

MODEL PLZ 50-15
ELECTRONIC LOAD
INSTRUCTION MANUAL

KIKUSUI ELECTRONICS CORP.

Power Requirements of this Product

Power requirements of this product have been changed and the relevant sections of the Operation Manual should be revised accordingly.

(Revision should be applied to items indicated by a check mark)

Input voltage

The input voltage of this product is _____ VAC,
and the voltage range is _____ to _____ VAC. Use the product within this range only.

Input fuse

The rating of this product's input fuse is _____ A, _____ VAC, and _____.

WARNING

- To avoid electrical shock, always disconnect the AC power cable or turn off the switch on the switchboard before attempting to check or replace the fuse.
- Use a fuse element having a shape, rating, and characteristics suitable for this product. The use of a fuse with a different rating or one that short circuits the fuse holder may result in fire, electric shock, or irreparable damage.

AC power cable

The product is provided with AC power cables described below. If the cable has no power plug, attach a power plug or crimp-style terminals to the cable in accordance with the wire colors specified in the drawing.

WARNING

- The attachment of a power plug or crimp-style terminals must be carried out by qualified personnel.



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1. GENERAL

MODEL PLZ 50-15 is completely electrical load, can be used as various load for power supply, generator or battery etc., and has both characters of constant resistance and current; therewithal can change unregular power supply to regulated constant voltage or current one.

In constant current operation, you can remotely control with external power supply, therefore can use it as the load of system measurements.

This instrument has the various protective circuit for safety operation.

2. SPECIFICATIONS

MODEL	PLZ 50-15	
Power requirement	100V AC ($\pm 10\%$), 50/60Hz, Single phase	
	Approx. 15 VA	
Dimensions	210W x 140H x 310D mm	
maximum	215W x 165H x 360D mm	
Weight	Approx. 6 kg	
Ambient temperature	0 ~ 40 °C	
Accessories supplied	Instruction manual	1
Polarity	Positive or negative	
Terminals	2 terminals on the front panel.	
	Terminal plate on the rear panel.	
Floating voltage	$\pm 150V$ maximum	
Cooling	Natural draft	
DC input voltage	3 ~ 50V	
input current	0 ~ 15A	
consumable power	150W	
Function	1)	Constant current; 0~15A, 0~1.5A 2 ranges continuously variable.
	2)	Constant resistor; minimum 0.33 Ω , 2 Ω 2 ranges continuous variable.
	3)	External control (constant current) external input voltage 0~5.5V max.
	4)	Constant voltage
	All functions have coarse, and fine controls.	
Stability	Line regulation; 0.1% against $\pm 10\%$ variation of line voltage	
	Load regulation; Against 0~100% variation of load	
	Constant current	0.1%
	Constant voltage	0.1% +100mV
Ripple and noise (5Hz~1MHz)	Constant current	3mArms
	Constant voltage	10mVrms

Protection circuit	1)	Over voltage protection	approx.	57V
	2)	Over current protection	approx.	16A
	3)	Over power protection	approx.	200W
	(Refer to Fig. 15)			
	4)	Reverse connection protector		
	5)	Inner temperature protector		

Those circuits make the load switch off.

Operation	1)	Single operation		
	2)	One control parallel operation		
	3)	Remote control (constant current)		
Voltmeter		DC 60V/6V	2 ranges	class 2.5
Ammeter		DC 15A/1.5A	2 ranges	class 2.5

- * Two PLZ 50-15s can be mounted side by side on a 19" or 500 mm standard rack with the rack mount frame.
 (Rack mount frame is supplied as optional accessory.)

3. DESCRIPTION OF PANEL

FRONT PANEL (See Fig. 1)

1. POWER switch ON/OFF switch for the input power.
Throw it upwards, and the power is on.
2. Pilot LED This lights when the power is on.
3. Ammeter This indicates the input current, DC 15A/1.5A 2 ranges.
Accuracy is $\pm 2.5\%$ of the full scale.
4. Ammeter sensitivity selector This selects the sensitivity of the meter for input current. Sensitivity of full scale becomes 15 A, when throwing it upwards.
Sensitivity of full scale becomes 1.5A, when throwing it downwards. Use it carefully so as not to be scale out.
5. Voltmeter This indicates the input voltage. The full scale is 60V and 6V. Accuracy is $\pm 2.5\%$ of the full scale.
6. Voltmeter selector It selects the sensitivity of the meter input voltage. Sensitivity of the full scale becomes 60V, when throwing it upwards.
Sensitivity of full scale becomes 6V, when throwing it downwards. Also, setting of over voltage protection is changed with this switch.

