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Programmable DC Power Supply

OPS Series

User Manual

Manual Part NO. 018OPS-2.0

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www.odacore.com
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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

Manual Part Number: 018OPS-2.0 Edition 2, February, 2018 Printed in ROK
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.




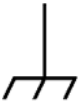

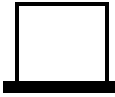

CAUTION






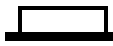


A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully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

1-1. Feature

ODA Technologies's OPS-Series are high efficiency, high performance programmable DC power supply RS232C & GPIB(IEEE-488.2) interface based on SCPI (Standard Commands for Programmable instrument) protocol. In addition, It is designed to be equipped in 3U*19inch Half-Rack.

General Functional Features

- Simple setting using jog & shuttle.
- Output voltage, current block & restore function (Output ON/OFF)
- Front panel's key lock function
- Caution alarms on events
- High accuracy & High limit of resolution
- Built-in Remote Sensing for Load Voltage(V-Sensing)
- Over Voltage Protection(O.V.P) / Over Current Protection(O.C.P) Secure Function
- Excellent Load Regulation & Line Regulation
- Operating condition(Voltage,Current,OVP,OCP) Store & Recall up to 10 slots.
- Store Error message (up to 10 messages)
- 3U * 19inch Half-Rack compatible

Remote Interface Features

- GPIB(IEEE-488.2) & RS232C Interface
- SCPI(Standard Commands for Programmable Instruments) compatible
- High speed setting & measurement
- plenty of Commands equipped
- Simple interface setting using front panel I/O config
- Insulation with instrument & Floating Logic realization
- SCPI programming grammatical order check options equipped

Calibration Features

- adopted Software Calibration do not requires inside correction
- Simple calibration operating using Independence or PC Interface

Factory Function Features

- Initialization memory function up to 10 memories
- Initialization mamory function up to 100 cycling mode memories
- Calibration restoration function
- Calibration back up function

Cycling mode Features

- Operating realization by instrument itself
- Safe storatoin used by permanent memories
- Store Voltage, Current, Slope time, Delay time each step up to 100 slots
- Cycling mode tests available using sequence panel

Self Test Features

- Front panel Test
- Remote interface Test
- Memory data verification Tes
- ADC H/W Error Test
- UnRegulated condition Test
- ADC/DAC Calibration verification Test

1-2. Accessories and Options

Accessories

- 1 Power Cord
- Output load (+), (-) 1 each. (Part number : OE-LW-BCW-2.0)
- 2 pcs metal short-bar for voltage sensing. (Part number : OM-S20)
- 1 User's Manual
- DEMO Software CD (Windows application manual included)

Option

- GPIB Module
- GPIB Cable 1M, 2M, 4M
- RS232C Cable 1M, 2M, 4M, 10M

- 100V \pm 10% , 50~60Hz AC input power
- 115V \pm 10% , 50~60Hz AC input power
- 230V \pm 10% , 50~60Hz AC input power
- Rear output
- Rack mount support
- Block system when it is overlapped.
Function that blocks Voltage/Current in "**OUTPUT OFF**" Mode.

1-3. Check

When you receive your power supply, inspect it for any obvious damage that may have occurred during shipment. If any damage is found, notify the carrier and the nearest ODA Sales Office immediately. Warranty information is shown in the front of this manual. Keep the original packing materials in case the power supply has to be returned to ODA Technologies in the future. If you return the power supply for service, attach a tag identifying the owner and model number. Also include a brief description of the problem.

Mechanical Check

- Check the broken key, encoder switch, power switch.
- Check the broken output terminals.
- Check the panel surfaces are free of dents and scratches.
- Check the cabinet is free of scratches.
- Check the LDC display is not scratched or cracked.

Electrical Check

- When turning on the power, it shows instrument model and ODA website at first.
- Check the model Number is matched with displayed model number.
- After, it shows "**OUTPUT OFF**" message, verifies to a high level of confidence that the power supply is operating in accordance with its specifications.

Note

Service Center : 82-32-623-5454
Home page : www.odacore.com

1-4. Operating Conditions

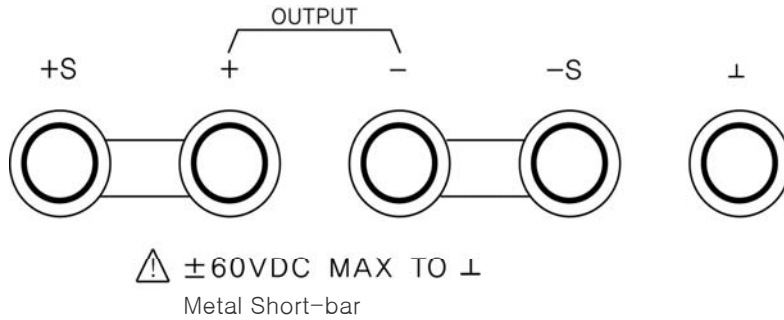
This instrument is designed for following environmental conditions in order to use optimized condition

- Environment Temperature : 0 ~ 40°C
 - Relative Humidity : Less than 80%
 - Operating Altitude : Less than 2000m
 - No Vibration
 - Avoid Electric Magnetic Field
-

1-5. Check Before Power On

Output Terminal Check

- Check the front panel two fixed outputs two variable output terminals and GND terminal.



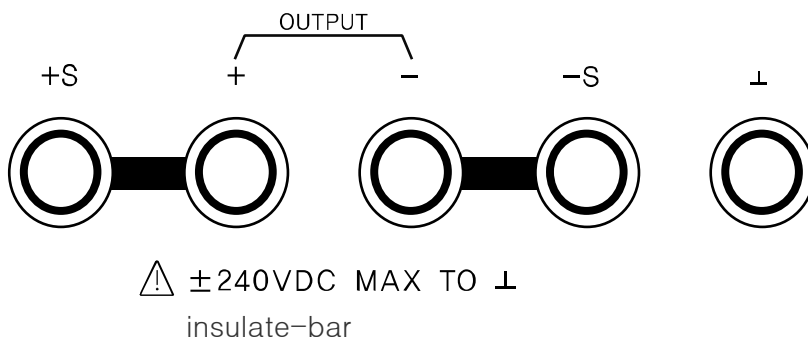
<Diagram 1-1>

WARNING

Floating the power supply output more than ± 60 Vdc from the chassis presents an electric shock hazard to the operator.

WARNING

If metal short bar that is supplied from our company excluded, maximum ± 240 Vdc output c. floated. Please make sure that there should be no contact between insulated output termina and the worker.



<Diagram 1-2>

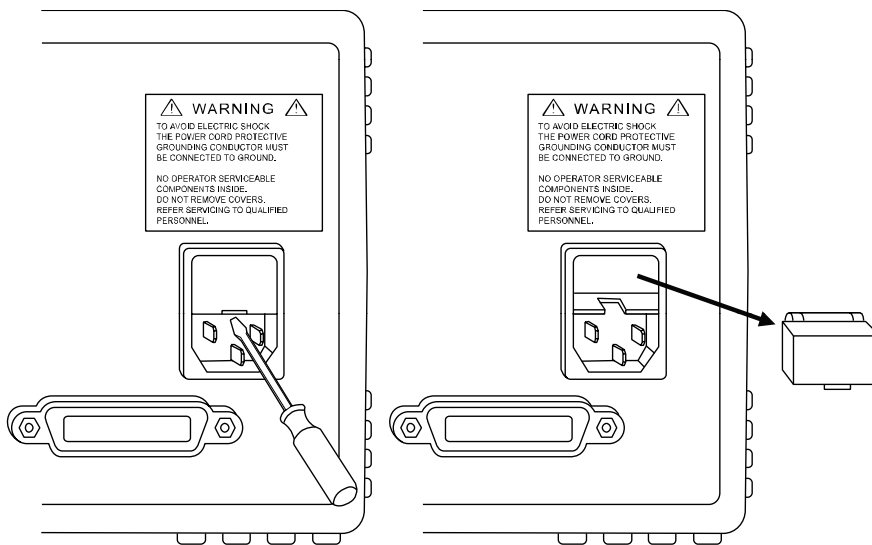
Power Cord Check

■ Your power supply is equipped with a 3-wire grounding type power cord; the third conductor being the ground. The power supply is grounded only when the powerline cord is plugged into an appropriate receptacle. Do not operate your power supply without adequate cabinet ground connection.

Input Power Line Check

■ You can operate your power supply from a nominal 198~242 V single phase ac power source at 47 to 63 Hz. AC100V, 110V, 115V, 230V input power is optional. Refer to chapter "1-2. Accessories & Options"

■ In other to prevent the instrument severe damage from overload, fuse is installed in inlet case. If the fuse is also repeatedly when power turns on, check the input power line or broken braker and then call to nearest ODA Technologies A/S Center Input power connection is following.



<Diagram 1-3>

1-6. Check After Power On

When turning on the power switch, the front-panel display will light up briefly while the instrument performs its power-on default value setting. And also keep the ex-remote interface setting mode, voltage value is zero and current value is max value. OVP & OCP will be set on maximum output value.

Display Procedure on LCD

- Homepage "WWW.ODACORE.COM" will be displayed.

Visit our homepage and we will provide various service and info about upgrading, manual and software.

- Also, Front lamp OVP, OCP, LOCK, RMT will be all lighted.

CV & CC are not included.

- "INITIALIZING. . ." Message will be displayed.

There will be a reset using non-volatile memory.

- Also, Front lamp OVP, OCP, LOCK, RMT lights will be turned off.


CV & CC are not included.

- "SELF-TESTING. . ." Message will be displayed.

While self-testing, message below will be displayed.

{	Front panel Test	Check Front panel's connection
	Remote interface Test	Check Remote interface for PC network
	Memory data verification Test	Check Instrument's info & setting
	ADC H/W error Test	Check ADC controlling
	UnRegulated condition Test	Check Output voltage Floating
	ADC/DAC Calibration Test	Check ADC & DAC Calibration Data

When an error occurs, there will be a alarm sound from instrument, and error No will be stored.

Press  Key to check error code.

Please read "7. Error Messages" to check details about error code.

Default Setting Value

- OVP : OVP Max value, OVP setting ON
- OCP : OCP Max value, OCP setting ON
- Output Voltage : 0V
- Output Current : Limit setting max value
- KEY LOCK : OFF
- Remote Interface : maintain previous setting
- Condition after Self-testing : "***OUTPUT OFF**"
- Cursor Location : Default Voltage Select
- Voltage : 1V scale
- Current : 5A > 100mA scale
- 50A > 1A scale

Note1

The RS232C is attached in the instrument when the power supply is shipped from the factory for remote interface configuration and baudrate is set 9600bps at first time. In case of choosing RS485 interface, address no. is 05 when this is shipped from the factory.

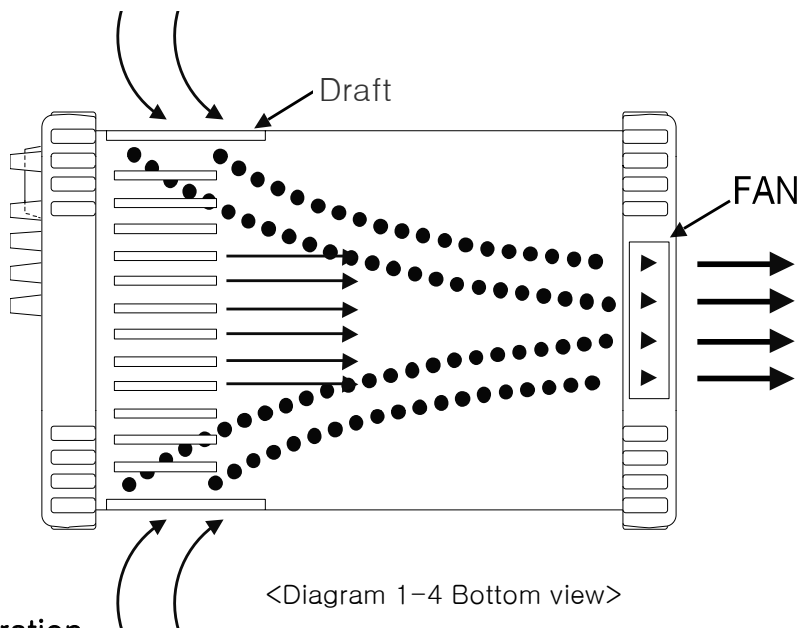
Note2

It has the option function that is last setup stated memory & recall. This function, when you turn down the instrument, the device store the last state(voltage, current and state) and after then the operator turn on again, this starts from last state.

1-7. Installation

Cooling

■ The power supply can operate without loss of performance within the temperature range of 0 °C to 40 °C, and with derated output current from 40 °C to 55 °C. A fan cools the power supply by drawing air through the rear panel and exhausting it out the sides. Using an ODA rack mount will not impede the flow of air.

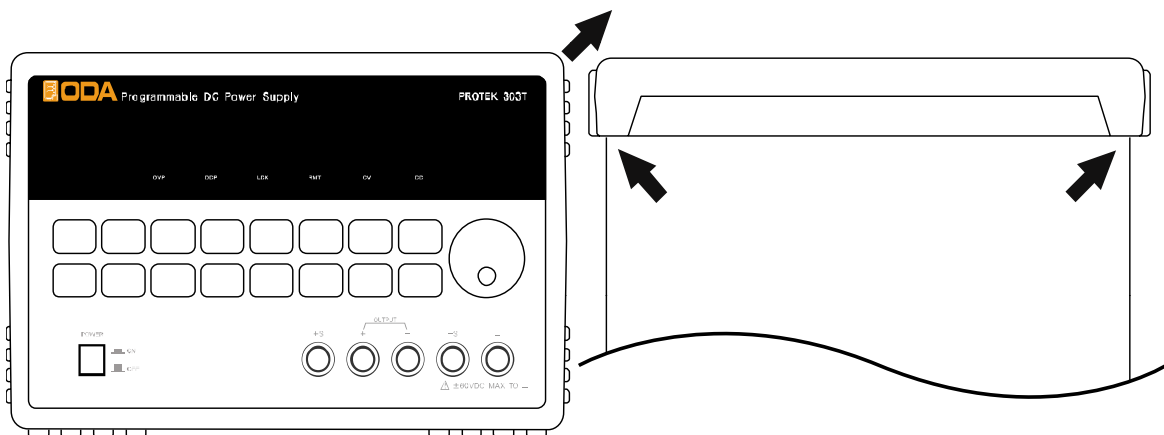


Bench Operation

■ Your power supply must be installed in a location that allows sufficient space at the sides and rear of the power supply for adequate air circulation.

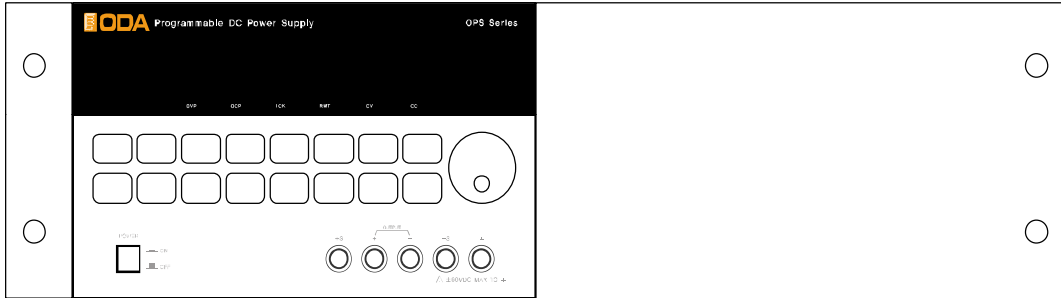
Rack Mounting

■ It is designed to be compatible in 3U * 19inch, please desort bumper (diagram below)



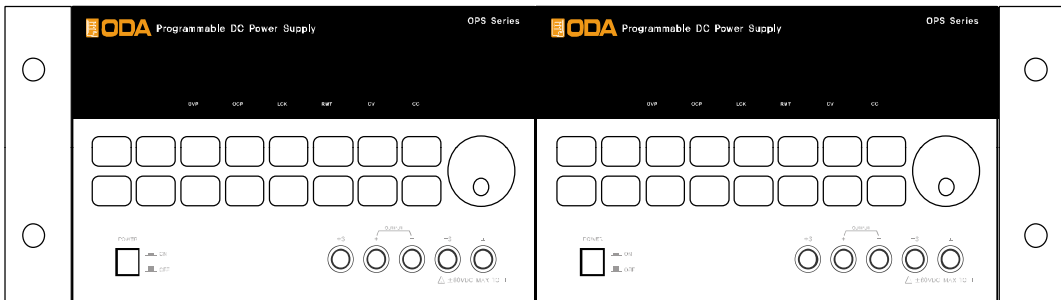
<Diagram 1-5>

- It is convenient to equip OM-3U19-FS(Option) supported by Power Supply independence on the rack.



