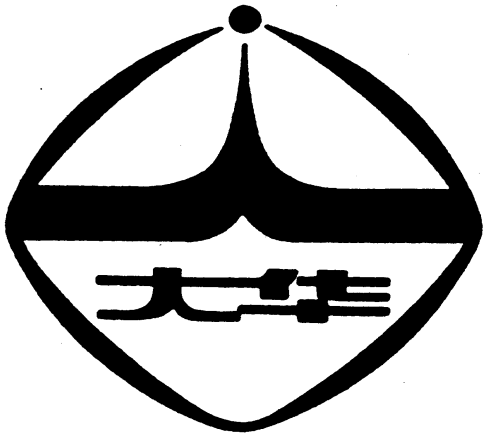
# Model DH1716 Family DC CC/CV

# Power Supply

# User's Manual



**Dahua Company of Electronic Instrument in Beijing**

# CONTENTS



NOTE:

## Checking Specification

No matter the output of the load is from the front or rear output terminal,When checking the specifictions of CV. Please connect a checking wire to +S,-S connection terminal on the rear panel (see SJ2811-standard).

# 1. Description

Model DH1716 family is a single—channel CV/CC power supply which provides a medium power with CV、CC auto—crossover operation mode. In order to improve the reliability of the power supply, it adopts a phase control circuit, an over—voltage protection circuit at the output terminal and a built—in over—temperature protection relay. This power supply offers functions of master—slave series and parallel connection. Remote resistance programming and remote voltage programming .so it is an ideal DC stabilized power supply .This unit can be widely used in factories research institutes, laboratories and various national economic departments.

# 2. Technical Features

2.1.Product Specifications

| Model<br>Spee | DH1716-1 | DH1716-2 | DH1716-3 |
|---|---|---|---|
| Setting Range of Output Voltage | 0~12.5V | 0~18.5V | 0~18.5V |
| Control Range of Output Voltage | 0~12V | 0~18V | 0~18V |
| Setting Range of Output Current | 0~50.5A | 0~50.5A | 0~30.5 |
| Control Range of Output Current | 0~50A | 0~50V | 0~30V |

| Model<br>Spee | DH1716-4 | DH1716-5 | DH1716-6 | DH1716-7 |
|---|---|---|---|---|
| Setting Range of Output Voltage | 0~36V | 0~62V | 0~103V | 0~13V |
| Control Range of Output Voltage | 0~35V | 0~60V | 0~100V | 0~30V |
| Setting Range of Output Current | 0~20.2A | 0~10.2 | 0~5.2A | 30.5A |
| Control Range of Output Current | 0~20A | 0~10A | 0~5A | 0~30A |

2.1. Performances and Specifications

2.2.1. In CV Operation: Source effect: 0.005%+1mV
Load effeft: 0.005%+2mV
PARD(Period and Random Deviation):1mV(rms)

2.2.2. In CC Operation: Suorce effect : 0.005%+10mA
Load effect: 0.005%+10mA
PARD (Period and Random Deviation ):20mA (ram)

2.2.3. Voltage drift in CV operation:$5\times10^{-4}$+5mV/1hs(20±2℃)

2.2.4. Using two sets of similar products in series is allowable

2.2.5. Using two sets of similar products in parallei is allowable

2.2.6. Remote programming in use (with an external sampling function)

2.2.7. Remote resistance programming output voltage: its resistance value: 0~10KΩ

2.2.8. Remote voltage programming output voltage: voltage range: 0~10V

2.2.9. Remote resistance programming output current: resistance range:0~10 kΩ.

2.2.10. Remote voltage programming output current: voltage range: 0~10V.

2.2.11.*Over-volatage protection voltage:5.5~40V adjustable, when the instrument has an over –voltage output, the switch of the unit can cut off total source automatically (when "OUTPUT" is on)

2.2.12.*Accuracy of the meter :2.5%,using a digital meter.Indication accuracy: 1% ±2 counts

2.3. Warm up :15 minutes, but when measuring drift for 1 hour is needed

2.4. *Power consumpsion of the whole unit: apparent power: 2.3KW(at 242V)
actual power consumpsion: About 1.2KW(depending on the circuit)

2.5. *Output power :700W

2.6. Environment condition: Conform to Ⅱ group in the Table of Sandard SJ2075-82 (General Programme of Electronic Measuring Instrument Environment Test)

2.7 Continuous operation: 8hs

2.8 Power supply:AC 220V±10%

2.9 Frequency of power supply:50±2.5Hz

2.10 *Dimensions:230×160×550㎜

2.11 *Weight: About 30kg

## 3. Operation Principle

3.1. Circuit Characteristics

The voltage drop of a regulator is fed back to phase-control circuit U13-2 for compareson so that can change the conducting angle of SCR,i.e, it can change the output voltage of a rectifier so as to keep the voltage drop on the regulator constant basically

