

LEADER

PAL VECTORSCOPE

INSTRUCTION MANUAL

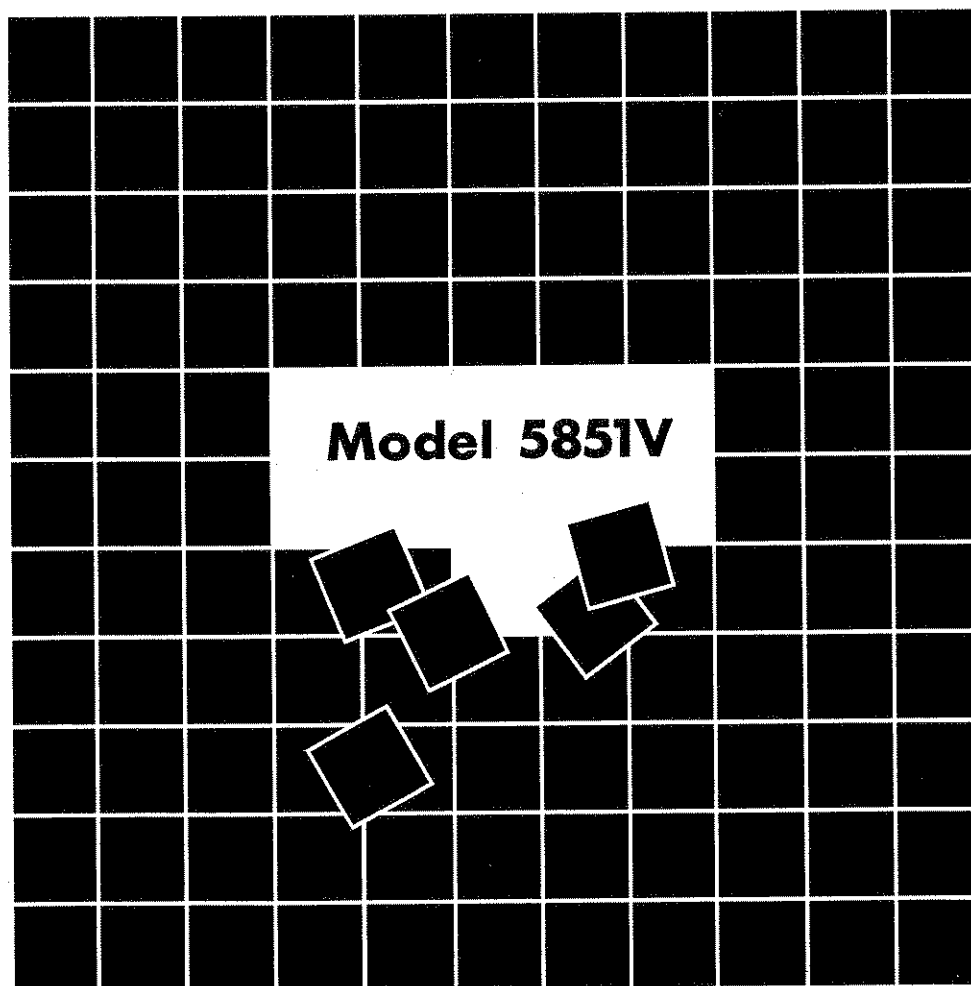


TABLE OF CONTENTS

1. GENERAL	1
2. SPECIFICATIONS	1
2.1 CRT	1
2.2 Composite Video Signal Input	1
2.3 Blanking Input	1
2.4 Chrominance	1
2.5 Measurement Items	1
2.6 Horizontal Synchronization	2
2.7 Subcarrier Signal Synchronization	2
2.8 Calibration	2
2.9 General	2
3. PANEL DESCRIPTIONS	3
3.1 Front Panel	3
3.2 Rear Panel	4
3.3 Vector Scale	5
4. USING THE 5851V	7
4.1 Precautions	7
4.2 Self-inspection with Test Circle	7
4.3 Connections and Measurements	8
4.3.1 Example connections	8
4.3.2 Adjustments and inspections before measurement	8
4.3.3 Measuring method	8
5. MAINTENANCE	11
5.1 Quad-phase Adjustments	12

1. GENERAL

The Model 5851V vectorscope displays, on the CRT, the vector of amplitude and phase of the chrominance component in the PAL television system composite video signal on a 4.43361875

MHz subcarrier. The accelerating voltage of 12 kV ensures bright, sharp display on the CRT. This compact, light instrument is housed in a half rack in inch size.

