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User Manual

Protek PR/PD Series
Programmable DC-Power supply

GSIPK-ENP-REV01

GS Instruments.Co,.Ltd

CERTIFICATION

Protek certifies that this product was thoroughly tested, inspected and found to meet published specifications when it is shipped out of the factory. Protek further certifies that its calibration measurements are traceable to the ITRI (Industrial Technology Research Institute/Center for Measurement Standards), and to the extent allowed by ITRI's calibration facility.

WARRANTY PERIOD - TWO YEARS

This product is warranted for the defects in materials and workmanship for a period of Two YEARS from date of shipment. During the warranty period, Protek will at its option, either repair or replace the products, which are proved to be defective. Protek is not liable for incidental/consequential damages and errors caused by improper use.

WARRANTY SERVICE

Protek will repair or replace the product during the warranty period and it should be returned to your nearest Protek authorized service center. Buyer shall prepay shipment charges to service center. After reparation, the service center will pay shipment charges and return the product to the buyer. Buyer should prepay the freight if the product is returned to Protek International Sale Dept. The RMA (Return Material Authorization Number) must be obtained directly from the Protek for warranty repairs. No liability will be accepted if the returned product is without such permission.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to any defect that is resulted from improper or inadequate maintenance by the buyer. Protek does not warrant supplied products or interfaces that are unauthorized modification, misused, operated outside of the specification, repaired, or maintained at the improper site. No other warranty is expressed or implied. Protek specifically disclaims the implied warranties of merchantability and fitness for a particular purpose.

ALL RIGHTS RESERVED

TRADEMARK INFORMATION

Protek power supply is a trademark of GSI.

CAUTION

The following safety precautions must be observed during all phases of operation, service and repair of this equipment. Failure to comply with the safety precautions or warnings in this document violates safety standards of design, manufacture and intended use of this equipment and may impair the built-in protections within. Protek shall not be liable for user’s failure to comply with these requirements.

GROUNDING

To minimize shock hazard, the product chassis must be connected to an electrical ground. The product must be connected to the AC power supply mains through a three-conductor power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet.
For instruments designed to be hard-wired to the supply mains, the protective earth terminal must be connected to the safety electrical ground before another connection is made. Any interruption of the protective ground conductor or disconnection of the protective earth terminal will cause a potential shock hazard that might cause a personal injury.

OUTPUT TERMINALS GROUNDING

There is a potential shock hazard at the RS-485 and the IEEE ports when power supplies are used with rated or combined voltage that is greater than 400V and the Positive Output of the Power Supply is grounded. Do not connect the Positive Output to ground when the RS-485 or IEEE-488 is used.
The output terminal can be connected by external conductor, be aware that only 105 deg conductor can be used.

FUSES

Authorized Protek service personnel must change fuses only. For continued protection against risk of fire, replace only with the same type and rating of fuse.

INPUT RATINGS

Do not use AC supply, which exceeds the input voltage and frequency rating of this instrument. The input voltage and frequency rating of the Protek ^{TM} power supply series is: 100-240Vac (190-240Vac for 3000W models), 50/60Hz. For safety reasons, the mains supply voltage fluctuations should not exceed +/-10% of nominal voltage. When considering the IEC 60320-1, the appliance inlet temperature limit relevant to mains supply voltage fluctuations -10%, the maximum output power can be up to 750W at AC 100V input and decreasing linearity to 600W at 90V AC input.

LIVE CIRCUITS

Operating personnel must not remove the cover of the product. Non- Protek qualified personnel allow no internal adjustment or component replacement. Never replace components with power cable connected. To avoid injuries, always disconnect power, discharge circuits and remove external voltage source before touching components.

PARTS SUBSTITUTIONS & MODIFICATIONS

Only authorized Protek service personnel is allowed to make parts substitutions and modifications. For repairs or modifications, the instrument must be returned to an authorized Protek service facility.

CONDENSATION

If the environment temperature of the power supply is changed suddenly (for example the unit is moved from a cold place to a warm place or using a heater in winter) the water droplet may form inside the power supply. Condensation may also occur if the power supply is exposed to the direct wind from an air-conditioner.
To avoid the harmfulness due to condensation, please let the power supply stand at room temperature for one or two hours without connecting to the input mains power.

SAFETY INSTRUCTIONS

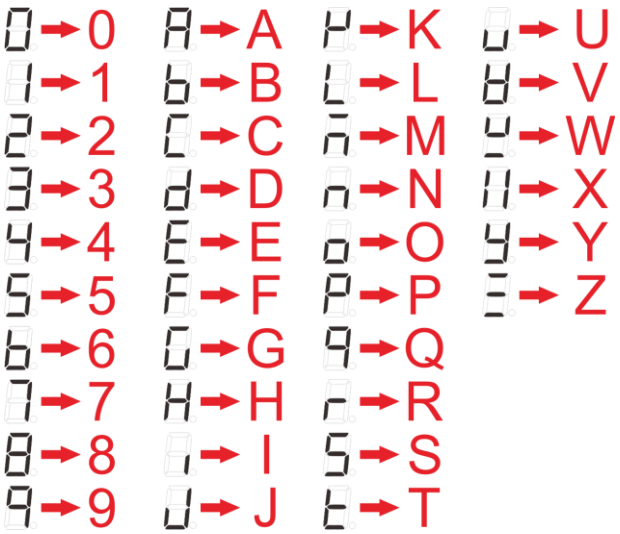
Environmental Conditions: The safety approval of Protek-PR/PD™ power supply series applies to the following operating conditions:

(1) Indoors use
(2) Ambient temperature: 0°C to 50°C
(3) Maximum relative humidity: 90% (no condensation)
(4) Altitude: up to 3000m

	CAUTION, risk of danger.
	CAUTION risk of electrical shock
	Indicates hazardous voltage
	Frame or chases terminal.
	Indicates ground terminal
	Protective ground conductor terminal
	OFF
	ON
WARNING	The WARNING sign denotes a hazard. An attention to a procedure is called. Not following procedure correctly could result in personal injury. A WARNING sign should not be skipped and all indicated conditions must be fully understood and met.
CAUTION	The CAUTION sign denotes a hazard. An attention to a procedure is called. Not following procedure correctly could result in damage to the equipment. Do not proceed beyond a CAUTION sign until all indicated conditions are fully understood and met.

Characters and Numbers

A 7-segment LED display cannot display all of the letters correctly, so please refer to the following list to understand what the displayed figures represent:



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CHAPTER 1 ACCESSORIES CHECK BEFORE USING

1-1. ACCESSORIES CHECK

After unpacking the product, please verify the items/accessories in accordance with the ones listed below. If there are any damages on/in the accessories, please do not hesitate to contact our distributors or us. *(*Note 1)*

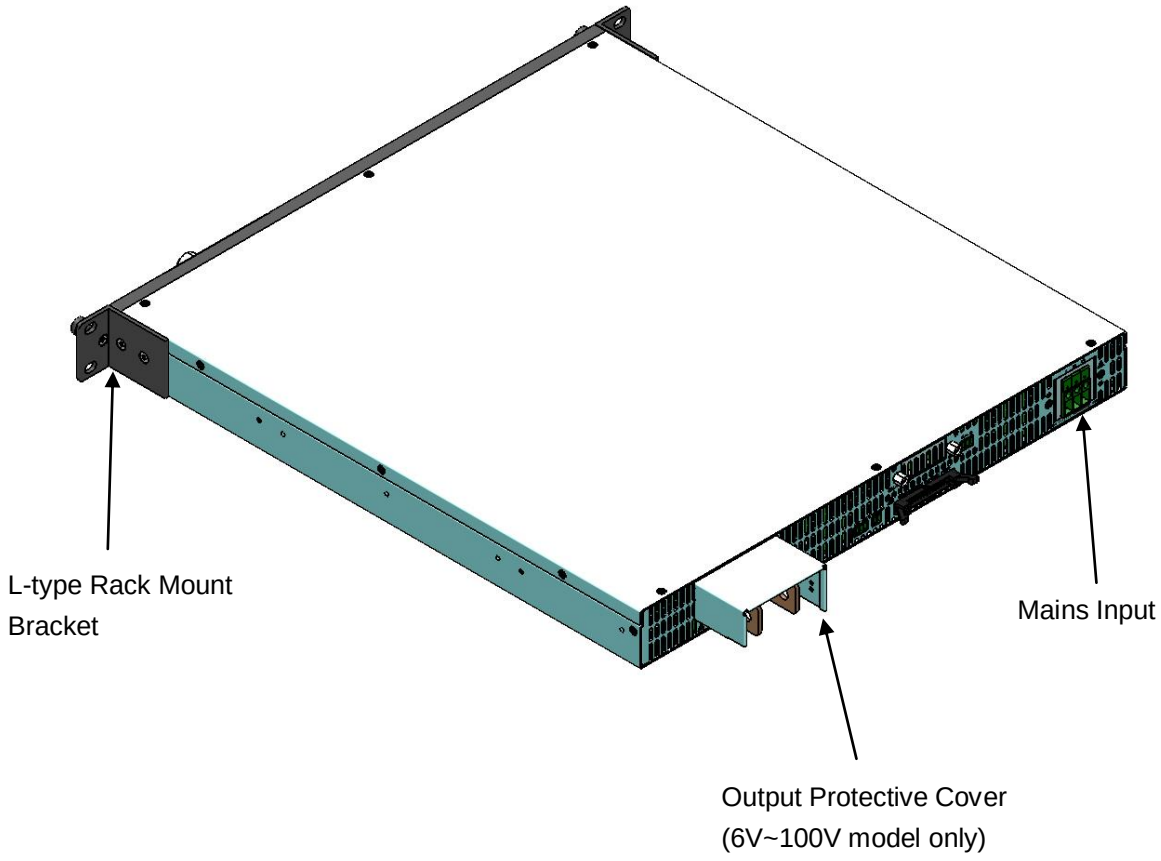
1-1-1. Operation manual

1-1-2. RS-485 Cable x 1

1-1-3. 19" rack installation kit (1 set, for 1U/2U models only)

1-1-4. Output protective cover (6V~100V models only)

1-1-5. Remote sense wire x2



*Note 1. AC cables are not provided with the power. The recommended AC cable (customer supplied) is: 25A 250V, 3x12AWG, 3.5 mm^2, rated 60°C min., 2m max. length. Add a non-locking plug approved by the national safety standards of the country of usage.

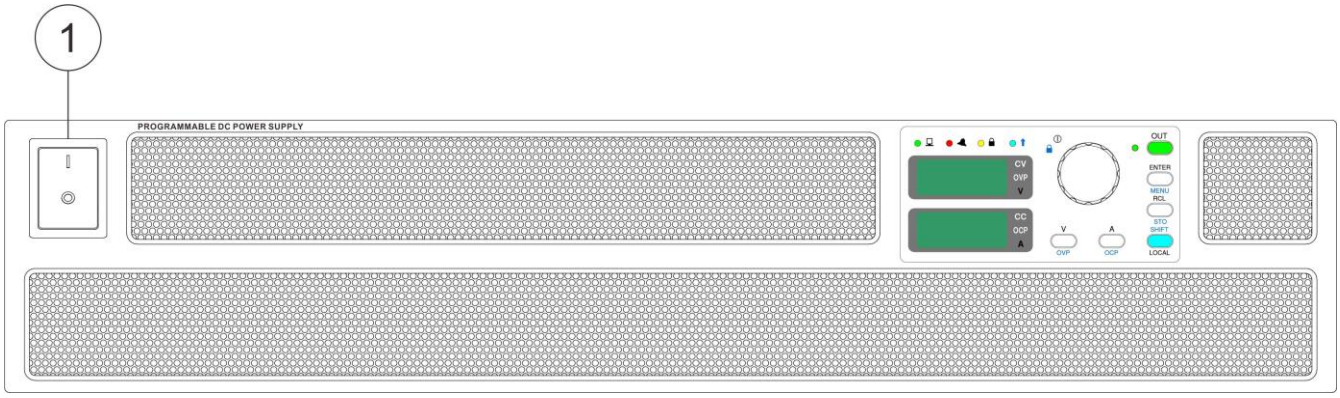
CHAPTER 2 GENERAL INFORMATION

- Up to 50 models: 6V~600V / 1A~400A are available for selection. (*depends on different models)*
- 750W in 1U half width, 1.5kW in 1U/2UH, 3kW in 2U height. Switching mode, high density and convenience for installation to 19" rack.
- Non-gap stacking, no ventilation holes at the cover and bottom plate of the power supply.
- Universal Input Voltage 1U / 1UH / 2UH:100-240Vac, 50/60Hz, 1P2W+GND continuous operation.
  2U:190-240Vac, 50/60Hz, 1P2W+GND continuous operation.
- Constant Voltage / Constant Current with automatic crossover.
- PROTEK DSP Series Programmable DC Power Supply uses digitalized design :
  - High resolution of D/A (16 bits) setting output Voltage & Current.
  - High resolution of A/D (24 bits H.W.) measuring output Voltage & Current.
- Up to 5 units in parallel and 2 units in series, equipped with active current sharing.
- Active power factor correction.
- Complete Protection: OVP, OCP and OTP.
- Definable output voltage ramp up and down with adjustable time.
- PR/PD Series can store 16 sets of memories; memories can be recalled manually in front panel or by external recall control.
- Last Panel Set. KEY LOCK setting.
- Embedded 3 RISC Micro-Controllers.
- Built-in remote sensing with max. 5V compensation.(Voltage drop in each output wire(+/-) should not exceed 2.5V, or the DC power will alarm)
- RS-485 baud rate up to 115200 bps.
- Command response time ≤ 20ms.
- Standard isolated RS-485 and LAN Interface, optional GPIB or isolated analog interface.
- GPIB are compatible with SCPI.
- Analog Programming and Monitoring, isolated type is available for optional selection.
- Forced air by speed controlled fan.
- DC Output ON / OFF Switch.
- CE approved
- LXI approved

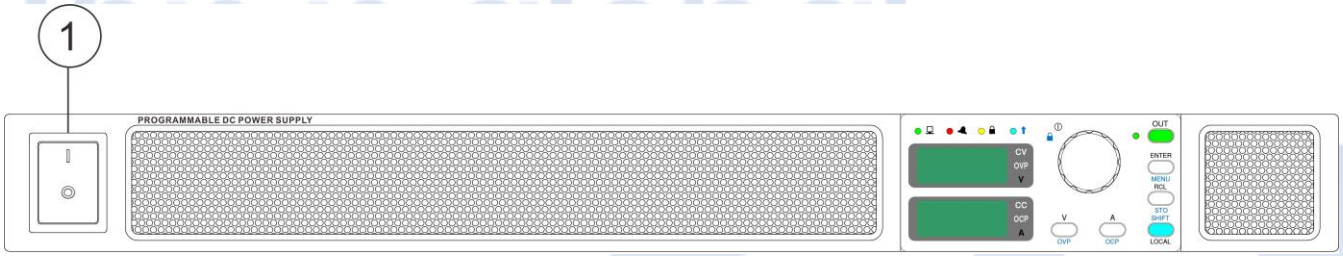
CHAPTER 3 FRONT PANEL DESCRIPTION

3-1. FRONT PANEL

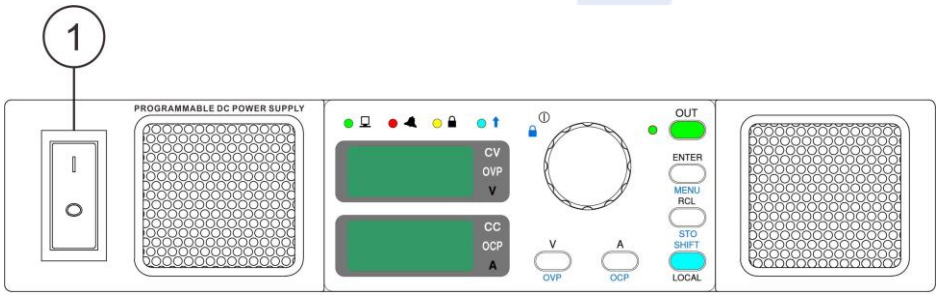
3-1-1. 2U Front Panel



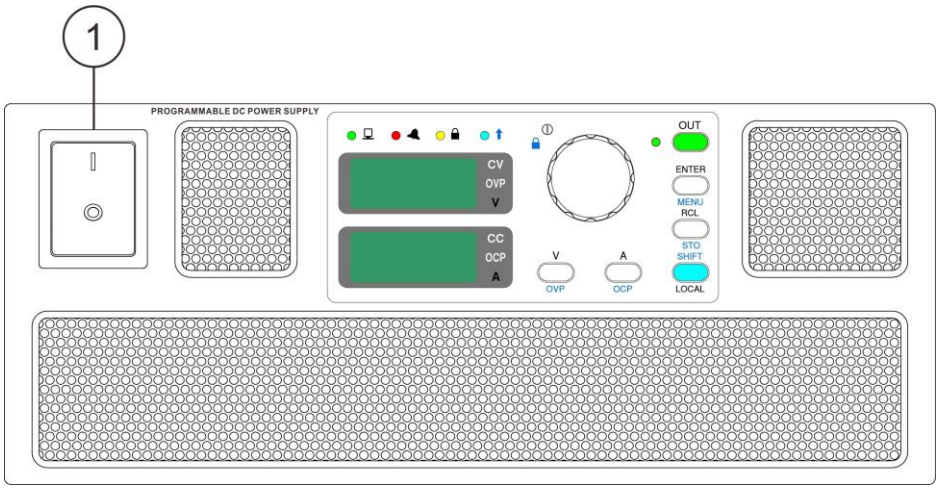
3-1-2. 1U Front Panel



3-1-3. 1UH Front Panel



3-1-4. 2UH Front Panel

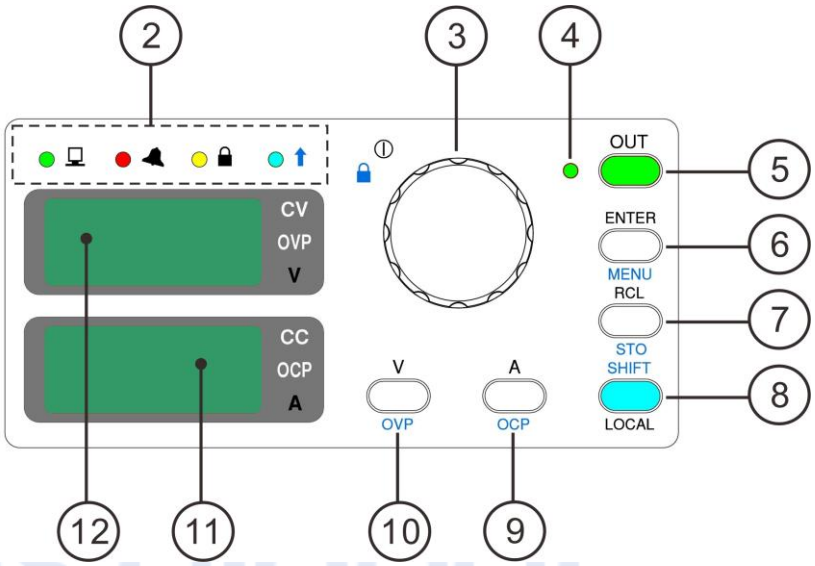


⚠CAUTION

To maintain good accuracy, please provide proper room for ventilation. Do not block the ventilation holes in the front and the rear parts of DC power supplies.

Keep the panel with a space above 20cm away from the wall or other objects. Also, clean the dust on the panel regularly to avoid having difficulty of heat radiating and causing overheated problem.

3-1-5. Front panel controls and indicators

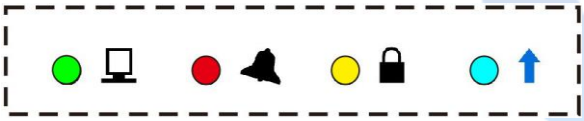


3-2. FRONT PANEL DESCRIPTION

3-2-1. Power switch:

I→ ON, **O**→ OFF.

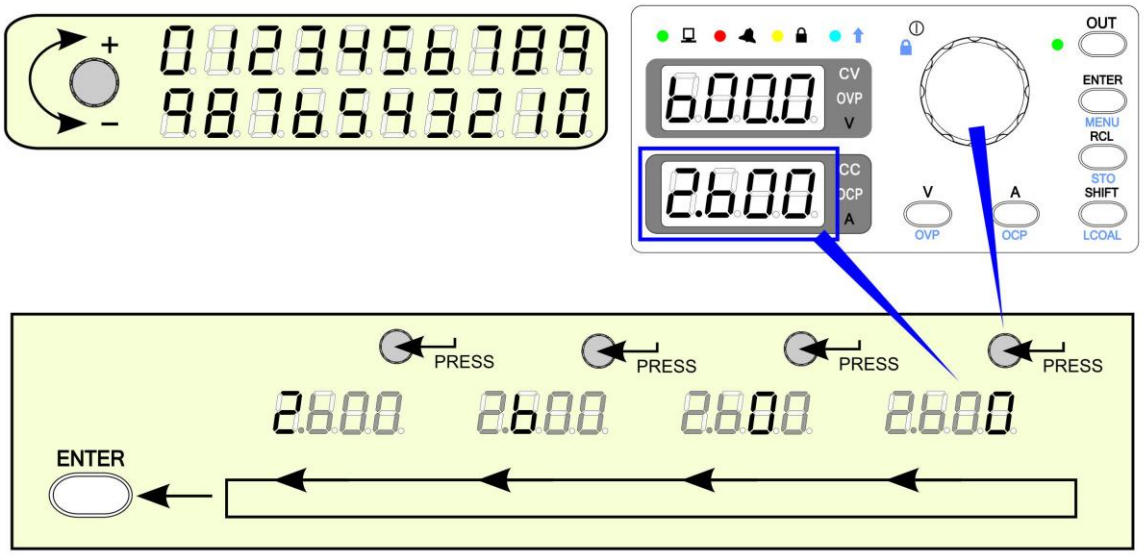
3-2-2. Operation status indicators:



REMOTE	REMOTE Indicator: LED is lighting when it is remote controlled. Press LOCAL key to disable the remote control.
ALARM	ALARM Indicator: LED is lighting when there is a command error, a manual operation error or power unit failure. Please refer to the Chapter 11 for ERROR CODE.
KEYLOCK	KEYLOCK Indicator: Key lock: Press KEYLOCK (SHIFT + encoder) to lock the panel function and the LED will be lighting. Press the KEYLOCK again to unlock, and the LED is unlit.
SHIFT	SHIFT Indicator. LED is lighting when the shift key is pressed.

3-2-3. Rotary encoder:

Press the encoder to change the digits for adjustment. Turn clockwise to increase value. Turn anti-clockwise to decrease the value. Press SHIFT + Encoder to lock the panel keys, press again to unlock the panel keys.



(1) Press the Encoder, the blinking (adjustable) digit will be moved forward to the left one. The blinking digit will be back to the last digit after a circulation.
(2) The selected digit will be blinking slowly. Turn the Encoder to adjust value, and then press ENTER to confirm.

3-2-4. Output ON/OFF indicator:

It's lighting when output is ON.

3-2-5. Output ON/OFF control key:

Output ON/OFF enable/disable.

The DC power supply output will be set to OFF automatically in the following situations:

(1) The P.ON MODE is set to OFF and the below situations occurred.
   1. Restart the DC power supply (please refer to 8-6-3 for power on mode setting).
   2. The mains supply is interrupted more than 100ms.
   3. The mains supply is exceed or under the specified input range more than 500ms.
(2) When OCP, OVP, OTP are occurred.

3-2-6. ENTER / MENU key:

(1) Press ENTER to confirm the set value.
(2) Press SHIFT+ENTER keys to get access to MENU function. For details, please refer to 8-6.

3-2-7. RCL / STO key:

There are the maximum of 16 memory-recall settings can be stored. For the details, please refer to 8-4.

(1) Press RCL to recall the stored voltage/current settings in sequence.
(2) Press SHIFT + STO to store settings.
(3) Press V set key to leave the RCL mode.

3-2-8. SHIFT / LOCAL key:

(1) When the DC power supply is operated manually, this key performs as sub functional key. When the light is ON, the functions in blue-text on the panel can be manipulated.
(2) When the DC power supply is remote controlled, only the Local key is functional. Press the key to disconnect the remote control in order to make the DC power supply operated manually.

3-2-9. A set / OCP key:

(1) Press A set key to adjust the current value, and the last digit will be blinking. By turning the Encoder, current value is adjustable. Press ENTER to confirm.
(2) SHIFT + A set key perform as OCP set. The process of adjusting the OCP value is the same as adjusting A set.

3-2-10. V set / OVP key:

(1) Press V set key to adjust the voltage value, and the last digit will be blinking. By turning the Encoder, voltage value is adjustable. Press ENTER to confirm.
(2) SHIFT + V set key perform as OVP set. The process of adjusting the OVP value is the same as adjusting V set.
(3) When in the Recall mode, press V set key to leave the Recall mode.

3-2-11. Current display, 4 digits LED. The indicators on the right side:

CC	Constant Current indicator. It lights when the DC power supply output is under constant current mode.
OCP	Over Current Protection indicator. It lights when over current is occurred. When you are adjusting over current value, the light will be blinking. The OCP will activate when output current is over OCP value and lasting more than 1s or output current is over 110% of rated current.
A	Ampere.

3-2-12. Voltage display, 4 digits LED. The indicators on right side:

CV	Constant Voltage indicator. It lights when the DC power supply output is under constant voltage mode.
OVP	Over Voltage Protection indicator. It lights when over voltage is occurred. The light will be blinking when OVP value is adjusted.
V	Voltage.

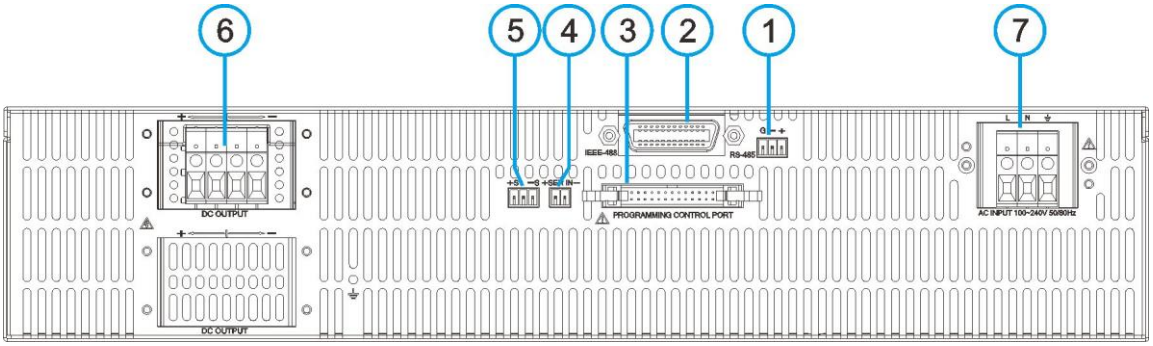
3-2-13. L-type Rack Mount Brackets:

used for fixing the unit in the standard 19" rack cabinet.

