and can be skipped.
- Parameters in Braces({ }) cannot be skipped.
- Triangle Bracket(< >) can be change as a CODE (EX: MIN,MAX).
- Separating Bar(|) indicates two or more parameters.

6-2. Commands

Channel Select Commands

```
INSTrument[:SElect]{OUT1|OUT2|OUT3|. . . |OUT255}  
INSTrument[:SElect]?
```

Output Setting Commands

```
APPLy{<voltage>}[,<current>]  
APPLy?  
[SOURce:]VOLTage{<voltage>|UP|DOWN}  
VOLTage?  
VOLTage:STEP{<numeric value>}  
VOLTage:STEP?  
VOLTage:PROTection{<voltage>}  
VOLTage:PROTection?  
VOLTage:PROTection:STATe {0|1|OFF|ON}  
VOLTage:PROTection:STAT?  
VOLTage:PROTection:TRIPped?  
VOLTage:PROTection:CLEar  
  
CURRent{<current>|UP|DOWN}  
CURRent?  
CURRent:STEP{<numeric value>}  
CURRent:SETP?  
CURRent:PROTection{<current>}  
CURRent:PROTection?  
CURRent:PROTection:STATe {0|1|OFF|ON}  
CURRent:PROTection:STAT?
```

CURRent:PROTection:TRIPped?
CURRent:PROTection:CLEAr
FLOW?

Measurement Commands

MEASure:CURRent[:DC]?
MEASure:VOLTage[:DC]?

System Commands

SYSTem:BEEPer
SYSTem:ERRor?
SYSTem:VERSion?

OUTPut[:STATe] {OFF|ON|0|1}
OUTPut[:STATe]?
OUTPut:TRACk[:STATe] {OFF|ON|0|1}
OUTPut:TRACk[:STATe]?
OUTPut:PARAllel[:STATe] {OFF|ON|0|1}
OUTPut:PARAllel[:STATe]?

*IDN?
*RST
*TST?
*SAV {1|2|3|4|5|6|7|8|10}
*RCL {1|2|3|4|5|6|7|8|10}
*CLS

6-3. Channel Select Commands

Function which select controller from two or more channels. (P1 ~ P255).

Before using 『Apply command』 & 『Output voltage current setting & Operating command』, please select the channel.

INSTrument[:SElect]{OUT1|OUT2|OUT3|. . .|OUT255}

Command which select a channel as controller.

- > OUT1 Select Channel P1.
 - > OUT2 Select Channel P2.
 - > OUT255 Select Channel P255. (External Power Module)
- ex1) INST OUT1 *From now on, controller is Channel P1.*

INSTrument[:SElect]?

Command which checks selected channel.

Return Value "OUTP1" – Channel P1 Selected
 "OUTP2" – Channel P2 Selected
 "OUTP3" – Channel P3 Selected
 "OUTP255" – Channel P255 Selected

6-4. Apply Commands

Command which controls output voltage and current at the same time using PC Remote Interface.

APPLy{<voltage>}[,<current>]

This command could control voltage and current at the same time.

- > Voltage Input Voltage
- > Current Input Current
- ex1) APPL 30,2 *Voltage 30V, Current 2A*
- ex2) APPL 5 *Set-up only voltage 5V*

APPLy?

Command which checks current setting voltage and current value.

Return Value "voltage,current"

ex) APPL? *return value "30.0000,2.5000"*

6-5. Output Voltage Current Setting & Operate Commands

Commands which controls voltage and current using PC Remote Interface.

VOLTage{<voltage>|UP|DOWN}

It controls output voltage setting.

Before using UP, DOWN command, use VOLTage:STEP command to set-up the range.

- > Voltage Input voltage value
- > UP Voltage setting increase as step value
- > DOWN Voltage setting decrease as step value
- ex1) volt 10 *Set-up voltage 10V*
- ex2) volt up *Voltage setting increase as step value*

Note

After Power ON or *RST Command, voltage step value will be Default.

VOLTage?

Checks current power supply setting voltage.

Return Value "voltage"

ex) volt? *return value "30.0000"*

VOLTage:STEP{<numeric value>}

Command which set-up Step value used in VOLT UP or VOLT DOWN.

- > Numeric Value Input Step value in available voltage range.
- ex) volt:step 0.5 *Setting Step value 0.5V*

VOLTage:STEP?

Command which check setting Step Value.

