INSTRUCTION MANUAL FOR

DC VOLTAGE/CURRENT STANDARD

MODEL 101

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.

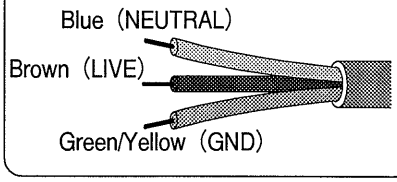
☐ AC power cable

The product is 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.

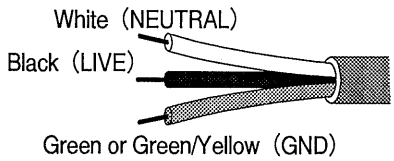
WARNING

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

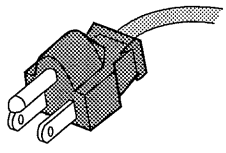
☐ Without a power plug



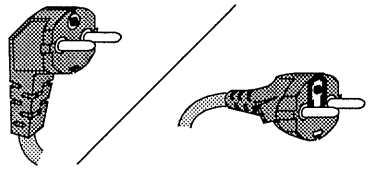
☐ Without a power plug



☐ 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 _____

 Kikusui Part No. Z9-000-027 IB001681

KIKUSUI

TABLE OF CONTENTS

1. GENERAL

The Kikusui Model 101 DC Voltage/Current Standard is a high stability voltage/current supply which provides a voltage of 0 - 12.220 V or a current of 0 - 1.2220 A at an accuracy of 0.05% in conformity with the dial setting. The 101 employs solid-state electronics and is compact and lightweight.

The voltage or current setting is made with three digit dials, a vernier dial, and a range switch. The vernier dial provides a resolution of 0.001% of range.

When the value at the output terminal has exceeded the rated value resulting in an overload state, an electronic protecting circuit is brought into effect to limit the value and an overload lamp lights on the front panel.

The 101 is used for calibration of conventional DC voltmeters and ammeters, as a power source for a DC bridge, as a precision power source for potentiometry, for research and inspection, for quality control, for maintenance of electronic apparatus, and for other various purposes.

2. SPECIFICATION

Output voltage:	0 - 12.220 V
Ranges:	10 mV, 100 mV, 1 V, and 10 V
Accuracies:	1 V, 10 V .... ±(0.05% + 0.02% of range) 10 mV, 100 mV .... ±(0.15% + 0.05% of range)
Maximum output or output resistance:	1 V, 10 V .... Approx. 1 A 10 mV, 100 mV .... 1 Ω
Overload protection:	Automatic crossover type
Ripple and noise:	Less than 200 μV (5 Hz - 1 MHz)
Load regulation: (at 1V. 10V Range)	±(0.003% of range + 150 μV) for 0 - 100 mA change ±(0.02% of range + 1.5 mV) for 0 - 1 A change
Line voltage regulation:	±0.005% of range for a 10% line voltage change from nominal
Output current:	0 - 1.2220 A
Ranges:	10 μA, 100 μA, 1 mA, 10 mA, 100 mA, 1 A
Accuracies:	1 mA - 100 mA .... ±(0.05% + 0.02% of range) 1 A .... ±(0.15% + 0.02% of range) 10 μA, 100 μA .... ±(0.15% + 0.05% of range)
Maximum output or output resistance:	1 mA, 10 mA, 100 mA, 1 A .... Approx. 10 V 10μA/1MΩ 100μA/100KΩ
Overload protection:	Automatic crossover type
Load regulation: (at 1mA. 10mA. 100mA. 1A Range)	±0.02% of range for full load to 1/10 load change
Line voltage regulation:	±0.005% of range for a 10% line voltage change from nominal.
Ambient temperature:	0°C - 40°C (specification performance guarantee range .... 25°C ±10°C)
Power requirements:	AC, 50/60 Hz, approx. 60 VA

Dimensions:	200 mm (W), 140 mm (H), 320 mm (D) 200 mm (W), 160 mm (H), 355 mm (D)
Weight:	Approx. 6.6 kg
Accessories:	Short bar ..... 1 Instruction manual 1

3. OPERATION PROCEDURE

3.1 EXPLANATION OF FRONT AND REAR PANELS (See Figs. 3-1 and 3-2.)

(1) POWER: Pushbutton-type alternate-action power switch. When this switch is depressed and locked, the power is turned on and the power pilot lamp lights.