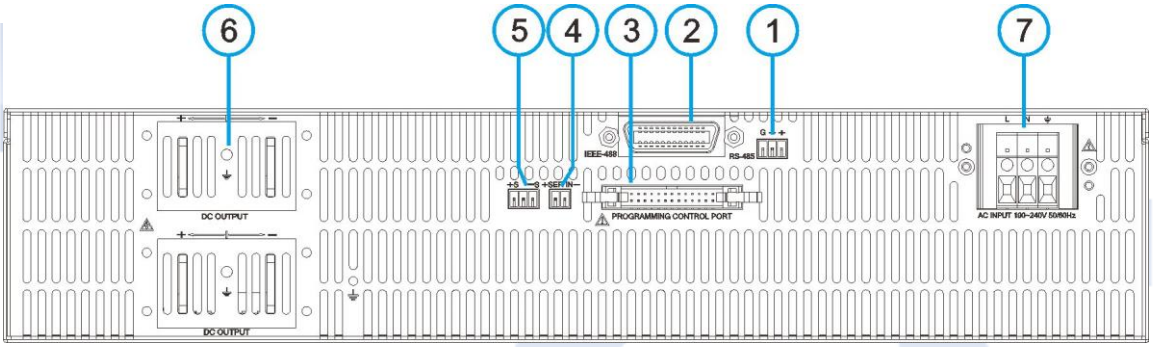
CHAPTER 4 REAR PANEL DESCRIPTION

4-1. REAR PANEL

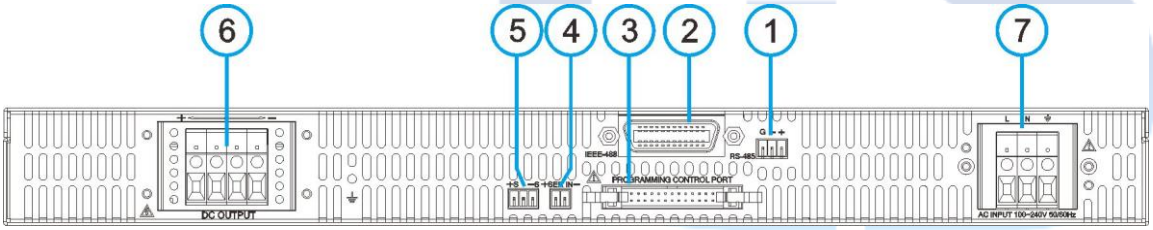
4-1-1. 2U High Voltage Rear Panel (150V~600V models)



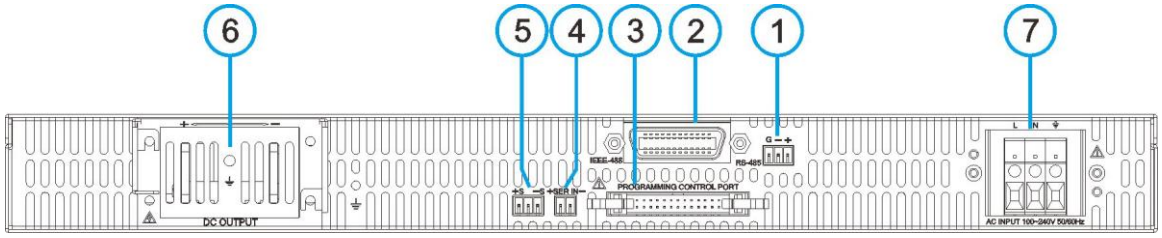
4-1-2. 2U Low Voltage Rear Panel (6V~100V models)



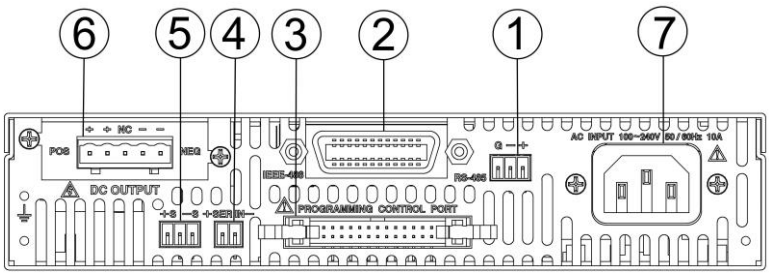
4-1-3. 1U High Voltage Rear Panel (150V~600V models)



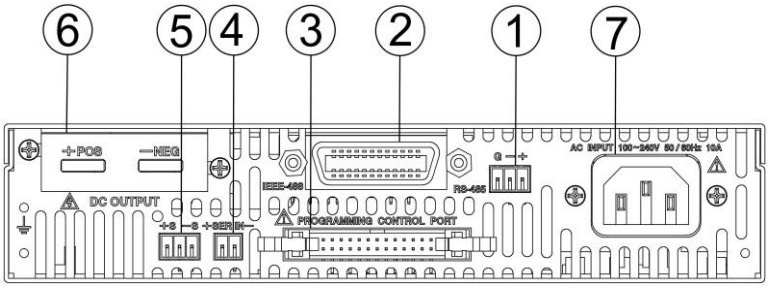
4-1-4. 1U Low Voltage Rear Panel (6V~100V models)



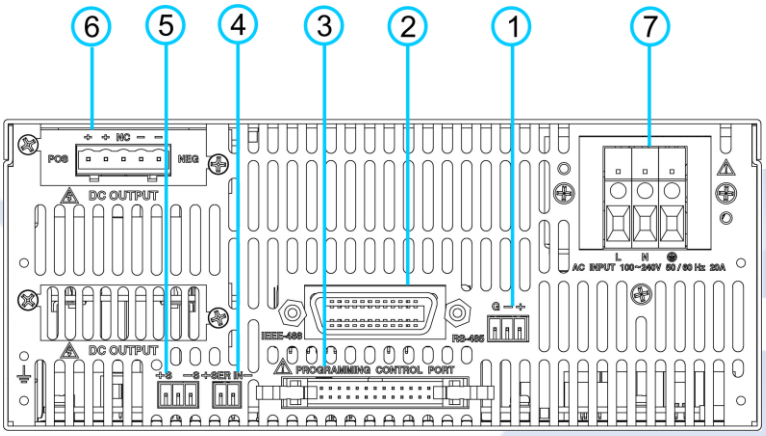
4-1-5. 1UH High Voltage Rear Panel (150V~600V models)



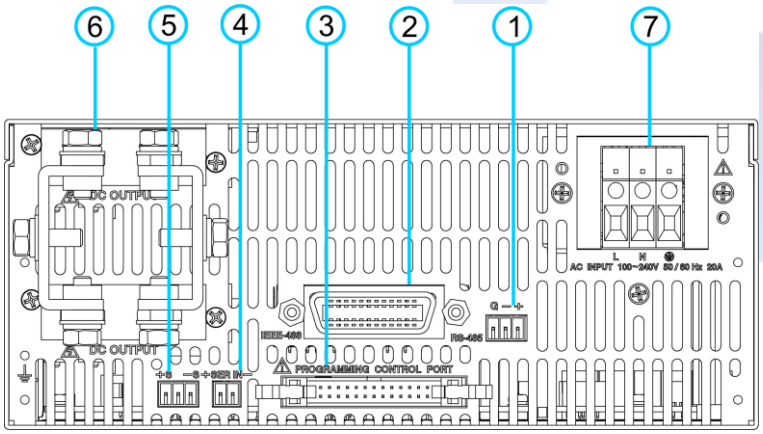
4-1-6. 1UH Low Voltage Rear Panel (6V~100V models)



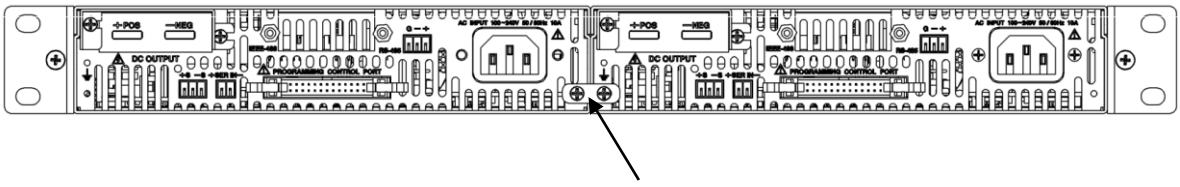
4-1-7. 2UH High Voltage Rear Panel (150V~600V models)



4-1-8. 2UH Low Voltage Rear Panel (6V~100V models)



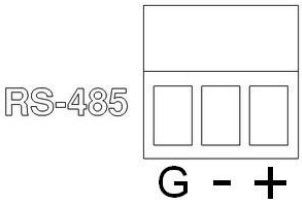
4-1-9. 1UHx2 Rear Panel connection



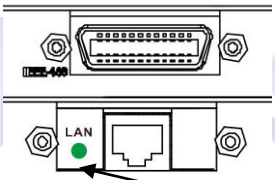
4-2. REAR PANEL DESCRIPTION

4-2-1. The 3 pins pluggable terminal block, for connection of RS-485 interface:

When one set of DC power supply is remote controlled, through RS-485 interface, a 1/4W 120Ω terminal resistor is required. In general, a system that its connecting distance is less than 300m does not need to use the terminal resistor. However, to avoid having interference, it is recommended to connect a 1/4W 120Ω terminal resistor (connect to + and – pin) at the last unit.



4-2-2. Digital programming Connector:



For GPIB remote control (Optional interface)

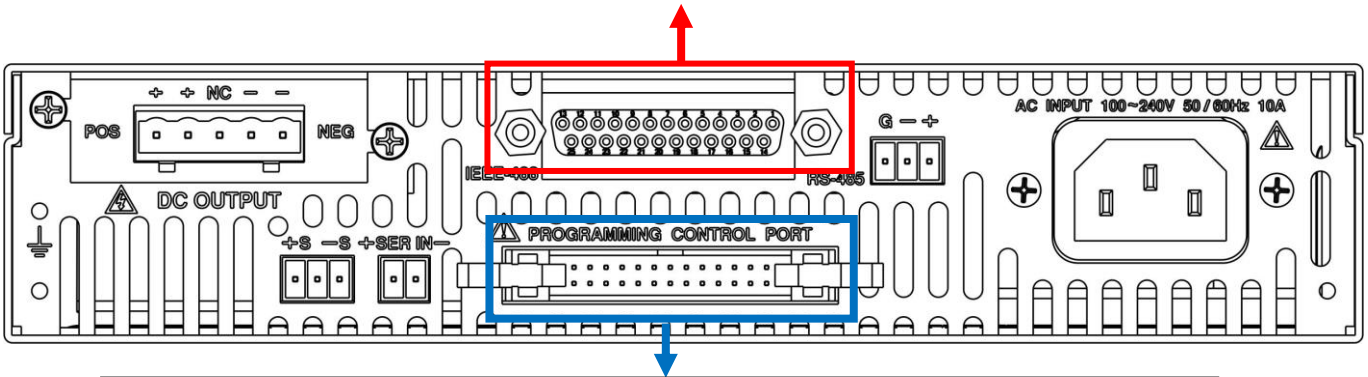
For LAN remote control (Standard interface)

LAN Status Indicator Color and States	
State	Status
On – Solid Green, steady illumination	Normal Operation
On – Flashing Green	Device Identify
Off	LAN Fault

4-2-3. Analog programming control port:

Please refer to < Chapter 5. ANALOG CONTROL> for functions

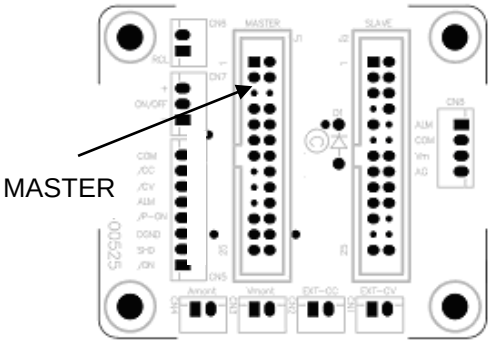
Isolated Analog Programming port (Optional)

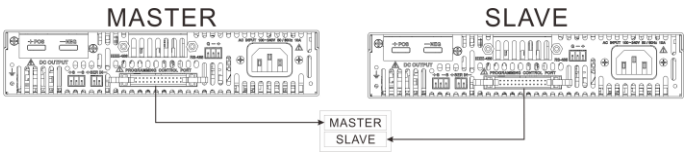


Non-Isolated Analog Programming port (Standard)

4-2-3-1. Circuit board for Series use (Optional):

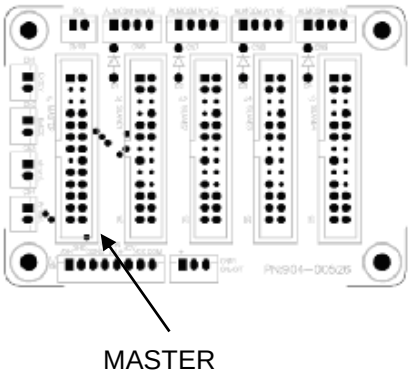
Please refer to <6-1 Series Operation> for detail

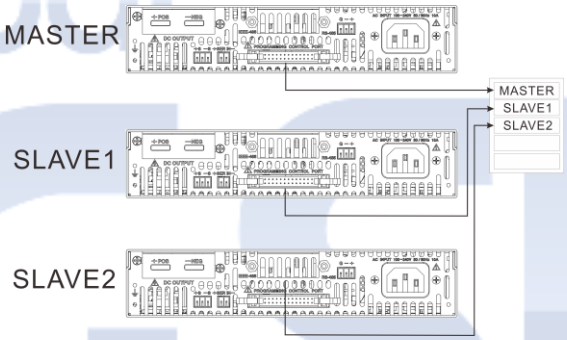




4-2-3-2. Circuit board for Parallel use (Optional):

Please refer to <6-2 Parallel Operation> for detail





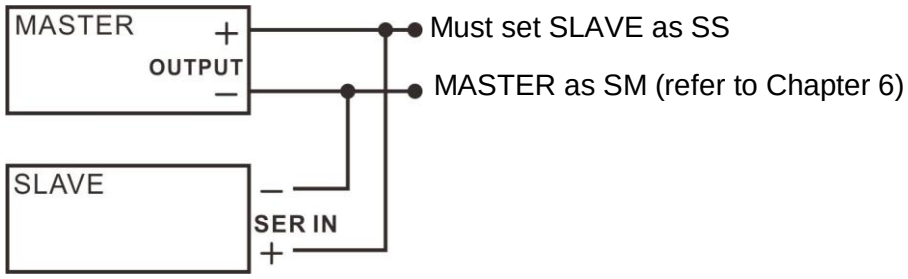
4-2-4. When 2 units of PR/PD (same model) are operated in series:

This connector will measure the output voltage of MASTER. The SLAVE unit will adjust the output voltage to make it be same as the output voltage of MASTER

(1) Position 1: Connect to -OUT of MASTER

(2) Position 2: Connect +OUT of MASTER

(3) As below:



4-2-5. Remote Sense/Compensation terminal:

This terminal is used to measure the voltage of load side. Please ensure to connect the correct polarity.

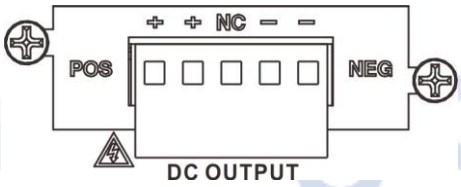
+S: Remote sense (+)
Not used
-S: Remote sense (–)

***The usages described below may cause the damage!!**
1. Connect +V out to -S
2. Connect –V out to +S
3. Connect +S to -S

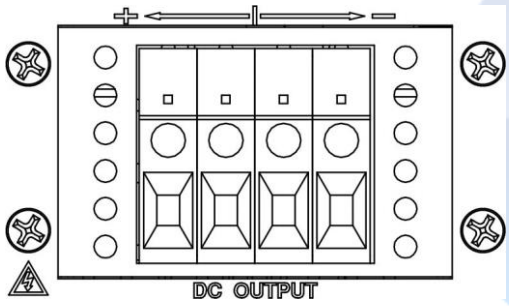
4-2-6. DC OUTPUT terminals:

May be changed according to different capacities.

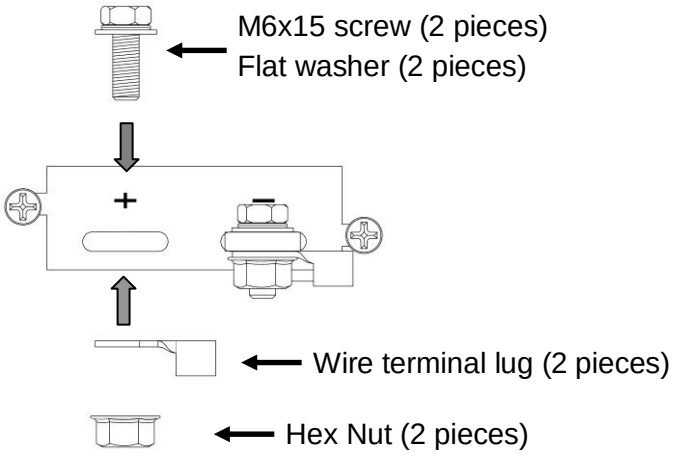
4-2-6-1. 1UH / 2UH High Voltage (150V~600V models) DC output terminals:



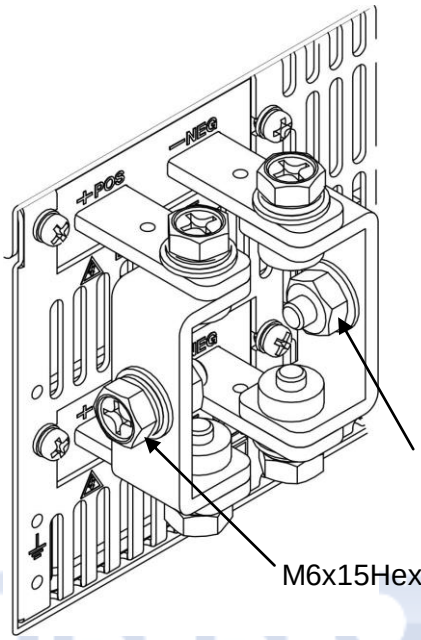
4-2-6-2. 1U / 2U High Voltage (150V~600V models) DC output terminals:



4-2-6-3. 1UH Low Voltage (6V~100V models) DC output terminals:

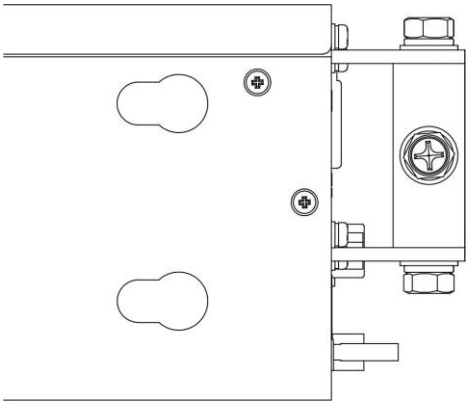


4-2-6-4. 2UH Low Voltage (6V~100V models) DC output terminals:

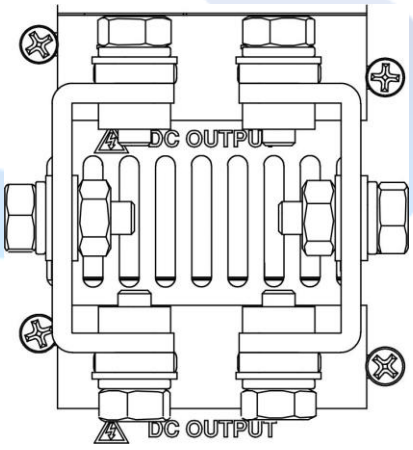


M6 Nut (2 pieces)

M6x15Hex Screw + Washer (6 pieces)

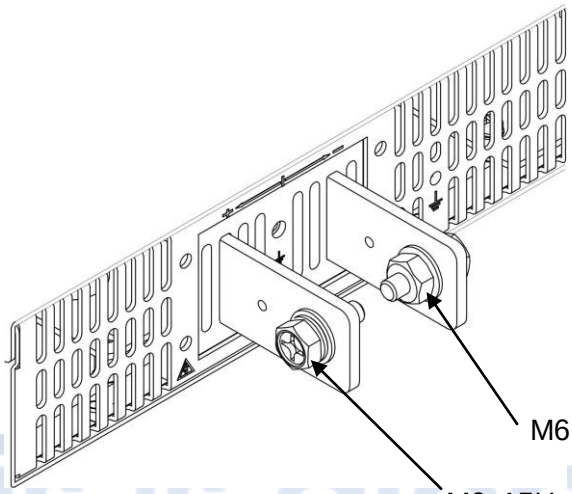


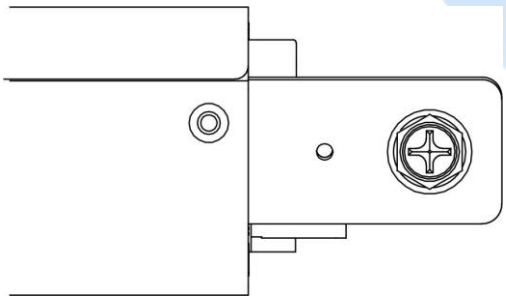
<Side View>



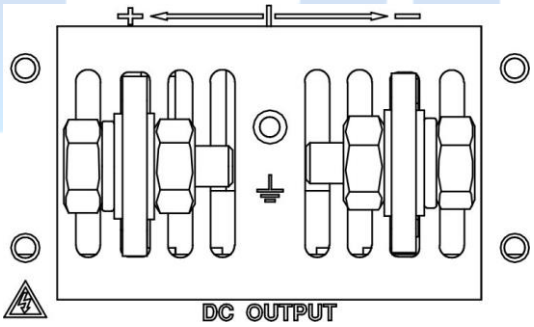
<Front View>

4-2-6-5. 1U Low Voltage (6V~100V models) DC output terminals:



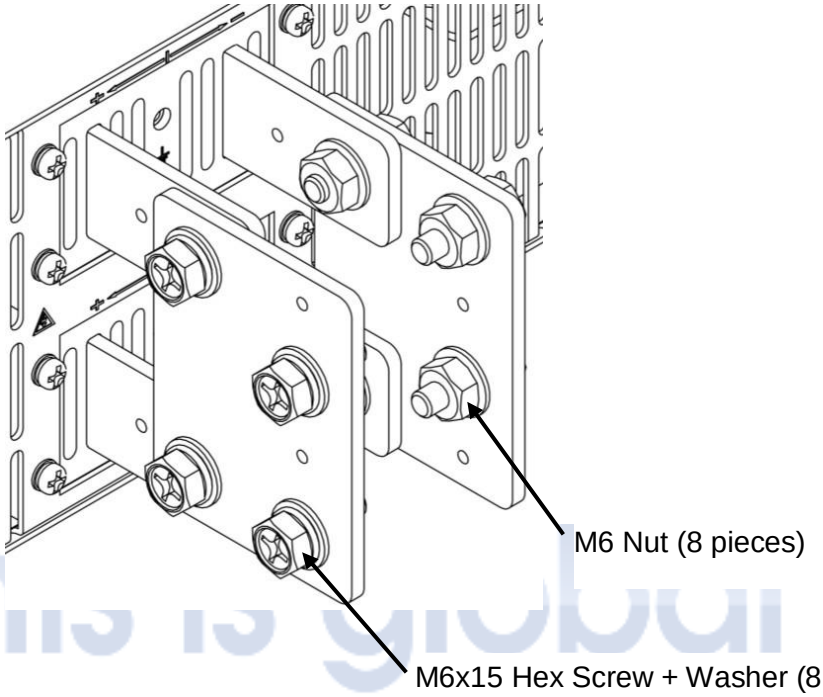


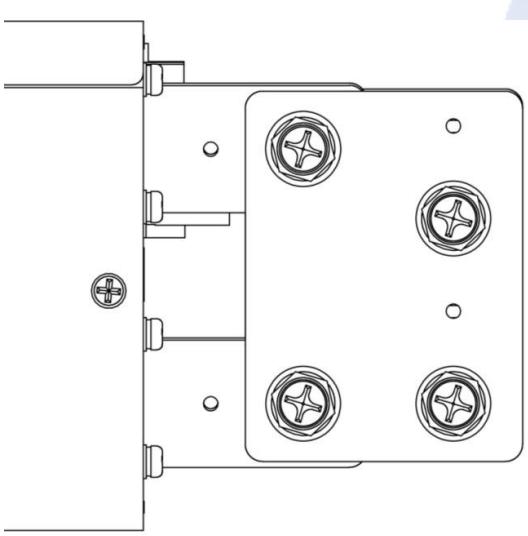
<Side View>



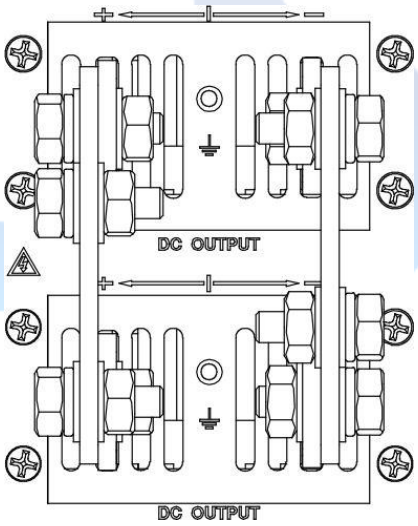
<Front View>

4-2-6-6. 2U Low Voltage (6V~100V models) DC output terminals:





<Side View>



<Front View>

4-2-7. AC INPUT terminal block:

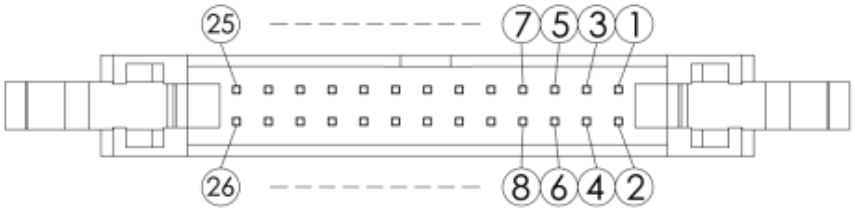
The input terminals may be changed according to different capacities.

**Note: When 2U model's AC input underload, error (error code: 79) occurred and alarmed.*

CHAPTER 5 ANALOG PROGRAMMING

5-1. Non-Isolated Analog Programming port *(Standard)*

5-1-1. Analog Programming port description



PIN	NAME	FUNCTION
1,2	RECALL	External recall control (Dry contactor) the same function as the “RCL” button on the interface.
3,4,5,6,7	Not function	
8	State common	Common for status signals from P9~ P12. *Note 1
9	ALARM State	Pin 9- Pin 8 short when the OVP, OCP or OTP trips or when a shutdown signal is applied (open collector controlled by a photo coupler). *Note 1
10	ON/OFF State	Pin 10- Pin 8 short when the output is on (open collector controlled by a photo coupler). *Note 1
11	CC State	Pin 11- Pin 8 short during CC operation (open collector controlled by a photo coupler). *Note 1
12	CV State	Pin 12- Pin 8 short during CV operation (open collector controlled by a photo coupler). *Note 1
13	EXT 5V input+	External voltage input. V+ (External input 5Vdc for the relay of output ON/OFF function).
14	EXTV input common	External voltage input V common (Output ON/OFF function).
15	PRL IN+	For units those operate in parallel, P15 is used for signal input of current sharing between MASTER and SLAVE.
16	EXT CV	Analog programming 0~10Vdc, for proportional output voltage setting.
17	PRL OUT+	For units those operate in parallel, P17 is used for signal output of current sharing between MASTER and SLAVE.
18	EXT CC	Analog programming 0~10Vdc, for proportional output current setting.
19	PRL IN-/OUT-	V common of P15 and P17.
20	V MONITOR	Analog monitor 0~10Vdc for proportional output voltage measurement.
21	ON/OFF Control	External output ON/OFF control (Dry contactor), ON (short); OFF (open).
22	A MONITOR	Analog monitor 0~10Vdc for proportional output current measurement.
23	Shut off	The output of the DC power will be shut off when short P23-P25.
24,26	Analog common	Analog programming signal ground, connect to pin#19.
25	Digital common	Digital signal control ground.
Note 1: Open collector output: Maximum voltage 30 V and maximum current 8 mA.		

5-1-2. OUTPUT VOLTAGE ADJUSTMENT BY ANALOG PROGRAMMING

Use Programming controls port (hereinafter referred to it as ”APG”) on the rear panel to supply 0~10Vdc between P16(+) and P26(-). The 10Vdc corresponds to full scale of output.

⚠CAUTION

The analog programming voltage should not exceed 10.5Vdc. The OVP will be executed whether the output of DC power is ON or OFF.

5-1-3. OUTPUT CURRENT ADJUSTMENT BY ANALOG PROGRAMMING

Use APG on the rear panel to supply 0~10Vdc between P18 (+) and P26 (-). The 10Vdc corresponds to full scale of output.

⚠CAUTION

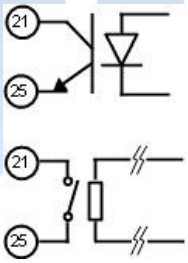
The analog programming voltage should not exceed 10.5Vdc. The OCP will be executed whether the output of DC power is ON or OFF.

5-1-4. OUTPUT ON/OFF EXTERNAL CONTROL SETTINGS

(1) Use APG on the rear panel to connect both of P21 and P25. To short or open P21 and P25 to control output ON/OFF.(non-isolated)
(2) Before controlling ON / OFF by short/open P21/P25, it is required to set EO.C to be ON (see 8-6-14 EO.C Control Menu), this action, hence, will be activated.
(3) Supply 5Vdc to P13-P14 to enable the output.(isolated)

⚠CAUTION

Use the photo-coupler or the relay to control.
Be aware of polarity when using the photo-coupler and refer to the figure on the right.
It is recommended to move the contacts as near the pins as possible.



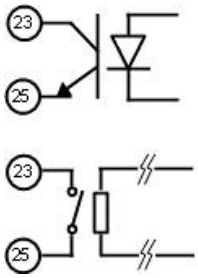
5-1-5. OUTPUT EMERGENCY OFF EXTERNAL CONTROL

(1) Use APG on the rear panel to short the P23 and P25.
(2) When controlling this action, ERROR 77 will be occurred (please refer to Chapter 11), and the output is OFF.

⚠CAUTION

Use the photo-coupler or the relay control.
Be aware of polarity when using the photo-coupler and refer to the figure on the right.

It is recommended to move the contacts as near the pins as possible.



5-1-6. OUTPUT VOLTAGE & CURRENT MONITORING

When the DC power is using to an external monitor, the pin assignments as follows:

APG	Signal Name	Description
P24	Analog common	Analog programming signal control ground
P20	V MONITOR	Analog monitor 0~10Vdc for proportional output voltage measurement
P22	A MONITOR	Analog monitor 0~10Vdc for proportional output current measurement

⚠CAUTION

To short P24, P20 and P22 will damage the DC power.
Output resistance: Approx. 100Ω; the maximum output current: Approx. 10mA

5-1-7. RECALL FUNCTION

To enable or disable recall by short or open the P1 and P2 (Please refer to 8-4 RECALL setting)

5-1-8. OUTPUT STATUS MONITORING

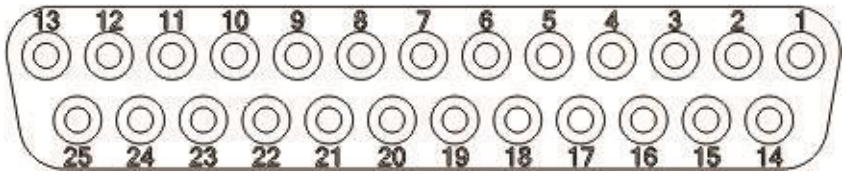
To connect P8, P9, P10, P11, P12 from APG on the rear panel

APG	Signal Name	Description
P8	State common	Common for status signals from P9~ P12 *Note 1
P9	ALARM State	Pin 9- Pin 8 short when the OVP, OCP or OTP trips or when a shutdown signal is applied (open collector controlled by a photo coupler) * Note 1
P10	ON/OFF State	Pin 10- Pin 8 short when the output is on (open collector controlled by a photo coupler) *Note 1
P11	CC State	Pin 11- Pin 8 short during CC operation (open collector controlled by a photo coupler) *Note 1
P12	CV State	Pin 12- Pin 8 short during CV operation (open collector controlled by a photo coupler) *Note 1

Note 1: Open collector output: Maximum voltage of 30 V and maximum current of 8 mA.

