

MODEL 5802

CURVE TRACER

INSTRUCTION MANUAL

KIKUSUI ELECTRONICS CORP.

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00705

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# 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

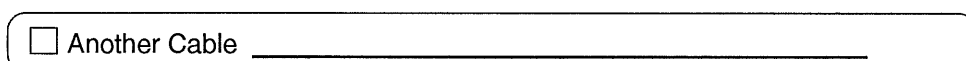
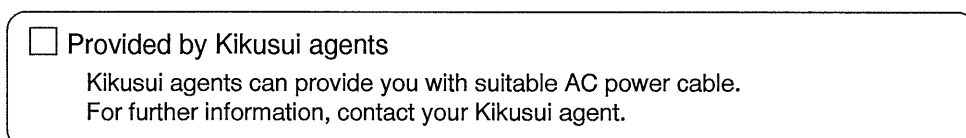
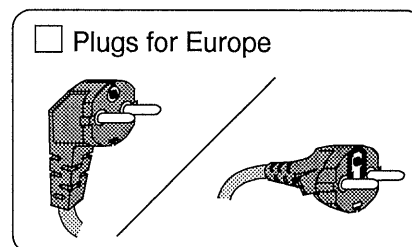
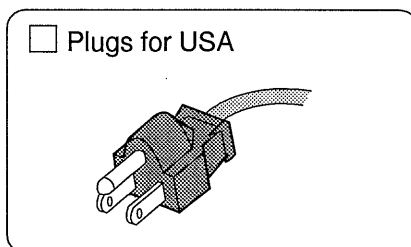
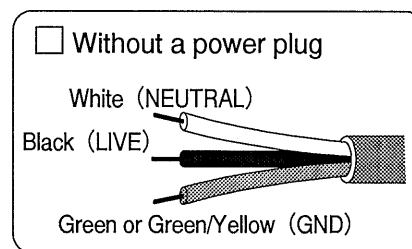
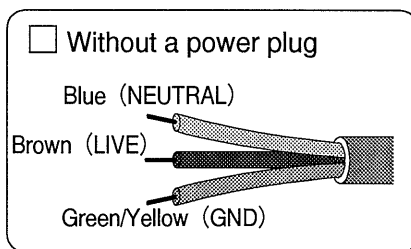
- To avoid electrical shock, always disconnect the AC power cable or turn off the switch on the switchboard before attempting to check or replace the fuse.
- Use a fuse element having a shape, rating, and characteristics suitable for this product. The use of a fuse with a different rating or one that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



## Contents

	Page
1. Outline	1
2. Specifications	2
3. Method of operation	8
3-1 Description of panel	8
3-2 Description of rear panel	12
3-3 Description of accessories	14
3-4 Supplementary description	15
3-5 Precautions in operation	18
3-6 Measurement	21
3-7 Option	31
4. Maintenance	33
4-1 Adjustments and calibration	35
5. Block diagram	40

## 1. Outline

This equipment is used for the observation and measurement of voltage/current characteristics of two-terminal elements by tracing it on a cathode ray tube. It enables measurement of forward and backward characteristics of diodes as well as measurement of thyristor reverse voltage and off-state voltage, measurement of varistors, etc., measurement of wide range resistance values ( $10\text{ m}\Omega - 10\text{ G}\Omega$ ) and withstanding voltage and leak resistivity of various parts.

The output of this equipment consists of 20 V - 10 A, 200 V - 1 A, 2 KV - 0.1 A. Detecting sensitivities are 10 mV/DIV - 200 V/DIV for voltage axis and 10 nA/DIV - 1 A/DIV for current axis, thus constituting wide and dynamic ranges. Since the voltage is provided with position shift mechanism, sample can be observed with high resolution capability. It is applicable not only to production lines but also to measuring instruments for research and development.

This equipment incorporates high voltage, so that sufficient precautions are paid on safety, e.g. provision of various protecting measures against electrical shock accident, etc. In addition, sufficient protection methods are employed for the prevention of set failure due to mishandling.

## 2. Specifications

### Output part

Item	Specifications	Remarks
Power supply for measurement	Commercial supply is stepped down or up with a transformer.	
Range and maximum output	-20 V range      0 - 20 Vp-p, max 10 Ap-p 200 V range     0 - 200Vp-p, max 1Ap-p 2 KV range       0 - 2KVp-p, max 0.1Ap-p	On supply voltage of 100 V
Waveform of applied voltage	Forward: Half-wave rectified form Reverse:        - ditto - Sine        : Non-rectified form	
Dissipation limiting resistance  (Series resistor)	0 - 1 M $\Omega$ , 14 ranges Error : $\pm$ (10 % + 0.3 $\Omega$ ) Allowable dissipation: 5 minutes durability is ensured when max. nominal output voltage of each range of the equipment is applied or max. output current power is applied	1.3 steps  Continuous durability is ensured on 1/2 power of the above.

### Parallel capacitance compensation

Item	Specifications	Remarks
Compensatable range	On 20 V output      0 - 150 PF On 2 KV output      0 - 10 PF	Current axis sensitivity 1 $\mu$ A /DIV Dissipation limiting resistance 0.3 M $\Omega$  (Series resistor)

782756 4

Voltage axis (horizontal axis)

Item	Specifications	Remarks
Sensitivity	0.1 V/DIV - 200 V/DIV, 11 range Sensitivity can be increased to 10 times.	1.2.5 steps
Accuracy	$\pm (3\% + 0.05 \text{ DIV})$ On 10 times sensitivity increase : $\pm (5\% + 0.05 \text{ DIV})$	On readings of 2DIV or more *(Note)
Position shift	Left hand shift with 10DIV/ Step to 100 DIV	
Accuracy	2.5 % of shifted quantity	

Current axis (vertical axis)

Item:	Specifications	Remarks
Sensitivity	0.1 $\mu$ A/DIV - 1A/DIV, 22 ranges Sensitivity can be increased to 10 times.	1.2.5 steps 10 times sensitivity is applicable only to output voltage of 200 or less.
Accuracy	$\pm (3\% + 0.1\text{DIV})$ On 10 times sensitivity increase: $\pm (5\% + 0.1\text{DIV})$ on 50 $\mu$ A/DIV	On readings of 2 DIV or more *(Note)

\* (Note) Original point of sensitivity measurement shall be left-under or center of scale with regard to both of voltage and current axis.

782757  
5

Calibration voltage

Item	Specifications	Remarks
Voltage	500mVp-P $\pm 1.5$ %	Calibratable with 10DIV on both of voltage and current axis
Waveform	Square-wave	50/60 Hz

Safety mechanism

In the following cases, primary side of power supply is interrupted.
In case of measuring terminal lid opening during measurement of 200V.2KV range.
In case of switching mode/range switch during voltage application
In case of interrupting signal application by rear panel connector

Protecting Circuits

Item	Specifications	Remarks
Overcurrent protection	Operable by $\pm$ (6-8) DIV from center of the CRT	Primary side of power supply interrupted
Dissipation limiting resistance protection	Operable when over allowable dissipation and the temp. is over raising.	

