INSTRUCTION MANUAL

FOR

MODEL 552J ALIGNMENTSCOPE

KIKUSUI ELECTRONICS CORPORATION

'79.6.26

7925-68A

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.

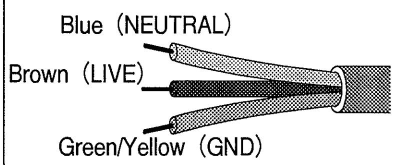
☐ AC power cable

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.

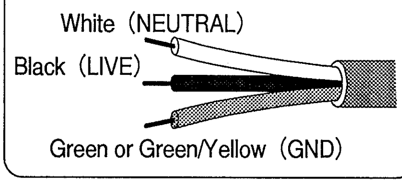
WARNING

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

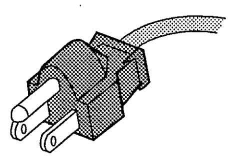
☐ Without a power plug



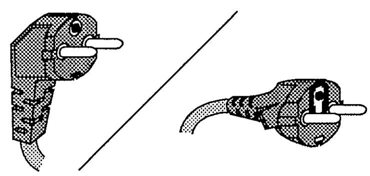
☐ Without a power plug



☐ 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

1-1. Description

Kikusui Model 552J Alignmentscope has been designed primarity for use as an X-Y scope in combination with a sweep generator for direct observation and measurement of frequency response and other performance characteristics of various devices.

The alignmentscope employs a vertical amplifier of 1 mV/DIV or over of sensitivity and up to 200 kHz of frequency response.
It employs a 133-mm high-Intensity CRT. The vertical amplifier is fabricated with ICs, reducing DC drift to the practicable minimum and enhancing the operation reliability. The high-intensity CRT with stabilized acceleration voltage ensures bright and stable waveform observation.

The alignmentscope is compact (170 mm wide and 260 mm high), improving the space factor.

1-2. Features

o High-sensitivity high-stability vertical amplifier:

The vertical amplifier employs ICs, thereby reducing DC drift to the minimum and attaining a high sensitivity of 1 mV/DIV or over and a wide frequency response of DC ~ 200 kHz (within -3 dB).

o High-intensity CRT:

The CRT is a high intensity type with a high beam penetration factor, thereby providing a sufficient brightness for observation of pulse signals. The screen diameter is 133 mm.

o Stabilized acceleration voltage:

The acceleration voltage is stabilized, thereby ensuring stable waveform display with less effects of line voltage variation and intensity change.

1-3. Composition

The instrument consists of the following:

Alignmentscope	1
942A Terminal adaptor	2
Instruction manual	1

2. SPECIFICATIONS

o Vertical axis

Item	Spec.	Remarks
Sensitivity	1 mV/DIV or over	1 DIV = approx. 9.5 mm
Attenuator	1/1, 1/10, 1/100, within $\pm$5%	4 ranges including GND
Sensitivity adjustment	Continuously variable between ranges	Variable range = 10 times or over
Frequency response	DC: DC ~ 200 kHz (within -3 dB) AC: 2 Hz ~ 200 kHz (within -3 dB)	With reference at 1 kHz, 8 DIV
Input impedance	1 MΩ $\pm$2%, 40 pF or less	Parallel
Input terminal	BNC receptacle	
Maximum allowable input voltage	400 Vp-p, for all ranges	DC + AC peak (AC at 1 kHz or lower)
Polarity switching	Possible	180° inversion

o Horizontal axis

Item	Spec.	Remarks
Sensitivity	200 mV/DIV or over	1 DIV ≈ approx. 9.5 mm
Sensitivity adjustment	Continuously variable down to approx. 1/100	
Frequency response	DC: DC ~ 100 kHz (within -3 dB) AC: 2 Hz ~ 100 kHz (within -3 dB)	With reference at 1 kHz, 10 DIV, maximum sensitivity
Input impedance	Approx. 100 kΩ, 40 pF or less	Parallel
Input terminal	BNC receptacle	
Maximum allowable input voltage	100 Vp-p	DC + AC peak (AC at 1 kHz or lower)
Line sweep	Phase adjustment 130° or over	
Polarity switching	Possible	180° inversion

o Pulse marker

Item	Spec.	Remarks
Sensitivity	1 Vp-p/DIV or over	1 DIV = approx. 9.5 mm
Input coupling	AC	
Input impedance	Approx. 100 kΩ, 130 pF or less	Parallel
Sensitivity adjustment	Continuously variable down to approx. 1/100	
Frequency response	Approx. 100 Hz to approx. 200 kHz	
Maximum allowable input voltage	100 Vp-p	DC + AC peak (AC at 1 kHz or lower)
Polarity switching	Selectable between "+" and "-"	180° inversion
Input terminal	BNC receptacle	Used in common for intensity modulation marker

o Intensity modulation marker

Item	Spec.	Remarks
Sensitivity	Discernible intensity modulation with a modulating signal of 300 mV or over	At modulating signal frequency 1 kHz
Polarity	Intensity increases with positive-going signal	
Input coupling	AC	
Input impedance	Approx. 100 kΩ, 110 pF or less	Parallel
Frequency response	Approx. 100 Hz to approx. 400 kHz	
Maximum allowable input voltage	100 Vp-p	DC + AC peak (AC at 1 kHz or lower)
Input terminal	BNC receptacle	Used in common for pulse marker

o Calibration voltage

Item	Spec.	Remarks
Frequency	Line frequency (50/60 Hz)	
Output voltage	50 mV	Positive polarity, square wave
Accuracy	±5%	

o CRT

Item	Spec.	Remarks
Type	Round type, 133 mm dia.	High intensity type
Fluorescent substance	B31	Green
Effective screen size	VERT 8 DIV × HORIZ 10 DIV	1 DIV = approx. 9.5 mm
Acceleration voltage	Approx. 1400 V	Stabilized