Return Value "numeric value"

ex) volt:step? *return value "0.5000"*

VOLTage:PROTection{<voltage>}

Command which set-up OVP Trip Level.

> Voltage Input voltage value in OVP setting range.

ex) volt:prot 32 *OVP Level is 32V.*

VOLTage:PROTection?

Command which checks OVP Trip Level.

Return Value "voltage"

ex) *return value "32.0000"*

VOLTage:PROTection:STATe {0|1|OFF|ON}

Command which clear, ON OVP(Over Voltage Protection) .

> 0 OR OFF OVP OFF

> 1 OR ON OVP ON

ex) volt:prot:stat on *OVP On*

VOLTage:PROTection:STAT?

Command which check whether OVP(Over Voltage Protection) is ON or cleared.

Return Value "0" – Cleared

"1" – ON

ex) volt:prot:stat? *return value "1"*

VOLTage:PROTection:TRIPped?

Command which checks whether OVP(Over Voltage Protection) is occurred.

Return Value "0" – Normally activating

"1" – OVP Tripped

ex) volt:prot:trip? *return value "1"*

Note

When OVP Trip occurs, output voltage/current will be shut-off.

VOLTage:PROTection:CLEAr

Command which clears OVP(Over Voltage Protection) Trip.

Before clearing Trip please check "3-4. Programming Over Voltage Protection(OVP)" to find the reason of tripping

ex) volt:prot:cle *Clear OVP Trip.*

CURRent{<current>|UP|DOWN}

Command which set-up output current.

Before using UP, DOWN command, use CURRent:STEP command to set-up the range.

- > Current Input current value
 - > UP Current setting value increase as step value
 - > DOWN Current setting value decrease as step value
- ex1) curr 1.5 *Set-up Current 1.5A*
ex2) curr up *Raise setting step value*

Note

Current Step value will be default value if power supply is ON.

*Check *RST command for more information about Default value.*

CURRent?

Command which check power supply current setting value.

Return Value "current"

ex) curr? *return value "1.5000"*

CURRent:STEP{<numeric value>}

Command which set-up step value used in CURR UP or CURR DOWN.

> Numeric Value Input Step value in current range.

ex) curr:step 0.5 *Setting step value 0.5A*

CURRent:STEP?

Command which check set-up Step Value.

Return Value "numeric value"

ex) curr:step? *return value "0.5000"*

CURRent:PROTection{<current>}

Command which set-up OCP Trip Level.

> Current Input OCP value

ex) curr:prot 3.2 *Set-up OCP Level 3.2A.*

CURRent:PROTection?

Command which check OCP Trip Level.

Return Value "current"

ex) curr:prot? *return value "3.2000"*

CURRent:PROTection:STATe {0|1|OFF|ON}

Command which check or clear OCP(Over Current Protection).

> 0 OR OFF OCP Clear

> 1 OR ON OCP ON

ex) curr:prot:stat on

CURRent:PROTection:STAT?

Command which checks OCP On,Off condition.

Return Value "0" – Off

"1" – On

ex) curr:prot:stat? *return value "1"*

CURRent:PROTection:TRIPped?

Command which checks whether OCP(Over Current Protection) is tripped.

Return Value "0" – Normally printing

"1" – OCP Tripped

ex) curr:prot:trip? *return value "1"*

Note

When OCP Trip occurs, it will shut-off voltage/current.

CURRent:PROTection:CLEar

Command which clears OCP Trip.

Before clearing Trip, please check "3–5. Programming Over Current Protection(OCP)" to find Tripping reason.

ex) curr:prot:cle *Clears OCP Trip.*

FLOWer?

Command which checks CV(Constant Voltage), CC(Constant Current) condition.

Return Value "CV" – Constant Voltage Condition

"CC" – Constant Current Condition

ex) FLOW? *return value "CV"*

6–6. Measure Commands

Command which measure Readback voltage & current of power supply. DVM(Digital Volt Meter) Ammeter are not needed.

MEASure:VOLTage[:DC]?

Command which measure power supply voltage.

Return Value "voltage"

ex) meas:volt? *return value "11.0000"*

MEASure:CURRent[:DC]?

Command which measure power supply output current.

Return Value "current"

ex) meas:curr? *return value "1.0000"*

6-7. System Commands

Commands about power supply control.

