MODEL 7025
DUAL TRACKING POWER SUPPLY
OPERATION MANUAL

KIKUSUI ELECTRONICS CORP.

79.3.14 7947938

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.

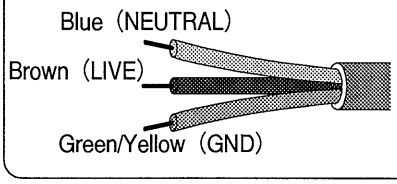
☐ AC power cable

The product is porvided 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.

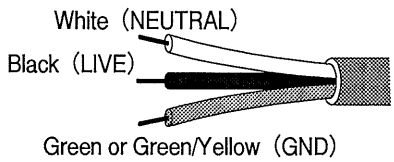
WARNING

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

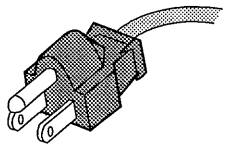
☐ Without a power plug



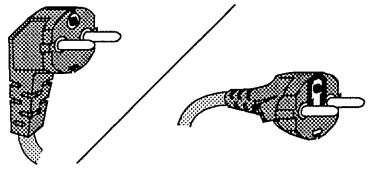
☐ Without a power plug



☐ Plugs for USA



☐ Plugs for Europe



☐ Provided by Kikusui agents

Kikusui agents can provide you with suitable AC power cable.
For further information, contact your Kikusui agent.

☐ Another Cable _____

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KIKUSUI

CONTENTS

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1. INTRODUCTION

Kikusui's Model 7025 is a transistorized series-type DC power supply capable of supplying electricity of positive and negative polarity simultaneously and also of being used in series. In other words, it can be used to supply electricity of 0 +30V and 0 ~ -30V and also it can be used as the power supply for 0 - 60V.

Output voltage adjustment is accomplished by three knobs ;

: One to adjust both polarities independently, one to vary simultaneously both polarities from 0 to the predetermined maximum voltage, and one to vary step by step at a 5% increment the predetermined voltage in a range from -20% to +20%.

The maximum output current of 1A is available for both polarities.

This equipment is protected from overload and output short-circuit accident by the output current limiting circuits which operate independently with certainty. The overload lamp indicates that the equipment is under overload condition.

Set current of overload protection can be varied continuously in a range from 10 to 100% of the maximum rating. Also, overload protection current can be used as the constant current power supply because of its constant current-type characteristics.

Thanks to this protection circuit safe operation is accomplished against capacitor · load and lamp load as well as resistance load.

On the panel are provided two meters so that output voltage and output current are indicated correctly by means of the polarity change switch for positive and negative.

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It is possible for this equipment to accomplish not only single operation but parallel operation of remote programing and

to control its output voltage from outside or to control output voltage of an other equipment.

The panel size of 1/2 rack makes it possible to place two sets of this equipments on a standard rack of 19" or 500 mm.

Output can be taken out of the rear terminals too.

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2. SPECIFICATIONS

AC input	AC _____V 50/60 Hz Full load approx. 135 VA
Operating ambient temperature range	0 to 40°C
Operating ambient humidity range	10 to 90% RH
Dimensions (maximum)*	210 (215) W x 145 (163) H x 260 (305) D mm
Weight	Approx. 6.4 kg
Accessories supplies	Short bar 1
	Operation manual 1

Output

Terminal	Color coding: red (+), white (-), black (COM), black (GND). 19 mm distance; arranged in inversed T shape
Floating voltage	Maximum ±150 V
Output voltage	1) A: 0 ~ +30 V, B: 0 ~ -30 V DC AC OUTPUT 2) 0 ~ 60 V
Output current	Maximum 1A
Ripple	1) 0.5 mVrms 2) 1 mVrms
Output regulation	Against ±10% fluctuation of power source voltage 1) 3 mV 2) 6 mV Against 0 - 100% fluctuation of load 1) 5 mV 2) 10 mV
Dual tracking	° 0 ~ Max. ° -20, -15, -10, -5, 0, +5, +10, +15, +20% step variable

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Overload protection circuit	Automatic crossover constant current. Continuously variable for 10 ~ 100% of maximum rating Overload indicating lamp.
Output voltage meter	32 V, accuracy 2.5% of full scale
Output current meter	1.2 A, accuracy 2.5% of full scale
Operation	In addition to single operation, one control parallel operation and remote programing by voltage or resistance are possible.

* It is possible to place two sets on a 19" or 500 mm standard rack.

