

Service Manual

HX-12 MONITOR

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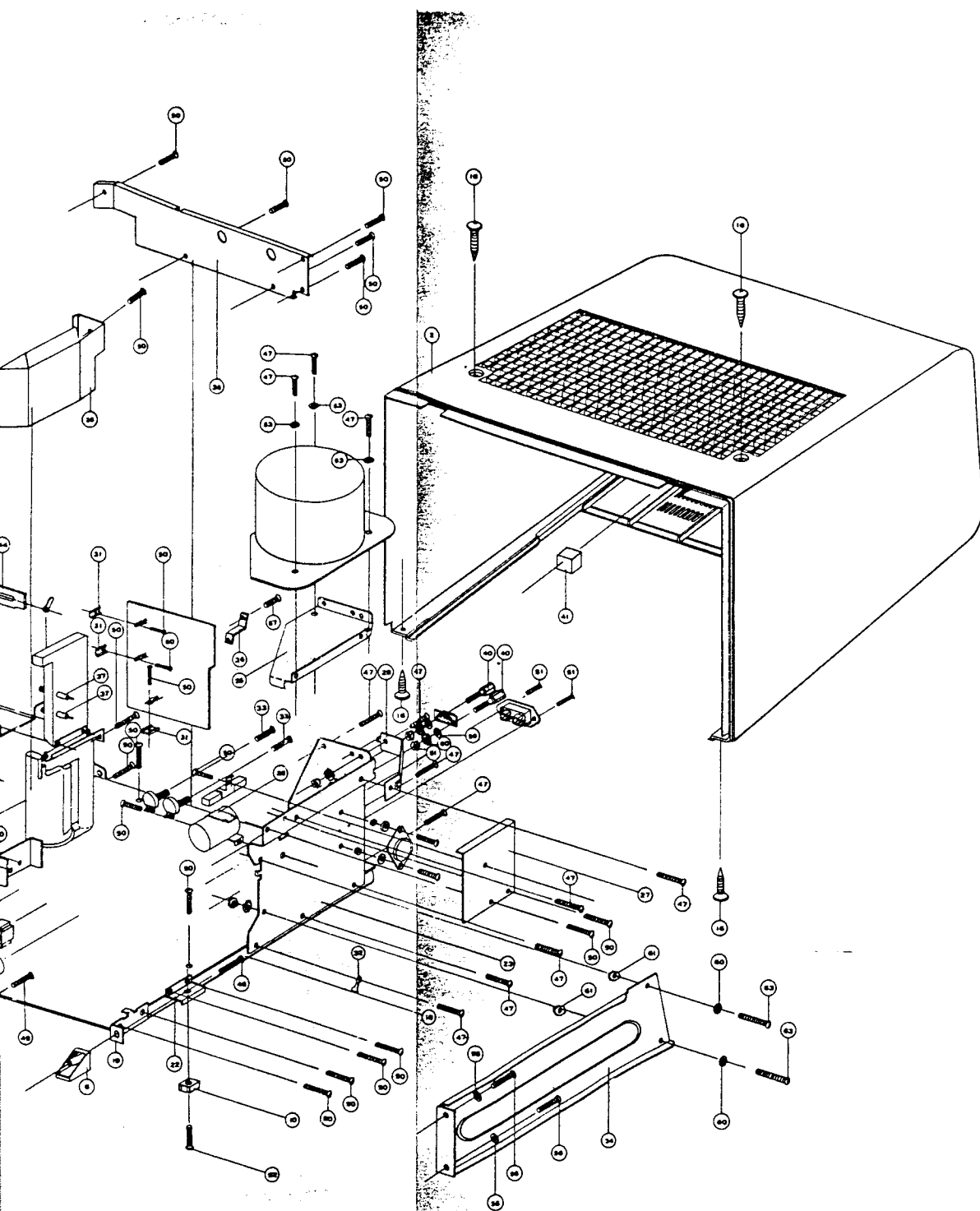