5-2. Isolated Analog Programming port *(Optional)*

5-2-1. Pin assignment of Isolated Analog Programming Port



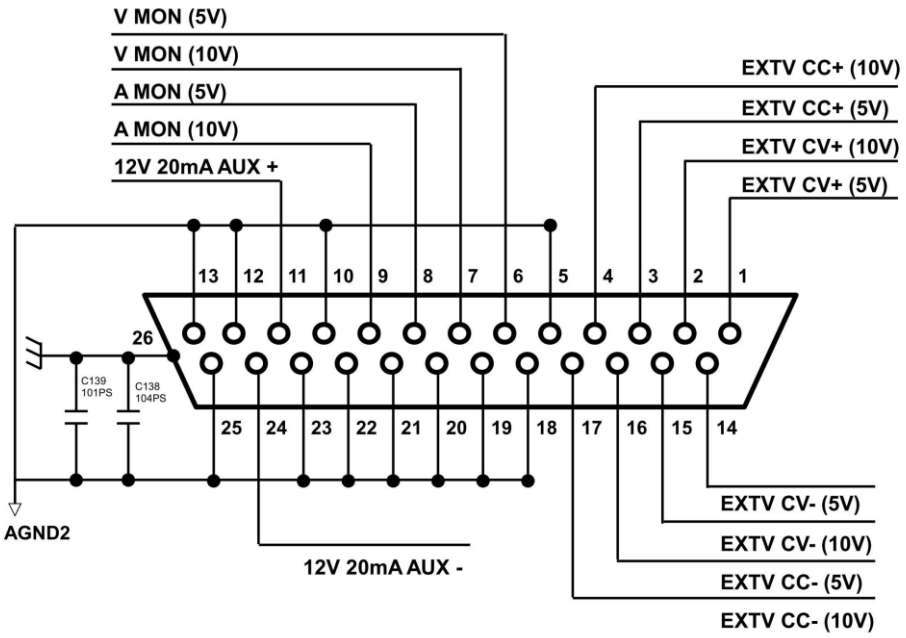
Pin 1	External 5V CV control +	“+” of external input 0~5Vdc, for proportional output voltage setting. Use with Pin 14.
Pin 2	External 10V CV control +	“+” of external input 0~10Vdc, for proportional output voltage setting. Use with Pin 15.
Pin 3	External 5V CC control +	“+” of external input 0~5Vdc, for proportional output current setting. Use with Pin 16.
Pin 4	External 10V CC control +	“+” of external input 0~10Vdc, for proportional output current setting. Use with Pin 17.
Pin 5	GND	Common ground
Pin 6	5V Output Voltage Monitor +	“+” of analog monitor 0~5Vdc for proportional output voltage measurement. Use with Pin 18
Pin 7	10V Output Voltage Monitor +	“-“ of analog monitor 0~10Vdc for proportional output voltage measurement. Use with Pin 19
Pin 8	5V Output Current Monitor +	“+” of analog monitor 0~5Vdc for proportional output current measurement. Use with Pin 20
Pin 9	10V Output Current Monitor +	“-“ of analog monitor 0~10Vdc for proportional output current measurement. Use with Pin 21
Pin 10	GND	Common ground
Pin 11	AUXOUT+	Positive of auxiliary output 12V/20mA, use with Pin 24
Pin 12	GND	Common ground
Pin 13	GND	Common ground
Pin 14	External 5V CV control -	“-” of external input 0~5Vdc, for proportional output voltage setting. Use with Pin 1.
Pin 15	External 10V CV control -	“-” of external input 0~10Vdc, for proportional output voltage setting. Use with Pin 2.
Pin 16	External 5V CC control -	“-” of external input 0~5Vdc, for proportional output current setting. Use with Pin 3.
Pin 17	External 10V CC control -	“-” of external input 0~10Vdc, for proportional output current setting. Use with Pin 4.
Pin 18	GND	Common ground, use with Pin 6
Pin 19	GND	Common ground, use with Pin 7
Pin 20	GND	Common ground, use with Pin 8
Pin 21	GND	Common ground, use with Pin 9
Pin 22	GND	Common ground
Pin 23	GND	Common ground
Pin 24	AUXOUT-	Negative of auxiliary output 12V/20mA, use with Pin 11
Pin 25	GND	Common ground
Pin 26	GND	Common ground, connected to chassis

5-2-2. Isolated Analog Programming port description

1. This option must be installed in Protek's factory, at the same position as LXI/GPIB, this position can only fit one of these three interfaces, i.e. Isolated analog/LXI/GPIB.

2. This option can only performs external voltage/current control/monitoring, the other functions has to be controlled through the standard analog programming port, please refer to 5-1-4, 5-1-5, 5-1-7, 5-1-8.

3. When equipped this optional isolated analog control, the external voltage/current control/monitoring of the standard analog control will be disabled, please refer to 5-1-2, 5-1-3, 5-1-6.



CHAPTER 6 SERIES & PARALLEL OPERATION

6-1. USE FOR SERIES CONNECTION

6-1-1. Series Operation Wiring:

PR/PD can be operated in series by using the maximum of two units with the same model to obtain a higher output voltage. However, to avoid causing damages, the total voltage should be lower than 600 Vdc.

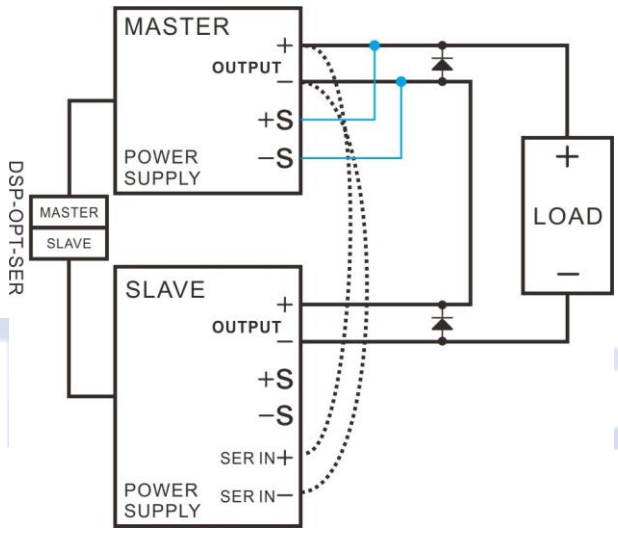


Fig.6-1. (without remote compensation) Series Mode Wiring Instructions

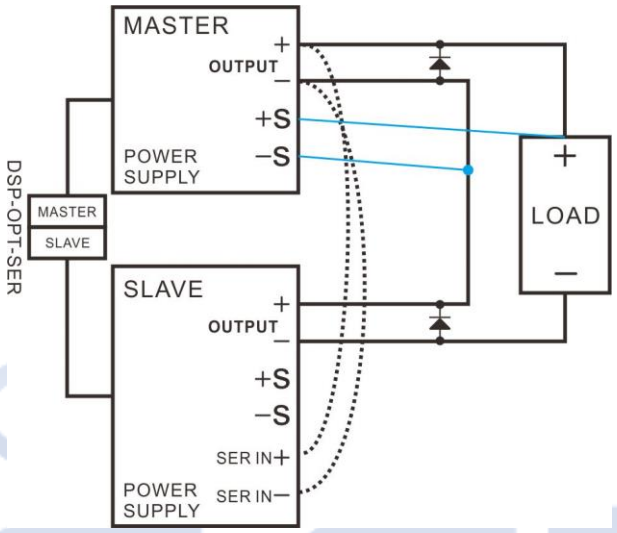


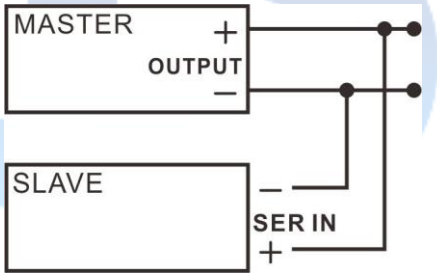
Fig 6-2. (with remote compensation) Series Mode Wiring Instructions

6-1-2. The wiring method below:

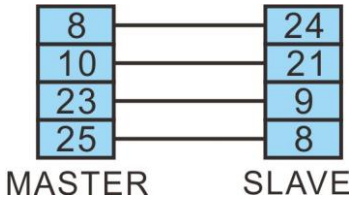
(1) Slave:

Connect Pin#1 of “series in” to MASTER output "+".

Connect Pin#2 of “series in” to MASTER output "-".



(2) If there is no series circuit board, follow the wiring method below to connect analog programming ports in each DC power:



6-1-3. Before turning on the power

please follow the wiring diagram to connect the output terminal of the DC power supply to the load. Also connect the related “series in” (for series use) and remote sense connectors (+S/-S).

6-1-4. Series function descriptions

a. Verify the series wiring of “series in”.

b. Priority of power ON operation: Master unit first and then Slave unit.

c. Priority of power OFF operation: Slave unit first and then Master unit.

d. Set the PSOP function in the MENU as SM for the Master unit.

e. Set the PSOP function in the MENU as SS for the Slave unit.

f. To ensure the protection function will work properly, please set a higher OVP/OCP value for the SLAVE unit.

g. After setting, the output ON/FF is controlled by MASTER.

h. The MASTER shows the output current and the output voltage of single unit, and the SLAVE shows the output voltage of single unit only.

i. The voltage monitoring functions, The APG connector Pin#20 (V MON) of MASTER and SLAVE are functional when these 2 units are used in series. The total output voltage = MASTER voltage + SLAVE voltage.

j. The current monitoring functions, The APG connector Pin#22 (A MON) of MASTER and SLAVE are functional when these 2 units are used in series.

k. When operated in series, the protection function of the MASTER, Pin#9 (ALM STATUS) of APG connector, is functional. If the MASTER acts abnormally, its protection function will be activated to shut down both of MASTER and SLAVE.

l. When operated in series, the protection function of the SLAVE, Pin#9 (ALM STATUS) of APG, is functional. If the SLAVE acts abnormally, its protection function will be activated and cause the MASTER to turn off the output.

m. When PR/PD is operated under the series mode and in the remote control, only MASTER can be operated and controlled by remote commands.

n. When changing the operation mode of the DC power supplies under series operation to a single unit operation, please turn off the power. Also remove the wires that are connected to “series in” and output connector wires. To change the PSOP (Parallel/Series operation) to PM (parallel master) in the Menu.

6-2. USE FOR PARALLEL CONNECTION

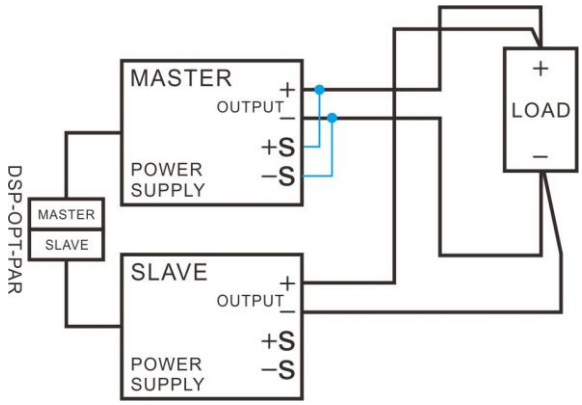


Fig.6-3. Wiring method for 2 units in parallel without remote sense

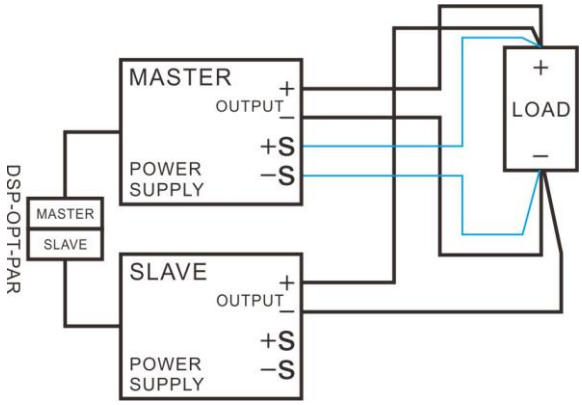


Fig.6-4. Wiring method for 2 units in parallel with remote sense

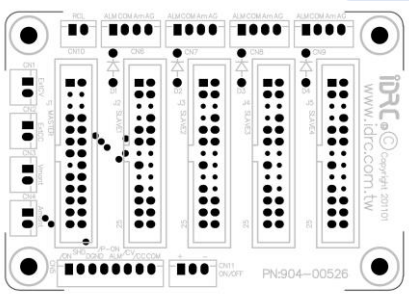
All of the same models of the PR/PD series can be operated for maximum of 5 units in parallel:

(1) Before turning on the power, please connect proper number of units based on your needs of current capacity.

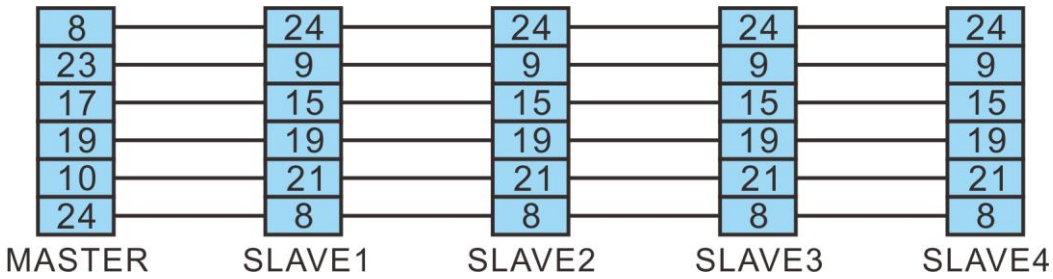
(2) Total output current = MASTER + SLAVE1 + SLAVE2 + SLAVE3 + SLAVE4

6-2-1. Connect APG of 2 units to the circuit board

Refer to the figure below for parallel use.



(1) If there is no parallel circuit board, follow the wiring method below to connect analog programming ports in each DC power:



Attention!! Please verify the output terminals of the MASTER and the SLAVE are connected with the same polarity.

(2) Please refer to “Wiring introduction” for the appropriate wire diameter. According to the wiring diagram, use the same length of the wire to connect the output terminals of power supply to the load. The length of the wire that is connected to the load should be as short as possible, and it should verify the connection of APG control terminals in each unit.

6-2-2. Parallel function descriptions

a. Priority of power ON operation: Master unit first and then Slave unit.

b. Priority of power OFF operation: Slave unit first and then Master unit.

c. It is required to set r.dnt in the MENU selection as 0.

d. Set the PSOP function in the MENU as PM for the power supply of MASTER.

e. Set the PSOP function in the MENU as PS for the other SLAVE units.

f. When over voltage or over current is occurred, to ensure the protection function will work properly, please set a higher OVP/OCP value for the SLAVE units.

g. After setting, the output ON/FF is controlled by MASTER.

h. The MASTER shows the output voltage and the output current of single unit, and the SLAVE shows the output current of single unit only.

i. The voltage monitoring functions, Pin#20 (V MON) of APG connector of MASTER and SLAVE, are functional when DC power supplies are used in parallel.

j. The current monitoring functions, Pin#22 (A MON) of APG connector of MASTER and SLAVE, are functional when the units are used in parallel. The total output current = MASTER current + SLAVE current.

k. When operated in parallel, the protection function of the MASTER, Pin#9 (ALM STATUS) of APG connector, is functional. If the MASTER acts abnormally, its protection function will be activated to shut down both of MASTER and SLAVE.

l. When operated in parallel, the protection function of the SLAVE, Pin#9 (ALM STATUS) of APG, is functional. If the SLAVE acts abnormally, its protection function will be activated and cause the MASTER to turn off the output.

m. The remote sensing function: Only the MASTER is functional; SLAVE is temporarily invalid.

n. When PR/PD is operated under the parallel mode and in the remote control through digital interfaces, only MASTER can be operated and controlled by remote commands.

o. When changing the operation mode of the DC power supplies under parallel operation to a single unit operation, please turn off the power. Also remove the wires that are connected to APG connector and output connector wires. To change the PSOP (Parallel/Series operation) to PM (parallel master) in the Menu.

CHAPTER 7 LOAD CONNECTION DESCRIPTION

7-1. WIRING INTRODUCTION

Notice: Please ensure the mains supply is turned off before wiring!!

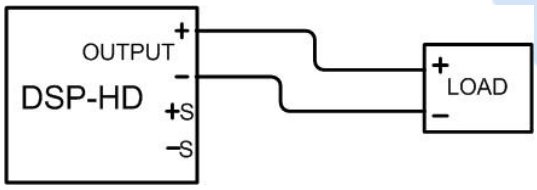
(1) Using the proper wires can avoid the attenuation characteristics. Please refer to the table below.
(2) The flexible wire is recommended.
(3) When the diameter of wire is smaller than the required one in the following table, please combine two wires in parallel with the same diameter and length.
(4) The wire and voltage drop reference table:

AWG Size	Diameter mm^2	Resistance (Ohm / 100m)	Max. length of voltage drop less than 1V(m)				
			5A	10A	20A	50A	150A
14	2	0.8	24.4	12.2	6.1	2.4	0.6
12	3.5	0.5	36.6	18.3	9.1	3.7	1.0
10	5.5	0.3	61.0	30.5	15.2	6.1	1.8
8	8	0.2	97.5	48.8	24.4	9.8	3.0
6	14	0.1	152.4	6.1	38.1	15.2	4.9
4	22	0.1	243.8	121.9	61.0	24.4	7.9
2	38	0.1	365.7	182.9	91.4	38.1	12.2
0	60	0.0	609.6	304.8	152.4	61.0	20.7

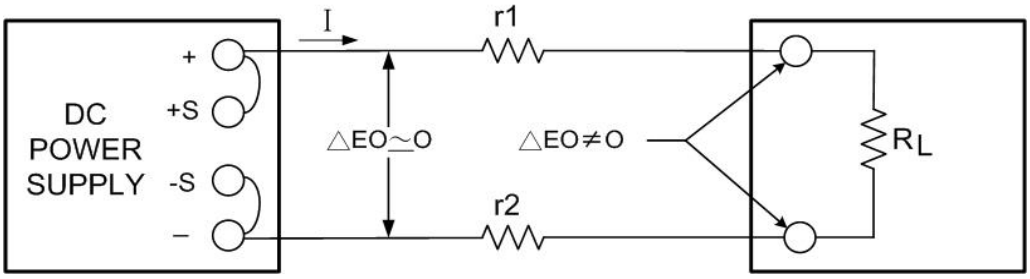
Example: When using 10AWG wire with 5m length, and current flow is10A, the voltage drop goes to 0.999x3x10 approx. 164mV.

7-2. OUTPUT CONNECTION WITHOUT REMOTE SENSE

(1) Wiring diagram:



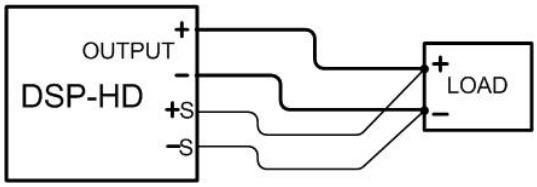
(2) Wiring description:



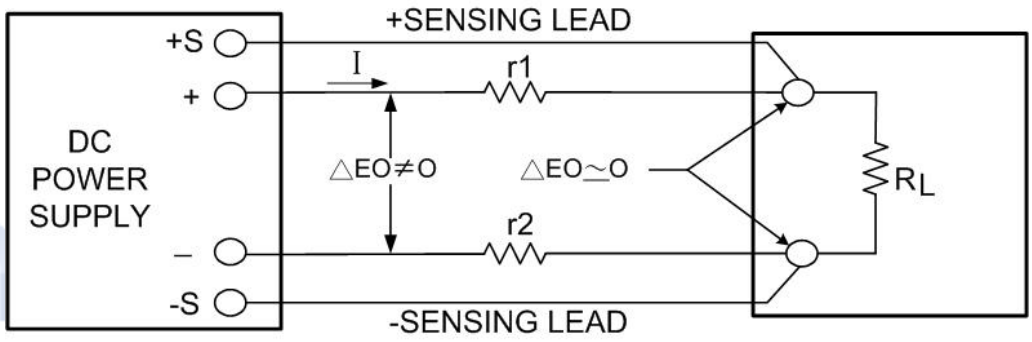
Refer to the above diagram, the +/- sense wiring is connected to the output terminal, and that will bring out the voltage drop. For example, the wire resistance is r1 & r2, and voltage drop is calculated as I x r1+ I x r2. The front panel displays the voltage of output terminals, so the voltage of load side will be equal to the value of that output terminal voltage deducts the dropped voltage (I x r1+ I x r2). The above wiring method is recommended for the high noise or switching mode load such as: DC TO DC, DC TO AC

7-3. OUTPUT CONNECTION WITH REMOTE SENSE

(1) Wiring diagram:



(2) Wiring description:

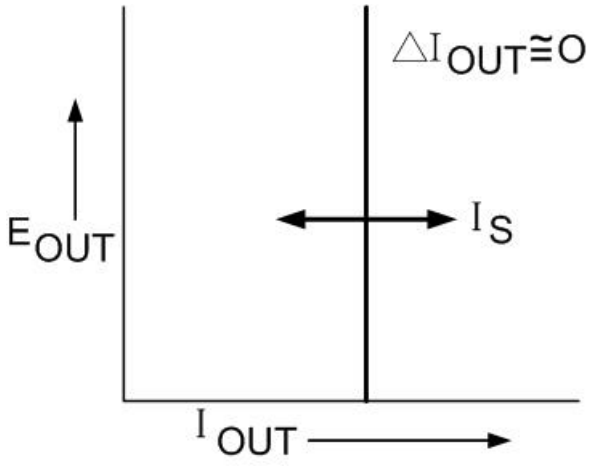


Refer to the above diagram, the +/- sense wiring is connected to the load side, which means the voltage drop will be compensated by using the +/- sense. The front panel displayed voltage equals to the voltage of load side. Please note that the compensation is varied in different models. The above wiring method is recommended to the low noise loads.

7-4. CONSTANT-VOLTAGE & CONSTANT-CURRENT CURVE

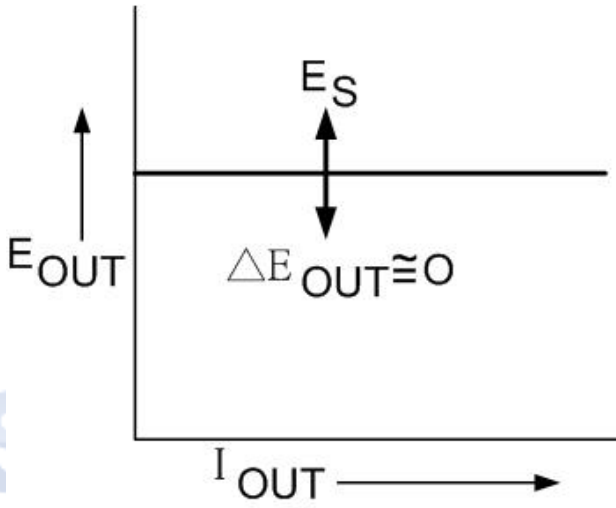
7-4-1. Description of constant current curve:

When the power supply acts to maintain its output current constant, in spite of changes of load, line, temperature and etc., for the change of load resistance, the output current remains constantly while the output voltage changes according to whatever necessary amount to accomplish this. (As follows)



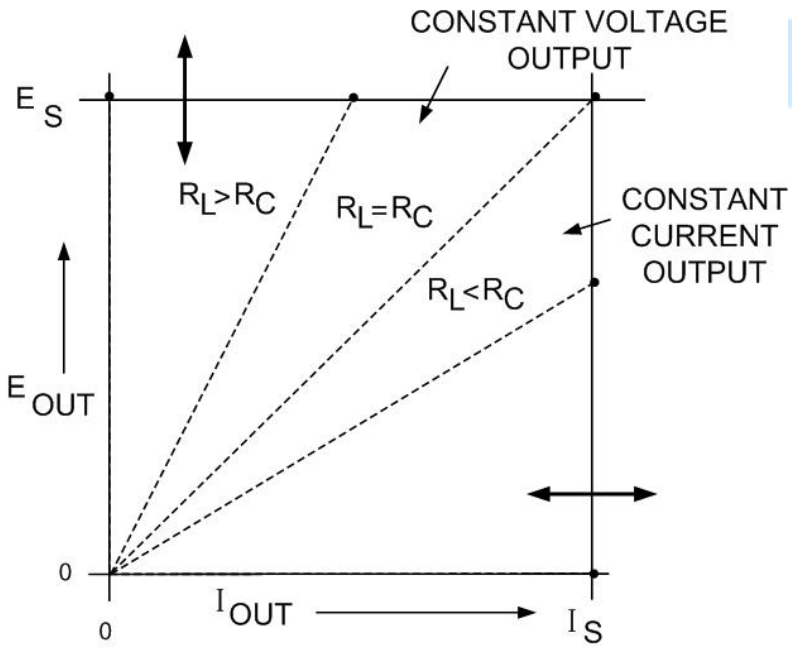
7-4-2. Description of constant voltage curve

When the power supply acts to maintain its output voltage constant in spite of changes in load, line, temperature, etc. Thus, for a change in load resistance, the output voltage of this type of supply remains constant while the output current changes by whatever amount necessary to accomplish this. (As follows)



7-4-3. Description of Constant Voltage/Constant Current (CC/CV) curve

A power supply acts as a constant voltage source for comparatively large values of load resistance, and it also functions as a constant current source for comparatively small values of load resistance. The automatic crossover or transition between these two modes of operation occurs at a "critical" or "crossover" value of load resistance Rc = Es/Is, where Es is the front panel voltage control setting and Is is the front panel current control setting.



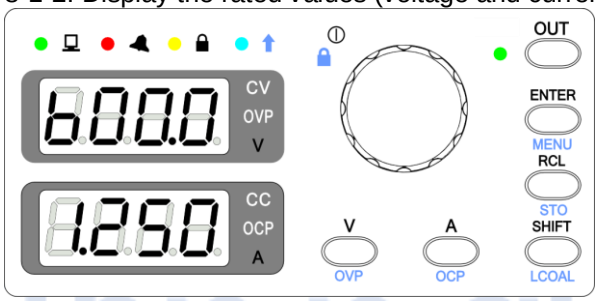
CHAPTER 8 OPERATION INTRODUCTION

8-1. POWER ON DISPLAY

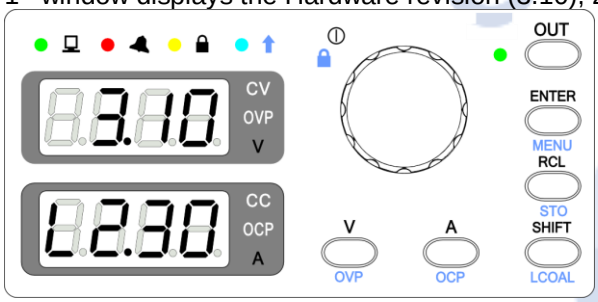
The front panel displays as the following, for example the DSP-600-01.25HD:

8-1-1. All the LEDs and indicators in the front panel light up when powering on.
Executing the self-test.

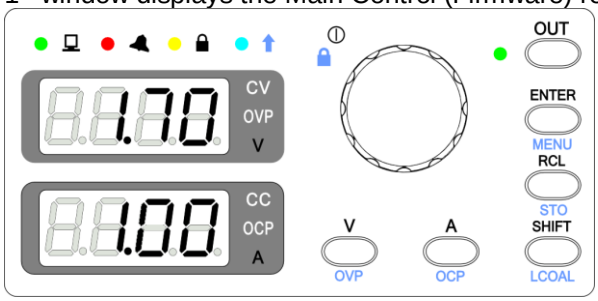
8-1-2. Display the rated values (voltage and current)



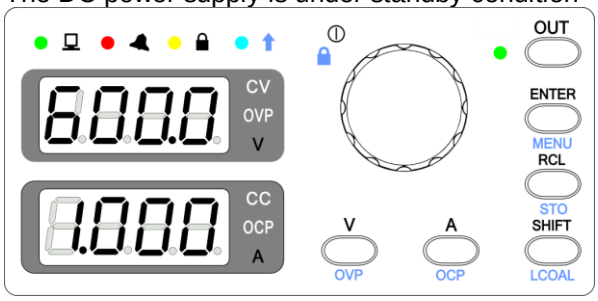
8-1-3. Display the revision -1
1st window displays the Hardware revision (3.10), 2nd window displays the Interface revision (L2.30)



8-1-4. Display the revision -2
1st window displays the Main Control (Firmware) revision (1.70), 2nd window displays the Display revision (1.00)

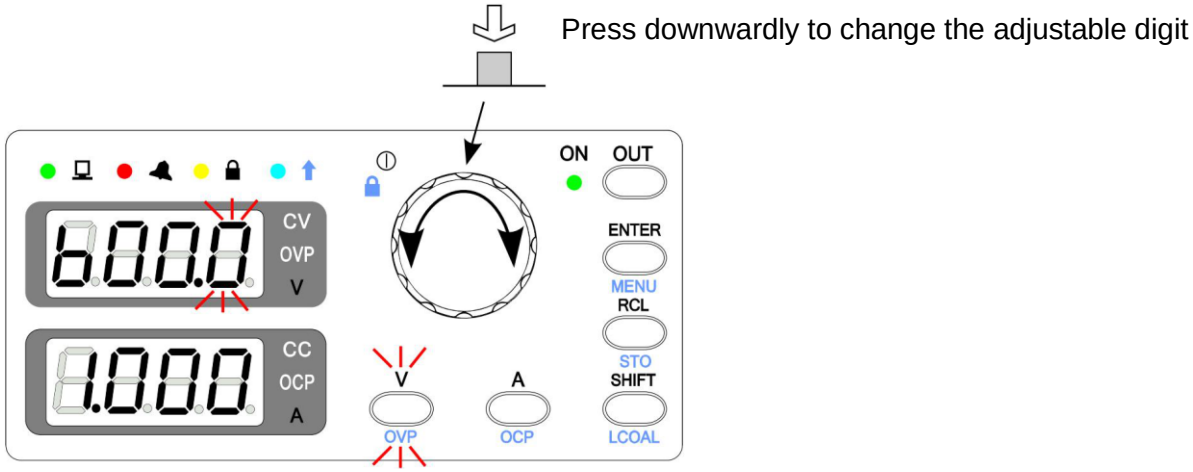


8-1-5. Display the rated values (voltage and current)
The DC power supply is under standby condition



8-2. VOLTAGE SETTING & OVP SETTING

Press V set key and turn the Encoder to adjust voltage value. The last digit will be blinking and adjustable.