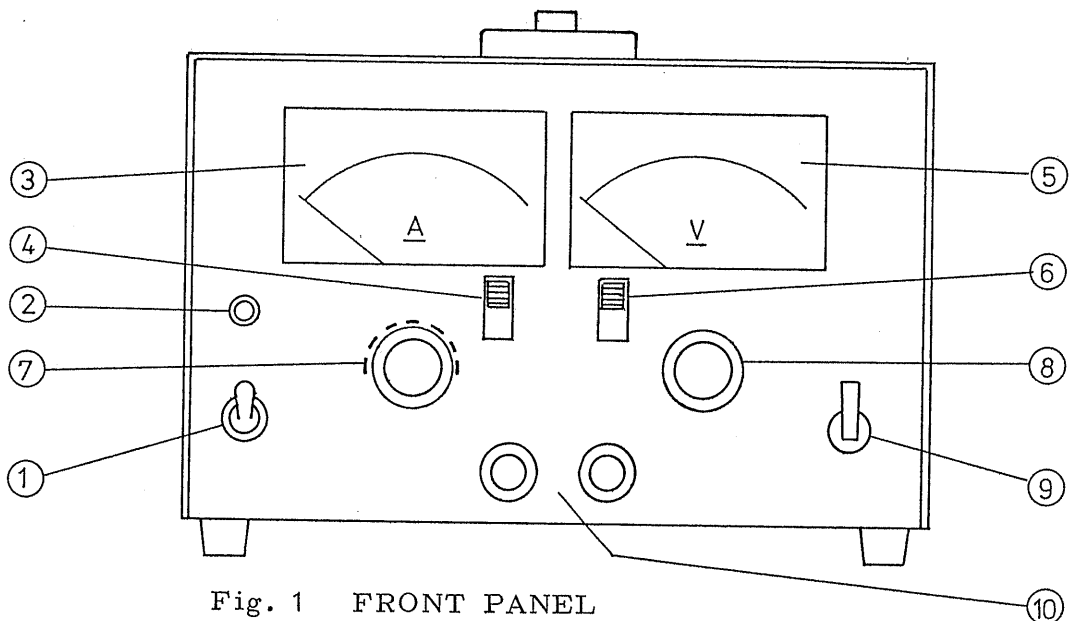


Fig. 1 FRONT PANEL

- 7. FUNCTION switch This selects the operation mode.
- 8. LOAD knob Knob for setting the input current, the value of resistor, and constant voltage.
Clockwise rotation increases the input current and decreases the value of resistor and constant voltage.
- 9. DC switch This connects DC input to the instrument and disconnects when various protection circuits such as over voltage operate.
- 10. DC INPUT terminals The left terminal (white) is - , and right terminal (red) is + .

REAR PANEL (See Fig. 2)

- 11. Terminal plate Input terminals, remote control terminals and one-control parallel operation terminals are provided on it. (Refer to Fig. 3)
- 12. Input fuse Inserted in the primary of the power transformer to avoid possible subsequent faults during a MODEL PLZ 50-15 trouble.