2. SPECIFICATIONS

2.1 CRT

Display area:	8 (V) x 10 (H) cm, rectangular
Accelerating voltage:	12kV/2kV
Graticule:	Internal scale Allowable frame; $\pm 20\%/\pm 10^\circ$ of standard color bar, circle, angle, U axis, V axis, and DG and DP, $\pm 5\%/\pm 3^\circ$ of standard color bar, and $\pm 20\%/\pm 10^\circ$ of burst signal

2.2 Composite Video Signal Input

Sensitivity:	Input A, input B Calibrated value: Color saturating; 75%, 100%, full scale Amplitude; 1Vp-p, 1.24Vp-p Variable range; Approx. 0.5 to 5 times of the calibrated value EXT. REF: Subcarrier; 2Vp-p ± 6 dB Black burst; 0.45Vp-p ± 6 dB
Input A:	Rear panel, loop-through, BNC connector Input impedance: Approx. 2 M Ω
Input B:	Rear panel, loop-through, BNC connector Input impedance: Approx. 2M Ω
EXT REF:	Rear panel, loop-through, BNC connector for subcarrier Input impedance: Approx. 10k Ω

2.3 Blanking Input

Sensitivity:	DC ± 1 V
Polarity:	Bright at positive

2.4 Chrominance

Bandwidth:	Center: Fsc=4.43361875 MHz High band: Fsc + approx. 500 kHz Low band: Fsc—approx. 500 kHz
Phase accuracy:	$\pm 2^\circ$
Amplitude accuracy:	$\pm 3\%$
Differential phase:	$\pm 1^\circ$
Differential gain:	$\pm 1\%$

2.5 Measurement Items

Vector measurement:	Phase and amplitude of; 75% or 100% color single saturation of chrominance on color bar signal
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2.6 Horizontal Synchronization

Input:

Synchronization by the horizontal Sync signal of composite video signal from input A or B.

Sync polarity:

Negative

Sync level range:

0.3Vp-p \pm 6dB

2.7 Subcarrier Signal Synchronization

Synchronization by burst signal (of composite video signal)

Sync level range:

0.3Vp-p \pm 6dB

Synchronization by external subcarrier signal (which is applied to the EXT REF input)

Subcarrier signal sync level range: 2Vp-p \pm 6dB

Synchronization by black burst signal (which is applied to the EXT REF input)

Black burst sync level range: 0.45Vp-p \pm 6dB

Note: The external subcarrier signal is switched to and from the black burst signal internally. (Set in black-burst mode at shipment)

Subcarrier frequency:

4.43361875 MHz

Sync capture range:

\pm 50 Hz (0°C to 40°C)

Phase adjustment range:

360°, continuously variable

2.8 Calibration

Test circle:

Set the chrominance signal applied from the input connector in asynchronous mode.

2.9 General

Power voltage:

100V, 120V, 200V or 240V; switchable by changing internal wiring

Power consumption:

Approx. 40VA

Size and weight:

215 (W) x 132 (H) x 423 (D) mm, approx. 6kg

Temperature range:

0°C to 40°C

3. PANEL DESCRIPTIONS

The Model 5851V operations on the panel are described in the order of the circled numbers given in Figs. 3-1 and 3-2. Note that letters in are indicated on the panel. Mark denotes that

a push-button switch being depressed ON and mark denotes that the switch being released OFF