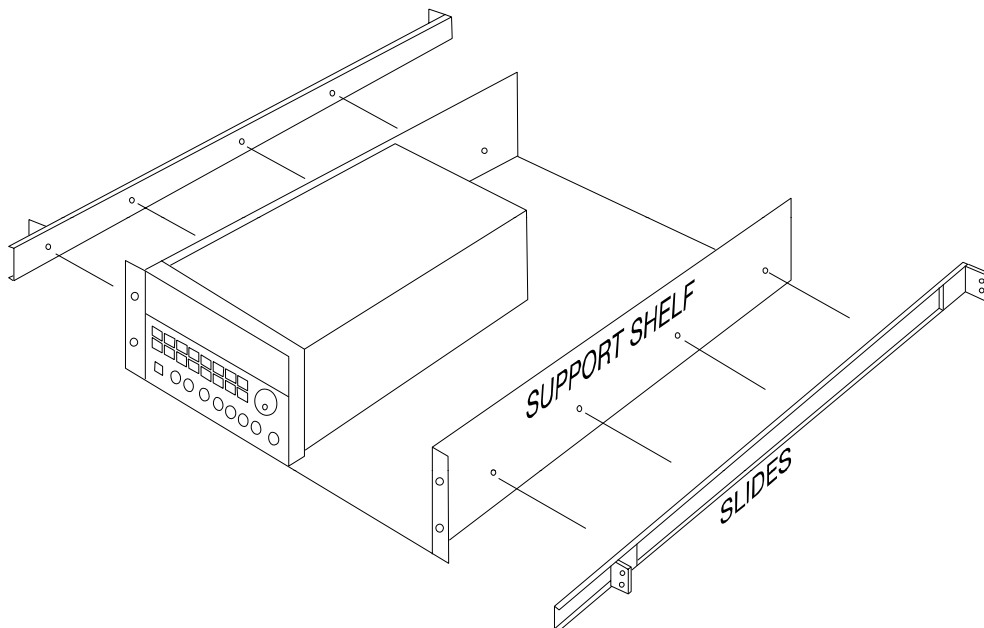
<Diagram 1-6>

- It is convenient if you equip power supply double on a rack with OM-3U19-FD(option).



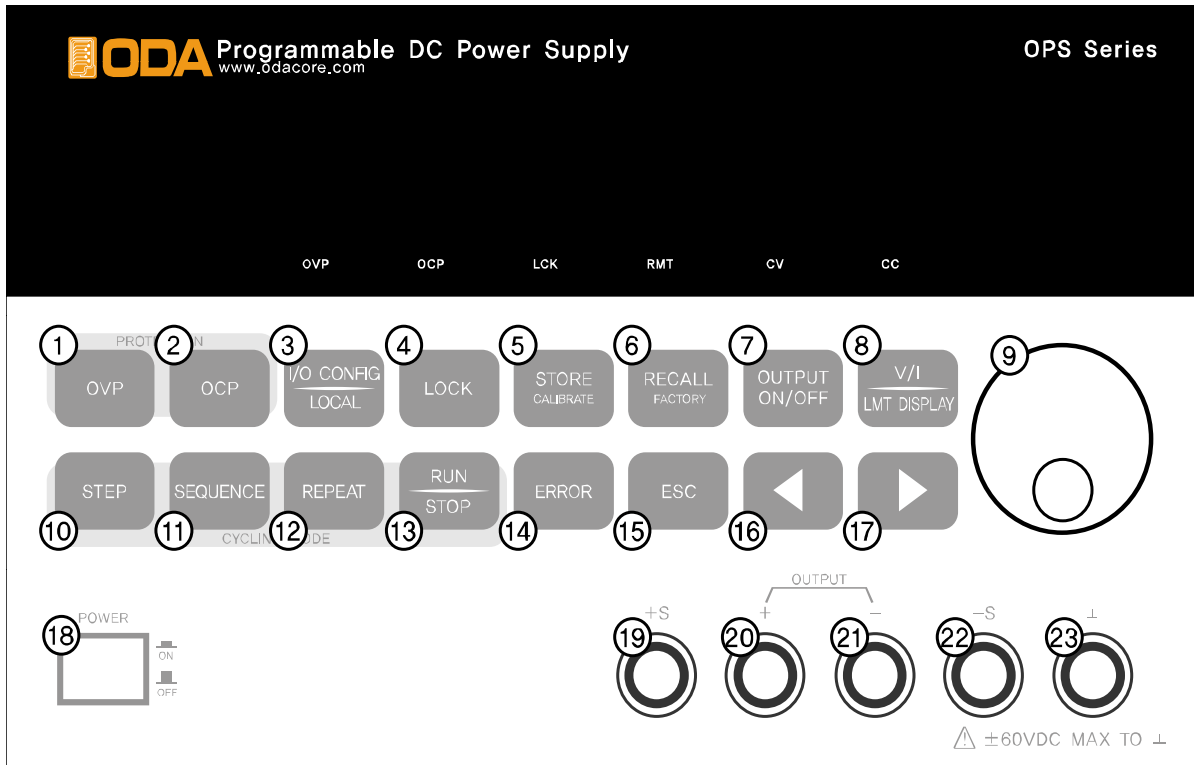
<Diagram 1-7>

- It is simpler to use instrument if you use inside cabinet & slider OM-3U19-SS(Option).



<Diagram 1-8>

2. Front Panel, Rear Panel Composition & Function



1	Over Voltage Protection Key	14	Error message Display Key
2	Over Current Protection Key	15	Menu Escape Key
3	I/O CONFIG or LOCAL Key	16	Voltage/Current Cursor or Menu Key
4	LOCK Key	17	Main Power ON/OFF Switch
5	Store present condition or Calibration Key	18	Remote V+ Sensing Input terminal
6	Restore memory save slot or Factory Key	19	+ output terminal
7	Output Voltage/Current ON/OFF	20	- output terminal
8	Choice Voltage/Current or Limit Display key	21	Remote V- Sensing Input terminal
9	Voltage/Current/Numbering Encorder Sw	22	Earth GND terminal
10	Cycling mode's STEP setting Key		
11	Cycling mode's Sequence control Key		
12	Cycling mode's repeating Key		
13	Cycling mode's RUN/STOP Key		

1. Over Voltage Protection Key

Over voltage protection function. On/Off selectable, able to change OVP Level value.

2. Over Current Protection Key

Over current protection function. On/Off selectable, able to change OCP Level value.

3. I/O CONFIG or LOCAL Key

Configures the power supply for remote interfaces. Set baudrate of RS232C. If remote interface is RS485, it can be used for setting baudrate & address. Also under Remote Interface situation, in other to recover bench top using, this key operate to local from remote.

4. LOCK Key

Lock/Unlock Key on the Front panel

5. Store current condition or Calibration Key

Store Voltage, Current, OVP / OCP Setting value. Press Power button while holding this key. This lead you in Calibration mode, voltage/current Calibration.

6. Memory save slot restoration or Factory Key

Saved Voltage, Current, OVP/OCP Setting value can be applied to instrument. Press Power button while holding this key. This will lead you in Factory mode, which allows you to restore or reset calibration.

7. Output Voltage/Current ON/OFF

Enables or disables the power supply output. This key toggles between on and off.

8. Voltage/Current select or Limit Display Key

Shows voltage and current limit values on the display and allows knob adjustment for setting limit values.

9. Voltage/Current Cursor or menu changing key

Move the blinking digit to the left. In the menu mode, it can change menu tree.

Under the ****OUTPUT OFF**** mode, this key work on recall key.

10. Cycling mode's STEP setting Key

Appoint 1~100 slots, Set Voltage, Current, Slope Time and Delay Time.

11. Cycling mode's Sequence control Key

Setting repeating panels from ()slot to ()slot.

12. Repeating setting key of Cycling mode

Setting No. of repetition.

13. Cycling mode's RUN/STOP Key

Operate or Cancel Cycling mode after setting 10 → 11 → 12.

14. Error message Display Key

When error occurs from Self-testing, Alarm sound will come out from the instrument, and will be up to 10 memories slot

15. Menu Escape Key

Canceling while in the Menu.

16. Voltage/Current Cursor or menu changing Key

Move the blinking digit to the left.

In menu mode, it can change menu tree.

Under the "**OUTPUT OFF**" mode, this key work on store key.

17. Voltage/Current Cursor or menu changing Key

Move the blinking digit to the left.

In menu mode, it can change menu tree.

Under the "**OUTPUT OFF**" mode, this key work on store key.

18. Main Power ON/OFF Switch

This switch allows to disable AC Power.

19. Remote V+ Sensing input terminal

+ Output Voltage sensing input terminal

20. + Output terminal

+ Output terminal.

21. – Output terminal

– Output terminal.

22. Remote V– sensing input terminal.

– Output Voltage sensing input terminal.








23. Earth GND terminal

GND terminal, it is able to connect to earth terminal of the DUT

2-1. Front-Panel Voltage & Current Setting

Use the method below to change limit value of voltage and current.




1. Check "**OUTPUT OFF**" When the instrument turned on
2. Press V/I & LMT DISPLAY key  to switch Limit Mode.
3. Press  key to select Voltage and Current
4. To select increasing or decreasing digit, press   and position cursor key.
5. In other to increase limit value, turn the  encoder clockwise.
In other to decrease limit value, turn the encoder  anti-clockwise.
6. Confirm the change of setting value at VFD Display
7. In other to output the setting voltage & current, press  key.

Note1

If there is a problem in "Self-test" Press  key to confirm the error code.


Please check "7. Error Messages" for Error code.

Note2

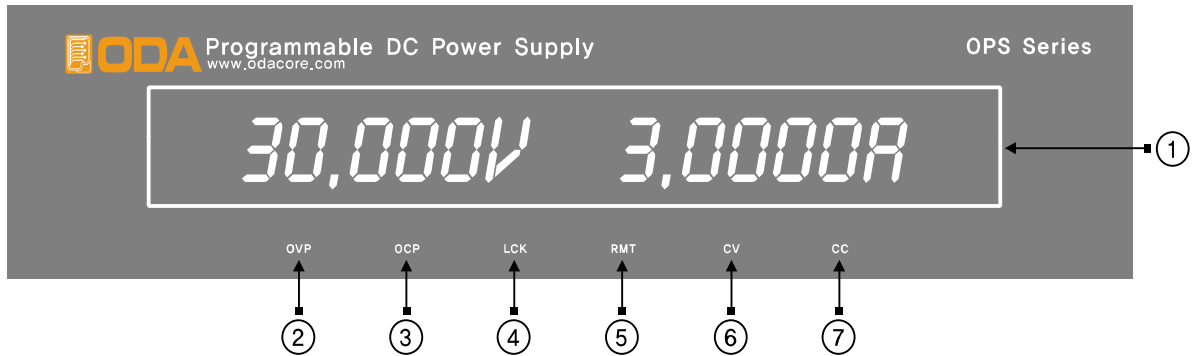
When press  key, disappear the message of "**OUTPUT OFF**" and then change to limit display state, and cursor is blinking. At that time, if let the display time-out after 3 seconds, "**OUTPUT OFF**" display at the LCD.

Note3

If it is under remote control, key and encoder switch on the front panel won't operate.

If turning to local mode from remote control, press  key to change to local mode.

2-2. Display & Condition Indicator LAMP

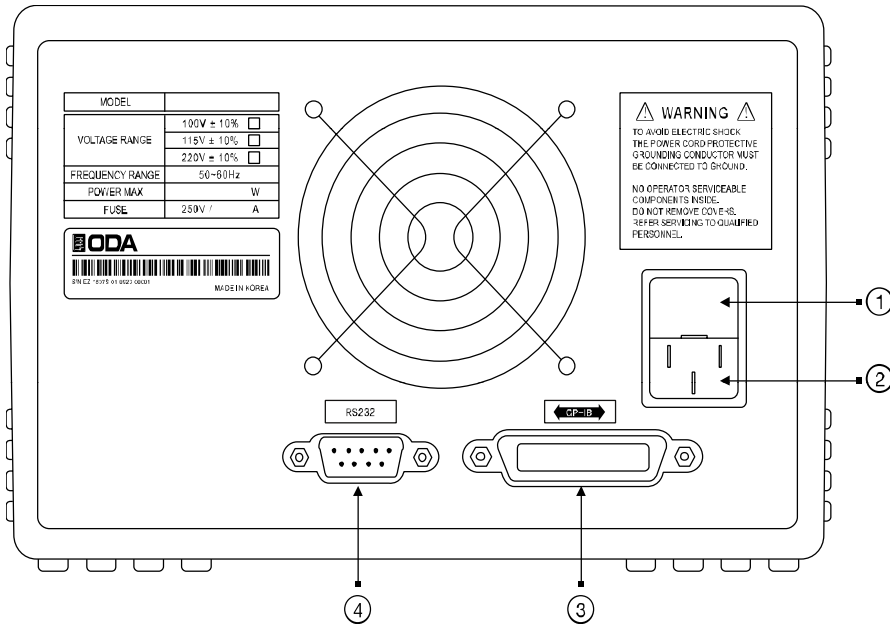


1	VFD	Voltage Current & Message Display module
2	OVP	OVP Setting mode "Brightened bulb"
3	OCP	OCP Setting mode "Brightened bulb"
4	LOCK	When it is pressed, Key & Encoder will disabled, when it is pressed once the light will go out and ables Key & Encoder.
5	RMT	In other to switch the display to Local, set Remote Interface and press key while the light bulb is ON.
6	CV	Lights ON while Constant Voltage Mode.
7	CC	Lights ON while Constant Current Mode.

Note


When the instrument turned on the first time, OVP, OCP, LOCK, RMT LAMP will lightened for 300ms and will be turned off. CV & CC are not included.

2-3. Rear Panel Composition



1	Fuse Holder	Power-line module
2	AC inlet	
3	GPIB (IEEE-488) interface connector	
4	RS-232C interface connector	






PC Interface Method

Press  key on the front panel in order to set PC interface.
 ("Refer to chapter 3-3. I/O Config & LOCAL")







2-4. Output Check

The following procedures check to ensure that the power supply develops its rated outputs and properly responds to operation from the front panel. For complete performance and verification refer to belows procedure.

Voltage Output Check

- The following steps verify basic voltage functions with no load.
 1. Turn on the power supply
 2. The output is disabled (the OUTPUT OFF annunciator turns on)
 3. In other to measure the voltage, connect the DVM to output terminals properly
 4. Press the  key in other to output the voltage.
 5. Press the  key and move the blinking cursor to voltage value.
 6. Press the   key and select the voltage resolution what you want.
 7. In other to increase or decrease, turn on the switch  CW or CCW.
 8. Compare between LCD display real voltage value and DVM annunciator.

Current Output Check

- The following steps check basic current functions with a short across the power supply's output.
 1. Turn on the power supply
 2. The output is disabled (the OUTPUT OFF annunciator turns on)
 3. Press the  key in other to output the current.
 4. Press the  key and move the blinking cursor to current value.
 5. Press the   key and select the current resolution what you want.
 6. Set the current upto 5A by using encoder switch  clockwise.
 7. Press the  key in other to output the current.
 8. Compare between LCD display real current value and DAM annunciator.

3. Front-Panel Operating

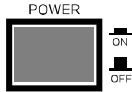

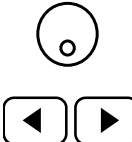

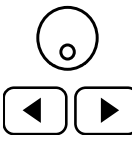

So far you have learned how to install your power supply and perform initial operation. During the initial operation, you were briefly introduced to operating from the front panel as you learned how to check basic voltage and current functions. This chapter will describe in detail the use of these front panel keys and show how they are used to accomplish power supply operation.