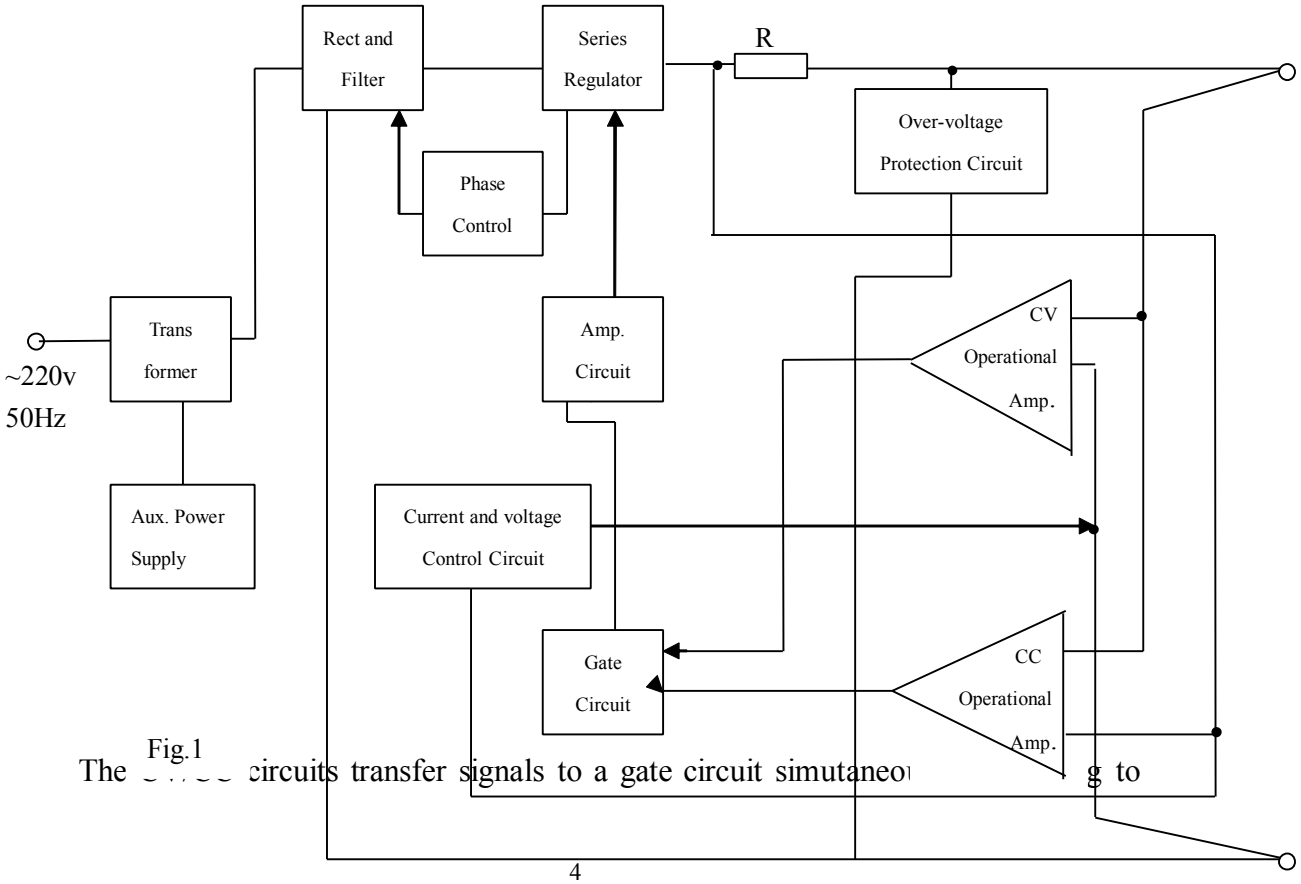



Fig.1

The [illegible] circuits transfer signals to a gate circuit simutaneo[illegible]g to

the needs of the load, determinate it is in CV operation or CC operation. The green lamp lights in CV operation mode. The red lamp lights in CC operation mode. The voltage and current can be preset when the instrumemt has no output.

3.2. Brief Description of CV Section

An adjustable reference circuit consists of an operational amplifier 1/2 U3,a multiturn potentiometer on the panel, vernier potentiometers VR1 and VR2. Single operational amplifier U4 is a sampling amplifier of CV section. The output voltage at the output terminal through a voltage divider along with a reference voltage is applied to the operational amplifier U4-3. The positive terminal of the output voltage is connected to the negative terminal of operational amplifier U4-2,the voltage from the output terminal of the amplifier passes through the gate circuit and is amplifed to control the regulator.