3.1 Front panel

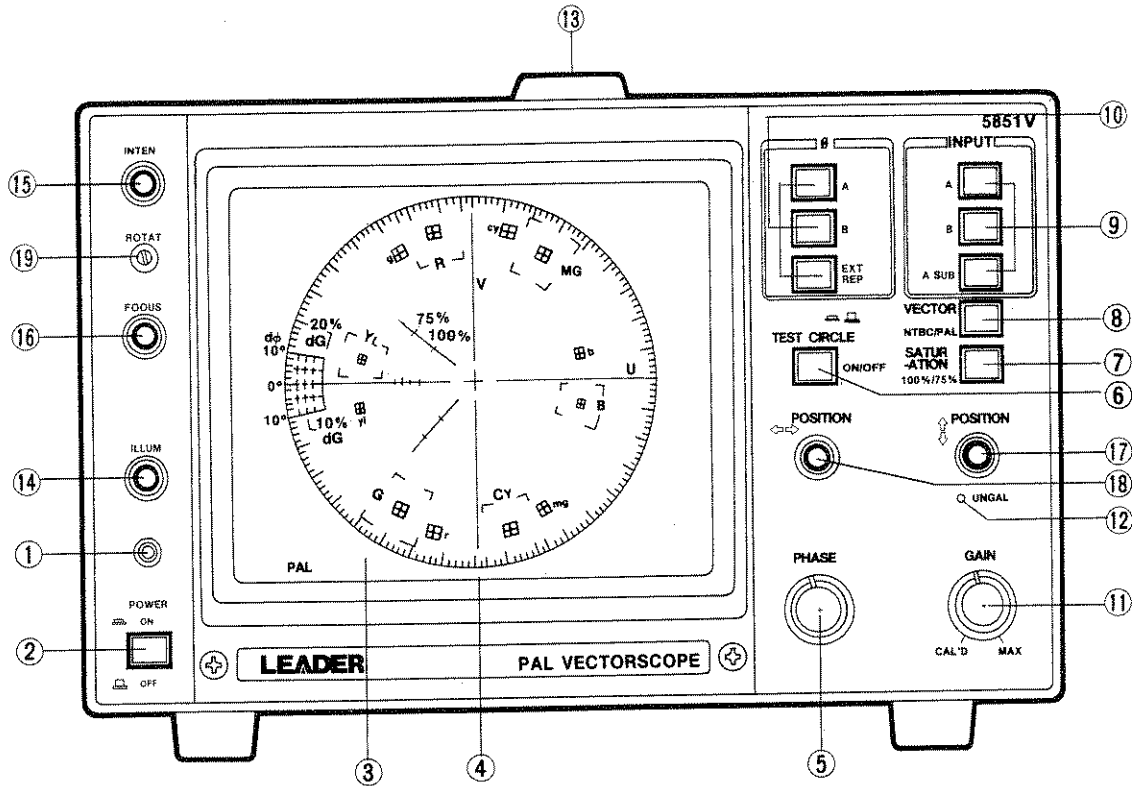


Figure 3-1

- | | |
|--|--|
| <p>① Pilot lamp
Comes on when power is supplied.</p> <p>② <input type="checkbox"/> POWER (Power Switch)
A push-button power switch. Push in this switch to turn power on.</p> <p>③ CRT
A rectangular CRT, 8 cm (V) x 10 cm (H)</p> <p>④ Scale
A vector scale having demodulation axes U, and V and the accuracy divisions in every two degrees alongside its circle. Also indicated are the allowable frame of $\pm 20\%$, $\pm 5\%$, $\pm 10^\circ$, $\pm 3^\circ$ of standard color bar, and the scale for differential phase and differential gain measurements.
Refer to section "3.3 Vector Scale" for the details.</p> | <p>⑤ <input type="checkbox"/> PHASE
A phase adjuster to change the vector phase. A full rotation changes the phase by 360 degrees. Use this control so that the vector can be adjusted to the scale.</p> <p>⑥ <input type="checkbox"/> TEST CIRCLE
Set this control as follows:
• TEST CIRCLE: ON
The test circle appears when the vector is rotated while the chrominance signal applied to input A or B, is set in asynchronous mode. If a perfect circle is drawn, it means that the Model 5851V has been adjusted correctly. If the circle is duplicated, then it indicates the instrument should be adjusted again. (For details about adjustment see Chapter 5.)</p> |
|--|--|

- ⑦ **SATURATION**
Select 100% or 75% saturation color bar. Push in this button to select 100%.
- ⑧ Switching **VECTOR** PAL display to NTSC display and vice versa.
Switches the vector display from PAL to NTSC and vice versa.
Push-in this switch to enter the NTSC display mode.
- ⑨ **INPUT**
Selects the chrominance component of the composite video input applied from input A or B. Press A to display the vector of the chrominance signal applied to input A. Press B to display the vector of the chrominance signal applied to input B.
A SUB is used to measure the vector of the continuous subcarrier signal applied to input A. Because the amplitude range for normal operation is 2Vp-p, the gain can be reduced to approx. 1/3 of the signal from input A, then displayed within the CRT.
⑩ **ϕ** (Synchronization Switch)
Press **A** to synchronize the internal subcarrier oscillator with the Sync signal and burst signal of the composite video signal applied from input A.
Press **B** to synchronize the oscillator with the Sync signal and burst signal of the composite video signal applied from input B on the rear panel.
Press **EXT REF** to demodulate the chrominance signal applied to input A or input B by using the subcarrier or black burst signal applied from **EXT REF**.
(The synchronization by EXT REF is set in the black-burst mode at shipment.)
- ⑪ **GAIN** (Amplitude Adjustment)
Changes the amplitude of the chromina signal applied to input A or B. When this control is set to the **CAL'D** position, the amplitude display of color bar signal (amplitude of 1 Vp-p, 75% saturation) displayed at the center of the allowable scale frame. The variable range is approx 0.5 to 5 times of the calibrated value.
- ⑫ **UNCAL** (Uncalibration Lamp)
Comes to the indicate that the instrument is uncalibrated when the amplitude adjust is put in variable state.
- ⑬ Grip
Used to carry the instrument.
- ⑭ **SCALE ILLUM**
Controls the scale illumination.
- ⑮ **INTEN**
Controls the intensity.
- ⑯ **FOCUS**
Controls the focus.
- ⑰ **\updownarrow** (Vertical Position Control)
Controls the vertical position.
- ⑱ **\leftrightarrow** (Horizontal Position Control)
Controls the horizontal position.
- ⑲ **ROTAT**
To align the trace with horizontal gratic line.