782758  
6

Cathode ray tube

Item	Specifications	Remarks
Kind	133 mm round CRT	
Phosphor	B31	
Accelerating voltage	2KV	
Effective area	10 DIV x 10 DIV	8 mm/DIV
Orthogonality	Correctable with rotator coil	

Measuring terminal block

Item	Specifications	Remarks
For high sensitivity	On 10 nA/DIV - 10 mA/DIV	Detachable
For large current	On 0.1 mA/DIV - 1 A/DIV	Detachable with voltage sampling terminal

Power supply

Item	Specifications	Remarks
Supply voltage range	100V $\pm$ 10 %	Excluding maximum output item
Frequency	50 - 60 Hz	
Power consumption	No load condition approx.40VA Full load condition approx.190VA	On forward 20V 10A output
Isolation resistance	DC 500 V, 30 M $\Omega$	Between line and ground

782759

7



Ambient conditions

Item	Specifications	Remarks
Operating temperature range	0°C - 40°C	
Applicable temperature range	5°C - 35°C	
Operating humidity range	20 % - 80 %	
Applicable humidity range	20 % - 80 %	

Mechanism

Item	Specifications	Remarks
Outer dimensional form	345W x 255H x 590D 325W x 235H x 420D	Maximum parts Case parts
Weight	Approx. 19.4 Kg	

Accessories

Instruction manual	1
Measuring terminal block for high sensitivity	1 set
Measuring terminal block for large current	1
Connector for safety control	1
AC Plug Adaptor (The AC Plug Adaptor is provided only for model versions for use within Japan. )	1

Option

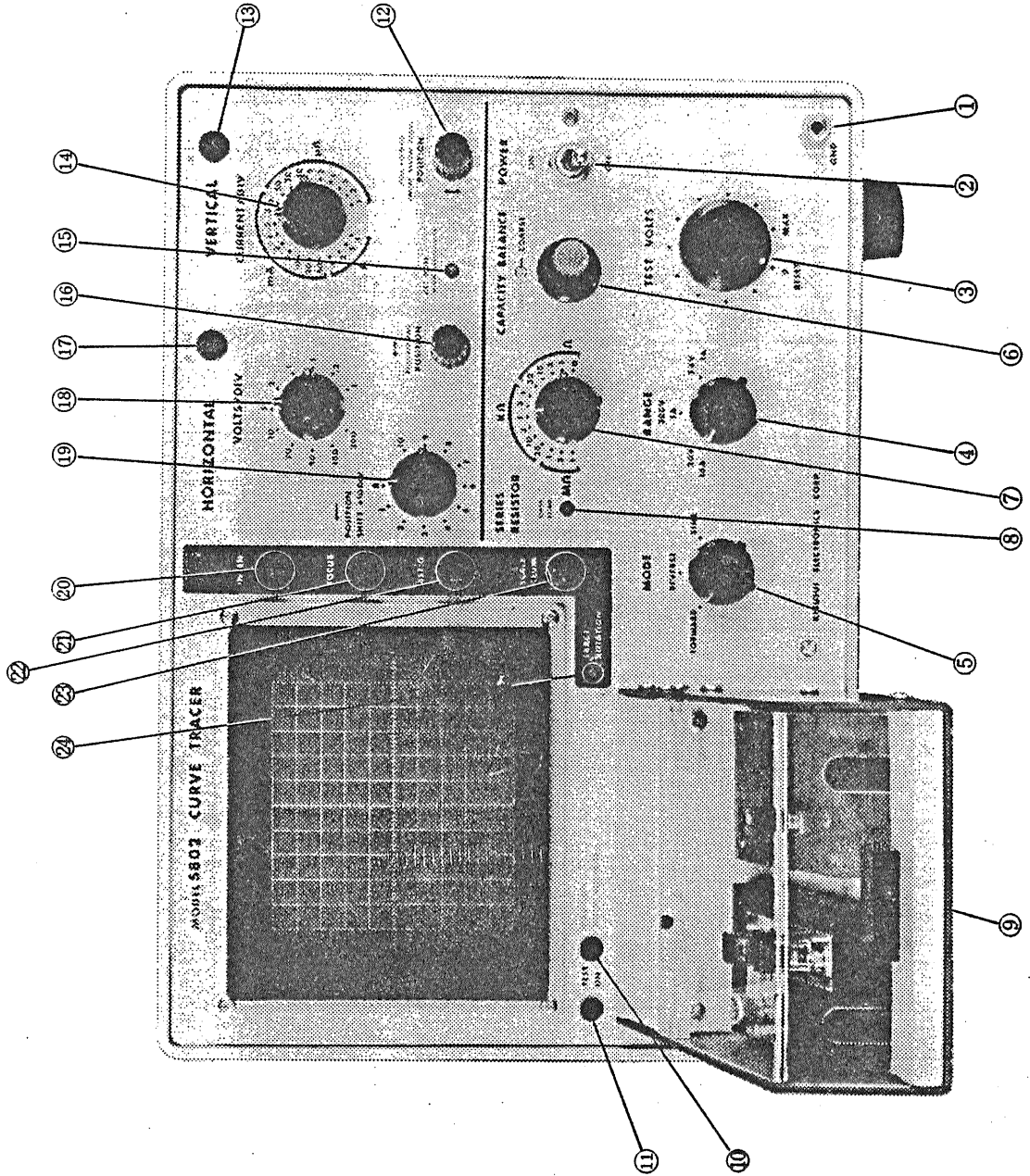
External slide transformer

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### 3. Method of application

#### 3-1 Description of panel surface




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- ① GND Terminal for grounding the equipment to earth
- ② POWER Power supply switch. If pushed upward, power source is switched in.
- ③ TEST VOLTS Knob for continuously varying voltage of measurement power supply
- Reset By turning knob fully in counter clockwise direction up to this position, resetting is completed after the operation of various protection circuits.
- ④ RANGE Switching knob of measurement power supply. Maximum output voltage and current of each range are indicated. Ranges consist of three kinds, i.e. 20V-10A, 200V-1A, 2KV-0.1A. Indication is made by (Vp-p) value. Be careful in case of (SINE).
- ⑤ MODE By attaching diode at sample terminal in an indicated direction, measurement can be made in the following modes as indicated on this switch.
- Forward Negative half-wave rectified voltage is applied to red terminal.
- Reverse Positive half-wave rectified voltage is applied to red terminal.

- SINE Sine-wave is applied to red terminal.
- ⑥ CAPACITY When current axis sensitivity is set to high  
BALANCE sensitivity, waveform becomes looped due to  
parallel capacity of sample. The knob is  
used for making this loop smaller.  
Outer black knob is for coarse adjustment and  
inner red knob for fine adjustment.
- ⑦ SERIES Knob for selecting resistance value of resis-  
RESISTOR tor connected series to sample for the limita-  
tion of power dissipation of sample.
- ⑧ OVER LOAD In case that the power dissipated in the above  
"SERIES RESISTOR" exceeds rated value causing  
excessive temperature rise in the inside, pro-  
tecting circuit operates to interrupt output.  
By the illumination of light emitting diode,  
this condition is indicated.
- ⑨ TEST BOX Portion for sample setting. It sets sample  
on the inside measuring terminal block.
- ⑩ CAUTION When "RANGE" switch is set at 2 KV, this lamp.  
HIGH VOLTAGE is lit for caution.
- ⑪ TEST ON In case that output is to be generated only by  
turning "TEST VOLTS" knob (namely in standby  
condition), or while output is actually gene-  
rated, this lamp is lit for caution.
- ⑫ POSITION Knob for adjusting vertical position of ori-  
↑

ginal point or trace. By clockwise turning, it moves upward and, by counter clockwise turning, it moves downward.

