

MODEL 5122
ALIGNMENTSCOPE
OPERATION MANUAL

KIKUSUI ELECTRONICS CORP.

Power Requirements of this Product

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

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

Input voltage

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

Input fuse

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

WARNING

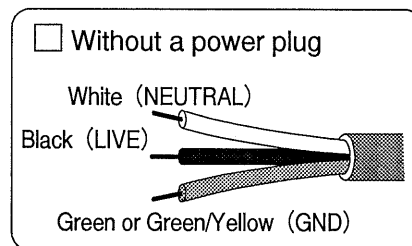
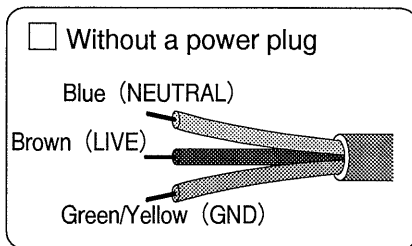
- To avoid electrical shock, always disconnect the AC power cable or turn off the switch on the switchboard before attempting to check or replace the fuse.
- Use a fuse element having a shape, rating, and characteristics suitable for this product. The use of a fuse with a different rating or one that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

AC power cable

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

WARNING

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



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1. INTRODUCTION

The ALIGNMENTSCOPE Model 5122, designed and manufactured by Kikusui Electronics Corporation, is an oscilloscope for alignment, or a dual trace oscilloscope of the electromagnetic deflection system, employing a 12-inch cathode-ray tube for television; and featuring 2mV/cm or over in sensitivity of the vertical axis, a-c clamping, the marker intensity modulation system, and superb luminance among others.

Construction

The block diagram of this model is as shown in Fig. 14. The vertical axis has two input channels for CH 1 and CH 2, each channel having potential divider, calibration voltage and a-c clamping circuits furnished therefor; meanwhile, the horizontal axis sweeps with a built-in line sweep circuit or sweep signals from outside, and the line sweep or outside sweep signals are supplied F.F circuit, a-c clamping circuit and blanking circuit that drive a channel change-over circuit through a waveform arranging circuit.

The intensity circuit and the spot killer circuit from the horizontal amplifier are so constructed that intensity is intensified only in case an input signal is applied on the horizontal amplifier, thus preventing overheating by the spot from taking shape.

The marker circuit is of the intensity modulation system, and the polarity is of the automatic change-over system.

2. SPECIFICATIONS



Vertical axis

Sensitivity	(both CH 1 and CH 2) 2mV/cm or more, w/1/10 ATTEN
Frequency characteristics	(ditto) DC: DC ~ 10kHz - 3dB AC: 3Hz ~ 10kHz - 3dB
Input impedance	(ditto) 200 k Ω
Polarity change-over	(ditto): w/NORMAL \leftrightarrow INVERT switch (arranged on the rear panel)
Channel selection	* CH 1: CH 1 only * ALTER: Alternating sweep of CH 1 and CH 2 * CH 2: CH 2 only When set at ALTER, alterate sweep can be conducted for a horizontal signal by LINE SWEEP and EXT SWEEP.
AC CLAMP	To be put in operation by LINE SWEEP and EXT SWEEP signals, AC CLAMP ON \leftrightarrow OFF switch arranged on rear panel.
Calibration voltage	10 mV square wave

Horizontal axis

Sensitivity	100mV/cm or over, w/1/10 ATTEN
Frequency characteristics	DC ~ 1kHz - 3dB
Input impedance	500 k Ω
Polarity change-over	w/NORMAL \leftrightarrow INVERT switch (arranged on the rear panel)
LINE SWEEP	Approx. 130° in phase shift range.

EATS

EXT SWEEP SELECT	Selector of EXT SWEEP waveform,  or  (arranged on the rear panel)
Marker signal	Intensity modulation system (polarity to be automatically selected) Marker signal level and pulse width, 0.5V, 5μsec or over
Deflection, distortion and linearity	5% or less on the scale for vertical axis and horizontal axis
Angle between Vert. axis and Horiz. axis	90° ± 2° or less at the center on the scale
Cathode-ray tube	Model 310DMB4, approx. 8kV in accelerating voltage, (Model 310DGB4)
Dimensions(max.)	430(430)W x 250(265)H x 360(380)D mm
Weight	Approx. 14 kg
Power consumption	-----V, 50Hz, approx. 150VA
Accessories	Operation manual 1

3. OPERATION

3.1 Explanation of front panel (See Fig. 1.)

(1) POWER

This model is connected with the power source by pushing the push-button switch, and a green lamp is switched on. Another push of the push-button switch reverses the switch, thus disconnecting with the power source.

(2) INTENSITY

Luminance is intensified by turning clockwise the intensity control knob. The circuit of this INTENSITY knob is put in operation only in case an input signal is applied on the horizontal axis amplifier, thus making the fluorescent surface luminant; therefore, apply an input signal on the horizontal amplifier by means of the LINE SWEEP built in this model, have a horizontal trace on the surface of the cathode-ray tube, and regulate the luminance properly.

(3) SCALE ILLUM

Luminance is intensified by turning clockwise the knob for illumination of the scale plate.