3.2 Rear Panel

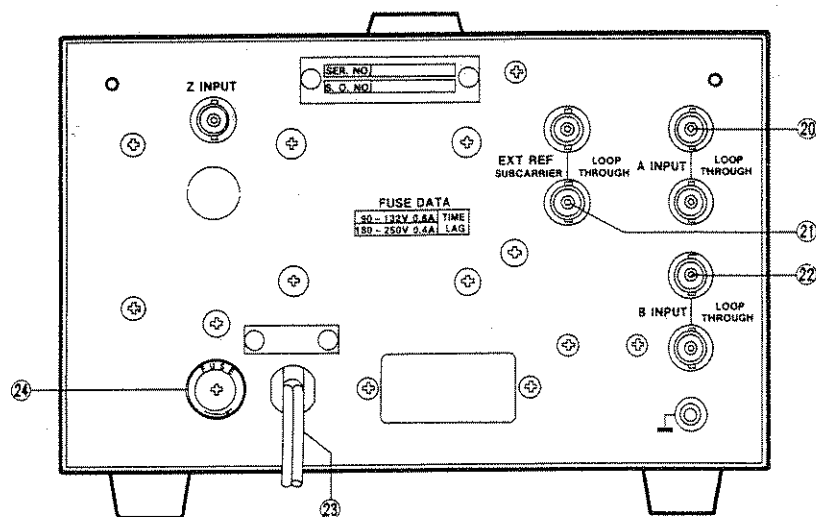


Figure 3-2

20 **A INPUT**

A pair of input connectors for composite video signals. These two connectors adopt a loop-through configuration. The input impedance is approx. 2 M Ω . The loop-through connectors are connected as shown in Fig. 3-3.

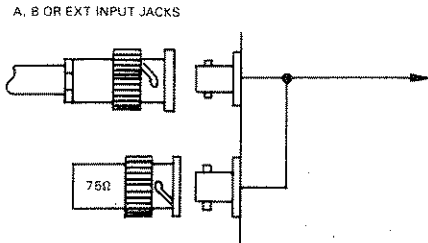


Figure 3-3

Supply signals to either of the two connectors; the other connector is terminated with a 75 Ω terminator or connected to a 75 Ω system equipment.

Use a cable with a characteristic impedance of 75 Ω .

21 **EXT REF** (External Subcarrier or Black Burst Input)

A pair of input connectors for external subcarrier signals. These two connectors adopt a loop-through configuration. The input impedance is approx. 10k Ω . These input connectors are applied continuous subcarrier signals, with which the instrument should be synchronized with the chrominance signal of the measured composite signal. Supply signals to either of these connectors; the other connector is terminated with a 75 Ω terminator or connected to a video equipment with a 75 Ω input impedance.

The external subcarrier range is from 1Vp-p to 4Vp-p, and the black burst signal range from 0.2Vp-p to 0.8Vp-p. The black burst input is set up at shipment from factory.

22 **B INPUT**

A pair of input connectors for composite video signals. These connectors adopt a loop-through configuration. For how to connect signals to these connectors, see **INPUT A**. The signal source is selectable from input A to B by operating the **INPUT** (input selector) on the front panel. Then, the selected vector display will appear on the CRT. The synchronization mode is switchable by operating the ϕ (10) to synchronize with signal from either input A or input B.

23 **Power cord**
Connect this cord to the power inlet. The voltage is selectable from 100V, 120V, 200V or 240V by changing the internal wiring.

24 **Fuse**
Time lag fuse whose fuse rating is 0.8A for a voltage of 100V to 120V; 0.4A for a voltage of 200V to 240V.

25 **BLANKING**
Input connector for external intensity control. +1V sets up the maximum intensity and -1V sets up the minimum intensity.

3.3 Vector Scale

The vector scale appears in Fig. 3-4.

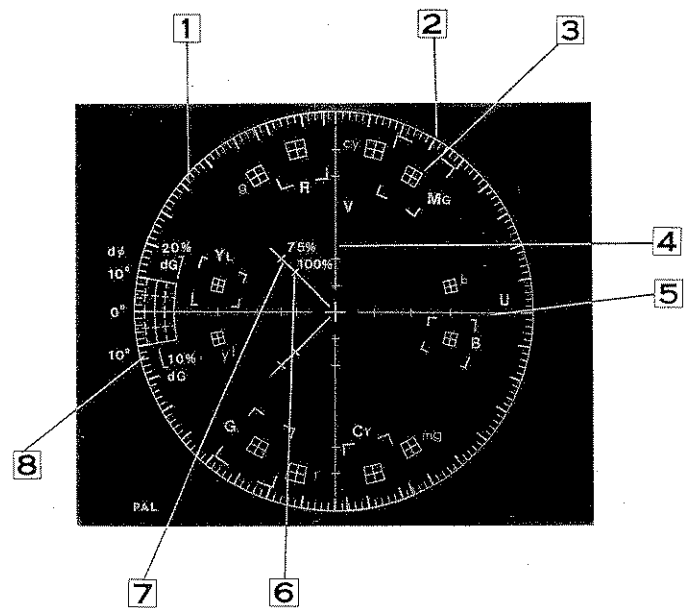


Figure 3-4

1 Circle of the graticule with a fixed amplitude. To set up this amplitude, the chrominance signal amplitude of inputs A and B must be 0.883Vp-p. The two scales on the circle are the main scale in 10 $^\circ$, and the subscale in 2 $^\circ$. These scales are used to measure the vector phase difference.

2 Indicates the allowable frame for the angle and phase of magenta of the standard color bar. The allowable angle range is within $\pm 10^\circ$ and the amplitude range within 20%. Other color bars are displayed in the same way.