o Power requirements

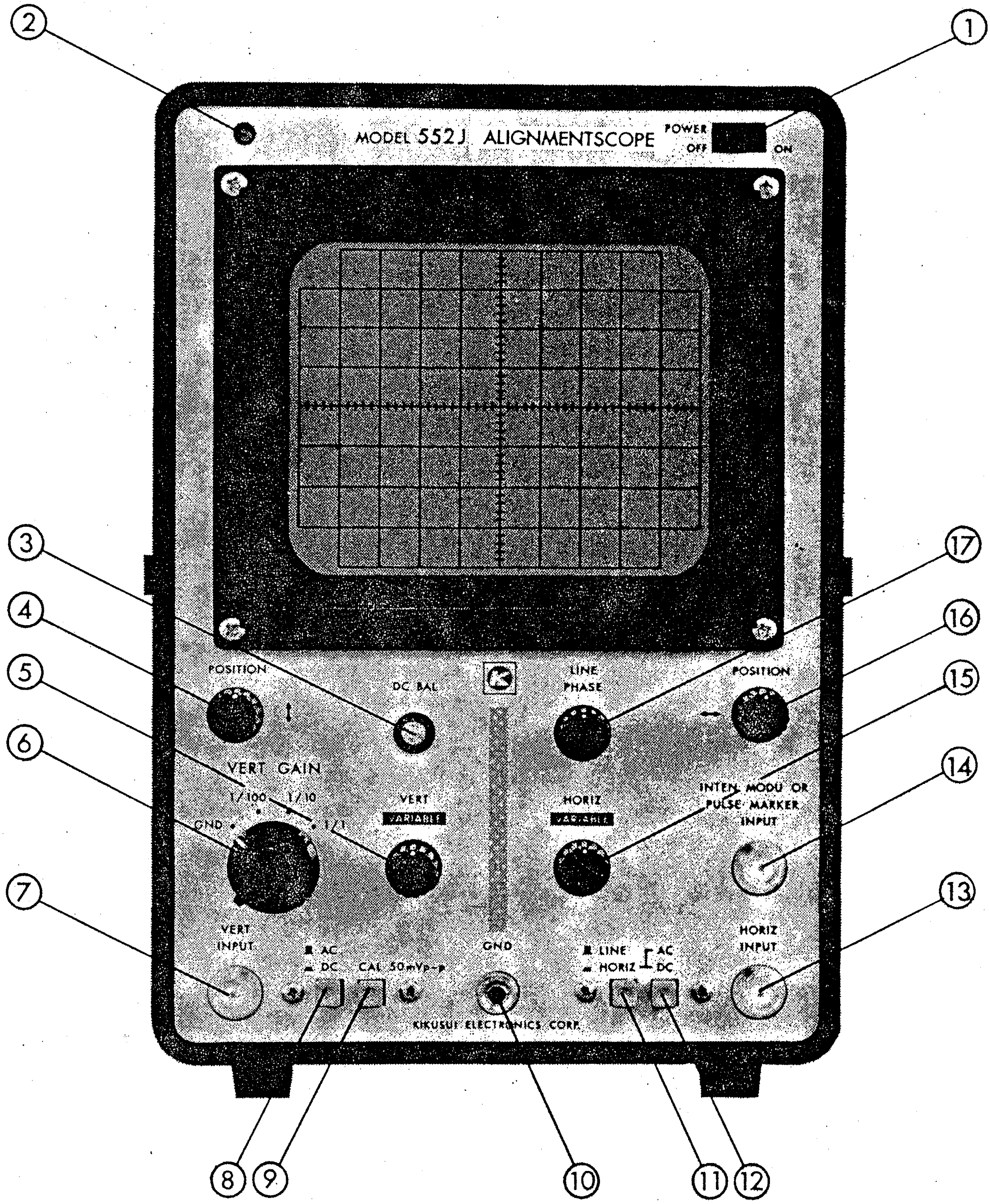
Item	Spec.	Remarks
Line voltage	100 V, 110 V, 120 V, 220 V, 230 V, 240 V. (within ±10% of each nominal voltage)	Line voltage modification by internal transformer tap change
Line frequency	50 ~ 60 Hz	
Power consumption	Approx. 11 VA	

o Mechanical specification

Item	Spec.	Remarks
External dimensions	165 W × 240 H × 405 D mm 170 W × 260 H × 450 D mm	Housing case Maximum dimensions
Weight (net)	Approx. 6.5 kg	

3. OPERATION METHOD

3-1. Layout of Front Panel Components



3-2. Explanation of Front Panel Components

(1) POWER

Main power switch (slide switch) of the instrument. The right-hand position is for instrument power ON.

(2) LED (light emitting diode)

Instrument power pilot light. Turns ON when the instrument power is turned ON.

(3) DC BAL

Semi-fixed potentiometer for DC balance control of the vertical amplifier. So adjust this potentiometer using a screwdriver that the trace (base line) does not shift vertically when (5) VERT VARIABLE knob is turned.

(4) POSITION

Knob for vertical positioning of the trace on CRT screen. The trace moves upward as this knob is turned clockwise, and vice versa.

(5) VERT VARIABLE

Vertical amplifier gain adjustment knob. Continuously variable down to approximately 1/10. The gain increases as this knob is turned clockwise.

(6) VERT GAIN

Vertical axis input attenuator switch, for ranges of 1/1, 1/10 and 1/100. By using in conjunction with (5) VERT VARIABLE knob, the vertical axis gain is continuously variable for a total range of from 1/1 to approximately 1/1000. When this switch is set in the GND position, (7) VERT INPUT terminal becomes open while the input point of the vertical amplifier is grounded.

(7) VERT INPUT

Vertical axis input terminal.

(8) AC DC

Pushbutton switch for vertical axis input coupling between AC and DC. The █ button state is for AC coupling for signal observation cutting off the DC component. The ▂ button state is for DC coupling for signal observation including the DC component.