PULL x 10 MAG Common with "POSITION" knob. By pulling this knob, the sensitivity of current axis (vertical axis) increases to 10 times.

⑬  CAL By depressing this button, 500 mVp-p calibrating voltage is applied to the input of current axis amplifier. On condition that the amplifier is calibrated, two spots having a space of 10DIV appear on CRT.

By depressing this button again, measuring condition recovers.

On condition that this button is projected, no output is generated.

⑭ VERTICAL Knob for switching current axis sensitivity.  
CURRENT/DIV 22 ranges are provided from 0.1  $\mu$  A/DIV to 1 A/DIV. This can be observed by the sensitivity indicated on the panel.

⑮ SET MORE In case that setting of current axis sensitivity  
HIGH SEN- becomes excessively lower with regard to ④  
SITIVITY "RANGE" knob setting, design is made to prevent  
output generation for overcurrent protection.  
In case that light emitting diode is lit, set  
⑭ "VERTICAL CURRENT/DIV" for higher sensitivity

①⑥ POSITION




Knob for adjusting horizontal position of original point or trace.

It moves to right or left direction depending on turning in clockwise or counter clockwise direction, respectively.

PULL x 10 MAG

Common with "POSITION" knob. By pulling this knob, the sensitivity of voltage axis (horizontal axis) becomes 10 times.

①⑦  CAL

By depressing this button, calibrating voltage of 500 mVp-p is applied to the input of voltage axis amplifier. On condition that the amplifier is calibrated, two spots having a space of 10 DIV appear on CRT.

By depressing this button again, measuring condition recovers.

①⑧ HORIZONTAL  
VOLTS/DIV

Knob for switching voltage axis sensitivity. 11 ranges are provided from 0.1V/DIV to 200V/DIV. Observable by the sensitivity indicated on the panel.

①⑨ POSITION

By this knob, original point or trace can be shifted to the left hand direction with the step of 10DIV each up to the maximum 100DIV.

②⑩ INTEN

Knob for adjusting brightness or original point or trace on CRT. Becomes brighter by clockwise turning and darker by counter clockwise

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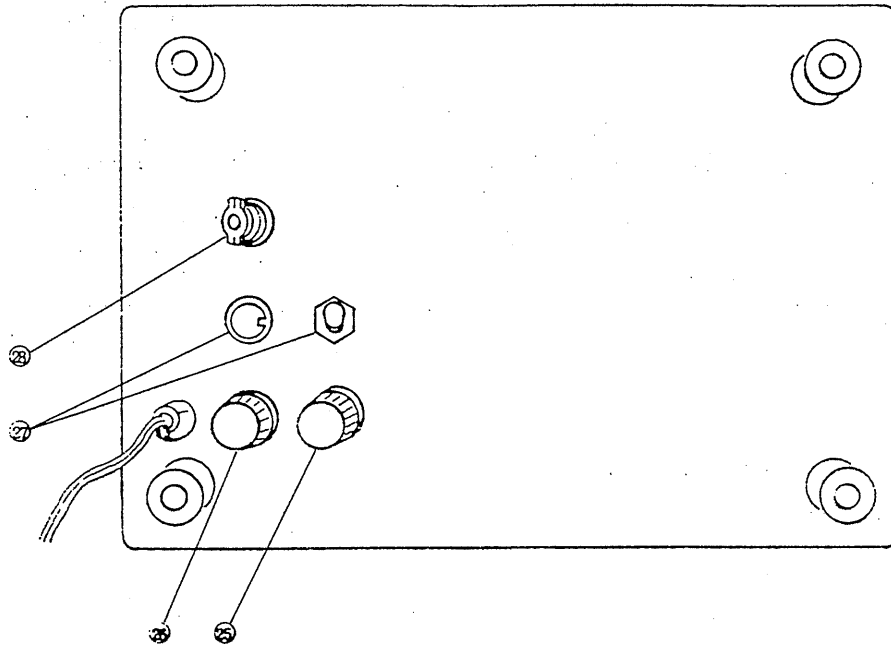
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turning.

- (21) FOCUS Knob for adjusting focus of bright point. Shall be adjusted in such a way that the sharpest condition is obtained on original point or trace.
- (22) ASTIG Knob for correcting astigmatism of bright point. Similarly as "FOCUS", shall be adjusted in such a way that the sharpest condition is obtained on original point or trace.
- (23) SCALE Knob for adjusting brightness of scale. Be-  
ILLUM comes brighter by clockwise turning and darker by counter clockwise turning.
- (24) TRACE Semi-fixed resistor for correcting horizontal  
ROTATION inclination of trace. By changing the direction of this equipment, horizontality of trace is slightly dislocated by the influence of terrestrial magnetism, etc. Adjust it once before use.

3-2 Description of rear surface panel

- (25) TEST FUSE Fuse of power supply for measurement. Rating is 3 A.
- (26) MAIN FUSE Fuse covering all the equipment. Rating is 3 A.



- ②⑦ REMOTE SLIDE TRANS Connector for connecting cable when output voltage control is made from external slide transformer.
- INT/EXT Switch for changing slide transformer to inside or outside.
- ②⑧ EXT Safety Can interrupt primary side of power source for measurement by external switch. Safer measurement is ensured by the application of external safety switch, etc.
- Upon shipment, pins are connected with a jumper inside of the connector. By cutting this jumper, interruption is completed. Connect external switch in such a manner that it turns ON when generating output and OFF when interrupting it.

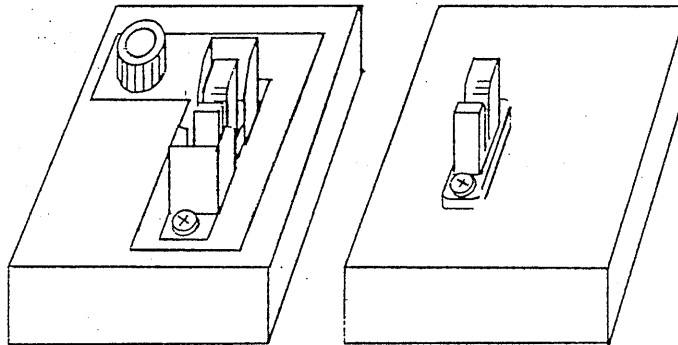
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3-3 Description of accessories

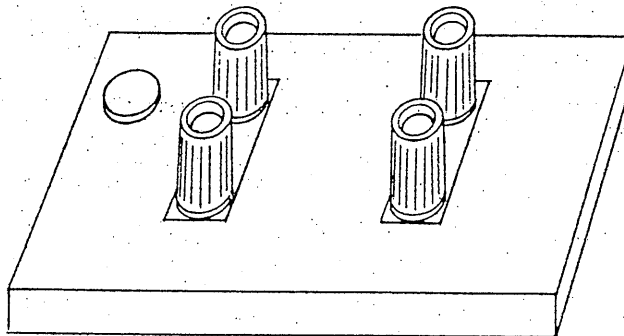
②⑨ Measuring terminal block for high sensitivity

Measuring terminal block to be used in installed condition on ⑨ "TEST BOX". Use it on condition that current axis sensitivity is 10 nA/DIV - 10 mA/DIV.



