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Title:

RC752 Video Display Monitor
Technical Manual

RCSL 42-i1592

A/S REGNECENTRALEN
af 1979

Keywords:

RC700, RC702, RC752, VDU752, Video Display.

Abstract:

This manual contains the technical manual for RC752 Video Display Monitor used in the RC700 system.

(32 printed pages)

Printed by A/S Regnecentralen af 1979, Copenhagen

RCSL 42-i1592

TABLE OF CONTENTS PAGE

1. GENERAL DESCRIPTION 1.

RC752 Video Display Monitor is normally used in connection with the RC702 Microcomputer system, but may also be used by other computer systems. The RC752 is designed by:

Nippon Electric Co., Ltd.
Tokyo,
Japan.

This manual is based on the service manual for NEC (Nippon Electric Co., Ltd.), Model JB-1201M(A). The RC752 is a special version of JB-1201M(A) and the corrections to this service manual are made by NEC and by RC Computer.

The technical name for RC752 is VDU752.

2. OPERATIONS 2.

In sections 2.1 to 2.3 the switches and controls on the front of the video monitor are explained. Sections 2.4 to 2.5 explain the switches and controls on the back of the video monitor.

2.1 POWER Switch 2.1

The picture will appear after approximately 10 seconds, when the power switch is turned to the right, and will disappear when the switch is turned to the left.

2.2 BRIGHTNESS Control Knob 2.2

The further to the right the knob is turned, the brighter the picture becomes. Adjustment needed is depending on ambient lighting conditions.

2.3 CONTRAST Control Knob 2.3

The further to the right the knob is turned, the more emphasized is the contrast between black and white. Do not overemphasize the contrast; it may strain your eyes.

2.4 H. HOLD Control Knob 2.4

If stripes appear on the screen, turn the knob slowly until the stripes disappear and a normal picture appears.

2.5 V. HOLD Control Knob 2.5

If the picture moves upward or downward, turn this knob slowly until a normal picture appears.

3. ADJUSTMENT 3.

The locations of the main part on the circuit board are shown in fig. 1.

The following adjustment may be done:

+B Adjustment: VR601 (+B ADJ)

Connect a DC voltmeter (range: 15 to 20V) to TP91 on the printed circuit board and the ground, and adjust VR601 until the voltmeter reads +12V.

Horizontal Width Adjustment: L503 (H. wodth coil)

(1) Display a character signal (e.g. for the letter H) fully on the CRT screen, and adjust the brightness and contrast to the best.

(2) Turn the hexagonal core of L503 until the optimum horizontal amplitude is obtained.

Vertical Height Adjustment (VR401 V. HEIGHT).

Vertical Linearity Adjustment (VR402 V. LIN)

(1) Display a character signal (e.g. the letter H) fully on the CRT screen, and adjust the brightness and contrast to the best.

(2) Turn VR401 and VR402 until the optimum vertical amplitude and linearity are obtained.

Focus Adjustment (VR901)

Bring the picture to the best focus by adjusting VR901.

LOCATIONS OF MAIN PARTS

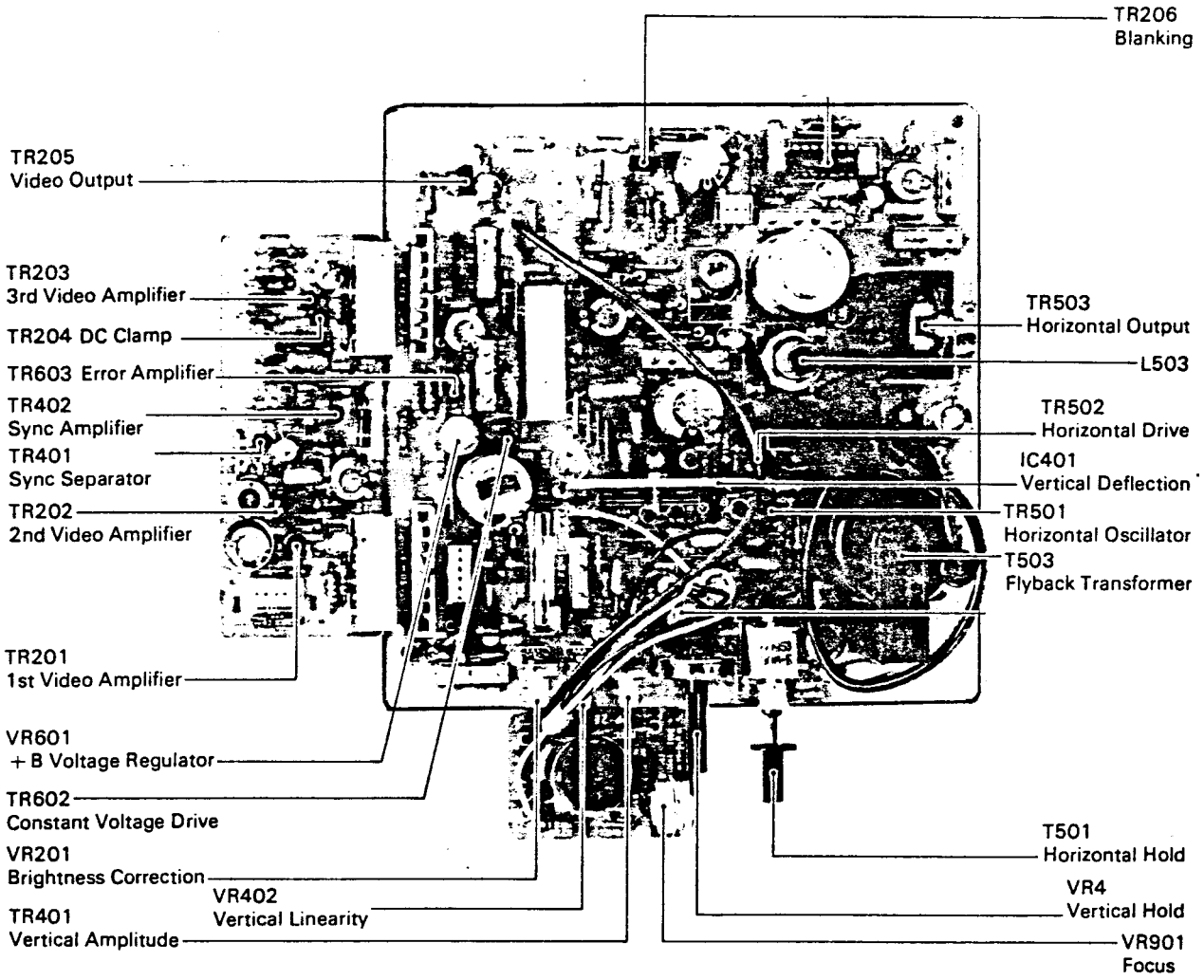


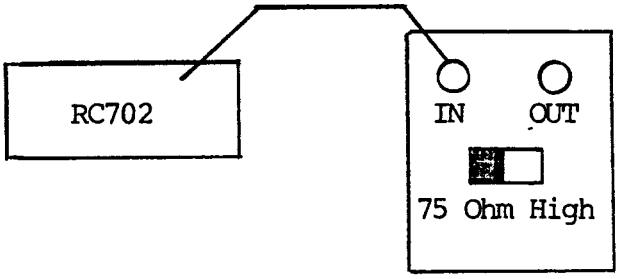
Figure 1: Location of main parts on PCBA.

4. CONNECTION TO RC702 4.

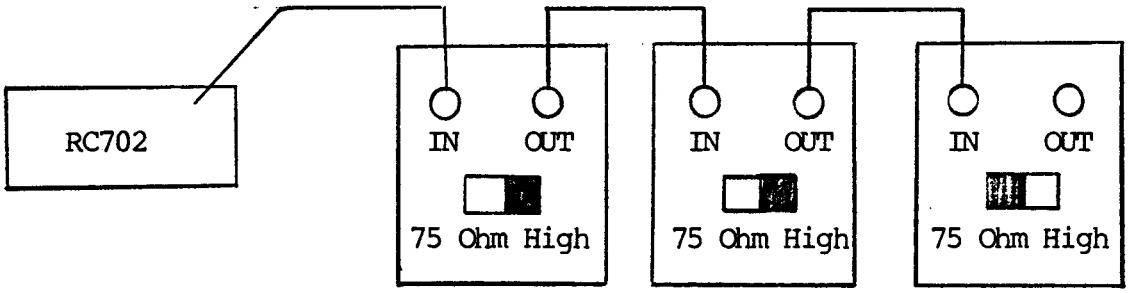
The power cable from RC752 is connected to RC702 to the Monitor Power Jack, which can only supply one RC752.

The signal from RC702 is supplied to RC752 using a coax cable and more than one monitor may be connected to the same signal.