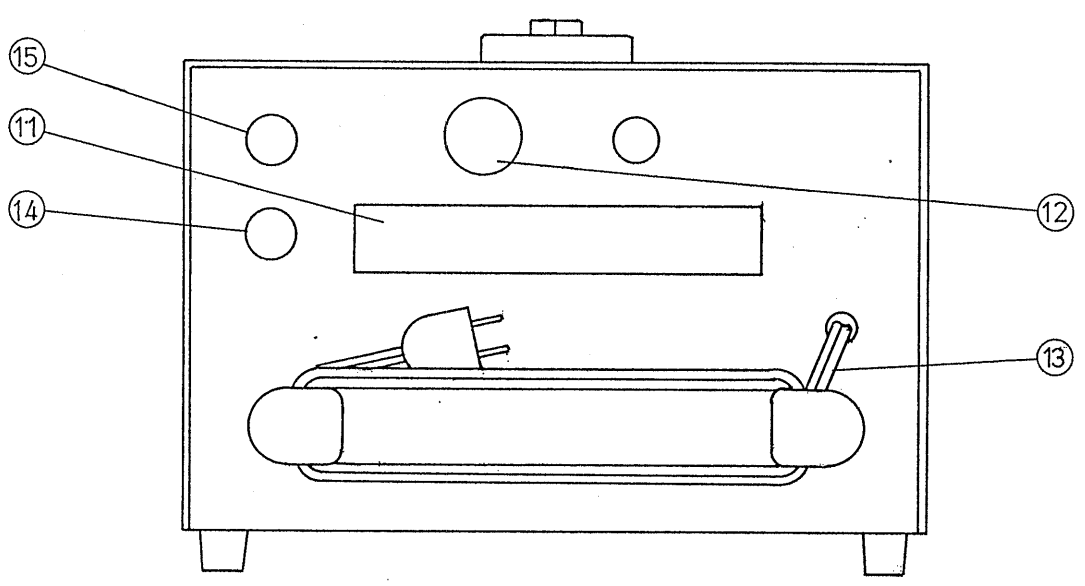
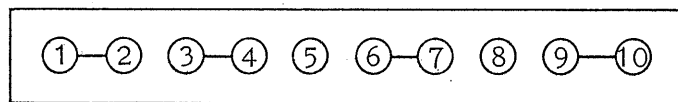


Fig. 2 REAR PANEL

- | | |
|-----------------------------|---|
| 13. Input AC plug | Before using the instrument, it is requested to fix a suitable plug for the AC input voltage. |
| 14. Ground terminal | Connected to the chassis of the instrument. Use if you want to connect ground each other. |
| 15. Remote control terminal | This is used when you want to control the instrument with external variable resistor. |

Fig. 3 Terminal Plate on Rear Panel



- ① Input ⊕
- ② Input voltmeter ⊕
- ③ Input voltmeter ⊖
- ④ Input ⊖
- ⑤ Input terminal for external control
- ⑥ } Terminals for remote control and one control parallel operation.
- ⑦ }
- ⑧ Terminal for one control parallel operation.
- ⑨ } Terminals for remote control
- ⑩ }

* ① - ②, ③ - ④, ⑥ - ⑦, ⑨ - ⑩ on the terminal plate are shorted electrically by short bar.

They must be tightened powerfully before various operation.

4. OPERATION

4-1 Precaution

The following cautions are needed to maintain the performance of the MODEL PLZ 50-15.

1) AC input

AC input for MODEL PLZ 50-15 should be within a range of 100V AC $\pm 10\%$, 48~62 Hz. Please use the instrument within DC input power limit 150W.

2) Installation

Avoid using MODEL PLZ 50-15 at a place exposed to heat; when the ambient temperature exceeds a range of 0°C to 40°C; that is humid or dusty; where it won't be level.

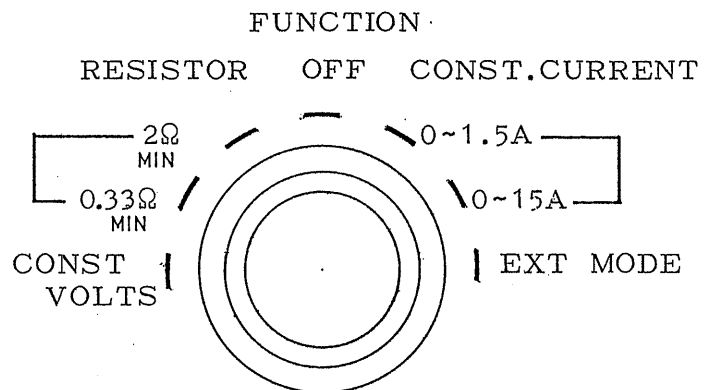
During operation, don't lay MODEL PLZ 50-15 on its side nor put anything on it.

Otherwise, a fault may be caused by reduction of its radiation effect. When two or more electrical loads or power supplies are used being stacked or installed on a rack, provide a gap of 50mm or more between adjoining them.

Turn the POWER to ON after DC input is connected to the instrument.

4-2 FUNCTION switch

Fig. 4



The operation mode of the instrument is determined by this switch. You have to change the FUNCTION switch after you have made the DC switch off.

4-3 CONSTANT CURRENT

4-3-1 Constant current source control: If you want to use the instrument in the load examination of power supply, or the constant current discharge test of battery, you have to do as follows.