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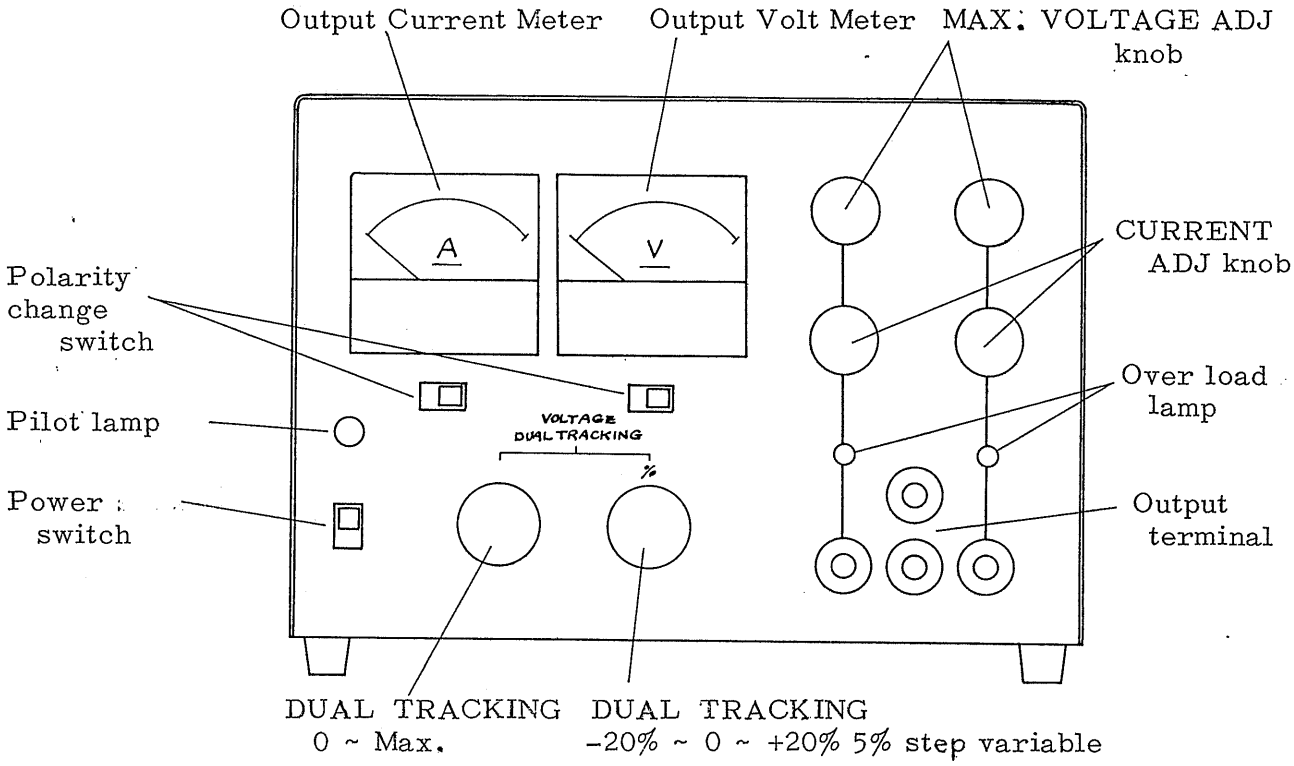
3. EXPLANATION OF PANEL