Trouble
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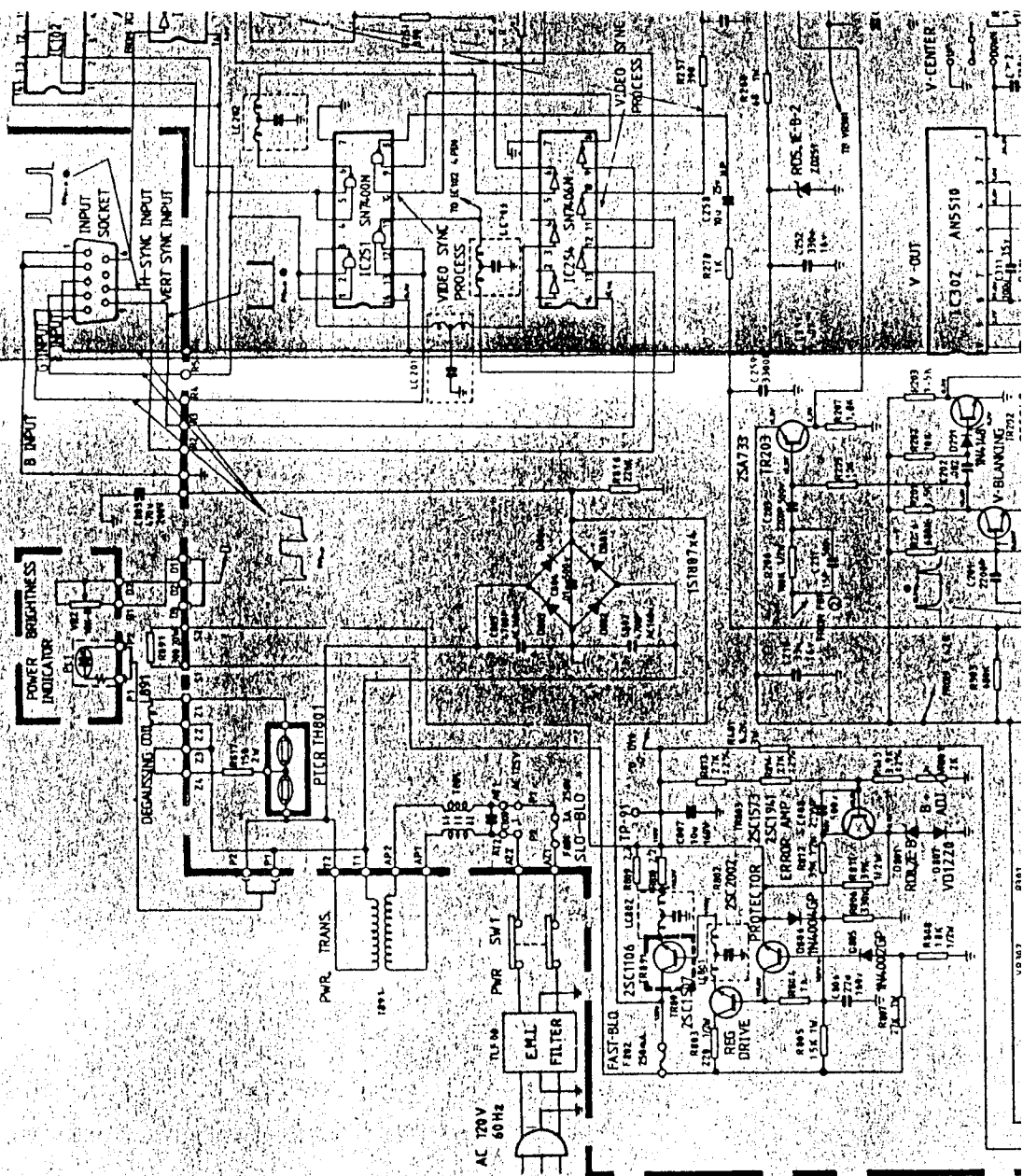