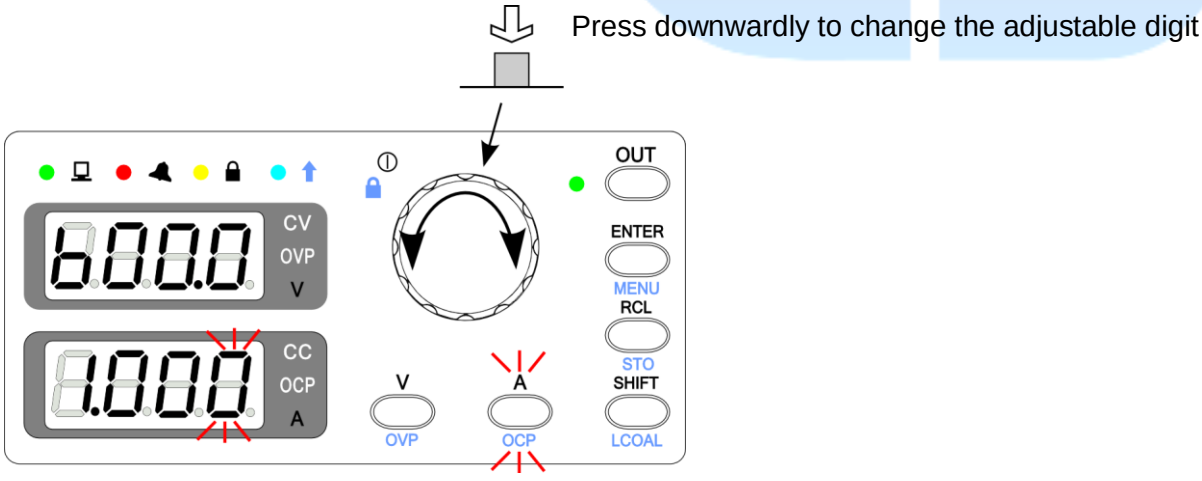


(1) Enter the setting mode of output voltage (please refer to 8-6-2 OUT MODE in the MENU for setting methods). Once you've finished the adjustment, press ENTER to confirm. The maximum adjustable value is 105% of rated voltage, and OVP setting voltage will limit the adjustment not to be higher than the OVP value.
Command: SOURce:VOLTage

(2) Press SHIFT + V set key to make it perform as OVP setting. The value can be adjustable by turning the Encoder, and the last digit will be blinking. Press ENTER to confirm. The maximum adjustable value is 110% of rated voltage and the OVP setting on the panel will limit the adjustment no to be lower than the panel V setting.
Command: SOURce:VOLTage:PROTection:LEVel

(3) To avoid having restraint caused by commands, when changing operation from remote control to manual, it is recommended to reset in MENU (refer to 8-6-21).

8-3. CURRENT SETTING & OCP SETTING



(1) Enter the output current setting mode (please refer to 8-6-2 OUT MODE in the MENU for settings). Press A set key and turn the Encoder to adjust the current value. The last digit will be blinking. Press ENTER to confirm. The A Set value will be limited by OCP value, not to be higher than the stored OCP value.
Command: SOURce:CURRent

(2) Press SHIFT + A set keys to make it perform as OCP setting. The value can be adjustable by turning the Encoder, and the last digit will be blinking. Press ENTER to confirm. The maximum adjustable value is 110% of rated current and the adjustment will be limited by the current setting of the panel (No lower than the panel A setting). Command: SOURce:CURRent:PROTection:LEVel

8-4. RECALL SETTING

(1) There are 16 memory-recalled settings. Under RECALL status, press RCL key to recall the memories. 16 sets of memory can be recalled in sequence. MEMORY FLAG should be set to define the execute range when stored memory sets are less than 16 sets.
(2) For safety operation, when you change the OVP/OCP value after storing some settings, the updated OVP/OCP value should be higher than the stored setting. Once you have recalled the settings, the recalled value will not be higher than the updated OVP/OCP value.
(3) When operating the RCL function, the output ON/OFF will remain at the last status.
(4) Press V set key to leave the RCL mode.

⚠ CAUTION

When the output is ON, after pressing RCL, the displays of voltage/current windows will be blinking at the first 3 seconds.
When the output is OFF, after pressing RCL, the displays of voltage/current windows will be blinking until the V set key is pressed.

8-5. STORE SETTING

(1) The STORE function provides total 16 settings for users to save the memory. The STORE saves V set and A set only, not includes the OVP and OCP.
(2) After pressing SHIFT+RCL keys, the V display will show a set number (01~16) and the A display will be blank. Turn the Encoder to select the number of stored settings. Press ENTER to confirm and leave STORE mode.

8-6. SETTING MENU FOR OPTIONAL GPIB MODELS (EQUIPPED WITH RS-485 & GPIB)

(1) Press SHIFT + ENTER keys to access MENU function.
(2) Turn the Encoder to select the functions of the MENU.
(3) After entering into MENU function, press ENTER to access the selected function and setting. Press ENTER to confirm the change. Turn the Encoder to move forward for the next function/setting. Press SHIFT + ENTER keys to leave the mode.
(4) Please refer to “Table of setting MENU” for the selections and procedures of the MENU.

PR/PD Table of setting MENU (RS-485 & GPIB interface)

Display 1	Display 2	Description	Refer to
Err	-999~999	Error code	8-6-1
OUT	Dir	Output mode setting	8-6-2
	Ent		
P.ON	Last	Power ON mode	8-6-3
	OFF		
R.uPT	00.0~99.9	Ramp up time	8-6-4
R.dNT	00.0~99.9	Ramp down time	8-6-5
MEM.F	01~16	RCL start/end setting	8-6-6
BEEP	ON	Key beep setting	8-6-7
	OFF		
BRIT	0~5	Display brightness	8-6-8
I.O	485	Interface selection	8-6-9
	GPIB		
485	4.8K	RS-485 baud rate setting	8-6-10
	9.6K		
	19.2K		
	38.4K		
	57.6K		
	115.2K		
GPIB	0~30	GPIB address	8-6-11
485	001~254	RS-485 address	8-6-12
PSOP	PM	Parallel master	8-6-13
	PS	Parallel slave	
	SM	Series master	
	SS	Series slave	
EO.C	OFF	External ON/OFF control disable	8-6-14
	ON	External ON/OFF control enable	
CV.V	LOC.	V set by panel	8-6-15
	EXT.	V set by APG	
CC.V	LOC.	A set by panel	8-6-16
	EXT.	A set by APG	
CAL	0000	Access calibration mode	8-6-17
SN00	0000	Serial number; total 6 numbers	8-6-18
FW	x.xx	Firmware version	8-6-19
HW	x.xx	Hardware version	8-6-20
RST	OFF	Reset Function OFF	8-6-21
	ON	Reset Function ON	

8-6-1. Err (ERROR CODE)

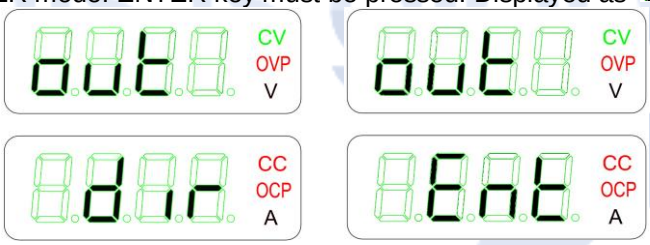
It is used to check error codes. The error code will be eliminated after it's been reviewed. Press ENTER to read the next error code. The last number is shown as 0.

8-6-2. OUT (OUTPUT MODE)

It's used to adjust V set value while the output is ON. When the DC power is selected to DIRECT mode, the output voltage value will be changed either higher or lower by turning the Encoder. When the DC power is selected to ENTER mode, the output voltage value will be only changed by pressing the ENTER key.

(1) DIRECT mode: Displayed as dir

(2) ENTER mode: ENTER key must be pressed. Displayed as Ent

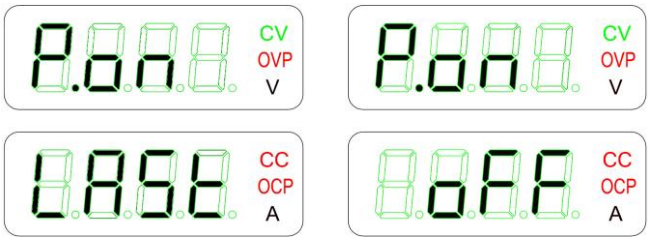


8-6-3. P.ON (POWER ON MODE)

When restarting the DC power /recovering mains supply, the output status is:

(1) LAST: The output status will be sustained as the previous one that is before turning off the DC power or mains supply is interrupted. Displayed as LASt (If the output status is ON before power off the DC power, it will remain output ON when restarting the DC power)

(2) OFF: The output status will be always off when restart the DC power. Displayed as oFF

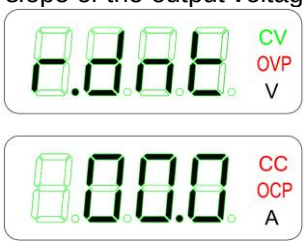


8-6-4. R.uPT (Output Voltage RAMP Up Time)

Ramp-up time can be set from 00.0 ~ 99.9s. The time setting will affect the slope of the output voltage.

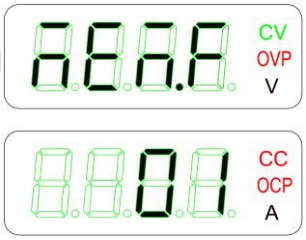
8-6-5. Output Voltage RAMP Down Time (R.dNT)

Ramp-down time can be set from 00.0 ~ 99.9s. This function will be disabled if it is set at 0s. The time setting will affect the slope of the output voltage.



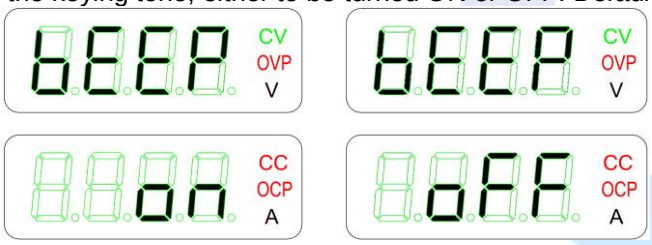
8-6-6. MEM.F (MEMORY FLAG)

There are 16 memory sets in total. MEM.F is used to indicate the execute range of the set ones, and the default value is set as 01. For example, when the MEMORY FLAG is set as 05, it means the RECALL will only be executed from 01~05.



8-6-7. BEEP (KEY BEEP)

To set up the keying tone, either to be turned ON or OFF. Default setting of the keying beep sound is set as ON.



8-6-8. BRIT (DISPLAY BRIGHT)

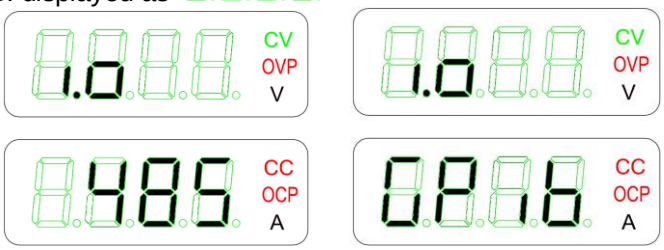
Set the brightness of the display. The level of the brightness can be set from 0~5.

8-6-9. I.O SELE (I/O SELECT)

It is used to select the programming interfaces which are: standard RS-485 and GPIB.
Interface setting mode:

(1) RS-485: displayed as 

(2) GPIB: displayed as 



8-6-10. RS-485 Baud rate

Baud rate setting for RS-485, the default setting is 115.2K.

(1) 4800: displayed as 

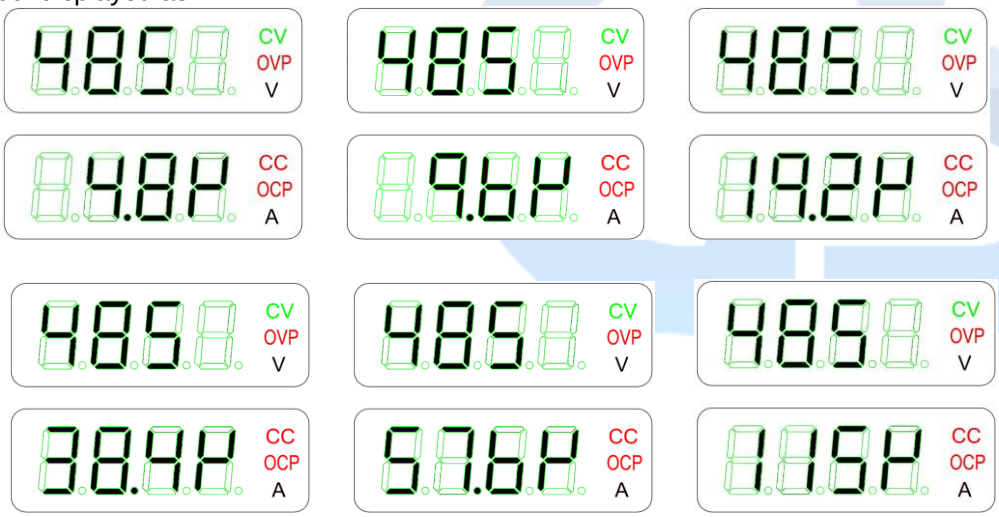
(2) 9600: displayed as 

(3) 19200: displayed as 

(4) 38400: displayed as 

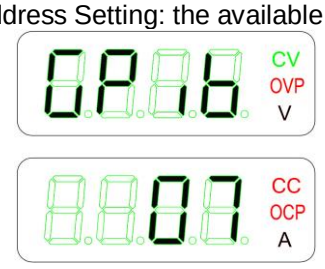
(5) 57600: displayed as 

(6) 115200: displayed as 



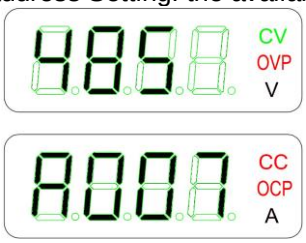
8-6-11. GPIB (GPIB ADDRESS)

GPIB address Setting: the available address is from 0~30. The default setting is 07.



8-6-12. 485 (RS-485 address)

RS-485 address Setting: the available address is from 001~254. The default setting is 007.

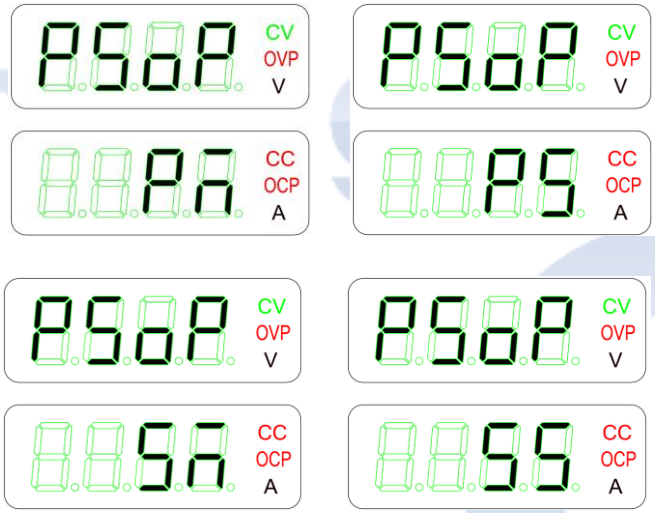


8-6-13. PSOP (Parallel and serial operation)

Set the power supplies for parallel or series operation: maximum 5 units (including MASTER) for parallel or 2 units (including MASTER) for series.

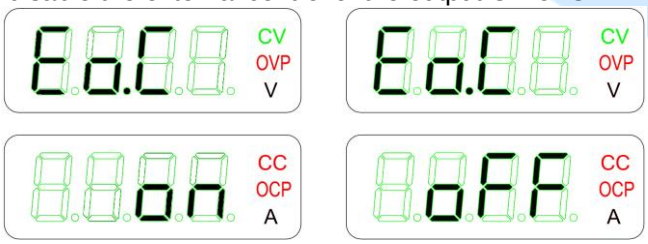
PM: Parallel Master PS: Parallel Slave

SM: Series Master SS: Series Slave



8-6-14. EO.C (External output ON/OFF control)

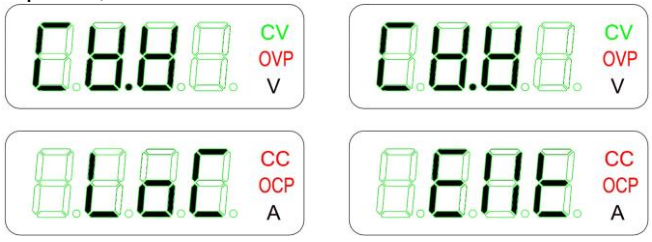
Enable or disable the external control of the output ON or OFF.



8-6-15. CV.V (Voltage Setting Selection)

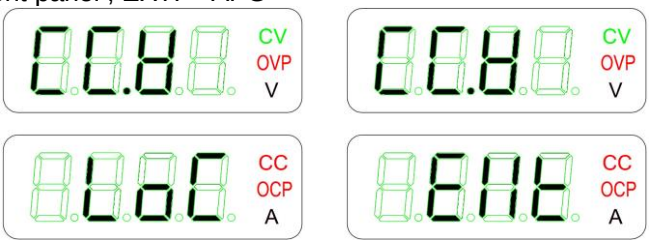
The voltage setting/adjustment can be selected to by using the front panel or APG.

LOC. = front panel , EXT. = APG



8-6-16. CC.V (Current Setting Selection)

The current setting/adjustment can be selected to by using the front panel or APG.
LOC. = front panel , EXT. = APG

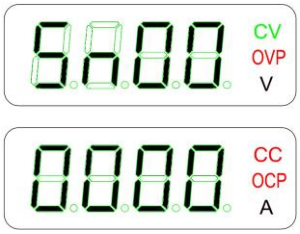


8-6-17. CAL CODE (CALIBRATION CODE)

An access to Calibration code: Press ENTER key, then turn the Encoder, and enter the pin number.

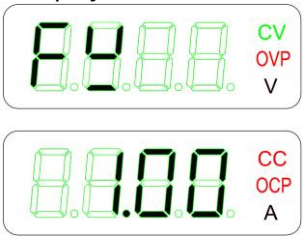
8-6-18. SN (SERIAL NUMBER)

Indicate and display Serial number only.



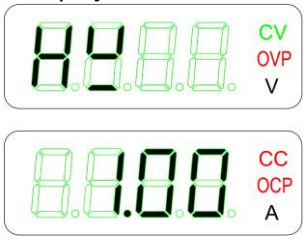
8-6-19. FW (SOFTWARE REVISION)

Indicate and display firmware/software version only.



8-6-20. HW (HARDWARE REVISION)

Indicate and display hardware version only.

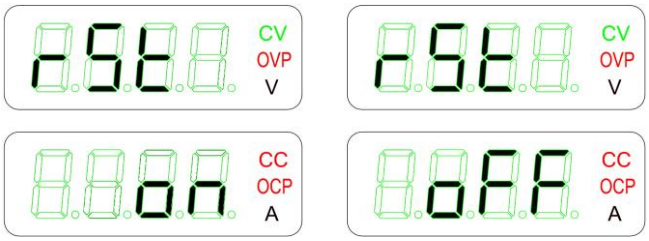


8-6-21. RST (Reset)

To reset the value of V set and A set to 0.

The values below will be reset to factory default setting when operate RST in MENU function or command *RST:

1. V set to 0V
2. A set to 0A
3. OVP is 110% of rated voltage
4. OCP is 110% of rated current
5. UVL is 0V
6. Output is OFF



Note1: Some of our higher capacity models contain default ramp-up time. For faster ramp-up time, please consult us.

Note2: The ramp-down time depends on different models. For faster ramp-down time, please consult us.

8-7. SETTING MENU FOR STANDARD LAN MODELS (EQUIPPED WITH RS-485 & LAN)

(1) Press SHIFT + ENTER keys to access MENU function.
(2) Turn the Encoder to select the functions of the MENU.
(3) After entering into MENU function, press ENTER to access the selected function and setting. Press ENTER to confirm the change. Turn the Encoder to move forward for the next function/setting. Press SHIFT + ENTER keys to leave the mode.
(4) Please refer to “Table of setting MENU” for the selections and procedures of the MENU.

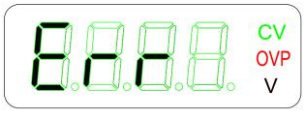
PR/PD Table of setting MENU (RS-485 & LAN interface)

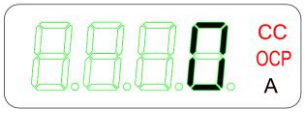
Display 1			Display 2	Description	Refer to
Err			-999~999	Error code	8-7-1
OUT			Dir	Output mode setting	8-7-2
			Ent		
P.ON			Last	Power ON mode	8-7-3
			OFF		
R.uPT			00.0~99.9	Ramp up time	8-7-4
R.dNT			00.0~99.9	Ramp down time	8-7-5
MEM.F			01~16	RCL start/end setting	8-7-6
BEEP			ON	Key beep setting	8-7-7
			OFF		
BRIT			0~5	Display brightness	8-7-8
I.O			485	Interface selection	8-7-9
			LAN		
485			4.8K	RS-485 baud rate setting	8-7-10
			9.6K		
			19.2K		
			38.4K		
			57.6K		
			115.2K		
485			001~254	RS-485 address	8-7-11
DHCP			OFF	DHCP function OFF	8-7-12
			ON	DHCP function ON	
DNS			OFF	DNS function OFF	8-7-13
			ON	DNS function ON	
DHCP OFF	DHCP ON	DHCP ON			
DNS OFF	DNS OFF	DNS ON			
S.IP1	V.IP1	V.IP1	001~223	Set/View the 1st IP address	8-7-14
S.IP2	V.IP2	V.IP2	001~254	Set/View the 2nd IP address	8-7-15
S.IP3	V.IP3	V.IP3	001~254	Set/View the 3rd IP address	8-7-16
S.IP4	V.IP4	V.IP4	001~254	Set/View the 4th IP address	8-7-17
S.MN1	V.MN1	V.MN1	001~254	Set/View the 1st Subnet Mask address	8-7-18
S.MN2	V.MN2	V.MN2	001~254	Set/View the 2nd Subnet Mask address	8-7-19
S.MN3	V.MN3	V.MN3	001~254	Set/View the 3rd Subnet Mask address	8-7-20
S.MN4	V.MN4	V.MN4	001~254	Set/View the 4th Subnet Mask address	8-7-21
S.GW1	V.GW1	V.GW1	001~223	Set/View the 1st Gateway address	8-7-22
S.GW2	V.GW2	V.GW2	001~254	Set/View the 2nd Gateway address	8-7-23
S.GW3	V.GW3	V.GW3	001~254	Set/View the 3rd Gateway address	8-7-24
S.GW4	V.GW4	V.GW4	001~254	Set/View the 4th Gateway address	8-7-25

S.DN1	S.DN1	V.DN1	001~223	Set/View the 1st DNS address	8-7-26
S.DN2	S.DN2	V.DN2	001~254	Set/View the 2nd DNS address	8-7-27
S.DN3	S.DN3	V.DN3	001~254	Set/View the 3rd DNS address	8-7-28
S.DN4	S.DN4	V.DN4	001~254	Set/View the 4th DNS address	8-7-29
PSOP			PM	Parallel master	8-7-30
			PS	Parallel slave	
			SM	Series master	
			SS	Series slave	
EO.C			OFF	External ON/OFF control disable	8-7-31
			ON	External ON/OFF control enable	
CV.V			LOC.	V set by panel	8-7-32
			EXT.	V set by APG	
CC.V			LOC.	A set by panel	8-7-33
			EXT.	A set by APG	
CAL			0000	Access calibration mode	8-7-34
SN00			0000	Serial number; total 6 numbers	8-7-35
FW			x.xx	Firmware version	8-7-36
HW			x.xx	Hardware version	8-7-37
Vma1			70.46	View the 1st and 2nd MAC Address	8-7-38
Vma2			42.xx	View the 3rd and 4th MAC Address	8-7-39
Vma2			xx.xx	View the 5th and 6th MAC Address	8-7-40
RST			OFF	Reset Function OFF	8-7-41
			ON	Reset Function ON	
RST1			OFF	Reset Function OFF	8-7-42
			ON	Reset Function ON	

8-7-1. Err (ERROR CODE)

It is used to check error codes. The error code will be eliminated after it's been reviewed. Press ENTER to read the next error code. The last number is shown as 0.



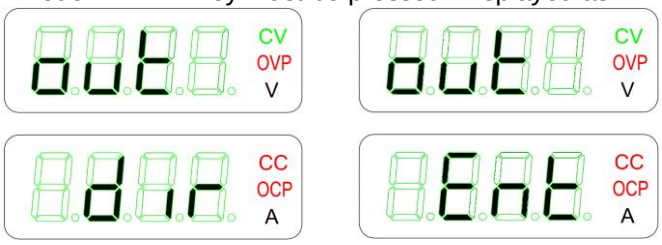


8-7-2. OUT (OUTPUT MODE)

It's used to adjust V set value while the output is ON. When the DC power is selected to DIRECT mode, the output voltage value will be changed either higher or lower by turning the Encoder. When the DC power is selected to ENTER mode, the output voltage value will be only changed by pressing the ENTER key.

(3) DIRECT mode: Displayed as 

(4) ENTER mode: ENTER key must be pressed. Displayed as 

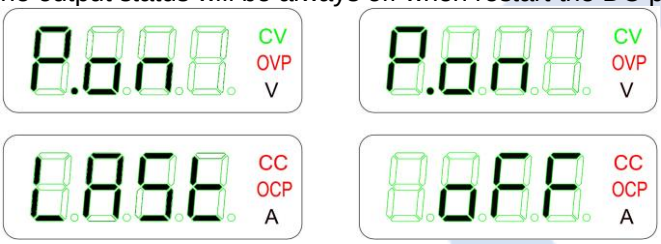


8-7-3. P.ON (POWER ON MODE)

When restarting the DC power /recovering mains supply, the output status is:

(3) LAST: The output status will be sustained as the previous one that is before turning off the DC power or mains supply is interrupted. Displayed as  (If the output status is ON before power off the DC power, it will remain output ON when restarting the DC power)

(4) OFF: The output status will be always off when restart the DC power. Displayed as 

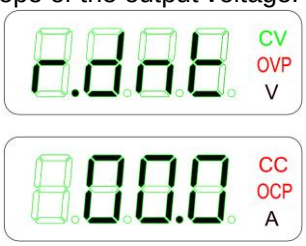


8-7-4. R.uPT (Output Voltage RAMP Up Time)

Ramp-up time can be set from 00.0 ~ 99.9s. The time setting will affect the slope of the output voltage.

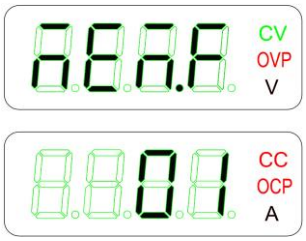
8-7-5. Output Voltage RAMP Down Time (R.dNT)

Ramp-down time can be set from 00.0 ~ 99.9s. This function will be disabled if it is set at 0s. The time setting will affect the slope of the output voltage.



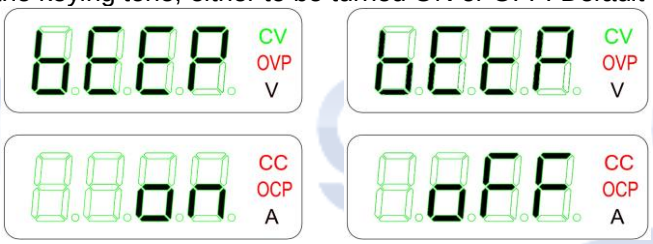
8-7-6. MEM.F (MEMORY FLAG)

There are 16 memory sets in total. MEM.F is used to indicate the execute range of the set ones, and the default value is set as 01. For example, when the MEMORY FLAG is set as 05, it means the RECALL will only be executed from 01~05.



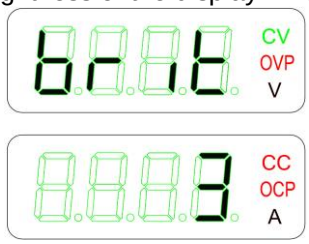
8-7-7. BEEP (KEY BEEP)

To set up the keying tone, either to be turned ON or OFF. Default setting of the keying beep sound is set as ON.



8-7-8. BRIT (DISPLAY BRIGHT)

Set the brightness of the display. The level of the brightness can be set from 0~5.

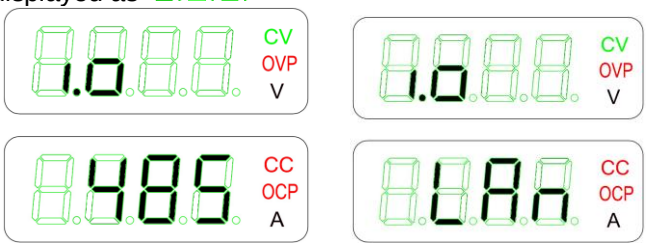


8-7-9. I.O SELE (I/O SELECT)

It is used to select the programming interfaces which are: standard RS-485 and GPIB.
Interface setting mode:

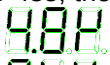
(3) RS-485: displayed as 

(4) LAN: displayed as 



8-7-10. RS-485 Baud rate

Baud rate setting for RS-485, the default setting is 115.2K.