3.3. Brief Description of CC Section

An adjustable reference voltage circuit consists of an operational amplifier 1/2 U3, a potentiometer on the panel, vernier potentiometers VR3 and VR4. Single operational amplifier U5 is an sampling amplifier of CC section. The voltage at the negative terminal of the standard sampling resistor along with the reference voltage is appied to the positive phase terminal of sampling amplifier U4-3,the negative terminal of amplifier U4-2 is connected to the positive termnal of the sampling resistor. The output voltage from the amplifier passes through the gate ciruit and is amplified to control the regulator.

3.4. CV/CC Conversion, CV Mode~CC Mode

Set the current potentiometer, CC is set to a preset value to reduce the resistance on the load. The output current increases. when the output current has reached the preset current value, the oupout voltage decreases, the output current also can not increase, that means the instrument has gone into CC operation mode, even through the resistance on the load is shorted to zero, the output current also can not increase ,that means the instrument can transfer from CV operation mode into CC operation mode automatically, making the load no over-current ,meanwhile also protecting the instrument itself, vice-versa, that is to say ,the CV/CC can transfer operation modes of the power supply automatically.

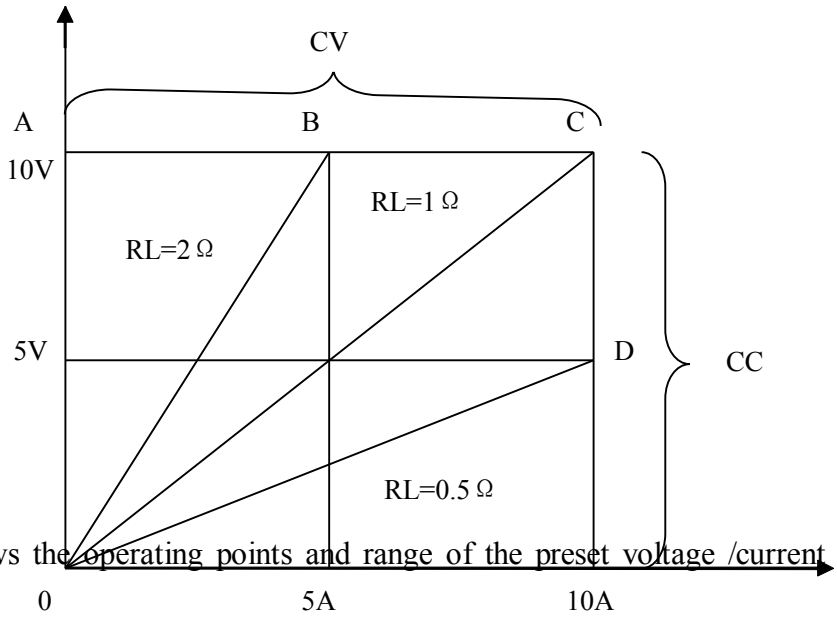



Fig.2

Fig.2 shows the operating points and range of the preset voltage /current of the load line.

When the output voltage is 10V the preset current is 10A.whlie the operating point of the load is at A point, then RL=∝,when RL=2Ω,the operating point is at B point. when RL=1Ω, the operating point is at C ,If the load decreases from RL=1Ω to RL=0.5Ω again ,then the operating point will move from C point to D point, the power supply will convert from CV region into CC region to operate, the operation mode converted at C point is specified as crossover point. The voltage on the load in CC operation mode Io ×RL =10A×0.5Ω=5V.