3 Indicates the angle of magenta (of the standard color bar) and the tolerance of the amplitude. The angle tolerance is $\pm 3^\circ$ and the amplitude tolerance is $\pm 5\%$. Other colors are displayed here in the same way. These include R (red), B (blue), CY (cyan), G (green), and YL (yellow). Burst signals are also displayed.

4 V axis. The angle is 90° from the U axis.

5 Denotes the U axis. Its angle is 0° and it intersects perpendicularly to the V axis.

6, 7 Indicate the amplitude of burst signal: Item 7 for the burst amplitude of a 75% saturated color bar signal, and item 6 for that of a 100% one.

Figure 3-5 shows the angles for each hue, and Fig. 3-6 shows an example of hue tolerance. The center of the scale indicates the amplitude and phase of the color bar signal with a 75% or 100% saturation.

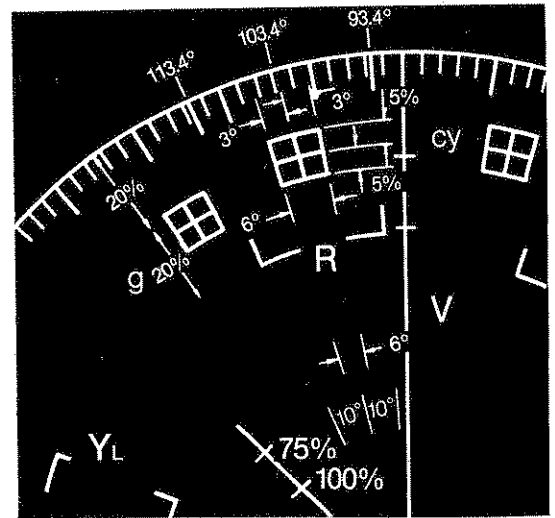


Figure 3-6

8 Scale for measuring differential phase and gain. They are measured with a staircase signal on which chrominance signal is superimposed. The scale indicates $\pm 5^\circ$ or $\pm 10^\circ$ range of the phase and $\pm 5\%$ or $\pm 10\%$ range of the amplitude.

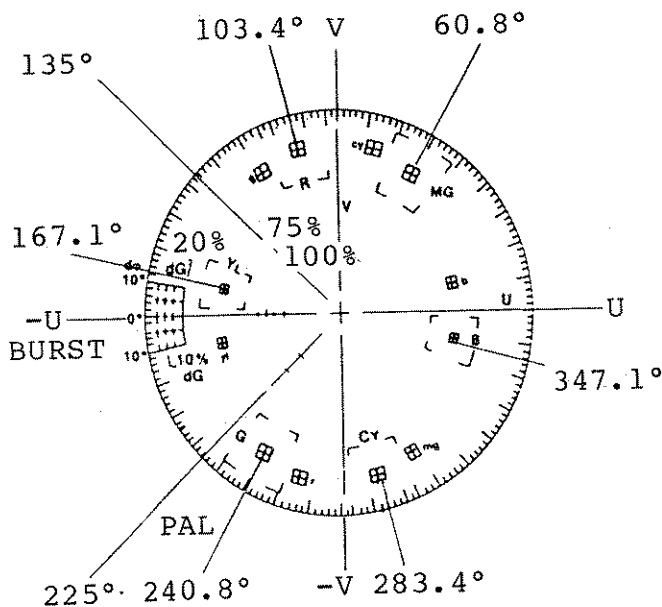


Figure 3-5

4. USING THE 5851V

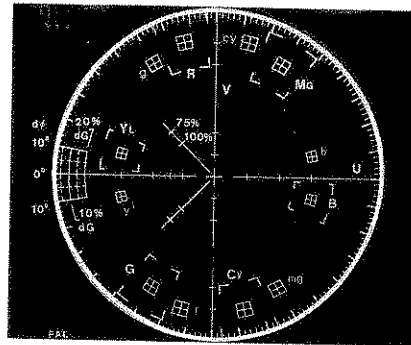
4.1 Precautions

- (1) Use the instrument with $\pm 10\%$ of the rated AC voltage. Applying excessive power may damage the Model 5851V or insufficient voltage may cause it to malfunction. With a rated power line voltage of 240V, the maximum input voltage is 250V.
- (2) Do not apply excessive voltage to each input connector:
For input A and B: Signal voltage of 5Vp-p and a DC voltage within $\pm 20V$ of the rated voltage.
For EXT REF: Signal voltage of 5Vp-p and a DC voltage within $\pm 20V$ of the rated voltage.
For BLANKING: The maximum sum of AC and DC voltages is within $\pm 100V$ of the rated voltage.
- (3) To prevent damage to the CRT and crystal oscillator, be careful not to subject these units to extreme mechanical shock.
- (4) When mounting the instrument on a rack, place it to a well-ventilated place to maintain an internal rack temperature under 40°C . Mount a fan on the instrument for air cooling where temperatures above 40°C are expected.
- (5) When testing or adjusting a TV receiver, VTR, or TV related equipment, refer to the Service Manual prepared by the manufacturer. Before connecting the input connectors inside the Model 5851V, be sure to disconnect the power cord from the AC line to prevent accidents due to electrical shock. In particular, be sure to wear voltage-protective gloves when handling the built-in high-voltage circuit of the TV receiver.
- (6) For more accurate measurements, supply power to the instrument about 20 minutes before operation to stabilize the internal temperature.
- (7) Without any input signal applied (where spot appears on the CRT), make sure that the luminescent point moves in horizontal direction when the H.POS control is turned to the right and to the left. If it does not move horizontally, adjust **ROTAT** so it can move horizontally.

