BENCHTOP INSTRUMENT

Multiple Output Programmable DC Power Supply Operation Manual

CE

Contents

Use of Operation Manual

Please read through and understand this Operation Manual before operating the product. After reading, always keep the manual nearby so that you may refer to it as needed. When moving the product to another location, be sure to bring the manual as well.

Calibration notification

We notify that the instruments included in this manual are in compliance with the features and specifications as stated in this manual. Before shipment, the instrument has been calibrated in factory. The calibration procedures and standards are compliant to the national regulations and standards for electronic calibration.

Warranty

We guarantee that the instrument has been passed strict quality check. We warrant our instrument's mainframe and accessories in materials within the warranty period of one year. We guarantee the free spare parts for products which are approved defective in this period. To get repair service, please contact with your nearest sales and service office. We do not provide any other warranty items except the one being provided by this summary and the warranty statement. The warranty items include but not being subjected to the hinted guarantee items related to tradable characteristics and any particular purpose. We will not take any responsibility in cases regarding to indirect, particular and ensuing damage, such as modifications to the circuit and functions by the users, repairing or component replacement by the users, or damage during transportation.

For product improvement, the specifications are subject to change without prior notice.

SAFETY INSTRUCTION

This chapter contains important safety instructions that you must follow when operating the instrument and when keeping it in storage. Read the following before any operation to insure your safety and to keep the best condition for the instrument.

Safety Symbols

The following safety symbols may appear in this manual or on the instrument:

	**WARNING**	Identifies conditions or practices that could result in injury or loss of life.
	**CAUTION**	Identifies conditions or practices that could result in damage to the instrument or to other properties.
	**DANGER**	High voltage
	**ATTENTION**	Refer to the manual
		Protective conductor terminal
		Earth (ground) terminal

Safety Guidelines

- Before plugging into local AC mains, check and make sure that the output voltage is compatible to the load. (It is suggested to disconnect a load before plugging into local AC mains.)
- Do not use this instrument near water.
- Do not operate or touch this instrument with wet hands.
- Do not open the casing of the instrument when it is connected to AC mains.
- The max.output voltage of the instrument may be over 60VDC, avoid touch the metal contact part of the output terminals.
- Do not use the instrument in an atmosphere which contains sulfuric acid mist or other substances which cause corrosion to metal.
- Do not use the instrument in a dusty place or a highly humid place as such will cause instrument reliability degradation and instrument failures.
- Install the instrument in a place where is free from vibration.
- Install the instrument in a place where the ambient temperature is in range of -10~70℃. Note that the instrument operation may become unstable if it is operated in an ambient temperature exceeding the range of 0~40℃

Power supply AC Input voltage: 110V/220V ±10%, 50/60Hz

Connect the protective grounding conductor of the AC power cord to an earth ground to avoid electrical shock.

Fuse WARNING	● Fuse type: 110V: T4A /250V, 220V: T6A/250V. ● Make sure the correct type of fuse is installed before power up. ● Replace the AC fuse with the same type and rating as the original fuse. ● Disconnect the power cord before fuse replacement. ● Make sure the cause of fuse blowout is fixed before fuse replacement.
Operation environment	● Location: indoor, no direc sunlight, dust free, almost non-conductive pollution (note below). ● Relative humidity: <80% ● Altitude: <2000m ● Temperature: 0℃ ~ 40℃ (Pollution Degree) EN 61010-1:2001 specifies the pollution degrees and their requirements as follows. The instrument falls under degree 2. Pollution refers to “addition of foreign matter, solid, liquid, or gaseous (ionized gases), that may produce a reduction of dielectric strength or surface resistivity”. Pollution degree 1: No pollution or only dry, non-conductive pollution occurs. The pollution has no influence. Pollution degree 2: Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected. Pollution degree 3: Conductive pollution occurs, or dry, nonconductive pollution occurs which becomes conductive due to condensation which is expected. In such conditions, equipment is normally protected against exposure to direct sunlight, precipitation, and full wind pressure, but neither temperature nor humidity is controlled.
Storage environment	● Location: indoor ● Relative humidity: <70% ● Temperature: -10 ℃ ~ 70℃

1. PRODUCT INTRODUCTION

1.1 Description

This series are a 4-in-1 linear DC power supplies, with two fully adjustable outputs and two auxiliary outputs. In constant voltage and current operations, the power supply provides high regulation and low ripple & noise. Auto series and parallel operations double output voltage and current. Automatic cooling fan control give sufficient cooling to the power supply and minimize fan noise. The output ON/OFF control and over load & short circuit protections protect the power supply and related loads from unexpected damages. As a 4-in-1 power supply, this series provide multiple solutions for powering operational amplifier, push pull stages, logic circuit and definition systems.

1.2 Features

- Four independent adjustable outputs
- Constant voltage, constant current operation
- Low ripple and noise, low temperature drift
- Auto Tracking
- Auto Series and Parallel operation
- Output ON/OFF control
- Preset current
- High efficiency, high power density
- Dual-color four digital panel meters

1.3 List of Models

Model	CH1 Output	CH2 Output	CH3 output	CH4 output	Dimension (mm)	Weight (kg)
TP-4303	0~30V 0~3A	0~30V 0~3A	8~15V 1A	2.2~5.2V 1A	250×150×305	9.5
TP-4305	0~30V 0~5A	0~30V 0~5A	8~15V 1A	2.2~5.2V 1A	250×150×305	10