## 4. Applications and Operation

4.1. Introduction of Front Panel and Rear Panel(see next page)

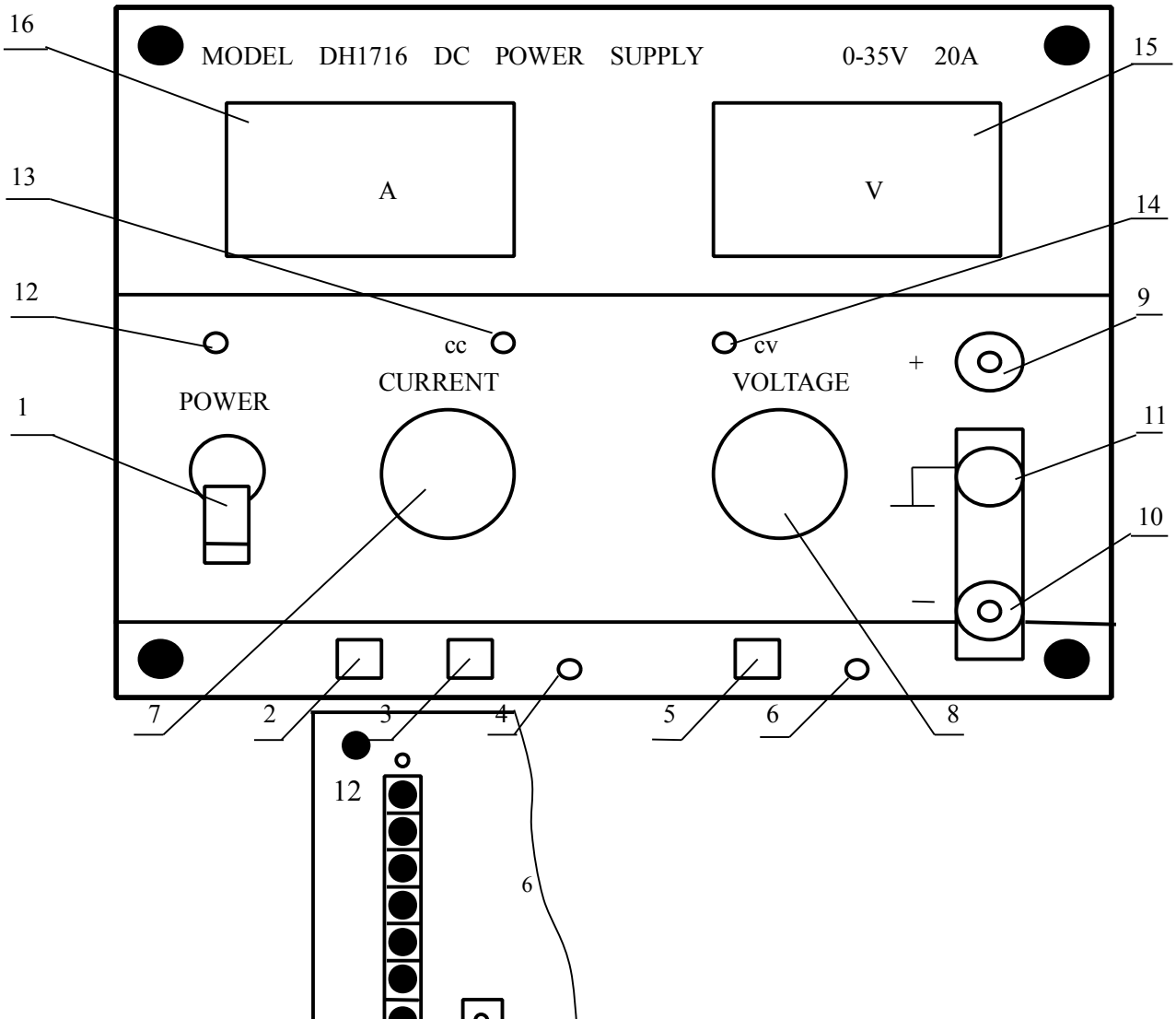
1. Power Supply Switch
2. V/I Checking, Voltage/Current Pre—Display Knob

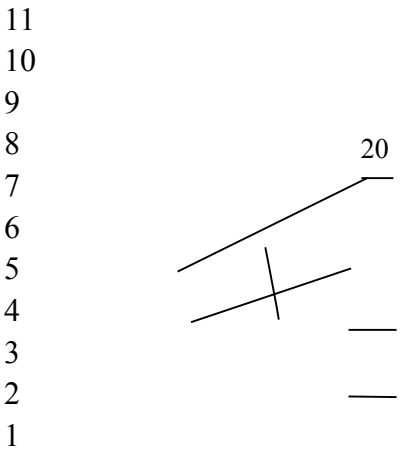
During pressing, pre—voltage/current are displayed on the voltmeter and ammter, respectively. When the output switch is not turned on. Don't press this knob, also the voltmeter can display pre—voltage value.

3. OVP CHECK NO-Self –Locked Key

During pressing the knob ,the voltmeter will display over—voltage protection preset value, when the over—voltage protection preset value is required to be set ,hold on the setting vernier potentiometer.

4. Over—voltage Protection Voltage Setting Potentiometer Hole
5. OUTPUT Self –Locked Key






Only when pressing the key, the output voltage appears at the output terminal.

6. Output Indicating Lamp.The indicaing lamp should light when output.
7. CURRENT Setting Knob.It can change the current preset value.
8. VOLTAGE Setting Knob.It can change the voltage preset value.
9. “+” Terminal Binding Post for Voltage Output.
10. “-” Terminal Binding Post for Voltage Output.
11. GND Point
12. Indicating Lamp of the Power Supply
13. CC Indicating Lamp. When it lights, this lamp means that the power supply is in CC operation mode.

14 CV Indicating Lamp. When it lights that means the power supply is in CV operation mode.

15. Voltmeter (Digital Display Type)

It indicates the output voltage, preset voltage and over—voltage protection voltage.

16. Ammeter(Digital Display Type)

It indicates the current output and preset current.

NOTE: This instrument has two displays of the voltage and the current analog meter and digital meter, plus“ D” shows a digital meter is used to display, for example,DH1716-4D shows a display of a digital meter.

17. Function Terminal Connection Strap
18. “+”,a positive output terminal of the power supply on the rear panel.
19. “-”,a negative output terminal of the power supply on the rear panel.
20. “+S”, a positive terminal of an external sampling terminal.
21. “-S”, a negative terminal of an external sampling terminal.
22. *Fuse holder contains a 10A fuse tube.