(9) CAL 50 mVp-p

Pushbutton switch for calibration of vertical axis sensitivity. When in the ▂ state, a calibration signal of 50 mVp-p and of a square wave of the AC line frequency is applied to the vertical amplifier input point. The input terminal in this case is held open.

(10) GND

GND terminal electrically connected to the instrument chassis.

(11) LINE HORIZ

Pushbutton switch for selecting the horizontal axis input signal. When in the ▮ button state (LINE state), the AC line signal is applied to the horizontal amplifier input; when in the ▬ button state (HORIZ state), the signal applied to (13) HORIZ INPUT is fed to the horizontal amplifier input.

(12) AC DC

Pushbutton switch for selecting the horizontal axis input coupling. The function is the same with that of (8) AC DC switch for the vertical axis.

(13) HORIZ INPUT

Horizontal axis input terminal.

(14) INTEN MODU OR PULSE MARKER INPUT

Input terminal for intensity modulation marker signal or pulse marker signal. Switching is done at the rear panel.

(15) HORIZ VARIABLE

Horizontal axis gain adjustment knob. As this knob is turned clockwise, the gain increases. The adjustment range is down to approximately 1/100.

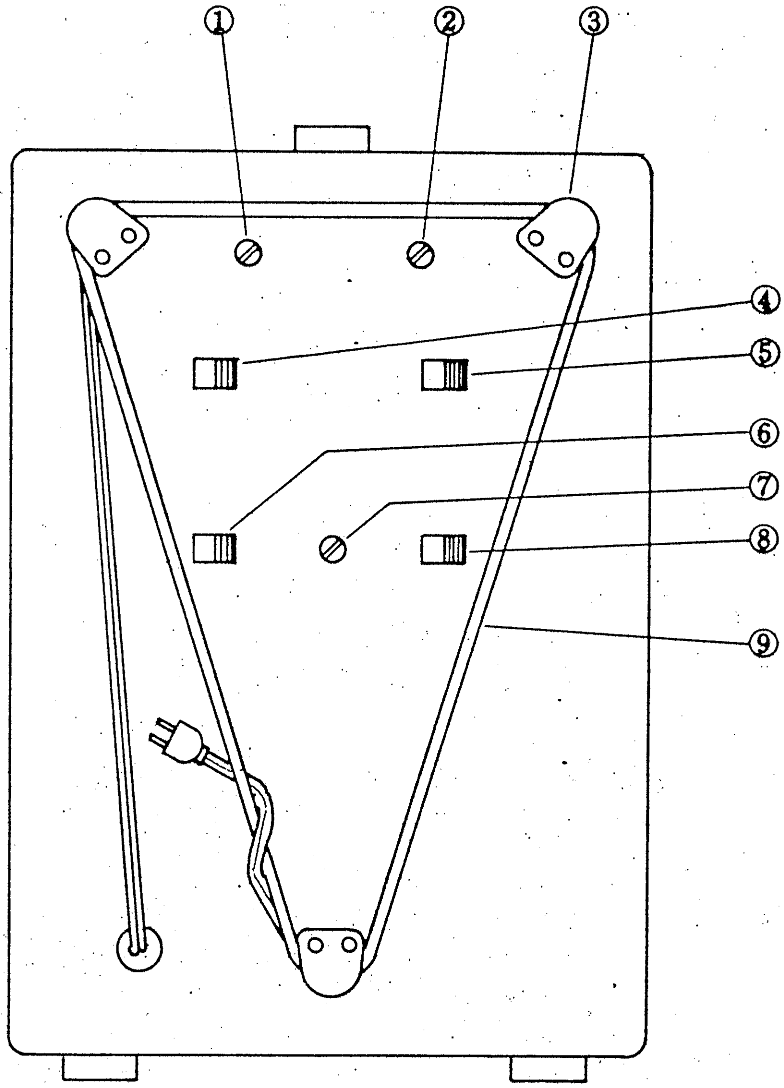
(16) POSITION

Knob for horizontal positioning of the trace on CRT screen. The trace moves rightward as this knob is turned clockwise, and vice versa.

(17) LINE PHASE

Knob for phase adjustment of the AC line signal to the horizontal amplifier when (11) LINE HORIZ switch is set in the _█_ state. The phase is continuously variable for 130° or over.

3-3. Layout of Rear Panel Components



3-4. Explanation of Rear Panel Components

(1) INTEN

Knob for trace intensity control. The trace becomes brighter as the knob is turned clockwise, it fades away as the knob is turned fully counterclockwise.

(2) FOCUS

Knob for focussing the trace image. So adjust this knob that the trace image becomes sharpest.

(3) CORD HOOKS

Hooks (three) for taking up the power cord.

(4) HOR POLARITY

Horizontal axis polarity switch which inverts the displayed waveform between rightward and leftward. Normally, set this switch in the "+" position.

(5) VERT POLARITY

Vertical axis polarity switch which inverts the displayed waveform between upward and downward. Normally, set this switch in the "+" position.

(6) INTEN MODU/PULSE MARKER

Switch for selecting the intensity modulation marker or pulse marker.

(7) AMPLITUDE

Pulse marker sensitivity adjustment knob. The sensitivity increases as this knob is turned clockwise. At the extremely counterclockwise position, the sensitivity is reduced to approximately 1/100.

(8) POLARITY

Pulse marker polarity selector slide switch.

(9) POWER CORD

AC power cord with separable plug of 125 V AC rating. When the instrument is modified for a voltage higher than 125 V, replace the plug with one which meets the required voltage.