(2) RANGE: Range selection switch knob. The scale figures denote the maximum values of respective ranges. As the knob position is changed, the decimal point also is changed accordingly.

(3) OUTPUT VOLTAGE/CURRENT SETTING DIALS: The set value of the output voltage or current increases as these dials are turned clockwise. The left-end dial (the most significant column) is movable between 0 - 11. The center dial and right-end dial (least significant column) are continuously rotatable through 0 - 11 - 0.

(4) VERNIER: The full variation (from 0 to 10) of this dial corresponds to the unit variation (variation by 1) of the least-significant column dial. The maximum output value setting is attained when all three dials are set in their "11" positions and the VERNIER dial is set in the extremely clockwise position.

(5) OVERLOAD: When the output current has exceeded approximately 1.1 A (for voltage setting) or when the output voltage has exceeded approximately 11 V (for current setting), the overload protection circuit is brought into effect and the OVERLOAD indicator lamp lights. The above, however, is not applicable to 10 mV or 100 mV voltage setting and 10 μA or 100 μA current

setting. At these settings neither voltage nor current output can cause any overload.

(6) OUTPUT: This terminal provides a DC output voltage of 0 - 12.22 V (approx. 1 A) and a DC current output of 0 - 1.222 A (approx. 10 V). The white binding post is an isolated ground; the black binding post is a ground terminal which is electrically connected to the chassis.

(7) FUSE: Connected in the primary circuit of the power transformer. The fuse is removable by turning the bracket counterclockwise.

(8) POWER CORD: To be connected to an outlet of an AC line of V, 50/60 Hz.

(9) CORD RETAINER: The power cord is wound on this retainer for storing the Standard.

3.2 PREPARATIONS FOR OPERATION

(1) Set all OUTPUT SETTING dials in the ZERO positions, and the RANGE switch in the STANDBY position.

(2) Connect the POWER cord to an outlet of an AC line of____V 50/60 Hz, and turn on the POWER switch.

(3) If the RANGE switch is set in the CURRENT mode position and no load is connected to the output terminal, the protection circuit will be brought into effect and the OVERLOAD lamp will light. This, however, is not an abnormal indication.

(4) When a high setting accuracy is required, allow a sufficient stabilization period after turning on the power. When no high accuracy is required, the Standard may be used in several seconds after turning on the power.

(5) When a high setting accuracy is required for the 100 mV or 10 mV range, allow a stabilization period of a minute or two after turning the RANGE switch.