4.2. Operation and Applications

4.2.1.Checking the instrument is normal. “VOLTAGE” knob is rotated fully counterclockwise. “CURRENT” knob is rotated fully clockwise. The input terminal of the instrument is inserted into 220V local power network.

4.2.2.“OUTPUT” is off, when it is on, the CV lamp lights, “VOLTAGE” is set to the preset value.

4.2.3.If over—voltage protection is needed, hold on pressing “OVPCHECK”, so the over—voltage protection value can be adjusted. Generally you’d better not set so as to prolong life of the vernier potentiometer.

4.2.4.Hold on pressing “V/I CHECK”, set “CURRENT” to the desired preset current value, in CV operation, rotate it fully clockwise.

4.2.5.Turn on “OUTPUT” switch, the output indicating lamp lights, the voltage and current output will appear across the output terminal.

4.2.6.If CC operation mode is required the preset current is set to the desired current, then voltage preset value can be set to lower. After “OUTPUT” is turned on. If CV lamp lights, can set “VOLTAGE” clockwise untill CV lamp goes out, but CC lamp lights.i.e CV mode has been converted into CC operation mode.

4.2.7.If the master and slave supplies are used in series, please make connection as follows:

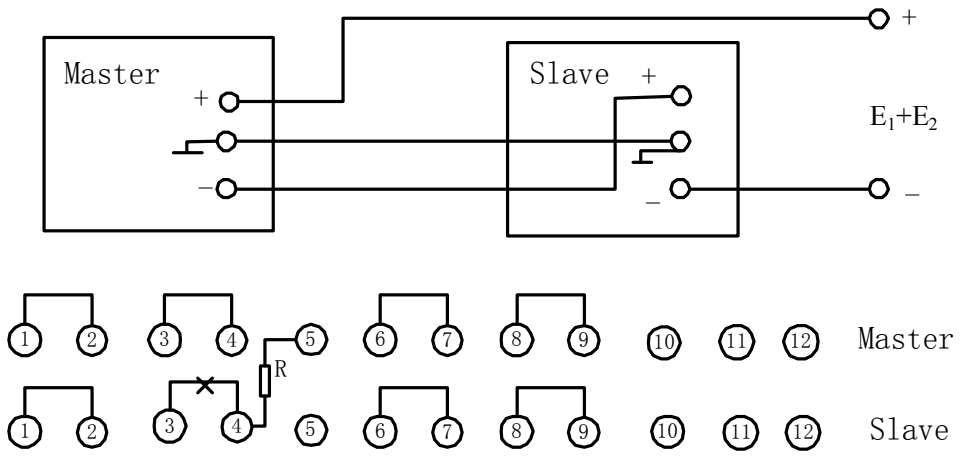



Fig.4

a. Disconnect the slave supplies (3)and(4),the master (5) connects a resistor to the slave supply(4).

Its resistance value is: R $\frac{VH}{mA}$ -10kΩ VH: Rated value of output voltage control range.

b. The output negative terminal of the master supply is connected to the positive terminal of the slave supply, The chassis of the master supply is connected with the chassis of the slave supply, only the output negative terminal of the slave supply is shorted in conjunction with the chassis.

c. The master supply controls the output voltage, if no 26KΩ resistor, then a 27 KΩ resistor can substitute, the output voltage of the slave supply is lower than that of the master supply, but the output is still E1+E2.

d. Power of resistor≥ 1/2W

4.2.8.If the master and slave supplies are used in parallel, please make connection as follows:

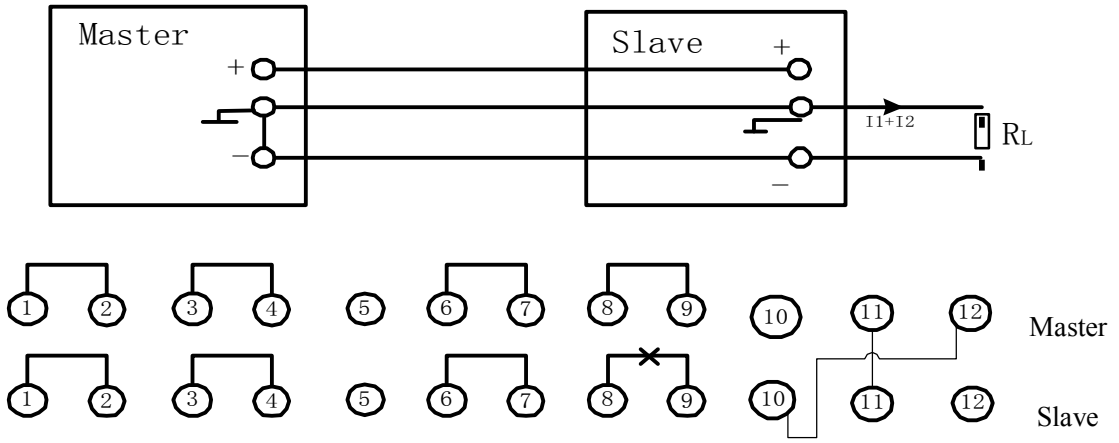



Fig. 5

a. Disconnect the slave supply (8) and (9),the master supply (11) is connected with the slave supply(11),the master supply (12) is connected with the slave supply(10).