Front Panel



Rear Panel

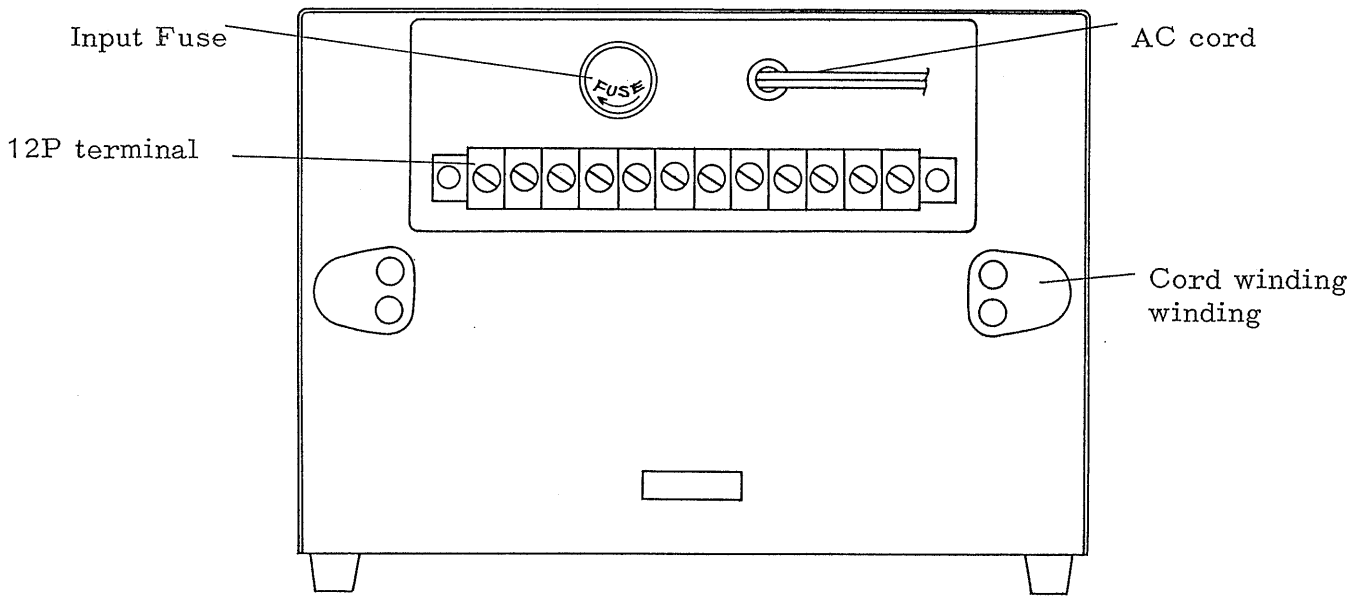


Fig. 2

4. OPERATING INSTRUCTION

Caution about installing place

Avoid the use at places where the ambient temperature exceeds 40°C, if circumstances allow. When this equipment is installed at poorly ventilated places or other places exposed to direct sunlight or radiant heat from any other heat sources, the continuous maximum output current should be controlled to a proper limit.

The range of power source voltage at which this equipment is operated safely is 90 ~ 110% of the rating.

Overshoot of output voltage

This equipment is so designed that voltage higher than set value is not generated between the output terminals when power is turned ON and OFF.

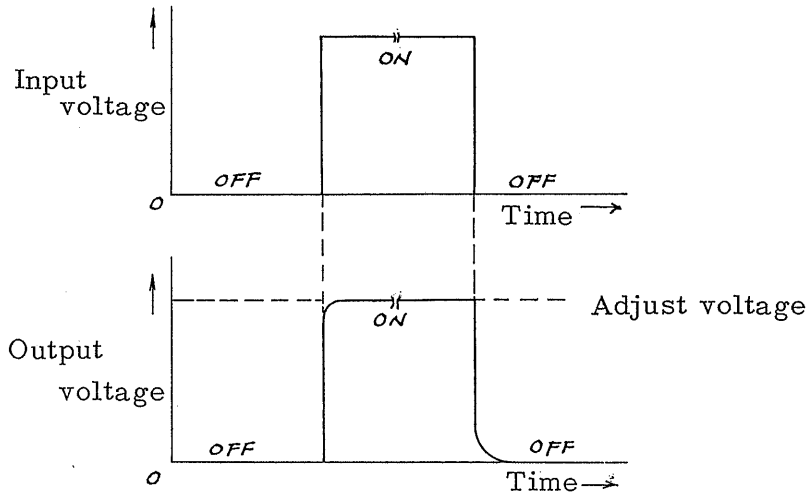


Fig. 3 Wave form of output voltage when power is turned ON and OFF.

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Voltage drop of ammeter

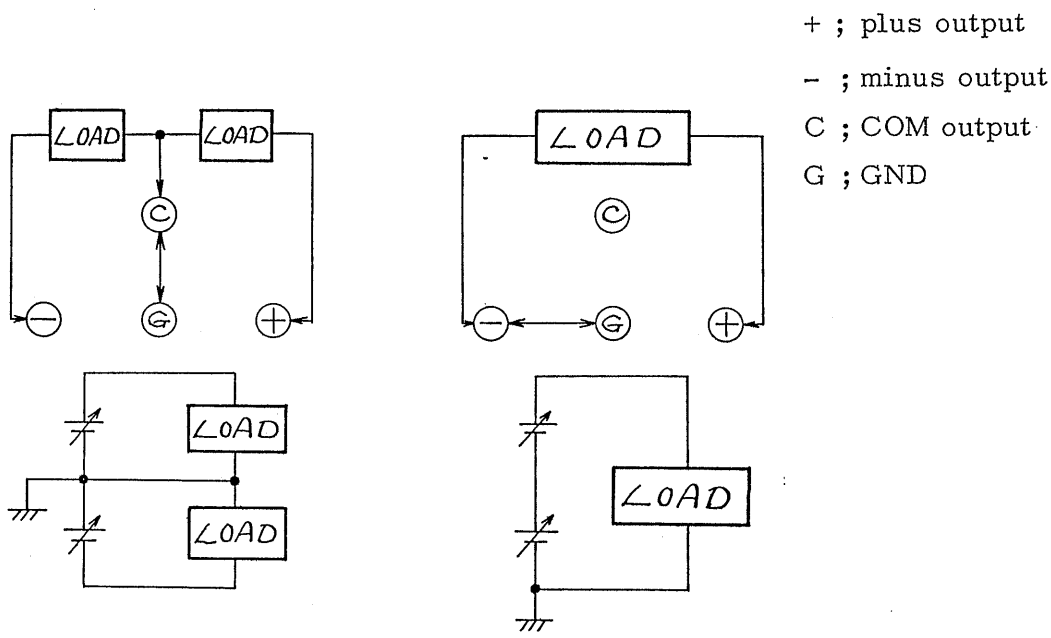
This equipment is so designed that voltage drop of the output ammeter is circuit compensated.