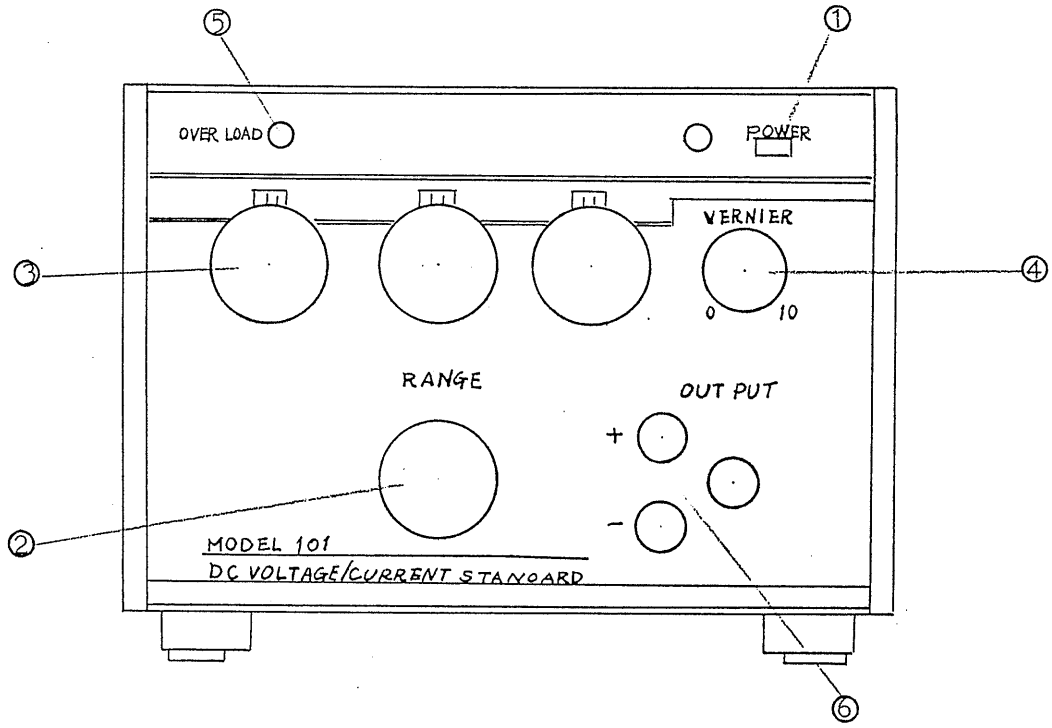

⑤
①
OVER LOAD
POWER
VERNIER
③
④
0
10
RANGE
OUT PUT
+
-
②
MODEL 101
DC VOLTAGE/CURRENT STANDARD
⑥

Fig. 3-1

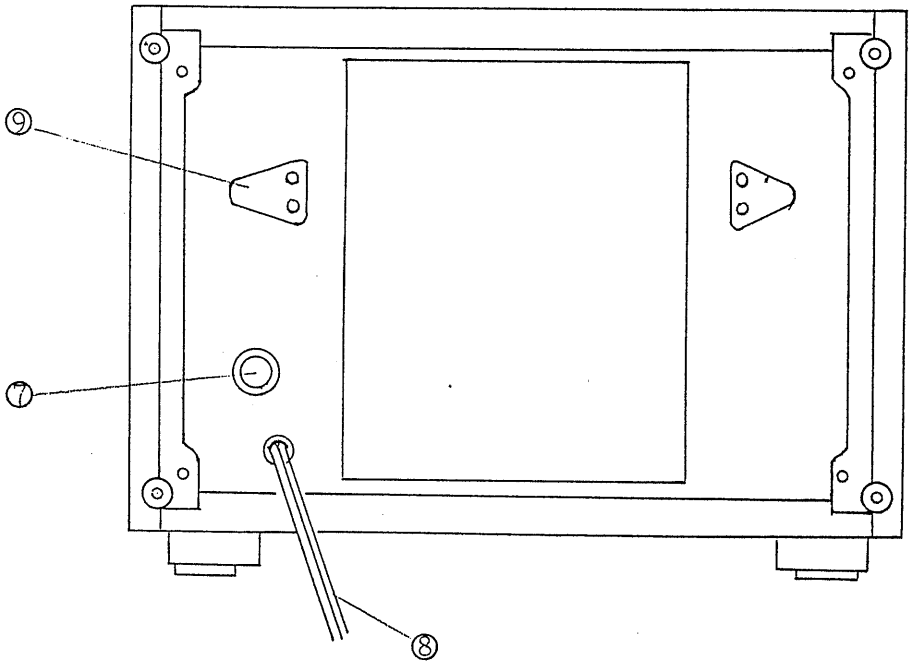
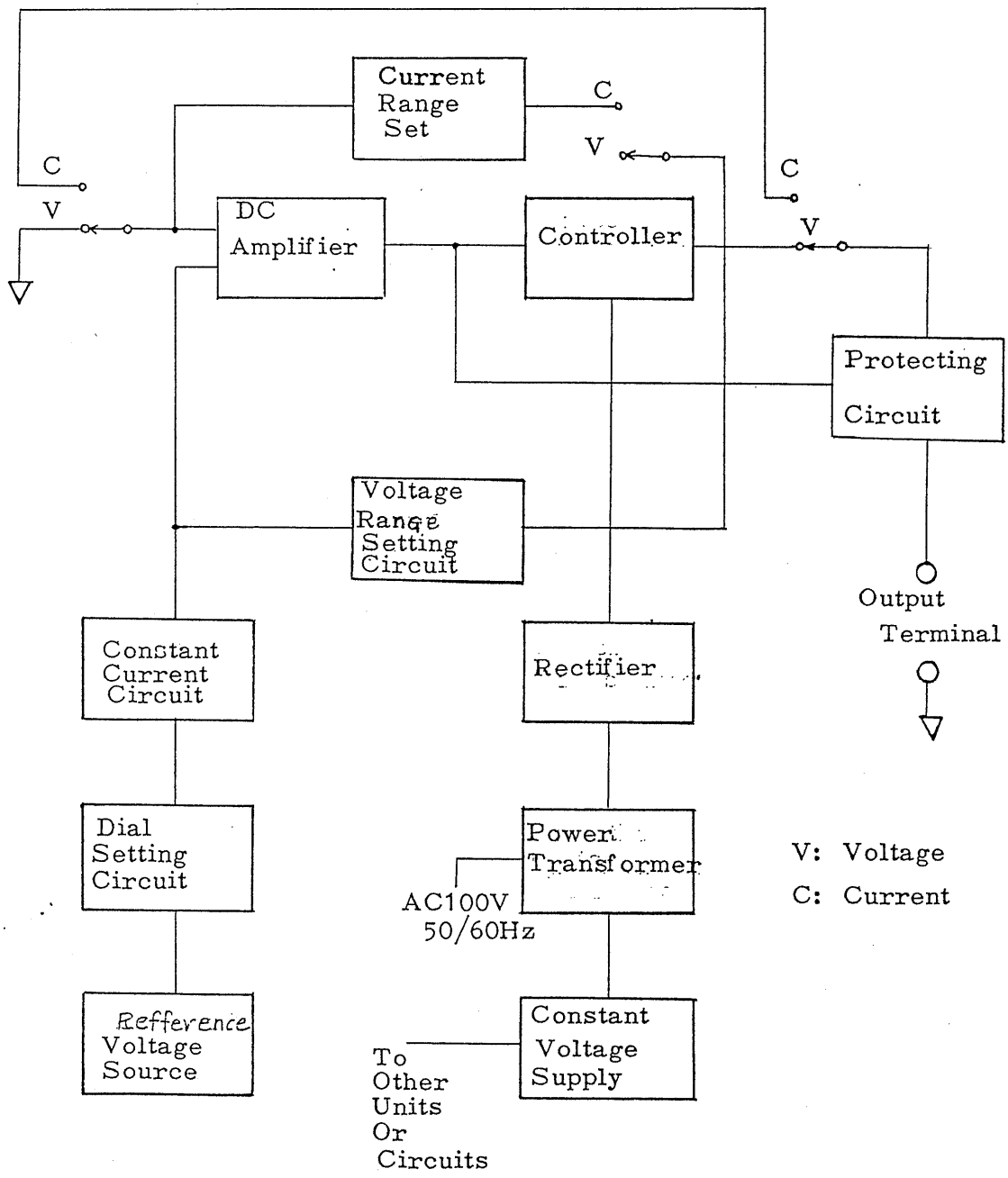