- (4) MARKER This knob is for regulating the size of a marker, in case the intensity modulated marker signal is reproduced on the surface of the cathode-ray tube. Now that the marker signal is intensified in case this knob is turned clockwise, adjust this knob properly.
- (5) FOCUS This knob is for making the luminant line or point sharp and clear, thus regulating the focus properly.
- (6) VERTICAL
CH 1, ALTER, CH 2
CH 1 For putting CH 1 only in operation
ALTER For putting CH 1 and CH 2 in operation alternately by switching-over.
In this case, a horizontal signal is put in operation by LINE SWEEP and EXT SWEEP signals.
CH 2 For putting CH 2 only in operation
- (7) ATTEN/CAL (CH 1 and CH 2) VERT input signal is directly applied on a GAIN control without running through ATTEN.

This is the ATTEN for attenuating 1/10 VERT input signal. to 1/10, prior to applying the signal on the GAIN control. 10mVp-p square wave built in the CAL is applied on the VERT GAIN control.

- (8) GAIN (CH 1 and CH 2) This is the knob for regulating VERT input signal or CAL signal in their amplitude. Sensitivity increases to the maximum by turning the knob clockwise, and it decreases to the minimum by turning the knob counterclockwise.

- (9) POSITION (CH 1 and CH 2) This is the knob for shifting the position in the vertical direction. The trace moves upward in case the knob is turned clockwise, while the trace moves downward in case the knob is turned counterclockwise.

- (10) INPUT terminal (CH 1 and CH 2) This is the input receptacle for connecting VERT input signals.

- (11) AC DC (CH 1 and CH 2) AC: VERT input is made AC coupling. DC: VERT input is made DC coupling.

HORIZONTAL

- (12) ATTEN/LINE SWEEP 1. HORIZ input signal is applied directly on the GAIN control without passing through the ATTEN.
- 1/10 HORIZ input signal is attenuated to 1/10 by this ATTEN, prior to being applied on the GAIN control.

LINE SWEEP

Phase is adjusted in the interior of this model by the use of sine wave of the commercial power source, and applied on the horizontal amplifier.

- (13) PHASE This is the phase adjustment knob to be employed at the time of the LINE SWEEP above.

- (14) GAIN This is the knob for control the amplitude of the HORIZ input signal or the LINE SWEEP signal. Sensitivity increases to the maximum by turning the knob clockwise, and sensitivity is reduced to the minimum by turning the knob counterclockwise.

- (15) POSITION This is the knob for adjusting the position of trace in the horizontal direction; and the position moves to the right in case the

knob is turned clockwise, while the
position moves to the left in case the
knob is turned counterclockwise.