3-5. How to Use the INTEN MODU OR PULSE MARKER INPUT terminal

o To use as INTEN MODU (Intensity modulation) terminal:

Set(6) INTEN MODU PULSE MARKER selector switch on the rear panel in the INTEN MODU state and apply an intensity modulation signal to (14) INTEN MODU OR PULSE MARKER INPUT terminal on the front panel. For discernible intensity modulation, an input signal voltage of 300 mVp-p or over is required. The input signal may be either positive or negative polarity, either pulse or sinusoidal waveform. The trace becomes brighter with a positive-going input signal.

o To use as PULSE MARKER terminal:

Set (6) INTEN MODU, PULSE MARKER selector switch on the rear panel in the PULSE MARKER state and apply a pulse marker signal to (14) INTEN MODU OR PULSE MARKER INPUT terminal on the front panel. With a marker signal input voltage of 1 Vp-p or over, a marker signal with a deflection amplitude of 1 DIV or over is displayed on the CRT screen. The displayed pulse marker amplitude is adjustable with (7) AMPLITUDE knob on the rear panel. The polarity of the displayed pulse marker is selectable with (8) POLARITY switch as shown in Fig. 1.

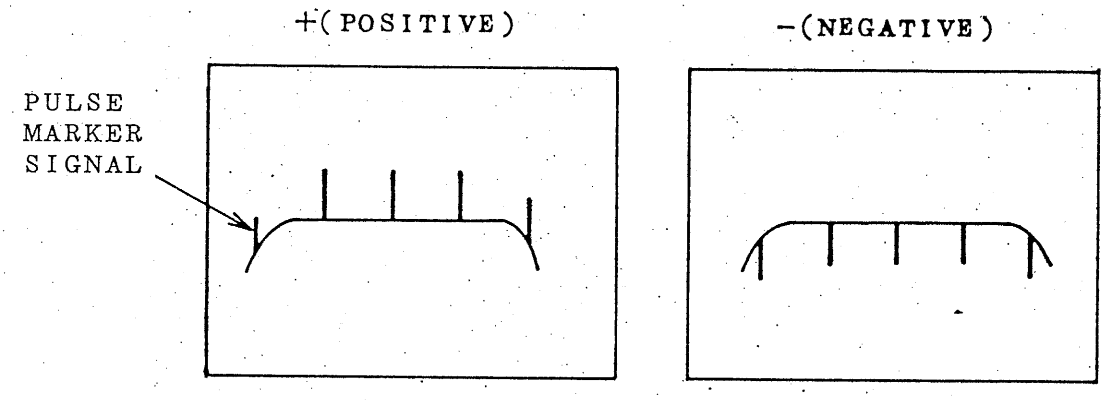


Fig. 1

3-6. Precautions in Use

o AC line voltage:

Normally, the instrument is shipped from the manufacturer's factory being set for the AC line voltage of nominal 100 V. Under this state, the instrument operates normally with an AC line voltage of 100 V $\pm$10%. Note that the instrument may not operate normally or may be damaged if the AC line voltage is not within this tolerance.

For use on an AC line voltage other than the above, modify the instrument referring to Item 3-7 "AC Line Voltage Modification."

o Ambient temperature:

The ambient temperature range for normal operation of this instrument is 0°C to 40°C.

o Environments:

Do not operate or store the instrument for a long time in high temperature, high humidity environments in order to prevent malefuctioning or failure of the instrument. Other unfavorable environments for the instrument are high magnetic or electric field, mechanical shocks and vibration.

o CRT screen:

Do not make the trace unreasonably bright and do not leave a stationary beam spot for a long period, lest the CRT screen should be damaged.

3-7. AC Line Voltage Modification

The instrument can be modified for various line voltages by means of internal connectors. Since the power cord plug is of the 125 V rating, change it with a one of the 250 V rating if the instrument is to be operated on a 200V-system line. For modification, change the fuse, tap and connector B referring to the following table and illustration.

AC line voltage range	Fuse	Tap position	Connector position
90 V ~ 110 V 99 V ~ 121 V 108 V ~ 132 V	0.5 A	100 V 110 V 120 V	Connect to the 100V-system position the connector B which runs from power transformer.
198 V ~ 242 V 207 V ~ 253 V 216 V ~ 264 V	0.3 A	220 V 230 V 240 V	Connect to the 200V-system position the connector B which runs from power transformer.