⑨
⑦
⑧

Fig. 3-2

4. OPERATING PRINCIPLE

A block diagram of the Model 101 DC Voltage/Current Standard is shown in Fig. 4-1.



The basic operating principle of the constant voltage circuit is shown in Fig. 4-2.

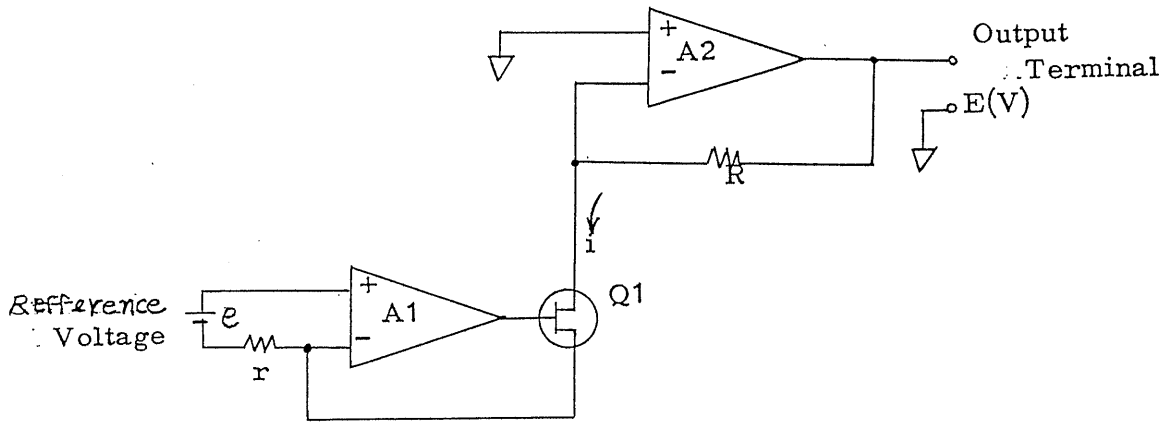


Fig. 4-2

Assuming A_1 and A_2 to be ideal amplifiers, current i which flows in Q_1 is determined by e/r and, therefore, it becomes a constant current. A voltage drop (R·i) is developed across resistor R by current i. Since the non-inverting input terminal of A_2 is grounded, the potential of the inverting input terminal becomes the same with the ground potential. Therefore, the output voltage (E) can be expressed with R·i.