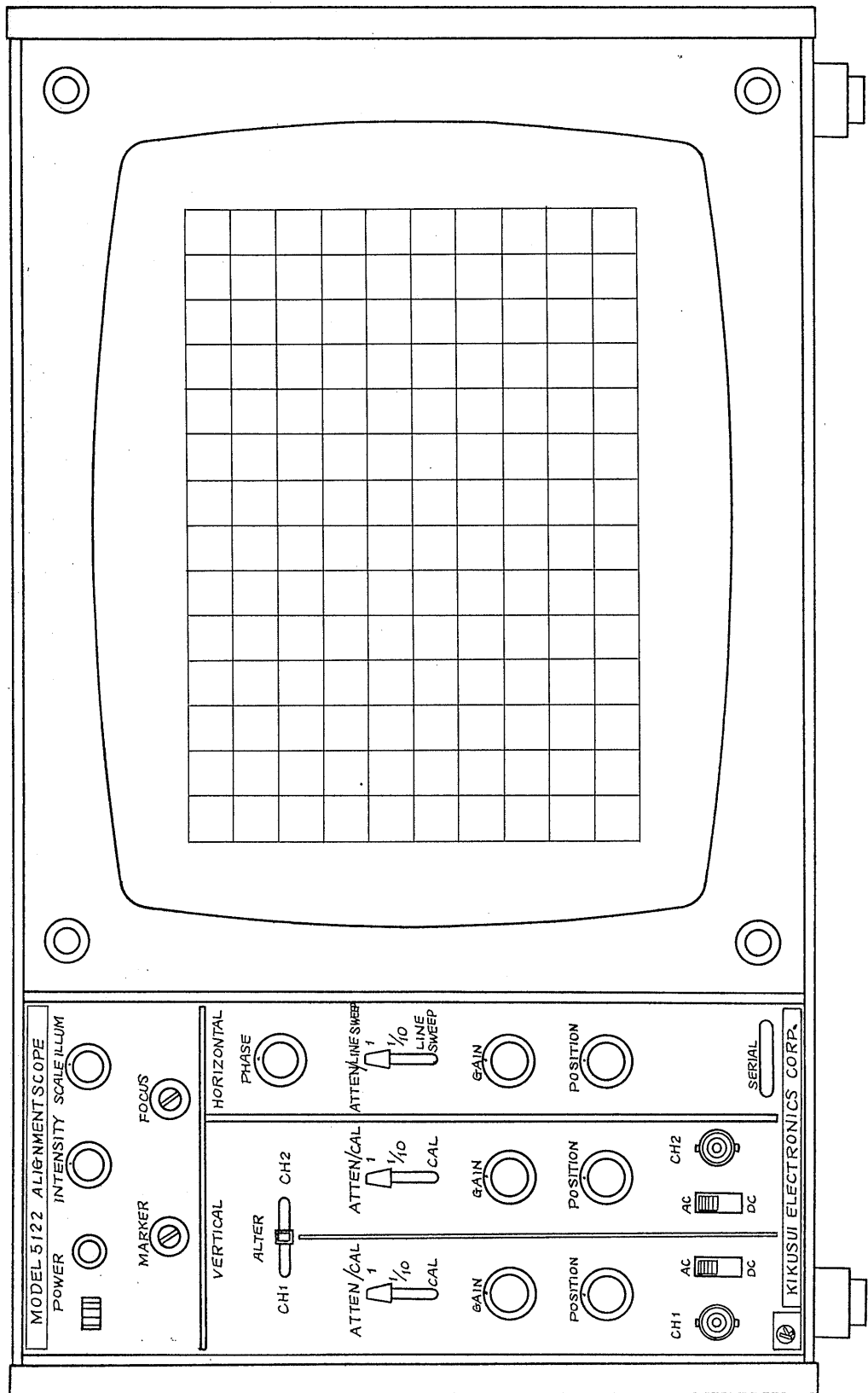


Fig. 1 Front Panel

3.2 Explanation of rear panel (See Fig. 2)

VERTICAL

(1) AC CLAMP (for CH 1 and CH 2)

ON: In case of putting AC CLAMP in operation, set this switch at ON.

OFF: In case AC CLAMP need not be put in operation, set this switch at OFF.

(2) POLARITY (CH 1 and CH 2)

NORMAL: The VERT input signal is in the direction of the polarity, and waveform deflects upward in this polarity.

INVERT: This is the reverse to the NORMAL, and the polarity is reversed.

HORIZONTAL

(3) POLARITY

NORMAL: The horizontal input signal is in the direction of positive polarity, and the waveform deflects to the right in this polarity.

INVERT: This is the reverse to the NORMAL, and the polarity is reversed.




(4) EXT SWP TRIG LEVEL

TRIG LEVEL

This is the knob for regulating the TRIGGERING LEVEL of the SWEEP signal at the time of EXT SWEEP, and it adjusts the starting point of the

SWEEP, and puts the single trace, the dual trace, the AC clamping circuit, and the blanking circuit in normal operation.

(5) EXT SWP SELECT

In case of employing the EXT SWEEP, select the waveform selective switch for  ,  , or  to match the sweep waveform for proper use thereof.

(6) HOR. This is an input plug for connecting horizontal input signal.

MARKER

(7) MARKER This is an input plug for connecting MARKER signal .