(7) 4800: displayed as 

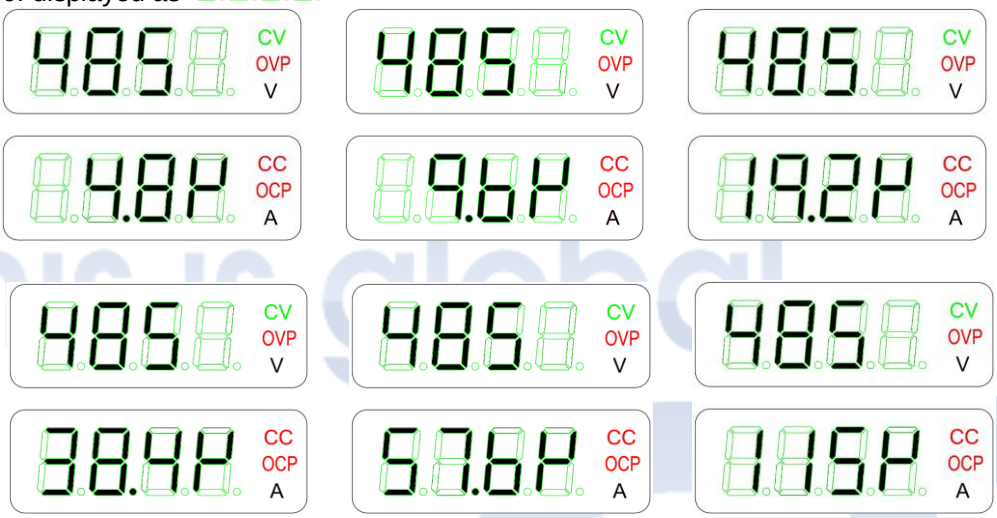
(8) 9600: displayed as 

(9) 19200: displayed as 

(10)38400: displayed as 

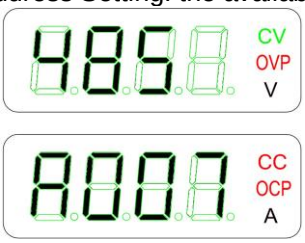
(11)57600: displayed as 

(12)115200: displayed as 



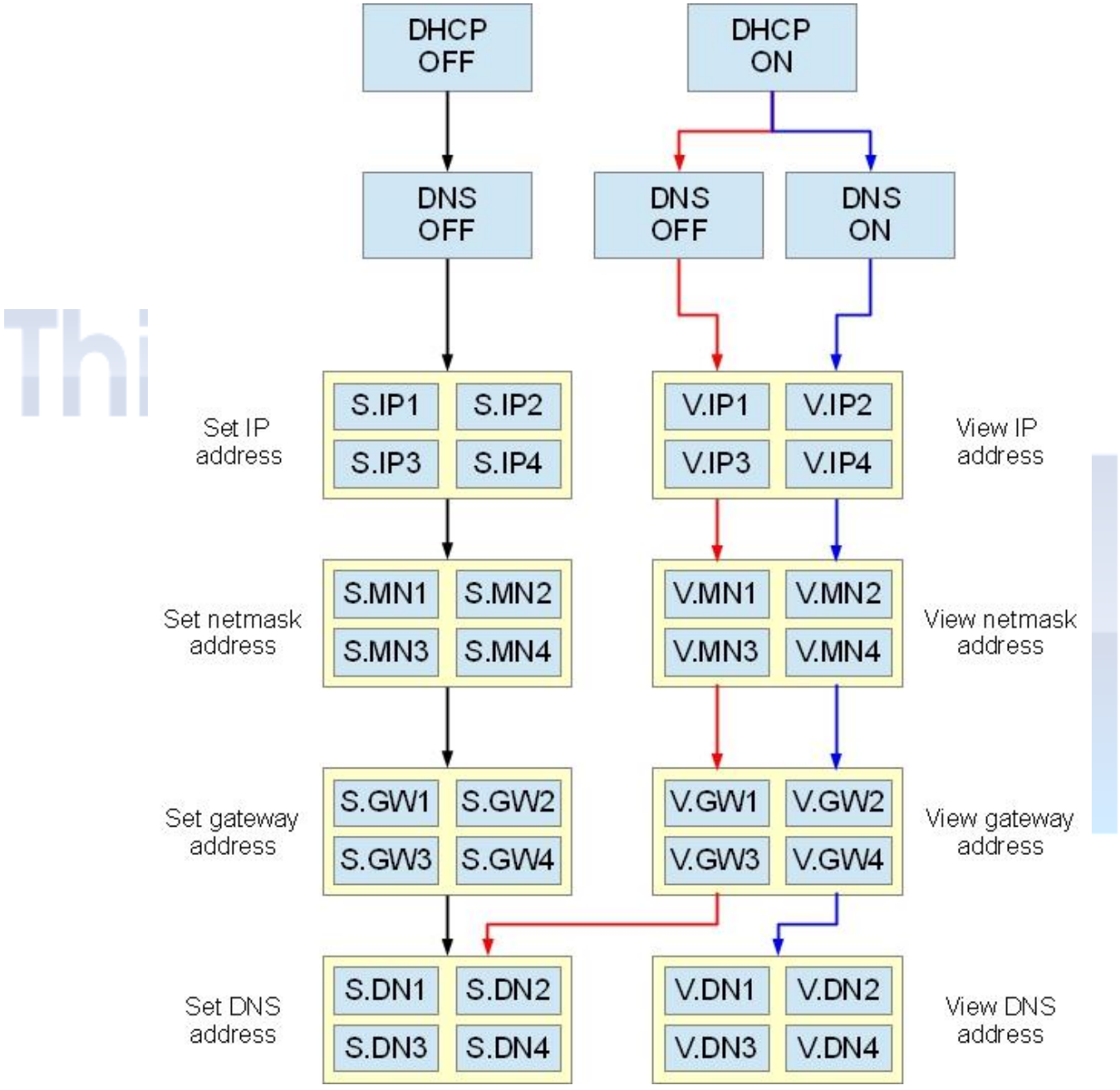
8-7-11. 485 (RS-485 address)

RS-485 address Setting: the available address is from 001~254. The default setting is 007.



8-7-12. DHCP (DHCP function ON/OFF control)

The default of DHCP is set to ON, the IP will be assigned by the DHCP server. Please set the DHCP to OFF (Refer to 8-7-12) if there is not a DHCP server available and set the IP manually (Refer to 8-7-13). You can also view the present IP address in the front panel (Refer to 8-7-14~8-7-17), or you may reset the IP to the default 192.168.0.100 (Refer to 8-7-42).



Set the acceptance of IP address assignment from DHCP server to ON/OFF.

(1) Turn the Encoder to select to this DHCP section, press ENTER key to access and turn the Encoder to select ON/OFF. Press enter key to confirm.

(2) Set this function to ON when connected the network through the network server. The IP address will be assigned by the server.

(3) Set this function to OFF when connected the PC directly to the DC power supply.

8-7-13. DNS (DNS function ON/OFF control)

Set the acceptance of DNS server address assignment from DHCP server to ON/OFF.

(1) Turn the Encoder to select to this DNS section, press ENTER key to access and turn the Encoder to select ON/OFF. Press enter key to confirm.

(2) Set this function to ON when connected the network through the network server. The DNS server address will be assigned by the server.

(3) Set this function to OFF when connected the PC directly to the DC power supply.

8-7-14. Set / View the 1st IP address

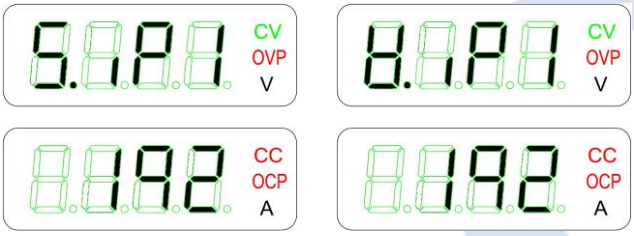
To ensure the setting of address (including IP, net mask, gateway and DNS address) correctly, it is required to complete the setting of whole address (i.e. S.IP1~S.IP4) before leave from the setting.

It indicates the 1st IP address which assigned by the server when DHCP ON.

The IP address has 4 numbers and each of them can be set from 1~223.

For example the IP address: xxx.xxx.xxx.xxx

This S.IP1 function is to set the IP address to 192.xxx.xxx.xxx.



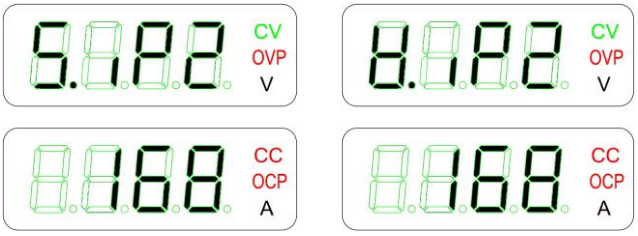
8-7-15. Set / View the 2nd IP address

Select to S.IP2 and press ENTER key to access. Turn the Encoder to change the number and then press enter key to confirm. It indicates the 2nd IP address which assigned by the server when DHCP ON.

The IP address has 4 numbers and each of them can be set from 1~254.

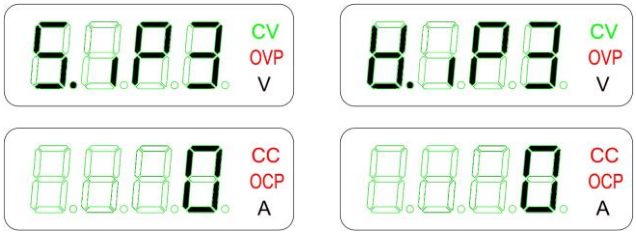
For example the IP address: 192.xxx.xxx.xxx

This S.IP2 function is to set the IP address to 192.168.xxx.xxx.



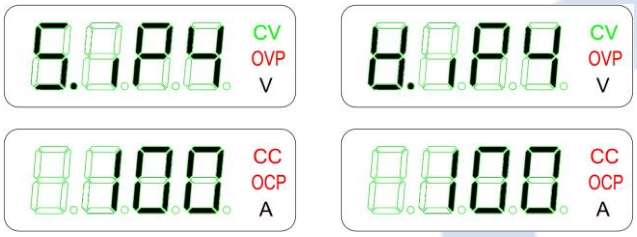
8-7-16. Set / View the 3rd IP address

Select to S.IP3 and press ENTER key to access. Turn the Encoder to change the number and then press enter key to confirm. It indicates the 3rd IP address which assigned by the server when DHCP ON.
The IP address has 4 numbers and each of them can be set from 1~254.
For example the IP address: 192.168.xxx.xxx
This S.IP3 function is to set the IP address to 192.168.0.xxx.



8-7-17. Set / View the 4th IP address

Select to S.IP4 and press ENTER key to access. Turn the Encoder to change the number and then press enter key to confirm. It indicates the 4th IP address which assigned by the server when DHCP ON.
The IP address has 4 numbers and each of them can be set from 1~254.
For example the IP address: 192.168.0.xxx
This S.IP4 function is to set the IP address to 192.168.0.100.

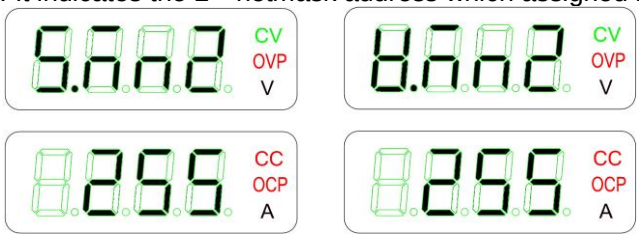


8-7-18. Set / View the 1st Subnet MASK address

The Subnet MASK address has 4 numbers and each of them can be 0~255.
For example the Subnet MASK address: xxx.xxx.xxx.xxx
Select to S.MN1 and press ENTER key to access. Turn the Encoder to change the number and then press enter key to confirm. It indicates the 1st netmask address which assigned by the server when DHCP ON.

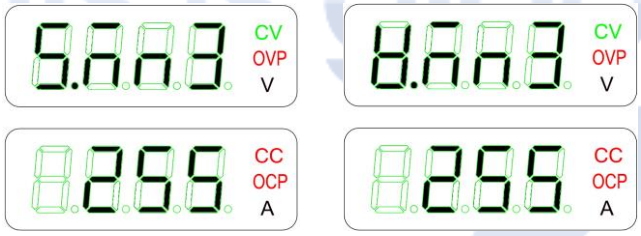
8-7-19. Set / View the 2nd Subnet MASK address

The Subnet MASK address has 4 numbers and each of them can be 0~255.
For example the Subnet MASK address : 255.xxx.xxx.xxx
This V.MN2 shows the Subnet MASK address is 255.255.xxx.xxx.
Select to S.MN2 and press ENTER key to access. Turn the Encoder to change the number and then press enter key to confirm. It indicates the 2nd netmask address which assigned by the server when DHCP ON.



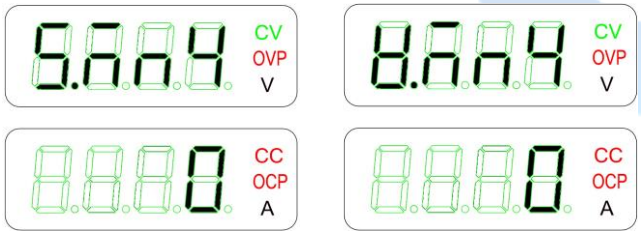
8-7-20. Set / View the 3rd Subnet MASK address

The Subnet MASK address has 4 numbers and each of them can be 0~255.
For example the Subnet MASK address : 255.255.xxx.xxx
This V.MN3 shows the Subnet MASK address is 255.255.255.xxx.



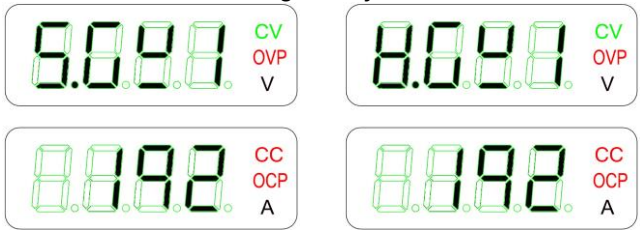
8-7-21. Set / View the 4th Subnet MASK address

The Subnet MASK address has 4 numbers and each of them can be 0~255.
For example the Subnet MASK address: 255.255.255.xxx
This V.MN4 shows the Subnet MASK address is 255.255.255.0.



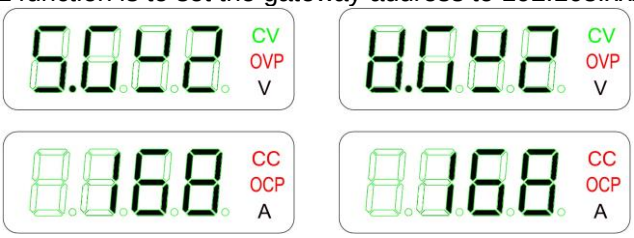
8-7-22. Set / View the 1st Gateway address

Select to S.GW1 and press ENTER key to access. Turn the Encoder to change the number and then press enter key to confirm. It indicates the 1st gateway address which assigned by the server when DHCP ON.
The gateway address has 4 numbers and each of them can be set from 1~223.
For example the gateway address: xxx.xxx.xxx.xxx
This S.GW1 function is to set the gateway address to 192.xxx.xxx.xxx.



8-7-23. Set / View the 2nd Gateway address

Select to S.GW2 and press ENTER key to access. Turn the Encoder to change the number and then press enter key to confirm. It indicates the 2nd gateway address which assigned by the server when DHCP ON.
The gateway address has 4 numbers and each of them can be set from 1~254.
For example the gateway address: 192.xxx.xxx.xxx
This S.GW2 function is to set the gateway address to 192.168.xxx.xxx.



8-7-24. Set / View the 3rd Gateway address

Select to S.GW3 and press ENTER key to access. Turn the Encoder to change the number and then press enter key to confirm. It indicates the 3rd gateway address which assigned by the server when DHCP ON.
The gateway address has 4 numbers and each of them can be set from 1~254.
For example the gateway address: 192.168.xxx.xxx
This S.GW3 function is to set the gateway address to 192.168.0.xxx.

8-7-25. Set / View the 4th Gateway address

Select to S.GW4 and press ENTER key to access. Turn the Encoder to change the number and then press enter key to confirm. It indicates the 4th gateway address which assigned by the server when DHCP ON.
The gateway address has 4 numbers and each of them can be set from 1~254.
For example the gateway address: 192.168.0.xxx
This S.GW4 function is to set the gateway address to 192.168.0.100.

8-7-26. Set / View the 1st DNS address

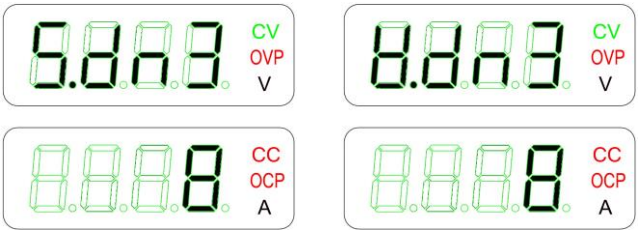
Select to S.DN1 and press ENTER key to access. Turn the Encoder to change the number and then press enter key to confirm. It indicates the 1st gateway address which assigned by the server when DHCP and DNS ON.
The DNS address has 4 numbers and each of them can be set from 1~223.
For example the gateway address: xxx.xxx.xxx.xxx
This S.DN1 function is to set the DNS address to 8.xxx.xxx.xxx.

8-7-27. Set / View the 2nd DNS address

Select to S.DN2 and press ENTER key to access. Turn the Encoder to change the number and then press enter key to confirm. It indicates the 2nd gateway address which assigned by the server when DHCP and DNS ON.
The DNS address has 4 numbers and each of them can be set from 1~254.
For example the gateway address: 8.xxx.xxx.xxx
This S.DN2 function is to set the DNS address to 8.8.xxx.xxx.

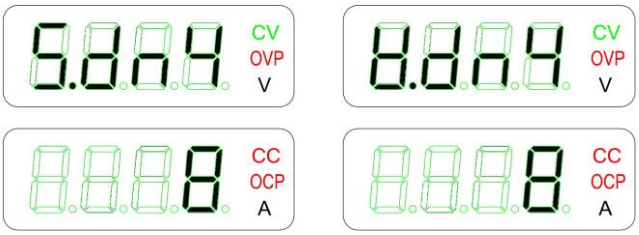
8-7-28. Set / View the 3rd DNS address

Select to S.DN3 and press ENTER key to access. Turn the Encoder to change the number and then press enter key to confirm. It indicates the 3rd gateway address which assigned by the server when DHCP and DNS ON.
The DNS address has 4 numbers and each of them can be set from 1~254.
For example the DNS address: 8.8.xxx.xxx
This S.DN3 function is to set the DNS address to 8.8.8.xxx.



8-7-29. Set / View the 4th DNS address

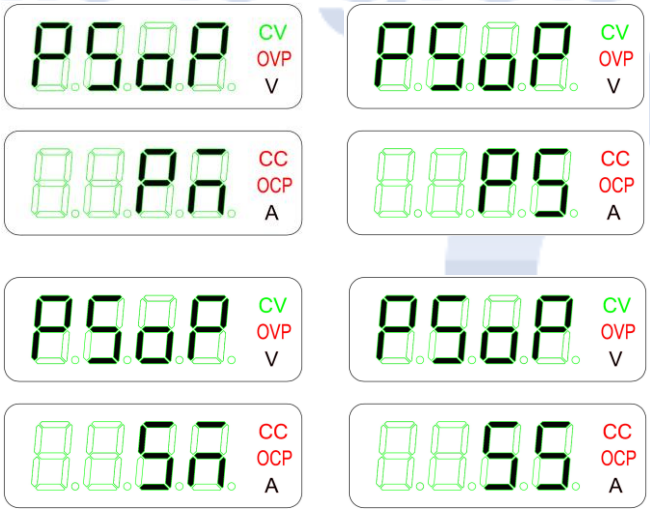
Select to S.DN4 and press ENTER key to access. Turn the Encoder to change the number and then press enter key to confirm. It indicates the 4th DNS address which assigned by the server when DHCP and DNS ON.
The DNS address has 4 numbers and each of them can be set from 1~254.
For example the gateway address: 8.8.8.xxx
This S.DN4 function is to set the DNS address to 8.8.8.8.



8-7-30. PSOP (Parallel and serial operation)

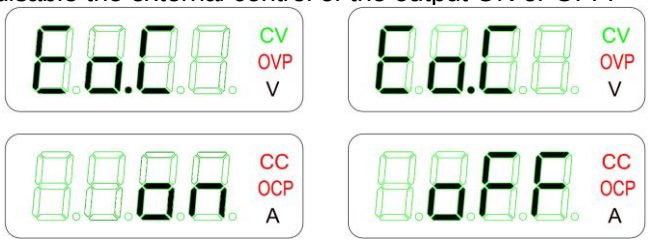
Set the DC power supplies for parallel or series operation: maximum 5 units (including MASTER) for parallel or 2 units (including MASTER) for series.

PM: Parallel Master PS: Parallel Slave
SM: Series Master SS: Series Slave



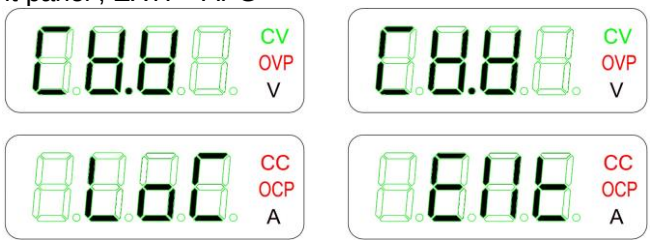
8-7-31. EO.C (External output ON/OFF control)

Enable or disable the external control of the output ON or OFF.



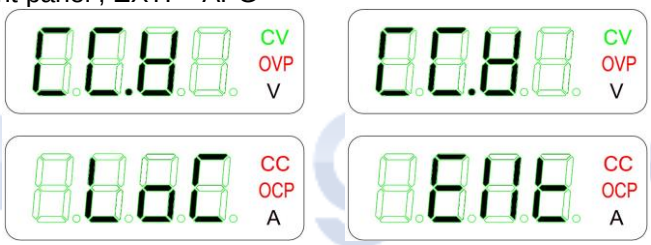
8-7-32. CV.V (Voltage Setting Selection)

The voltage setting/adjustment can be selected to by using the front panel or APG.
LOC. = front panel , EXT. = APG



8-7-33. CC.V (Current Setting Selection)

The current setting/adjustment can be selected to by using the front panel or APG.
LOC. = front panel , EXT. = APG

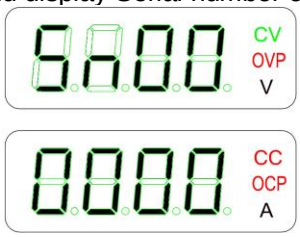


8-7-34. CAL CODE (CALIBRATION CODE)

An access to Calibration code: Press ENTER key, then turn the Encoder, and enter the pin number.

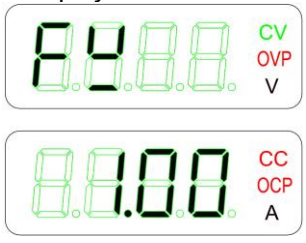
8-7-35. SN (SERIAL NUMBER)

Indicate and display Serial number only.



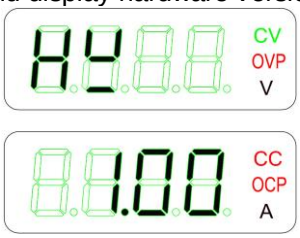
8-7-36. FW (SOFTWARE REVISION)

Indicate and display firmware/software version only.



8-7-37. HW (HARDWARE REVISION)

Indicate and display hardware version only.



8-7-38. To view the 1st and 2nd hex number of MAC address

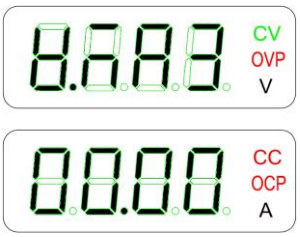
The MAC address contains 6 hex numbers, i.e. 00~FF.
For example the MAC address : 70.46.42.00.00.00
This V.MA1 shows the 1st and 2nd MAC number as 70.46.xx.xx.xx.xx

8-7-39. To view the 3rd and 4th hex number of MAC address

The MAC address contains 6 hex numbers, i.e. 00~FF.
For example the MAC address : 70.46.42.00.00.00
This V.MA2 shows the 3rd and 4th MAC number as xx.xx.42.00.xx.xx

8-7-40. To view the 5th and 6th hex number of MAC address

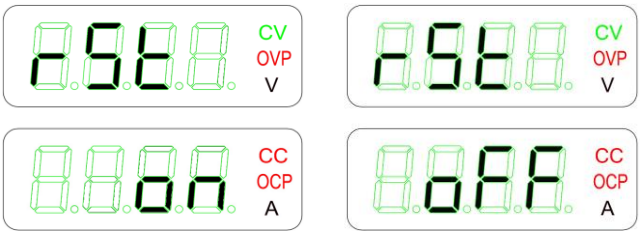
The MAC address contains 6 hex numbers, i.e. 00~FF.
For example the MAC address : 70.46.42.00.00.00
This V.MA3 shows the 5th and 6th MAC number as xx.xx.xx.xx.00.00



8-7-41. RST (Reset)

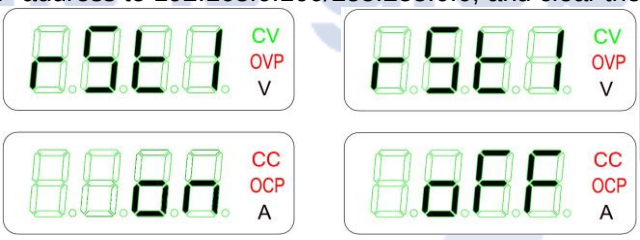
To reset the value of V set and A set to 0. The values below will be reset to factory default setting when operate RST in MENU function or command *RST:

(1) V set to 0V
(2) A set to 0A
(3) OVP is 110% of rated voltage
(4) OCP is 110% of rated current
(5) UVL is 0V
(6) Output is OFF



8-7-42. RST1 (IP address Reset)

Reset the IP address to 192.168.0.100/255.255.0.0, and clear the setting of Gateway and DNS



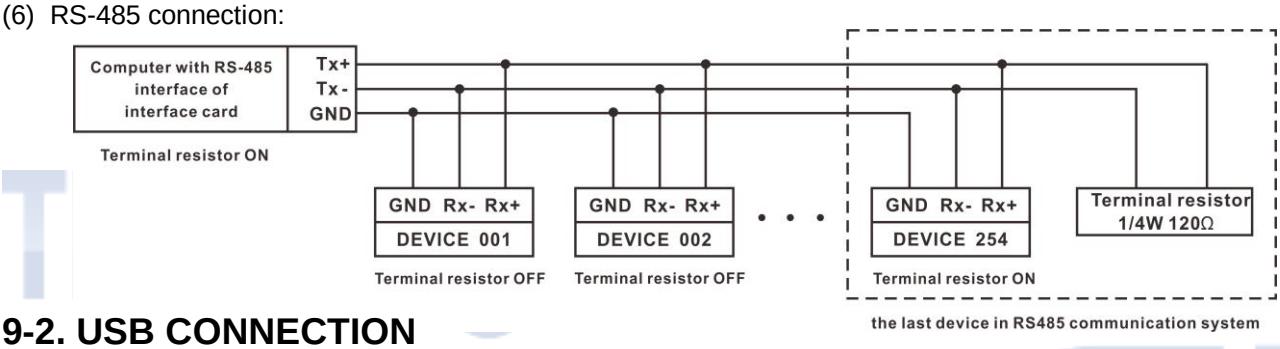
Note1: Some of our higher capacity models contain default ramp-up time. For faster ramp-up time, please consult us.

Note2: The ramp-down time depends on different models. For faster ramp-down time, please consult us.