The connections are made the following way:



RC752



The signal cable supplied together with RC752 is named CBL919.

5. SPECIFICATIONS 5.

Picture Tube	: C1270P4Y ARU 12" diagonal and 90° deflection
Phosphor	: Yellow (P4Y)
Video Input Signal	: Composite Video signal
Polarity	: Negative sync.
Level	: 1.0 V p-p
Impedance	: 75 Ohm (switchable to higher impedance)
Input Terminal	: BNC jacks
Active Display Area	: 230 (W) x 165 (H) mm
Scanning Frequency	
Horizontal	: 15.4 KHz (64.9 uS)
Vertical	: 50 Hz (20 uS)
Active Video Period	
Horizontal	: 48.1 uS
Vertical	: 17.9 mS
Video Bandwidth	: 30 Hz - 20 MHz (± 3 dB)
Display Characters	: 80 characters with 25 lines 5 x 7 dot matrix (7 x 11 dot/cell)
Controls	
Inside	: H. width, V. height, V. lin., focus, Sub brightness
Outside	: Brightness, Contrast, H. hold, V. hold
Operating Ambient Temperature	: 0°C - +40°C
Power Supply	: 15 V DC
Power Consumption	: 15 W
Dimensions	: 360 (W) x 296 (H) x 330 (D) mm
Weight	: 5 kg

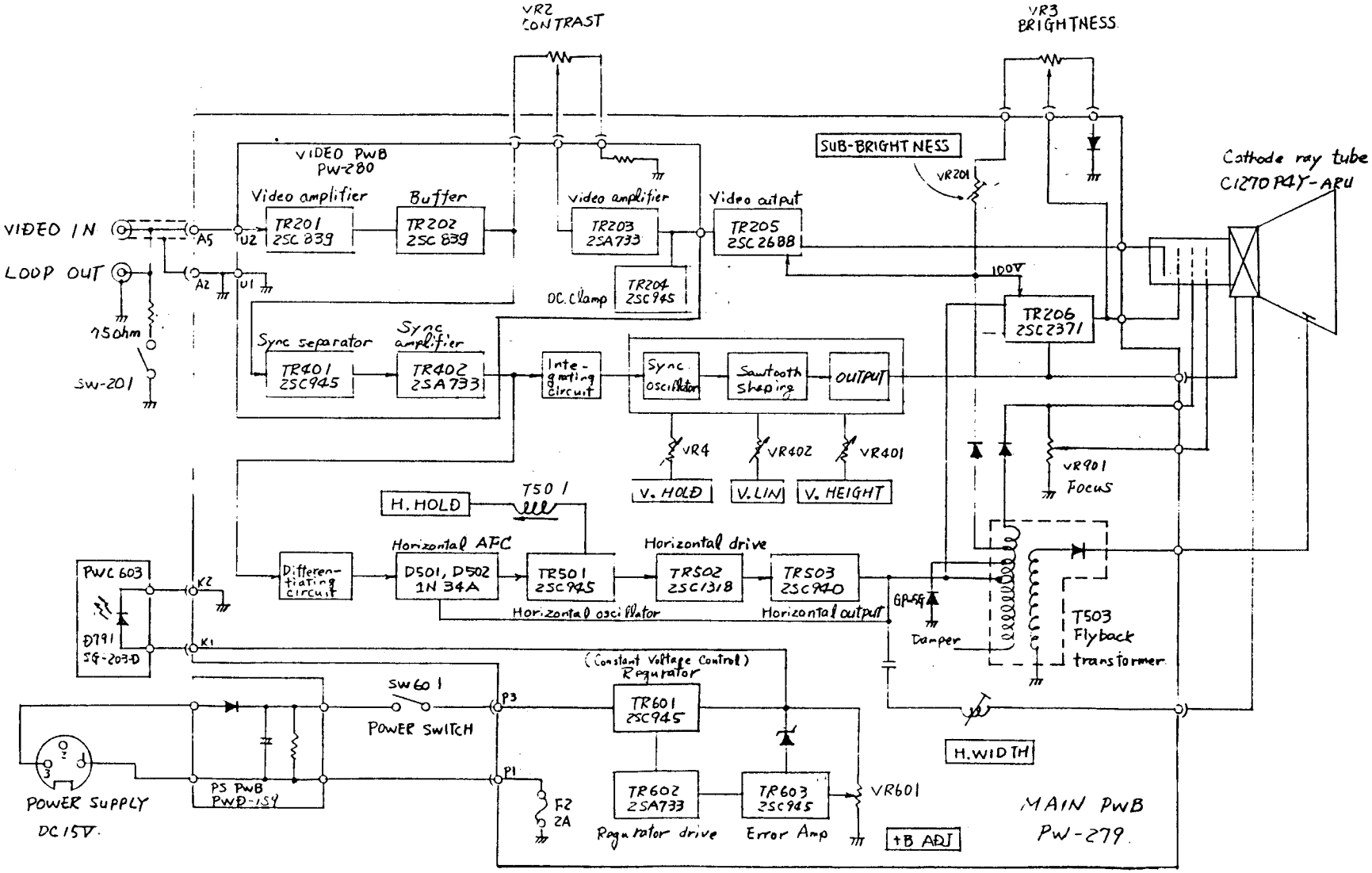
Note: The above specifications are subject to change without further notice.

6. CIRCUIT DESCRIPTION 6.

The rest of the manual is a part of the original NEC manual and contains the following parts:

A. Block Diagram
B. Circuit Explanation, 6 pages
C. Circuit Diagram, 2 pages
D. Drawings of Printed Circuit Boards
E. Thoubleshooting

BLOCK DIAGRAM

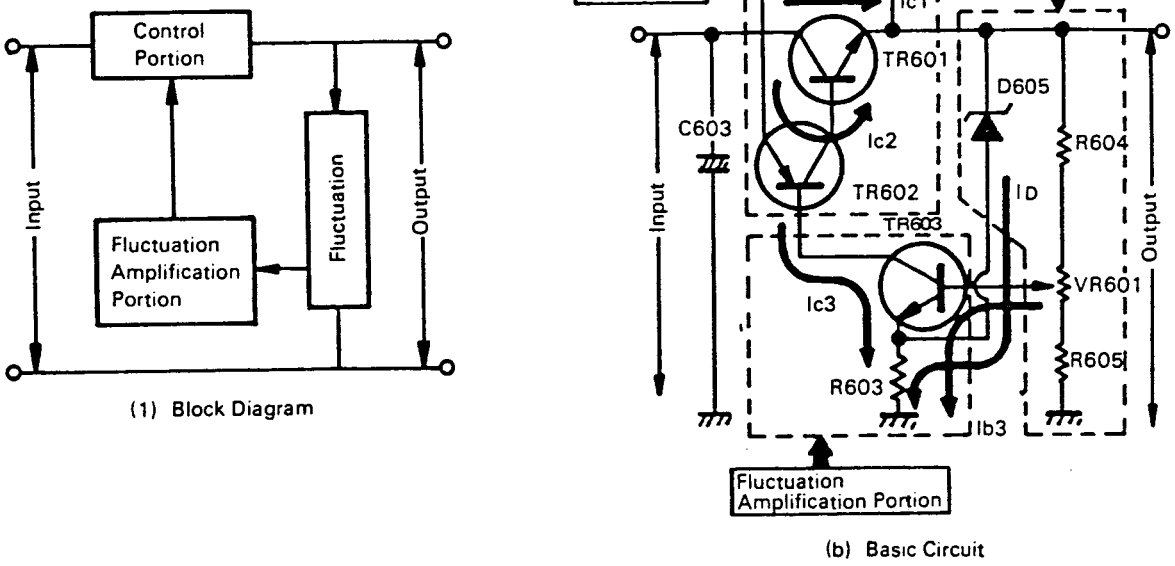


MODEL RC752

CIRCUIT EXPLANATIONS

1. Power Regulator Circuit

The Power Regulator Circuit is used to stabilize the power source voltage in case the transistor circuit as load, has a composition in which the operating current changes considerably by the input signal.



(1) Block Diagram

(b) Basic Circuit

Fig. 3 Power Regulator Circuit

As shown in Fig. 3, the Power Regulator Circuit is composed of three major blocks when roughly divided into its functions.

The Fluctuation Detection Portion detects the fluctuation of output voltage and adds this to the Fluctuation Amplification Portion.

The Fluctuation Amplification Portion will amplify the voltage fluctuation and add this to the Control Portion. By doing so, the Control Portion will control the current supplied to the B Circuit.

If we consider the case in which the output voltage begins to get high by the influence of something, the fluctuation amount will be added to the emitter of TR603 by the Zener diode D605, and the emitter voltage will be raised.