③⑩ Measuring terminal block for large current

Measuring terminal block to be used in installed condition on ⑨ "TEST BOX". Use it on condition that current axis sensitivity is 0.1 mA/DIV - 1 A/DIV. Remove short bar, then measurement is enabled by four-terminal method. Refer to (26 page, 3-6(5)).



782768

3-4 Supplementary description

(1) "CAPACITY BALANCE"

For correcting parallel capacity of sample. Its correctable range varies considerably depending on output voltage, current axis sensitivity and quality of supplied power waveform. Approximate values of correctable ranges and indicated in the following table.

Current sensitivity \ Output voltage	5mA - 2 $\mu$ A/DIV	1 $\mu$ A/DIV	0.1 $\mu$ A/DIV	10nA/DIV
20 V	200 PF	150 PF	150 PF	5 PF
200 V	200 PF	150 PF	5 PF	-
2 KV	50 PF	10 PF	-	-

Where series resistor : 0.3 M $\Omega$

(2) Permissible power consumption of "SERIES RESISTOR"

By this knob, setting is enabled at an arbitrary value indicated on the panel. These resistors can withstand heat generated when rated output voltage of arbitrary "RANGE" is applied (however, within rated output voltage), for 5 minutes or more. These values are shown in the left column of the table on the 17 page. In addition, it can withstand one half of its mean power continuously. Even if a certain amount of power is

782769

continuously consumed, or even if excessive power is consumed and, taking pause period thereafter, it is repeated with a certain cycle, no problem arises as far as mean power remains within the values of the right column of the table.

If dissipation exceeds permissible value and the temperature of resistor rises excessively, protecting circuit operates to interrupt output. This condition is indicated by the illumination of light emitting diode of "OVER LOAD" located closely to the knob of "SERIES RESISTOR". Wait while leaving "TEST VOLTS" knob at reset position, until temperature decreases and the light emitting diode is turned off. No output is generated even if voltage reapplication is attempted, as long as the light emitting diode is lit.

Voltage reapplication becomes possible after turning-off of light emitting diode.

This operation of "OVER LOAD" protection means that excessive power was applied to a resistor designated on the panel. Therefore, in case of voltage reapplication, select a resistor having 1-step or 2-step smaller resistance value to make power consumption in the resistor smaller.

782770

Relation between series resistor and permissible dissipation (expressed by current value)

Resistance of series resistor	Withstanding the following current for 5 min	Withstanding the following current continuously
( $\Omega$ )	(Ap-p)	(Ap-p)
1	10	7
3	7	5
10	2	1.5
30	1	0.7
100	1	0.7
300	0.7	0.5
1 K	0.2	0.15
3 K	0.1	70 m
10 K	0.1	70 m
30 K	70 m	50 m
100 K	20 m	20 m
300 K	7 m	7 m
1 M	2 m	2 m

(3) Relationship between "RANGE" switch and "VERTICAL CURRENT/DIV" switch

This equipment is designed in such a manner that no output is generated for the protection of overcurrent while these two knobs are in the following combination. In case of this combination, light emitting diode "SET

782771

MORE HIGH SENSITIVITY" is lit to indicate this condition within the following conditions:

At 2 KV range : - 20 mA/DIV

§

1 A/DIV

At 200 V range : - 0.2 A/DIV

§

1 A/DIV

If "CURRENT/DIV" knob is set at higher sensitivity, light emitting diode is extinguished and voltage application is enabled.

(4) Relationship between "MODE" switch and original point

Turn "MODE" switch to "SINE" and adjust "POSITION"  $\leftrightarrow$ .  $\updownarrow$  " so as to position original point at the center of scale. Then turn "MODE" switch to "REVERSE" or "FORWARD", then the original point automatically moves to left bottom of the scale. In other words, by the operation of "MODE" switch, the original point shifts by 5 DIV step in both of current and voltage axis.

3-5 Precautions in operation

Since this equipment incorporates high voltage, suffi-

782772

cient precautions have been paid for safety in its design. However, for the prevention of accidental fault, take the following precautions without fail for its use.

- (1) Connect GND terminal on the panel to ground before use.
- (2) Before switching-in "POWER" switch, confirm that the knob of "TEST VOLTS" is located on "RESET" position.
- (3) In case of application in 200V. 2 KV range, connect sample in "TEST BOX" without fail. It is very dangerous to draw out output with lead wire, so do not make such wiring.
- (4) Securely return the knob of "TEST VOLTS" to the position of "RESET" except for measuring time.
- (5) Do not change "RANGE" and "MODE" switches while generating output. Change those after once returning the knob of "TEST VOLTS" to "RESET" position. If the above switches are changed while generating output, the primary side of power supply for measurement is interrupted. In such case, return the knob of "TEST VOLTS" to "RESET" position, then reapplication of output is made possible.

782773

- (6) Do not touch sample or measuring terminal while applying voltage on the sample. There is a danger of electrical shock.
- (7) The equipment is designed in such a manner that, if the lid of "TEST BOX" is opened during the use of 200V.2KV range, output is interrupted to ensure safety. No output is generated if reapplication of output is tried by resetting while the lid is opened. In such condition, "TEST ON" lamp is not lit, which indicates non-readiness for generating output.

It is not preferable to interrupt test supply by opening the lid of "TEST BOX" while applying voltage to sample. Open the lid after returning the knob of "TEST VOLTS" to "RESET".

The following points shall be taken into consideration for the ensurance of long-time trouble-free application of this equipment.

- (1) If original point is made stationary for a long-time with high brightness, scorch is caused on fluorescent surface. Decrease "INTENSITY" adequately except for measuring time.

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- (2) The equipment can be used normally within the range of input supply voltage  $100V \pm 10\%$ . The application outside of this range may cause not only incomplete operation but also trouble, so adjust the supply voltage within the range of  $100V \pm 10\%$  by adequate method before application.
- (3) Avoid application in an ambient condition where high temperature, high humidity or dusty environment is involved, which may cause trouble.

### 3-6 Measurement

#### (1) Preparatory step

Before applying power supply, connect panel GND terminal to ground. Then set the knobs and switches as follows.

#### Rear panel

o REMOTE SLIDE TRANS : INT (Push to upper position.)

#### Panel

- ② POWER : OFF (Push to lower position.)  
③ TEST VOLTS : RESET (Turn fully counter clockwise.)  
④ RANGE : 20 V  
⑤ MODE : SINE

782775



- ⑥ CAPACITY BALANCE : Fully turn counter clockwise  
(both of outside and inside).
- ⑦ SERIES RESISTOR : Arbitrary
- ⑫ POSITION  $\updownarrow$  : Approximately center
- ⑬ POSITION  $\leftrightarrow$  : - ditto -
- ⑭ VERTICAL CURRENT/DIV: 10 mA/DIV
- ⑮ HORIZONTAL VOLTS/DIV: 1V/DIV
- ⑰ POSITION SHIFT : 0
- ⊙ Measuring terminal : For high sensitivity  
block

Connect power supply cord to the socket of AC 100V  
 $\pm 10\%$  ( 50 - 60 Hz), then turn switch on.

"INTEN" adjustment

10 - 15 seconds after turning the switch on, turn  
this knob clockwise, then bright point appears. Ad-  
just this to have adequate brightness.

"FOCUS", "ASTIG" adjustment

Adjust each so as to make bright point smallest and  
sharpest, respectively.