2. PANEL INTRODUCTION

2.1 Front Panel

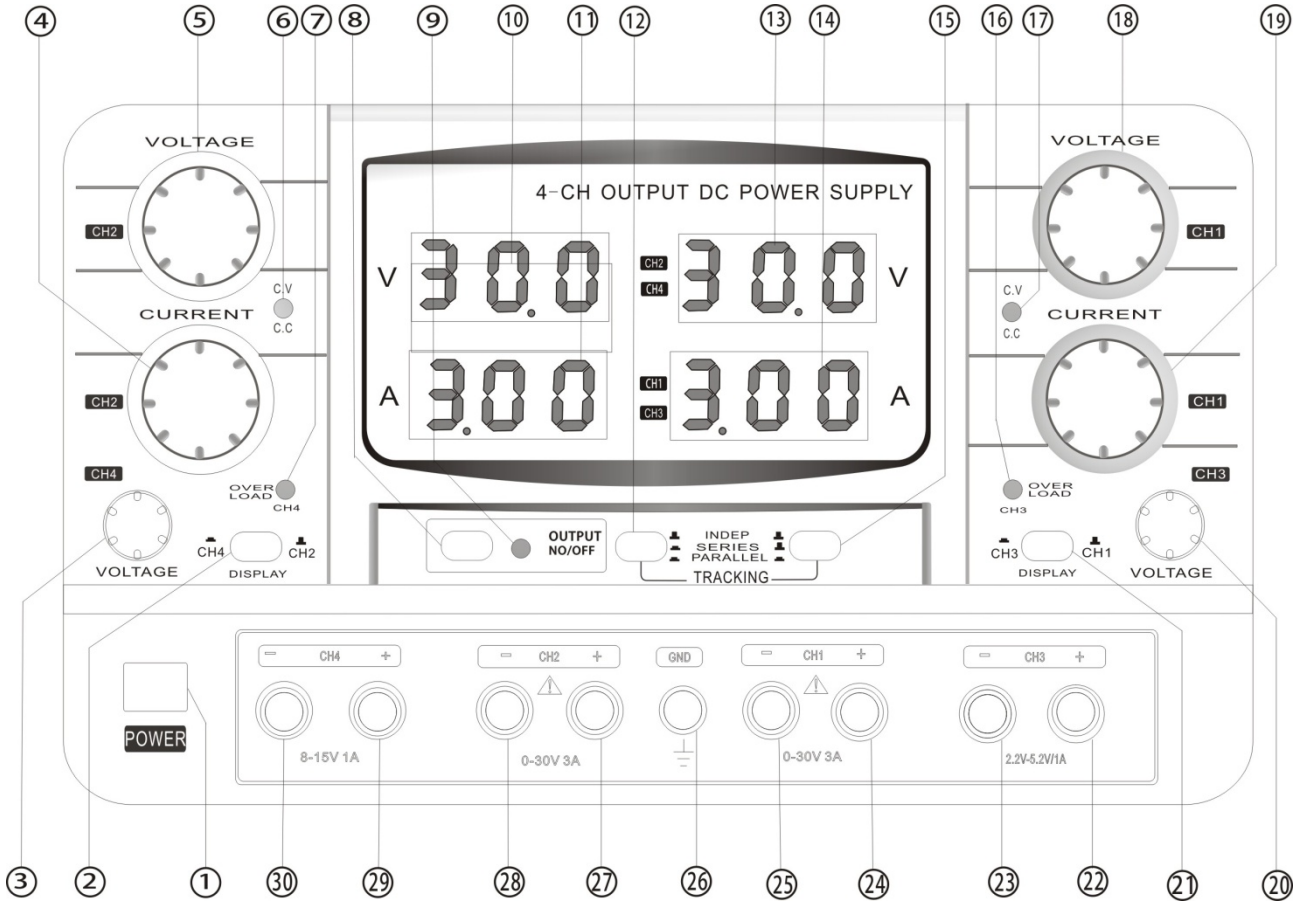


Fig.2.1-1 Front Panel

No.	Name	Description
1	Power switch	Press it to power on/off the power supply.
2	CH2/CH4 display switch	Press it to select display for CH4 voltage/current values. Release it to select display for CH2 voltage/current values.
3	CH4 voltage knob	Tune it clockwise to increase the voltage value; tune it anti-clockwise to decrease the voltage value.
4	CH2 current knob	Tune it clockwise to increase the current value; tune it anti-clockwise to decrease the current value.
5	CH2 voltage knob	Tune it clockwise to increase the voltage value; tune it anti-clockwise to decrease the voltage value.
6	CH2 CV/CC indicator	When CH2 is at the Constant Voltage (CV) mode, the indicator lights on as green color. When CH2 is at the Constant Current (CC) mode and in PARALLEL TRACKING mode, the indicator lights on as red color.
7	CH4 overload indicator	When CH4 is at the CC mode, the indicator lights on.
8	Output ON/OFF key	Turn on or off the output. After output is turned off, it takes 3 seconds to return to normal state.
9	Output indicator	When there is power output on output terminals, the indicator lights on.

No.	Name	Description
10	CH2/CH4 voltage display panel	The panel displays CH2 or CH4 voltage value.
11	CH1/CH3 voltage display panel	The panel displays CH1 or CH3 voltage value.
12	Tracking mode selection key	This key is operated with key 15 to select INDEPENDENT mode, SERIES TRACKING mode and PARALLEL TRACKING mode for CH1 and CH2 output. a) To select INDEPENDENT mode: Release both key 12 and key 15.Then CH1 and CH2 will operate independently. b) To select SERIES TRACKING mode: Press key 12 and release key 15 at the same time. CH2 output voltage will be followed by CH1. Connect the load to CH1 “+” output terminal and to CH2 “-” output terminal to get double rated voltage output. c) To select PARALLEL TRACKING mode: Press both key 12 and key 15. The CH2 output voltage and current will be followed by CH1. Connect the load in parallel to CH1 output terminals to get double rated current output.
13	CH2/CH4 current display panel	The panel displays CH2 or CH4 current value.
14	CH1/CH3 current display panel	The panel displays CH1 or CH3 current value.
15	Tracking mode selection key	This key is operated with key 12 to select INDEPENDENT mode, SERIES TRACKING mode and PARALLEL TRACKING mode for CH1 and CH2 output. Refer details to descriptions of key 12.
16	CH3 overload indicator	When CH3 is at CC mode, the indicator lights on.
17	CH1 CV/CC indicator	When CH1 is at CV mode, the indicator lights on as green color. When CH1 is at CC mode and in PARALLEL TRACKING mode, the indicator lights on as red color.
18	CH2 voltage knob	Tune it clockwise to increase the voltage value; tune it anti-clockwise to decrease the voltage value. When in SERIES/PARALLEL TRACKING mode, use this knob to adjust CH2 voltage.
19	CH1 current knob	Tune it clockwise to increase the current value; tune it anti-clockwise to decrease the current value. When in SERIES/PARALLEL TRACKING mode, use this knob to adjust CH2 current.
20	CH3 voltage knob	Tune it clockwise to increase the voltage value; tune it anti-clockwise to decrease the voltage value.
21	CH1/CH3 display switch	Press it to select display for CH3 voltage/current values. Release it to select display for CH1 voltage/current values.
22	CH3 “+” terminal	Positive terminal of 2.2~5.2V adjustable output.
23	CH3 “-” terminal	Negative terminal of 2.2~5.2V adjustable output.
24	CH1 “+” terminal	Positive terminal of 0~30V adjustable output.
25	CH1 “-” terminal	Negative terminal of 0~30V adjustable output.
26	GND grounding terminal	This terminal is connecting to the casing and the earth.
27	CH2 “+” terminal	Positive terminal of 0~30V adjustable output.
28	CH2 “-” terminal	Negative terminal of 0~30V adjustable output.
29	CH4 “+” terminal	Positive terminal of 8~15V adjustable output.
30	CH4 “-” terminal	Negative terminal of 8~15V adjustable output.