Overview

1. **Constant Voltage (CV)**
Explanation about constant voltage output mode operation.
2. **Constant Current (CC)**
Explanation about constant current output mode operation.
3. **Remote Voltage Sensing**
Explanation about load's voltage sensing.
4. **Programming Over Voltage Protection(OVP)**
Explanation about over voltage protection.
5. **Programming Over Current Protection(OCP)**
Explanation about over current protection.
6. **I/O Config & LOCAL**
Explanation about remote interface setting and recovering to local mode.
7. **KEY LOCK**
Explanation about Front panel's locking function.
8. **STORE / CALIBRATE**
Explanation about User memory store.
9. **RECALL / FACTORY**
Explanation about how to use & apply the stored 『user memory』 store.
10. **OUTPUT ON/OFF**
Explanation about the output disable or enable.
11. **V/I 및 LMT DISPLAY**
Explanation about voltage/current select or limit display.
12. **CYCLING MODE**
Explanation about Cycling mode.
13. **ERROR**

3-1. Constant Voltage Operating(CV)

To set up the power supply for constant voltage (CV) operation, proceed as follows.

	<ul style="list-style-type: none"> Turn ON the power supply After turned on, check the power supply displays "***OUTPUT OFF**" . Connect the DUT to output terminals.
	<ul style="list-style-type: none"> In other to set the limit value, press the LMT key.
	<ul style="list-style-type: none"> Adjust the knob & resolution button for the desired voltage limit.
	<ul style="list-style-type: none"> Move the cursor to current.(Press the V/I Key once more)
	<ul style="list-style-type: none"> Adjust the knob & resolution button for the desired current limit.
	<ul style="list-style-type: none"> Enable the output.(Press the output ON/OFF key.) After about 2.5 seconds later, power supply changes to readback display from limit display.
	<ul style="list-style-type: none"> Please check CV lamp is on, CC lamp is off. If it is on and off opposite, check the load giving enough current, and raise current limit value.

» Related Remote Interface Command

[SOURCE:]VOLTage{<voltage>|UP|DOWN}

[SOURCE:]CURRent{<current>|UP|DOWN}

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

Refer: OUTPUT OFF Block output

VOLT 10 Set voltage 10V

CURR 5 Set current 5A

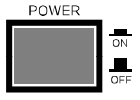

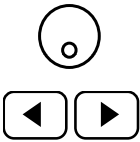

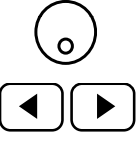

OUTPUT ON Output Voltage & Current

Note

- Select scale of increasing or decreasing voltage & current using cursor key.
- ReadBack Display? It refers to displaying voltage & current 's output.

3-2. Constant Current Operating(CC)

To set up the power supply for constant current (CC) operation, proceed as follows.

	<ul style="list-style-type: none"> Turn on the power supply After turned on, check the power supply displays "***OUTPUT OFF**" . Connect the DUT to output terminals
	<ul style="list-style-type: none"> In other to set the limit value, press the LMT Display key.
	<ul style="list-style-type: none"> Adjust the knob & resolution button for the desired voltage limit.
	<ul style="list-style-type: none"> Move the cursor to current.(Press the V/I Key once more)
	<ul style="list-style-type: none"> Adjust the knob & resolution button for the desired current limit.
	<ul style="list-style-type: none"> Enable the output.(Press the output ON/OFF Key. After about 2.5 seconds later, power supply changes to readback display from limit display.
	<ul style="list-style-type: none"> Check the CC annunciator is lit If the CC annunciator turn off of twinkle, choose a higher voltage limit.

» Related Remote Interface Command
`[SOURce:]VOLTage{<voltage>|UP|DOWN}`
`[SOURce:]CURRent{<current>|UP|DOWN}`
`OUTPut[:STATe] {OFF|ON|0|1}`

Application : `OUTPUT OFF` Block output
`VOLT 10` Setting voltage 10V
`CURR 5` Setting current 5A
`OUTPUT ON` Voltage & Current `OUTPUT ON`

3-3. Remote Voltage Sensing

When a electric load is connected from power supply's output terminal, voltage regulation will c from output terminal. Therefore, to supply accurate power to load, Remote Voltage Sensing (V-Sensing) can be used. Please read below to use V-sensing correctly.

CV Regulation

Specification's voltage Load Regulation attribute.

While using V-Sensing, because of the change from current, 5mV should be added to this a between+S Point and +output terminal. Because, sensing lead line is power supply's feedback It will stable when the resist value is below 0.5Ω .

Output Rating

Please read below about specification's output voltage & current.

When you use V-Sensing, the load leadline's voltage drop point will be added to it's load. Therefore if you print out more than maximum voltage, V-sensing mode will not guarantee y and power supply will be unregulated mode. Also, when each load leadline rise more than 1 the instrument will be unregulated not related to maximum voltage.

Note

What is UnRegulated mode? Disabled power supply's CC and CV

Output Noise

Noise from power supply's output can lead to a serious problem in Load Regulation. Please follow the steps below :

- twist sensing leadlines toger to decrease noise from outside.
- connect in a straight line with sensing leadline, when it's near load leadline.
- cover sensing leadline when it's disclosed.
- Noise cover equipment should be connected to GND in the closest location.

Stability

When load leadline is long and contains a lot of capacity, it can lead to a problem using V-: It will act like a filter on a part of voltage feedback loop which is problem on sensing. This will decrease the liability of power supply, and voltage terminal supply could be instable. Also, this un-reliable loop will be feedback to lead to power supply's eruption. To decrease these probability, please follow steps below :

- Connect Load & Sensing leadline as short as possible.
- twist Load leadline to use.
- Sensing leadline should be connected to load safely.

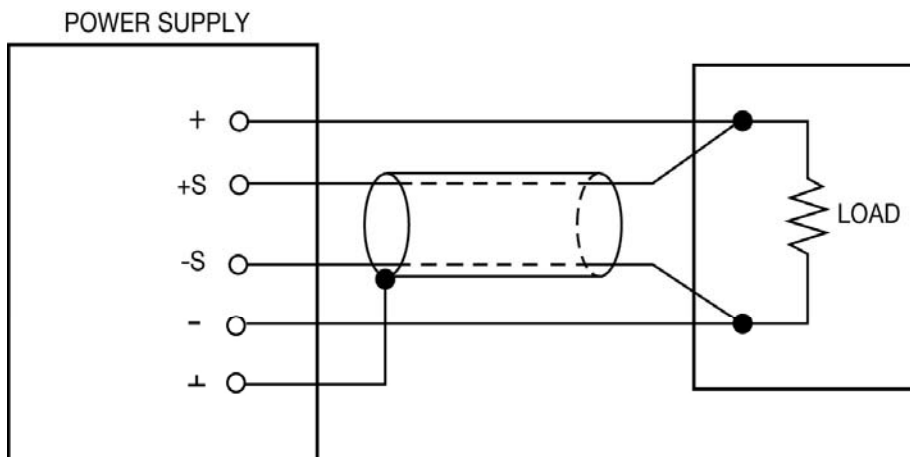
- Do not connect load leadlines to sensing terminal.

Remote Voltage Sensing Connection

Connect V-Sensing carefully checking +,- from output terminal to load. If you connect load with sensing terminal, it can turn to unregulated condition, and its very dangerous that voltage & current can be different from displaying value.

Note

To connect V-Sensing, please take out metal short-bar, and put it back on if V-Sensing is not using.














< Diagram 3-1 >

3-4. Programming Over Voltage Protection(OVP)

Disables Voltage when output voltage is higher than user set up.
Read below to set up OVP Level.

the OVP Level below can be different from others

	<p>■ Power Switch On After turning on, check "***OUTPUT OFF**" is displayed on the screen.</p>
	<p>■ Press OVP key to Level & Set up. VFD Display Description OVP ON</p>
	<p>■ In "OVP ON" condition, press OVP button once more. VFD Display Description OVP-LEVEL 32.0\</p>
	<p>■ Change value using cursor keys.</p>
	<p>■ Use encoder switch to change level value.</p>
	<p>■ When the setting is done, press OVP key. VFD Display Description CHANGED Message will be Displayed and return to front page.</p>
	<p>■ To cancel, press ESC key. There is no cancelling message, return to front page.</p>
	<p>■ To disable OVP, press OVP Key VFD Display Description OVP ON</p>
	<p>■ Press Left or Right cursor key while "OVP ON" displayed. VFD Display Description OVP OFF</p>
	<p>■ To save "OVP OFF" press OVP Key. VFD Display Description CHANGED Message will be Displayed and return to front page.</p>
	<p>■ To cancel, press ESC key. There is no cancelling message, return to front page.</p>

» Related Remote Interface Command

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

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

Refer: VOLT:PROT 20 OVP Level Setting

VOLT:PROT:STAT ON 쏘는, OVP On

VOLT:PROT:STAT OFF OVP Off

Note

Read reference "1-6. Check after power on" for more info about first OVP Setting

If output voltage is higher than OVP Level, "OVP TRIPPED" message will be displayed.

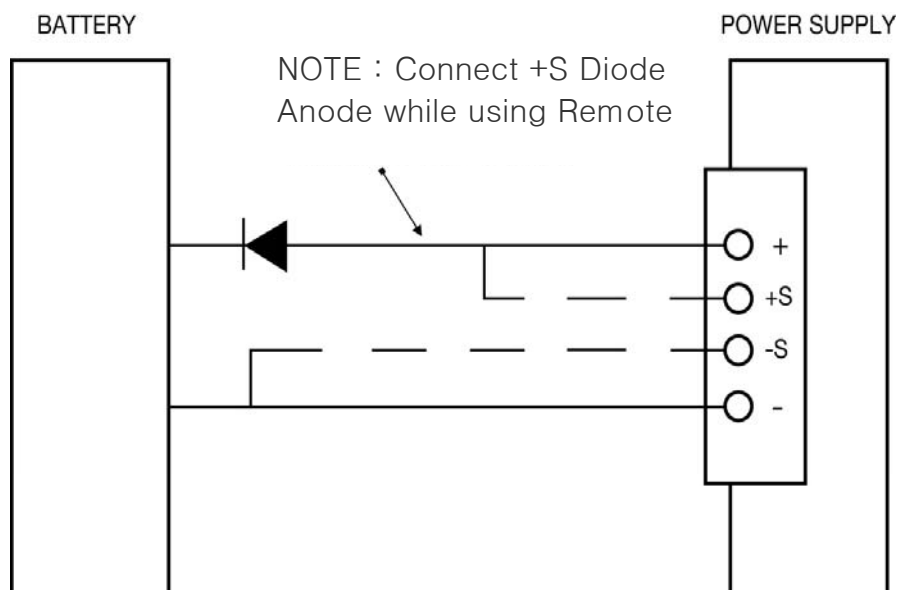
It disables output voltage & current from sources.

If you wish to output voltage & current, please remove the load and used the method below the causes of trip occurring Trip are :









First, The different OVP Level can cause trip. Therefore raise level value to get resolution.

Second, when you used load that causes counter-electromotive force from coil & motor. Can be protected as below diagram

Third, When sources used by load also can cause tripping. This happens when source one is used from load



< Diagram 3-2 >

OVP TRIPPED	<p>■ When voltage rise more than OVP Level, "OVP TRIPPED" will be displayed on VFD.</p>
	<p>■ To clear OVP Trip, raise OVP Level first. To raise OVP Level, press OVP Key.</p> <p>VFD Display Description OVP ON</p>
	<p>■ Press OVP Key once more when "OVP ON" is displayed.</p> <p>VFD Display Description OVP-LEVEL 10.0V</p>
	<p>■ Use cursor key to change value.</p>
	<p>■ Use encorder switch to raise Level.</p>
	<p>■ When the setting is done, press OVP Key.</p> <p>VFD Display Description CHANGED</p> <p>Message above will be displayed, and return to condition before trip.</p>
	<p>■ Second method to clear OVP Trip. To clear OVP, Press OVP Key.</p> <p>VFD Display Description OVP ON</p>
	<p>■ Press Left or Right while "OVP ON" is displayed.</p> <p>VFD Display Description OVP OFF</p>
	<p>■ To apply changes, press OVP Key when "OVP OFF" is displayed.</p> <p>VFD Display Description CHANGED</p> <p>Message above will be displayed, and return to condition before trip.</p>

» Related Remote Interface Command

[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 there is a trip

VOLT:PROT:TRIP? Return value "1" Check whether it is OVP Trip

VOLT:PROT:32 OVP Level Setting

VOLT:PROT:CLE OVP Trip Clear

Method to disable OVP

VOLT:PROT:TRIP? Return value "1" Check whether it is OVP Trip

VOLT:PROT:STAT OFF Disables OVP












VOLT:PROT:CLE OVP Trip Clear

3-5. Programming Over Current Protection(OCP)

Disables current when output current is higher than user set up.

Read below to set up OCP Level.

the OCP Level below can be different from others

	<p>■ Power switch ON After turning on, check "***OUTPUT OFF**" is displayed on the screen.</p>
	<p>■ To set up OCP Level & Panel press OCP Key. VFD Display Description OCP ON</p>
	<p>■ Press OCP button once more while "OCP ON" is displayed. VFD Display Description OCP-LEVEL 11.0A</p>
	<p>■ Use cursor key to change value.</p>
	<p>■ Use encorder switch to change level.</p>
	<p>■ When the setting is done, press OCP Key. VFD Display Description CHANGED Message above will be displayed and return to previous condition.</p>
	<p>■ To cancel, press ESC Key. There is no message for cancelling, return to previous condition.</p>
	<p>■ To disable OCP, press OCP Key. VFD Display Description OCP ON</p>
	<p>■ Press left or right cursor while "OCP ON" is displayed. VFD Display Description OCP OFF</p>
	<p>■ To save changes, press OCP Key while "OCP OFF" is displayed. VFD Display Description CHANGED Message above will be displayed, return to previous condition.</p>
	<p>■ To cancel, press ESC Key. There is no message for cancelling, return to previous condition.</p>

» Related Remote Interface Command

[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 Sensing condition

CURR:PROT:STAT OFF OCP Disable

Note









First OCP set-up Reference : 1-6

If output current is higher than OCP Level, "OCP TRIPPED" message will be displayed. It disables output voltage & current from sources.