b. The output positive terminal, negative terminal, the chassis of the master supply are all connected with that of the slave supply correspondingly. The output negative terminal of the master supply is connected with the chassis.

c. Before the master supply is not connected in parallel with the slave supply ,the preset voltage is set to almost same value of the two power supplies, after the two supplies are connected in parallel, the slave supply is in CC operation mode, while the master supply is in CV operation mode.

4.2.9.If the remote programming is needed, should make connection as follows:

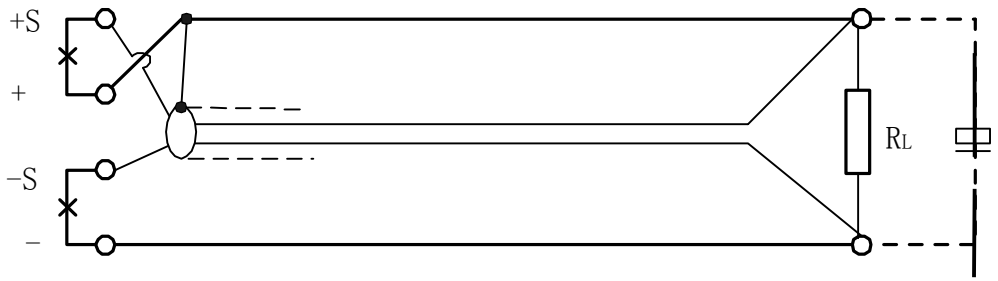



Fig. 6

a. Disconnect (+S) and (+),(-S) and (-) uses a shielded two-wire cable to be connected according to the following diagram, the coating layer of the shielded cable is connected to the positive terminal.

b. When the lead is longer, should connect a 100 μ F capacitor to the load in parallel, the voltage endurance should be more than the output voltage and should notice its polarity.

4.2.10 If the remote resistance programming output voltage is needed, should make connection as follows:

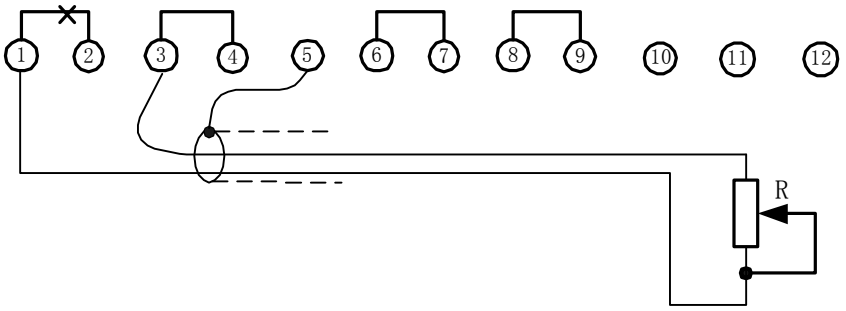



Fig. 7

a. Disconnect (1) and (2), the shielded two—wire cable is connected as shown in Fig.7.

b. R is a 10K Ω potentiometer which can not be open circuit at any time, otherwise, the output voltage will result in over—voltage.

c. The output voltage is proportional to the resistance value.

2.4.11 If the remote voltage programming output voltage is required, should make connection as follows:

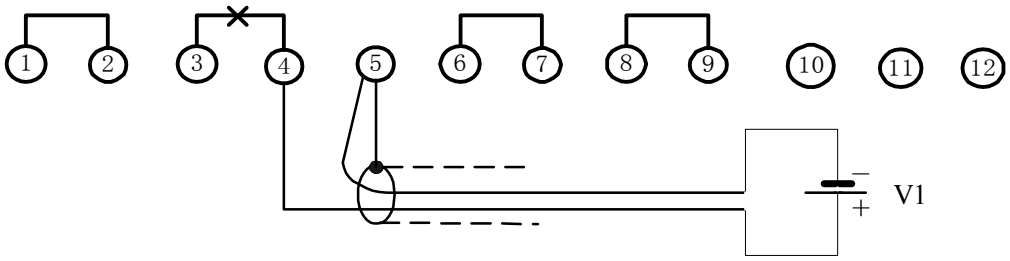



Fig.8

a. Disconnect (3) and (4), the shielded two—wire cable is connected as shown in Fig.8. “+” terminal is connected with (4) , “-” terminal with (5) , the outer coating of the cable with (5).

b. The output voltage is proportional to the controlled voltage, it is possible to need a 10.5V to reach a 35V output only, but the externally –controlled voltage is not allowed too high, the external voltage is floated.