"SCALE ILLUM" adjustment

Turn clockwise, then becomes brighter. Adjust it

782776

to have desired brightness.

"TRACE ROTATION" adjustment

Adjust "POSITION  $\uparrow$  .  $\rightarrow$ " to position bright point at the scale center. Then turn the knob of "TEST VOLTS" clockwise, resulting in appearance of horizontal trace, so set the trace to become full scale. In this case, adjust semi-fixed resistor of "TRACE ROTATION" so as to mate the trace with the horizontal axis of the scale.

Thus measurement preparation is completed, so return the knob of "TEST VOLTS" once to "RESET" position.

Exemplary description will be given in the following in due sequence with regard to the method of measurement on various samples.

- (2) Example of measurement on forward characteristics of diode for small signal
- o Set knobs as follows.

- ④ RANGE : 20 V
- ⑤ MODE : FORWARD
- ⑥ CAPACITY BALANCE : Fully turn counter clockwise.
- ⑦ SERIES RESISTOR : 30  $\Omega$
- ⑭ VERTICAL CURRENT/DIV : 10 mA/DIV
- ⑱ HORIZONTAL VOLTS/DIV : 0.1 V/DIV

782777

- ⑰. POSITION SHIFT : 0
- ⊙ Measuring terminal : For high sensitivity (black:left,  
block red: right)

o ⑦, ⑭ and ⑱ indicate one example. In case of different condition, set those so as to comply with measuring condition. This holds correct identically in measuring cases of other samples.

o Insert sample in the direction as indicated on the lid of "TEST BOX".

o Turn the knob of "TEST VOLTS" slowly clockwise and apply voltage, then the forward characteristics of diode are obtained.

o In this case, take care not to overturn the knob of "TEST VOLTS" causing scale-over of trace. If it becomes 6 - 8 DIV or higher than the center of the tube surface, overcurrent protecting circuit will operate to interrupt output. In case that it is desired to figure trace again, return the knob of "TEST VOLTS" once to the position of "RESET", then reapply voltage.

(3) Example of measurement on backward characteristics of diode for small signal

o Set knobs as follows.

782778

- ④ RANGE : 200 V
- ⑤ MODE : REVERSE
- ⑥ CAPACITY BALANCE : Fully turn counter clockwise.
- ⑦ SERIES RESISTOR : 0.1K $\Omega$
- ⑭ VERTICAL CURRENT/DIV : 10  $\mu$  A/DIV
- ⑱ HORIZONTAL VOLTS/DIV : 20 V/DIV
- ⑲ POSITION SHIFT : 0
- ⊙ Mesuring terminal : For high sensitivity  
block

- o Apply voltage gradually while leaving sample setting as it stands, then the backward characteristics of diode are obtained.
- o In case that the adjustment of applied voltage is difficult due to overcurrent protecting circuit operation caused by rapid rising at breakdown point, increase the value of "SERIES RESISTOR", then it will become easy.
- o There is a possibility where waveform becomes a loop due to parallel capacity of sample. Adjust it with the knob of CAPACITY BALANCE so as to obtain smallest loop. Inner red knob is for fine adjustment and outer black knob for coarse adjustment.

(4) Example of measurement on forward characteristics of medium power diode

o Set knobs as follows.

- ④ RANGE : 20 V
- ⑤ MODE : FORWARD
- ⑥ CAPACITY BALANCE : Fully turn counter clockwise.
- ⑦ SERIES RESISTOR : 10  $\Omega$
- ⑭ VERTICAL CURRENT/DIV : 50 mA/DIV
- ⑱ HORIZONTAL VOLTS/DIV : 0.1 V/DIV
- ⑲ POSITION SHIFT : 0
- ⊙ Measuring terminal : For large current block

o Connect sample in the direction as indicated on the lid of "TEST BOX".

o Apply voltage gradually, then the forward characteristics of diode are obtained.

(5) Example of measurement on forward characteristics of medium power diode by four-terminal method

o When measuring sample by applying current larger than 1 A, measuring error may be caused by contact resistance of binding cord, resistance of lead wire, etc. Measurement by four-terminal method is recommended.

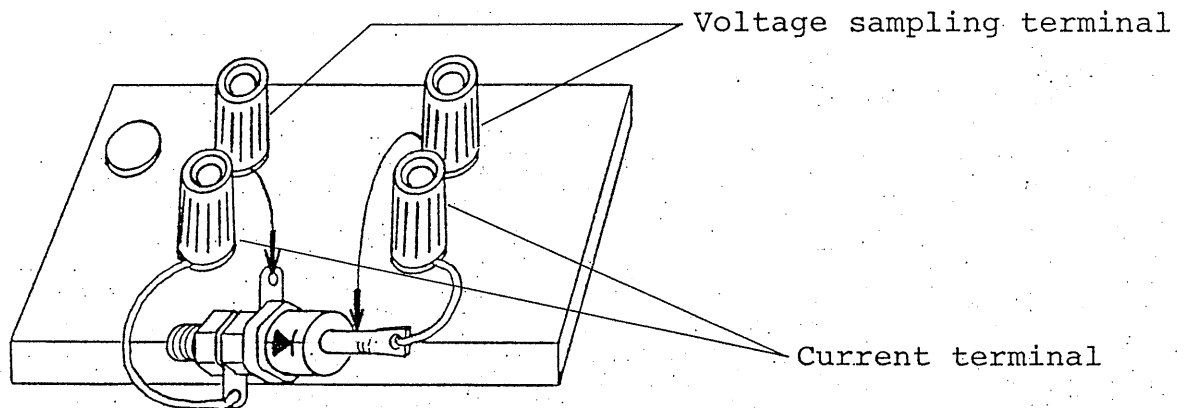
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o Set knobs as follows.

- ④ RANGE : 20 V
- ⑤ MODE : FORWARD
- ⑥ CAPACITY BALANCE : Fully turn counter clockwise.
- ⑦ SERIES RESISTOR : 1  $\Omega$
- ⑭ VERTICAL CURRENT/DIV : 0.1 A/DIV
- ⑱ HORIZONTAL VOLTS/DIV : 0.1 V/DIV
- ⑲ POSITION SHIFT : 0
- ⊙ Measuring terminal : For large current  
block

o Remove short bar of output terminal.

o Connect sample as shown in the following drawing.



Apply voltage gradually in the above connection, then waveform measurement can be made without error due to contact resistance, etc.

(6) Example of measurement on backward characteristics of medium

782781

power diode

o Set knobs as follows.

- ④ RANGE : 200 V
- ⑤ MODE : REVERSE
- ⑥ CAPACITY BALANCE : Fully turn counter clockwise.
- ⑦ SERIES RESISTOR : 0.1 K $\Omega$
- ⑭ VERTICAL CURRENT/DIV : 10  $\mu$  A/DIV
- ⑱ HORIZONTAL VOLTS/DIV : 20 V/DIV
- ⑲ POSITION SHIFT : 0
- ⊙ Measuring terminal : For high sensitivity  
block

o Connect sample and apply voltage gradually, then backward characteristics of diode are obtained.

o In case that waveform becomes a loop, adjust the knob of "CAPACITY BALANCE" so as to obtain smallest loop.

However, if sensitivity is set beyond certain limit, the loop becomes 8 figure regardless of the adjustment of "CAPACITY BALANCE". This is caused by the voltage coefficient of sample capacity. In this case, capacity cancellation can be made only at one point of certain voltage. This corresponds to the cross point of 8. If 8 figure is so large that the measurement is impossible,

782782

reset ⑭ VERTICAL CURRENT/DIV to lower sensitivity side for before use.