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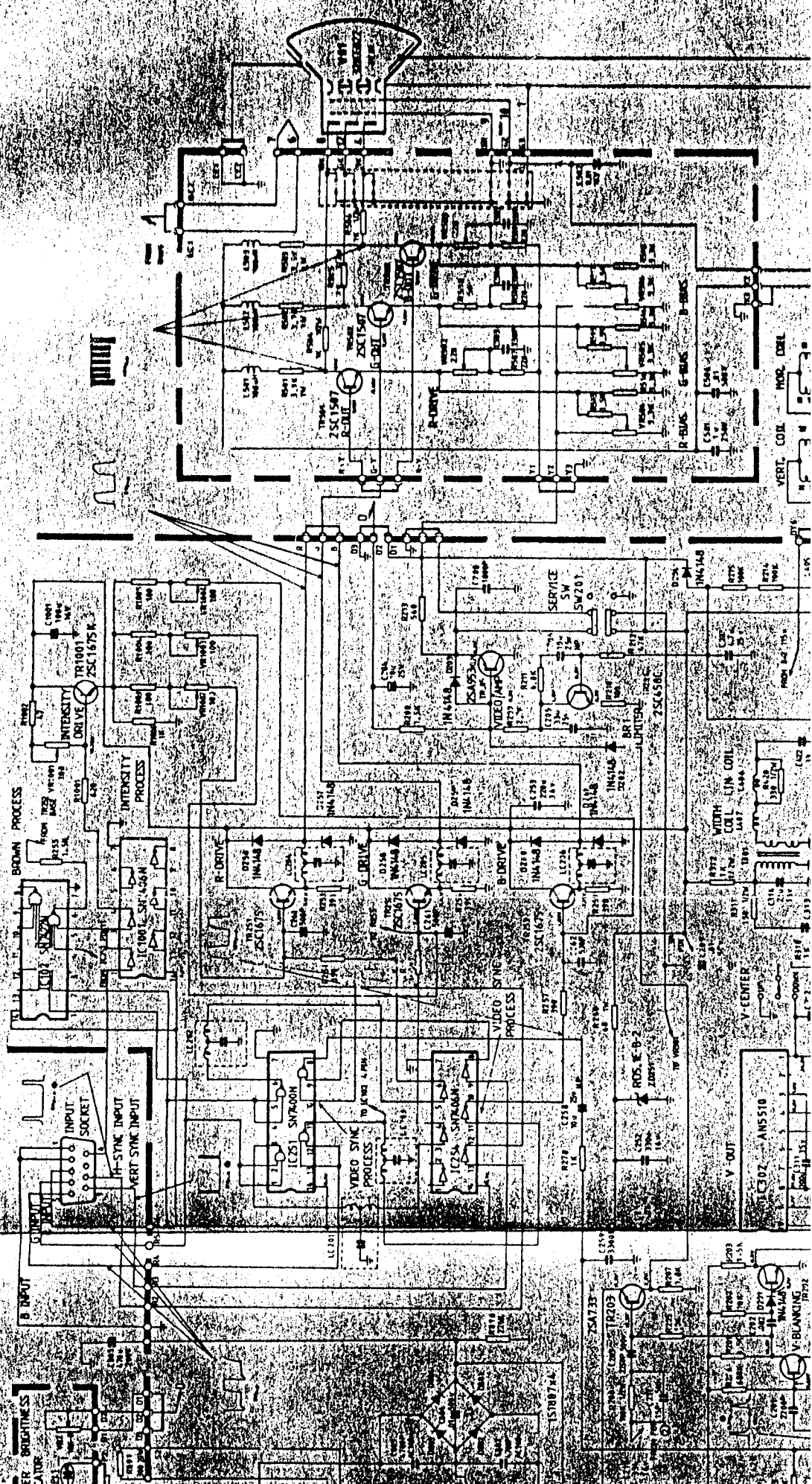
Printed
Wiring Board
Layout