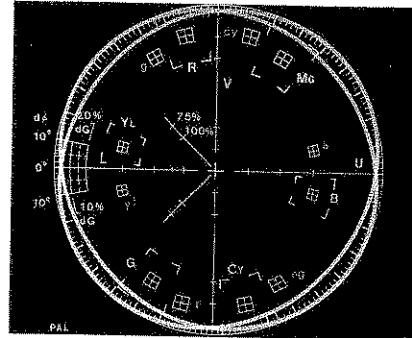
4.2 Self-inspection with Test Circle

The Model 5851V has a self-inspection capability by using the test circle. This circle is used to check if the amplitude and phase of the 5851V decoder have been adjusted correctly. They are measured by displaying the circle on the CRT after setting the chrominance signal applied to input A or B, in asynchronous mode.

Figure 4-1 shows a correct waveform and irregularly-adjusted waveform.



Correct



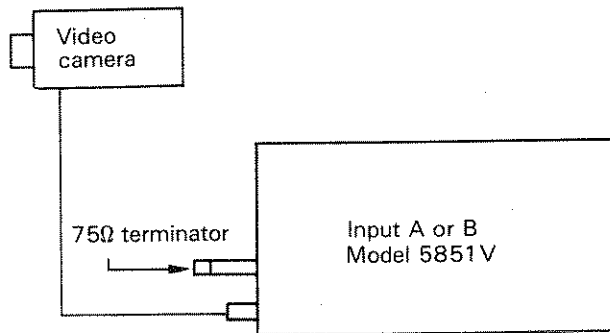
Irregularly-adjusted

Figure 4-1

No extreme deviation of the quadrature phase will be observed in normal operation. But, in case that the phase deviates due to secular change or parts replacement, it need be adjusted again. For details, see Chapter 5.

4.3 Connections and Measurements

4.3.1 Example connections



4.3.2 Adjustments and inspections before measurement

Before observation, the intensity and focus should be adjusted. For horizontal and vertical position controls, adjust them so the center of vector is centered at the scale. Then, inspect the quadrature phase using the test circle.

4.3.3 Measuring method

- (1) For measuring the vector of the chrominance signal of a single composite video input:
 - (a) Connect the signal for measuring to either input A or input B.
 - (b) Select A if input A is selected during **INPUT** and ϕ setting: select B if input B is selected accordingly.
 - (c) Select a 75% or 100% saturation according to the type of signal.
 - (d) Set the **amplitude adjuster** to CAL'D position.
 - (e) Adjust the burst signal to the Burst axis by using the **PHASE adjuster**.
 - (f) Measure the vector phase and amplitude by comparing them with the respective scales to check that they comply with the target allowable values.
 - (g) Changes the vector display mode from PAL to NTSC and vice versa.

Figure 4-2 shows an example measurement display.

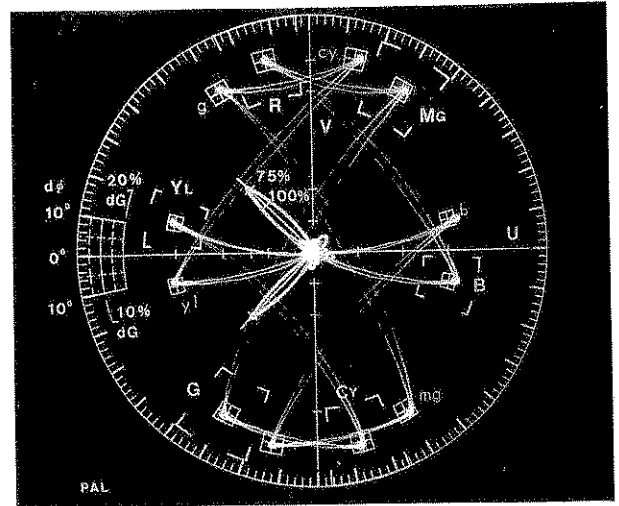


Figure 4-2

- (2) For measuring the phase difference between two signals:

The chrominance signals of both composite video signals should be synchronized to each other. Figure 4-3 shows an example connection.