(7) Example of measurement on Zener voltage of Zener diode

o Set knobs as follows.

- ④ RANGE : 20 V
- ⑤ MODE : REVERSE
- ⑥ CAPACITY BALANCE : Fully turn counter clockwise.
- ⑦ SERIES RESISTOR : 0.3 K $\Omega$
- ⑭ VERTICAL CURRENT/DIV : 1 mA/DIV
- ⑱ HORIZONTAL VOLTS/DIV : 1 V/DIV
- ⑲ POSITION SHIFT : 0
- ⊙ Measuring terminal : For high sensitivity block

o Connect sample and apply voltage gradually, then Zener characteristics of Diode are obtained.

(8) Example of use of "POSITION SHIFT" knob

o Set voltage axis sensitivity at 0.1 V/DIV having 10 times better sensitivity, while applying output in the foregoing condition. Then the waveform becomes in a condition



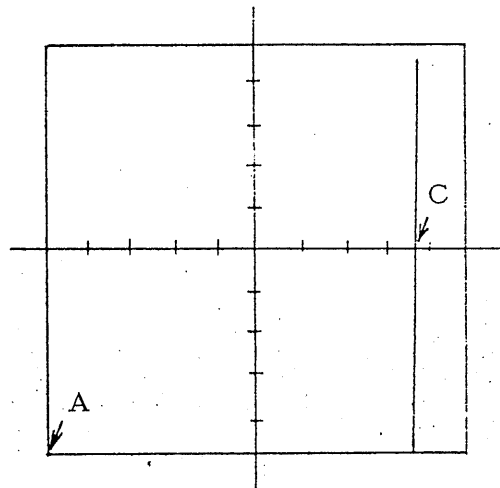
where 10 times magnification is applied to the right hand direction, and it disappears on the CRT surface.

- o Turn the knob of "POSITION SHIFT" continuously, then rising part of Zener appears at a certain location.
- o One example is shown in the following drawing.
- o Read the number of steps of "POSITION SHIFT".

Setting of knob  
on panel surface

HORIZONTAL 1 V/DIV

POSITION SHIFT 0

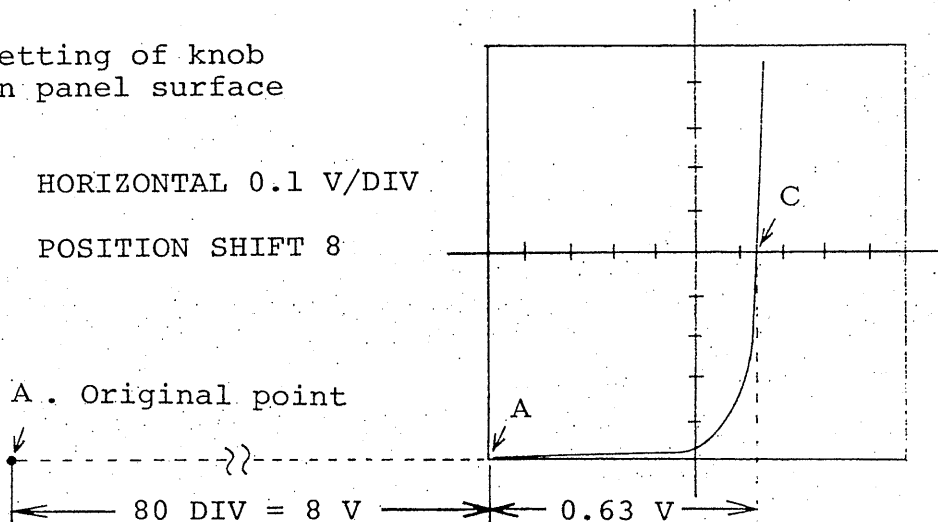


Setting of knob  
on panel surface

HORIZONTAL 0.1 V/DIV

POSITION SHIFT 8

A.. Original point



- o In the above example, the original point shifts to the left

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hand direction by the amount

$$10 \text{ DIV} \times 8 = 80 \text{ DIV}$$

then it becomes A'. The voltage between A' and A becomes

$$0.1 \text{ V/DIV} \times 80 \text{ DIV} = 8 \text{ V.}$$

The voltage on the point C is obtained as

$$8 \text{ V} + 0.63 \text{ V} = 8.63 \text{ V.}$$

Thus the measurement can be made with one order higher resolution in comparison with the measurement without "POSITION SHIFT".

### 3-7 Option

As for an option, external slide transformer is provided. By this application, output voltage may be varied by remote operation.

#### Method of use

- o Turn "POWER" switch of the main body to "OFF".
- o Connect the cable of external slide transformer to the connector on the rear surface of the main body.
- o Change the switch on the side of the connector from "INT" to "EXT".
- o Confirm the knob of "TEST VOLTS" on the external slide transformer is on "RESET" position, then switch "POWER" switch to "ON".

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- o Thus the external slide transformer can be used identically to the internal transformer.