2.2 Rear Panel

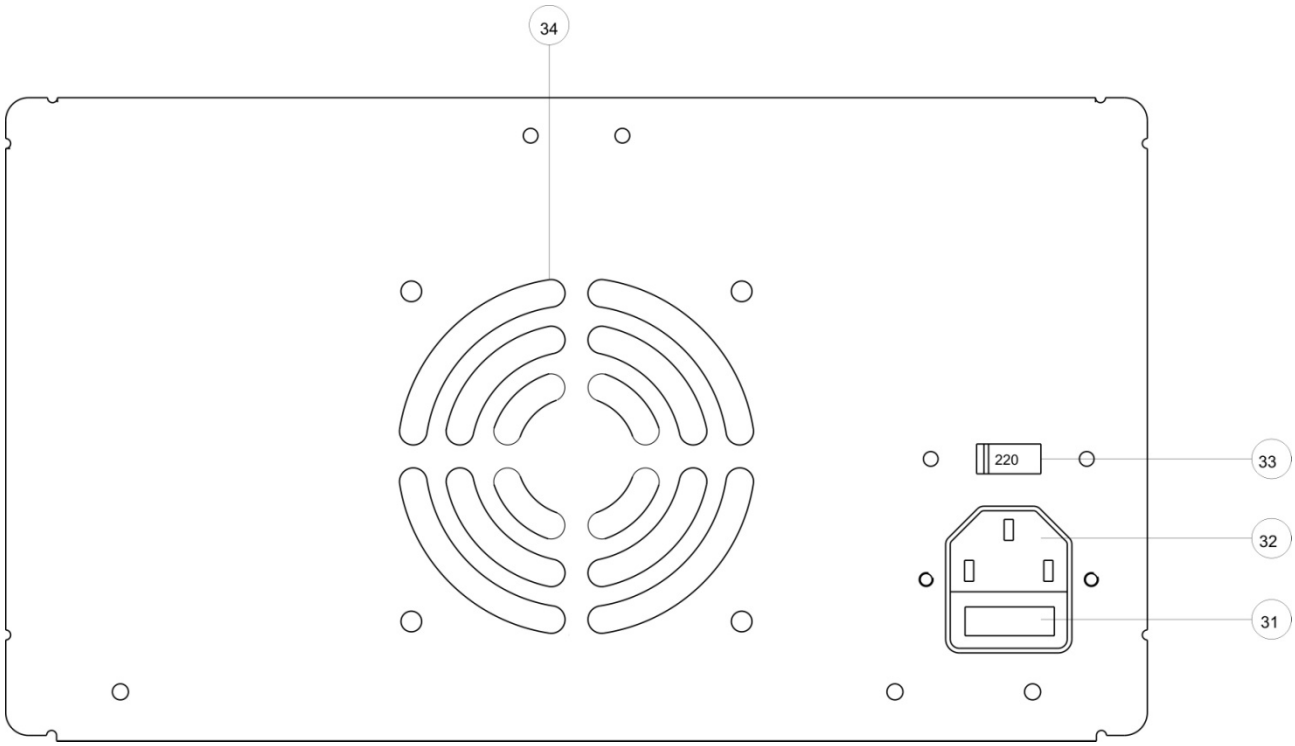
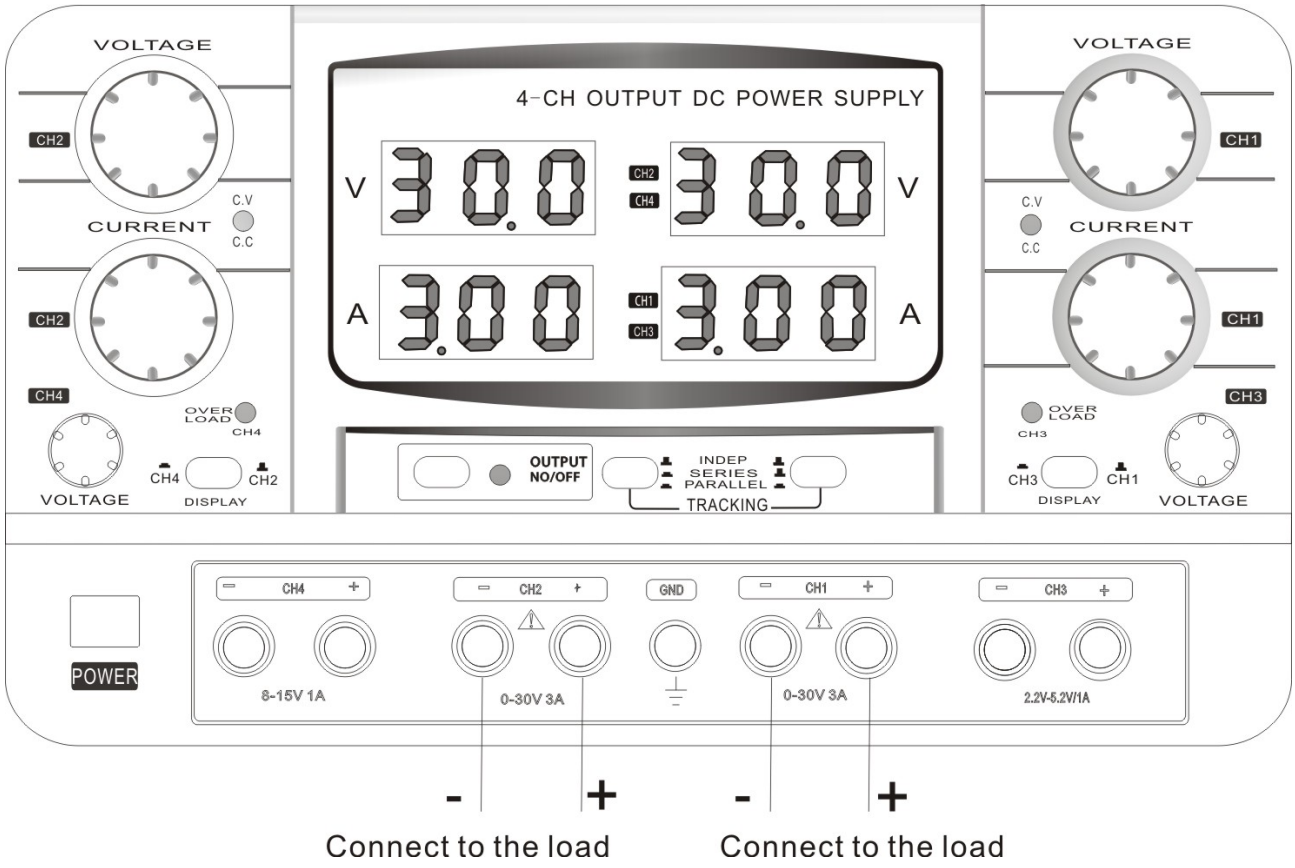