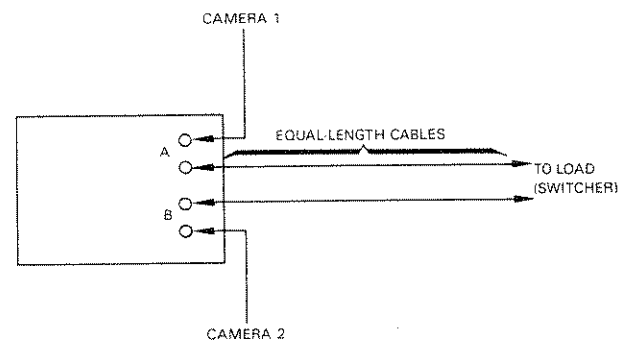


Figure 4-3

For example when the chrominance signal phases from two TV cameras do not match, a color mismatch may occur when the camera is switched to another. Therefore, the cable between cameras 1 and 2 must be adjusted.

- (a) Connect the composite video signals of cameras 1 and 2 to inputs A and B of the Model 5851V respectively.
- (b) Select a 75% or 100% saturation according to the type of signal.
- (c) Set the amplitude control to CAL'D position.
- (d) Adjust the synchronization switch according to the camera (camera 1 here) defined as the base camera.
- (e) Set the input to A and adjust the amplitude adjuster control so that the burst amplitude will touch the circle.
- (f) Adjust the burst phase to the $-V$ axis by using the phase adjuster.
- (g) Set the input switch to B and measure the burst phase of camera 2 with the scale on the circle. The portion off from the $-V$ axis is the phase difference from camera 1.

The allowable error in the phase difference between inputs A and B is within 1° .

Do not operate the amplitude adjuster during measurements because any amplitude change will also change the phase.

- (3) For measuring the chrominance signal without sync or burst signal:

Some TV equipment send the video images with composite video signals and others send the sync and video signals separately. And other TV equipment do not send burst signals. In such a case, the equipment sends subcarrier signals separately. Since synchronized black burst signals are available here, it can be used to synchronized with the instrument. The Model 5851V is set up at shipment so it will be synchronized with black burst signals. To use the external subcarrier signals for this purpose, switch the synchronization mode by referencing Section (5).

- (a) Connect video signal or chrominance signal to input A or B of the Model 5851V.

- (b) Connect the subcarrier or black burst signal to **EXT REF**. The subcarrier amplitude may range from 1Vp-p to 4Vp-p. The black burst signal may range from 0.2Vp-p to 0.8Vp-p.
- (c) Select a 75% or 100% saturation according to the type of signal.
- (d) Set the ϕ switch to **EXT REF**.
- (e) Select the input connector to which **INPUT** is connected.
- (f) For normal operation, set the amplitude adjuster to the **CAL'D** position. Change it, if necessary.
- (g) By using the phase adjuster, adjust the vector to the scale for measurements. Select **EXT REF** to select the demodulation subcarrier signal or black burst signal, and to change the input source from input A or B to **EXT REF**.

- (4) Measuring differential gain (DG) and differential phase (DP).

The differential gain and differential phase of a TV equipment can be measured by using the staircase where subcarrier is superimposed on.

- (a) Connect the staircase signal from the equipment to be measured, to input A or B of the Model 5851V.
- (b) Select 75% or 100% saturation according to the type of signal.
- (c) Select the sync and input modes according to the input connector to which the signal is connected.
- (d) With the amplitude control, adjust the outer-most vector so it can touch the circle. See Fig. 4-4.

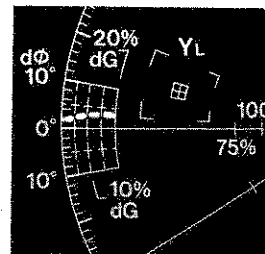


Figure 4-4

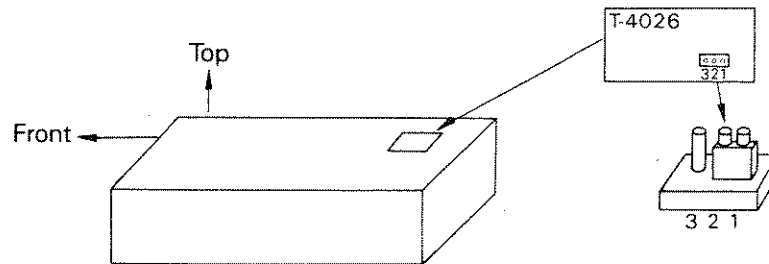
- (e) With the phase control, adjust the vector (d) to the 180° axis.
- (f) Measure the DP and DG from the scale.

- (5) Changing the EXT REF input
The EXT REF input of the Model 5851V may be synchronized either with subcarrier signal or with black burst signal. The input level of black burst signal is within $0.4V_{p-p} \pm 6dB$. And, that of subcarrier signal ranges from $1V_{p-p}$ to $4V_{p-p}$. At shipment, the instrument is setup so it can be synchronized with a black burst signal. To synchronize with subcarrier signal, the internal setting need be changed.

How to set up the input mode (how to mount a connector)

Subcarrier input: Between pins 1 and 2
Black burst input: Between pins 2 and 3

The instrument is synchronized with the subcarrier signal input while it is in the black burst input mode. This, however, causes the phases of inputs A and B to change.