CHAPTER 9 INTERFACE CONNECTION

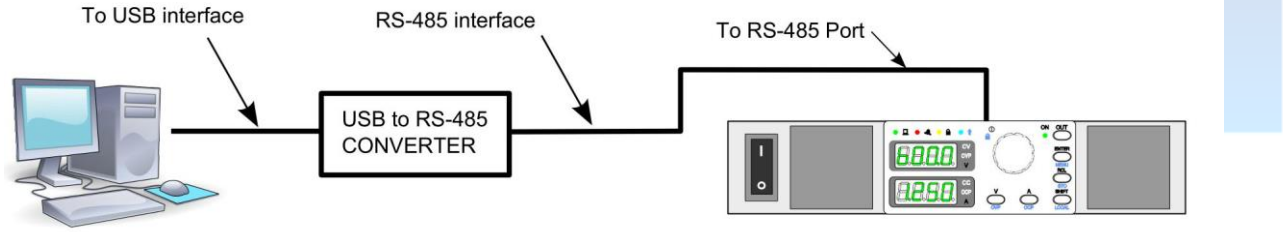
9-1. RS-485 CONNECTION

(1) RS-485 mode : Start stop synchronization
(2) RS-485 baud rate : 4800 / 9600 / /19200 / 38400 / 57600 / 115200 bps
(3) To ensure the connecting quality and effectivity enhance the remote programming, the double shielding cable is recommended.
(4) When programming via RS-485, please verify that terminal resistor ON/OFF status of each equipment in the network. In a typical RS-485 network, the last equipments which user connected has to set ON and the rest of equipments are OFF.
(5) Please refer to Chapter 10 for descriptions of the commands of GPIB and RS-485 interfaces.
(6) RS-485 connection:



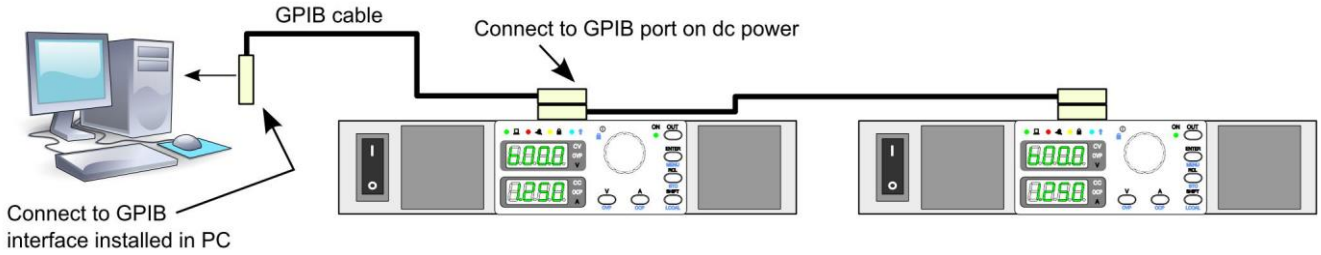
9-2. USB CONNECTION

(1) The DSP-OPT-USB convertor is available for option to control the DC power supply via USB interface.
(2) The DSP-OPT-USB convertor uses the FTDI chip set, please connect to http://www.ftdichip.com/ for downloadingthe driver.
(3) Please refer to the Chapter 10. for the SCPI commands.
(4) The USB interface of DSP-OPT-USB convertor is the standard USB interface, Please refer to 9-1 for RS-485 connection.
(5) USB connection:



9-3. GPIB CONNECTION

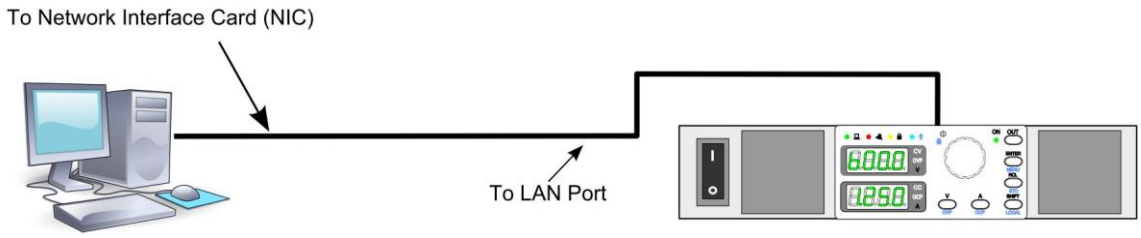
(1) Please insure the proper GPIB interface had installed to your PC.
(2) Please use the standard IEEE488 cable.
(3) Use the utility software that provided by the manufacturer of GPIB card to make sure the communication properly.
(4) The default GPIB address is 7 , please refer to 8-6-11 for changing the address.
(5) GPIB connection:



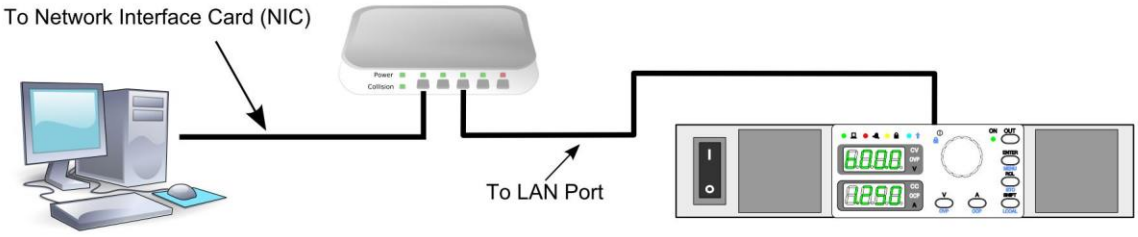
9-4. ETHERNET CONNECTION

(1) Please use CAT 5 or higher grade cable.
(2) When connecting to the LAN with DHCP server and DNS, the DC power supply will obtain an IP automatically, this will take around 1 minute.
(3) The obtained IP can be read from the front panel, please refer to the 8-7-14~8-7-29 and 8-7-38~8-7-40 for detail, or it can also be read from the web browser, please refer to 9-4-3.
(4) Please refer to the Chapter 10. for the SCPI commands.
(5) Ethernet connection:

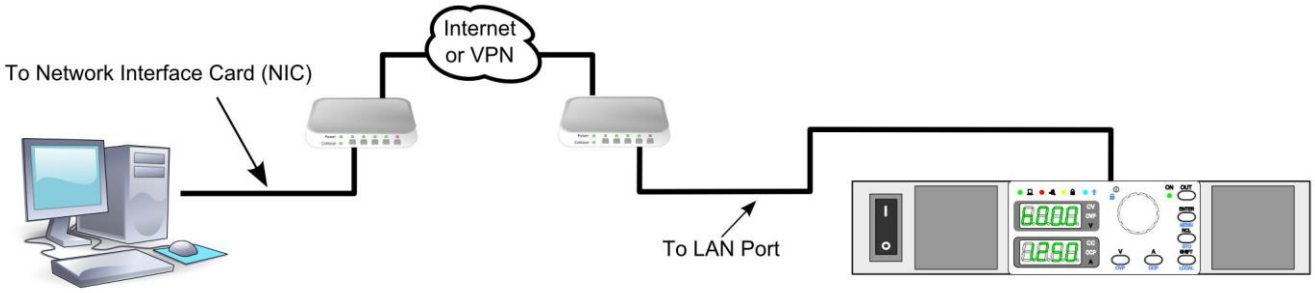
9-4-1. Direct Connection



9-4-2. Connection through HUB

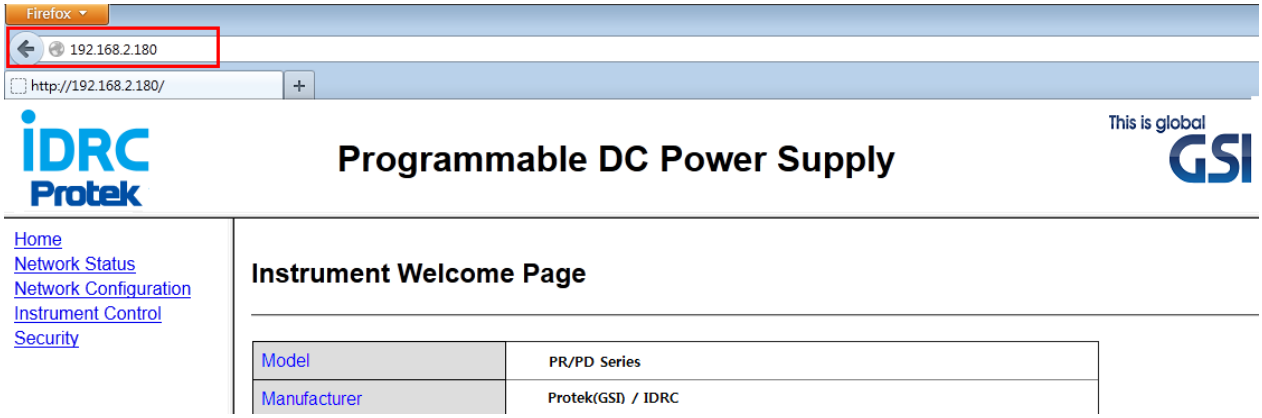


9-4-3. Through Internet or VPN



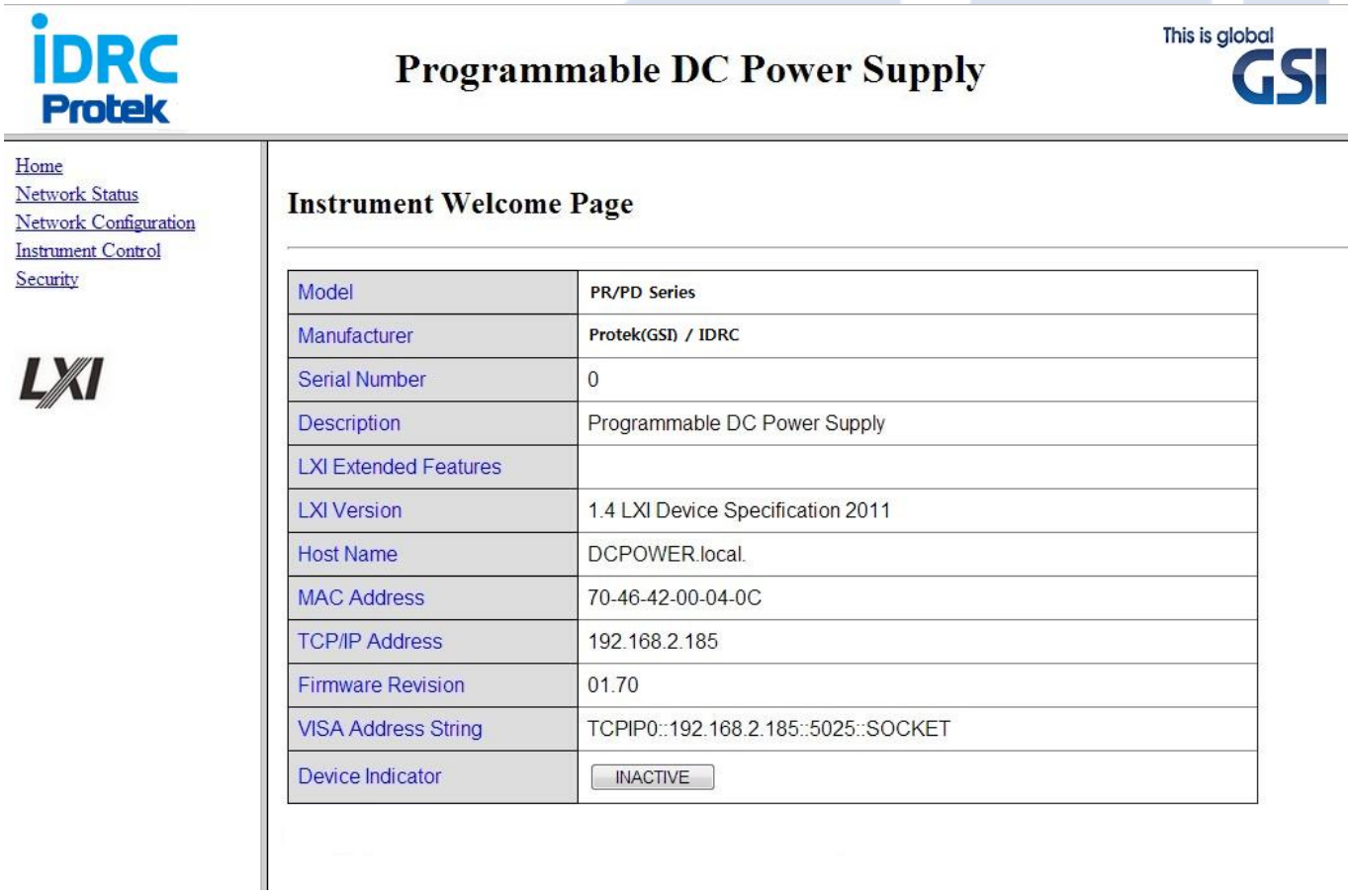
9-4-4. Enter the IP address

Enter the IP address of the DC power, you can find the DC power's information in home page.



9-4-5. Network Configuration

Click the "Network Configuration" on the left side of the browser for the setting of IP configuration, click "Instrument Control" for the control of the DC power supply and change the voltage value or current value those desired, the default password for "Network Configuration" and "Instrument Control" is "admin", the password can be changed in the "Security" page.



9-4-6. Introduction of Network Status

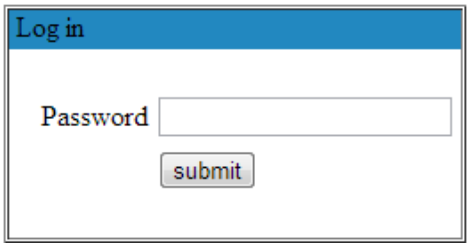
This page shows all the settings related to network.

Network Status Information

TCP/IP Configuration	
IP Address	192.168.2.185
IP Subnet Mask	255.255.255.0
Default Gateway	192.168.2.251
Preferred DNS Server	8.8.8.8
Alternate DNS Server	168.95.1.1
IP Configured By	DHCP
DNS Configured By	Auto
DHCP Server	192.168.2.251
Network Identification	
Host Name	DCPOWER
Domain Name	idrcis.com.tw
Service Name	Programmable DC Power Supply
mDNS Domain Name	DCPOWER.local.
mDNS Discovery	Enabled
Network Hardware Configuration	
MAC Address	70-46-42-00-04-0C
Link Speed and Duplex Mode	100 Mbps full duplex

9-4-7. Log in screen

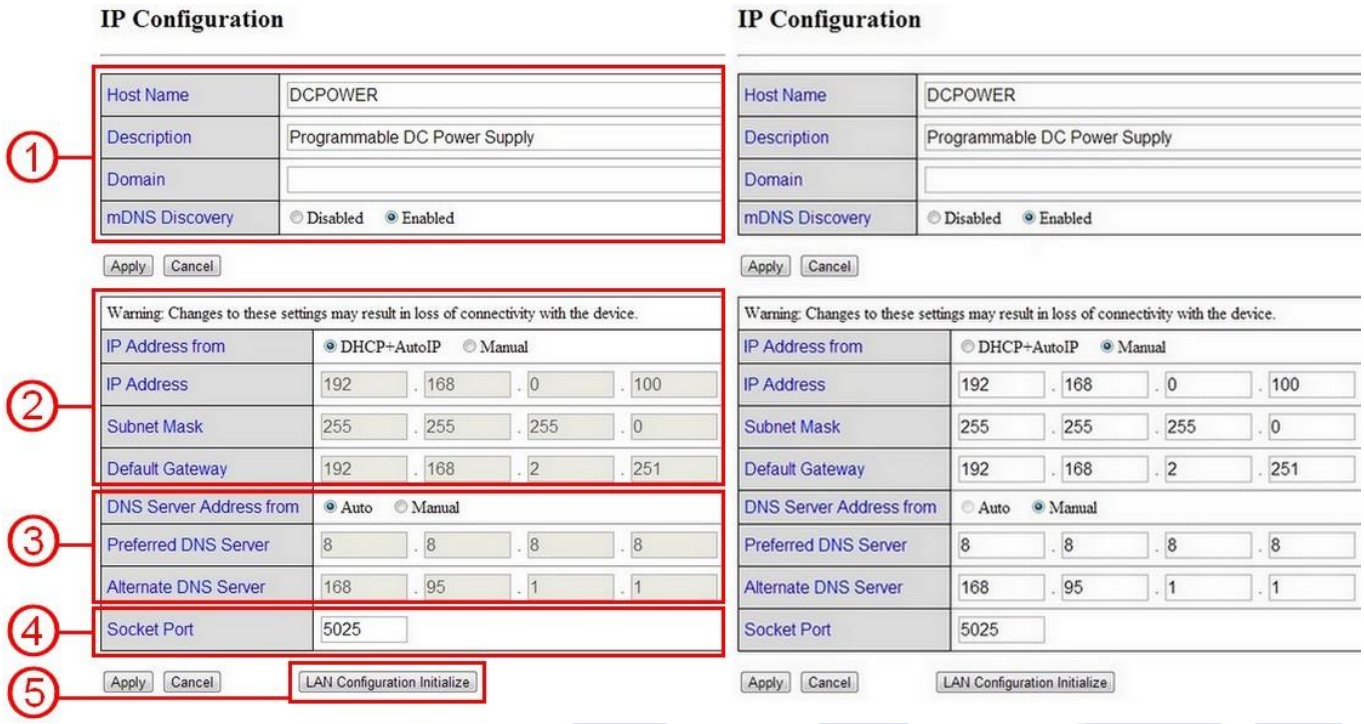
The password is required when entering the “Network Configuration” and “Instrument Control” pages, the default password is “admin”



9-4-8. Introduction of Network Configuration

There are five sections in the “Network Configuration”,

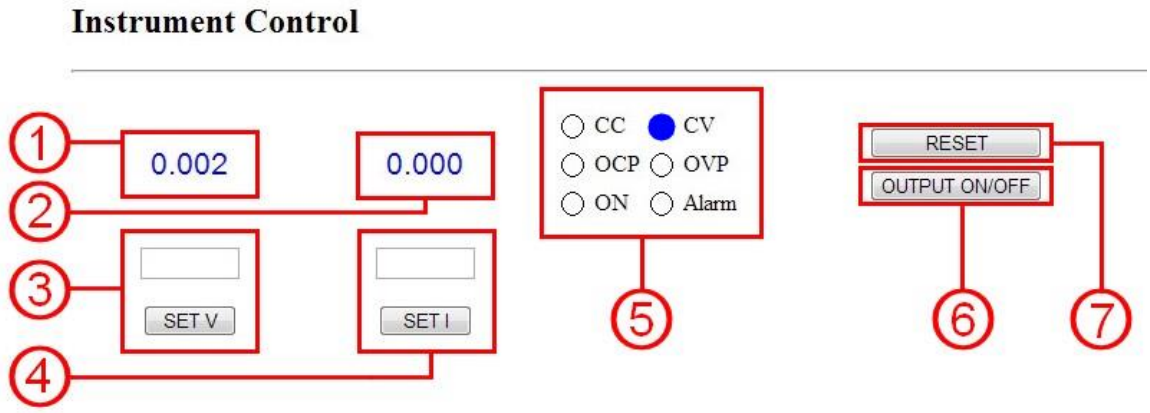
(1) Setting of Host Name and enable/disable mDNS Discovery.
(2) Setting of IP Address, the IP address will be assigned by the DHCP server if the “DHCP+AutoIP” is selected.
(3) Setting of DNS Server Address.
(4) Setting of Socket Port when using the Hyper Terminal, the default value is 5025.
(5) Loading the default settings.



9-4-9. Introduction of instrument control

There is a control screen for the basic controls of PR/PD series.

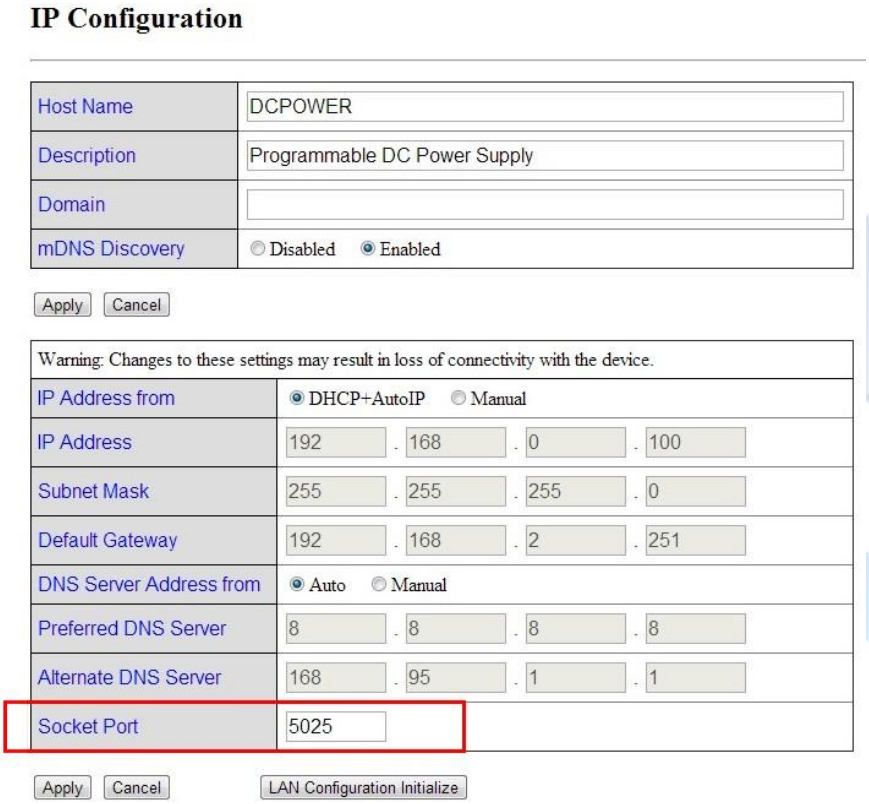
(1) Displaying the measured voltage value when OUTPUT ON.
(2) Displaying the measured current value when OUTPUT ON.
(3) Setting for output voltage.
(4) Setting for output current.
(5) The status indication of DC power, the blue dot indicated the present status of DC power.
(6) OUTPUT ON/OFF.
(7) RESET, set the voltage and current to default value and OUTPUT OFF.



9-4-10.Security

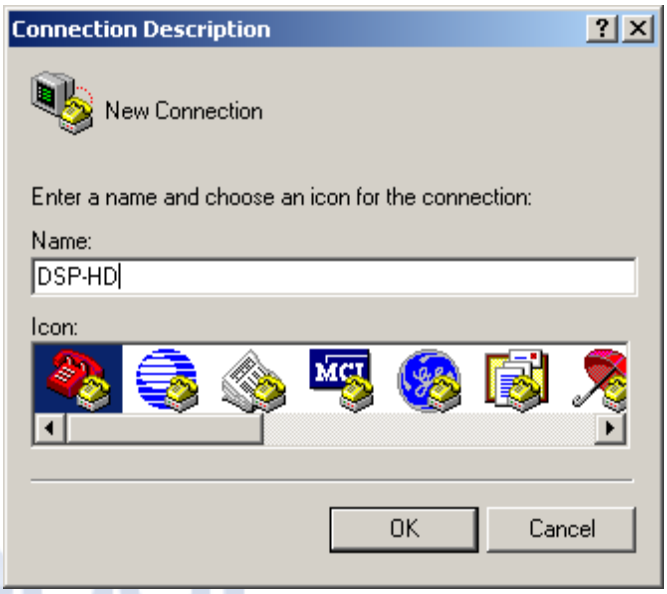
Please ensure the “New Password” and “Confirm Password” fields are filled in with the exactly same content.
Execute the “RST1” function in the MENU to load the default password if you forgot the new password, please note, all the settings those related to the Network will be reset to the default settings.
after executed the “RST1” function.

9-4-11. Using the Hyper Terminal to check if the connection is correctly.



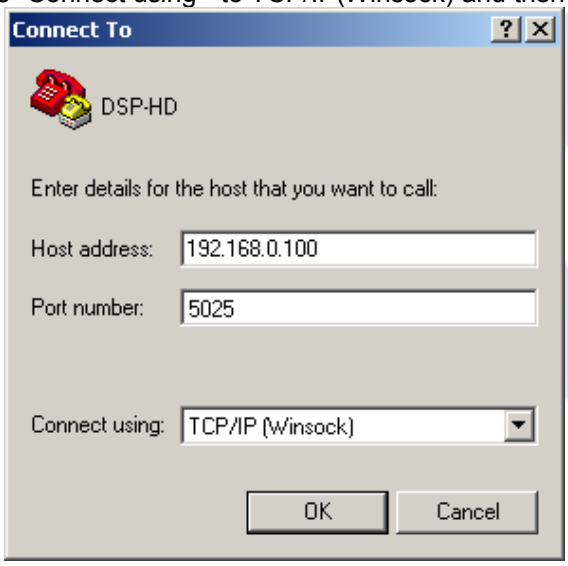
9-4-12. Name the connection

Start up the Hyper Terminal and key in the name of connection for example : “DSP-HD”.



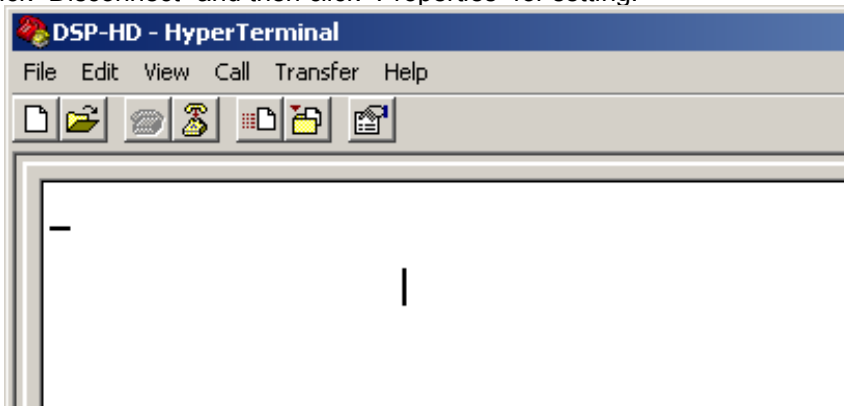
9-4-13. Select SOCKET PORT

Select the “Connect using “ to TCP/IP(Winsock) and then key in the Host address and SOCKET PORT.



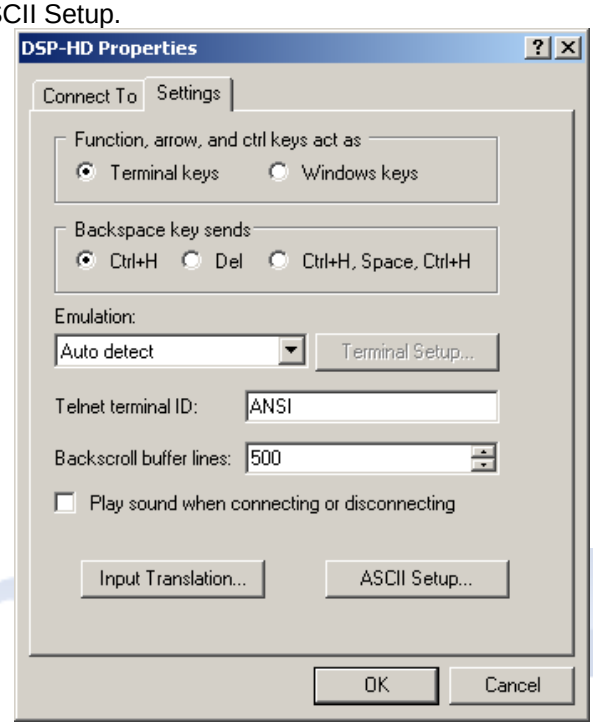
9-4-14. click “Properties” for setting.

Please click “Disconnect” and then click “Properties” for setting.



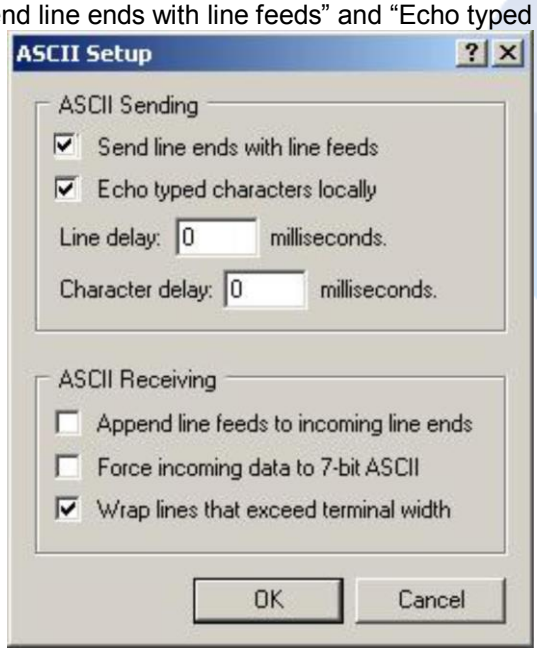
9-4-15. ASCII Setup-1

Click ASCII Setup.

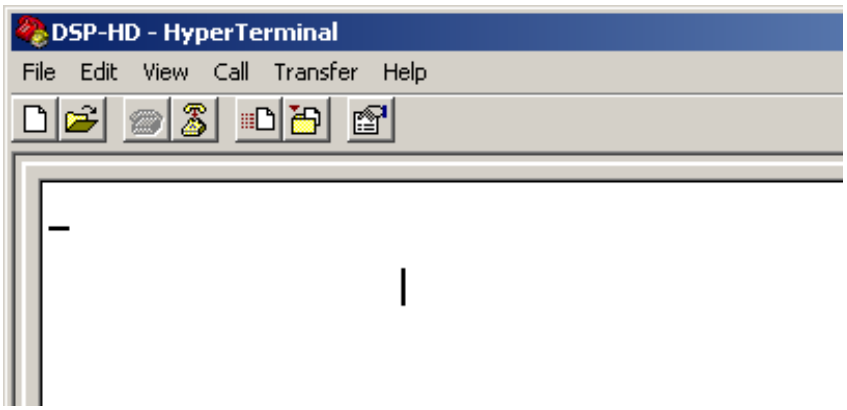


9-4-16. ASCII Setup-2

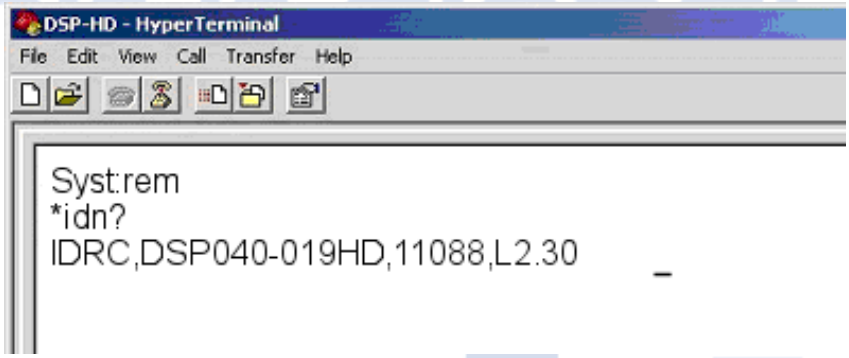
Click “Send line ends with line feeds” and “Echo typed characters locally”.



9-4-17. Re-connected again.



9-4-18. Enter the commands, for example *IDN?



CHAPTER 10 LAN / GPIB / RS-485 COMMAND INTRODUCTION

*NOTE:

(1) When PR/PD series is remote controlled by GPIB, RS-485, the DC power will remain at the currently status (The baud rate is common use for RS-485).

(2) GPIB cannot execute SYSTem: LOCal command

(3) SYST:REM; This is the command to estabilishing remote control, the remote indicator  in the front panel lights, the other commands will not effective until the remote control is estabilished.

(4) RS-485 command format: Add a RS-485 address such as A001~A254 before SCPI Command.
Example: DISP:CONTrast
Example: A001DISP:CONTrast 3
Set the A001's display contrast to 3

(5) Add a semicolom symble ";" between two commands
Example: A001SYST:REM;A001DISP:CONTrast 3;A001 SOURce:VOLTage 30;

(6) When writing commands, please use "0X0A" as the end of line

10-1. IEEE488.2 INTERFACE

10-1-1. Specification :

Standard IEE488.2

10-1-2. Function :

1.SH1: Full Source Handshake

2.AH1: Full Acceptor Handshake

3.T6: Basic Talker

4.L4: Basic Listener

5.SR0: Without Service Request

6.RL1: Remote/Local Change

7.PP0: Without Parallel Polling

8.DC1: Device Clear

10-1-3. Command :

10-1-3-1. *CLS - CLEAR STATUS COMMAND

Syntax: *CLS

Description: Clears status data. Clears the following registers without affecting the corresponding Enable Registers: Standard Event Status Register (ESR), Operation Status Event Register, Questionable Status. Event Register, and Status Byte Register (STB). Also clears the Error Queue.

10-1-3-2. *IDN? - IDENTIFICATION QUERY

Syntax: *IDN?