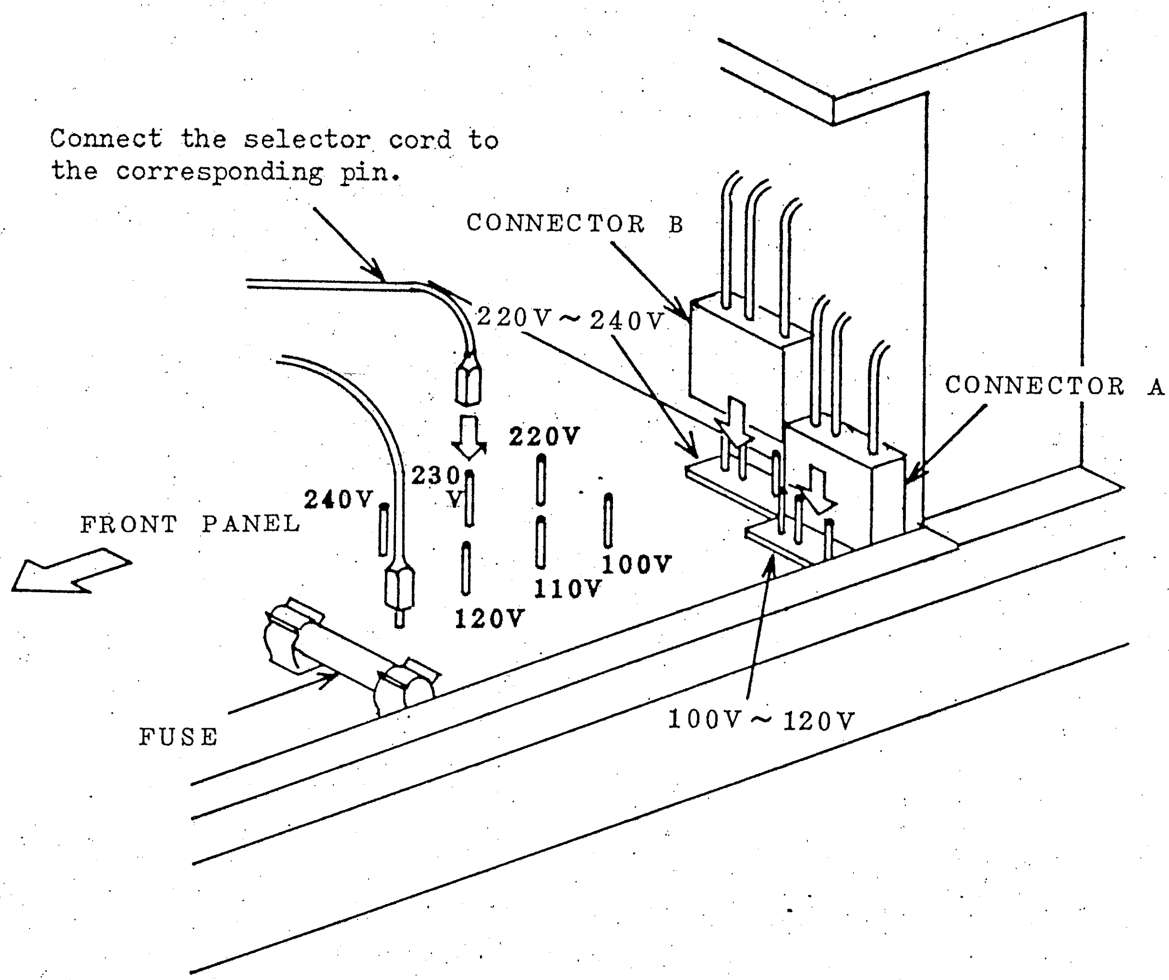


Fig. 2

Precautions

* Be sure to disconnect to power cord from the AC line receptacle when modifying the instrument AC lien voltage.

** Do not more connector A either for the 100V-system or 200V-system.

4. MEASUREMENTS

4-1. Phase Measurement

The phase difference between two signals of the same frequency can be measured by displaying a Lissajous figure with on this alignmentscope. Note, in this measurement, that the phase difference between vertical and horizontal axis of this instrument itself has become not negligible at higher frequencies. Before this measurement, measure the phase difference of the instrument itself (approximately 3° at 10 kHz).

For phase difference measurement, set the LINE/HORIZ selector switch in the HORIZ state and apply the sine wave output of the low frequency signal generator to both vertical and horizontal input terminals as shown in Fig. 3.

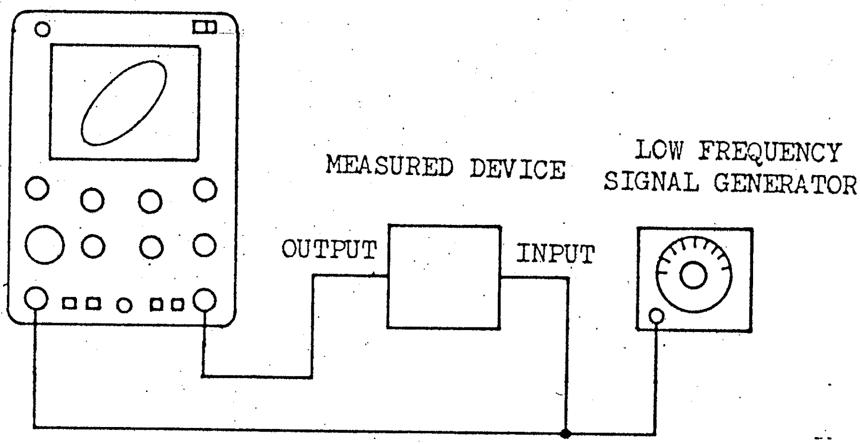


Fig. 3

Make equal the vertical and horizontal amplitude as shown in Fig. 4, by adjusting the VERT GAIN switch, VERT VARIABLE knob and HORIZ variable knob. The phase difference (θ) can be expressed as follows:

$$\theta = \sin^{-1} \frac{A}{B}$$

Where, A: Distance between points the Lissajous figure crosses the vertical (or horizontal) center line when the figure is positioned at the CRT center.

B: Distance between points the Lissajous figure crosses the horizontal (or vertical) center line when the figure is positioned at the CRT center.

The phase difference between the two signals can be known as follows:

Actual phase difference $= \theta$ - (instrument phase difference)

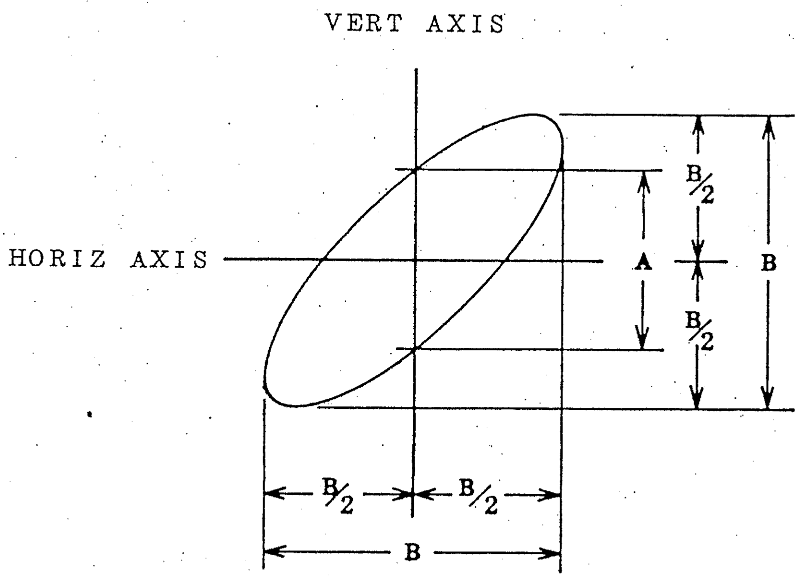


Fig. 4

4-2. Frequency Measurement

Prepare a measuring set up by connecting to the VERT INPUT terminal a known signal source (signal generator, etc) and to the HORIZ INPUT terminal the signal to be measured, so that a Lissajous figure is displayed on the alignmentscope. Gradually change the known signal frequency until the Lissajous figure becomes stationary. When the figure is stationary, there is an integer ratio between the two frequencies. Therefore, the frequency of the measured signal can be known as follows:

$$\text{Measured frequency [Hz]} = \frac{\text{Number of points crossing the horizontal scale line}}{\text{Number of points crossing the vertical scale line}} \times \text{Frequency of signal generator [Hz]}$$