Complementary output and series output

Output is taken out by two methods:

1) Output of plus and minus polarity ranging 0 ~ +30 V and 0 ~ -30 V can be taken out by connecting the COM to the GND. (Complementary output)

2) Output of 0 ~ +60 V or 0 ~ -60 V can be taken out by grounding plus or minus terminal. (Series output)



a) Complementary output

b) Series output
(e.g., Negative)

Fig.4

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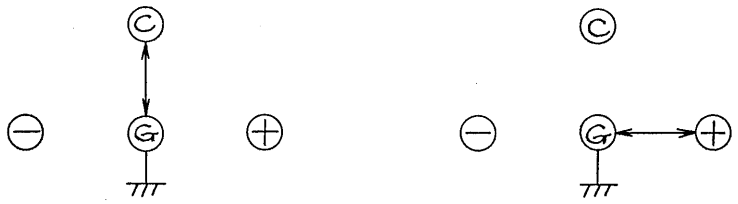
Usually, when the output terminals are to use COM or plus or minus terminal (which is electrically connected to the chassis/panel) is connected to the GND terminal using the attached short bar. However, it is also possible to operate this equipment while applying DC bias up to ±150 V.



a) Grounding of COM terminal

b) Grounding of plus terminal

c) Grounding of minus terminal

d) How to apply DC bias (e.g., positive DC bias)

Fig. 5

Before turning ON power supply

Before turning ON power supply, check the following.

- o Make certain that the rear terminal is correctly wired.
- o Make certain that the rated fuse (2 A) is provided.
- o Make certain that power voltage is within a range of _____V ± 10%.

After the above checking is finished, turn ON the power switch.

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Use of MAX VOLTAGE ADJ

This knob is used to set voltage of plus or minus. When this setting is made, be sure to turn the VOLTAGE DUAL TRACKING knob to the MAX and 0% positions.

After that set output voltage using the polarity change switch of the voltmeter.

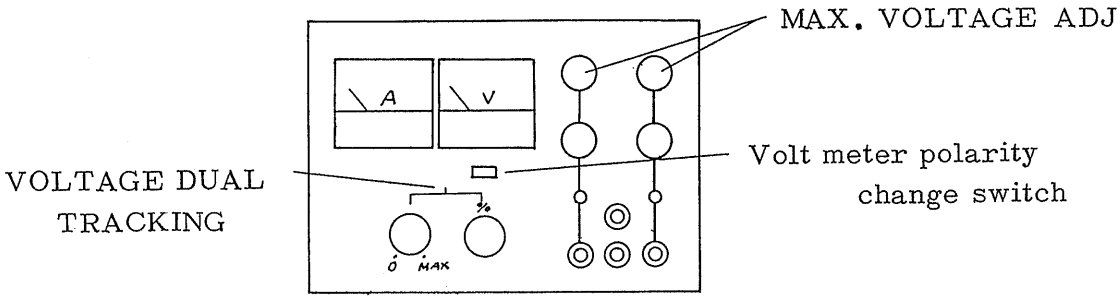

Fig. 6

Use of VOLTAGE DUAL TRACKING

When the 0 ~ MAX knob on the left side is turned, the voltage of plus and minus output is increased or decreased at the same rate in the case of complementary output. When this knob is turned counterclockwise to its end, output voltage becomes zero. On the other hand, in the case of series output, output voltage can be varied to the sum of voltage set by the MAX VOLTAGE ADJ knob in the range from 0 to the maximum.

The % change switch on the right side is used to vary the output voltage from a set value at an accurate step of 5% increment.

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In the case of complementary output:

The output voltage of +10 V is become to +11.5 V at +15% and become to +8.0 V at -20%.

The output voltage of -20 V is become to -23 V at +15% and become to -16 V at -20%.

In the case of series output:

The output voltage of 50 V is become to 57.5 V at +15% and become to 40 V at -20%.

This equipment is so designed that the maximum output becomes 30 V when the VOLTAGE DUAL TRACKING knobs and the MAX VOLTAGE ADJ knobs are positioned at MAX.

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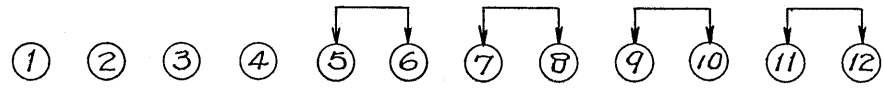
5. OPERATION

Single operation

Wiring at the rear terminals is shown below.



Terminals (1), (2), (3), (4), are + OUTPUT, GND, COM, and -OUTPUT, respectively, output is taken out.

(1) Turn ON the power switch, and the pilot lamp lights on and the equipment starts operation immediately. When drift is a problem, allow aging for about 30 minutes before use.