On the other hand, at the base of TR603, the voltage fluctuations will be divided at R604, R605, and fluctuation voltage smaller than the emitter will be added. Therefore, the voltage increase of the emitter will become greater than the base, and the voltage between the base of TR603 and the emitter will become small, and the base current will decrease.

In case the base current of TR603 decreases, the base current of TR602, TR601 will decrease.

Consequently, the collector current of TR601 will decrease, and make the output voltage drop.

Furthermore, in case the output voltage begins to drop, the potential of TR603 base and emitter will be reduced, but the degree of reduction will be greater for the emitter.

Thus, the voltage difference between TR603 base and emitter will become greater, and Ib3 will increase. By this, Ic3, Ic2 and Ic1 will increase and make the output voltage rise.

R602 will actuate so that the output voltage will generate immediately when the power source switch is turned ON. In other words, in case R602 does not exist, output voltage will not be impressed when the power source switch is turned ON, and TR603 will not actuate. As a result, no voltage will appear in the output, and it will remain as it is.

For this reason, voltage is impressed to the output side at the start up time by R602, to actuate this constant voltage circuit.

2. Explanation of VIDEO PWB

The VIDEO INPUT of 1 Vpp is added from the A5 terminal of PW-279 of the main PWB, then added to the base of TR201 of 1st VIDEO AMP via the U_2 terminal of VIDEO PWB PW-280

Subsequently, it is amplified to about 2.7 Vpp by TR201 and TR202.

Between the output side of TR202 and the amplifier of the next stage, VR is installed, and the input to TR203 of the next stage is increased or decreased by the changes in this division ratio, and the adjustment of the picture contrast is made.

Each stage of the image portion is connected with capacitors, so the direct current portion will be eliminated, and the average brightness of the picture will be reduced.

On the other hand, to the base of TR204, pulses of the synchronous pulses of TR402, which have been delayed by L201, C206, are input and only during this pulse period TR204 will maintain continuity.

This period is equivalent to the back porch of the composite video signal, and when continuity is made for TR204, the back porch of the video signal on the collector side will be clamped to the electric potential of the emitter side of TR204.

In this way, VIDEO signal of which the direct current portion has been regenerated by TR204 will be sufficiently amplified by TR205, and impressed on the cathode of the CRT.

On the other hand, the output of TR202 will appear at test point TP31, and be synchronously separated at SYNC SEP of TR401. The synchronous signal which has been amplified by TR402 will pass through integration circuit composed of R408, R409, C405 and C408 via terminal W2, and only the vertical synchronous ones will be separated and added to pin 5 of IC401.

Furthermore, the synchronous signals which passed through the differentiating circuits C501 and R501 via terminal W3 will be added to the unbalanced type AFC Circuit.

3. Sound Output Circuit

The sound signal which enters from the SOUND IN terminal will be input to pin 7 of IC301 via S1 terminal of the main PWB and the Sound Adjustment control, VR1.

At this IC, it is amplified to about 40 dB and output to pin 8.

To pin 9, voltage to drive this IC is added from C603.

C308 and R306 of pin 6 raises the S characteristics.

C305 between pin 8 and pin 10 is a capacitor for bootstrap, and R302 is resistance for bias of the output.

4. Vertical Deflection Circuit

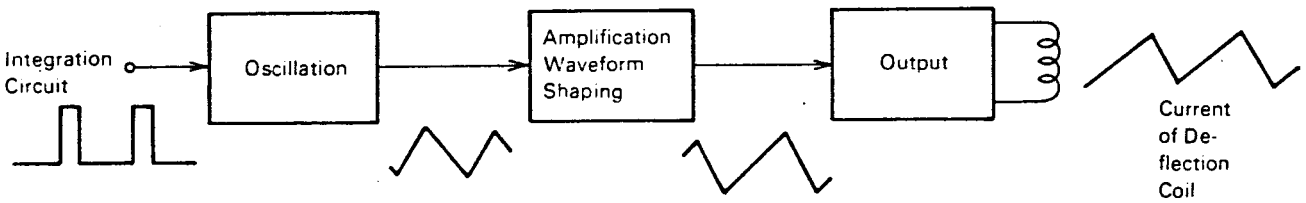


Fig. 4 Composition of Vertical Deflection Circuit

As shown in the block diagram, the base circuit of the vertical deflection circuit is composed of vertical oscillation circuit which generates saw tooth wave voltage, amplification waveform shaping, and output circuit.

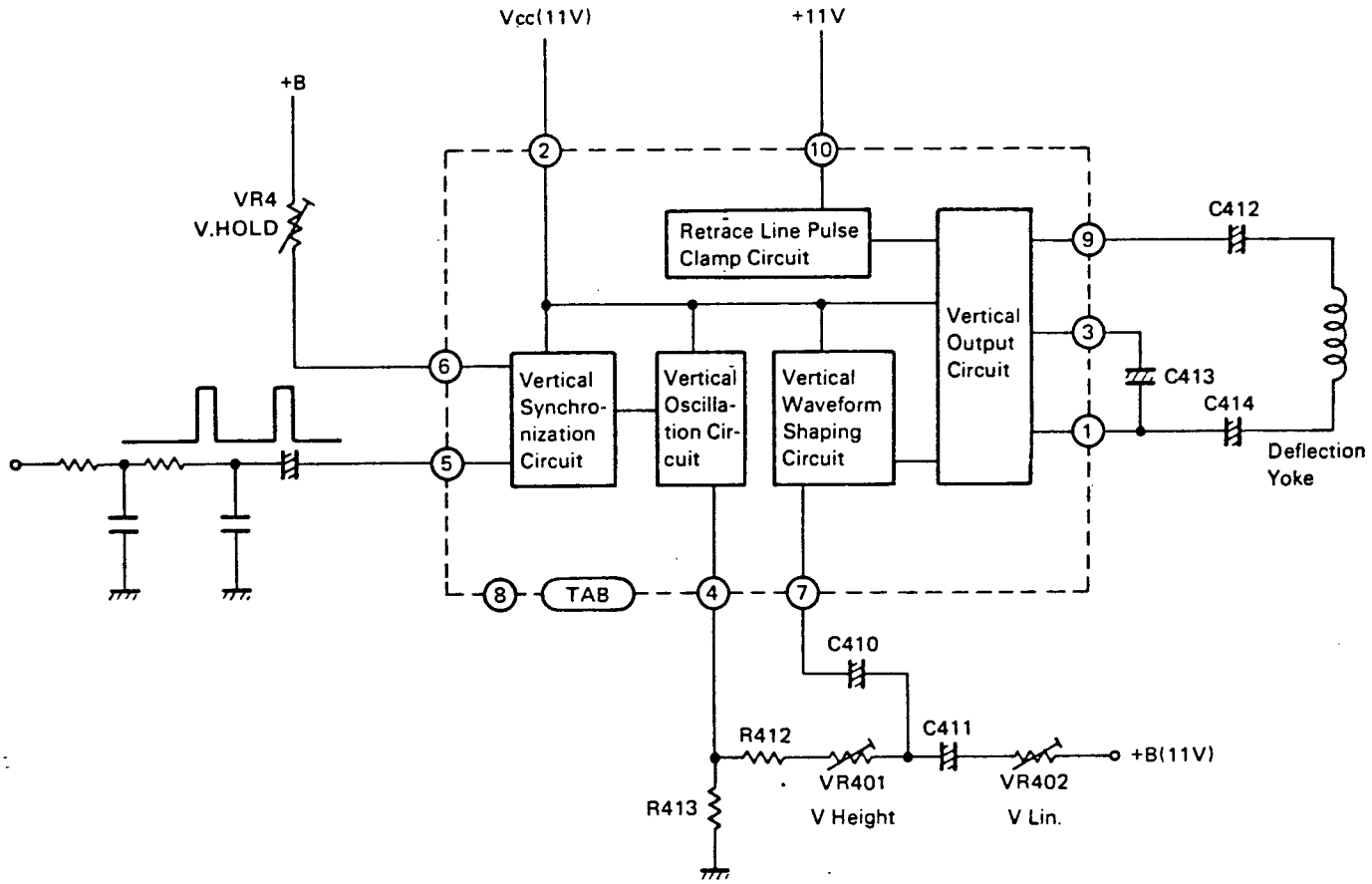


Fig. 5

The vertical synchronous signal that has been synchronously separated and which has passed through the integration circuit is added to the vertical synchronous circuit by pin 5 of IC401.

The saw tooth wave of 50 Hz which has been generated by the vertical oscillation circuit is taken from pin 4, and after passing through R412, VR401 and C410, it is added to pin 7, then after the waveform shaping, it is amplified, and added to the vertical output.

R413 and C409 are time constants which determine the oscillation.