If you wish to output voltage & current, please remove the load and used the method below the causes of trip occurring Trip are :

First, The different OCP Level can cause trip. Therefore raise level value to get resolution. Second, when you used load that causes counter-electromotive force from coil & motor. Can be protected as below diagram

Third, When sources used by load also can cause tripping. This happens when source one is used from load

OCP TRIPPED	<p>■ When OCP Trip occurs, "OCP TRIPPED" will be displayed on VFD.</p>
	<p>■ To clear OCP Trip, raise OCP Level in the first step. To set up Level, press OCP Key. VFD Display Description OCP ON</p>
	<p>■ Press OCP button once more while "OCP ON" is displayed. VFD Display Description OCP-LEVEL 10.0A</p>
	<p>■ Use cursor key to change value.</p>
	<p>■ Use encoder switch to raise level.</p>
	<p>■ When the setting is done, press OCP Key. VFD Display Description CHANGED Message above will be displayed, and return to condition before trip.</p>
	<p>■ Second step to clear OCP Trip. To disable OCP, press OCP Key. VFD Display Description OCP ON</p>
	<p>■ Press left or right cursor while "OCP ON" is displayed. VFD Display Description OCP OFF</p>
	<p>■ To save changes, press OCP key while "OCP OFF" is displayed. VFD Display Description CHANGED Message above will be displayed, return to condition before trip.</p>