Description: *IDN? - IDENTIFICATION QUERY Identifies the instrument. This query requests identification. The power supply returns a string which contains the manufacturer name, the model, the serial number and the firmware level. The character string contains the following fields: <Manufacturer>, <Model>, <Serial Number>, <Firmware revision> where: <Manufacturer> = PROTEK, <Model> = PR/PD model number, <Serial Number> = SSSSSS <Firmware revision=n.m, (e.g, 1.0).

10-1-3-3. *RST - RESET COMMAND

Syntax: *RST

Description: Resets power supply to the power on default state. The power supply output set to power-on default state. After sending *RST, output voltage is set to 0, output current is set to 0, OVP is set to rated voltage +10% and OCP is set to rated current +10%. It is recommended that this command is always the first command set after remote digital control starts, to ensure that the output is set to zero and control of output on/off is properly enabled.

10-1-3-4. *TST? - SELF TEST QUERY

Syntax: *TST?

Description: Power Supply test.This query causes the power supply to do a self-test and provide the controller with pass/fail results. A 0 is returned if the unit passes the test. A 1 is returned to indicate the unit failed self-test.

10-2. NUMERIC PARAMETERS

<NR1>	Digits with an implied decimal point assumed at the right of the least-significant digit. Examples: 123
<NRf>	The data format <NRf> is defined in IEEE 488.2 for flexible Numeric. Representation. Zero, positive and negative floating point numeric values are some examples of valid data. Examples: 1.2300E+02
<Bool>	Boolean Data. Can be numeric (0, 1), or named (OFF, ON).
<address>	Network address Examples: 192.168.0.1
<String>	String program data.

10-3. SCPI COMMAND SUMMARY

SCPI Command	Description	
SYSTem		
:REMote	Sets the power supply to be in remote mode.	10-4-1
:LOCal	Sets the power supply to be in local mode.	10-4-2
:ERRor?	Returns error codes and messages.	10-4-3
:KLOC ON | OFF | <Bool>	Disables front panel keys and encoder.	10-4-4
:KLOC?	Indicates whether front panel keys and encoder are enabled or disabled	10-4-5
:VERSion?	Indicates the SCPI version to which unit complies.	10-4-6
:BEEP ON | OFF | <Bool>	Sets the audible beep each time a front panel key is pressed to on or off.	10-4-7
:BEEP?	Indicates whether audible beep is on or off.	10-4-8
:COMMunicate		
:LAN		
:IP?	Query the present IP	10-4-9
:IPADdress "<address>"	Set a static IP address	10-4-10
:SMASk	Set the Subnet MASK address	10-4-11
:SMASk?	Query the Subnet MASK address	10-4-12
:MAC?	Query the MAC address	10-4-13
:TELNet:PORT <NR1>	Set the Telnet Command Port	10-4-14
:TELNet:PORT?	Query the Telnet Command Port	10-4-15
:RESet	This command will reset the LAN settings to the factory default state.	10-4-16
:DHCP ON | OFF | <Bool>	To enable or disable DHCP	10-4-17
:DHCP?	Query DHCP state	10-4-18
:GATeway"<address>"	To set a static Default Gateway	10-4-19
:GATeway?	Query gateway address	10-4-20
:DNS "<address>"	To set a static DNS address.	10-4-21
:AUTO	Set DC power to auto-obtain the DNS addresses from DHCP.	10-4-22
:DNS?	Query DNS address	10-4-23
:AUTO?	Query the DNS addresses auto-obtain state	10-4-24
OUTPut		
ON | OFF | <Bool>	Enables or disables the power supply output.	10-4-25
:PON OFF | LAST	Programs the unit to output state upon power up or recovery from mains loss	10-4-26
:PON?	Indicates power up status	10-4-27
:PROTection		10-4-28
:CLEar	This command clears the latched signals that have disabled the output	
OUTPut?	Indicates whether power supply output is enabled or disabled.	10-4-29
FETCh?	Measures actual output voltage and current	10-4-30
MEASure		
:VOLTage?	Measure commands measure the output voltage.	10-4-31
:CURRent?	Measure commands measure the output current.	10-4-32
:ADDRess?	Query the address, the returned address will be different when using the different	10-4-33

SCPI Command	Description	
SOURce		
:VOLTage <NRf+> | { MIN | MAX }	Sets the output voltage value.	10-4-34
:VOLTage?	Indicates programmed output voltage	10-4-35
:PROTection:LEVel <NRf+>	Sets the over voltage protection value	10-4-36
:PROTection:LEVel?	Indicates programmed over voltage protection for output voltage	10-4-37
:LIMit:LOW <NRf+> | MIN | MAX	Sets the lower limit of output voltage	10-4-38
:LIMit:LOW?	Indicates programmed lower limit for output voltage	10-4-39
:PROTection:TRIPped?	This query returns a 1 if the protection circuit is tripped and a 0 if it is untripped.	10-4-40
:CURRent <NRf+> | { MIN | MAX }	Sets the output current value	10-4-41
:CURRent?	Indicates programmed output current	10-4-42
:PROTection:LEVel <NRf+>	Sets the over current protection value	10-4-43
:PROTection:LEVel?	Indicates programmed over current protection for output current	10-4-44
:PROTection:STATE <Bool> | { ON | OFF }	Controls whether the output protection circuit is enabled.	10-4-45
:PROTection:STATE?	Indicates output protection state	10-4-46
:PROTection:TRIPped?	This query returns a 1 if the protection circuit is tripped and a 0 if it is untripped.	10-4-47
:LIST		
:RTIMe <NRf+>	Sets the output voltage ramp-up time.	10-4-48
:RTIMe?	Indicates how long output voltage takes to reach programmed value.	10-4-49
:DTIMe <NRf+>	Sets the output voltage ramp-dwon time.	10-4-50
:DTIMe?	Indicates how long output voltage takes to reach programmed value.	10-4-51
:MEMory		
:CLS	Clears all memory locations used for storing and recalling power supply settings.	10-4-52
:RECall <NR1>	Restores power supply settings to the voltage and current values stored in memory	10-4-53
:LIST:<NR1>?	Returns voltage and current in scientific notation.	10-4-54
:VOLTage:<NR1> <NRf+>	Sets the memory location defined by <NR1> to the voltage value	10-4-55
:VOLTage:<NR1> ?	Returns voltage value stored in memory location <NR1>	10-4-56
:CURRent:<NR1> <NRf+>	Sets the memory location defined by <NR1> to the current value	10-4-57
:CURRent:<NR1>?	Returns current value stored in memory location <NR1>	10-4-58
:MODE?	Query for Operating Mode	10-4-59
DISP		
:CONTrast <NR1>	Sets the brightness of front panel Voltage and Current displays.	10-4-60
:CONTrast?	Returns the brightness level	10-4-61

10-4. SCPI COMMAND

10-4-1. SYSTem:REMote COMMAND

Syntax: Short F: SYST:REM
Long Form: SYSTem:REMote
Description: Sets the power supply to be in remote mode. The front panel [REMOTE] indicator lights and the front panel keys and encoder are disabled. Pressing SHIFT/LOC key on the front panel restores the unit to local mode.
Argument: None
Example: SYSTem:REMote puts the power supply in remote mode.

10-4-2. SYSTem:LOCal COMMAND

Syntax: Short Form: SYST:LOC
Long Form: SYSTem:LOCal
Description: Sets the power supply to be in local mode. The front panel [REMOTE] indicator goes off and the front panel keys and encoder are enabled.
Argument: None
Example: SYSTem:LOCal puts the power supply in local mode.

10-4-3. SYSTem:ERRor? QUERY

Syntax: Short Form: SYST:ERR?
Long Form: SYSTem:ERRor?
Description: Returns error codes and messages.
Return Format: <string> is text format in -XXX XXXXXXXXXXXX
Example: Input command S0URce:VOLTage 2w will cause error. SYSTem:ERR? returns error code “-138” and sending SYSTem:ERR? again returns no error code “+0,”. Refer to Table for a complete list of error codes.

10-4-4. SYSTem:KLOC COMMAND

Syntax: Short Form: SYST:KLOC { ON | OFF | 1 | 0 }
Long Form: SYSTem:KLOC { ON | OFF | 1 | 0 }
Description: Disables front panel keys and encoder. Pressing SHIFT/LOC key on the front panel restores functionality to front panel keys and encoder
Argument: <ON> or 1 keys are locked.
<OFF> or 0 key are unlocked
Example: SYSTem:KLOC 1 disables the front panel keys and encoder.

10-4-5. SYSTem:KLOC? QUERY

Syntax: Short Form: SYST:KLOC?
Long Form: SYSTem:KLOC?
Description: Indicates whether front panel keys and encoder are enabled or disabled. Returns 1 to indicate keys are enabled, 0 to indicated keys are disabled.
Return Format: <bool>
Example: SYSTem:KLOC? returns 1 (front panel keys and encoder are unlocked).

10-4-6. SYSTem:VERSion? QUERY

Syntax:	Short Form: SYST:VERS? Long Form: SYSTem:VERSion?
Description:	Indicates the SCPI version to which unit complies.
Return Format:	<string> where <string> is text in XXXX.X format corresponding to SCPI year and revision.
Example:	SYSTem:VERSion? returns 1990.0 (unit complies with SCPI version 1990.0.)

10-4-7. SYSTem:BEEP COMMAND

Syntax:	Short Form: SYST:BEEP { ON | OFF | 1 | 0 } Long Form: SYSTem:BEEP { ON | OFF | 1 | 0 }
Description:	Sets the audible beep each time a front panel key is pressed to on or off.
Argument:	<ON> or 1 enables audible beep <OFF> or 0 disables audible beep
Example:	SYSTem:BEEP 1 turns on the audible beep.

10-4-8. SYSTem:BEEP? QUERY

Syntax:	Short Form: SYST:BEEP? Long Form: SYSTem:BEEP?
Description:	Indicates whether audible beep is on or off. Returns 1 to indicate the beep is on, 0 to indicate beep is off.
Return Format:	<bool>
Example:	SYSTem:BEEP? returns 1 (audible beep is enabled).

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It requires to re-start the DC power when the below Ethernet address has been changed

10-4-9. SYSTem:COMMunicate:LAN:IP? QUERY

Syntax:	Short Form: SYST:COMM:LAN:IP? Long Form: SYSTem:COMMunicate:LAN:IP?
Description:	Query the present IP
Return Format:	"<address>"
Example:	SYST:COMM:LAN:IP? Read the DC power's IP address. 192.168.0.100 is a typical default IP address

10-4-10. SYSTem:COMMunicate:LAN:IPADdress COMMAND

Syntax:	Short Form: SYST:COMM:LAN:IPAD "<address>" Long Form: SYSTem:COMMunicate:LAN:IPADdress "<address>"
Description:	Set a static IP address
Argument:	"<address>" is text format in xxx.xxx.xxx.xxx
Example:	SYST:COMM:LAN:IPAD "192.168.0.100" Set a static IP address 192.168.0.100 is a typical default IP address

10-4-11. SYSTem:COMMunicate:LAN:SMAS COMMAND

Syntax:	Short Form: SYST:COMM:LAN:SMAS "<address>" Long Form: SYSTem:COMMunicate:LAN:SMAS "<address>"
Description:	Set the Subnet MASK address
Argument:	"<address>" is text format in xxx.xxx.xxx.xxx
Example:	Example: SYST:COMM:LAN:SMAS 255.255.0.0 Set 255.255.255.0 is a typical subnet MASK address

10-4-12. SYSTem:COMMunicate:LAN:SMAS? QUERY

Syntax:	Short Form: SYST:COMM:LAN:SMAS? Long Form: SYSTem:COMMunicate:LAN:SMAS?
Description:	Query the Subnet MASK address
Return Format:	"<address>"
Example:	SYST:COMM:LAN:SMAS? Read the DC power's Subnet MASK 255.255.0.0 is a typical default IP address

10-4-13. SYSTem:COMMunicate:LAN:MAC? QUERY

Syntax:	Short Form: SYST:COMM:LAN:MAC? Long Form: SYSTem:COMMunicate:LAN:MAC?
Description:	Query the MAC address
Return Format:	<string>, text format in 70-46-42-xx-xx-xx
Example:	SYST:COMM:LAN:MAC? Read the MAC address. 70-46-42-xx-xx-xx is a typical default IP address

10-4-14. SYSTem:COMMunicate:LAN:TELNet:PORT COMMAND

Syntax:	Short Form: SYST:COMM:LAN:TELN:PORT <NR1> Long Form: SYSTem:COMMunicate:LAN:TELNet:PORT <NR1>
Description:	Set the Telnet Command Port. Use a Telnet session to transfer commands and read responses over a TCP/IP network. PR/PD/HR series uses LAN port 5025 for Telnet sessions. A Telnet session can typically be started as follows from a host computer shell. For example: telnet 192.168.0.100 5025
Argument:	<NR1> is text format in 0~65535
Example:	SYST:COMM:LAN:TELN:PORT 5025 Set the TCP/IP port to 5025, you may control the DC power by using SCPI command under telnet address 192.168.0.100:5025

10-4-15. SYSTem:COMMunicate:LAN:TELNet:PORT? QUERY

Syntax:	Short Form: SYST:COMM:LAN:TELN:PORT? Long Form: SYSTem:COMMunicate:LAN:TELNet:PORT?
Description:	Query the Telnet Command Port.
Return Format:	<NR1>
Example:	SYST:COMM:LAN:TELN:PORT? Read the DC power's telnet prot ,

10-4-16. SYSTem:COMMunicate:LAN:RESet COMMAND

Syntax: Short Form: SYST:COMM:LAN:RES
Long Form: SYSTem:COMMunicate:LAN:RESet
Description: This command will reset the LAN settings to the factory default state. The effect of this includes changing the IP address and hostname, so LAN communication could be lost.
Argument: none
Example: SYST:COMM:LAN:RES Reset the LAN settings to the factory default state

10-4-17. SYSTem:COMMunicate:LAN:DHCP COMMAND

Syntax: Short Form: SYST:COMM:LAN:DHCP <Bool> | { ON | OFF }
Long Form: SYSTem:COMMunicate:LAN:DHCP <Bool> | { ON | OFF }
Description: To enable or disable DHCP.
Argument: <ON> or 1 to enable DHCP function
<OFF> or 0 to disable DHCP function
Example: SYST:COMM:LAN:DHCP OFF Disable DHCP.

10-4-18. SYSTem:COMMunicate:LAN:DHCP? QUERY

Syntax: Short Form: SYST:COMM:LAN:DHCP?
Long Form: SYSTem:COMMunicate:LAN:DHCP?
Description: Query DHCP state
Return Format: <Bool>
Example: SYST:COMM:LAN:DHCP? returns DHCP state

10-4-19. SYSTem:COMMunicate:LAN:GATEway COMMAND

Syntax: Short Form: SYST:COMM:LAN:GATE "<address>"
Long Form: SYSTem:COMMunicate:LAN:GATEway "<address>"
Description: To set a static Default Gateway. This command will invalid when DHCP set to ON.
Argument: "<address>" is text format in xxx.xxx.xxx.xxx
Example: SYST:COMM:LAN:GATE “192.168.0.1” set a static Gateway address to 192.168.0.1

10-4-20. SYSTem:COMMunicate:LAN:GATEway? QUERY

Syntax: Short Form: SYST:COMM:LAN:GATE?
Long Form: SYSTem:COMMunicate:LAN:GATEway?
Description: Query gateway address
Return Format: "<address>"
Example: SYST:COMM:LAN:GATE? returns gateway address

10-4-21. SYSTem:COMMunicate:LAN:DNS COMMAND

Syntax: Short Form: SYST:COMM:LAN:DNS "<address>"
Long Form: SYSTem:COMMunicate:LAN:DNS "<address>"
Description: To set a static DNS address. This command will invalid when DHCP set to ON.
Argument: "<address>" is text format in xxx.xxx.xxx.xxx
Example: SYST:COMM:LAN:DNS “8.8.8.8” set a DNS address to 8.8.8.8

10-4-22. SYSTem:COMMunicate:LAN:DNS:AUTO COMMAND

Syntax:	Short Form: SYST:COMM:LAN:DNS:AUTO <Bool> | { ON | OFF }
	Long Form: SYSTem:COMMunicate:LAN:DNS:AUTO <Bool> | { ON | OFF }
Description:	set DC power to auto-obtain the DNS addresses from DHCP.
Argument:	<ON> or 1 to enable auto-obtain the DNS addresses from DHCP.
	<OFF> or 0 to disable auto-obtain the DNS addresses from DHCP.
Example:	SYST:COMM:LAN:DNS:AUTO 1 set auto-obtain the DNS addresses from DHCP.

10-4-23. SYSTem:COMMunicate:LAN:DNS? QUERY

Syntax:	Short Form: SYST:COMM:LAN:DNS?
	Long Form: SYSTem:COMMunicate:LAN:DNS?
Description:	Query DNS address
Return Format:	"<address>"
Example:	SYST:COMM:LAN:DNS? returns DNS address

10-4-24. SYSTem:COMMunicate:LAN:DNS:AUTO? QUERY

Syntax:	Short Form: SYST:COMM:LAN:DNS:AUTO?
	Long Form: SYSTem:COMMunicate:LAN:DNS:AUTO?
Description:	Query the DNS addresses auto-obtain state
Return Format:	<Bool>
Example:	SYST:COMM:LAN:DNS:AUTO? returns 1 the DNS addresses is auto-obtain from DHCP.

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10-4-25. OUTPut COMMAND

Syntax:	Short Form: OUTP ON | OFF | <Bool>
	Long Form: OUTPut ON | OFF | <Bool>
Description:	Enables or disables the power supply output.
	To enable DC power supply output: <ON> or 1. To disable DC power supply output: <OFF> or 0
Argument:	<ON> or 1 to enable power supply output
	<OFF> or 0 to disable power supply output
Example:	OUTP ON enables the DC output of the power supply.

10-4-26. OUTPut:PON COMMAND

Syntax: Short Form: OUTP:PON { OFF| LAST }
Long Form: OUTPut:PON { OFF| LAST }

Description: Determines power up status of output and operation of OUTP command after power up or recovery from mains loss. When set to OFF (recommended), the power supply will power up with output off; output on/off can be controlled with OUTP command. When set to LAST (NOT recommended), the power supply will return to the output setting (on or off) in effect when power turned off or lost. If output was off, unit powers up with output off. If output was on, unit powers up with output on, however OUTP command can no longer turn the output off and *RST is required to set output off.

Argument: <OFF> Programs the unit to output off upon power up or recovery from mains loss.
<LAST> Programs the unit to output on/off setting in effect just before the unit was turned off.

Example: OUTP:PON OFF Programs the unit to output off state upon power up or recovery from mains loss and allows OUTP command to set output to on or off.

10-4-27. OUTPut:PON? QUERY

Syntax: Short Form: OUTP:PON?
Long Form: OUTPut:PON?

Description: Indicates power up status of output and operation of OUTP command after power up or recovery from mains loss. Returns OFF if unit set to power up with output disabled, returns LAST if unit set to power up with output set to setting in effect before unit was turned off.

Return Format: { OFF | LAST }

Example: OUTP:PON? returns OFF (the unit will power up with output off.)

10-4-28. OUTPut:PROTection:CLEar COMMAND

Syntax: Short Form: OUTP:PROT:CLE
Long Form: OUTPut:PROTection:CLEar

Description: This command clears the latched signals that have disabled the output.
Such as over-voltage, over-current, over-temperature and AC-fail condition.
All conditions that generate the fault must be removed before the latch can be cleared.
The output is then restored to the state it was in before the fault condition occurred.

Argument: none

Example: OUTP:PROT:CLE clears the latched signals that have disabled the output.

10-4-29. OUTPut? QUERY

Syntax: Short Form: OUTP?
Long Form: OUTPut?
Description: Indicates whether power supply output is enabled or disabled. Returns 0 if output disabled, returns 1 if output enabled.
Return Format: <Bool>
Example: OUTP? returns 1 (the DC output of the power supply is enabled).

10-4-30. FETCh? QUERY

Syntax: Short Form: FETC?
Long Form: FETCh?
Description: Measures actual output voltage and current. The query performs a measurement and returns the value of DC output current in Amperes and DC output voltage in Volts.
Return Format: <NR1>
Example: FETC? returns 1.41000E+01 , 3.00100E-00 (Voltage is 14.1V and current is 3.001A)

10-4-31. MEASure:VOLTage? QUERY

Syntax: Short Form: MEAS:VOLT?
Long Form: MEASure:VOLTage?
Description: Measure commands measure the output voltage.
Return Format: Volts as a 5-digit number, which is one decimal place more than the power supply's front panel voltmeter
Example: Example : MEASure:VOLTage? Returns the output voltage value.

10-4-32. MEASure:CURRent? QUERY

Syntax: Short Form: MEAS:CURR?
Long Form: MEASure:CURRent?
Description: Measure commands measure the output current.
Return Format: Amps as a 5-digit number, which is one decimal place more than the power supply's front panel ammeter
Example: MEASure:CURRent? Returns the output current value.

10-4-33. MEASure:ADDRess? QUERY

Syntax: Short Form: MEAS:ADDR?
Long Form: MEASure:ADDRess?
Description: Query the address, the returned address will be different when using the different interfaces.
Return Format: address,Volt,curr
Example: MEAS:ADDR?
When using RS-485, the power supply returns
A007,1.00000E+02,3.00000E+01,3.00000E+03
When using GPIB, the power supply returns
7,1.00000E+02,3.00000E+01,3.00000E+03

10-4-34. SOURce:VOLTage COMMAND

Syntax:	Short Form: SOUR:VOLT <NRf+> | { MIN | MAX }
	Long Form: SOURce:VOLTage <NRf+> | { MIN | MAX }
Description:	Sets the output voltage value.
Argument:	<NRf+> is a value in the range from 0 to rated voltage of unit. Rated voltage and current are defined by model (e.g., for DSP-030-025HD, rated voltage is 30V, rated current is 25A).
Example:	SOUR:VOLT 30 sets output current value to 30V. *Note: The actual output voltage should be ≤ 0.1% of the rated voltage when the output voltage set to zero.

10-4-35. SOURce:VOLTage? QUERY

Syntax:	Short Form: SOUR:VOLT?
	Long Form: SOURce:VOLTage?
Description:	Indicates programmed output voltage(in Volts).
Return Format:	<NRf+>
Example:	SOUR:VOLT? returns 30 to indicate output voltage is programmed to 30V.

10-4-36. SOURce:VOLTage:PROTection:LEVel COMMAND

Syntax:	Short Form: SOUR:VOLT:PROT:LEV <NRf+> | { MIN | MAX }
	Long Form: SOURce:VOLTage:PROTection:LEVel <NRf+> | { MIN | MAX }
Description:	Sets the over voltage protection (OVP) value (in Volts).
Argument:	<NRf+> is a value in the range from 0% to 110% of rated voltage.
Example:	SOUR:VOLT:PROT:LEV 300 sets the overvoltage protection level to 300V

10-4-37. SOURce:VOLTage:PROTection:LEVel? QUERY

Syntax:	Short Form: SOUR:VOLT:PROT:LEV?
	Long Form: SOURce:VOLTage:PROTection:LEVel?
Description:	Indicates programmed over voltage protection for output voltage (in Volts).
Return Format:	<NRf+>
Example:	SOUR:VOLT:PROT:LEV? returns 300 to indicate overvoltage protection level is programmed to 300V.

10-4-38. SOURce:VOLTage:LIMit:LOW COMMAND

Syntax:	Short Form: SOUR:VOLT:LIM:LOW <NRf+> | { MIN | MAX }
	Long Form: SOURce:VOLTage:LIMit:LOW <NRf+> | { MIN | MAX }
Description:	Sets the lower limit of output voltage (in Volts). The lower limit can be set to a maximum of 95% of rated voltage. Minimum value for lower limit is 0. *RST sets this value to 0.
Argument:	<NRf> is a value in the range from 0 to 95% of rated voltage of unit. MIN is the minimum value for lower limit MAX is the maximum value for lower limit
Example:	SOURce:VOLTage:LIMit:LOW 100; sets lower limit for output voltage to 100V. For a 450V model this means that output voltage could not be programmed lower than 100V.

10-4-39. SOURce:VOLTage:LIMit:LOW? QUERY

Syntax:	Short Form: SOUR:VOLT:LIM:LOW? Long Form: SOURce:VOLTage:LIMit:LOW?
Description:	Indicates programmed lower limit for output voltage (in Volts).
Return Format:	<NRf+>
Example:	SOURce:VOLTage:LIMit:LOW? returns 100 to indicate lower limit for output voltage is programmed to 100V.

10-4-40. SOURce:VOLTage:PROTection:TRIPped? QUERY

Syntax:	Short Form: SOUR:VOLT:PROT:TRIP? Long Form: SOURce:VOLTage:PROTection:TRIPped?
Description:	This query returns a 1 if the protection circuit is tripped and a 0 if it is untripped.
Return Format:	<NRf+>
Example:	SOURce:VOLTage:PROTection:TRIPped? Returns 0 when OVP is not executed, 1 when OVP is executed.

10-4-41. SOURce:CURRent COMMAND

Syntax:	Short Form: SOUR:CURR <NRf+> | { MIN | MAX } Long Form: SOURce:CURRent <NRf+> | { MIN | MAX }
Description:	Sets the output current value.
Argument:	<NRf+> is a value in the range from 0 to rated current of unit. Rated voltage and current are defined by model (e.g., for DSP-030-025HD, rated voltage is 30V, rated current is 25A).
Example:	SOUR:CURR:AMPL 25 sets output current value to 25A. *Note: The actual output current should be ≤ 0.2% of the rated current when the output current set to zero

10-4-42. SOURce:CURRent? QUERY

Syntax:	Short Form: SOUR:CURR? Long Form: SOURce:CURRent?
Description:	Indicates programmed output current(in Amps).
Return Format:	<NRf+>
Example:	SOUR:CURR:AMPL? returns 25 to indicate output current is programmed to 25A.

10-4-43. SOURce:CURRent:PROTection:LEVel COMMAND

Syntax:	Short Form: SOUR:CURR:PROT:LEV <NRf+> | { MIN | MAX } Long Form: SOURce:CURRent:PROTection:LEVel <NRf+> | { MIN | MAX }
Description:	Sets the over current protection (OCP) value (in Amps).
Argument:	<NRf+> is a value in the range from 0% to 110% of rated current.
Example:	SOUR:CURR:PROT:LEV 200 sets the over current protection level to 200A

10-4-44. SOURce:CURRent:PROTection:LEVel? QUERY

Syntax:	Short Form: SOUR:CURRT:PROT:LEV? Long Form: SOURce:CURRent:PROTection:LEVel?
Description:	Indicates programmed over current protection for output current (in Amps).
Return Format:	<NRf+>
Example:	SOUR:CURR:PROT:LEV? returns 200 to indicate over current protection level is programmed to 200A.

10-4-45. SOURce:CURRent:PROTection:STATE COMMAND

Syntax:	Short Form: SOUR:CURR:PROT:STATE <Bool> | { ON | OFF } Long Form: SOURce:CURRent:PROTection:STATE <Bool> | { ON | OFF }
Description:	Controls whether the output protection circuit is enabled.
Argument:	1 or ON will turn the foldback protection <ON> (*NOTE) 0 or OFF will turn the foldback protection <OFF> *NOTE: The fold-back protection will be executed (turns output off) when the DC power is operating in constant current mode and exceeds 0.5 second.
Example:	SOUR:CURR:PROT:STATE 1 enable the fold-back protection

10-4-46. SOURce:CURRent:PROTection:STATE? QUERY

Syntax:	Short Form: SOUR:CURR:PROT:STATE? Long Form: SOURce:CURRent:PROTection:STATE?
Description:	Indicates output protection state
Return Format:	<Bool>
Example:	SOUR:CURR:PROT:LEV? returns fold-back protection state.

10-4-47. SOURce:CURRent:PROTection:TRIPped? QUERY

Syntax:	Short Form: SOUR:CURR:PROT:TRIP? Long Form: SOURce:CURRent:PROTection:TRIPped?
Description:	This query returns a 1 if the protection circuit is tripped and a 0 if it is untripped.
Return Format:	<NRf+>
Example:	SOUR:CURR:PROT:TRIP? Returns 0 when OCP is not executed, 1 when OCP is executed.

10-4-48. SOURce:LIST:RTIMe COMMAND

Syntax:	Short Form: SOUR:LIST:RTIM <NRf+> Long Form: SOURce:LIST:RTIMe <NRf+>
Description:	Sets the output voltage ramp-up time.
Argument:	<NRf+> is a value in the range from 0.0 to 99.9 seconds.
Example:	SOURce:LIST:RTIMe 3.0 programs the output ramp-up time to 3.0 seconds.

10-4-49. SOURce:LIST:RTIMe? QUERY

Syntax:	Short Form: SOUR:LIST:RTIM?
	Long Form: SOURce:LIST:RTIMe?
Description:	Indicates (in seconds) how long output voltage takes to reach programmed value.
Return Format:	<NRf+>
Example:	SOURce:LIST:RTIMe? returns 3.0 to indicate ramp-up time is 3.0 seconds

10-4-50. SOURce:LIST:DTIMe COMMAND

Syntax:	Short Form: SOUR:LIST:DTIM <NRf+>
	Long Form: SOURce:LIST:DTIMe <NRf+>
Description:	Sets the output voltage ramp-dwon time.
Argument:	<NRf+> is a value in the range from 0.0 to 99.9 seconds.
Example:	SOURce:LIST:RTIMe 3.0 programs the output ramp-down time to 3.0 seconds.

10-4-51. SOURce:LIST:DTIMe? QUERY

Syntax:	Short Form: SOUR:LIST:DTIM?
	Long Form: SOURce:LIST:DTIMe?
Description:	Indicates (in seconds) how long output voltage takes to reach programmed value.
Return Format:	<NRf+>
Example:	SOURce:LIST:RTIMe? returns 3.0 to indicate ramp-down time is 3.0 seconds

10-4-52. SOURce:MEMory:CLS COMMAND

Syntax:	Short Form: SOUR:MEM:CLS
	Long Form: SOURce:MEMory:CLS
Description:	Clears all memory locations used for storing and recalling power supply settings.
Argument:	None
Example:	SOURce:MEMory:CLS clears all memory locations.