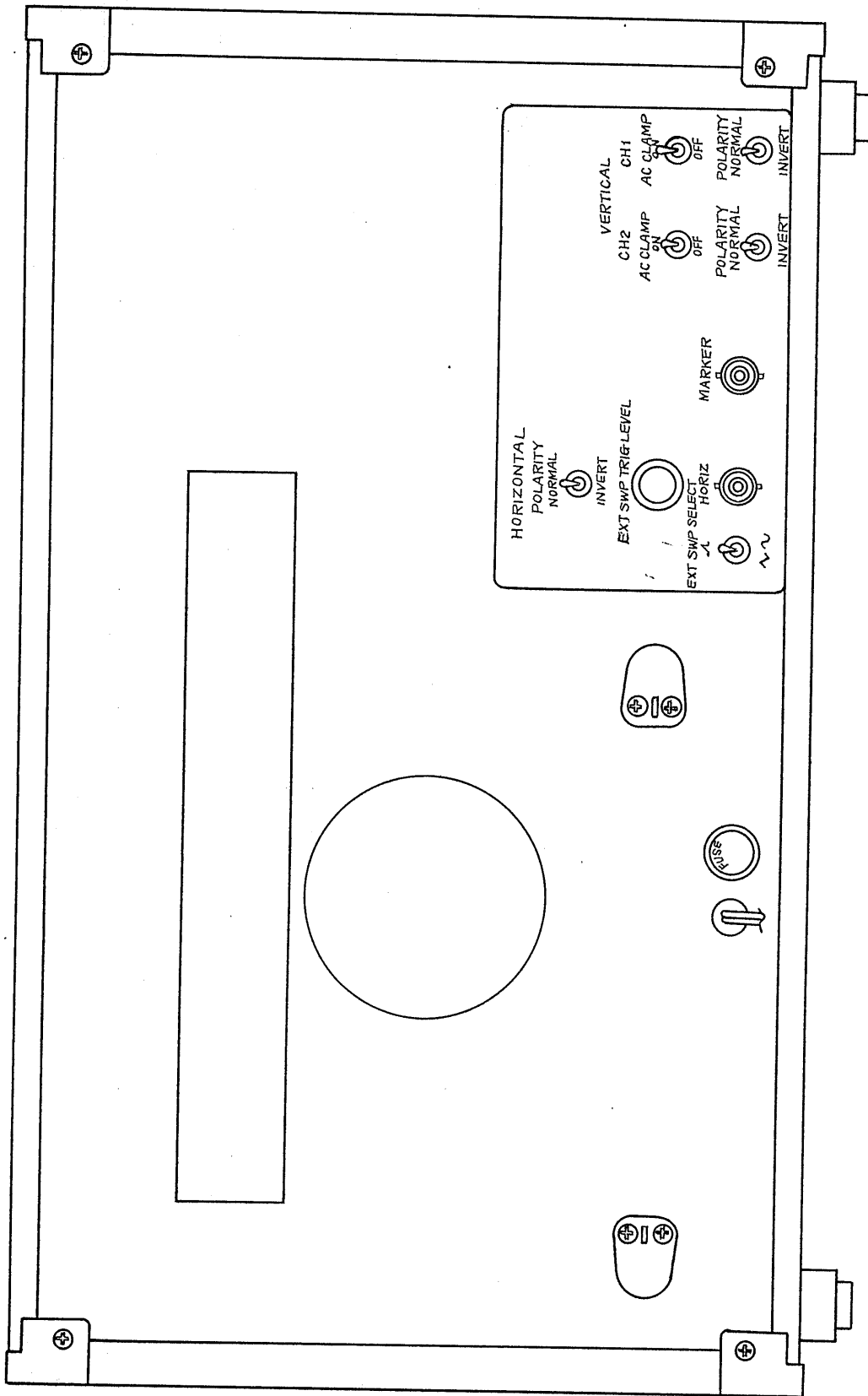


Fig. 2 Rear Panel

3.3 Initial operation

- 1) Turn on POWER switch of the model 5122.
- 2) Set the HORIZONTAL ATTEN/LINE SWEEP switch at LINE SWEEP, turn the HORIZ GAIN knob clockwise to increase the intensity, and now a horizontal trace line appears on the surface of the cathode-ray tube.
- 3) Then, set the VERTICAL switch at ALTER, a couple of horizontal trace lines appear on the surface of the cathode-ray tube.

In case the HORIZ POLARITY is NORMAL, the switching point on the two horizontal lines appear to the right; however, in case the switching points are not at the extreme right end as shown in Fig. 3, adjust the HORIZ EXT SWEEP TRIG LEVEL knob in such a manner that the switching points appear at the extreme right.

Fig. 3

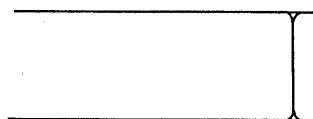
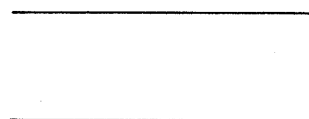


Fig. 4



- 4) Adjust the INTENSITY and SCALE ILLUM knobs properly.
- 5) Set the VERTICAL ATTEN/CAL knob at 1, change-over the AC ↔ DC switch on the VERT input side to either one as required by the case, select the POLARITY on the rear panel, and set the AC clamp switch at ON, in case AC CLAMP at AC connection is required of the input side.

(These methods of operation are all the same for CH 1 and CH 2 as well.)

- 6) In case the dual trace observation is to be conducted, feed the input receptacle of CH 1 and CH 2 with input signals.
In case the single trace is to be observed, feed either one of the channels with an input signal, and change-over the channel selection switch to the channel fed with an input signal.
- 7) Turn the VERT GAIN knob clockwise, and a waveform appears on the surface of the acathode-ray tube.
- 8) In case the waveform appears on the surface of the cathode-ray tube has some deviation as shown on Fig, 5 or Fig. 6, adjust the PHASE knob on the front panel, thus eliminating the phase deviation.

Fig.5

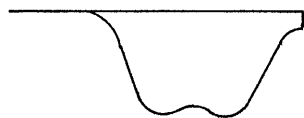





Fig.6



By the way, in case such a deviation as shown in fFig. 6 is present, AC CLAMP is not pit in ragular operation evenby simply eliminating such a phase deviation; therefore, in case AC CLAMP need be put in regular operation, operate the sweep generator in such a manner that the the high frequency output of the sweep generator be

suspended during the period of retrace as shown in Fig. 5.

Furthermore, in case of sweeping with an EXT SWEEP signal, especially to put AC CLAMP in operation in case the waveform of the SWEEP signal is either a triangular wave or a sine wave, have the high frequency output of the sweep generator suspended during the period of retrace in the same manner as set forth above.

- 9) In case of overlapping a marker signal on the waveform to be observed, connect the exterior marker signal with the MARKER input receptacle arranged on the rear panel, and adjust the semifixed resistor for the MARKER arranged on the front panel, in such a manner that the intensity modulated marker signal is modified to be proper in size. Then, adjust the FOCUS knob in such a manner that the trace is sharp and clear enough.
- 10) In the case of employing an EXT SWEEP signal, set the HORIZ ATTEN/LINE SWEEP at 1 or 1/10, feed the HORIZ input terminal on the rear panel with the signal, set the EXT SWP SELECT switch at either , , or , to match the waveform of the signal, and adjust the HORIZ GAIN knob; now a couple of trace lines appear at the time of the ALTER without any VERT input signal. However, in case only one trace line appears adjust the HORIZ EXT SWP TRIG LEVEL knob until a couple of trace lines appear.
- 11) Next, make connection for feeding with the VERT input signal in

such a manner as shown in 6) above, and turn the VERT GAIN knob clockwise; now a waveform of either the single trace or the dual trace will appear for observation.