The vertical output waveform is a waveform in which pulse is superposed with sawtooth wave as it is clear from TP82. This is designed so that high voltage is added to retrace line period, and low voltage is added to scanning period in order to decrease the power consumption of vertical deflection circuit by retrace line pulse clamp circuit.

In the above mentioned way, the circuit power consumption is reduced and the operation is done efficiently.

VR401 is VR for adjustment of V Height and VR402 is VR for adjustment of V. Lin, and they are connected to pin 4 and pin 7, respectively.

Furthermore, vertical synchronization is done by VR4 connected to pin 6.

5. Blanking Circuit

During the retrace line period, if the television picture tube is operating, white slantwise lines vertical retrace (flyback) lines will appear on the tube and become obstacle to the picture, so they must be eliminated.

Such a phenomenon occurs when the black label adjusted to the cut-off and below of the picture tube moves, and the scanning lines in the vertical retrace (flyback) line period appears in the picture.

In order to prevent this, it will be sufficient if the television picture tube does not operate during the retrace (flyback) line period.

As an actual circuit operation, positive polarity pulse generated during the retrace (flyback) period is added to the base of the Blanking Transistor TR206 from IC401 pin 1 and the collector of horizontal output transistor TR503, and negative polarity pulse is taken out to the collector of TR206, and this is added to the control grid G1 of CRT via C211.

During the retrace (flyback) line period, the bias of CRT is made deeper, and cut off.

6. Horizontal Deflection Circuit

As shown in Fig. 6, the horizontal deflection circuit is composed of AFC Circuit, Oscillation Circuit, and Output Circuit, and its function is to pass sawtooth wave current synchronized with the horizontal synchronization signal to the deflection coil.

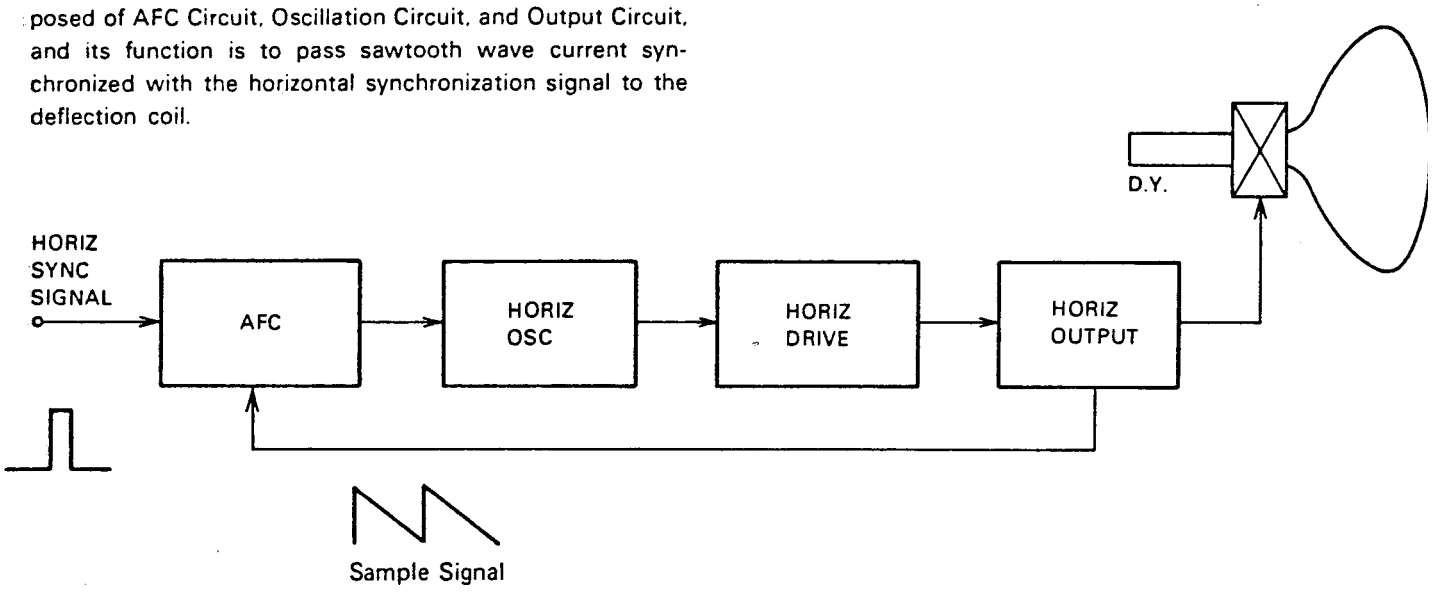


Fig. 6 Horizontal Deflection Circuit

Function of AFC Circuit

The vertical synchronous signals which control the vertical oscillation current pass through 2 or 3 stages of integration circuit which is a kind of lowpass filter, so the horizontal synchronous signals and pulsing noises are leveled off and do not appear in the output.

Therefore, the oscillation circuit can be directly controlled by the synchronous signals. However, horizontal synchronous signals are taken out by passing them through a kind of high-pass filter, so pulsing noises will be mixed, and in the same way as the vertical circuit, if direct control is done, the synchronization will be disturbed, and a stable picture can not be obtained.

Consequently, for the control of horizontal oscillation frequency, AFC circuits are used.

The AFC circuits will compare the phase of the oscillation circuit and the phase of the synchronous signal, then generate direct current output voltage proportionate to the phase difference. This voltage is added to the oscillation circuit, and the oscillation frequency and its phase will be coincided with the horizontal synchronous signal.

The horizontal oscillation signal fed back to the AFC circuit is normally done by changing the pulse generated in the horizontal output circuit into sawtooth wave (This is called comparative waveform signal).

7. Horizontal Oscillation Circuit

The horizontal oscillation circuit generates frequency of 15.625 kHz, and just like in case of the vertical oscillation circuit, blocking oscillation circuit which employs the oscillation transformer is often used.

The oscillation time constant becomes rather small time constant than that in case of the vertical oscillation circuit at R510, C507 and C508.

The Oscillation Transformer is designed so that positive feedback and oscillation will be made at T501.

In case the base voltage of the oscillation transistor becomes high, the oscillation frequency also becomes high, and in case the base voltage becomes low, the oscillation frequency becomes low.

Therefore, the frequency control will function as follows.

If the oscillation frequency begins to get low (The phase is delayed) the output of AFC increases.

Since this voltage is added to the base of the horizontal oscillation, it will function as raising the oscillation frequency (The phase is advanced.).

Contrary to this, if the oscillation frequency begins to get high (The phase advances), the output of AFC will become low, and this will be added to the oscillation circuit. Consequently, it will function as lowering the oscillation frequency (The phase is delayed). In the above mentioned way, the horizontal oscillation frequency and its phase will always coincide with the horizontal synchronous signal.

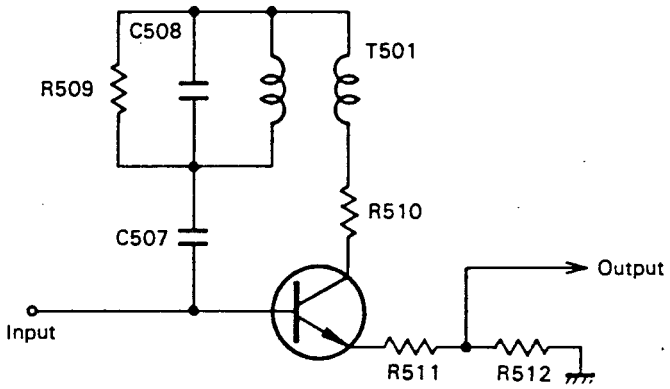


Fig. 7 Horizontal Oscillation Circuit

8. Horizontal Drive Circuit

The horizontal oscillation drive circuit is located between the oscillation circuit and the output circuit, and its function is to amplify the oscillation output and drive the output circuit. In Fig. 8, its circuit is shown.

The waveform which is amplified is a waveform like rectangular waves. Since transformers are used, sharp pulses generate when the transistors become ON or OFF. C510 and R513 are inserted to absort such pulses.

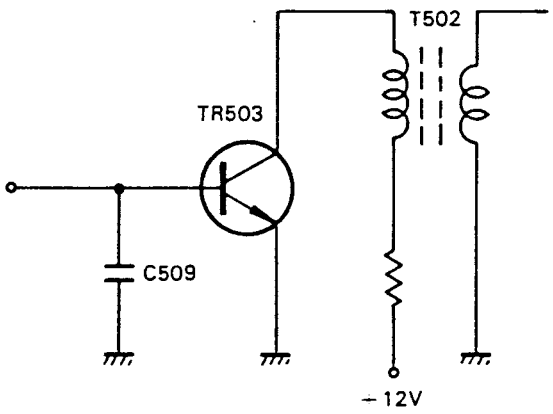


Fig. 8 Horizontal Drive Circuit

9. Horizontal Output Circuit

The horizontal output circuit has the function of sending sawtooth wave current of 15.625 kHz to the horizontal deflection coil. However, unlike the vertical output circuit, this is done by the switch operation of the transistors. Fig. 9 shows the horizontal output circuit.