(2) Turn the 0 ~ MAX knob of DUAL TRACKING to its maximum position, and turn the % knob to the 0 position.

(3) Turn the polarity change switch of the voltmeter toward + side, and then set the output voltage of positive polarity by turning the MAX VOLTAGE ADJ knob.

(4) Turn the polarity change switch of the voltmeter toward - side, and then set the output voltage of negative polarity by turning the MAX VOLTAGE ADJ knob.

(5) The CURRENT ADJ knob gives approx. 1 A when turned clockwise to its end. Set this knob at a proper position.

(6) When the aimed voltage and current are set after the above procedure, connect load to the equipment.

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Parallel operation

More than two sets of this equipment can be connected in parallel to utilize output current more than 1 A.

(1) Method for merely connecting output terminals in parallel

It is possible to utilize output current more than 1 A by merely connecting the output terminals of several sets of this equipment in parallel. However, the extent of use is limited due to the voltage current characteristics as shown in Fig. 8.

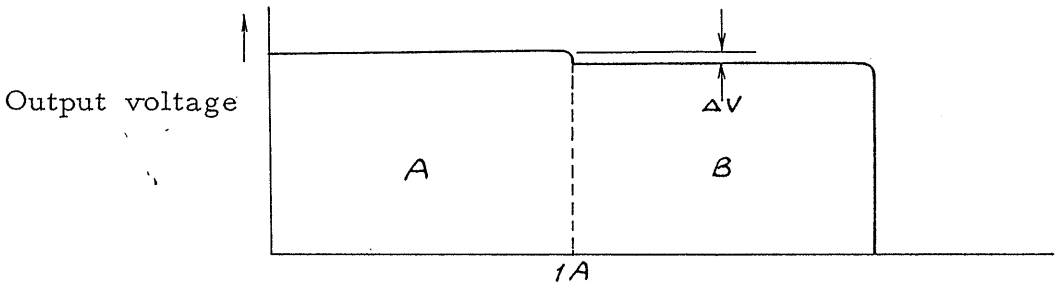

Fig. 8 Output characteristics in parallel operation of 2 sets

In other words, slight discrepancy in output voltage between the two equipments connected causes unbalanced operation, i.e., the one wit high output voltage continues to operate until it becomes overload and then output voltages decreases under overload condition. When output voltage reaches the set value of another equipment, operation recovers from the reverse voltage condition to the normal condition. Thus, one equipment is operated under the overload condition and another equipment is operated under the constant voltage condition. Consequently, load fluctuates in the range of

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difference ΔV of set voltage. At the same time, other characteristics such as ripple is also deteriorated.

The same condition as this is also observed in complementrary output and series output.

(2) One control parallel operation

This method has no adverse effect as mentioned in the above. When current of more than 1 A is required, connect the rear terminals as shown below.

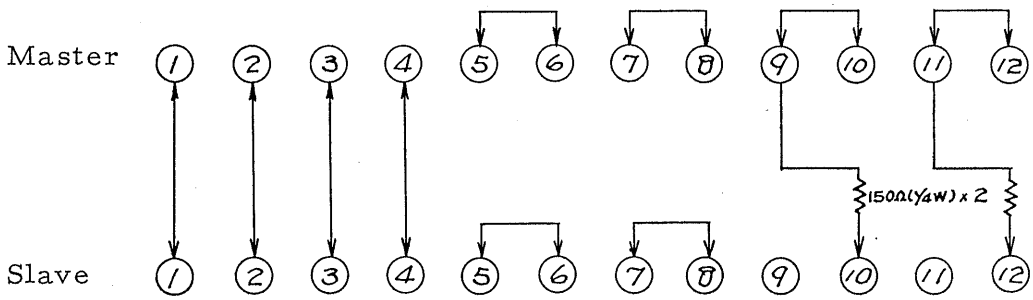

Fig. 9

This operation method can be used for two sets. One is operated as the master equipment and another is operated as the slave equipment. Setting of output voltage and output current is accomplished by the master equipment. Therefore, in this method, turn the adjusting knobs for DUAL TRACKING on the slave equipment to the maximum position and turn the other four knobs to the minimum position. Remove the short bar from the GND terminal.

Even when series output is used, keep the terminals (3) - (3) connected as in the case of complementary output.

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Series operation

(1) Output voltage higher than 60 V can be used as series output. Connect output terminals as shown in Fig. 10. Take care not to ground the different terminals of the two equipments. Also, do not connect the COM terminal. In this case, turn the % knob of DUAL TRACKING equally for both equipments, and the output can be varied accurately.