- 1) Throw the FUNCTION switch to either 1.5A or 15A range in the CONSTANT CURRENT.
- 2) Connect the test system to the instrument correctly under the condition of the DC switch off. You can recognize the input voltage value with its own voltmeter, and never do it scale out.
- 3) Turn the DC switch to ON, and you can get constant current by turning the LOAD knob clockwise. (Refer to Fig. 5)

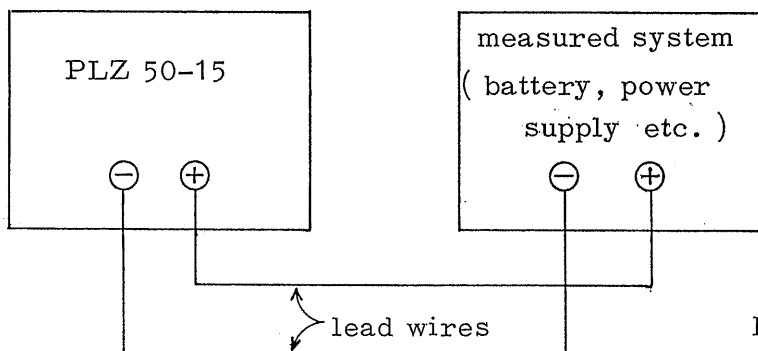


Fig. 5

- * The resistance of lead wire may cause large voltage drop, if you need rather large current, in such a case, you had better use voltage sampling terminals on the terminal plate..

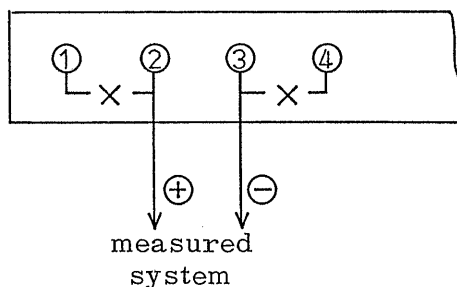


Fig. 6

4-3-2 Constant current source control

You can easily get a constant current source, utilizing the instrument and constant voltage source. Connect instrument, a load, and a constant voltage source each other as follow (Refer to Fig. 7). In such a operation, the DC switch is intercepted by the voltage, current or power which are consumed in the instrument.

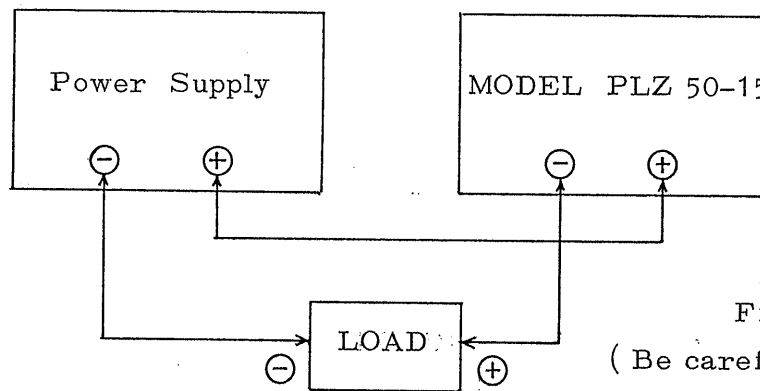


Fig. 7
(Be careful of polarity)

4-4 Constant Resistor

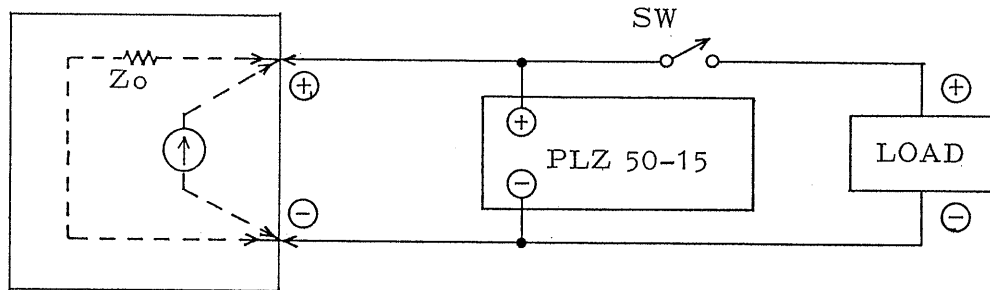
You can use the instrument as variable resistor by setting the FUNCTION switch to " RESISTOR 0.33 Ω , or 2 Ω ".