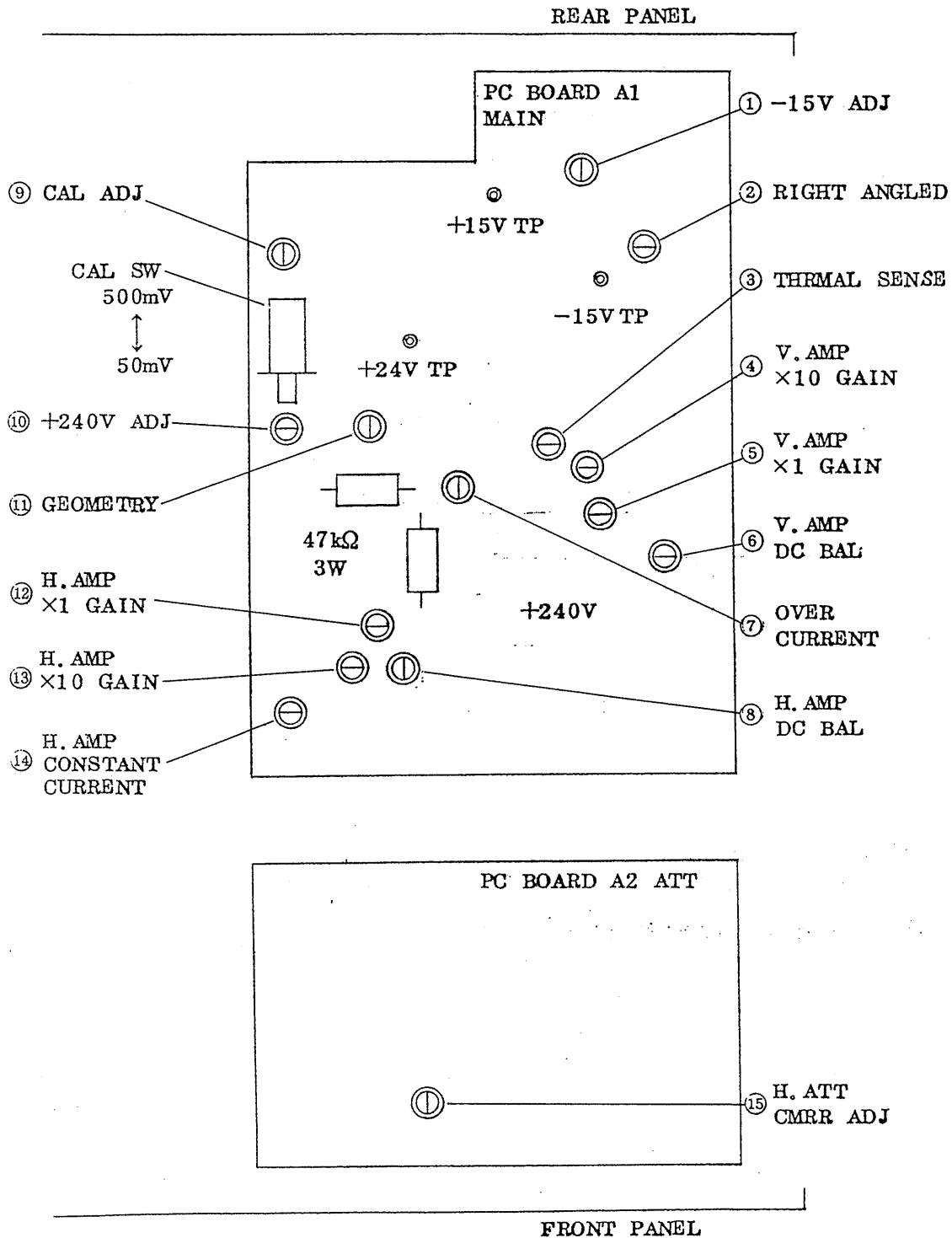
#### Precautions

- o The above operation of "INT" and "EXT" change switch shall be made after setting the knob of "TEST VOLTS" to "RESET" together with setting "POWER" to "OFF".

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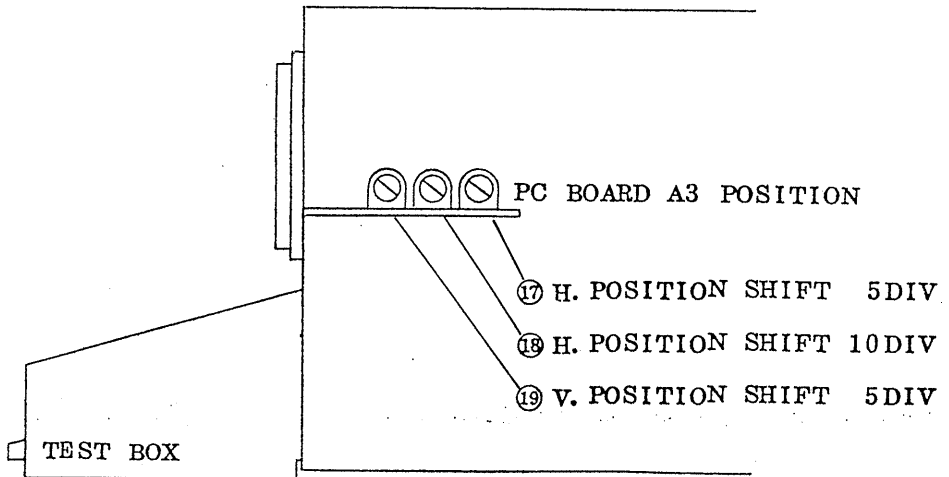
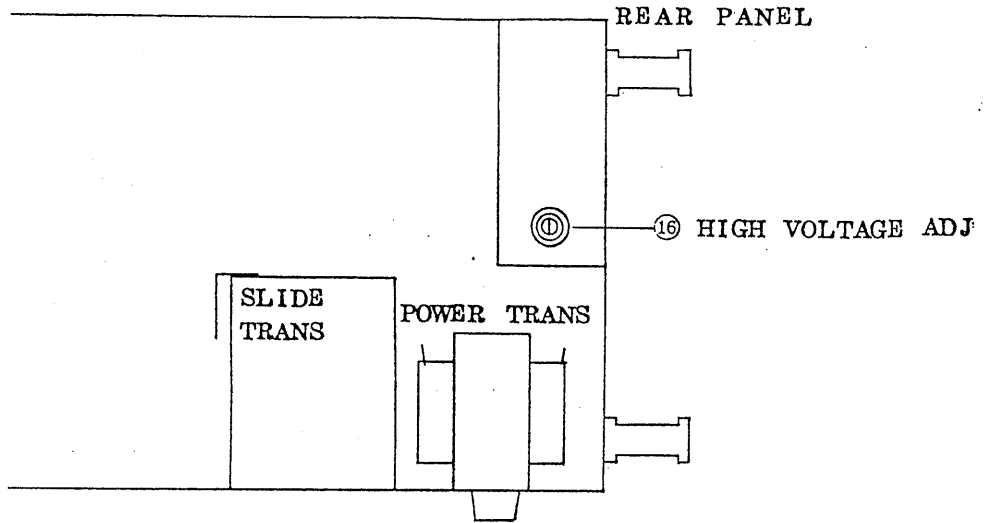
4. MAINTENANCE

Locations of potentiometers (semi-fixed resistors) for adjustments and calibration of this instruments are shown in the drawings which follows. Adjust these potentiometers observing the explanations (in the due order of explanations) given in the subsequent paragraphs.



\* TOP VIEW

782787



782788

#### 4-1. Adjustments and Calibration

(1) -15 V ADJ:

This potentiometer is for the  $\pm 15$  V and +24 V supply voltages. The -15 V supply voltage is used as the reference. So adjust this potentiometer that the voltage measured at the -15 V TEST point becomes -15 V. Then, check the voltages at the +15 V and +24 V TEST points.

(10) +240 V ADJ:

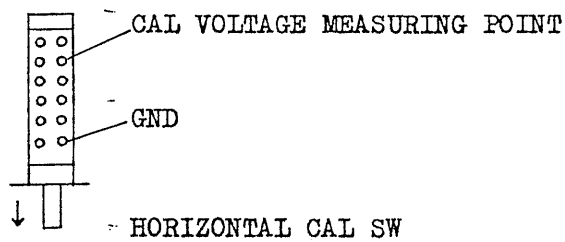
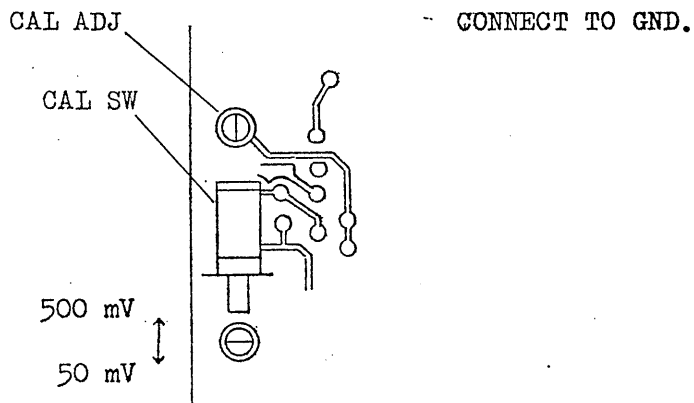
This potentiometer is for the +240 V supply voltage. So adjust this potentiometer that the voltage measured at the 240 V TEST point becomes +240 V.

(16) HIGH VOLTAGE ADJ:

This potentiometer is for the CRT acceleration voltage. So adjust this potentiometer that the voltage becomes -1900 V as measured at the CRT cathode (Pin No. 3) using a high input impedance voltmeter.