SYSTEM:BEEPer

Command which occurs alarm sound once.

ex) syst:beep *Alarm Occurs*

SYSTEM:ERRor?

Command which checks power supply error.

Error description will be save in fixed memory up to 10 messages. From 11th message, Earliest message will be deleted.

User may find +0, "No error" Message.

Return Value - error number , "message"

ex) syst:err? *return value -222, "Out of data"*

Note

1. For more information about error, please check "7. Error Messages".
2. All Error will be cleared by CLS Command.

SYSTEM:VERSion?

Checks Power Supply version.

Return "YYYY.Ver"

YYYY - Indicates product year.

Ver - Indicates product version.

ex) syst:vers? *return value "2005.1"*

OUTPut[:STATe] {OFF|ON|0|1}

Command which allows or shut-off output.

> ON or 1 Allows Output

> OFF or 0 Shut-off Output

ex1) outp on *Allows to print*

ex2) outp off *Shut-off printing*

OUTPut[:STATe]?

Command which checks current power supply output condition.

Return Value " 0 " *Output Off condition*

" 1 " *Output On condition*

ex) outp? *return value "1"*

OUTPut:TRACk[:STATe] {OFF|ON|0|1}

Command which set-up P1,P2 setting same in 『Apply command』 & 『Output voltage current setting & control command』

> ON OR 1 Tracking mode ON

> OFF OR 0 Tracking mode OFF

ex1) outp:trac on *Tracking on*

ex2) outp:track off *Tracking off*

OUTPut:TRACk[:STATe]?

Command which check whether the power supply is in Tracking Mode.

Return Value " 0 " *Tracking off condition*

" 1 " *Tracking on condition*

ex) outp:track? *return value "1"*

OUTPut:PARAllel[:STATe] {OFF|ON|0|1}

Command which controls Parallel Function.

> ON OR 1 Parallel mode ON

> OFF OR 0 Parallel mode OFF

ex1) outp:par on *Parallel on*

ex2) outp:par off *Parallel off*

OUTPut:PARAllel[:STATe]?

Command which checks whether power supply is in Parallel Mode.

Return Value " 0 " *Parallel off Condition*

" 1 " *Parallel on Condition*

ex) outp:par? *return value "1"*

*IDN?

Command which checks power supply version.

3 version information will be sent using comma ','.

Return Value "ODA Technologies,OPC-3010,1.0-1.0-1.0"

First Manufacturer

Second Model Name

Third Product Detail Version

First System controller Version

Second Front panel Version

Third SCPI protocol Version

ex) *idn? *return value "ODA Technologies,OPC-3010,1.0-1.0-1.0"*

*SAV {1|2|3|4|5|6|7|8|10}

Command which save Voltage, Current, OVP, OCP Level in 『User Memory』

from 1 ~ 10 memory.

> 1 ~ 10 Memory save range

ex) *sav 2 *Save in No2 Memory*

*RCL {1|2|3|4|5|6|7|8|10}

Command which applies description saved in 『User Memory』 .

Select from 1 ~ 10 Memory.

> 1 ~ 10 Memory range

ex) *rcl 2 *Apply description saved in No2 Memory.*

***RST**

Command which resets power supply.

Below chart is reset description of each model.

MODEL	VOLT	VOLT: STEP	VOLT: PROT	VOLT: PROT: STAT	CURR	CURR: STEP	CURR: PROT	CURR: PROT: STAT
OPC-95	0V	1mV	9.6V	ON	5A	0.1mA	5.3A	ON
OPC-97			9.6V		7A	1mA	7.5A	
OPC-910			9.6V		10A		11.0A	
OPC-915			9.6V		15A		16.2A	
OPC-920			9.6V		20A		21.5A	
OPC-930			9.6V		30A	32.0A		
OPC-183			19.5V		3A	0.1mA	3.2A	
OPC-185			19.5V		5A		5.3A	
OPC-187			19.5V		7A	1mA	7.5A	
OPC-1810			19.5V		10A		11.0A	
OPC-1815			19.5V		15A		16.2A	
OPC-302			32.0V		2A	0.1mA	2.20A	
OPC-303			32.0V		3A		3.2A	
OPC-305			32.0V		5A		5.3A	
OPC-307			32.0V		7A	1mA	7.5A	
OPC-3010			32.0V		10A		11.0A	
OPC-501			53.0V		1A		0.1mA	
OPC-502			53.0V		2A	2.20A		
OPC-503			53.0V		3A	3.2A		
OPC-505			53.0V		5A	5.3A		
OPC-801			85.0V		1A	1.1A		
OPC-802			85.0V		2A	2.20A		
OPC-803			85.0V		3A	3.2A		
OPC-1001			107.0V		1A	1.1A		
OPC-1002		107.0V	2A		2.20A			
OPC-1003		107.0V	3A		3.2A			
OPC-1501		160.0V	1A		1.1A			
OPC-1502		160.0V	2A		2.20A			
OPC-2001		215.0V	1A		1.1A			
OPC-3001		320.0V	1A		1.1A			