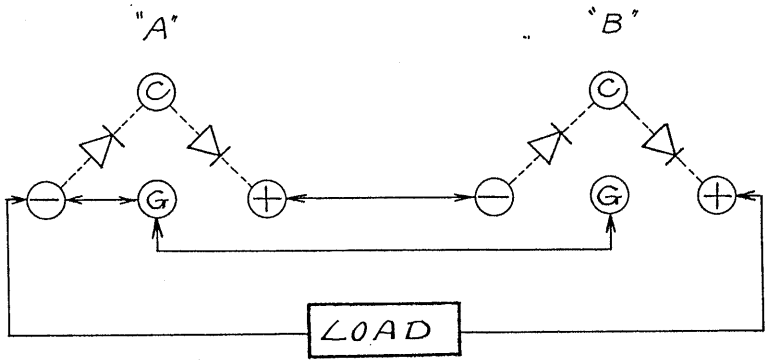

Fig. 10 In case of grounding of minus terminal

In this method of operation, overload causes one equipment to apply output voltage in the reverse direction to another equipment in which the protective circuit has started to operate first, and the serial control transistor in the latter is destroyed. To prevent this trouble diodes are connected between output terminals to bypass current. (Refer to Fig. 10)

(2) In the case of serial connection by complementary output The maximum output voltage available with this equipment is ±30 V when complementary output is used. When output

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higher than 30 V is required, connect the terminals in the following way. However, in this case the % knob of DUAL TRACKING does not vary voltage accurately. In other words, each of output is applied DC bias voltage.

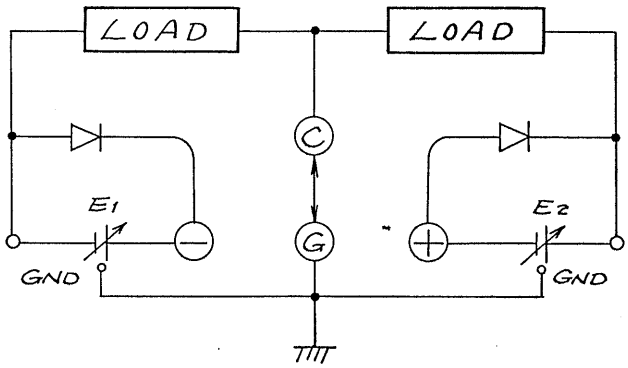

Fig. 11

By making connection in this way the maximum output voltage of $-(30 + E_1)$V and $+(30 + E_2)$ V can be used. In this case of connection, use E_1 and E_2 with sufficient current capacity necessary for load. Also, for the purpose of protection at the time of overload, use power supply to which diode is connected. Take care so that the floating voltage does not exceed the specification value. (Kikusui's transistorized DC power supply is provided with protective diode.)

(3) Other methods of use

The output of this equipment is usually taken out as complementary output or serial output. When it is required that output of the two systems be used in positive or

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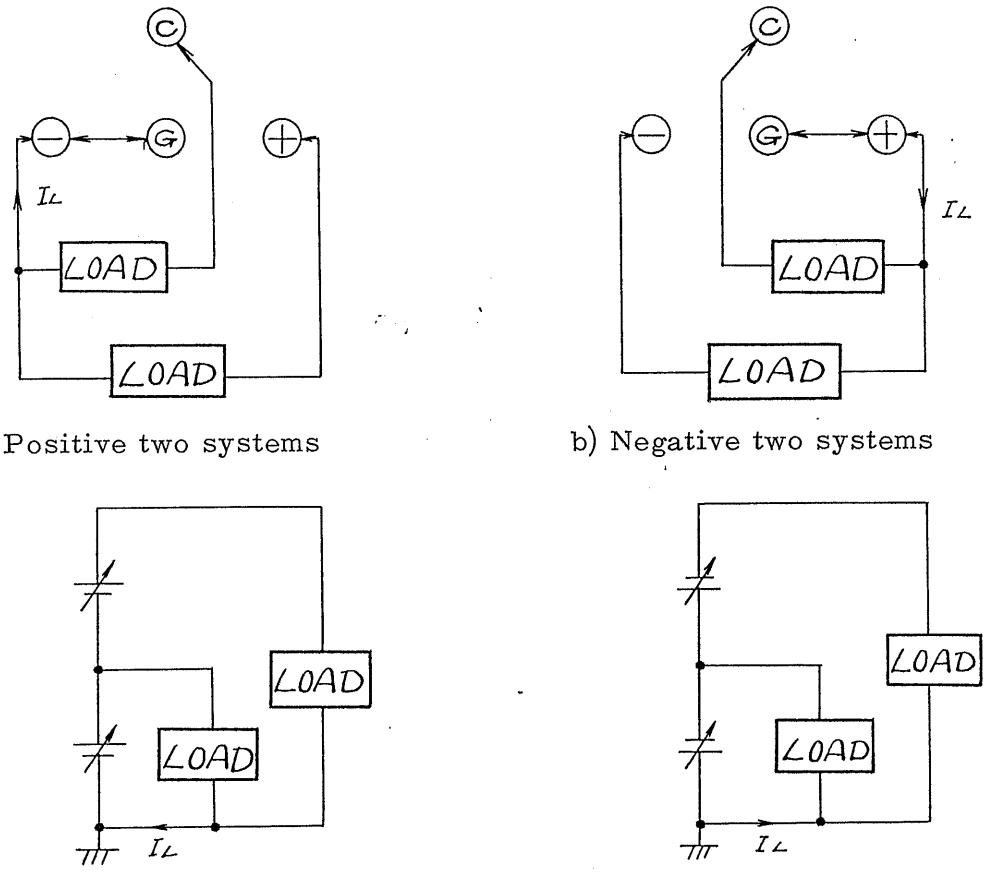
negative only, connect the terminals as shown below. In this case the rated current can not be used, but the output is sufficient for practical use.