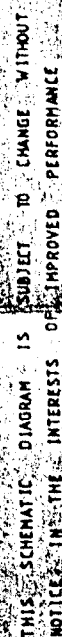
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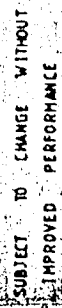


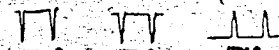
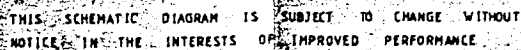
Schematic Diagram

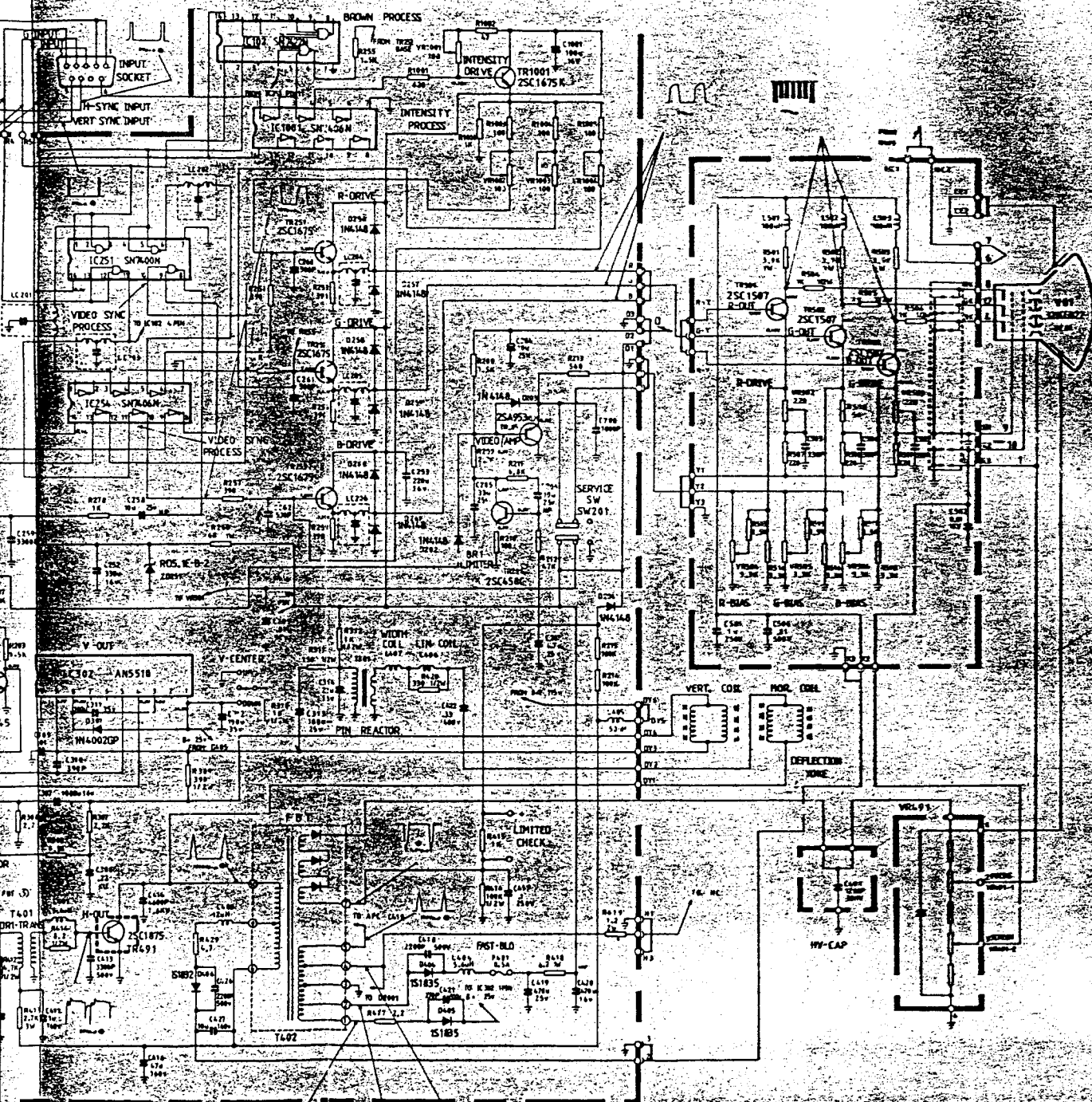






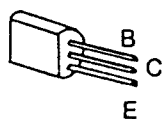




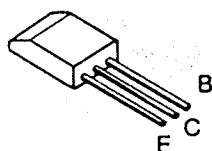


IS SUBJECT TO CHANGE WITHOUT
S OF IMPROVED PERFORMANCE

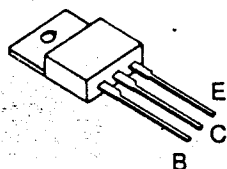
Transistors Diagram



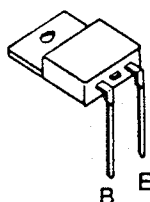
2SC815
2SC838, 839
2SC945
2SA733
2SC2002
2SA953