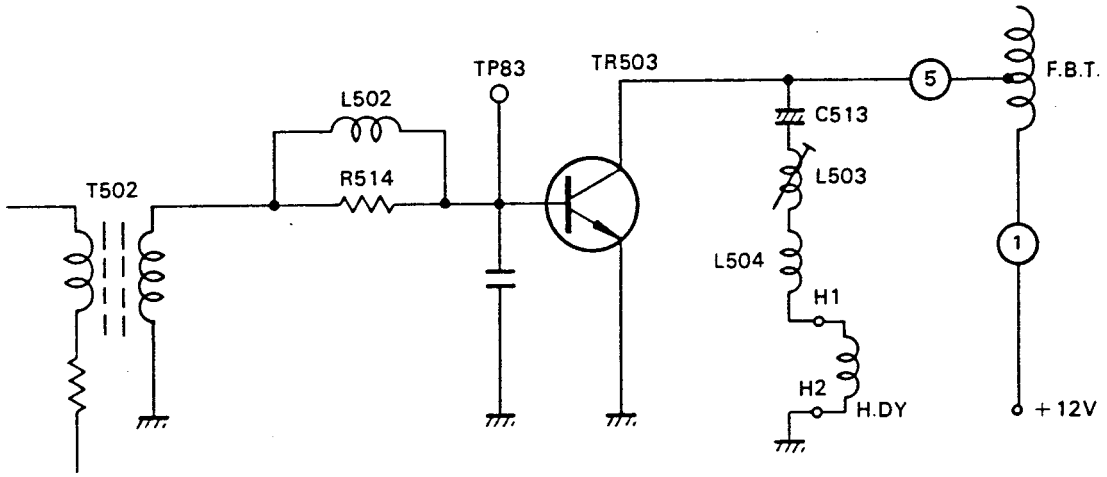
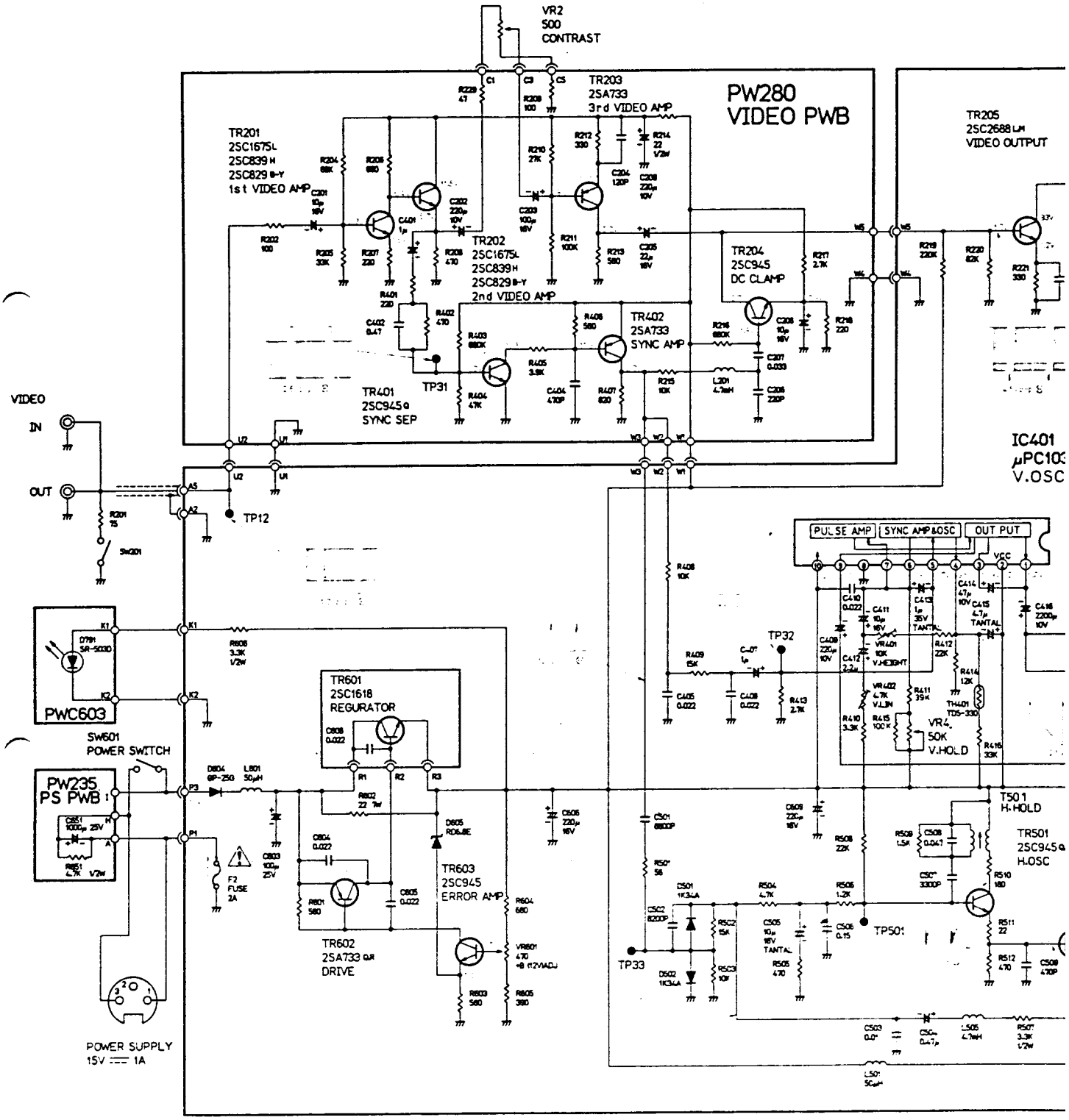
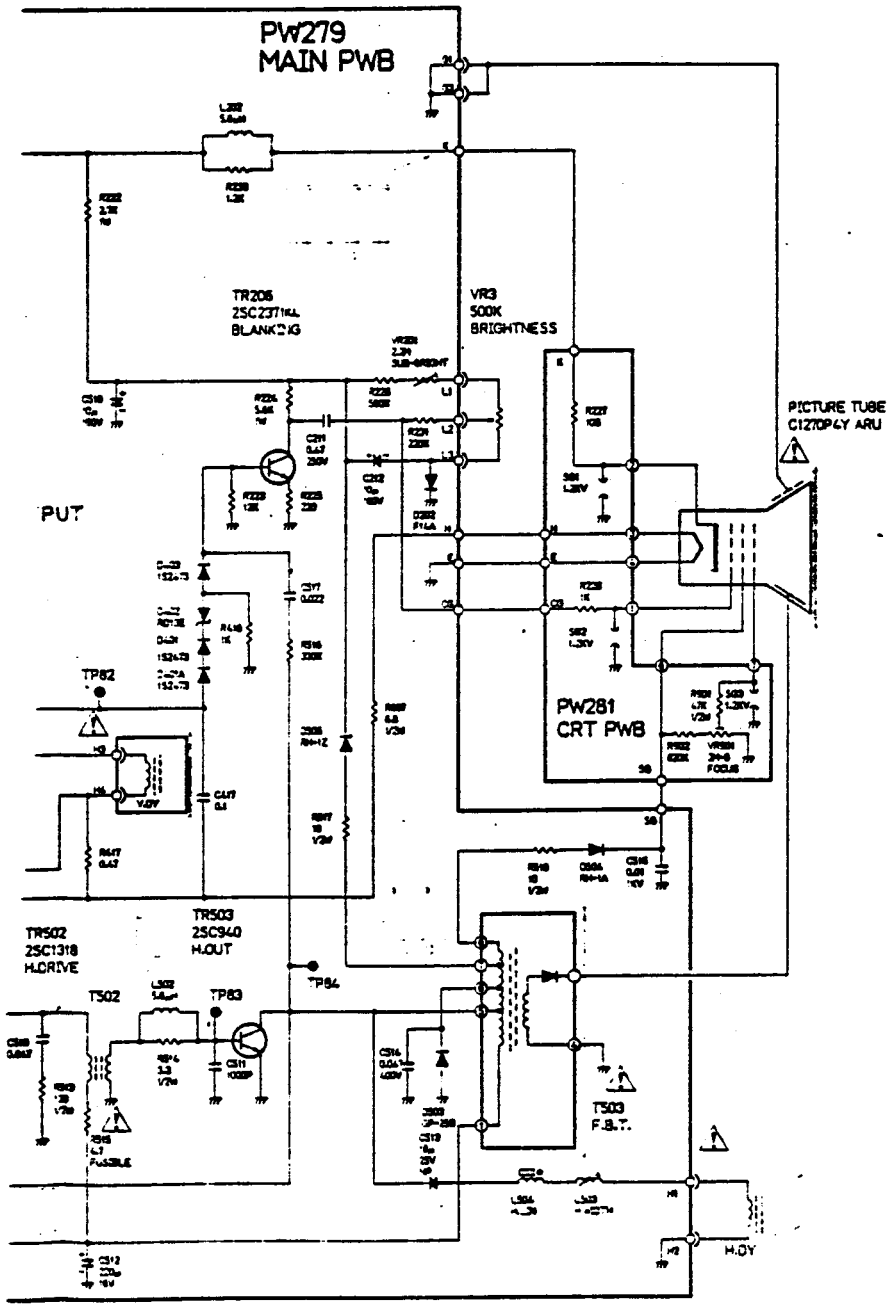
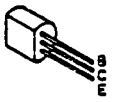