- 12) However, in case the waveform for observation is deviating in the starting point of sweep as shown in Fig. 7, adjust the HORIZ EXT SWEEP TRIG LEVEL knob until such a waveform as shown in Fig. 8 can be obtained. This adjustment of the knob is specially required in case the SWEEP waveform is such as




 or , but not so much in case the SWEEP wave is 

Fig. 7

Fig. 8





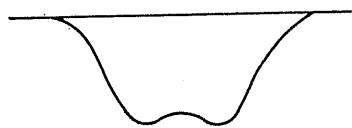
- 13) In the case of EXT SWEEP, this model is subjected to blanking during the period of retrace as shown in Fig. 7 and Fig. 8 so that no retrace may appear on the surface of the cathode-ray tube; however, in case the retrace of either one of the waveforms,  and , of the EXT SWEEP need appear on the surface of the cathode-ray tube, connect the pin #5 of the socket of the cathode-ray tube with GND for grounding, and the waveform for observation as shown in Fig. 8 will take such a waveform for observation with a retrace

Fig. 9





However, in case a retrace is given birth on the surface of the cathode-ray tube, as shown in Fig. 9, and in case the waveform of the EXT SWEEP signal is , and the waveform is rather short in the sweep width for repetition as shown in Fig. 10, in other words, in case the period of sweep suspension is rather long, luminance at the starting point is intensified by far as shown in Fig. 11, thus resulting in spot heating; therefore, in case the EXT SWEEP waveform is , it is recommended to put this model in operation in the blanked condition.

Fig. 10



Fig. 11



- 14)° In case the AC CLAMP is put in operation at the time of employing the EXT SWEEP signal, put the sweep generator in operation in a proper manner, so that during the period of retrace of the sweep signal the high frequency output of the sweep generator may be suspended. And, in case the EXT SWEEP signals of this kind are employed, the adjusting range of the EXT SWP TRIG LEVEL knob is to $\pm 7V$ peak value in the amplitude of the signals. Therefore, in case the amplitude is

too large, adjust the output level of the sweep signal by the sweep generator.

- 15) The operation of this model in the case of the dual trace operation or the AC CLAMP operation by way of the EXT SWEEP signal is exactly the same as set forth above.
 - 16) For selection of polarity either of VERT or HORIZ, employ this model properly for the purpose.
 - 17) In the case of checking the VERT sensitivity, the built-in square wave of 10mVp-p in calibration voltage is utilized for the purpose. In utilizing this square wave, be sure to switch off AC CLAMP and to shift the phase, prior to checking.
 - 18) In case the AC CLAMP is put in operation by the employment of the built-in LINE SWEEP and by switching on the AC CLAMP, the AC CLAMP is not put in normal operation, in other words, the amplitude of the waveform under observation shows no deflection at all, as far as the phase of the LINE SWEEP of this model and the phase of the sweep generator thus employed deviate from each other by 180° . In such a case, put the plug of the AC line either of this model or of the sweep generator into the reverse polarity.
- 3.4 Cautions to be exercised in operation
- 1.) Now that this model generates heat, place nothing on this model; thus ensuring favorable ventilation for cooling it.

- 2) Now that the neck of the cathode-ray tube is rather fragile mechanically, keep it free from being subjected to sharp vibration or impact.
- 3) This model is so designed that no luminant spot may not appear on the surface of the cathode-ray tube, to prevent spot heating from taking shape, in case the horizontal amplifier is fed with no input signals; however, in case the horizontal amplifier is fed with input signals until the surface of the cathode-ray tube is illuminated, and in case the vertical amplifier is fed with no input signals or it is applied with calibration voltage of the square wave, abrupt suspension of feeding the horizontal amplifier with input signals results in reduction in the horizontal amplitude to the minimum (spot), thus eliminating the luminant point at that instant. For all that, there still is some span of time (quite short a while as it is) before the elimination of the luminant point; therefore, in case the INTENSITY knob is set at the maximum level, spot heating appears. To avoid such a case, it is recommended to set the said INTENSITY knob at the minimum level without fail every time the above-mentioned operation is carried out.
- 4) In case the horizontal trace on the surface of the cathode-ray tube is not in parallel with the scale plate, be sure to rearrange it to be parallel with the said scale plate by turning the deflection yoke after loosening the screw of the deflection yoke. Also in that case, be sure to push the deflection yoke forward, thus having it come in close contact with the cathode-ray tube completely.