Fig.2.1-2 Rear Panel

No.	Name	Description
31	Fuse socket	Use suitable fuse which is stated in page IV.
32	Power input socket	Input voltage: 110V/220V ±10%, 50/60Hz
33	Input voltage selector	For 110V AC power system, please slide the input voltage selector to 110V position; while for 220V AC power system, slide it to 220V position.
34	Ventilation hole for cooling fan	The cooling fan exhaust heat air from internal heat sink via this ventilation hole.

3. OPERATION INSTRUCTION

3.1 Set CH1 and CH2 Output Voltage



Steps for setting:

1. Connect the power supply to local power source.
2. Press power switch [1] to turn on the power supply.
3. To set CH1 output voltage:
   a) Use the CH1 voltage knob [18] to set the CH1 voltage to a desired output voltage value.
   b) Connect the load to terminals [24, 25].
   c) Press OUTPUT ON/OFF key [8] to activate output and the output indicator [9] will lights on.
4. When the CH1 CV/CC indicator [17] lights on as red color, tune the CH1 current knob [19] to give a suitable current value.
   To set CH2 output voltage: repeat the above steps. Use the CH2 voltage knob [5] to set the CH2 voltage to a desired output voltage value. Short the main terminal [26, 27]. The CH2 CV/CC indicator lights on.

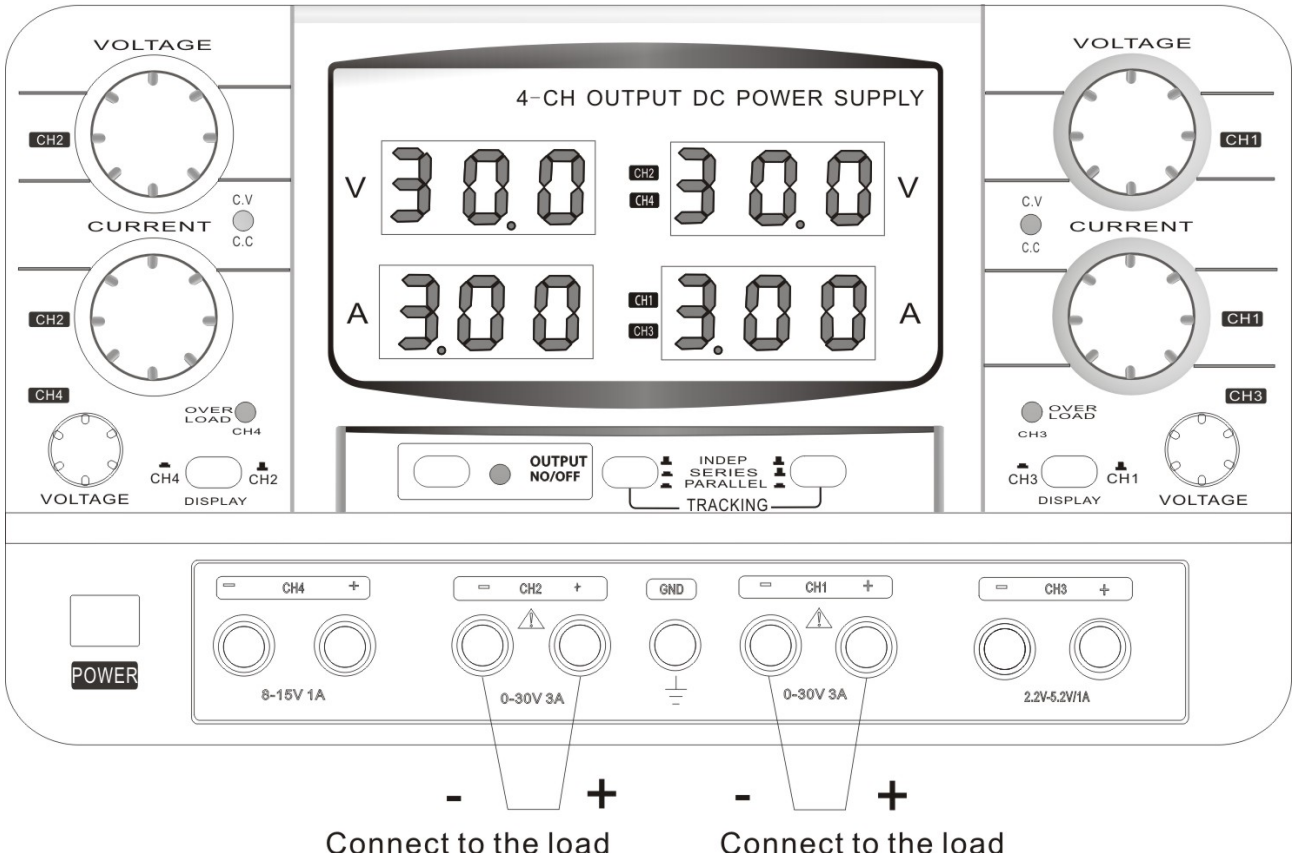
Remarks:

1. If CH2 voltage cannot be adjusted, check the TRACKING mode selection key [12, 15]. Make sure that these two keys are released.
2. To set a desired output current before connecting to the load, read section 3.2 first.

CAUTION

1. To avoid damage to the power supply, make sure that the input voltage selector [33] is set to a correct position.
2. To avoid electrical shock, the power cord protective grounding conductor must be connected to ground.
3. To avoid damage to the power supply, do not short the main terminals [26, 27] for more than 1 minute.

3.2 Set CH1 and CH2 Output Current



Steps for setting:

1. Connect the power supply to local power source.
2. Refer to section 3.1 step 1 to 3 b) to give the voltage around 2~5V.
3. To set CH1 output current:
   a) Tune the CH1 current knob [19] anti-clockwise to reach the minimum current value.
   b) Short the "+" and "-" main terminals [24, 25] with a conductor whose cross section area is not less than 0.5 mm^2.
   c) Press OUTPUT ON/OFF key [8] to activate output and the output indicator [9] will lights on. The CH1 CV/CC indicator [17] lights on as red color.
   d) Tune the CH1 current knob [19] to give a desired output current.
   e) Press OUTPUT ON/OFF key [8] to turn off the output.
   f) Remove the conductor between the main terminals [24, 25].
   g) Set the voltage to a desired value.
   h) Connect the load to the main terminal [24, 25].
4. To set CH2 output current, repeat the above steps. Use CH2 current knob [4], short main terminal [26, 27]. CH2 CV/CC indicator will light on as red color.

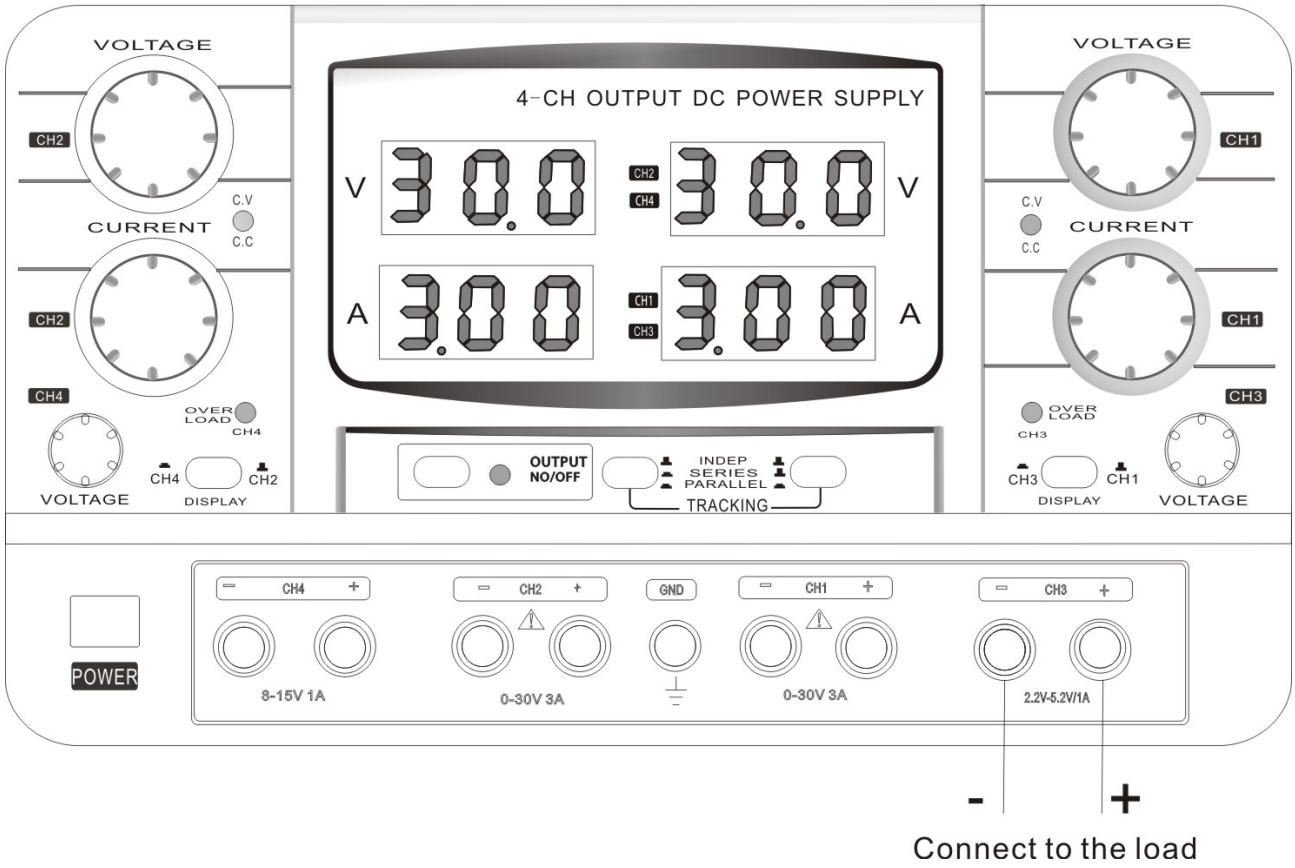
Remarks:

The conductor is not provided as a standard accessory to the power supply.