Fig. 9 Horizontal Output Circuit

MODEL RC 752
SCHEMATIC DIAGRAM







2SA733
2SC1318
2SC2002
2SC945
2SC828,829
2SC838,839
2SC1684

2SC2371
2SC2568

2SC940
2SC1618

E: EMITTER
B: BASE
C: COLLECTOR

NOTES

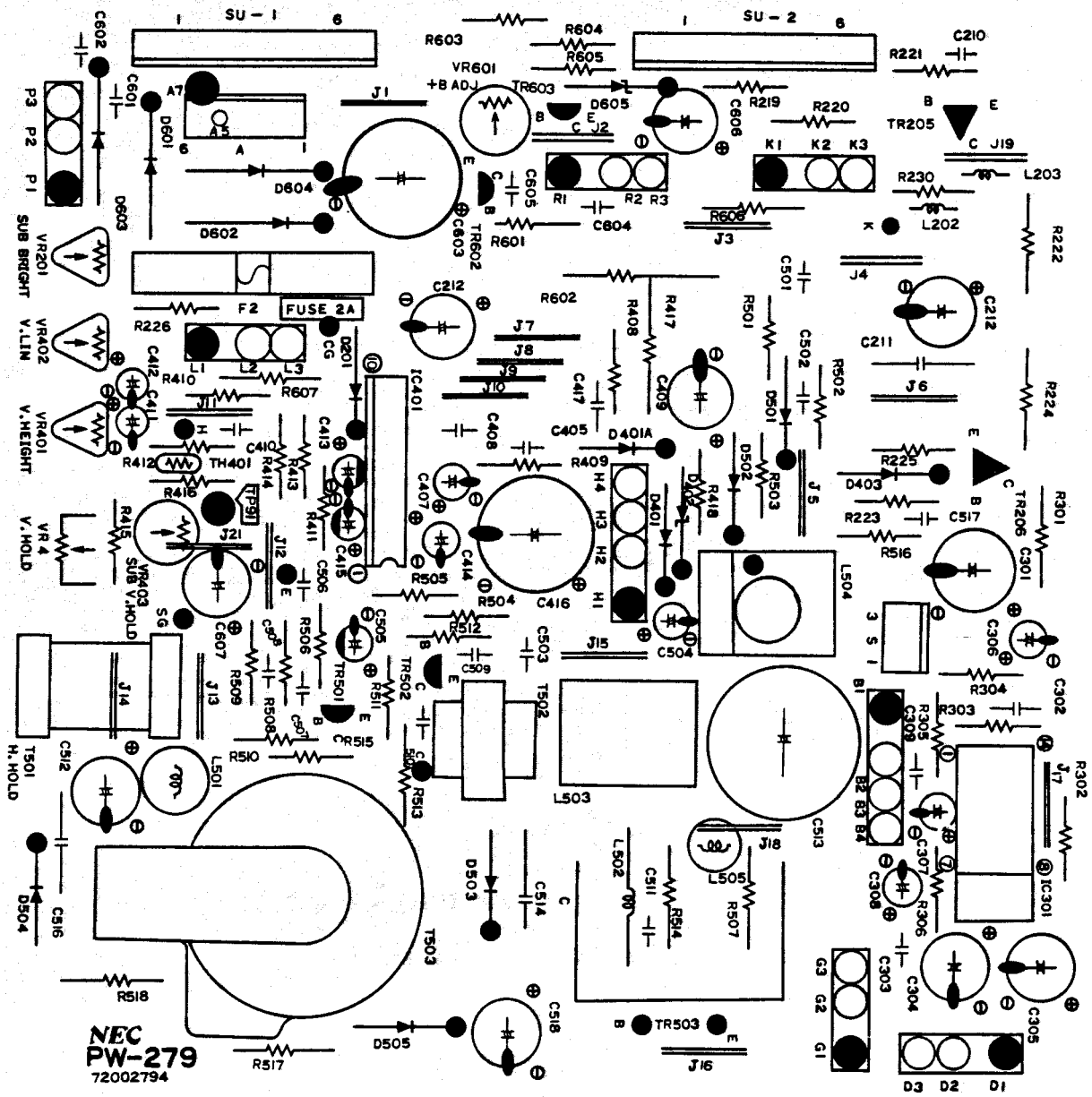
1. RESISTOR VALUES ARE IN Ω (OHM) K=1000Ω M=1000,000Ω
2. ALL RESISTORS ARE ¼WATT. EXCEPT WHERE OTHERWISE INDICATED.
3. CAPACITOR VALUES ARE IN μF UNLESS OTHERWISE INDICATED. P=
4. ALL CAPACITORS ARE 50VOLTS EXCEPT WHERE OTHERWISE INDICATE
5. VOLTAGES AND WAVEFORMS ARE MEASURED UNDER THE CHARACTOR SIGNALS IN THE CONDITIONS OF CONTRAST AND BRIGHTNESS CONTR ARE MAXIMUM AND ALL OTHER CONTROLS ARE NORMAL OPERATION.
6. ⊖---- HORIZONTAL RATE. ⊖---- VERTICAL RATE.

WARNING

REPLACEMENT PARTS WHICH HAVE SPECIAL SAFETY CHARACTERISTICS ARE IDENTIFIED BY ⚠ SHADING ON THE SCHEMATIC REPLACE THESE CRITICAL COMPONENTS WITH RECOMMENDED REPLACEMENT PARTS.
DON'T DEGRADE THE SAFETY OF THE SET THROUGH IMPROPER SERVICING.

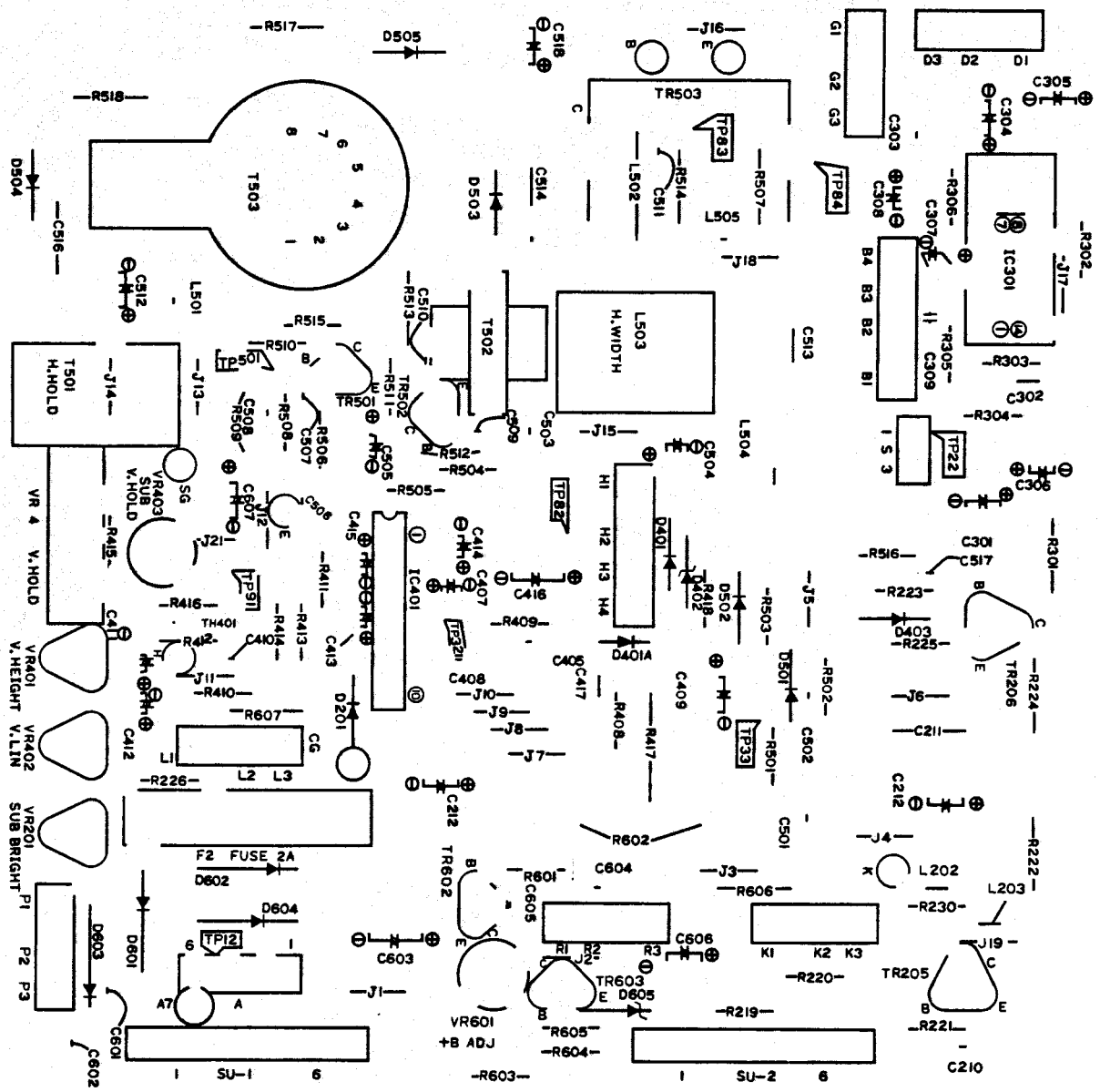
MAIN PWB ASS'Y (PW-279)