$$E = R \cdot i = R \cdot e/r$$

Thus, the output voltage is determined by resistor R and current I. Abbreviations used in the above illustration and explanation are as follows:

e: Fixed standard voltage
r: Dial
R: Voltage range

The basic operating principle of the constant voltage circuit is shown in Fig. 4-3.

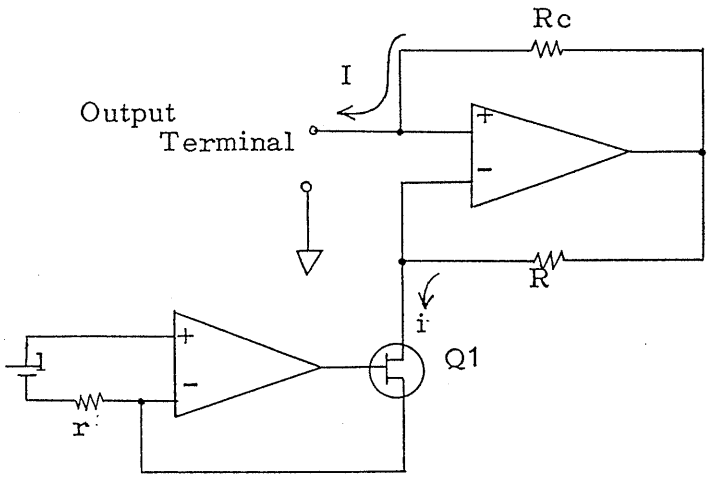


Fig. 4-3

As is the case for the constant voltage circuit, the current i which flows in Q_1 is determined by e/r and, therefore, a voltage drop of $R \cdot e/r$ is developed across resistor R. Since ideal amplifiers are assumed, the voltage drop across resistor R and that across R_C are equal, and a current (I) as given by the below equation is produced.

$$I = R \cdot e/r/RC$$

The current does not flow into the input circuit of the amplifier but flow into the output circuit. Abbreviations used in the above illustration and explanation are as follows:

R: Fixed resistor
e: Fixed standard voltage
r: Range
Rc: Current range

5. MAINTENANCE

5.1 ACCESS TO INTERNAL COMPONENTS

To gain access to the internal components of the Standard, remove the four clamping screws shown in Fig. 5-1 and slowly pull backwards both side panels, top panel, and bottom panel.