CAUTION

1. To avoid damage to the power supply, ensure that the current is set to zero before shorting the main terminals.
2. To avoid electrical shock, the power cord protective grounding conductor must be connected to ground.
3. To avoid damage to the power supply, do not short the main terminals for more than 1 minute.

3.3 Set CH3 Output Voltage



Steps for setting:

1. Connect the power supply to local power source.
2. Press power switch [1] to turn on the power supply.
3. Press CH1/CH3 display switch [21] to select display for CH3 voltage and current values. When CH3 values are displayed, the CH3 icon lights on.
4. Tune CH3 voltage knob [20] to set a desired voltage value.
5. Connect the load to the CH3 terminals [22, 23].
6. Press OUTPUT ON/OFF key [8] activate output and the OUTPUT indicator [9] will light on.
7. When the CH3 overload indicator [16] lights on, reduce the load onto the terminals to reduce current consumption.

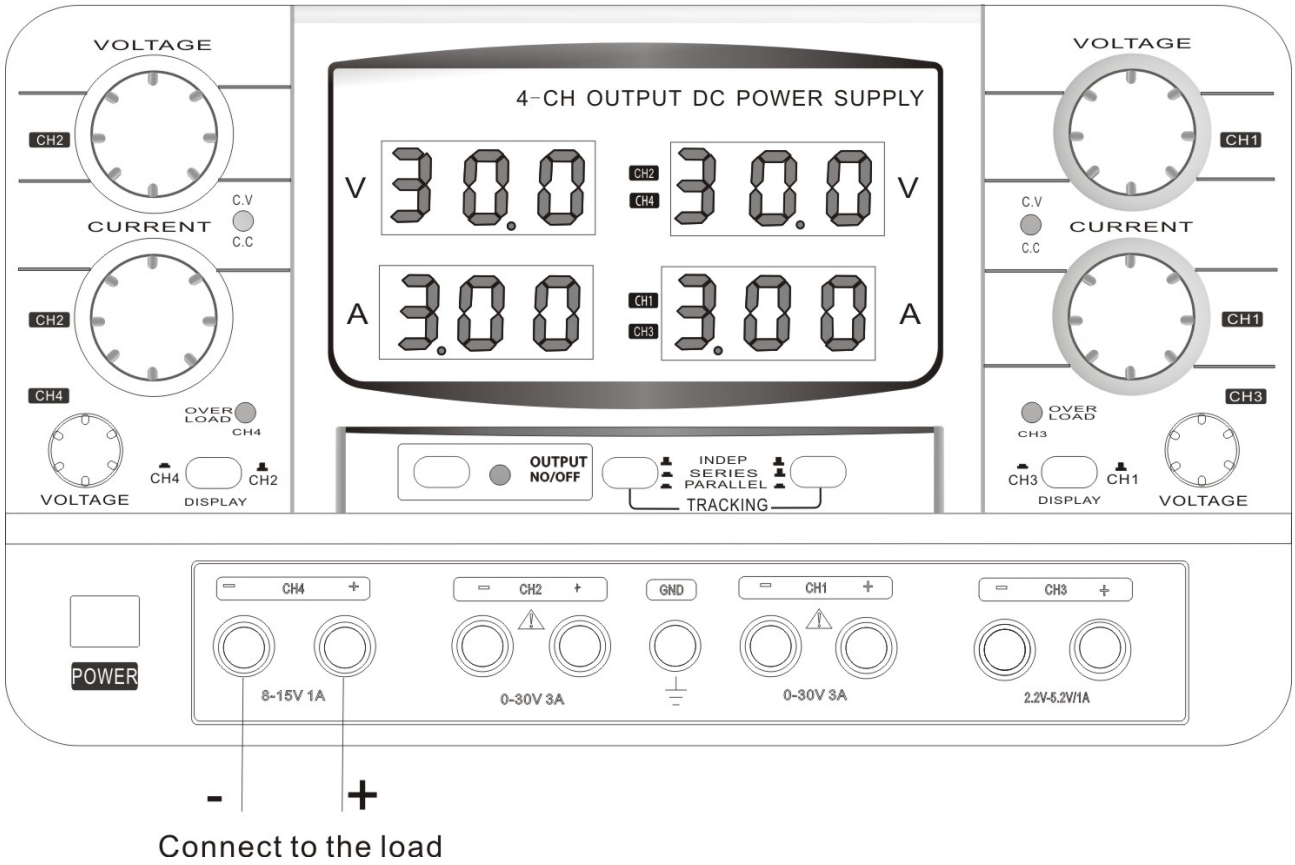
Remarks:

The output current is fixed at 1A, not adjustable.

CAUTION

1. To avoid damage to the power supply, ensure that the current is set to zero before shorting the main terminals.
2. To avoid electrical shock, the power cord protective grounding conductor must be connected to ground.
3. To avoid damage to the power supply, do not short the main terminals for more than 1 minute.

3.4 Set CH4 Output Voltage



Steps for setting:

1. Connect the power supply to local power source.
2. Press power switch [1] to turn on the power supply.
3. Press CH2/CH3 display switch [2] to select display for CH4 voltage and current values. When CH3 values are displayed, the CH4 icon lights on.
4. Tune CH4 voltage knob [3] to set a desired voltage value.
5. Connect the load to the CH4 terminals [29, 30].
6. Press OUTPUT ON/OFF key [8] activate output and the OUTPUT indicator [9] will light on.
7. When the CH4 overload indicator [7] lights on, reduce the load onto the terminals to reduce current consumption.

Remarks:

The output current is fixed at 1A, not adjustable.

CAUTION

1. To avoid damage to the power supply, ensure that the current is set to zero before shorting the main terminals.
2. To avoid electrical shock, the power cord protective grounding conductor must be connected to ground.
3. To avoid damage to the power supply, do not short the main terminals for more than 1 minute.