(Component Side)



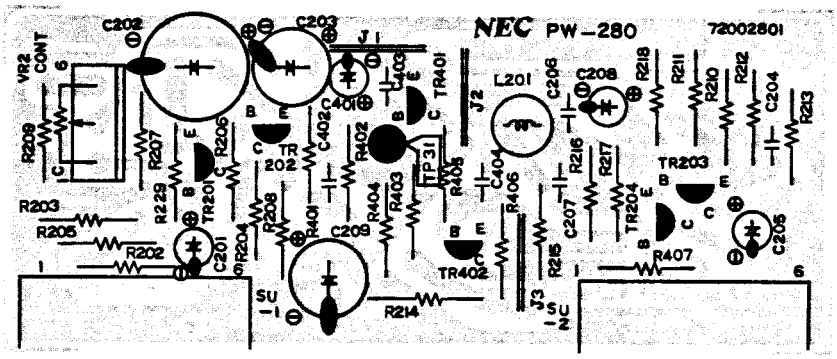
MAIN PWB ASS'Y (PW-279)

(Solder Side)

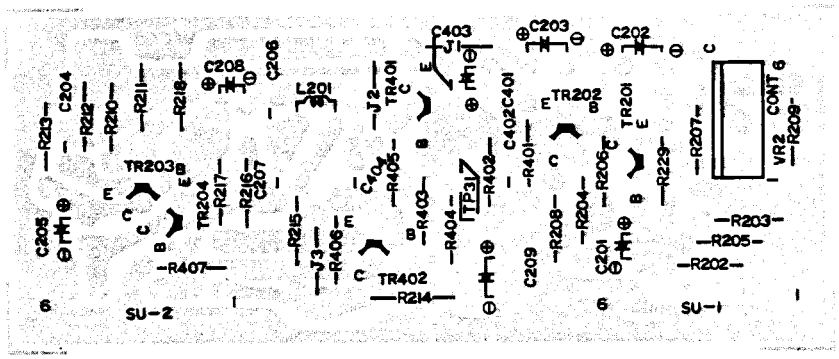


VIDEO PWB ASS'Y (PW-280)

(Component Side)

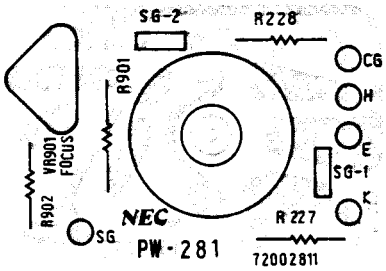


(Solder Side)

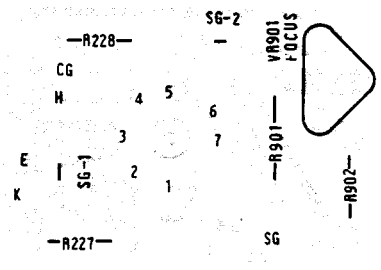


CRT PWB ASS'Y (PW-281)

(Component Side)

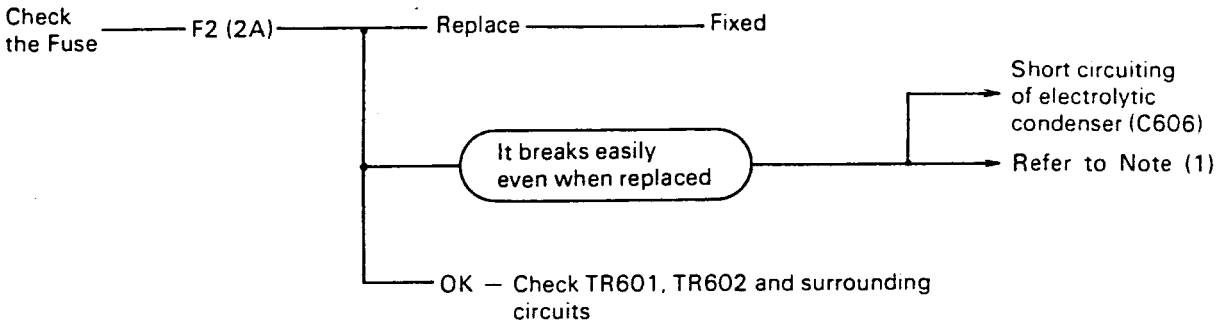


(Solder Side)

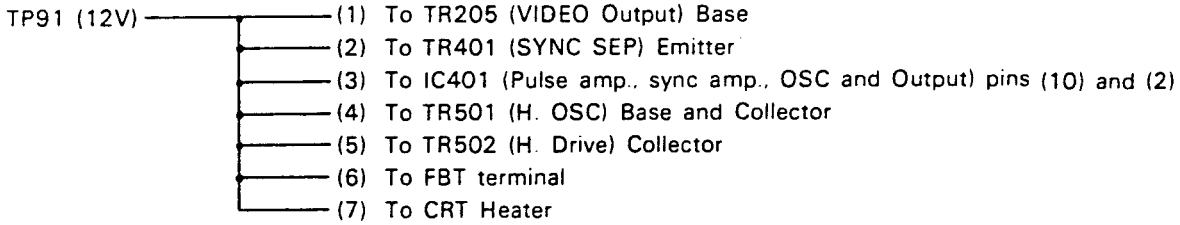


TROUBLESHOOTING

1.

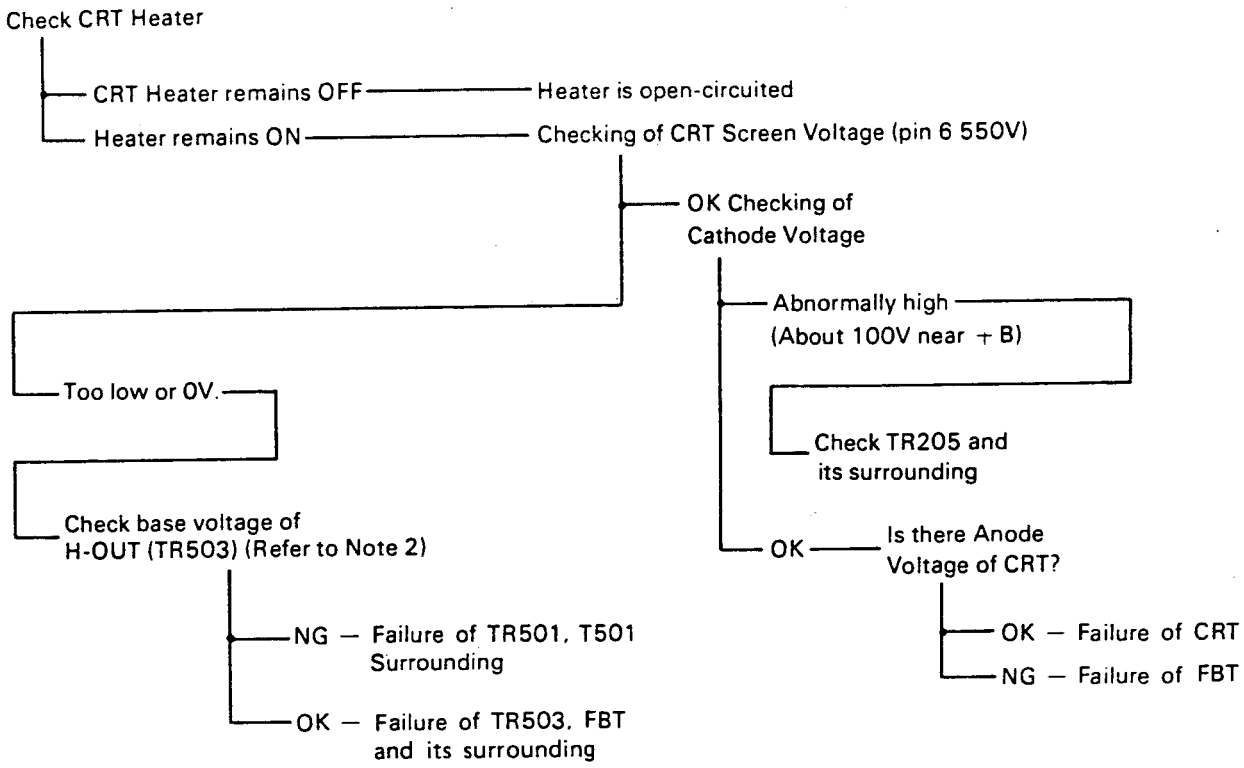


Note (1): Supply source of DC voltage (12V)