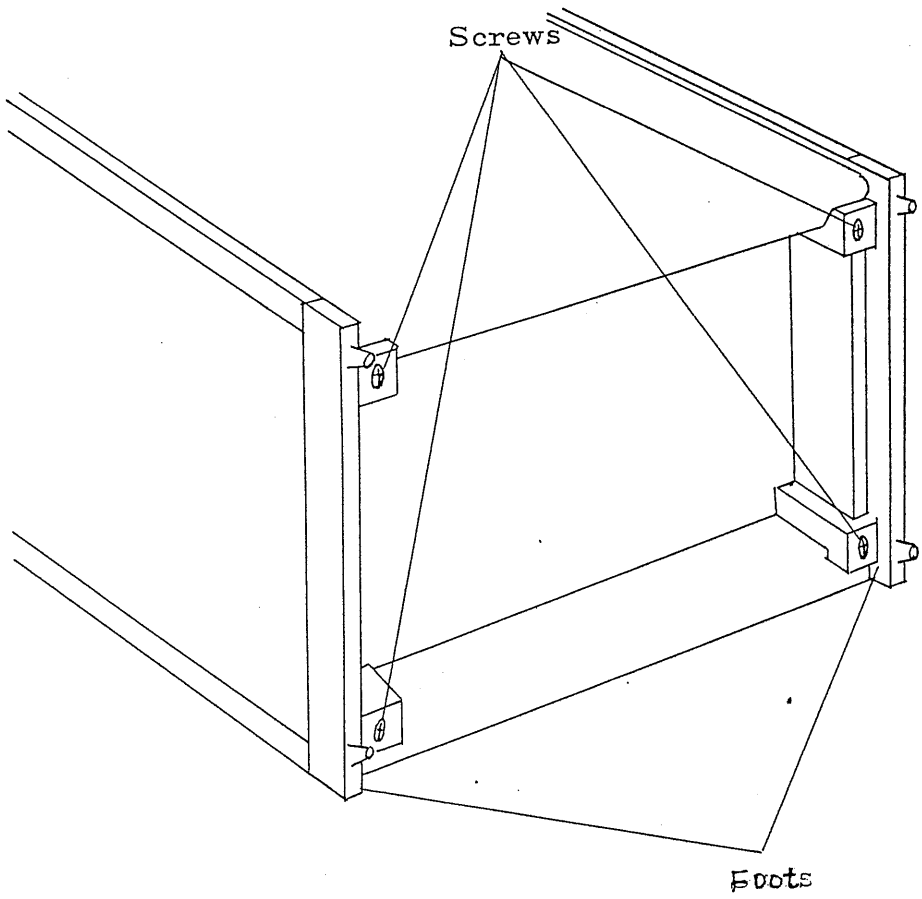


Fig. 5-1

Note: If the housing is inclined to this side by holding the handles under the state that the foots of the rear panel are removed, the top panel will come off the frame. Do not incline the housing under such state.

5.2 LAYOUT

The layout of internal units of the Standard is shown in Fig. 5-2.

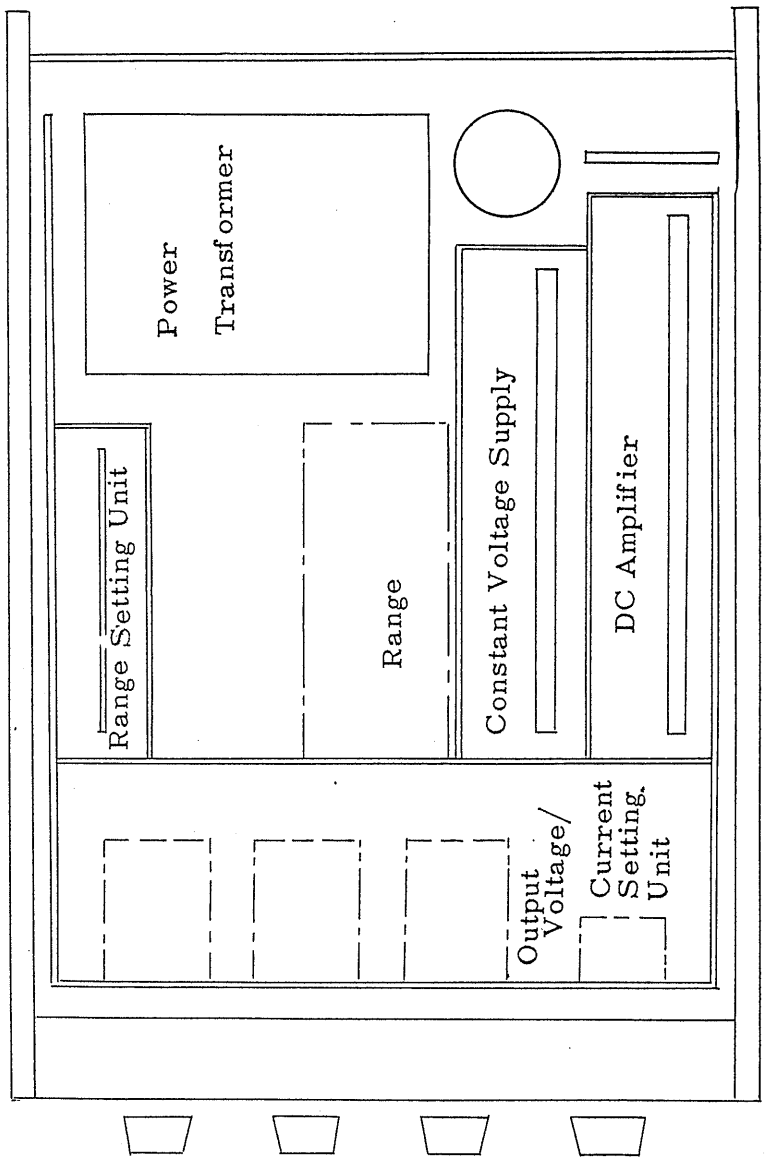


Fig. 5-2