3.5 Set Independent Mode

Steps for setting:

1. Release the two TRACKING mode selection keys [12, 15] at the same time to enable INDEPENDENT mode.
2. In INDEPENDENT mode, CH1 and CH2 are two independent power supply units, whose voltage or current can be adjusted independently.
3. Adjust CH1 or CH2 voltage/current knob [19, 20 / 4, 5] to set the desired values.
4. Connect the load to the CH1 or CH2 output terminals.

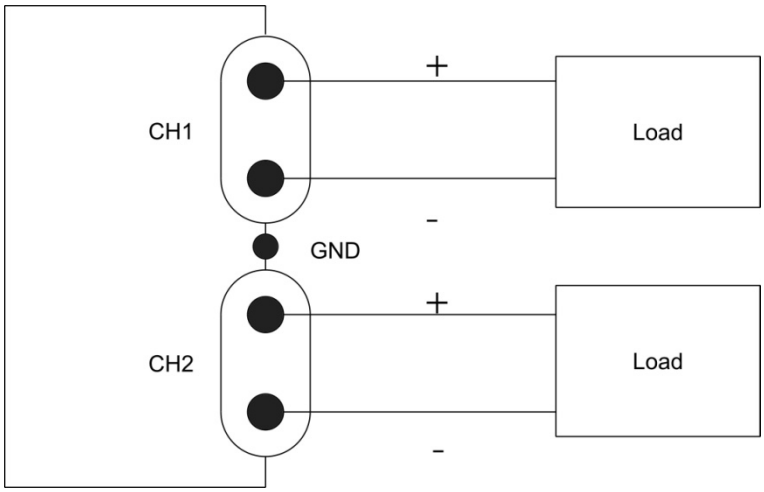
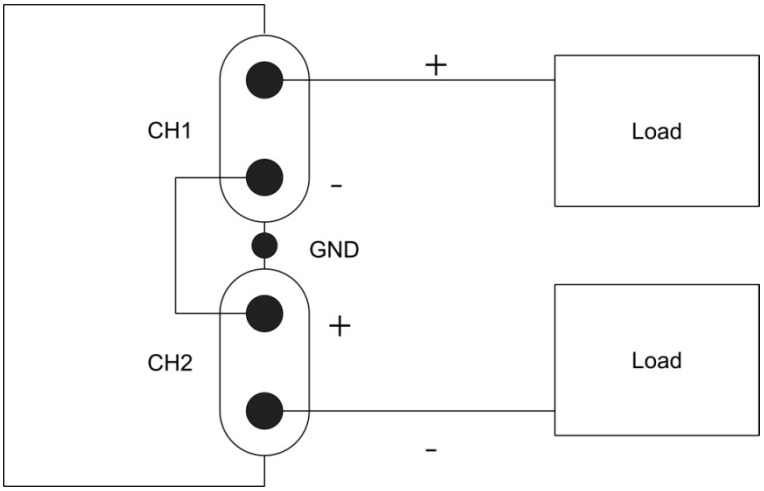


Illustration of Independent Mode

3.6 Set Series Tracking Mode

Steps for setting:

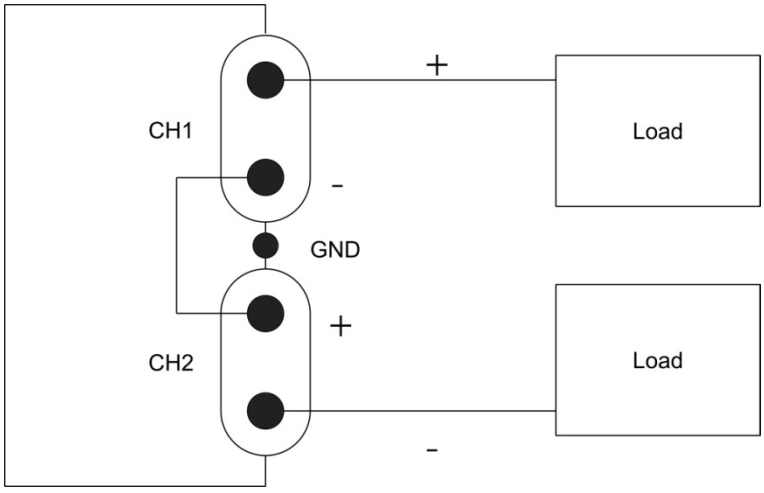
1. Press TRACKING mode selection key [12], while release TRACKING mode selection key [15] at the same time to enable SERIES TRACKING mode.
2. In SERIES TRACKING mode, CH2 output voltage and current follows CH1 settings. The output voltage is double to the CH1 display value.



DC Power Supply

Illustration of Series Tracking Mode

3. Tune CH2 current knob [4] clockwise to maximum current value, and then tune CH1 current knob [19] to set the desired output current value. (Refer to section 3.2)
4. Tue CH1 voltage knob [18] to set the desired output voltage value.
5. Connect the load to the CH1 “+” output terminal [24] and CH2 “-” output terminal [28] to get double voltage output.
6. For a bi-polar DC power supply with common grounding, connect CH2 “+” terminal [27] to “GND” terminal [26]. CH1 “+” terminal [24] is the positive output and the CH2 “-” terminal [28] is the negative output.



DC Power Supply

Illustration of Bi-polar Tracking Mode

3.7 Set Parallel Tracking Mode

Steps for setting:

1. Press the two TRACKING mode selection keys [12, 15] at the same time to enable PARALLEL TRACKING mode.
2. In PARALLEL TRACKING mode, CH2 output voltage and current follows CH1 settings. The output current is double to the CH1 display value.