(9) CAL ADJ:

This potentiometer is for the reference voltage (CALIBRATION voltage). Connect the base of 2SC372 of the CAL circuit to the GND, pull out the HORIZONTAL CAL pushbutton switch, and so adjust this potentiometer that the switch pin voltage becomes 500 mV as measured with a DC voltmeter.



PULL OUT

(11) GEOMETRY:

This potentiometer is for geometrical distortion compensation. So adjust this potentiometer that geometrical distortion becomes minimum.

(2) RIGHT ANGLED:

This potentiometer is for co-ordinate angle (the right angle) adjustment of CRT. So adjust this potentiometer that the horizontal trace and vertical trace cross with the right angle.

782790

(6) V. AMP DC BAL:

This potentiometer is for DC balance adjustment of the current axis amplifier. So adjust this potentiometer that the spot remains at the same position on the CRT screen when the sensitivity is changed between 1 and 10 by means of the 10 MAG knob.

(5) V. AMP  $\times 1$  GAIN:

This potentiometer is for  $\times 1$  GAIN adjustment of the current axis amplifier. Set the CAL switch on PC board A1 in the 500 mV state and pull out the CAL button on the front panel so that spots are displayed at approximately 10-DIV intervals vertically on the CRT screen. So adjust this potentiometer that the spots are spaced accurately with 10-DIV distances.

(4) V. AMP  $\times 10$  GAIN:

This potentiometer is for  $\times 10$  GAIN adjustment. Set the CAL switch in the 50 mV state and pull out the 10 MAG knob so that spots are displayed at approximately 10-DIV intervals. So adjust this potentiometer that the spots are spaced accurately with 10-DIV distances.

(14) H. AMP CONSTANT CURRENT:

This potentiometer is for setting the operating point of the voltage axis amplifier.

(8) H. AMP DC BAL:

This potentiometer is for DC balance adjustment of the voltage axis amplifier. Adjust this potentiometer in a similar manner as that of the current axis amplifier.

782791



(12) H. AMP  $\times$  1 GAIN:

This potentiometer is for  $\times$  1 GAIN adjustment of the voltage axis amplifier. Adjust this potentiometer in a similar manner as that of the current axis amplifier.

(13) H. AMP  $\times$  10 GAIN:

This potentiometer is for  $\times$  10 GAIN adjustment of the voltage axis amplifier. Adjust this potentiometer in a similar manner as that of the current axis amplifier.

(15) H. ATT CMRR ADJ:

This potentiometer is for balance adjustment of the voltage axis attenuator.

(18) H. POSITION SHIFT 10 DIV:

This potentiometer is for adjustment of the position shift rate of voltage axis.

(17) H. POSITION SHIFT 5 DIV:

(19) V. POSITION SHIFT 5 DIV:

Set the MODE switch in the SINE position, move the spot to the CRT screen center and change the MODE switch to the REVERSE position. The spot will shift by 5 DIV both in the voltage and current axes. These potentiometers are for adjustment of these shifting rates.

782792

(3) THERMAL SENSE:

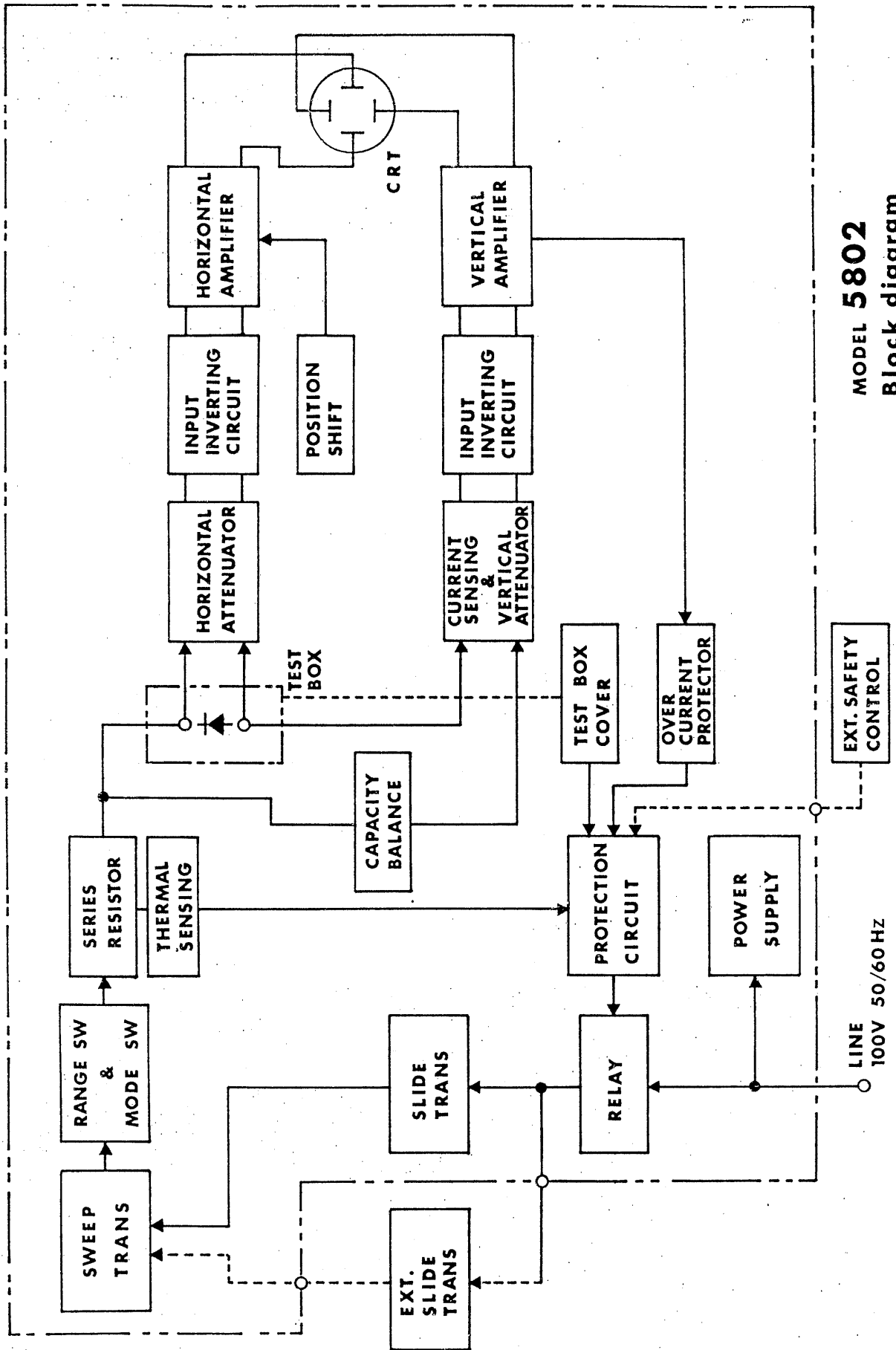
This potentiometer is for setting the operating point of the overheat protection circuit which guards against overheating of the dissipation limiting resistor.

(7) OVERCURRENT:

This potentiometer is for setting the operating point of the overcurrent protection circuit. So adjust this potentiometer that the circuit operates at the 7 DIV point from the CRT screen center.

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MODEL 5802  
Block diagram