» Related Remote Interface Command

```
[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 there is a trip
 CURR:PROT:TRIP? Return value "1" Check whether it is OCP Trip condition
 CURR:PROT 10 OCP Level Setting
 CURR:PROT:CLEAR OCP Trip Clear

Method to disable OCP when there is a Trip
 CURR:PROT:TRIP? Return value "1" Check whether it is OCP Trip condition
 CURR:PROT:STAT OFF Disable OCP
 CURR:PROT:CLEAR OCP Trip Clear







3-6. I/O Config & LOCAL

To configure the power supply for the RS-232 and RS485 interface, proceed as follows. RS232C interface is standard, in case of RS485, it is optional and remove the RS232C module. If interface is RS485 when it is shipped, address default is no. 05. Baud rate default is 9600bps and setting of RS232C & RS485 is able to set on front panel.

- The RS-232 baud rate and parity selections are stored in non-volatile memory, and does not change when power has been off or after a remote interface reset.
- If remote interface works, the lamp of RMT on front panel lits and power supply is remotely controlled preferentially.
- If you want to control power supply on local mode, at first finish remote nterface and then press the "I/O & LOCAL" key. Lamp of "RMT" turn off and you can contorol.

RS232C Setting

Sequence of RS232C Setting.

	<p>■ Turn on the power supply After turned on, check the power supply displays "**OUTPUT OFF**".</p>
	<p>■ Press "I/O" key in other to set RS232C interface. LCD Display I/O - RS232C I/O - GPIB</p>
 	<p>■ RS232C or GPIB will be displayed following previous condition. If "I/O - GPIB" displayed, press cursor key once more to "I/O - RS232C" is displayed. When VFD Displays I/O - GPIB press cursor key and change into I/O - RS232C If previous Display description is "I/O - RS232C" , perss I/O CONFIG Key. VFD Display Description BAUD-RATE 4800</p>
	<p>■ Baud rate is divided into 4800bps, 9600bps, 19200bps, 38400bps. It must be the fitted with PC Interface and Baud rate. For instance, to select 19200bps, press right cursor key twice. VFD Display Description BAUD-RATE 1920</p>
	<p>■ To save changes, press I/O CONFIG Key. VFD Display Description CHANGE SAVED Now, Interface would be RS232C and Baud rate is 19200bps.</p>

Note

What is bps? The initial of Bit per Second, data transmission unit of 1bit per one second.

RS232C Setting(Option)

- RS232C is fixed as below.

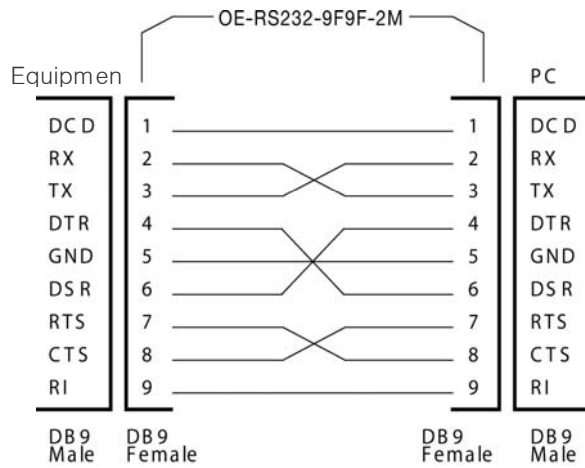
Data Bit : 8
 Stop Bit : 1
 Parity Bit : None

- RS232C Data frame structure



- To connect product and PC, Female type cross cable is required. Diagram below is explanation when both side is all female type cross cable.

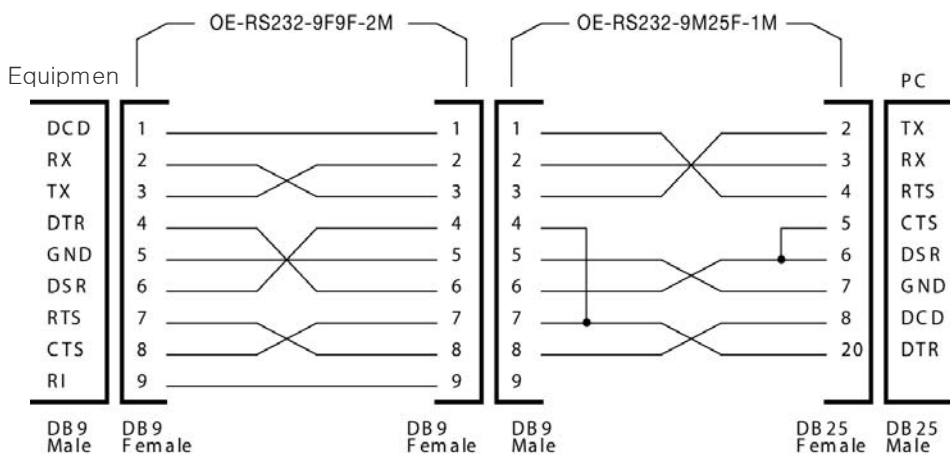
Read "1-2. Accessories & Instrument Option" for more information.



< Diagram 3-3 >

- It is convenient when you use separated adapter cable. (If you wish to use DB25PIN from

Read "1-2. Accessories & Instrument Option" for more information.










< Diagram 3-4 >

GPIB Setting

Including PC, maximum 15 connection is enabled. Network is fast and creates critical affects to production.

Draw below is how to set up GPIB.

	<p>■ Power Switch ON After turning on, check "***OUTPUT OFF**" is displayed on the screen.</p>
	<p>■ Press "I/O CONFIG Key to set up GPIB. VFD Displays I/O - RS232C OR, I/O - GPIB</p>
 	<p>■ GPIB will be displayed on previous setting. If VFD is displaying "I/O - RS232C" press cursor key once to make I/O-GPIB displayed. When VFD Display I/O - RS232C Press cursor key, and I/O - RS232C will be displayed. IF the first display description is "I/O-GPIB", press I/O CONFIG key. VFD Display Description ADR-SELECT 05</p>
 OR 	<p>■ GPIB's Address can be selected 00 ~ 30, PC Interface should be the same as GPIB Address. For instance, to set 04 address, press left cursor key once. VFD Display Description ADR-SELECT 04</p>
	<p>■ To save changes, press I/O CONFIG Key. VFD Display Description CHANGE SAVED Now, GPIB is selected for Interface, and address is set to 04.</p>

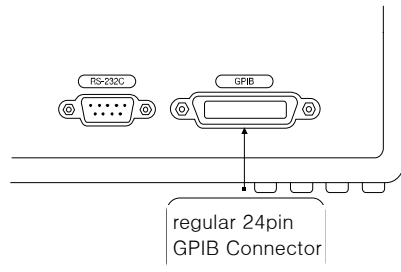
Note

RS232C port is female type, must be a cross type.

Please read "1-2. Accessories & Instrument Option" for more information.

GPIB Installation & Setting

GPIB connector is regular 24pin, located on the rear panel of our instrument.
Only available when you have selected the option.



< Diagram 3-5 >

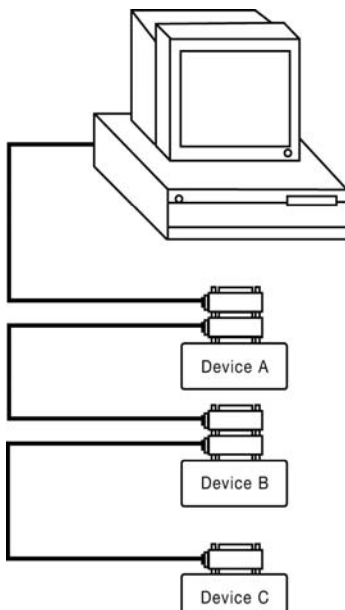
■ GPIB PC Interface Installation

When you connect each equipment, use shield line, and line should be less than 2m.

Also, do not connect more than 15 devices including PC.

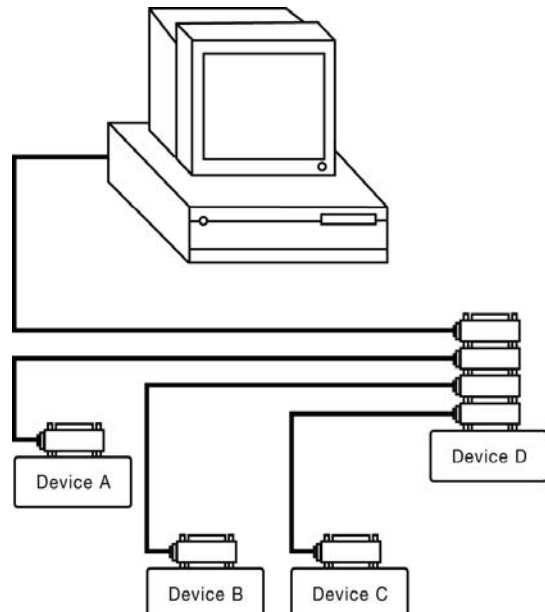
Do not use more than 3 IEEE488.2 connector block.

<A>



< Diagram 3-6 >

OR

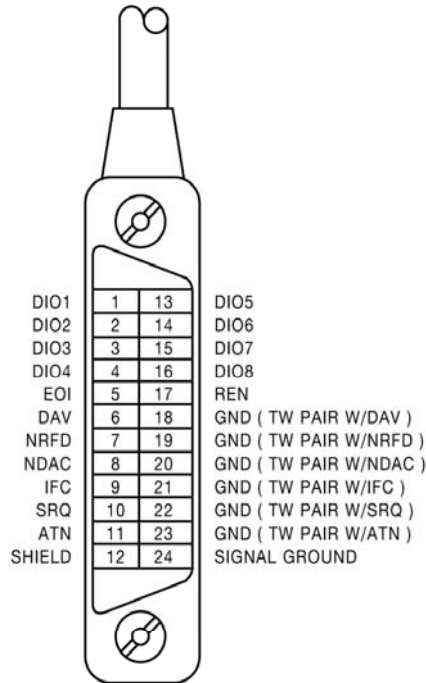


< Diagram 3-7 >

Note

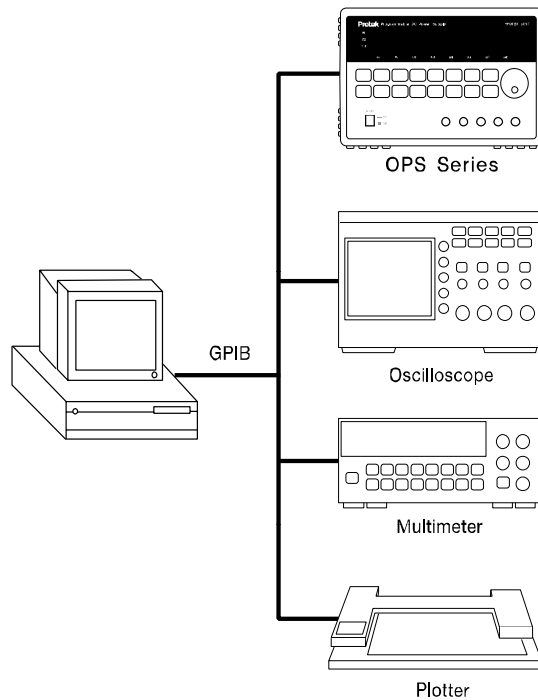
If connecting cable is more than 4M, Please read IEEE488.2 warning.

■ General GPIB 24pin Shield cable



< Diagram 3-8 >

■ Structure of power supply & load, devices below :






< Diagram 3-9 >

3-7. KEY LOCK

Function to disable all the keys on Front panel.

Can protect customers making mistakes while running the instrument.

	<ul style="list-style-type: none"> Power Switch ON After turning on, check "***OUTPUT OFF**" is displayed.
	<ul style="list-style-type: none"> Press LOCK Key once to disable front panel keys. LOCK lamp will be lighted and other keys will be disabled.
	<ul style="list-style-type: none"> To allow controlling Front panel, press LOCK Key once. LOCK lamp light will be off and allows front panel control.

» Related Remote Interface Command

KEYLock[:STATe] {OFF|ON}

KEYLock[:STATe]?

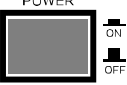



Refer: Checking KEY LOCK, Checking KEY UNLOCK

KEYL? Return value "0" Check Lock ON

KEYL ON Lock Setting

3-8. STORE / CALIBRATE

You can store the operating states that are total five voltage, current in non-volatile memory. In case of this function, the mode must be in **"**OUTPUT MODE**"**. If the mode of power supply is output on mode, store key is used the left move key of cursor. Proceed as follows.
OVP & OCP 's Level is stored, not On.OFF condition.

	<ul style="list-style-type: none"> Power Switch ON After turning On, please check "**OUTPUT OFF**" is displayed.
	<ul style="list-style-type: none"> To save user's memory, press STORE Key. <p>VFD Display Description STORE NO, 01</p>
	<ul style="list-style-type: none"> Use cursor key to change slots. For instance, press right key to select 02 slot or use encoder switch <p>VFD Display Description STORE NO, 02</p>
	<ul style="list-style-type: none"> To save slot, press STORE Key once. <p>VFD Display Description STORE DONE</p>
	<ul style="list-style-type: none"> After STORE DONE displayed, return to previous condition.

» Related Remote Interface Command

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

Refer: *SAV 4 User's memory



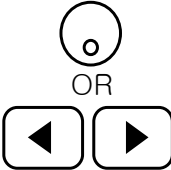

Note

User's memory can be reset. Please read reference "5-4" USER-MEM CLEAR.

3-9. RECALL / FACTORY

You can recall the saved operating states that are total five voltage, current in non-volatile memory. In case of this function, the mode must be in **"**OUTPUT MODE**"**. If the mode of power supply is output on mode, recall key is used the right move key of cursor. Proceed as follows.

Under tracking mode, if you use recall function, cancelled the tracking mode.

	<p>■ Power Switch ON After turning on, please check "**OUTPUT OFF**" is displayed.</p>
	<p>■ To bring back saved slots, press RECALL Key. VFD Display Description RECALL NO, 01</p>
	<p>■ Use encorder switch or cursor key to select saved slots. For instance, if you wish to bring back 02 slot, press right cursor key once, or use trun the encorder switch clock-wise. VFD Display Description RECALL NO, 02</p>
	<p>■ To save changes, press RECALL Key once. VFD Display Description RECALL DONE</p>
	<p>■ After displayed "RECALL DONE", return to previous condition.</p>




» Related Remote Interface Command

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

*Refer: *RCL 4 User's Memory*

3-10. OUTPUT ON/OFF

Enables or disables the power supply output. This key toggles between on and off. At the output off mode, voltage and current output is 0V and 50mA, therefore you can acquire the effect of output off without remove the connected DUT. Proceed as follow:

	<p>■ Power Switch ON After turning On, please check "**OUTPUT OFF**" is displayed.</p>
	<p>■ To allow general output, press OUTPUT ON/OFF Key once more.</p>
	<p>■ To block again, press OUTPUT ON/OFF Key once more.</p>

» Related Remote Interface Command

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

OUTPut[::STAtE]?

Refer: Check Output condition, Method to turn it ON

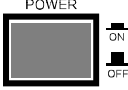



OUTP? Return value "0" Check output condition

OUTP ON Allow output

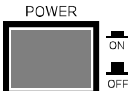



3-11. V/I & LMT DISPLAY

Shows voltage and current limit values on the display and allows knob adjustment for setting limit values. Also you can choose between voltage limit set or current limit set.

V/I Function

	<ul style="list-style-type: none"> Power Switch ON After turning on, please check "***OUTPUT OFF**" is displayed.
	<ul style="list-style-type: none"> To set up voltage & current limit, press OUTPUT ON/OFF Key.
	<ul style="list-style-type: none"> Cursor will blink to voltage. When it is blinking, press V/I to move it to current side.
	<ul style="list-style-type: none"> To move back to voltage side, press V/I Key once more.

LMT DISPLAY Function

	<ul style="list-style-type: none"> Power Switch ON After turning On, please check "***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"> Wait for 2.5 seconds approximately, when the blinking cursor disappears, press LMT DISPLAY Key.
	<ul style="list-style-type: none"> Return back to Limit Display condition after blinking
	<ul style="list-style-type: none"> Press LMT DISPLAY Key once more to move back to V/I Selection.

Note

1. If you turn encorder switch while cursor is blinking, Limit Display will be last. While cursor is not blinkir turn to ReadBack Display.
2. When you press cursor key while blinking, Limit Display will be last. While cursor is nott blinking, turn to ReadBack Display.

3-12. CYCLING MODE

Simple function for implement of a load. Can set repeating time, Slope Time, Delay.
 Also, this function do not need any PC interfaces & software, can be operated by itself.

Attributes

- Operates independently
- Safe saving using infinit memory
- Voltage, Current, Slope Time, Delay Time can be saved up to 100 slots
- Cycling mode test available using sequence panel
- Support repetition up to 1500 times.

Record Tabel

- Create Record Table below to use it with convenience.

STEP				
STEP	VOLT	CURR	SLOPE TIME	DELAY TIME
1	4.5	5	10	60
2	5	5	10	60
3	5.5	5	10	60

SEQUENCE	
START NUMBER	FINISH NUMBER
1	3

REPEAT
100

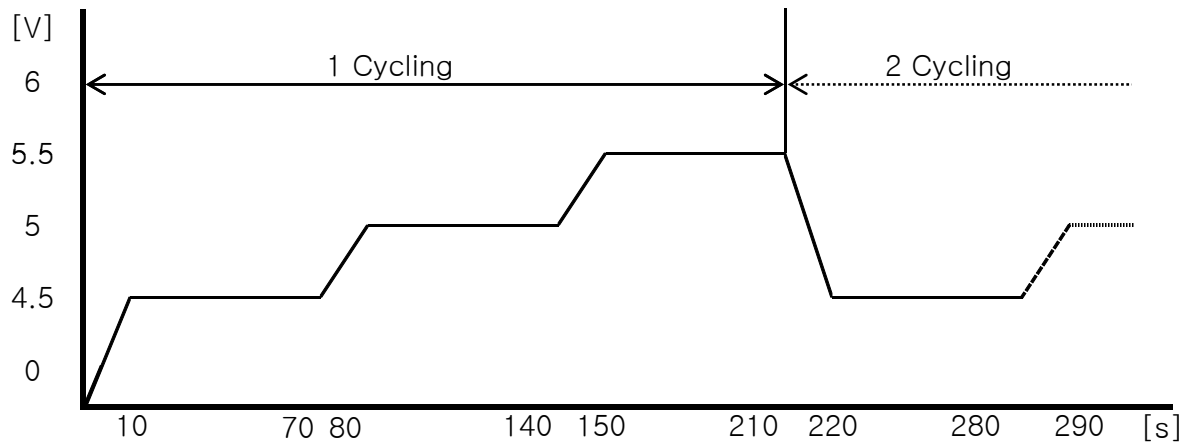
- >step 1 : If it was 0V before operating, voltage will rise up to 4.5V within 10seconds.
 Current will be 5A at the same time.
 When the Slope Time is done, 4.5V will maintain for 60seconds.
 After 60 seconds, go on to step 2.
- >step 2 : After setting current 5A, Voltage will be rise up to 5V within 10seconds.
 When the Slope Time is done, 5V will maintain for 60seconds.
 After 60 seconds, go on to step 3.
- >step 3 : After setting current 5A, Voltage will rise from 5V up to 5.5V within 10seconds
 When the Slope Time is done, 5.5V will maintain for 60seconds
 After 60 seconds, repeat step 1 to step 3 that REPEAT is set.

> After 100 times,

CYCLING FINISH

 message will be displayed and finish cyclir

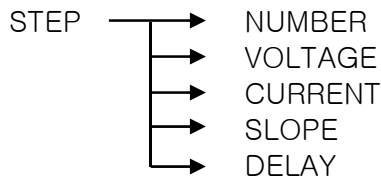
- Power Supply's output Scope
Pretend output voltage is 0V before Start.



STEP

- Step Number, Voltage, Current, Slope Time, Delay Time can be entered in STEP

- STEP's Structure




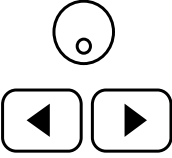



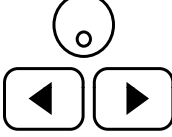





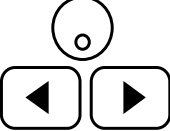



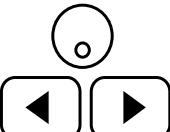



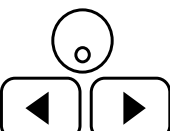


- ◆ NUMBER
Setting memory range for Voltage, Current, Slope Time, Delay Time

> Memory Range 1~100
- ◆ VOLTAGE
Set step's voltage value from number.
> Voltage rang Full Range
- ◆ CURRENT
Set current value from Number Selected.
> Current rang Full Range
- ◆ SLOPE
Set step's voltage rise or decrease time from number

> Setting Time 100 ms ~ 24Hours (86,400 seconds)
- ◆ DELAY
Maintaining time for selected set from number.
Delay Time is activated when Slope Time is finished.
> Setting Time 100 ms ~ 24Hours (86,400 seconds)

Setting STEP

	<p>■ Power Switch ON After turning On, please check "***OUTPUT OFF**" is displayed.</p>
	<p>■ Press STEP Key. VFD Display Description TEP 001 - NUMBE</p>
	<p>■ To set up Step Number, press STEP Key once more. VFD Display Description - NUMBER 001</p>
	<p>■ To change Step Number, use cursor key or encorder switch. For instance, to change to 002, press right cursor key once or turn encorder switch clock-wise. VFD Display Description - NUMBER 002</p>
	<p>■ To set up, press STEP Key once. Changed value will be displayed. VFD Display Description TEP 002 - NUMBE</p>
	<p>■ To set Voltage, press right cursor key. VFD Display Description TEP 002 - VOLTAG</p>
	<p>■ Press STEP Key. VFD Display Description VOLTAGE 00.000</p>
	<p>■ For instance, to set 4.5V, use encorder and cursor key to change. VFD Display Description VOLTAGE 04.500</p>
	<p>■ To set up, press STEP Key. VFD Display Description TEP 002 - VOLTAG</p>
	<p>■ To set up current, press right cursor key once. VFD Display Description TEP 002 - CURREN</p>

	<p>■ Press STEP Key. VFD Display Description CURRENT 00.000</p>
	<p>■ For instance, to set 5A, use encorder and cursor key to change. VFD Display Description CURRENT 05.000</p>
	<p>■ To set up, press STEP Key. VFD Display Description STEP 002 - CURREN</p>
	<p>■ To set up SLOPE TIME, press right cursor key once. VFD Display Description STEP 002 - SLOPE</p>
	<p>■ Press STEP Key. VFD Display Description SLOPE 00000.</p>
	<p>■ For instance, to set up 5seconds, use encorder and cursor key to change. VFD Display Description - SLOPE 00005.0</p>
	<p>■ To set up, press STEP Key once. VFD Display Description STEP 002 - SLOPE</p>
	<p>■ To set up DELAY TIME, press right cursor key once. VFD Display Description STEP 002 - DELAY</p>
	<p>■ Press STEP Key. VFD Display Description DELAY 00000.</p>
	<p>■ For instance, to set up 60seconds, use encorder and cursor key to change VFD Display Description - DELAY 00060.0</p>
	<p>■ To set up, press STEP Key once. VFD Display Description STEP 002 - DELAY</p>
	<p>■ After saving changes above, press ESC Key to go back to previous page.</p>

SEQUENCE

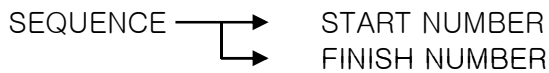
- Repeat & operate starting point and finish point. If Start Number is higher than Finish Number, it causes error immediately.

When an error occurs, please read "7. Error Messages"

Note

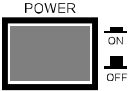


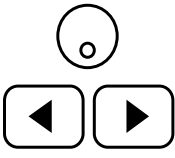

It is convenient to control many other test modes dividing 100 step range using Start number and Finish number in Sequence menu.




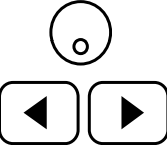

SEQUENCE Structure



- ◆ **START NUMBER**
Set Step Starting point.
> Selection range 1~100
- ◆ **FINISH NUMBER**
Set Step Finishing point.
> Selection range 1~100

SEQUENCE Number Input

	<ul style="list-style-type: none"> Power Switch ON After turning On, please check "***OUTPUT OFF**" is displayed.
	<ul style="list-style-type: none"> Press SEQUENCE Key. VFD Display Description SEQUENCE - STAR
	<ul style="list-style-type: none"> To set up START Number, press SEQUENCE Key. VFD Display Description START NO. 001
	<ul style="list-style-type: none"> Use cursor key or encorder switch to select 0~99 STEP. For instance, to set starting point number 002, press right cursor key or turn encorder switch clock-wise. VFD Display Description START NO. 002
	<ul style="list-style-type: none"> To save, press SEQUENCE Key. After "CHANGE SAVED" Message Displayed, VFD will go back to previous Sequence.

	<p>■ To set up FINISH Number, press SEQUENCE Key. VFD Display Description SEQUENCE - STAR</p>
	<p>■ To select FINISH Number, press cursor key once. VFD Display Description SEQUENCE - FINIS</p>
	<p>■ To set up, press SEQUENCE Key once more. VFD Display Description FINISH NO. 100</p>
	<p>■ Use cursor key or encorder switch to change steps from 2~100. For instance, to set 003, press right cursor key or turn encorder switch clock-wise. VFD Display Description FINISH NO. 003</p>
	<p>■ To save, press SEQUENCE Key. After "CHANGE SAVED" Message Displayed, VFD will go back to previous Sequence.</p>

REPEAT



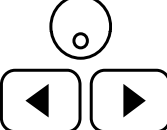

This is third step after entering Voltage, Current, Slope Time, Delay Time. This step sets number Repetition in the cycling mode.

◆ REPEAT

Set REPEAT Number.

> Selection number 1~15 million

INPUT REPEAT NUMBER

	<p>■ Power Switch ON After turning On, please check "***OUTPUT OFF**" is displayed.</p>
	<p>■ Press REPEAT Key. VFD Display Description REPEAT 000010</p>
	<p>■ To set up number of repeating value, use cursor key or turn encorder switch clock-wise. For instance, to set 200 repeat, press right cursor key once or turn encorder switch clock-wise. VFD Display Description REPEAT 000020</p>
	<p>■ To save, press REPEAT Key. After "CHANGE SAVED" Message Displayed, VFD will go back to previous Sequence.</p>

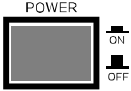

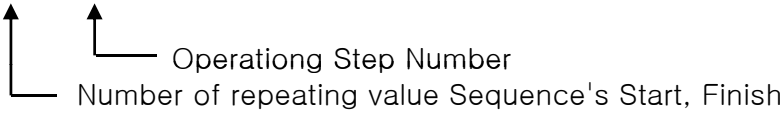
RUN / STOP

When you have done above steps, use RUN/STOP Key to start testing.

When you press RUN/STOP Key, it will start testing the first data. If an error occurs, Cycling mode will be cancelled and error message will be saved with alarm.

If there is an error, please refer "7. Error Messages".

RUN / STOP OPERATING

	<ul style="list-style-type: none"> Power Switch ON After turning On, please check "***OUTPUT OFF**" is displayed.
	<ul style="list-style-type: none"> Press RUN / STOP Key.
	<ul style="list-style-type: none"> Display Description CYC - 00000000 - 001 





3-13. ERROR

Error found in self-testing mode, calibration, SCPI Program, will be saved in volatile memory up

Read reference "7. Error Messages" for more information

- ERROR's memory is stack-structured, and the latest error will be accessed.
- Error message will be stored max 10, from 11th message, first saved message will be del