► Common : Output OFF , Channel Select P1 , Error queue , Maintaining OVP/OCP Trip

***TST?**

Command which operates power supply self-testing.

Please check "1-6. Check After Power ON" for more information.

Return Value " 1 " Test good

" 0 " Test fail

ex) *tst? return value "0 Check

***CLS**

Command which clears all error description.

ex) *CLS

7. Error Messages

Description about ERROR messages. Press  SYSTEM:ERROR? Command in PC Interface.

Key to check, or check with

+0, "No error"

There are no errors

gf

7-1. Power Module Error

Error which occurs in internal power module, or extended power module.

+1, "Do not perform ex-command"

Error which occurs when previous command is not performed.

+2, "Buffer overflow"

Error which occurs when received data buffer is overflowed.

+3, "Received not exist command"

Error which occurs when not existing command is received from main controller.

+4, "Not match the data length"

Error which occurs when there is damaged data received from main controller.

+5, "Not only right command but invalid data"

Received data from main controller is invalid.
Occurs when same address module is connected.

+48, "No device"

Power Module is not connected
There should be at least one Power Module connected.

+49, "Broken data"

Received data from power module is damaged.

+50, "Time out"

Error which occurs when there is no active command for specific time.

+51, "Different data length"

Received Data from power module is damaged.

7-2. Hardware Error

-200, "System interface error"

Occurs when SCPI Module is not working.

-201, "ADC operating failed"

ADC Part circuit is not operating.

-202, "Front panel operating failed"

Front Panel does not response.

-255, "Error not define"

Occurs when the error is not defined.

7-3. Interface Commands Error

Informs error description while using PC Interface.

-120, "Suffix too long"

Occurs when memory buffer is more than 50Byte.

-121, "Invalid data"

Occurs when wrong data is input on digit.

ex) Volt 10V 'V' is added.

Fix) Volt 10

-122, "Syntax error"

Occurs when there is grammatical error.

ex) Volt Value is not written.

Fix) Volt 10

-123, "Invalid suffix"

Occurs when data has error.

ex) Volt 10 '*' is added at the end.*

Fix) Volt 10

-124, "Undefined header"

Occurs when undefined command is sent.

ex) Volta 10 Recognize Volt or Voltage.

Fix) Voltage 10 or Volt 10

-220, "Out of parameter"

Occurs when parameter does not exist while using available Command.

ex) INST OUT4 OUT4 Parameter exists, but can be used in 4-channel power supply.

-221, "Setting conflict"

SCPI command exists, but cannot be used with using power supply.

ex)POL N Command which change the polarity, however it can be used when there is more than one channel.

-222, "Out of data"

Occurs when setting value is out of range.

ex)Volt 1000 Value is too high.

Fix) Volt 10

-223, "Incorret error"

Occurs when user operated another command before finishing previous buffer description.

*ex)*idn? Sending new command before receiving data.*

volt?

b = data

*Fix)*idn?*

a = data Saves data in a idn.

volt?

b = data

8. Warnings

To use power supply safely, please check below :

- Avoid cold, hot places.
- DO NOT operated equipment after bringing from cold place.
Liquefaction may damage the power supply.
Stand by 20~30 minutes to operate.
- DO NOT place liquid on the equipment.
If liquid falls on the power supply, it may cause serious damage.
- Avoid place with vibration.
- There should be enough space around ventilation.
- DO NOT place heavy object on the power supply.
- Avoid place with magnetic field such as motors.
- DO NOT input object in radiator.
- DO NOT place hot object around power supply.
- Front Panel should not be placed on the ground.
It may damage Knob & output terminal.
- DO NOT connect other types of power supply with output terminal.
- When Power supply is ON, do not connect load with output terminal.

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