The value of resistor are 0.33 Ω and 2 Ω at minimum, and increase by turning the LOAD knob counterclockwise.

		maximum resistance
0.33 Ω range	at 5V	approx. 3k Ω
	at 50V	approx. 7k Ω
2 Ω range	at 5V	approx. 4k Ω
	at 50V	approx. 13k Ω

4-5 Use as constant voltage source

You can make use of the instrument as constant voltage parallel regulator by employing a current source (or the voltage source which has rather large output impedance.).



Constant current source
or constant voltage source
(Output impedance must be
relatively high)

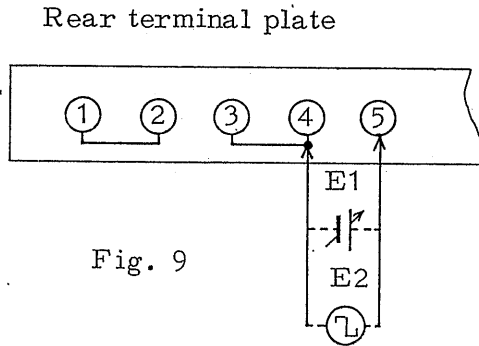
Fig. 8

- * In this operation if the DC switch is off, the instrument doesn't operate as the constant voltage regulator, and the voltage of the current source is given to the load.
Therefore you have to join the switch (SW at Fig. 8)), and recognize the instrument operating as the constant voltage regulator, then you can use it.
- * When the SW is open, the power from the constant current is consumed in the instrument at all, if the voltage, current and power exceed the specified level, so the DC switch to protect the instrument is turned off.
In such a case, you have to decrease current of the current source or increase the output impedance of the constant voltage source by inserting series resistor between constant voltage source.
- * In this operation, the maximum input voltage is 50V.

4-6 External mode

You can use this function when you want to control output regardless the LOAD knobs on the front panel by providing the instrument with the external voltage or want to modulate the consumed current in the instrument.

As shown in Fig. 9, you have to supply the signal between 4 and 5 on the terminal plate. (5 for +, 4 for -) In this operation you can get external control in constant current, and the input impedance is approximately $15k\Omega$.



4-6-1 Control with DC voltage

Connect DC voltage to the instrument as Fig. 9 . You can get maximum constant current 15A with the LOAD knobs extremely clockwise when input voltage is approximately 5.5V, and the current is proportion to the input voltage.

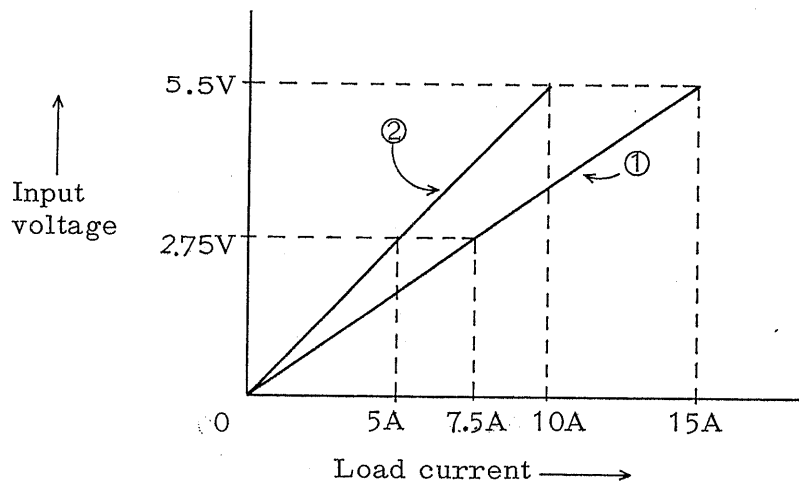


Fig. 10

4.6.2 Control with various waveform

You can modulate the waveform in the constant current not only DC control but with various waveform . Connect E2 in stead of E1 as Fig. 9. But you can control the constant current with only the positive level of the waveform. (Refer to Fig. 11)