4.2.12 If the remote resistance programming output current is required, should make connection as follows

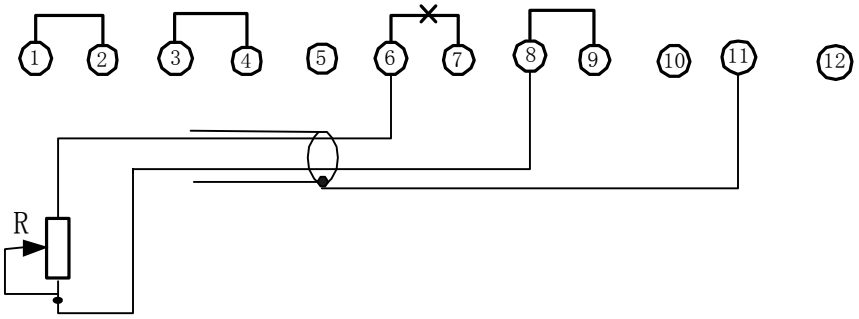



Fig.9

a. Disconnect (6) and (7), the shielded two—wire cable is connected as shown in Fig.9

b. R is a 10KΩ potentiometer which can not be open at any time otherwise, the output current is out of control, as soon as the load current becomes larger, can cause the damage to the regulator.

c. The output preset current is proportentional to the resistance value.

4.2.13 If the remote voltage programming output current is required, should make connection as follows:

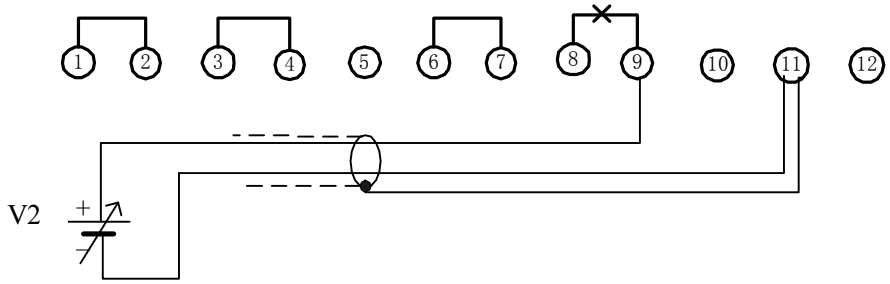



Fig. 10

a. Disconnect (8) and (9), the shielded two—wire cable is connected as shown in Fig. 10, the positive terminal of the externally –controlled voltage is connected with (9), the negative with (11), also the outer coating of the cable with (11).

b. The output current is proportional to the controlled voltage, it is possibleto need a 10.5V to reach a 20A output current only, but the externally—controlled voltage can not be too high.

c. The external voltage is floated.

4.2.14 Some Attentions in Applications

a. In CV mode operation, the determination of the load effect should locate in conjuntion point (i.e.in conjuction with +S,-S) with the sensing terminal.

b. The output terminal on the front and rear panels can be used, when checking specifications, should make inspection according to the specifications step (a).

c. The power supply is not suitable to use Model 614 AC voltage regulator.

4.2.15 Attentions in Applications

a. Keep air flowing, when installing other instruments, should place them far

30cm from ventilator.

b. Prevent the instrument from placing in dirty or poisonous cnvironment .

c. The induced instrument can not be placed nearby the power supply.

## 5. Maintenance and Replacement

5.1. Maintenance

5.1.1.Opening the cabinet, remove two screws on the front and rear panel and three screws on each leftside, four screws on the top cover.

5.1.2.*Replacement of Fuse

The fuse can not be used when it is more or less than the specified range, it should be Φ6x30—10A.

5.2. Adjustment

5.2.1. Setting Range of Output Voltage

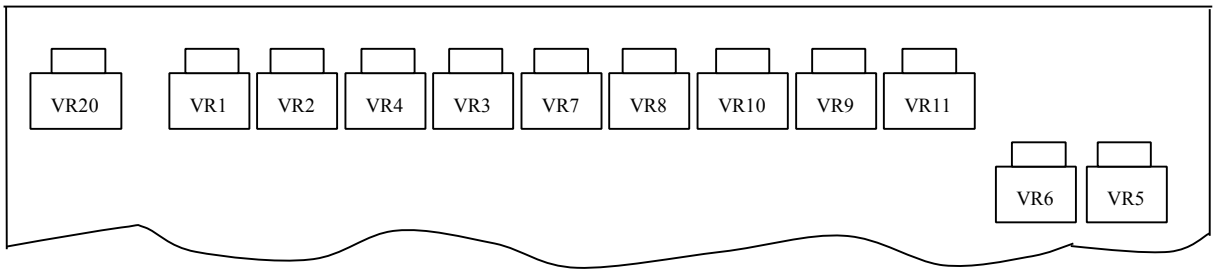
The CV control is rotated fully counterclockwise step by step, press down OUTPUT switch, anexternal voltmeter is used for monitoring, VR2 is set to make the output to zero (allowable to set to 0.2V) The CV control is rotated fully clockwise step by step, at this time. note that the voltmeter indication is monitored externally, while rotating by adjusting VR1, making CV control rotated fully clockwise and the output to 36~37V.