4. MAINTENANCE

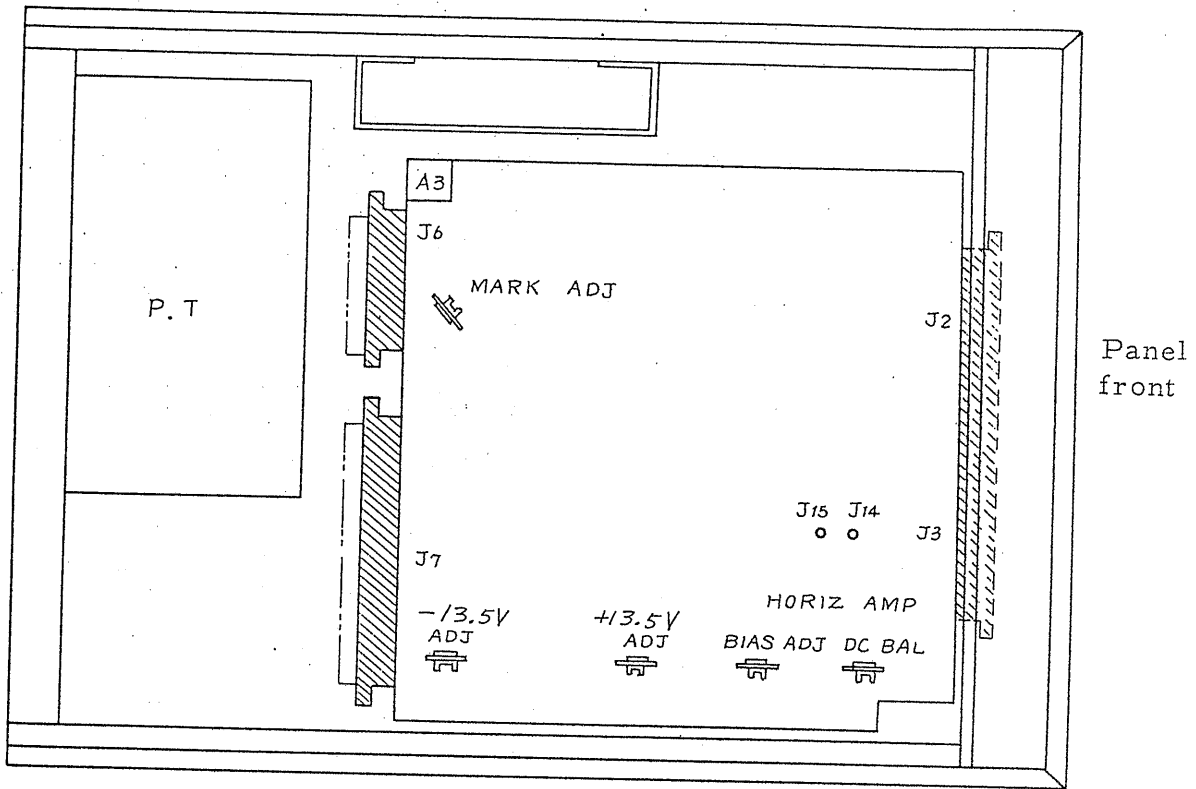


Fig. 12

To begin with, take off the printed circuit board A2, and conduct adjustment, starting from the semifixed resistor arranged on the printed circuit board A3 shown in Fig. 12 above.

- 1) DC voltage +13.5V ADJ and -13.5V ADJ

These are the semifixed resistors for regulating DC stabilized power supply. Adjust them in such order as regulating +13.5V \pm 0.2V first, followed by -13.5V \pm 0.2V.

- 2) HORIZ AMP DC BAL

Adjust the DC BAL in such a manner that, under the condition that

the HORIZ POSITION knob is set at the center at the time of the LINE SWEEP, the horizontal trace is positioned virtually at the center of the scale plate.

3) HORIZ AMP BIAS ADJ

Move the POSITION in the horizontal direction under the condition that the horizontal trace is deflected by approximately 3cm, while measuring with a voltmeter the voltage at the both end of 2.5Ω and 5W connected with the GND on the emitter side of the transistor 2SC520A at the final stage, through the semifixed resistor for adjusting the current of the transistor at the final stage of the HORIZ AMP, adjust the BIAS ADJ knob to such a degree that the length of the luminant line does not deflect abruptly at the extreme end of the right or the left of the surface of the cathode-ray tube, and make sure that the voltage is 5 volts across the resistor 2.5 ohms.

4) MARK ADJ

This semifixed resistor is for regulating the bias of the marker circuit; connect a voltmeter with the Zener diode RD7A on the marker circuit and the point with which the resistor of 6.8 k Ω is connected, and properly adjust the MARK ADJ in such a manner that the voltage at the said point is reduced to virtually 0V ($\pm 0.1V$), in case the input of the marker signal is zero.