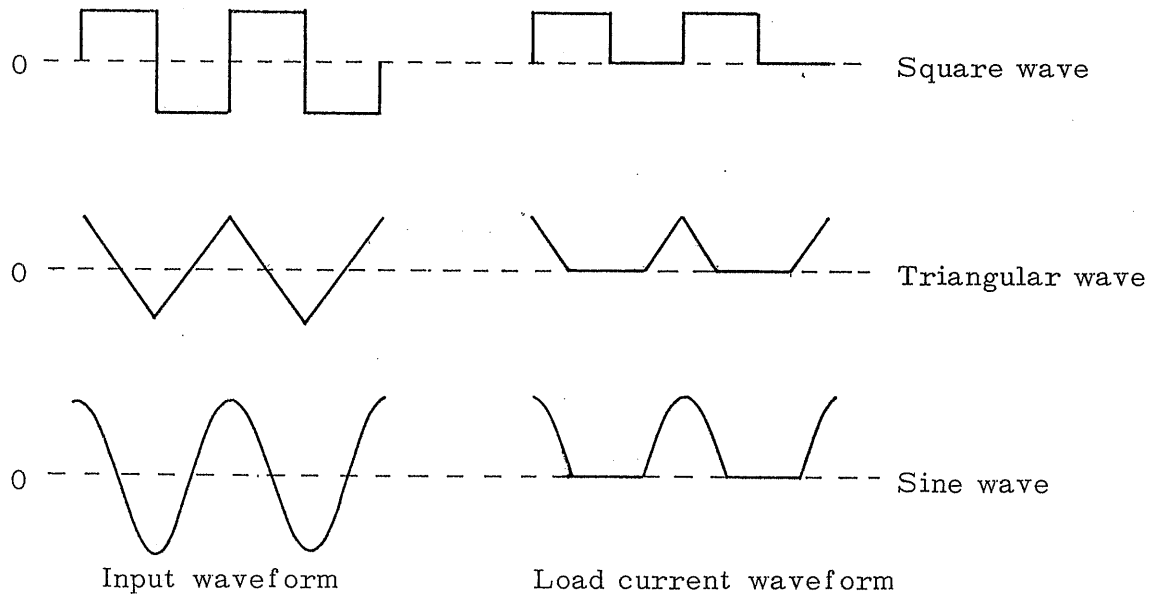


Fig. 11

- * In this mode, it takes about $60\mu\text{S}$ for the load current to rise up and fall down.
- * If you want to reappear input waveform perfectly the input waveform, you have to apply positive DC voltage with input signal, and it's value more than a half of input signal (peak to peak) must be supplied.
- * You can monitor the waveform watching an oscilloscope. (8) is connected to floating side of an oscilloscope, and (4) is connected to ground of the oscilloscope. The resistance value between (8) and (4) is 0.33Ω .

4-7 One control parallel operation

If you want to get the current or power more than the specified value, you can easily get it by using one control parallel operation in the constant current or resistor mode.

- 1) Connect two or more than three MODEL PLZ 50-15s on their terminal plate as Fig. 12.

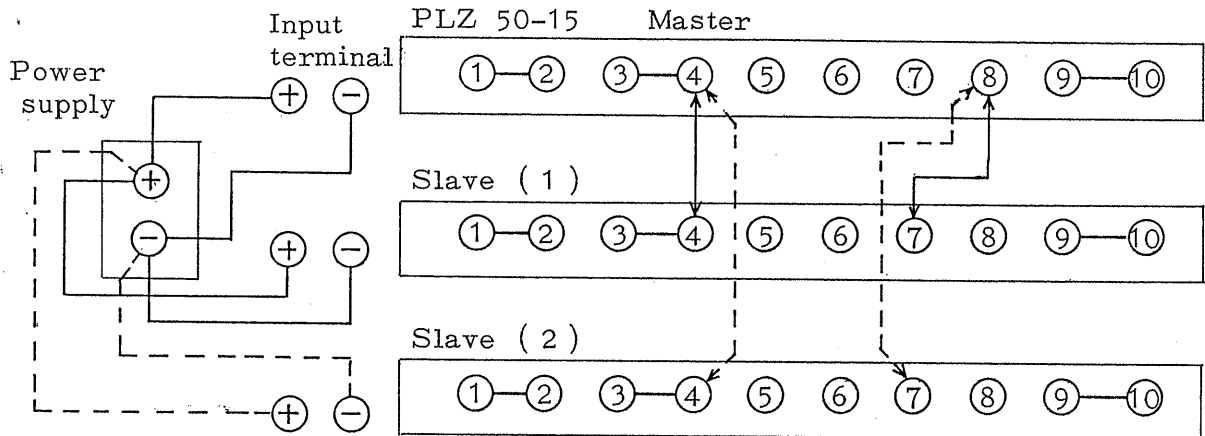


Fig. 12

* Connect the lead wires from a power source to each instrument directly as shown in Fig.12.