5.2.2.Adjustment of the Voltmeter Indication (before power applied, first of all, adjust zero point of machinism).

Turn off OUTPUT switch , the CV knob is rotated fully counterclockwise, VR8 is set to 0V off the meter indication.

Turn of OUTPUT switch, VR11 is set to zero of the meter indication, the output is set to 35V ,VR7 is set to make the output voltage on the voltmeterindicator in accordance with the readings on monitoring voltmeter.

Turn off OUTPUT switch, VR5 is set to make the output voltage indication in accordance with the preset indication value.




Fjg. 11

5.2.3.Setting of Output Current Range

The CC control is rotated fully counterclockwise, the voltage is preset to 3~5V,the variable resistor is connected to the ammter, turn on OUTPUT switch, the variable resistor will be shorted step by step.VR4 is set to make output current to zero, the CC control is rotated fully clockwise step by step to make indication of the external monitoring ammter to 20A (or a little larger ). The variable resistormust not be shorted, can use a lower resistance value.

5.2.4.Setting of Ammeter Indication (before power is applied, first, adjust

machinism point)

The CC control is rotated fully counterclockwise, turn on OUTPUT switch, the load is off, VR10 is set to make indication of the ammter to zero, in connection with the load, RL is set to make the output to 20A, mean while VR9 is set to make indication to 20A. Press down V/I CHECK, the indication of the ammter is also 20A (in CC operation mode ),when they are unconformable, set VR6,the preset value is always more than output value in CV operation mode.

5.2.5.Repairment

Normal troubles should be troubleshooted according to the following methods:

1. Power not applied. the indicating lamp does not light.

Maybe something wrong with power line, poor contact, input fuse is broken..

2. The power on, but as soon as OUTPUT switches on, the power is off.

Maybe over—voltage protection voltage is lower than the voltage output, individual regulator is broken.

3. Output voltage is zero or lower.

Maybe built—in output wires are loose and off. The function terminal is misconnected, The output diode is damaged, due to longer output lead line, resulting in HF oscillation thus can shunt a capacitor to eliminate.

4. Output is too large.

Maybe the terminals (1) and (2) , (6) and (7) have dropped off, CV and CC potentiometers are open.

5. Output voltage and current are not controlled by the knobs.

The terminal on the rear panel is misconnected. May be control circuits are defictive.

14.The output is not stable.

Connection wires dropped off or misconnected, the voltage of the power supply has exceeded the specifified range, a special load causes oscillation, the sensing terminal contact is not tight, should avoid strong electric—magnetic field nearby.

## 6. Completeness of the Instrument

| | |
|---|---|
| 1. Main Power Supply | 1 |
| 2. Power Lead line | 1 |
| 3. Operating Manual | 1 |
| 4. Fuse Tube BGXP— ϕ 6x30—10A | 2 |
| 5. Output Protection Board, Terminal and Protection Board | 1 for each |

## 7. Quality Warranty

After delivery within 18 months, if users abide by regulations of transportation, storage and applications. but the quality of the product does not meet the specifications given, our factory is responsible for repaiment and replacement free of charge.

1. *PARD 1mV(rms) is for Model DH1716-1~5, 2mV (rms) for Model DH1716-6
2. 5.5~40V range of over—voltage protection voltage is adjustable for Model.

DH1716-4 .The range of other models are as follows:

Model DH1716-1~3: 5~20V

Model DH1716-5: 8~65V

Model DH1716-6: 15~110V

3. Power consumption: 1.2KW for Model DH1716-4, Model DH 1716-2 is more than 1.2KW, other models are all less than this value.

4. Output power:700W for DH 1716-4, other models are all computed according to rated output voltage and current value.

5. Dimensions: 230×160×550mm only for DH1716-3 and DH1716-4,larger or smaller for other models.

6. Weight: About: 30kg for DH1716-3 and DH1716-4 only ; other models are larger with increasing current.

7. Fuse tubes: except Φ 6x30 –15A for DH1716-2,others use Φ 6x30—10A. (For Model DH1716-6, a 5A fuse tube is added).

8. Because the digital meters are produced by different manufacturers, the symbol "-" is shown in different ways, while " " is expressed as "-" in partial meters, this symbol may be considered as incomplete. For example, "-0.1", i.e, it is expressed as "0.1". Here for Model DH1716-6,the accuracy of its digital meter is 1%±3 digits.

9. Model DH1716-7 is an expanded type.