- When you check message by pressing ERROR Key, messages from last will be deleted.
- There will be a alarm everytime when an ERROR occurs.

Check ERROR

	<ul style="list-style-type: none"> ■ Power Switch ON After turning On, please check "***OUTPUT OFF**" is displayed.
	<ul style="list-style-type: none"> ■ To check ERROR message, press ERROR Key. If there is no Error, below description will be displayed for 2 seconds and return to previous page. VFD Display Description ERROR NO ERRO ■ If there is an Error, Error number will be displayed VFD Display Description ERROR NO, -200
	<ul style="list-style-type: none"> ■ To check next ERROR number, press ERROR Key. If there is an Error the Error number 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"

Able to check Error number and message

Note

1. Only ERROR Numbers can be check from Front panel, and message discription can be checked from remote interface.
2. Stack memory? FILO(First In Last Out)-structured

Queue memory? FIFO(First In First Out)-structured

3-14. ESC

Move on to local mode when you cancel entering menu and low menu.

Note

If you do not panel about 10seconds on front panel, esc key will be activated by itself.

4. CALIBRATION

Warning

Do not use calibrate function without person with knowledge.
Calibration should be done > every 180 days for accuracy
cyclically. > every 365 days to be activated properly

4-1. Attributes

- Calibrate without opening case
- Calibration using Front panel Key
- PC based calibration from Remote Interface
- Store in fixed memory
- Support Calibration data Backup & Value Backup

4-2. Preparing for accurate calibration

- Use measuring instruments should measure spec of power supply.
- Give more than 1 hour in temp 20~30 degree to warm up.

- Humidity should be below 80%.
- Connect Power Supply's output terminal to load instrument.
- Other instruments that causes magnetic field should be off.

4-3. Required efficiency for accurate calibration

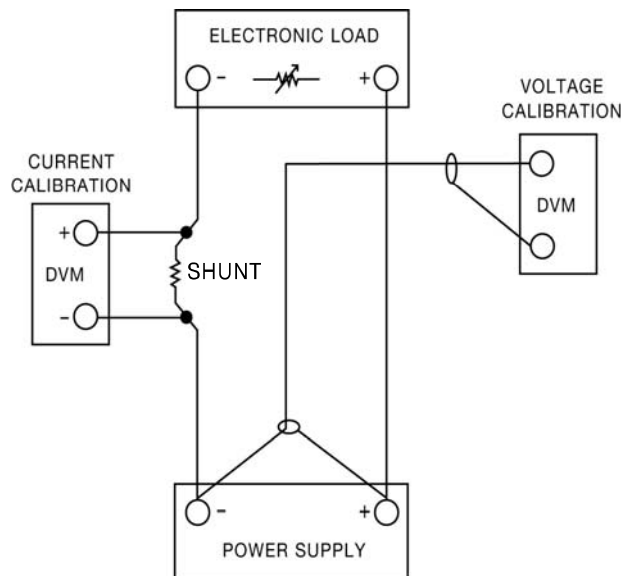
Instrument	Required Efficiency	Recommendation	Usage
GPIB Controller	Full GPIB capabilities	Agilent 82341C Interface card	PC based Calibration
Digital Voltmeter	Resolution: 0.1 mV Accuracy: 0.01%	Agilent 34401A	Voltage Calibration
Electronic Load	Voltage Range: 50 Vdc Current Range: 10 Adc Open and Short Switches Transient On/Off	Agilent 6063B	Current Calibration, Power Supply Protection
Current monitoring	0.01Ω , 0.01%		while Current Calibration Monitoring Voltage
Oscilloscope	100 MHz with 20MHz bandwidth	Tektronix TDS3014	ripple & noise Measuring

4-4. Calibration Technique

Technical description about calibration below :

Instrument Connection

- Connect output terminal and measuring instrument as below.
- While Voltage Calibration, Switch OFF electric load, or remove from output terminal.



< Diagram 4-1 >

Electronic Load

- Use electronic load which changes resistor from power supply's current calibration
- Must be able to short Load with On/Off function.
- Must be suitable with GPIB network, using pc calibration.

Current-Monitoring Resistor(shunt)

- Use current monitoring resistor for general current measuring
- Make less TCR 10ppm.
- Use 0.01% standard resist.

DVM(Digital Volt Meter)

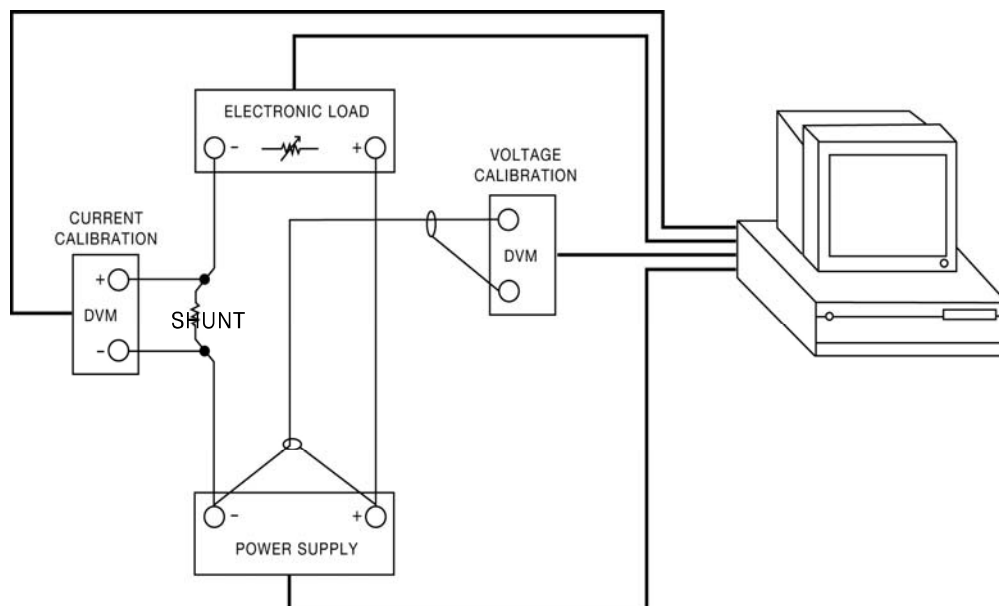
- Used in Voltage Calibration & Current monitoring Sensing measurement.
- Use measuring instrument which displays more than Resolution: 0.1 mV , Accuracy: 0.01%
- Must be suitable with GPIB network, using pc calibration.

Programming

This instrument supports PC Interface based Calibration.

Connect Power Supply, DVM, Ammeter, Electric Load using GPIB, and there will be no error and allow accurate calibration data.

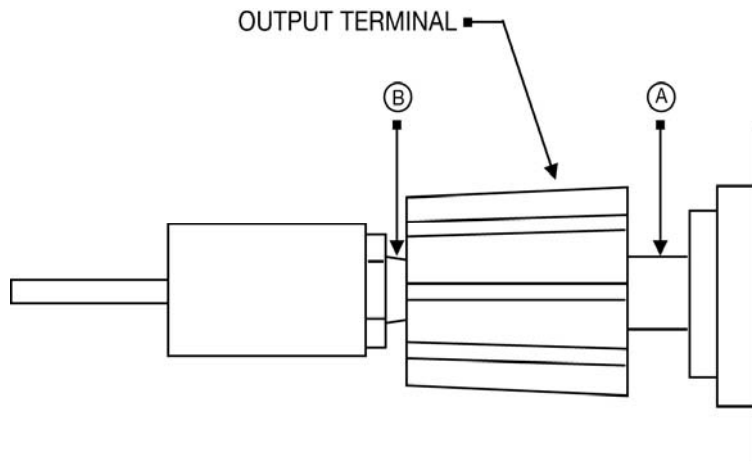
GPIB Connection below :



< Diagram 4-2 >

Measuring Location

If you wish to get accurate result of load regulation, pk-pk voltage and response time, Follow as below :



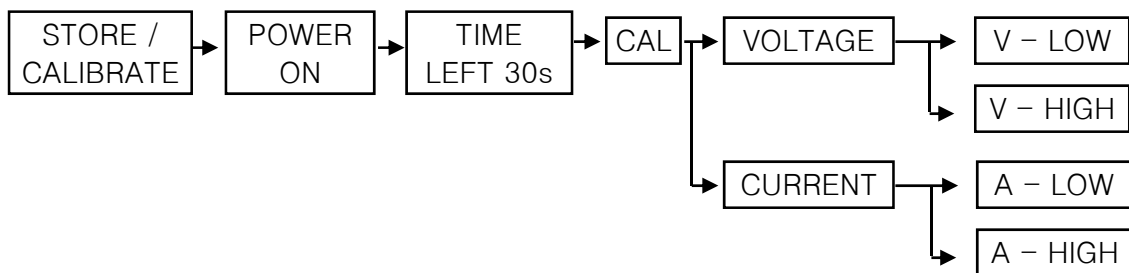
Front Panel Terminal Connections (Side View)

< Diagram 4-3 >

4-5. Calibration using Front Panel

Explanation about Front panel using CALIBRATE Key to fix manual.

CALIBRATE KEY Structure




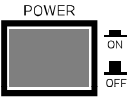


CALIBRATE Setting Range

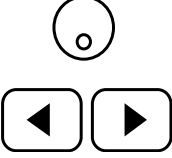

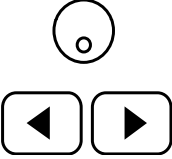

- Voltage & Current Calibration is divided into LOW and HIGH.
- It is range chart for each model below.

MODEL		LOW		HIGH		MAX Output
		Low	High	Low	High	
OPS-95	Voltage	0.00V	0.90V	8.70V	9.60V	9.45V
	Current	0.00A	0.50A	4.80A	5.30A	5.25A
OPS-97	Voltage	0.00V	0.90V	8.70V	9.60V	9.45V
	Current	0.00A	0.70A	6.80A	7.50A	7.35A
OPS-910	Voltage	0.00V	0.90V	8.70V	9.60V	9.45V
	Current	0.00A	1.00A	10.00A	11.00A	10.5A
OPS-915	Voltage	0.00V	0.90V	8.70V	9.60V	9.45V
	Current	0.00A	1.50A	14.50A	16.20A	15.75A
OPS-920	Voltage	0.00V	0.90V	8.70V	9.60V	9.45V
	Current	0.00A	2.00A	19.50A	21.50A	21A
OPS-930	Voltage	0.00V	0.90V	8.70V	9.60V	9.45V
	Current	0.00A	3.00A	29.00A	32.00A	31.5A
OPS-183	Voltage	0.00V	1.80V	17.70V	19.50V	18.9V
	Current	0.00A	0.30A	2.90A	3.20A	3.15A
OPS-185	Voltage	0.00V	1.80V	17.70V	19.50V	18.9V
	Current	0.00A	0.50A	4.80A	5.30A	5.25A
OPS-187	Voltage	0.00V	1.80V	17.70V	19.50V	18.9V
	Current	0.00A	0.70A	6.80A	7.50A	7.35A
OPS-1810	Voltage	0.00V	1.80V	17.70V	19.50V	18.9V
	Current	0.00A	1.00A	10.00A	11.00A	10.5A
OPS-1815	Voltage	0.00V	1.80V	17.70V	19.50V	18.9V
	Current	0.00A	1.50A	14.50A	16.20A	15.75A
OPS-302	Voltage	0.00V	3.00V	29.00V	32.00V	31.5V
	Current	0.00A	0.20A	2.00A	2.20A	2.1A
OPS-303	Voltage	0.00V	3.00V	29.00V	32.00V	31.5V
	Current	0.00A	0.30A	2.90A	3.20A	3.15A
OPS-305	Voltage	0.00V	3.00V	29.00V	32.00V	31.5V
	Current	0.00A	0.50A	4.80A	5.30A	5.25A
OPS-307	Voltage	0.00V	3.00V	29.00V	32.00V	31.5V
	Current	0.00A	0.70A	6.80A	7.50A	7.35A
OPS-3010	Voltage	0.00V	3.00V	29.00V	32.00V	31.5V
	Current	0.00A	1.00A	10.00A	11.00A	10.5A
OPS-501	Voltage	0.00V	5.00V	48.00V	53.00V	52.5V
	Current	0.00A	0.10A	1.00A	1.10A	1.05A
OPS-502	Voltage	0.00V	5.00V	48.00V	53.00V	52.5V
	Current	0.00A	0.20A	2.00A	2.20A	2.1A
OPS-503	Voltage	0.00V	5.00V	48.00V	53.00V	52.5V
	Current	0.00A	0.30A	2.90A	3.20A	3.15A
OPS-505	Voltage	0.00V	5.00V	48.00V	53.00V	52.5V
	Current	0.00A	0.50A	4.80A	5.30A	5.25A

OPS-801	Voltage	0.00V	8.00V	77.00V	85.00V	84V
	Current	0.00A	0.10A	1.00A	1.10A	1.05A
OPS-802	Voltage	0.00V	8.00V	77.00V	85.00V	84V
	Current	0.00A	0.20A	2.00A	2.20A	2.1A
OPS-803	Voltage	0.00V	8.00V	77.00V	85.00V	84V
	Current	0.00A	0.30A	2.90A	3.20A	3.15A
OPS-1001	Voltage	0.00V	10.00V	96.00V	107.00V	105V
	Current	0.00A	0.10A	1.00A	1.10A	1.05A
OPS-1002	Voltage	0.00V	10.00V	96.00V	107.00V	105V
	Current	0.00A	0.20A	2.00A	2.20A	2.1A
OPS-1003	Voltage	0.00V	10.00V	96.00V	107.00V	105V
	Current	0.00A	0.30A	2.90A	3.20A	3.15A
OPS-1501	Voltage	0.00V	15.00V	144.00V	160.00V	157.5V
	Current	0.00A	0.10A	1.00A	1.10A	1.05A
OPS-1502	Voltage	0.00V	15.00V	144.00V	160.00V	157.5V
	Current	0.00A	0.20A	2.00A	2.20A	2.1A
OPS-2001	Voltage	0.00V	20.00V	192.00V	215.00V	210V
	Current	0.00A	0.10A	1.00A	1.10A	1.05A
OPS-3001	Voltage	0.00V	30.00V	288.00V	320.00V	315V
	Current	0.00A	0.10A	1.00A	1.10A	1.05A






CALIBRATE Voltage









	<ul style="list-style-type: none"> ■ Connect instrument before calibration.
 <i> Holding</i>	<ul style="list-style-type: none"> ■ Keep pressing CALIBRATE key and turn on the power.
	<ul style="list-style-type: none"> ■ Power Switch ON
	<ul style="list-style-type: none"> ■ When the self-testing mode is done, "LEFT 30" Message will be displayed. Let go CALIBRATE Key.
<i>30초 대기</i>	<ul style="list-style-type: none"> ■ After 30 seconds, it will enter CALIBRATE Mode. VFD Display Description CAL - VOLTAGE
	<ul style="list-style-type: none"> ■ Press CALIBRATE Key while "CAL - VOLTAGE" is displayed. VFD Display Description V-LOW 00.000V

	<ul style="list-style-type: none"> Wait for voltage on the DVM meter to be settled.
	<ul style="list-style-type: none"> Use cursor key and encoder switch to input voltage value on DVM Meter. <p>For instance, if it is 154.1mV, set as below :</p> <p>VFD Display Description V-LOW 00.154V</p>
	<ul style="list-style-type: none"> When it is done, press CALIBRATE Key to go on to High Range. <p>VFD Displays ADC-LO 00001B</p> <p>V-HIGH 29.000V <i>Turn to High Calibration condition.</i></p>
	<ul style="list-style-type: none"> Wait for voltage on the DVM meter to be settled.
	<ul style="list-style-type: none"> Use cursor key and encoder switch to input voltage value on DVM Meter. <p>For instance, if it is 30.123V, input data as below :</p> <p>VFD Display Description V-LOW 30.123V</p>
	<ul style="list-style-type: none"> When it is done, press CALIBRATE Key to save. <p>VFD Displays ADC-HI 01FF1C</p> <p>MEMORY SAVED</p> <p>SYSTEM RESTART</p>
	<ul style="list-style-type: none"> Calibration data will not be changed until Panelling HIGH is done.

Paneling Current CALIBRATION

- Connect instrument before fixing.
 - > Connect Power Supply's plus(+) output terminal to Load's input terminal(+), and connect input terminal to current monitoring resist, and connect power supply's (-) output terminal opposite resist lead

 <i> Holding</i>	<ul style="list-style-type: none"> ■ Press power switch while holding CALIBRATE Key.
	<ul style="list-style-type: none"> ■ Power Switch ON
	<ul style="list-style-type: none"> ■ When self-testing is done, let go CALIBRATE Key when VFD displays "LEFT 30 MESSAGE" .
<i>Wait for 30 seconds</i>	<ul style="list-style-type: none"> ■ After 30 seconds, it will enter to CALIBRATE Mode. VFD Display Description CAL - VOLTAGE
	<ul style="list-style-type: none"> ■ To calibrate current, press cursor key once. VFD Display Description CAL - CURRENT
	<ul style="list-style-type: none"> ■ In "CAL - CURRENT" condition, press CALIBRATE Key. VFD Display Description A-LOW 00.000A
	<ul style="list-style-type: none"> ■ Wait for DVM meter to be stabled.
	<ul style="list-style-type: none"> ■ When it is stabled, calculate current value.

  	<ul style="list-style-type: none"> Use encoder switch or cursor key to input changed current value. <p>VFD Display Description A-LOW 00.123A</p>
	<ul style="list-style-type: none"> When input is done, press CALIBRATE Key to turn to high range. <p>VFD Displays ADC-LO 00001B <i>displays HEX for 500ms (inside readback)</i> A-HIGH 09.000A <i>High Calibration condition</i></p>
	<ul style="list-style-type: none"> Wait for DVM meter to be stabled.
	<ul style="list-style-type: none"> When it is stabled, calculate current value.
  	<ul style="list-style-type: none"> Input current value using encoder switch or cursor key. <p>VFD Display Description A-LOW 10.123A</p>
	<ul style="list-style-type: none"> Press CALIBRATE Key to save. <p>VFD Displays ADC-HI 01FF1C MEMORY SAVED <i>Saves Calibration description in Memory</i> SYSTEM RESTAR <i>activate System reset</i></p>
	<ul style="list-style-type: none"> Calibration data will not changed when HIGH is not done.

4-6. Calibration (GPIB) using REMOTE INTERFACE

Explanation about remote calibration using remote Interface.

Other commands cannot be used while remote calibration.

Connect measuring instrument

- Before, calibration, connect to a measuring instrument (Diagram 4-2).
- Input GPIB Address in each measuring instrument.
- Activate Warming-up including power supply and required measuring instrument.

Command sequence Remote Calibration

- Read reference "6-6. Calibration command" SCPI commands.
- When an error occurs, Remote Calibration will be cancelled.

- Restart Remote Calibration if there is an error.
- Sequence (Calibration:Voltage or, Calibration:Current)
MIN → VALUE → MAX → VALUE

Operating Voltage CALIBRATION

- Send electric load switch off command.

- Send Power Supply voltage minimum calibration command.
Command : `CAL:VOLT MIN`

- After specific time, measure DVM voltage.

- Send measured voltage value to power supply.
For instance, if measured value is 0.1234, send as below :
Command : `CAL:VOLT 0.1234`

- Send power supply voltage Maximum Calibration command.
Command : `CAL:VOLT MAX`

- After specific time, measure DVM Voltage.

- Send measured voltage value to power supply voltage value.
For instance, when measured value is 30.123, send as below :
Command : `CAL:VOLT 30.123`

Operating Current CALIBRATION

- Setting current mode after sending electric load switch ON command.
- Send power supply current minimum calibration command.
Command : `CAL:CURREN MIN`
- Set maximum current value to make CC mode.

- After specific time, measure DVM Voltage connected with current monitoring resist.
- Send output current value from calculating program to power supply value.

For instance, if calculated value is 0.1234, send as below :
Command `CAL:CURREN 0.1234`
- Send Voltage Maximum Calibration command to Power Supply.
Command `CAL:CURREN MAX`
- After specific time, measure DVM Voltage connected with current monitoring resist.
- Send output value from calculating program to power supply value.
For instance, if calculated value is 10.123, send as below :
Command `CAL:CURREN 10.123`

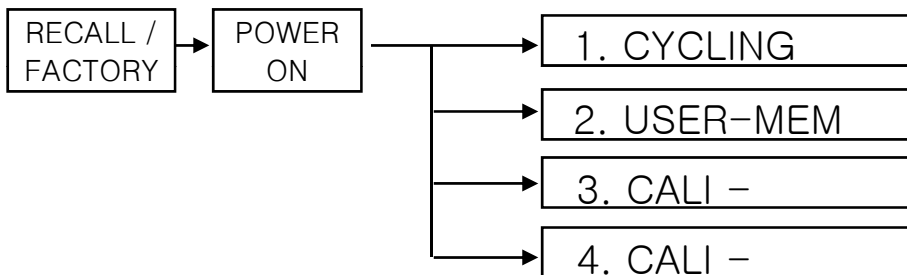
5. FACTORY

This instrument supports user's memory backup, Cycling Mode, Calibration backup & restore of

5-1. Attribute

- Reset 10 data in User's Memory.
- Reset data from CYCLING MODE.
- Restore & Backup CALIBRATION Data.
- Saves into fixed memory.
- Controlling using Remote Interface.




5-2. FACTORY KEY STRUCTURE



5-3. CYCLING CLEAR

- Command that resets memory 1~100 from Cycling mode.
- When the command above is done, can not be returned.
- Reset Description
 - >Step Voltage 00.000V
 - >Step Current 00.000A
 - >Step Slope T 00000.0s
 - >Step Delay T 00000.0s
 - >Sequence St Set No.1 memory
 - >Sequence Fi Set memory for No.100
 - >Repeat 100 Times

Operating CYCLING CLEAR

 <i> Holding</i>	<ul style="list-style-type: none"> ■ Power Switch ON while holding FACTORY Key.
	<ul style="list-style-type: none"> ■ Power Switch ON
	<ul style="list-style-type: none"> ■ When "1. CYCLING CLEAR" Message is displayed, stop holding Key.
	<ul style="list-style-type: none"> ■ To clear Cycling Memory, press FACTORY Key once more. ■ When "MEMORY RESET" is displayed, It is properly activated. ■ "SYSTEM RESTART" will be displayed and reset the system.

» Related Remote Interface Command






FACTory:CYCling CLEar

Refer: FACT:CYC CLE Cycling Memory Reset

5-4. USER-MEM CLEAR

- Command to clear user's memory up to 1~10.
- When it is activated, previous data cannot be seen.
- Reset description
 - >Voltage 0V
 - >Current Limit Maximum value
 - >OVP-Level OVP set maximum value
 - >OCP-Level OCP set maximum value

Operating USER-MEM CLEAR

 <i> Holding</i>	<ul style="list-style-type: none"> ■ Switch the power ON while holding FACTORY Key.
	<ul style="list-style-type: none"> ■ Power Switch ON
	<ul style="list-style-type: none"> ■ When "1. CYCLING CLEAR" displayed, stop holding FACTORY Key.
	<ul style="list-style-type: none"> ■ Press right cursor key once to enter in to user's memory. VFD Display Description USER-MEM CLE
	<ul style="list-style-type: none"> ■ To clear user's memory, press FACTORY Key once more. ■ When "MEMORY RESET" is displayed, it is activated properly. ■ "SYSTEM RESTART" will be displayed, and reset the system.

» Related Remote Interface Command






FACTory:USER-Memory CLEAR

Refer: FACT:USER-M CLE

5-5. CALI-RESTORE

- Restores saved Calibration data to current system.
- Can be used when user Calibrated with no info, or made a mistake while calibration.

Operating CALI-RESTORE

 <i> Holding</i>	<ul style="list-style-type: none"> ■ Switch Power ON while holding FACTORY Key.
	<ul style="list-style-type: none"> ■ Power Switch ON
	<ul style="list-style-type: none"> ■ When "1. CYCLING CLEAR" is displayed, stop holding FACTORY Key.
	<ul style="list-style-type: none"> ■ press right cursor twice to enter Restore menu. VFD Display Description 3. CALI - RESTOR
	<ul style="list-style-type: none"> ■ To restore Calibration data, press FACTORY Key once more.
	<ul style="list-style-type: none"> ■ When "RESTORED" is displayed, it is activated properly. ■ "SYSTEM RESTART" will be displayed and reset the system.

» Related Remote Interface Command






FACTory:CALibration REStore

Refer: FACT:CAL RES Calibration restoration

5-6. CALI-BACKUP

- When forwarding, fixed data will be saved in protected non-volatile memory.
- To assure accuracy, instrument should be calibrated within 6 months.
- To be protected safely, There could be a calibration data backup.
- When the backup is operated, previous backup description cannot be restored.

Operating CALI-BACKUP

 <i>Holding</i>	<ul style="list-style-type: none"> ■ Switch Power ON while holding FACTORY Key.
	<ul style="list-style-type: none"> ■ Power Switch ON
	<ul style="list-style-type: none"> ■ When "1. CYCLING CLEAR" is displayed, stop holding FACTORY Key.
	<ul style="list-style-type: none"> ■ Press right cursor key three times to enter CALI-Backup. VFD Display Description 4. CALI - BACKUP
	<ul style="list-style-type: none"> ■ To backup calibration data, press FACTORY Key once more.
	<ul style="list-style-type: none"> ■ When "BACKUPED" is displayed, it is activated properly. ■ "SYSTEM RESTART" will be displayed and reset the system.

» Related Remote Interface Command

Factory:Calibration Backup

Refer: FACT:CAL BAC Calibration Back-up

6. SCPI COMMAND

This section summarizes the SCPI (Standard Commands for Programmable Instruments) commands available to program the power supply over the remote interface. Refer to the later sections in this chapter for more complete details on each command.

6-1. Commands Syntax

- Be able to use the command of capital/small letter.
- It is no limit about quantity of blank (20H) or tap(09H) and set minimum 1 more
- Command sending is one by one time.
- Braces ({ }) enclose parameters within a command string.
- A vertical bar (|) separates one of two or more alternative parameters.
- Parameters in Braces({ }) cannot be skipped.
- Command finish suffix is LF(0AH).
- Maximum character of one time are 50 Byte.
- Return response of RS485 Query is same of RS232C communication response.(Excluded address)
- Triangle brackets (< >) indicate that you must substitute a value or a code for the enclosed parameter.

6-2. Commands

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
VOLTage:RANGe {LOW|HIGH}
VOLTage:RANGe {LOW|HIGH}

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?
POLarity {P|N}
POLarity?
```