a) Positive two systems

b) Negative two systems

Fig. 12

When the total of two loads exceeds 1 A the overload protective circuit works. Take care so that the total of two loads does not exceed the set value.

Remote programing

Operation of DUAL TRACKING can be controlled by three methods: remote programing method by resistor or voltage

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from outside; and remote programing method from the other equipment. In each case of these methods, parallel operation is possible.

(1) Remote programing by resistor from outside

Turn off power supply and connect distributing wires on the rear terminals as shown in Fig. 13.

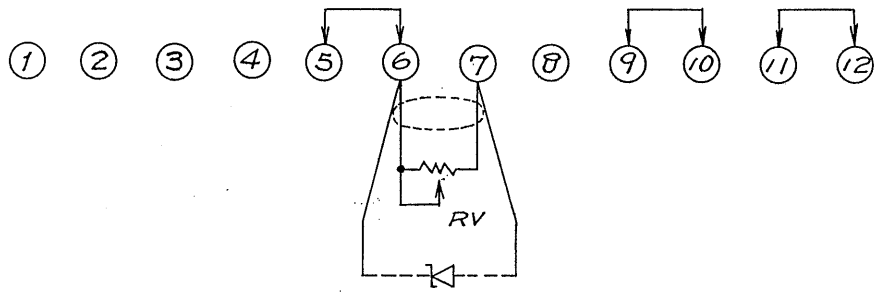

Fig. 13

When power supply is turned ON, the output voltage changes at a rate of about 3 V/kΩ. If it is not desirable to allow the output voltage go up higher than a certain set value, connect a constant-voltage diode (with less leakage current) to the variable resistor in parallel.

It is recommended that wire wound resistor or metal film resistor with a low temperature coefficient be used as the variable resistor. It is desirable that power dissipation of the resistor be higher than 0.5 W when combined with that of the constant voltage diode. The value of resistance should be less than 10 kΩ.

While this remote programing is in operation, the 0 ~ MAX

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knob of DUAL TRACKING on the panel becomes useless, but the % knob remains unaffected.

For wiring to the external resistor use shielded wire with two conductors and connect it to the terminal (2).

(2) Remote programing by voltage source from outside

Turn off power supply and connect distributing wires on the rear terminals as shown in Fig. 14.

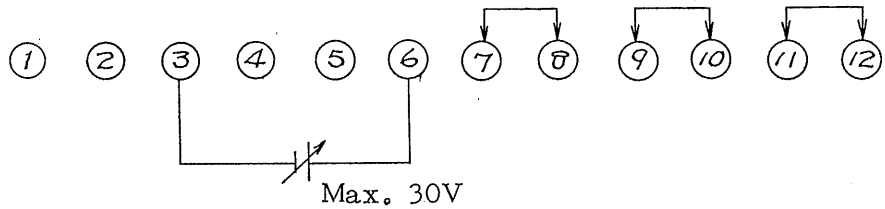

Fig. 14

When power supply is turned ON, the output voltage increases or decreases almost the same rate of change of the external voltage. In this case the maximum voltage is 30 V and the maximum current is about 6 mA. In this remote programing method ripple in the external voltage causes ripple in the output. Care should be taken in this regard.

Both knobs of DUAL TRACKING on the panel become useless; turn them to the maximum position.

(3) Remote programing to the other equipment

Turn OFFpower supply and connect distributing wires on the rear terminals as shown in Fig. 15.