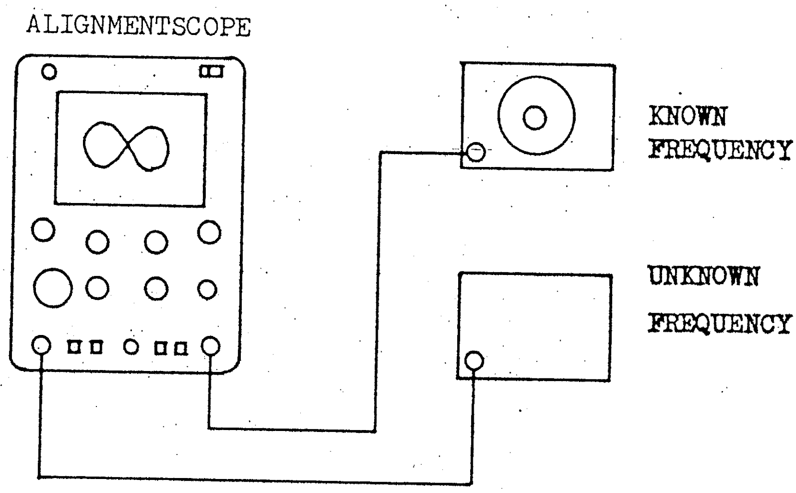
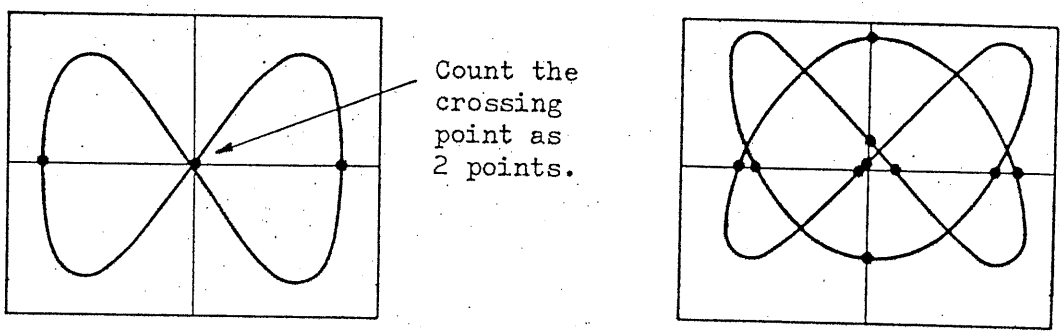


Fig. 5



$\frac{4}{2} = \frac{2}{1}$ (H) (V)

$\frac{6}{4} = \frac{3}{2}$ (H) (V)

Fig. 6

5. MAINTENANCE

5-1. Removing the Case

To gain access to the internal components, remove the top case by undoing the eight clamping-screws and the bottom case by undoing the four clamping-screws as shown in Fig. 7. Be sure to turn-OFF the POWER switch and disconnect the power cord from the AC line receptacle before removing the case.