10-4-53. SOURce:MEMory:RECall COMMAND

Syntax:	Short Form: SOUR:MEM:REC:<NR1>
	Long Form: SOURce:MEMory:RECall:<NR1>
Description:	Restores power supply settings to the voltage and current values stored in memory location defined by <NR1>. If the output is off, the recalled voltage and current set values are shown on the front panel Voltage and Current displays. If the output is on, the output changes to the recalled voltage and current values which are also shown on the front panel Voltage and Current displays.
Return Format:	<NR1> is a number from 1 to 16 representing one of 16 memory locations
Example:	SOURce:MEMory:RECall:3 sets power supply setpoints to 50V and 2.5A (values previouslystored via either front panel or SOURce:MEMory:VOLTage:<NR1> and SOURce:MEMory:CURRent:<NR1>commands). If output is on, output is changed to 50V, 2.5A. If output is off, set values of 50V and 2.5A are displayed on the front panel.

10-4-54. SOURce:MEMory:LIST:<NR1>? QUERY

Syntax: Short Form: SOUR:MEM:CURR:<NR1>?
Long Form: SOURce:MEMory:CURRent:<NR1>?
Description: For the memory location defined by <NR1>, returns voltage (Volts) and current (Amperes) in scientific notation.
Return Format: <NRf+>
Example: SOURce:MEMory:LIST:3? returns 5.00000E+02, 2.50000E-00 (Voltage/Current stored in memory location 3 is 50V, 2.5A).

10-4-55. SOURce:MEMory:VOLTage:<NR1> <NRf+> COMMAND

Syntax: Short Form: SOUR:MEM:VOLT:<NR1> <NRf>
Long Form: SOURce:MEMory:VOLTage:<NR1> <NRf>
Description: Sets the memory location defined by <NR1> to the voltage value <NRf>.
Argument: <NR1> is a number from 1 to 16 representing one of 16 memory locations
<NRf> is a value in the range from 0 to rated voltage of unit.
Example: SOURce:MEMory:VOLTage:5 62.4 sets memory location 5 to 62.4V.

10-4-56. SOURce:MEMory:VOLTage:<NR1>? QUERY

Syntax: Short Form: SOUR:MEM:VOLT:<NR1>?
Long Form: SOURce:MEMory:VOLTage:<NR1>?
Description: Returns voltage value stored in memory location <NR1> (in Volts).
Return Format: <NRf+>
Example: SOURce:MEMory:VOLTage:5? returns 62.4 (Voltage stored in memory location 5 is 62.4V).

10-4-57. SOURce:MEMory:CURRent:<NR1> <NRf+> COMMAND

Syntax: Short Form: SOUR:MEM:VOLT:<NR1> <NRf>
Long Form: SOURce:MEMory:VOLTage:<NR1> <NRf>
Description: Sets the memory location defined by <NR1> to the current value <NRf>.
Argument: <NR1> is a number from 1 to 16 representing one of 16 memory locations
<NRf> is a value in the range from 0 to rated current of unit.
Example: SOURce:MEMory:CURRent:5 11.6 sets memory location 5 to 11.6A.

10-4-58. SOURce:MEMory:CURRent:<NR1>? QUERY

Syntax: Short Form: SOUR:MEM:CURR:<NR1>?
Long Form: SOURce:MEMory:CURRent:<NR1>?
Description: Returns current value stored in memory location <NR1> (in Volts).
Return Format: <NRf+>
Example: SOURce:MEMory:CURRent:5? returns 11.6 (Voltage stored in memory location 5 is 11.6A).

10-4-59. SOURce:MODE? QUERY

Syntax:	Short Form: SOUR:MODE?
	Long Form: SOURce:MODE?
Description:	Query for Operating Mode
Return Format:	CV when in constant-voltage mode.
	CC when in constant-current mode.
	OFF when the output is off
Example:	SOURce:MODE? Returns CV when operating in constant voltage mode

10-4-60. DSIP:CONTrast COMMAND

Syntax:	Short Form: DSIP:CONT <NR1>
	Long Form: DSIP:CONTrast <NR1>
Description:	Sets the brightness of front panel Voltage and Current displays.
Argument:	<NR1> is a value in the range from 0 to 5.
Example:	DSIP:CONTrast 3 sets display contrast to level 3.

10-4-61. DSIP:CONTrast? QUERY

Syntax:	Short Form: DSIP:CONT?
	Long Form: DSIP:CONTrast?
Description:	Returns the brightness level set by DISP:CONT
Return Format:	<NR1>
Example:	DISP:CONT? returns 3

CHAPTER 11 ERROR CODE

Error code	Name	Description
0	No Error	
-102	Syntax error	An unrecognized command or data type was encountered; for example, a string was received when the device does not accept strings.
-104	Data type error	The parser recognized a data element different than one allowed; for example, numeric or string data was expected but block data was encountered.
-109	Missing parameter	Fewer parameters were received than required for the header; for example, the *EMC common command requires one parameter, so receiving *EMC is not allowed.
-221	Settings conflict	Indicates that a legal program data element was parsed but could not be executed due to the current device state. (see IEEE 488.2, 6.4.5.3 and 11.5.1.1.5.)
-222	Data out of rang	Indicates that a legal program data element was parsed but could not be executed because the interpreted value was outside the legal range as defined by the device. (see IEEE 488.2, 11.5.1.1.5.)
-223	Too much data	Indicates that a legal program data element of block, expression, or string type was received that contained more data than the device could handle due to memory or related device-specific requirements.
-224	Illegal parameter valid	Used where exact value, from a list of possibles, was expected.
-241	Hardware missing	Indicates that a legal program command or query could not be executed because of missing device hardware; for example, an option was not installed. Definition of what constitutes missing hardware is completely device-specific.
-313	Calibration memory lost	Indicates that nonvolatile calibration data used by the *CAL? command has been lost.
-430	Query DEADLOCKED	Indicates that a condition causing an DEADLOCKED Query error occurred (see IEEE 488.2, 6.3.1.7); for example, both input buffer and output buffer are full and the device cannot continue.
-440	Query UNTERMINATED after indefinite response	Indicates that a query was received in the same program message after an query requesting an indefinite response was executed. (see IEEE 488.2, 6.5.7.5)
-500	OVP Setting too low	The OVP setting value is lower than output setting value. This error code will be generated but power unit will remains its present condition.
-599	IP conflict	The desired IP address is existing in the network.

72	OVP	a. The output voltage is exceeding the OVP value. b. The Analog Programming input for output voltage setting is too high (higher then OVP value).
73	OCP	The output current exceeding 110% of rated current, this OCP value is restricted by hardware and not adjustable.
74	REMOTE SENSER OVER	The maximum compensated voltage is 5VDC (the sum of two wires, i.e. 2.5VDC for each).
75	D2D Module 1 fault	The DC to DC converter module number 1 is failed (including OTP of module 1). There is only one DC to DC module in 750W models.
76	D2D Module 2 fault	The DC to DC converter module number 2 is failed (including OTP of module 2). There are two DC to DC modules in 1500W models.
77	Analog shut-off / shutdown	a. The slave unit(s) failed when operating in parallel/series. b. The PIN23 and PIN24 of the Analog Programming Port is shorted to shut-off the output.
78	software OCP	The output current exceeding the set OCP value (adjustable manually or remotely) over 1 second.
79	AC Fault	Ac line input abnormal.
83	FAN error / OTP	a. One or more fan failed. b. The surface temperature of Discharge Board exceeds.
84	D2D Module 3 fault	The DC to DC converter modules number 3 is failed (including OTP of module 3). There are four DC to DC modules in 3000W models.
85	D2D Module 4 fault	The DC to DC converter modules number 4 is failed (including OTP of module 4). There are four DC to DC modules in 3000W models.

CHAPTER 12 SPECIFICATION

12-1. COMMON SPECIFICATION

Panel setting resolution	4 digits or 5 digits
Panel display resolution	4 digits or 5 digits
Panel setting accuracy	Voltage : ± (0.1% + 3 count) Current : ± (0.5% + 3 count)
Panel display accuracy	Voltage : ± (0.1% + 3 count) Current : ± (0.5% + 3 count)
Command setting resolution	±0.002% of full scale
Command reading resolution	±0.002% of full scale
Digital Programming Accuracy	Voltage: ± (0.1% + 3 count) Current: ± (0.5% + 3 count)
Digital Readback Accuracy	Voltage : ± (0.2% + 2 count) Current : ± (0.5% + 3 count)
Analog Programming Accuracy	Standard Voltage : 5% ; Current : 5% Optional Isolated Voltage : 0.5% ; Current : 1%
Analog Readback Accuracy	Standard Voltage : 5% ; Current : 5% Optional Isolated Voltage : 1% ; Current : 1%
Temperature Coefficient	100ppm/°C from rated output, after a 30 minute warm-up
Temperature drift	0.05% of rated output, over 8 hours, after a 30 minute warm-up with constant line, load and temperature
Protective functions	Programmable over voltage protection, Programmable over current protection, Over temperature protection, Fuse blown protection
Command response time	≤20ms (After received)*(Note.1)*
Transient response time	Constant Voltage mode : 20V and under ≤ 1.5ms ; 30V~100V ≤ 1ms ; 150V~600V ≤ 2ms
Input voltage	750W /1500W type : 100~240VAC, 50/60Hz, single phase 3000W type : 190~240VAC, 50/60Hz, single phase
Input current (Full load)	750W type : 115VAC - 8.1A; 230VAC - 4.1A 1500W type : 115VAC - 16.2A; 230VAC - 8.1A 3000W type : 230VAC - 15.6A
Inrush current	750W type : 230VAC - 12.5A 1500W type : 230VAC - 25A 3000W type : 230VAC - 50A
Efficiency	750W type : 76% – 87% 1500W type : 77% – 88% 3000W type : 82% – 88%

Overvoltage / Overcurrent Protection	0 ~ 110% of rated voltage ; 0 ~ 110% of rated current
Power Factor (PF)	0.99 (at 115VAC, rated output)
Withstand voltage	Input-Output - AC2000V:1 minute Input-Ground - AC2000V:1 minute
Cooling	Forced air by speed controlled fan
Noise	<70 dB(A)
Weight	1UH type : approx. 5.1 kg 1U type : approx. 9.0 kg 2UH type : approx. 8.2 kg 2U type : approx. 15.1 kg
Operating environment	Temperature : 0~40°C (for 750W series models) 0~50°C (for 1500W and 3000W series models) Humidity: 30%~90% relative humidity (no condensation)
Storage environment	Temperature: -20~70°C; Humidity: 10%~90% relative humidity (no condensation)
EMC Standard	EN 61326-1:2006
EMC Emissions (EN 61326-1)	EN 55011:2007 +A2:2007, (group 1, class B) EN 61000-3-2:2006 EN 61000-3-3:2008
EMC Immunity (EN 61326-1)	EN 61000-4-2:2009 EN 61000-4-3:2006 + A1:2008 + A2:2010 EN 61000-4-4:2004 + A1:2010 EN 61000-4-5:2006 EN 61000-4-6:2009 EN 61000-4-11:2004
Low Voltage Drective 2006/95/EC	IEC 61010-1:2010(3rd Edition)
Vibration Test	ISTA 2A
Drop Test	JIS Z 0200

Note 1. Programming time = Command response time + Output response time. Different models may have different output response time, from 30ms ~ 200ms.

12-2. 1UH 750W SPECIFICATION

Output		Model	Ripple (*3)		Line regulation (*5)		Load regulation		Response time(sec) (*8)			Remote Sense (V)	Size
CV(*1)	CC(*2)		CV	CC(*4)	CV	CC	CV(*6)	CC(*7)	Full Load UP	Full Load Down	No Load Down		
V	A		mV rms	mA rms	0.05% +mV	0.1% +mA	0.05% +mV	0.1% +mA					
0 - 6	0 - 100	PR/PD-6100	10	180	2.8	11	2.8	23	0.08	0.05	0.6	1	1UH
0 - 8	0 - 90	PR/PD-8090	10	180	2.8	11	2.8	23	0.08	0.05	0.6	1	1UH
0 - 12.5	0 - 60	PR/PD-1260	10	120	4	8.5	4	18	0.08	0.05	0.8	1	1UH
0 - 20	0 - 38	PR/PD-2038	10	76	4	5.8	4	12.6	0.08	0.05	0.8	1	1UH
0 - 30	0 - 25	PR/PD-3025	10	63	5	4.5	5	10	0.08	0.08	0.9	1.5	1UH
0 - 40	0 - 19	PR/PD-4019	10	48	6	3.9	6	8.8	0.08	0.08	1	2	1UH
0 - 50	0 - 15	PR/PD-5015	10	43	8	3.6	8	8.2	0.08	0.08	1.1	2	1UH
0 - 60	0 - 12.5	PR/PD-6012	10	38	8	3.25	8	7.5	0.08	0.08	1.1	3	1UH
0 - 80	0 - 9.5	PR/PD-809	10	29	10	2.95	10	6.9	0.15	0.15	1.2	4	1UH
0 - 100	0 - 7.5	PR/PD-1007	10	23	12	2.75	12	6.5	0.15	0.15	1.5	5	1UH
0 - 150	0 - 5	PR/PD-1505	16	18	17	2.5	17	6	0.15	0.15	2	5	1UH
0 - 300	0 - 2.5	PR/PD-3002	25	13	32	2.25	32	5.5	0.15	0.15	3	5	1UH
0 - 350	0 - 2.1	PR/PD-3502	25	13	32	2.25	32	5.5	0.15	0.15	3	5	1UH
0 - 450	0 - 1.7	PR/PD-4501	34	13	35	2.3	35	5.5	0.21	0.24	3.5	5	1UH
0 - 600	0 - 1.25	PR/PD-6001	75	8	62	2.13	62	5.26	0.25	0.3	4	5	1UH

12-3. 1U 1500W SPECIFICATION

Output		Model	Ripple (*3)		Line regulation (*5)		Load regulation		Response time(sec) (*8)			Remote Sense (V)	Size
CV(*1)	CC(*2)		CV	CC(*4)	CV	CC	CV(*6)	CC(*7)	Full Load UP	Full Load Down	No Load Down		
V	A		mV rms	mA rms	0.05% +mV	0.1% +mA	0.05% +mV	0.1% +mA					
0 - 6	0 - 200	PR/PD-6200	15	360	2.8	18.5	2.8	38	0.08	0.05	0.6	1	1U
0 - 8	0 - 180	PR/PD-8180	15	360	2.8	18.5	2.8	38	0.08	0.05	0.6	1	1U
0 - 12.5	0 - 120	PR/PD-12120	15	248	3.4	14.5	4	28	0.08	0.05	0.8	1	1U
0 - 20	0 - 76	PR/PD-2076	15	152	4	9.6	4	20.2	0.08	0.05	0.8	1	1U
0 - 30	0 - 50	PR/PD-3050	15	125	5	7	5	15	0.08	0.08	0.9	1.5	1U
0 - 40	0 - 38	PR/PD-4038	15	95	6	5.8	6	12.6	0.08	0.08	1	2	1U
0 - 50	0 - 30	PR/PD-5030	15	85	7	5.2	7	11.4	0.08	0.08	1.1	2	1U
0 - 60	0 - 25	PR/PD-6025	15	75	8	4.5	8	10	0.08	0.08	1.1	3	1U
0 - 80	0 - 19	PR/PD-8019	15	57	10	3.9	10	8.8	0.15	0.15	1.2	4	1U
0 - 100	0 - 15	PR/PD-10015	15	45	12	3.5	12	8	0.15	0.15	1.5	5	1U
0 - 150	0 - 10	PR/PD-15010	24	45	12	3.5	12	8	0.15	0.15	2	5	1U
0 - 300	0 - 5	PR/PD-3005	38	25	32	2.5	32	6	0.15	0.15	3	5	1U
0 - 350	0 - 4.2	PR/PD-3504	38	25	32	2.5	32	6	0.15	0.15	3	5	1U
0 - 450	0 - 3.4	PR/PD-4503	68	18	35	2.5	32	5.8	0.21	0.24	3.5	5	1U
0 - 600	0 - 2.5	PR/PD-6002	113	15	62	2.26	62	5.5	0.25	0.3	4	5	1U

12-4. 2UH 1500W SPECIFICATION

Output		Model	Ripple (*3)		Line regulation (*5)		Load regulation		Response time(sec) (*8)			Remote Sense (V)	Size
CV(*1)	CC(*2)		CV	CC(*4)	CV	CC	CV(*6)	CC(*7)	Full Load UP	Full Load Down	No Load Down		
V	A		mV rms	mA rms	0.05% +mV	0.1% +mA	0.05% +mV	0.1% +mA					
0 - 6	**0 - 200**	PR/PD-6200H	**15**	**360**	**2.8**	**18.5**	**2.8**	**38**	**0.08**	**0.05**	**0.6**	**1**	**2UH**
0 - 8	**0 - 180**	PR/PD-8180H	**15**	**360**	**2.8**	**18.5**	**2.8**	**38**	**0.08**	**0.05**	**0.6**	**1**	**2UH**
0 - 12.5	**0 - 120**	PR/PD-12120H	**15**	**248**	**3.4**	**14.5**	**4**	**28**	**0.08**	**0.05**	**0.8**	**1**	**2UH**
0 - 20	**0 - 76**	PR/PD-2076H	**15**	**152**	**4**	**9.6**	**4**	**20.2**	**0.08**	**0.05**	**0.8**	**1**	**2UH**
0 - 30	**0 - 50**	PR/PD-3050H	**15**	**125**	**5**	**7**	**5**	**15**	**0.08**	**0.08**	**0.9**	**1.5**	**2UH**
0 - 40	**0 - 38**	PR/PD-4038H	**15**	**95**	**6**	**5.8**	**6**	**12.6**	**0.08**	**0.08**	**1**	**2**	**2UH**
0 - 50	**0 - 30**	PR/PD-5030H	**15**	**85**	**7**	**5.2**	**7**	**11.4**	**0.08**	**0.08**	**1.1**	**2**	**2UH**
0 - 60	**0 - 25**	PR/PD-6025H	**15**	**75**	**8**	**4.5**	**8**	**10**	**0.08**	**0.08**	**1.1**	**3**	**2UH**
0 - 80	**0 - 19**	PR/PD-8019H	**15**	**57**	**10**	**3.9**	**10**	**8.8**	**0.15**	**0.15**	**1.2**	**4**	**2UH**
0 - 100	**0 - 15**	PR/PD-10015H	**15**	**45**	**12**	**3.5**	**12**	**8**	**0.15**	**0.15**	**1.5**	**5**	**2UH**
0 - 150	**0 - 10**	PR/PD-15010H	**24**	**45**	**12**	**3.5**	**12**	**8**	**0.15**	**0.15**	**2**	**5**	**2UH**
0 - 300	**0 - 5**	PR/PD-3005H	**38**	**25**	**32**	**2.5**	**32**	**6**	**0.15**	**0.15**	**3**	**5**	**2UH**
0 - 350	**0 - 4.2**	PR/PD-3504H	**38**	**25**	**32**	**2.5**	**32**	**6**	**0.15**	**0.15**	**3**	**5**	**2UH**
0 - 450	**0 - 3.4**	PR/PD-4503H	**68**	**18**	**35**	**2.5**	**32**	**5.8**	**0.21**	**0.24**	**3.5**	**5**	**2UH**
0 - 600	**0 - 2.5**	PR/PD-6002H	**113**	**15**	**62**	**2.26**	**62**	**5.5**	**0.25**	**0.3**	**4**	**5**	**2UH**

12-5. 2U 3000W SPECIFICATION

Output		Model	Ripple (*3)		Line regulation (*5)		Load regulation		Response time(sec) (*8)			Remote Sense (V)	Size
CV(*1)	CC(*2)		CV	CC(*4)	CV	CC	CV(*6)	CC(*7)	Full Load UP	Full Load Down	No Load Down		
V	A		mV rms	mA rms	0.05% +mV	0.1% +mA	0.05% +mV	0.1% +mA					
0 - 6	0 - 400	PR/PD-6400	23	1000	2.8	42	6.2	85	0.08	0.02	0.5	1	2U
0 - 8	0 - 360	PR/PD-8360	23	1000	2.8	42	6.2	85	0.08	0.02	0.5	1	2U
0 - 12.5	0 - 240	PR/PD-12240	23	800	3.2	29	7.1	60	0.08	0.1	0.8	1	2U
0 - 20	0 - 152	PR/PD-20150	23	600	4	18.5	8	38	0.08	0.1	0.8	1	2U
0 - 30	0 - 100	PR/PD-30100	23	310	5	13	9.5	27	0.08	0.16	0.9	1.5	2U
0 - 40	0 - 76	PR/PD-40076	23	250	6	10.5	11	22	0.08	0.16	1	2	2U
0 - 50	0 - 60	PR/PD-5060	23	200	7	9	13	19	0.08	0.16	1.1	2	2U
0 - 60	0 - 50	PR/PD-6050	23	150	8	7.5	14	16	0.08	0.16	1.1	3	2U
0 - 80	0 - 38	PR/PD-8038	23	110	10	6.2	17	13.4	0.15	0.3	1.2	4	2U
0 - 100	0 - 30	PR/PD-10030	23	90	12	5.3	20	11.6	0.15	0.3	1.5	5	2U
0 - 150	0 - 20	PR/PD-15020	36	90	17	4.2	27.5	9.4	0.15	0.3	2	5	2U
0 - 300	0 - 10	PR/PD-30010	57	50	32	3.1	50	7.2	0.15	0.3	3.5	5	2U
0 - 350	0 - 8.4	PR/PD-3508	57	50	32	3.1	50	7.2	0.15	0.3	3.5	5	2U
0 - 450	0 - 6.8	PR/PD-4506	134	42	43	2.8	84	6.7	0.25	0.5	4	5	2U
0 - 600	0 - 5	PR/PD-6005	170	30	62	2.55	95	6.1	0.25	0.5	4	5	2U

* *For 750W/1500W, complied with the rated power output while input AC115V or 230V; For 3000W, complied with the rated power output while input AC230V; please decrease to lower output power when the input voltage is lower than the specific volts. For example the 750W models, it can be full power output when input with 115Vac, but reduces to 600W when input as low as 90Vac.*
* *After 30 minutes of turning on the DC power supply, the temperature should be 23±5°C, the humidity should be under 80%R.H, AC voltage±5%, and THD≤2%, not using the remote compensating, not operate in series or parallel.*
* *Specifications subject to change without notice.*

Notes:

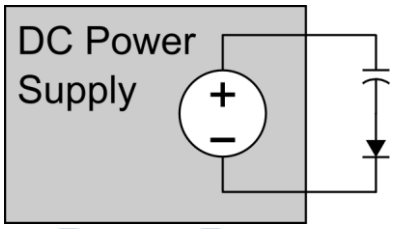
**1. The actual output voltage should be ≤0.1% of the rated voltage when the output voltage sets to zero.*
**2. The actual output current should be ≤0.2% of the rated current when the output current sets to zero (resistance load).*
**3. Measured when output 10%~100% load.*
**4. For 6V model: measured when output voltage 2~6V; the other models measured when output 10~100% of rated voltage.*
**5. Input voltage: 750W/1500W models: 100~240Vac (50/60Hz) or 3000W models: 190~240Vac (50/60Hz), static load.*
**6. Static input voltage and output from no load to full load.*
**7. Static input voltage and output from no load to full load.*
**8. The output voltage varies from 10%~90% or 90%~10%, rated input voltage, resistive load.*
**9. Remote sensing compensation: no compensate if exceed the specified voltage. For example: DSP-100-07.5HD, Output setting 99V, the wire's power drop 2V. The remote sensing compensation is 1V, which means the voltage is 98V at load side.*

APPENDIX 1 LOAD PROTECTION FUNCTION

Since the PR/PD series meet a wide range of user needs, the use of various loads is also considered. Depending on the load, the use of power supply as is may cause trouble or erroneous operation and countermeasures must be taken.

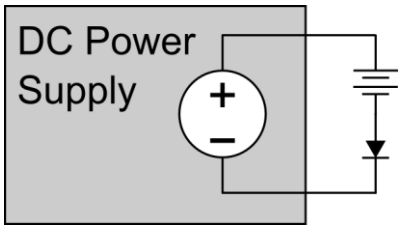
A1-1. HIGH CAPACITANCE LOAD

When the high capacitance load connects to the DC power supply, please insert a diode in series to protect the DC power supply from OVP rapidly.



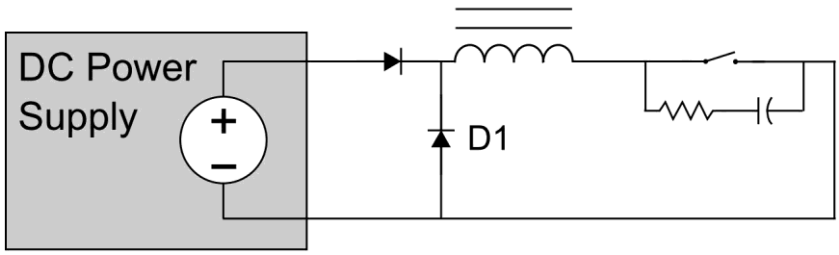
A1-2. RECHARGEABLE BATTERY

Use the DC power supply in series with a diode. Since the DC power supply output electrolytic capacitor is full charged, when the DC power supply is connected to the load, sparks may fly.



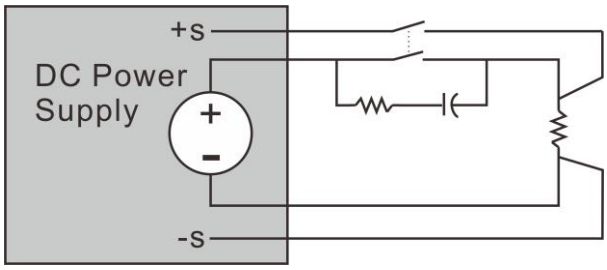
A1-3. INDUCTIVE LOAD

The counter electromotive force generated when turning output off the power supply, add a free wheel diode D1 and connect in parallel with the output is required.



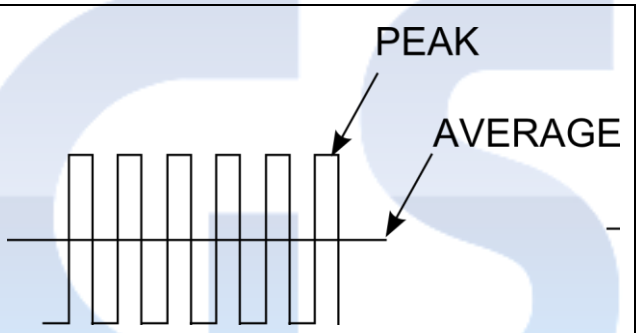
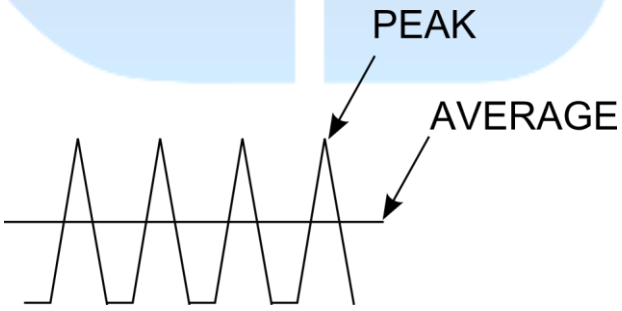
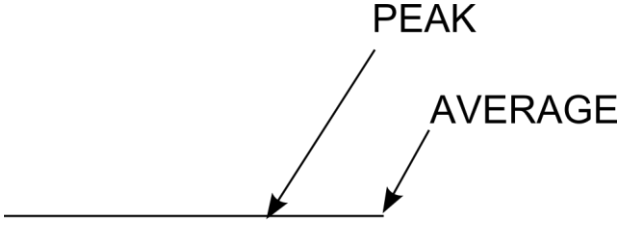
A1-4. OUTPUT IS TURNED ON/OFF WITH A MECHANICAL SWITCH

When the output voltage is higher than 100V and using a magnetic contactor as the switch, the arc may generate. The noise may enter the power supply differential amplifier through the load line and cause the output to become unstable. The noise can be absorb by add a RC connected in parallel. When using the remote sensing, always turn the sensing cable ON and OFF simultaneously.



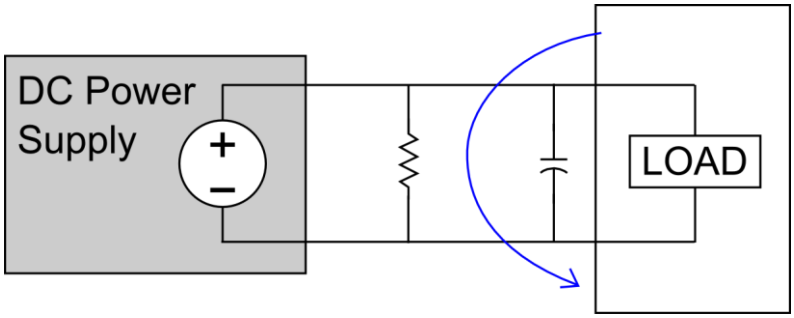
A1-5. WHEN THE LOAD DRAWS THE PULSE CURRENT

When connected to the PWM load, although some times the measured current value (Mean or RMS) is lower than the rated current of the power supply. But the peak value is exceeding the rated value. The output voltage in this case will still drop. However, if the pulse width is narrow or the peak value is not too high, the user can solve this problem by install a large capacitor at the load side.

The current waveform when connecting a DC TO DC converter	
The current waveform when connecting a DC TO AC inverter	
The current waveform when connecting resistance load	

A1-6. WHEN THE LOAD MAY REGENERATES A REVERSE CURRENT

Since the DC power supply can not absorb the reverse current from the load, so the output voltage will rise. Please connect a resistor in parallel at the output stage to absorb the reverse current, if the load regenerates a surge current, please connect a capacitor in parallel.



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