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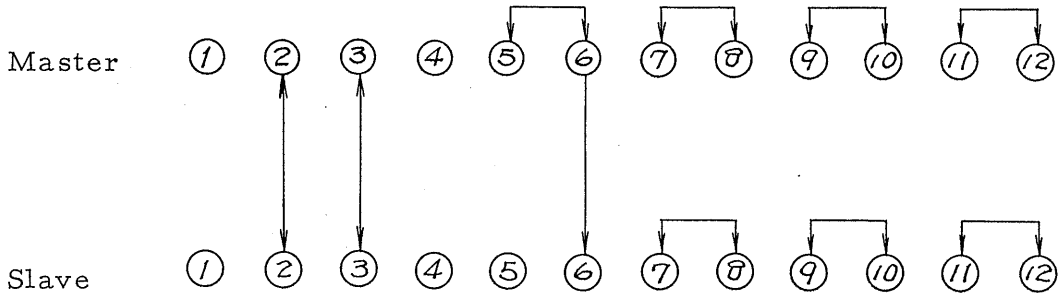

Fig. 15

This remote programing method is used when output of both polarity is needed in two systems and DUAL TRACKING is needed to be accomplished simultaneously. One equipment is operated as a master equipment and another, a slave equipment. Since DUAL TRACKING can be controlled by the master equipment, as mentioned earlier, turn the DUAL TRACKING knobs to the minimum position.

Do not connect the GND terminal of the slave equipment to other terminals. Grounding should be done on the master equipment.

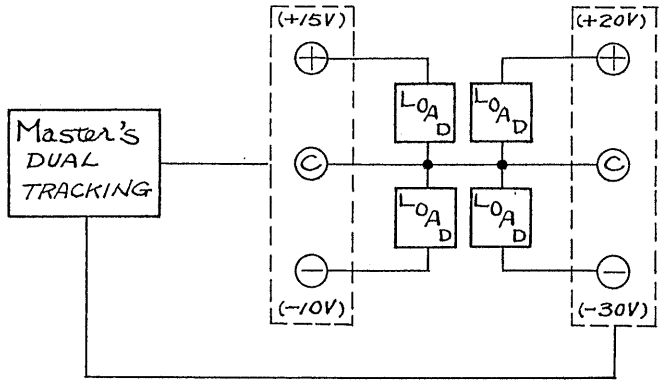

Fig. 16

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6. TRANSIENT RESPONSE TIME

The DC power supply is used at a constant current load and more commonly it is connected to dynamic load such as pulse load. When load current changes abruptly due to turning on and off, spike-like decrease and increase of output voltage is caused as shown in the output voltage characteristics of Fig. 17. This peak value is usually higher than the static stability in the specifications and returns to the static stability value exponentially. The time required for fluctuation caused by spike due to abrupt change of load to return to the static regulation value (10 mV in the case of this equipment) is called the transient response time, which is considered one of methods to appraise performance of the power supply. Long transient response time means that the equipment has a high output impedance at high frequencies and it can not supply stable output at high frequency load.

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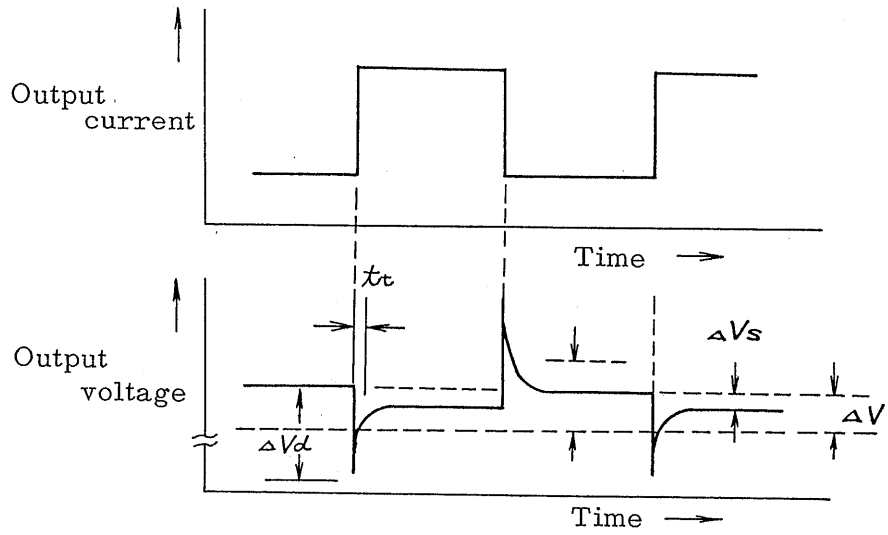

Δ V: Output regulation range in the specifications

ΔV_s: Practical static fluctuation

ΔV_d: Dynamic fluctuation

t_t: Transient response time

Fig. 17

In spite of high stability of 10 mV for static fluctuation, this equipment has a transient response time of 100 μsec (TYP), making possible to supply stable output in the high frequency circuit and digital circuit.

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7. DRIFT AND TEMPERATURE COEFFICIENT

Circuit components with less temperature coefficient were selected and the circuit is so constructed that the temperature change is set off each other in this equipment. And many differential amplifiers are used in the amplifier for small signals. Therefore, no fluctuation of output voltage will be observed 30 minutes after power supply is turned on.

Typical values are as follows:

Drift: 0.02 %/h or 5 mV/h

Temperature coefficient: 0.01 %/°C or 2.5 mV/°C

The above values are for complementary output and in the case of serial output approximately twice as high as values will be shown.

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