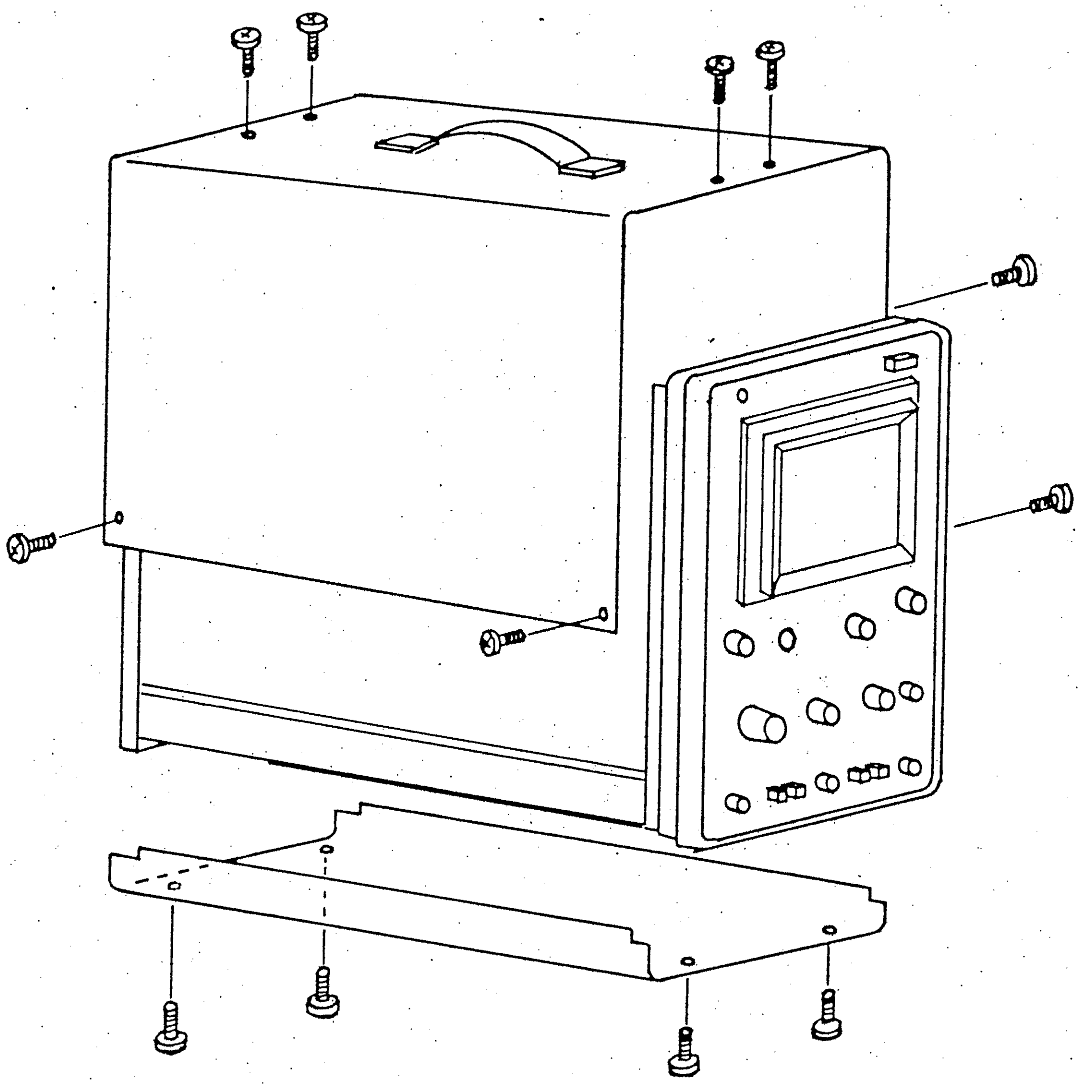


Fig. 7

5-2. Adjustment of ASTIG Potentiometer

So adjust this semi-fixed potentiometer, in conjunction with the FOCUS knob on the rear panel, that the trace displayed on the CRT becomes sharpest and uniform in boldness. For the location of the ASTIG potentiometer, see Fig. 8.

5-3. Adjustment of CENTERING Potentiometers

The VERT CENTERING and HORIZ CENTERING semi-fixed potentiometers should be so adjusted that the displayed image is positioned in the center of the CRT screen when the VERT and HORIZ POSITION knobs are set in mid-positions of their moving spans. For locations of the potentiometers, see Fig. 8.

o Adjustment of VERT CENTERING potentiometer:

Without applying any input signal to neither both vertical nor horizontal axis, so set the alignmentscope that a trace is displayed on the screen. Then, so adjust the VERT CENTERING potentiometer that the trace does not move when the VERT POLARITY switch on the rear panel is switched.

o Adjustment of HORIZ CENTERING potentiometer:

Without applying any input signal to neither vertical nor horizontal axis, so set the alignmentscope that a beam spot is displayed on the CRT. Then, so adjust the HORIZ CENTERING potentiometer that the trace does not move when the HORIZ POLARITY switch on the rear panel is switched.

5-4. Adjustment of CAL 50mVp-p Potentiometer

The calibration voltage generator circuit is incorporated with a stabilization circuitry, it is accurately adjusted at the factory before shipment and it seldom requires adjustment by the user. When it is required to be adjusted, however, proceed as follows: Apply to the VERT INPUT terminal an accurately calibrated signal of 50 mVp-p and adjust the displayed amplitude at an appropriate amplitude. Next, set in the ▄ state the CAL 50mVp-p button on the front panel and so adjust the CAL 50mVp-p semi-fixed potentiometer that the same amplitude is obtained on the CRT.

5-5. Phase Adjustment of Vertical Axis Input Attenuator

Apply to the VERT INPUT terminal a quality square wave signal of repetition frequency 1 kHz, apply to the horizontal axis a ramp signal which is synchronized with the vertical axis input signal, and set the LINE HORIZ switch in the ▄ HORIZ sate. Set in the 1/10 position the VERT GAIN switch on the front panel and so adjust the 1/10 PHASE COMPENSATION trimmer capacitor (C104) that the overshoots and undershoots of the displayed waveform becomes smallest when the waveform amplitude is 4 DIV. In the same manner, set the 1/100 position the VERT GAIN switch and so adjust the 1/100 PHASE COMPENSATION trimmer capacitor (C102). For locations of the trimmer capacitors, see Fig. 8.

These trimmer capacitors have been accurately adjusted at the factory before shipment and, normally, they require no adjustment by the user for a long period of time.