Measurement Commands

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

Calibration Commands

CALibration:VOLTage {voltage|MIN|MAX}
CALibration:CURRent {current|MIN|MAX}

Factory Commands

FACTory:CYCling {CLEar}
FACTory:USER-Memory {CLEar}
FACTory:CALibration {REStore|BACKup}

System Commands

SYSTem:BEEPer
SYSTem:BEEPer {OFF|ON|0|1}
SYSTem:BEEPer?

SYSTem:ERRor?
SYSTem:VERSion?

SYSTem:PASSWord {CLEar}

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

KEYLock[:STATe] {OFF|ON}
KEYLock[:STATe]?

LASTPower[:STATe] {SAFety|REMain|UPDate}
LASTPower[: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. Apply Command

Command that controls voltage and current together using PC remote Interface.

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

This command can control voltage and current at the same time, also can be used independently

- > voltage Input Voltage value
- > current Input Current Value
- ex1) APPL 30,5 *Voltage is 30V, Current is 5A*
- ex2) APPL 5 *Set voltage only 5V*

APPLy?

Command that checks setting voltage & current value of power supply.

Return value, First letter refers to voltage, Second refers to current.

Return value "voltage,current"

- ex) APPL? *return value "30.0000,5.0000"*

6-4. Output Voltage & Current & Operating Commands

Command that controls output voltage & current using PC remote Interface.

VOLTage{<voltage>|UP|DOWN}

output voltage can be set, instrument output voltage will be set right after.

Before using UP, DOWN command, Use VOLTage:STEP command to setting range.

- > Voltage Input Voltage value
- > UP Raise set voltage as step value
- > DOWN Decrease set voltage as step value
- ex1) volt 10 *Voltage 10V setting*
- ex2) volt up *raise step value.*

Note

After *RST Command & Power ON, voltage step value will be default.

Refer *RST command for info about Default value

VOLTage?

Check current setting voltage.

Return value "voltage"

- ex) volt? *return value "30.0000"*

VOLTage:STEP{<numeric value>}

Command that set Step value used in VOLT UP OR VOLT DOWN command.

- > numeric value Input step value in setting voltage range
- ex) volt:step 0.5 *Setting 0.5V step value*

VOLTage:STEP?

Command that checks setting step value.

Return value "numeric value"

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

VOLTage:PROTection{<voltage>}

Set OVP(Over voltage protection) Trip Level.

- > voltage Input voltage value (OVP)
- ex) volt:prot 32 *Set 32V for OVP Level.*

VOLTage:PROTection?

Check trip level from setting OVP(Over Voltage Protection).

Return value "voltage"

- ex) *return value "32.0000"*

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

Sense or disable OVP(Over voltage protection).

- > 0 OR OFF OVP Disable
- > 1 OR ON OVP Sense
- ex) volt:prot:stat on *OVP Sensing Setting*

VOLTage:PROTection:STAT?

Command that checks current OVP(Over voltage protection) Sensed or disabled.

Return value "0" – Disabled

"1" – Sensed

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

VOLTage:PROTection:TRIPped?

Command that checks current OVP(Over voltage protection) made aTrip.

Return value "0" – Proper output condition

"1" – OVP Tripped.

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

Note

When OVP Trip occurs, it blocks output voltage/current.

VOLTage:PROTection:CLEAr

Command that disables OVP(Over voltage protection) Trip.

Before disable Trip, check reference "3-4. Programming Over Voltage Protection(OVP)" and find reason of tripping.

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

VOLTage:RANGe {LOW|HIGH}

Command that selects low range & high range of Dual Range Power Supply.

LOW Select low range.

HIGH Select high range.

ex) volt:rang HIGH *Select high range*

VOLTage:RANGe?

Command that check current selection of Dual Range Power Supply.

Return value "LOW" - Low Range Condition

"HIGH" - High Range Condition

ex) volt:rang? *return value "HIGH"*

CURRent{<current>|UP|DOWN}

Able to set output current, instrument current will be set.

Control setting range before using UP, DOWN Command.

> current Input current value

> UP Raise current setting value as step value

> DOWN Decrease current setting value as step value

ex1) curr 4.5 *Current 4.5A Setting*

ex2) curr up *Raise as step value*

Note

After power on and *RST command, Current step value will be DEFAULT.

Read reference for Default value

CURRent?

Check Power Supply's current setting.

Return value "current"

ex) curr? *return value "4.5000"*

CURRent:STEP{<numeric value>}

Command that set step value that is used in CURR UP or CURR DOWN command.

> numeric value Input step value in selectable range

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

CURRent:STEP?

Command that checks setting step value.

Return value "numeric value"

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

CURRent:PROTection{<current>}

Command that controls OCP(Over current protection) Trip Level.

> current Input current value in OCP setting range.

ex) curr:prot 5.2 *set OCP Level to 5.2A.*

CURRent:PROTection?

Command that checks set OCP(Over current protection) Trip Level.

Return value "current"

ex) curr:prot? *return value "5.2000"*

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

Clear or Perceive OCP(Over current protection).

> 0 또는 OFF OCP Clear

> 1 또는 ON OCP Perceive

ex) curr:prot:stat on *OCP perceive setting*

CURRent:PROTection:STAT?

Clear or Sense current OCP(Over current protection) Level.

Return value "0" – Clear

"1" – Sensed

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

CURRent:PROTection:TRIPped?

Command that checks whether there is OCP(Over current protection) Trip.

Return value "0" – Proper output condition

"1" – OCP Trip Condition

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

Note

When OCP Trip occurs, blocks voltage/current.

CURRent:PROTection:CLEAr

Command that disable OCP(Over current protection) Trip.

Before disable Trip, Read reference "3–5. Programming Over Current Protection(OCP)"

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

FLOWer?

Command that checks power supply's current CV(Constant Voltage, CC(Constant Current).

Return value "CV" – Constant Voltage Condition

"CC" – Constant Current Condition

ex) FLOW? *return value "CV"*

POLarity {P|N}

Command is only for Polarity Power Supply, changes polarity of output terminal.

> P Change to straight polarity output.

> N Change to reverse polarity output.

ex) POL P *Change to straight output*

POLarity?

Command that checks power supply's polarity condition. Only used for Polarity Power Supply.

Return value "P" – Straight polarity output condition.

"N" – Reverse polarity output condition.

ex) POL? *return value "P"*

6–5. Measure Command

Command that measures power supply's read back voltage & current. Does not require DVM(Digital Volt Meter) & Ammeter.

MEASure:VOLTage[:DC]?

Command that measure power supply's output voltage.

Return value "voltage"

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

MEASure:CURRent[:DC]?

Command that measure power supply's output current.

Return value "current"

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

6-6. Calibration Command

Explanation of Remote Calibration command.

CALibration:VOLTage {voltage|MIN|MAX}

Voltage Calibration Command.

Please remind Calibration sequence.

"Refer 4-6 Calibration(for GPIB) using REMOTE INTERFACE"

> voltage Save MAX & MIN range calibration value.

> MIN Panel Low range voltage calibration.

> MAX Panel High range voltage calibration.

CAL:VOLT MIN *Operate Low Value.*

CAL:VOLT voltage *Send measured Voltage value from DVM.*

CAL:VOLT MAX *Operate High Value.*

CAL:VOLT voltage *Send measured Current value from DVM.*

From Low to High, Power Supply saves calibration Data into fixed memory..

CALibration:CURRent {current|MIN|MAX}

Command related to current calibration.

Remind sequence of Calibration.

Read reference "4-6 Calibration(for GPIB) using REMOTE INTERFACE"

> current Saves measured calibrated voltage from Minimum to Maximum range.

> MIN Panel Low range current calibration.

> MAX Panel High range current calibration.

ex) Operate sequence of current calibration.

CAL:CURR MIN *Operated low value.*

CAL:CURR current *Send current value to DAM.*

CAL:CURR MAX *Operate High value when Low value is done.*

CAL:CURR current *Send current value to DAM.*

6-7. Factory Command

Reset, restore, back up calibration data of power supply.

FACTory:CYCLing {CLEAr}

Previous data cannot be restored when an reset is operated in Cycling mode.

Read reference "5-3. CYCLING CLEAR" for more information about reset data description

- > CLE Reset Cycling mode memory.
- ex) fact:cyc cle

FACTory:USER-Memory {CLEAr}

Reset user's memory, and when it is operated, previous data cannot be restored.

Read reference "5-4. USER-MEM CLEAR" for more information about reset data

- > CLE
- ex) Reset User memory.

FACTory:CALibration {REStore|BACKup}

Command that backup & restore Calibration.

Read reference "5-5. CALI-RESTORE" and "5-6. CALI-BACKUP" for more information.

- > RES adopt backup description to current system.

- > BAC Backup current saved description to fixed memory.
 - ex1) fact:cal res
 - ex2) fact:cal bac

6-8. System Command

Various commands about power supply panel.

SYSTEM:BEEPer

Command making alarm when a error occurs.

- ex) syst:beep *Alarm starts*

SYSTEM:BEEPer {OFF|ON|0|1}

When there is any events, there will be a alarm. This command is about panelling alarm sound.

When it is disabled, alarm sound will not be occurred.

- > ON OR 1 Allow alarm sound.
- > OFF OR 0 Forbid alarm sound.
 - ex1) syst:beep off *Forbidden*
 - ex2) syst:beep on *Allowed*

SYSTEM:BEEPer?

Command that checks alarm condition of power supply.

- Return value " 0 " *Disable.*
- " 1 " *Enabled.*

SYSTEM:ERRor?

Command that checks error occurred from power supply.

Error message will be stored up to 10 volatile memory, and from 11th message, the latest message will be deleted. When there is no error occurred, below message will be displayed.

+0, "No error" Message.

Return value - error number , "message"

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

Note

1. Read reference "7. Error Messages" for more info about error.
 2. Use CLS command to clear all the messages.
-

SYSTEM:VERSion?

Check Power Supply's Version.

Return "YYYY.Ver"

YYYY - Indicates product's developed year.

Ver - Indicates product's version.

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

SYSTEM:PASSWord {CLEar}

Command that clears password.

When it is cleared, password resets "000000".

ex) syst:passw cle *Reset password*

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

Command that allows & disables output voltage & current.

> ON OR 1 Allows output

> OFF 또는 0 Disables output

ex1) outp on *Allows output*

ex2) outp off *Disables output*

OUTPut[:STATe]?

Command that checks current output condition of power supply.

Return value " 0 " *disabled output condition*

" 1 " *allowed output condition*

ex) outp? *return value "1"*

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

Command that controls front panel's key & encorder switch.

- > ON OR 1 Stop Operating
- > OFF 또는 0 Start Operating
- ex1) keyl on *Operation*
- ex2) keyl off *Allow Panel*

KEYLock[:STATe]?

Command that checks current power supply's front panel key & encorder switch adoptance.

Return value " 0 " *Allow panel condition*
" 1 " *Stopped panel condition*
ex) keyl? *return value "1"*

LASTPower[:STATe] {SAFety|REMain|UPDate}

Command that restore previous output & panel condition.

- > SAFety Operate *RST Command.
- > REMain Maintain latest update.
- > UPDate Restore setting just before OFF.

Note

Update command also restore OVP, OCP, LOCK, Output range, Sound function.

LASTPower[:STATe]?

Command that checks last power condition in current power supply.

Return value "SAF" *Safety Condition.*
"REM" *Remain Condition.*
"UPD" *Update Condition.*
ex) last? *return value "1"*

***IDN?**

Command that checks power supply's option.

Return value "ODA Technologies,OPC-3010,1.0-1.0-1.0"
1 Company name
2 Name of the model
3 Product detail version info.
1 System controller Version
2 Front panel Version
3 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 that saves power supply's voltage, current, OVP, OCP level in non-volatile memory in 1 ~ 10 memories.

- > 1 ~ 10 Memory saving range
- ex) *sav 2 *save in to slot 2*

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

Command that applicates saved momories in non-vertile "user memory" into power supply.
Slot 1 ~ 10 selectable.