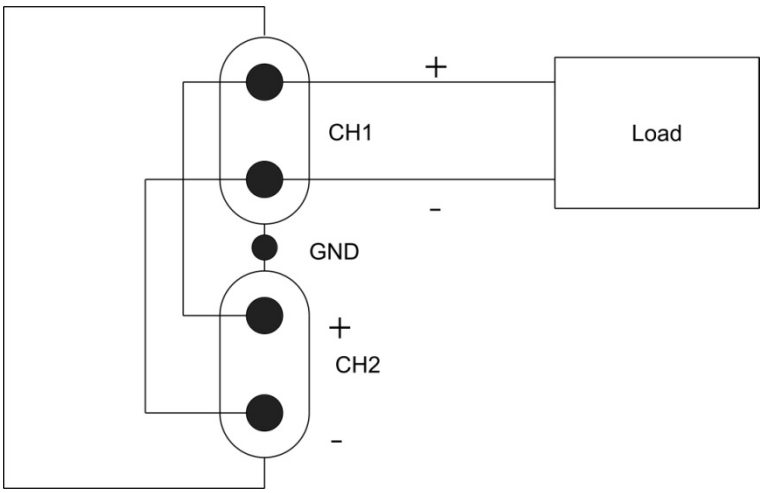


Illustration of Parallel Tracking Mode

3. Tune CH1 voltage knob [18] to set the desired output voltage value.
4. Tune CH1 current knob [19] to set the desired output current value. (Refer to section 3.2)
5. Connect the load to the CH1 terminals [24, 25] to get double current output.

4. MAINTENANCE

WARNING

The following instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing other than contained in the operating instructions unless you are qualified to do so.

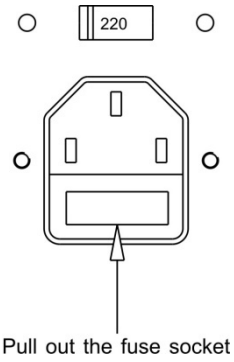
4.1 Inspection

1. Inspect the instrument at regular intervals so that it maintains its initial performance for a long time.
2. Check the input power cord for damage of the vinyl cover and overheating of the plug and cord stopper. Check the terminal screws and binding posts for loosening.
3. Remove dust from the inside of the casing and ventilation holes of the cover by using a compressed air of the exhaust air of a vacuum cleaner.

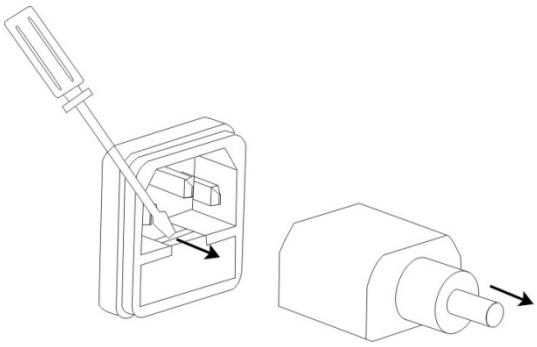
4.2 Fuse Replacement

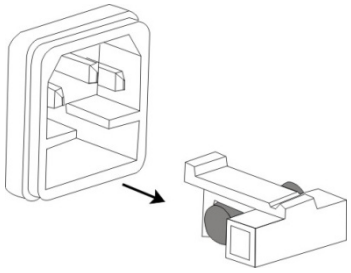
Steps for setting:

1. Disconnect all power connections.
2. Locate the fuse socket in the rear panel power socket.



3. Take off the power cord, and pull out the fuse socket from the power socket.





4. Replace the fuse with identical rating.
   Fuse rating: 110V: T4A/250V
   220V: T6A/250V

5. Reinstall the fuse socket (Push the fuse socket into the power socket).

1. To avoid electrical shock, ensure no power is connected to the power supply.
2. To avoid damage to the fuse socket, do not over push the fuse socket.

4.3 Cleaning

1. Before cleaning, disconnect the AC mains.
2. To clean the power supply, use a soft cloth dampened in a solution of mild detergent and water. Do not spray cleaner directly onto the instrument, since it may leak into the cabinet and cause damage.
3. Do not use chemicals containing benzene, benzene, toluene, xylene, acetone, or similar solvents.
4. Do not use abrasive cleaners on any portion of the instrument.

4.4 Trouble Shooting

Problem	The power supply cannot startup. (No display)
Solution	1. Ensure the power source or power cord is working properly. 2. Check the fuse. If the fuse is blown, disconnect the unit from the power source. And then replace with a new fuse of identical rating.

Problem	When operating in the CV mode, the voltage suddenly drops and the CC indicator lights on.
Solution	The power supply is in current protection mode. The desired current value is below the circuit gain; therefore the power supply is switched to CC mode. Tune the current knob clockwise to increase the current range.

Problem	The power supply output is unstable.
Solution	1. The power supply needs at least 30 minutes to warm up and reach the specifications as stated in this manual. 2. The power source is below the minimum requirement.

If the above solutions cannot solve the problems, please contact your local distributor/dealer or the manufacturer for repairing.

5. SPECIFICATIONS

Constant voltage operation		
Load regulation		≤0.01%+3mV (I≤3A); ≤0.02%+3mV (I>3A)
Line regulation		≤0.01%+3mV
Ripple & Noise		≤1mV rms (5Hz~1MHz)
Temperature co-efficient		≤300ppm/℃
Recovery time		≤100ms (50% load change, minimum load 0.5A)
Constant current operation		
Load regulation		≤0.2%+3mA
Line regulation		≤0.2%+3mA
Ripple & Noise		≤3mA rms
Tracking operation		
Parallel	Line regulation	≤0.01%+5mV
	Load regulation	≤0.02%+5mV
Series	Line regulation	≤0.01%+3mV
	Load regulation	≤300mV
CH3 output 8~15V/1A		
Output accuracy		±8%
Max. output current		1A
Regulation		Line regulation≤5mV, Load regulation≤15mV
Ripple & noise		≤2.0mVrms (5Hz~1MHz)
CH4 output 2.2~5.2V/1A		
Output accuracy		±8%
Max. output current		1A
Regulation		Line regulation≤5mV, Load regulation≤15mV
Ripple & noise		≤2.0mVrms (5Hz~1MHz)
Display		
Meter		3 digits LED display
Resolution		Voltage: 100mV, Current: 10mA
Accuracy	Voltage	±(0.5% reading+2 digits)
	Current	±(1% reading+2 digits)
Power source		AC110V/220V ±10%, 50/60Hz
Operating environment		0℃~40℃, <80%
Storage environment		-10℃~70℃, <80%
Accessories		Power cord ×1, Operation manual ×1, Test lead x1

For the purpose of product improvement, specifications are subject to change without prior notice.