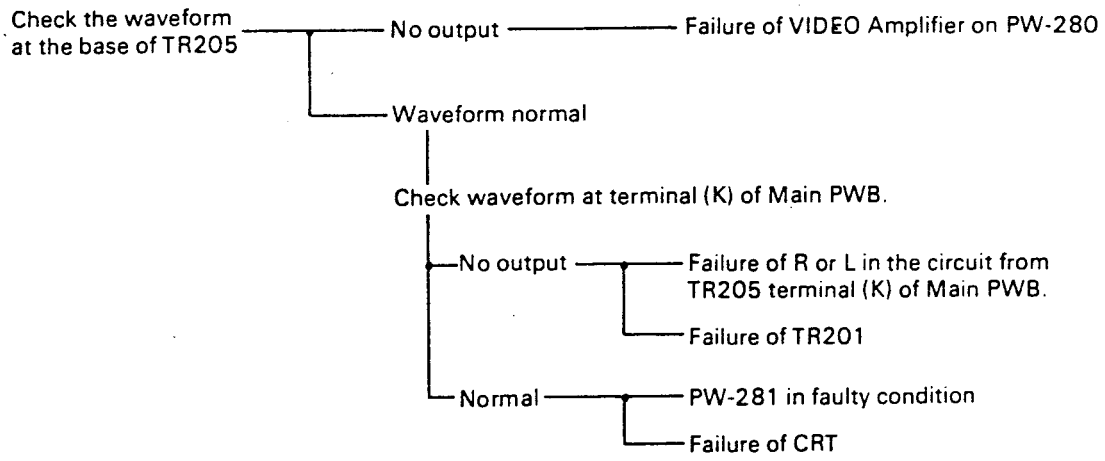


As described above. DC~~11~~12V is supplied to various circuits from TP91. Therefore, in order to find what the cause is, it is necessary to divide the circuits into separate circuits, and judge where the trouble lies.

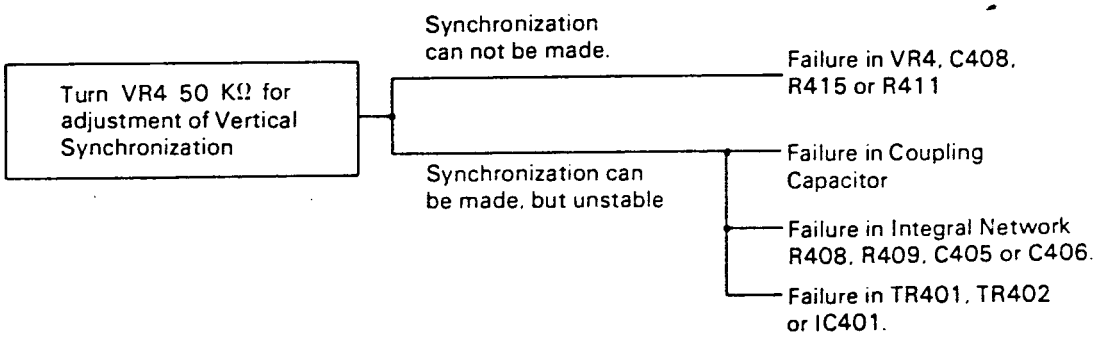
Note (2): In case AC~~10~~12V range tester is connected to the base of TR503, the meter will deflect when the horizontal oscillating circuit is oscillating, so it can be judged whether the trouble exists before the oscillating circuit or after the oscillating circuit.



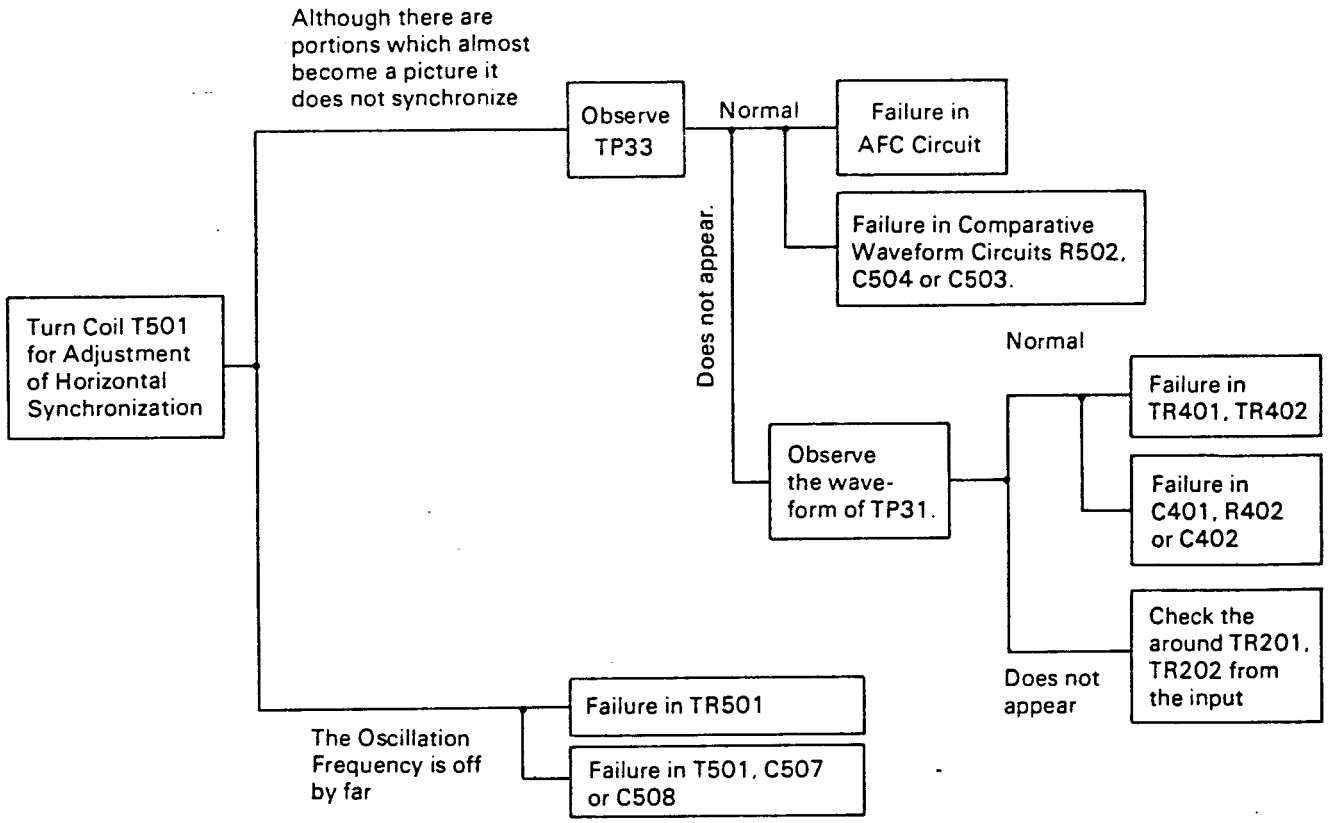
2. ~~Sound and~~ raster are normal, but picture does not show up.



3 ~~4~~ Vertical Synchronization can not be made.



4. 5. **Horizontal Synchronization can not be made.**



RETURN LETTER

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Do you find errors in this manual? If so, specify by page.

How can this manual be improved?

Other comments?

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Company: _____

Address: _____

Date: _____

Thank you

42-i 1288

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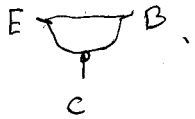

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