> 1 ~ 10 Memory range

ex) *rcl 2 *Applicates saved 2 slot.2 into power supply*

***RST**

Command that reset power supply.

Reset description of each model below :

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

Common OUP – OFF KEYL – OFF BEEP – ON LASTP – SAF

* It will be cleared when there is OVP or OCP Trip.

***TST?**

Command that activates power supply's self-test.

Read reference "1-6. for more information about self-testing".

Return value " 1 " *Test good*

" 0 " *Test fail*

ex) *tst? *return value "0"*

***CLS**

Clear all the Stacked Error.

ex) *CLS

7. Error Messages

Message about instrument's error, press ERROR Key to check, and SYSTEM:ERROR from PC Inte

+0, "No error"

There is no error occurred.

7-1. Operating Error

-10, "Invalid the DAC parameter"

This error occurs when Calibration is activated wrong.

Read reference "4. CALIBRATION"

7-2. Hardware Error

-200, "System interface error"

SCPI Module is not operating.

-201, "ADC operating failed"

ADC Part circuit is not operating.

-202, "Front panel operating failed"

Front panel is not responding.

-255, "Error not define"

There is an error that is not defined.

7-3. Remote Calibration Error

Read reference "4-6. Calibration(for GPIB) using REMOTE INTERFACE"

-20, "Ignored min run under volt"

This error occurs when Max or value is activated while Min voltage value is not operated.
Sequence : Min → VALUE → MAX → VALUE

-21, "Ignored min save under volt"

Operated MAX Value without voltage min value.
Sequence : Min → VALUE → MAX → VALUE

-22, "Invalid min value use under volt"

This error occurs when you have send value without activating max value after operating minimum value.
Sequence : Min → VALUE → MAX → VALUE

-23, "En route to cal the curr"

This error occurs when you have send voltage calibration while current calibration.

-24, "Over volt min parameter"

This error occurs when Minimum value is out of range.
Read reference "4-5. CALIBRATE Setting Range"

-25, "Under volt max parameter"

This error occurs when voltage max value range is out of lowest limit.
Read reference "4-5. CALIBRATE Setting Range"

-26, "Over volt max parameter"

This error occurs when voltage max value range is out of highest limit.
Read reference "4-5. CALIBRATE Setting Range"

-27, "Ignored min run under curr"

This error occurs when max value is operated when current min value is not operated.
Sequence : Min → VALUE → MAX → VALUE

-28, "Ignored min save under curr"

Operated MAX value before operating current min value.
Sequence : Min → VALUE → MAX → VALUE

-29, "Invalid min value use under curr"

This error occurs when you have sent value again without operating maximum after minimum
Sequence : Min → VALUE → MAX → VALUE

-30, "En route to cal the curr"

This occurs when you have sent current calibration commands while voltage calibration.

-31, "Over curr min parameter"

When Current Min value is out of range.

Read reference "4-5. CALIBRATE setting range"

-32, "Under curr max parameter"

This error occurs when Max current value range is out of lowest value.

Read reference "4-5. CALIBRATE Setting Range"

-33, "Over curr max parameter"

This error occurs when Current Max value range is out of highest value.

Read reference "4-5. CALIBRATE Setting Range"

-34, "Not allowed command under cal"

Other command cannot be used while Remote Calibration.

7-4. Cycling Mode Error

-50, "Invalid sequence of cycling mode"

Occurs when Sequence's finish number is bigger than start number.

ex) Start Number Input 10

Finish Number Input 05, and press RUN/STOP  Key to sense error code.

7-5. Calibration Error

Readback Calibration will be activated while calibrating.

Check whether there is an error occurred.

-74, "ADC-V low limit over"

Occurs when voltage is out of ADC Low range.

-75, "ADC-V high limit over"

Occurs when voltage is out of ADC High range.

-76, "ADC-A low limit over"

Occurs when current is out of ADC Low range.

-77, "ADC-A high limit over"

Occurs when current is out of ADC High range.

7-6. Error from Non-volatile memory check.

Before sailing, our product records error message in non-volatile memory.

-80, "Memory limit volt error"

There is an error with voltage value.

-81, "Memory limit curr error"

There is an error with current value.

-82, "Memory max volt error"

There is an error with maximum voltage value.

-83, "Memory max curr error"

There is an error with maximum current value.

-84, "Memory volt decimal error"

There is an error with voltage decimal point.

-85, "Memory curr decimal error"

There is an error with current decimal point.

-86, "Memory volt length error"

There is an error with voltage digit length.

-87, "Memory curr length error"

There is an error with current digit length.

-88, "Not match volt length and limit"

Voltage value and digit length does not match.

-89, "Not match curr length and limit"

Current value and digit length does not match.

7-7. Interface Commands Error

Informs you about panelling using PC Interface.

-120, "Suffix too long"

Maximum memory buffer is 50byte. This error occurs when it is more than 50byte.

-121, "Invalid data"

This error occurs when there is letters or invalid data.

ex) volt 10V 'V' is added

fix) volt 10

-122, "Syntax error"

There is a grammatical error.

ex) Value is missing after volt
fix) volt 10

-123, "Invalid suffix"

There is an error with last part of sent data.

*ex)volt 10**
fix) volt 10

-124, "Undefined header"

This error occurs when undefined command is sent.

ex)volta 10 Indicate volt OR voltage
Fix) voltage 10 OR volt 10

-221, "Setting conflict"

SCPI command exists, but not in this instrument.

ex)POL N cannot be used in Single channel power supply

-222, "Out of data"

Setting value is out of data.

ex)volt 1000 Value is to high.
Fix) volt 10

-223, "Incorret error"

Occurs when a new operating before remove Buffer descriptionBuffer.

*ex)*idn? Send command, and do not obtain new data*
volt? Send new command
b = data
*Fix)*idn?*
a = data
volt?
b = data

8. Option

8-1. Analog Input

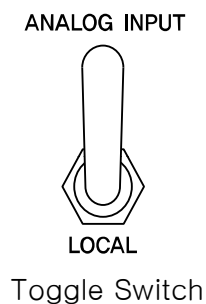
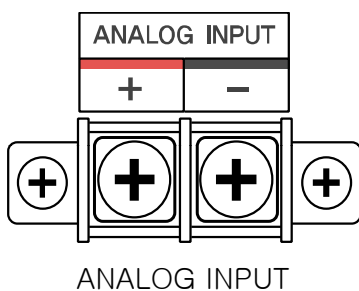
Able to panel output voltage & current with ratio by inputting analog DC power supply.

Analog Voltage Input 0V ~ 10V Control (Selectable)
 Analog Current Input 4mA ~ 20mA Control (Selectable)

- ◆ OP-AV5-V Analog Voltage Input 0V~5V
- ◆ OP-AV10-V Analog Voltage Input 0V~10V
- ◆ OP-AA20-V Analog Current Input 4mA~20mA
- ◆ OP-AV5-A Analog Voltage Input 0V~5V
- ◆ OP-AV10-A Analog Voltage Input 0V~10V
- ◆ OP-AA20-A Analog Current Input 4mA~20mA

Analog Input instruction

1. Connect rear 2pin terminal fitting +,-.
2. Select toggle switch analog input mode.
3. Change voltage or current.
4. Check output voltage or output current is changed with ratio.
5. Cannot change voltage or current from front panel of DC Power Supply.

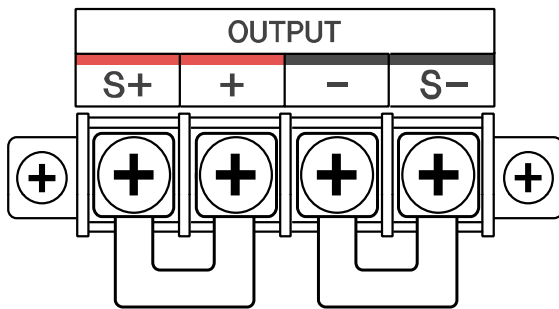


Note

When you panel equipment from Analog Input Signal, voltage output can be fluctuate because of noises.

8-2. Rear Output

Output +,- terminal is connector supplied to load, S+, S- terminal is structured in sensing term



Note

Please use output terminal on the front panel only for measurement, and when back output terminal is equipped, Instrument's standard output will be set on backside output terminal.

9. Specifications

	Output Rating (@0°C~40°C)		Programming Accuracy (@25°C±5°C) ±(%of output +offset)		Readback Accuracy (@25°C±5°C) ±(%of output +offset)		Ripple and Noise (@20Hz to 20kHz)		Load Regulation ±(0.01% + offset)/ ±(0.01% + offset)		Line Regulation		Resolution	
	Voltage	Current	Voltage	Current	Voltage	Current	Voltage	Current	Voltage	Current	Voltage	Current	Programming / Headback	Display
OPS-95	0 to 5	0.15%+5mA		0.08%+3mA		≤2mVp-p		500uA		≤50uA		1mV/100uA		
OPS-97	0 to 7			0.15%+5mA		≤2mVp-p				≤70uA				
OPS-910	0 to 10	0.05%+3mV	0.05%+1.5mV	0.15%+5mA	2mV	≤2mVp-p	500uA	500uV	2mV	≤100uV	1mA	1mV/1mA		
OPS-915	0 to 15			0.15%+5mA		≤2mVp-p				≤130uA				
OPS-920	0 to 20			0.15%+5mA		≤2mVp-p				≤170uA				
OPS-930	0 to 30			0.15%+5mA		≤2mVp-p				≤250uA				
OPS-183	0 to 3			0.08%+3mA		≤2mVp-p				≤30uA		1mV/100uA		
OPS-185	0 to 5			0.08%+3mA		≤2mVp-p				≤50uA				
OPS-187	0 to 7	0.05%+5mV	0.05%+2.5mV	0.15%+5mA	2mV	≤2mVp-p	500uA	500uV	2mV	≤150uV	1mA	1mV/1mA		
OPS-1810	0 to 10			0.15%+5mA		≤2mVp-p				≤100uA				
OPS-1815	0 to 15			0.15%+5mA		≤2mVp-p				≤130uA				
OPS-302	0 to 2			0.08%+3mA		≤2mVp-p				≤20uA		1mV/100uA		
OPS-303	0 to 3			0.08%+3mA		≤2mVp-p				≤30uA				
OPS-305	0 to 5	0.05%+10mV	0.05%+5mV	0.15%+5mA	2mV	≤2mVp-p	500uA	500uV	2mV	≤250uV		1mV/1mA		
OPS-307	0 to 7			0.15%+5mA		≤2mVp-p				≤70uA				
OPS-3010	0 to 10			0.15%+5mA		≤2mVp-p				≤100uA				
OPS-501	0 to 1			0.08%+3mA		≤2mVp-p				≤10uA		1mV/100uA		
OPS-502	0 to 2			0.08%+3mA		≤2mVp-p				≤20uA				
OPS-503	0 to 3	0.05%+12mV	0.05%+6mV	0.15%+5mA	2mV	≤2mVp-p	500uA	500uV	2mV	≤500uV		1mV/100uA		
OPS-505	0 to 5			0.15%+5mA		≤2mVp-p				≤50uA				
OPS-801	0 to 1			0.08%+3mA		≤2mVp-p				≤10uA		1mV/100uA		
OPS-802	0 to 2	0.05%+35mV	0.05%+18mV	0.15%+5mA	3mV	≤2mVp-p	500uA	500uV	3mV	≤800uV		1mV/100uA		
OPS-803	0 to 3			0.15%+5mA		≤2mVp-p				≤30uA				
OPS-1001	0 to 1			0.08%+3mA		≤2mVp-p				≤10uA		1mV/100uA		
OPS-1002	0 to 2	0.05%+40mV	0.05%+20mV	0.15%+5mA	3mV	≤2mVp-p	500uA	500uV	3mV	≤1mV		1mV/100uA		
OPS-1003	0 to 3			0.15%+5mA		≤2mVp-p				≤30uA				
OPS-1501	0 to 1			0.08%+3mA		≤2mVp-p				≤10uA		1mV/100uA		
OPS-1502	0 to 2	0.05%+50mV	0.05%+25mV	0.15%+5mA	4mV	≤2mVp-p	500uA	500uV	4mV	≤1.5mV		1mV/100uA		
OPS-2001	0 to 200	0.05%+75mV	0.05%+40mV	0.15%+5mA	4mV	≤2mVp-p	500uA	500uV	4mV	≤2mV		1mV/100uA		
OPS-3001	0 to 300	0.05%+95mV	0.05%+50mV	0.15%+5mA	4mV	≤2mVp-p	500uA	500uV	4mV	≤3mV		1mV/100uA		

OVP and OCP Accuracy \pm (% of output + offset)

OVP 5%+ 0.5V
 OCP 5%+ 0.5A
 Activation time <80ms when maximum output rating

Remote Sensing Capability

Voltage drop 1V/per Lead
 Load regulation Add 5mV to drop point +S and +output terminal because of load current

 Load voltage

Temperature Coefficient \pm (% of output + offset) after a 30-minute warm-up

Voltage 0.01% + 3mV
 Current 0.02% + 3mA

Stability \pm (% of output + offset) after a 1 hour warm-up

Voltage 0.02% + 1mV
 Current 0.1% + 1mA

Transient Response Time

Less than 50usec for output to recover to within 15mV following a change in output current from full load to half load or vice versa

Voltage Programming Speed

	<i>No load</i>	<i>Half load</i>
Rising Time	$\leq 2\text{ms}/15\text{V}$	$\leq 4\text{ms}/15\text{V}$
Falling Time	$\leq 5\text{ms}/15\text{V}$	$\leq 2.5\text{ms}/15\text{V}$

Command Processing Time(average)

Apply Commands

Setting	20ms
Query	32ms

Output setting Commands

Voltage & Current setting	15ms
Voltage & Current query	32ms

Measurement Commands

Voltage & Current query	32ms
-------------------------	------

The Other Commands

Setting & Query	<35ms
-----------------	-------

Output Terminal Isolated(maximum, from chassis ground)

When output terminal (+) and (+S) & (-) and (-S) is connected with metal short bar ($\pm 60\text{VDC}$)

When output terminal above is not connected with metal short bar ($\pm 240\text{VDC}$)

AC Input Ratings

Standard	220V \pm 10% , 50~60Hz
Option	100V \pm 10% , 50~60Hz
	115V \pm 10% , 50~60Hz
	230V \pm 10% , 50~60Hz

Maximum Input Power (full load)

$\leq 900 \text{ VA}$

Cooling

Isolation DC-Fan

Operation Temperature

0°C ~ 40°C for full rated output. At higher temperatures, the output current is derated linearly to 50% at 55°C maximum temperature.

Output Voltage Overshoot & Undershoot (During voltage output setting)

No overshoot
No undershoot

Programming Language

SCPI(Standard Commands for Programmable Instruments)

State Storage Memory

Ten(10) user-configurable(voltage, current, OVP & OCP level) stored states

Cycling Mode Storage Memory

One hundred(100) cycling mode-configurable(voltage, current, slope & delay time) stored states and start / finish number of sequence and repeat count.

Calibration Interval

Precision	6 month
Recommended	1 year

Dimensions

Excepted the bumper	213mm(W) * 133mm(H) * 348mm(D) (=inch 8.4 * 5.2 * 13.7)
Included the bumper.	243mm(W) * 152.5mm(H) * 348mm(D) (=inch 8.4 * 5.2 * 13.7)

Weight

Net weight	13.5kg
Gross weight	15kg

10. Caution

Non compliance with the warnings and/or the instructions for use may damage the instrument and/or its components or injure the operator. Keep the following articles.

- Avoid the installation in severe cold or hot area.

- Do not use immediately after moved from cold area
As liquefaction phenomenon, it gives damage to the power supply
Please wait for 20~30 minutes to use power supply.

- Do not place liquid on the power supply.
The use of this instrument in a wet state could result in electrical shock or fire.

- Avoid vibration or severe impact.

- Make sufficient space at the sides and rear of the power supply for adequate air circulation.

- Do not place heavy items on the instrument.

- Avoid electric-magnetic field as motors and etc.

- Do not allow any metal or inflammable substances getting into the instrument via the air holes

- Avoid hot instrument such as iron nearby the power supply.

- Do not place the front panel to downside. It will occur to broken knob & output terminals.

- Do not connect other kinds power sources to this power supply output terminals.

- Do not remove either the cover or panel.

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