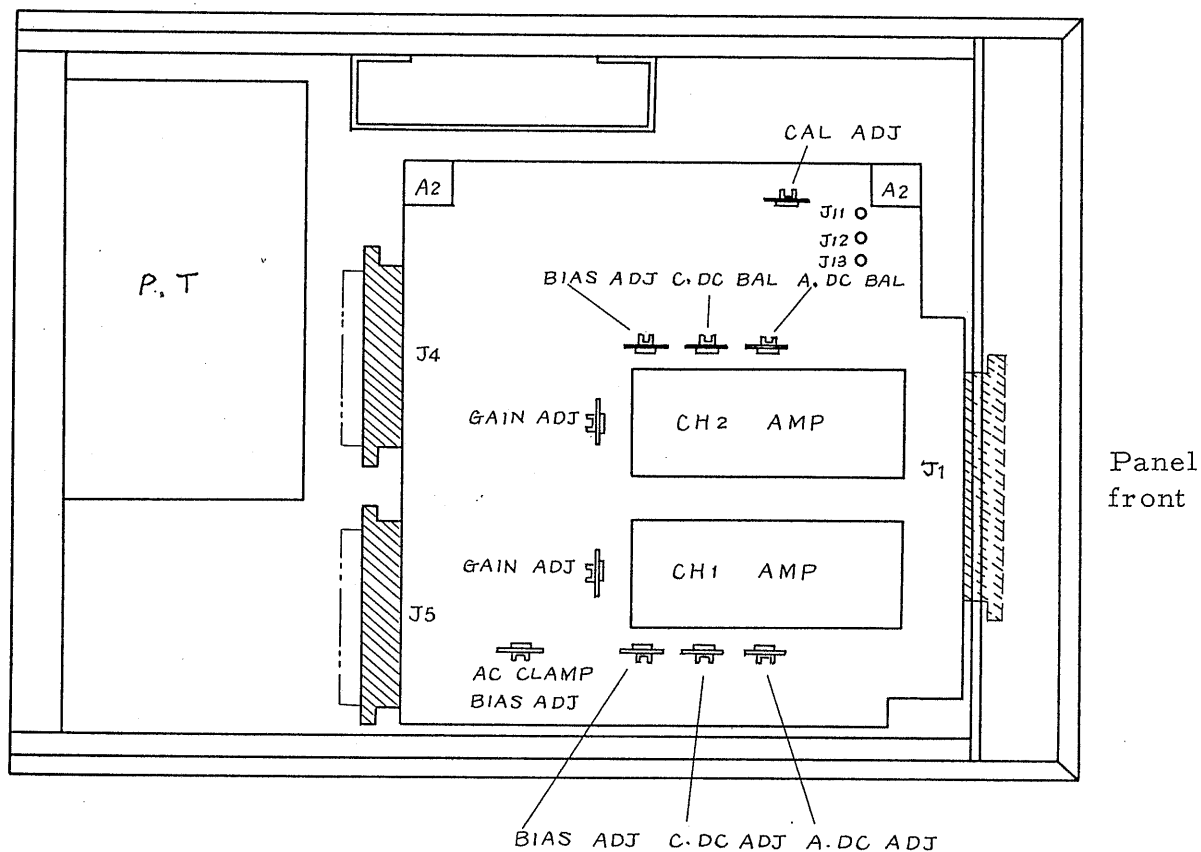


Fig. 13

Then, put the printed circuit board A2 in place, and conduct the following adjustments, making reference to Fig. 13.

5) CH 1 AMP A. DC BAL

As to the HORIZ, switch the dual trace system to CH 1 while keeping the LINE SWEEP intact, set the AC CLAMP switch arranged on the rear panel at OFF, and adjust this A. DC BAL semifixed resistor to such a degree as the horizontal trace is virtually free from deflecting in the vertical direction,

in case the semifixed resistor GAIN ADJ of the CH1 AMP is turned.

6) CH 1 AMP C. DC BAL

Adjust this C. DC BAL to such a degree as the horizontal trace is virtually free from fluctuating in the vertical direction, in case the AC CLAMP switch arranged on the rear panel is set over at ON from OFF. Now that this C. DC BAL and the A. DC BAL set forth in 6) above are inter-related with each other, conduct the both adjustments repeatedly.

7) CH 1 AMP GAIN ADJ

Set the AC CLAMP switch arranged on the rear panel at OFF, set the VERT ATTEN/CAL at CAL, and set GAIN knob at the maximum value of sensitivity. Now that a square wave appears on the surface of the cathode-ray tube, adjust the semifixed resistor and the GAIN control in such a manner that the amplitude of that square wave becomes $5\text{cm} \sim 5.5\text{cm}$. Thereby the maximum sensitivity is improved from 2mVp-p/cm to 1.8mVp-p/cm .

8) CH 1 AMP BIAS ADJ

Move the POSITION in the vertical direction under the condition that the square wave of the above-mentioned CAL is kept appearing on the surface of the cathode-ray tube, while measuring with a voltmeter the voltage at the both ends of 0.5Ω and $5W$ connected with the GND on the emitter side of the transistor 2SC520A at

the final stage, through the semifixed resistor for regulating the current of the transistor arranged at the final stage of the VERT at the time of employing CH 1, and adjust this CH 1 AMP BIAS ADJ knob to such a degree that the amplitude does not fluctuate abruptly at the extreme end of the top and the bottom of the surface of the cathode-ray tube.

Make sure that the voltage at the both ends of 0.5Ω and 5W at that time is in the range of 0.9V ~ 1.5V.

9) AC CLAMP BIAS ADJ

Now that, when the waveforms of the connectors J₅, P₉ and P₁₀ are observed with this model of alignment scope under the condition that HORIZ is set at LINE SWEEP and the VERT at ALTER, the waveforms appear in the shape of the square waveform, adjust the AC CLAMP BIAS ADJ in such a manner that the amplitudes of those two waveforms become virtually the same.