- 2) At first, turn each POWER switch on, and do the DC switch of the slave instrument on. Next do the DC switch of the master one on.
- 3) The load current begins to flow when the DC switch of the master instrument is turned on.
- 4) The function is selected at all by the master instrument, not the slave one.
- 5) When you want to finish the operation, at first you have to turn the DC switch of the master instrument off, and next, turn it of slave one. The load current is cut off by turning the DC switch of the master instrument off.

* All protective circuit operate independently.

* The wiring of the rear terminal plate have to take the shortest distance.

4-8 Remote control

There are two ways to control the instrument with the external method, or at the distant place. One is the way with voltage (described in clause 4-6) and the other is the way with variable resistor.

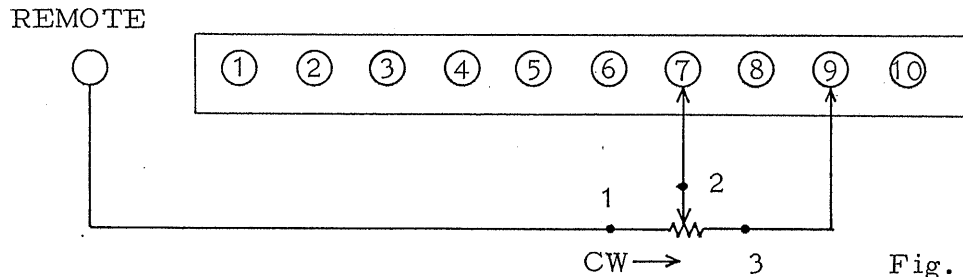


Fig. 13

- 1) Connect as shown in Fig. 13, a variable resistor whose value is $1.5\text{ k}\Omega$.
- 2) When you use the variable resistor at farther place from the instrument, its characteristic in ripple and so on may grow worse.

Therefore you had better use the shielded wire in the connection.

4-9 Protection circuits

The instrument has various protection circuits in order to prevent damage.

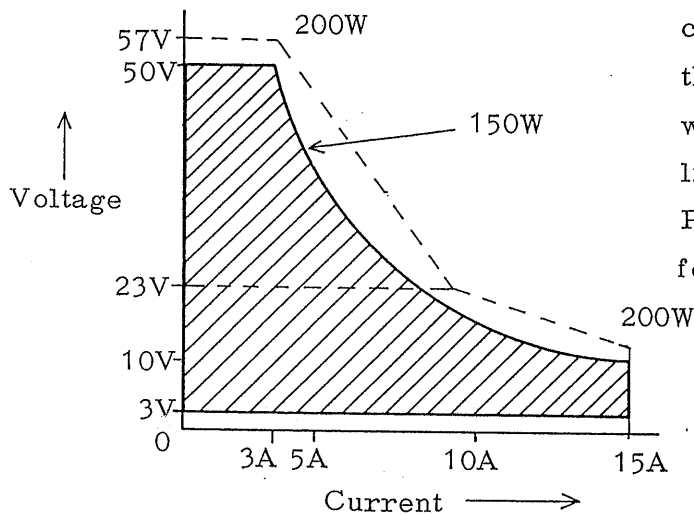
4-9-1 over voltage protection

In order to prevent damage if excessive voltage is applied to the input terminals, the instrument has over voltage protection circuits, and they are interlocked with the voltmeter sensitivity selection switch, and the DC switch is turned off at the voltage of approximately 60V and 6V.

4-9-2 Over power protection

The consumable power in the instrument is restricted within 150W.

If excessive power is applied to it, a protection circuit operates to prevent power transistors from destruction, and turns the DC switch off.



The power beyond 150W can't be consumed in the instrument, therefore, you have to use it within the power below an oblique line as shown in Fig. 14.

Parallel operation is required for the power more than it.

Fig.14

4-9-3 Reverse connection protection

The DC switch is turned off when reverse voltage more than 3V is supplied to the input terminals.

4-9-4 Inner thermal protection

It may happen that power transistors are superheated with the reason of undesirable installation, etc, even if you use the instrument within specified power. In such a case, inner thermal protection circuit operates and the DC switch is turned off.

You can use the instrument again if inner temperature goes down.

* If the various protection circuits operate, you have to discover the reason. Use the instrument with adequate measures.