5. MAINTENANCE

This well-designed Model 5851V operates stably and rarely causes troubles under normal handlings. But, in case of a deviation due to the aged parts or an irregular operation, contact the shop where you bought the instrument or our Service Department for repair.

This chapter explains the adjusting method required for using the Model 5851V more accurately.

Here, you will have to touch the inside of the Model 5851V. Therefore, be careful not to receive an electric shock because the AC line voltage and high-voltage are generated from the inside of the instrument.

Figure 5-1 indicates the dangerous places where high-voltages are generated.

Before taking off the case, be sure to turn off the power switch and disconnect the AC power cord from the AC line inlet. The capacitor in the circuit may be still charged with high voltages while the power is turned off. Therefore, do not touch any internal circuits and conductors.

The case of the Model 5851V can be removed from the mainframe by unscrewing four each of the top and bottom screws and four each of each side screws. After adjustment, immediately mount the case on the mainframe to cover the dangerous high-voltage section.

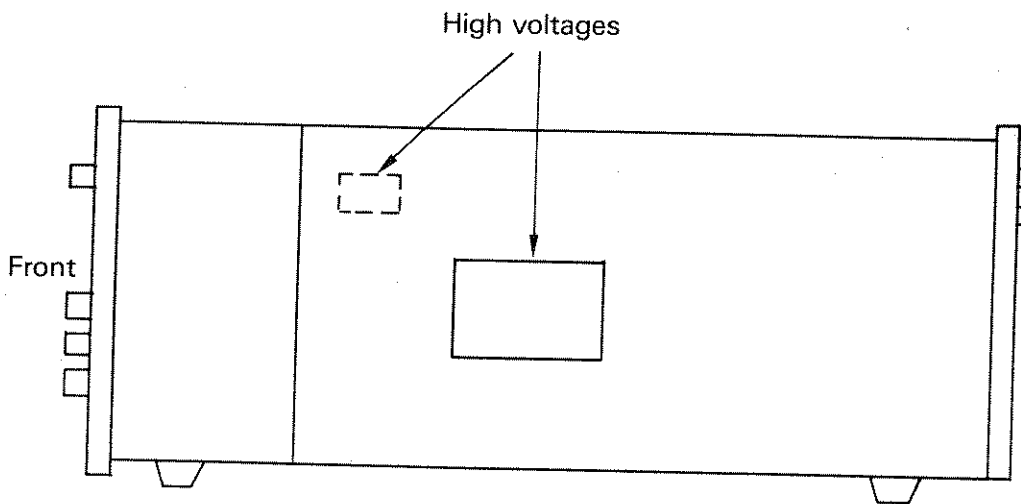


Figure 5-1

5.1 Quad-phase Adjustments

To adjust the quadrature phase, do:

- (1) Apply subcarrier or chrominance signal to input A. The input amplitude should be 0.15Vp-p to 3.5Vp-p.
- (2) Set the input switch to A.
- (3) With the amplitude control, adjust the vector so its amplitude will touch the circle. If the input signal is too large to fit the circle, change the input switch to A SUB to adjust the signal to the circle.
- (4) Turn the scale ON.
- (5) Turn the test circle ON.
- (6) Center the circle by horizontal and vertical positioning.
- (7) Use the VC401 (see Fig. 5-3) so the circle will be a perfect circle. See Fig. 5-2.

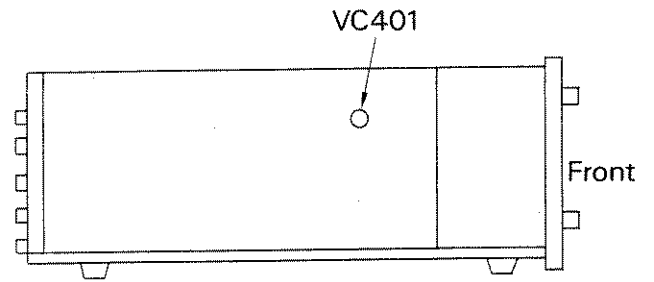
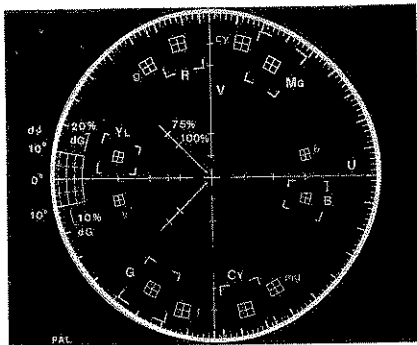
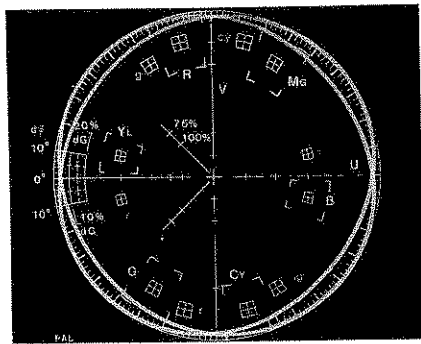


Figure 5-3



Correct waveform

Figure 5-2