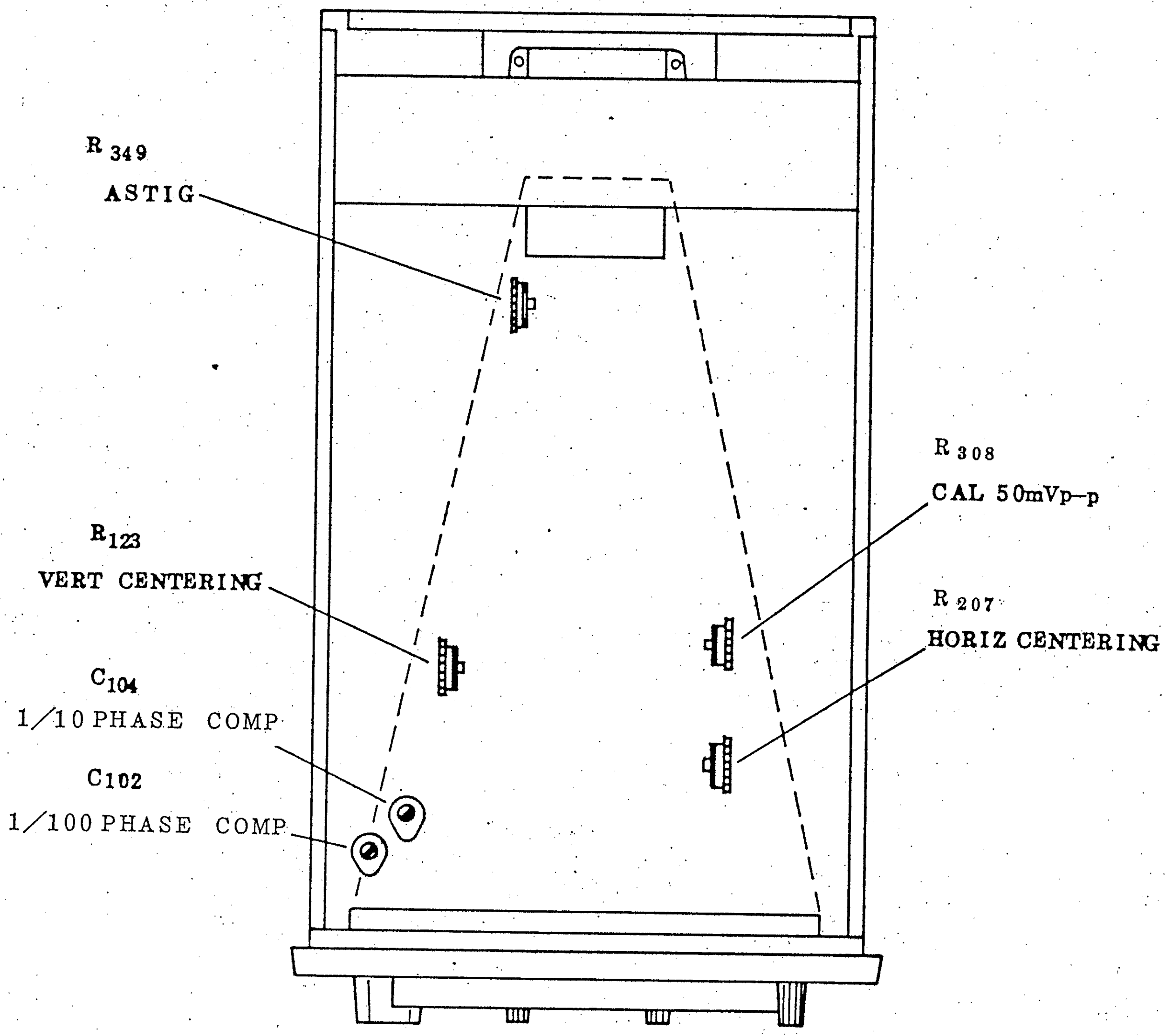
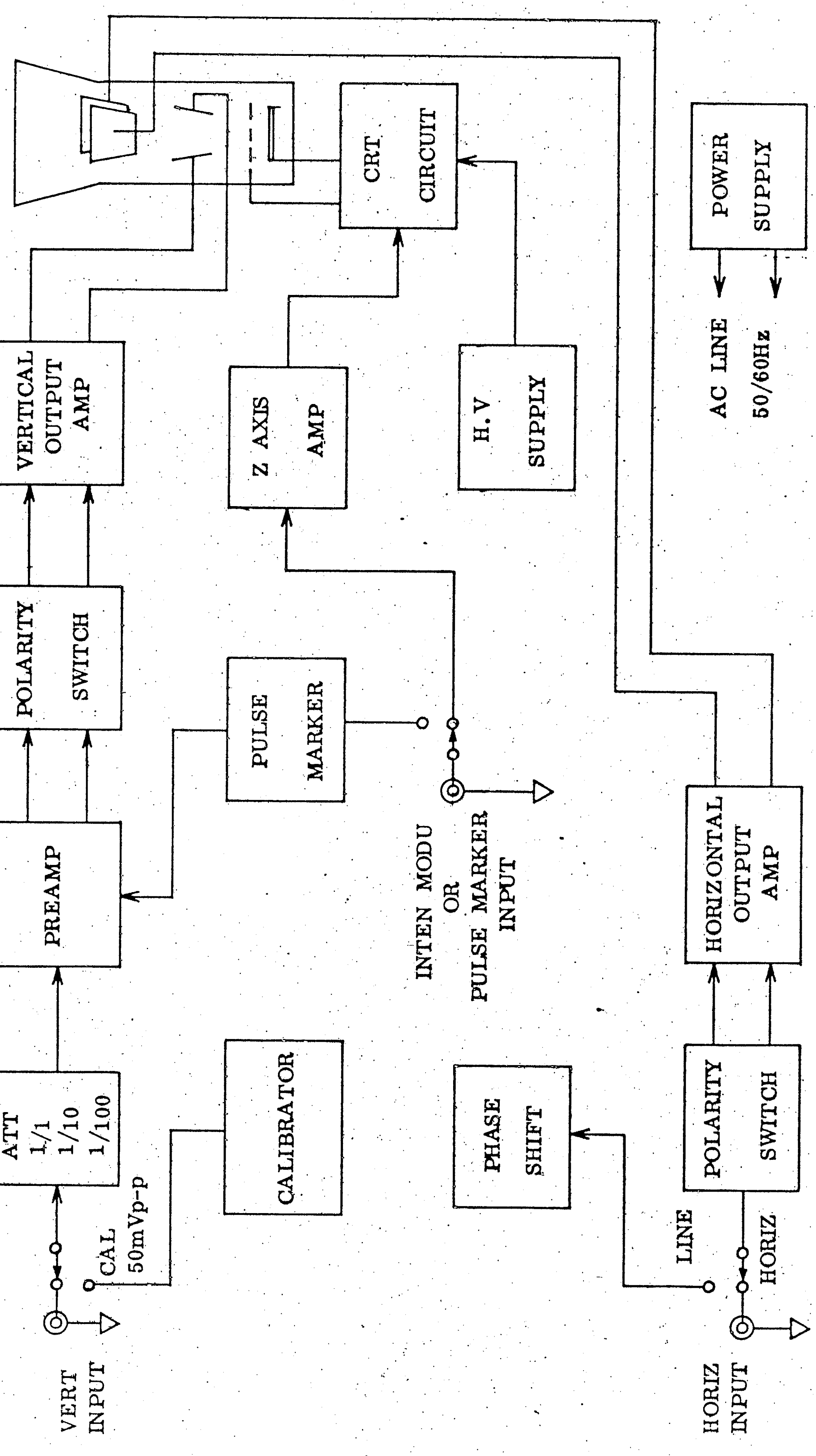


Fig. 8

6. BLOCK DIAGRAM



792600