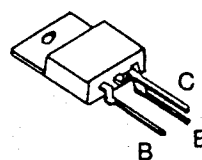
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2SA916



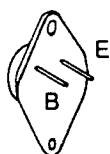
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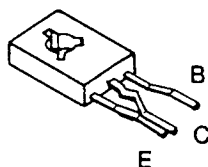
2SC1506



2SC1507



2SC1106
2SC1185
2SC1875



NO RASTER APPEARS

DOES 120V AC APPEAR BETWEEN THE CROSS POINT OF D803 & D804 AND THE CROSS POINT OF D802 & D801?

YES

F801
BROKEN

NO

D801, D802
D803, D804
PL1 ARE
SHORTED

POWER CORD LOOSE
FAILURE OF SW1
F801 OPEN
FAILURE OF DEGAUSSING CIRCUIT
C809 IS SHORTED
FAILURE OF T891
FAILURE OF PL1

DOES 145V DC APPEAR BETWEEN THE C805 POSITIVE SIDE AND GROUND?

YES

NO

FAILURE OF C802 C803 C804
FAILURE OF D801 D802 D803
D804
FAILURE OF C805

DOES 115V REGULATOR VOLTAGE APPEAR BETWEEN THE TP-91 AND GROUND?

YES

NO

ABNORMAL
115V

POWER
REGULATOR
OPEN

FAILURE OF IC301
FAILURE OF H. OSC. CIRCUIT
C404
FAILURE OF H. DRIVE CIRCUIT
FAILURE OF H.V. PROTECTOR
CIRCUIT
FAILURE OF 115V POWER
REGULATOR CIRCUIT

CHECK 12V B +

OK

ABNORMAL

FAILURE OF 12V CIRCUIT LOOP
FUSE F401 OPEN
FAILURE OF AMBIENT F.B.T.
CIRCUIT

OK CHECK F802
OK OR NOT

SHORTED

FAILURE OF H. O/P TRANSISTOR

OPEN OR BROKEN

CHECK H. OUTPUT
TRANSISTOR

NORMAL

115V LINE IS SHORTED
FAILURE OF H. DRIVE CIRCUIT
FAILURE OF F.B.T.
FAILURE OF C414

IF ABOVE STEPS ARE NORMAL

CHECK CRT HEATER

NO

CRT HEATER DISCONNECTED
FAILURE OF HEATER CIRCUIT
FAILURE OF F.B.T.

OK

CHECK CRT CATHODE
VOLTAGE

HIGH

CHECK EMITTER VOLTAGE
OF TR251, TR252, TR253

NORMAL

NORMAL

LOW

CHECK SCREEN VOLTAGE

NORMAL
400V

FAILURE OF TR251,
TR252, TR253 AND
AMBIENT CIRCUIT
(ON MAIN PCB)
FAILURE OF IC251
IC254 AND AMBIENT
CIRCUIT
FAILURE OF IC1001
INTENSITY CIRCUIT

FAILURE OF
TR205, TR204
AND AMBIENT
CIRCUIT

TOO LOW OR 0 VOLT

FAILURE
OF CRT

FAILURE OF VR 491-2

DARK RASTER

CHECK SYNCHRONIZATION

UNSTABLE SYNC

FAILURE OF IC251, IC254
FAILURE OF AMBIENT CIRCUIT

STABILIZED

CHECK SUPPLY VOLTAGE
OF CRT

OK

CHECK EMITTER VOLTAGE OF
TR251, TR252, TR253

LOW
HIGH VOLTAGE

LOW
EG2

FAILURE OF
VR491-2

LOW

NORMAL

FAILURE OF H. DRIVE CIRCUIT
FAILURE OF H. O/P CIRCUIT
FAILURE OF F.B.T.