Now, once this is adjusted, no further adjustment is virtually called for.

10) CH 2 AMP, A. DC BAL, C. DC BAL, BIAS ADJ, GAIN ADJ

Change over the dual trace switch to CH 2, and conduct adjustment of each one of these, in the same manner as set forth in 6 through 9 above, respectively.

11) CAL ADJ

This semifixed resistor is for regulating the amplitude of the square

wave voltage for calibrating the VERT AMP. Adjust the CAL ADJ in such a manner that the amplitude of the square wave becomes 10mVp-p, after connecting the calibrated alignment scope with connectors J₆ and P₁₀.

Now that the range of adjustment by this CAL ADJ is 5mV - 150mV, it is recommended to adjust it properly to meet the requirement of each case, thus utilizing this CAL ADJ for calibrating the sensitivity of the VERT AMP.

BLOCK DIAGRAM

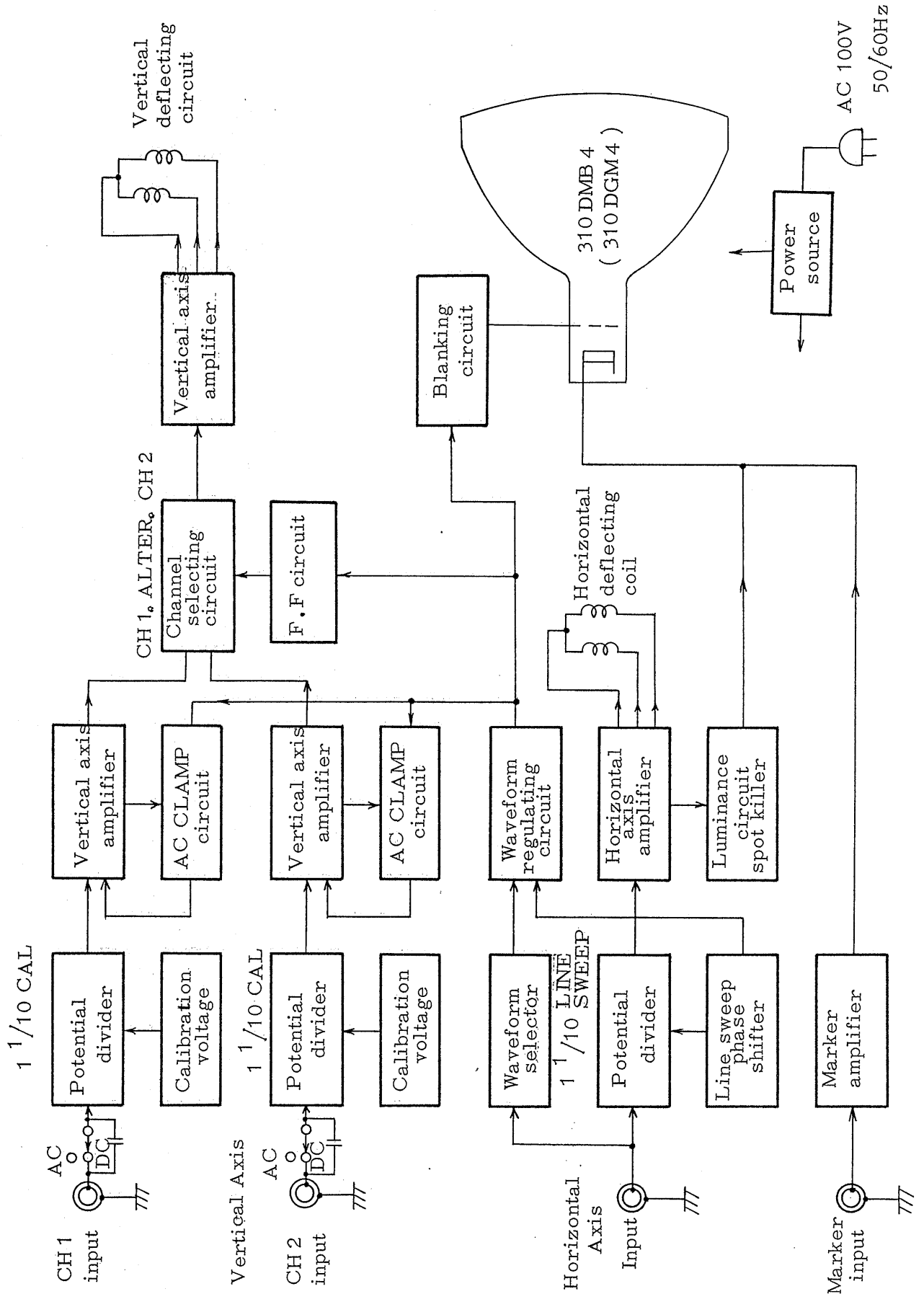


Fig. 14

HOOD ASSEMBLY

The hood which is Option of the Model 5122 Oscilloscope is used to shield the CRT screen against light incident from above. Refer to the below illustration to assemble the hood.