FAILURE OF
VIDEO CIRCUIT

FAILURE OF
TR205 AND
TR204
FAILURE AMBIENT
CIRCUIT

- **Receivable Frequency Range:** Video signal frequency
- **CRT:** 12", 76°, 31 mm dot pitch, black matrix, non-glare
- **CRT Size:** 28.1 cm wide, 22.2 cm high and 32.2 cm diagonal
- **Power Consumption:** 67W
- **High Voltage Output:** 24.0 kV
- **Semiconductors:** 6 ICs
18 transistors
25 diodes
- **Power Supply:** 120V, 60Hz (220/240V, 50Hz available)
- **Cabinet:** Plastic
- **Dimensions:** 37.7(W) x 28.0(H) x 41.8(D) cm
- **Weight:** 12.0 kg
- **AC Cord:** 1.9 m
- **Input Connector:** 9-pin "D" subminiature connector
- **Input Signal:** R.G.B. direct drive system
- **Video Signal Input:** TTL level, positive
- **Ver./Hor. Sync:** TTL level, positive
- **Intensity:** TTL level, positive
- **Scanning Frequency:** Horizontal—15.7 kHz
Vertical—60 Hz
- **Active Video Period:** Horizontal—48.0 μ S max
Vertical—14.61ms max
- **Resolution:** Horizontal—640 pixels
Vertical—200 lines (non-interlaced),
(690 x 240 max in 216mm x 160mm area at 15.7 kHz)
- **Active Display Area:** 215(W) x 160(H) mm
- **Display Characters:** 80 characters with 25 lines—8 x 8 dots
- **Display Colors:** 16 colors, red, green, blue, cyan, yellow, magenta, black,
white & 2 intensity levels
- **Accessory:** Owner's Manual
Signal cable
Power cord

NOTE: SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

NO VERTICAL SWEEP

CHECK B + 25V VOLTAGE
ON RECTIFIER CIRCUIT

LOW OR 0 VOLT

FAILURE OF 25V
RECTIFIER CIRCUIT

NORMAL

APPLY 22ND PIN SYNC
SIGNAL TO 17TH PIN
OF IC301 THROUGH
CAPACITOR

VERTICAL GETS
HEIGHT

FAILURE OF IC301

WITHOUT
EFFECT

FAILURE OF IC301
FAILURE OF D.Y. (WHEN AC
SIGNAL OBTAINED ON 9TH PIN
OF IC302)

FAILURE OF WHITE BALANCE

READJUST WHITE
BALANCE

OK

NO

CHECK CRT
CATHODE VOLTAGE

NORMAL

FAILURE OF CRT

ABNORMAL

FAILURE OF VIDEO O/P TRANSISTOR
TR501, TR502, TR503
FAILURE OF VIDEO O/P TRANSISTOR
AMBIENT CIRCUIT
FAILURE OF VIDEO CIRCUIT

UNSTABLE VERTICAL

FAILURE OF C305

**60HZ APPEARS BUT
UNSTABLE**CHECK FREQUENCY
VARIATION BY
ROTATING V-HOLD**OSCILLATION FREQUENCY
SHIFTS**FAILURE OF IC301
FAILURE OF C301**UNSTABLE HORIZONTAL**CHECK FREQUENCY
VARIATION WITH
ROTATING H-HOLD**LACK OF HORIZONTAL
SYNC**FAILURE OF
IC301**OSCILLATION FREQUENCY
SHIFTS**FAILURE OF C404 or C425
FAILURE OF IC301

ABNORMAL BRIGHTNESS OF SCREEN

CHECK 180V VOLTAGE LINE

LOW

DOES R429 OPEN?
FAILURE OF 180V POWER CIRCUIT

NORMAL

CHECK EMITTER VOLTAGE
OF TR251, TR252, TR253

LOW

FAILURE OF TR205, TR204

NORMAL

FAILURE OF TR205 and TR204
FAILURE OF AMBIENT CIRCUIT

PICTURE ABNORMAL

CHECK PINS 3, 6, 11, OF IC251

HIGH

FAILURE OF IC251
FAILURE OF AMBIENT

LOW

LOW

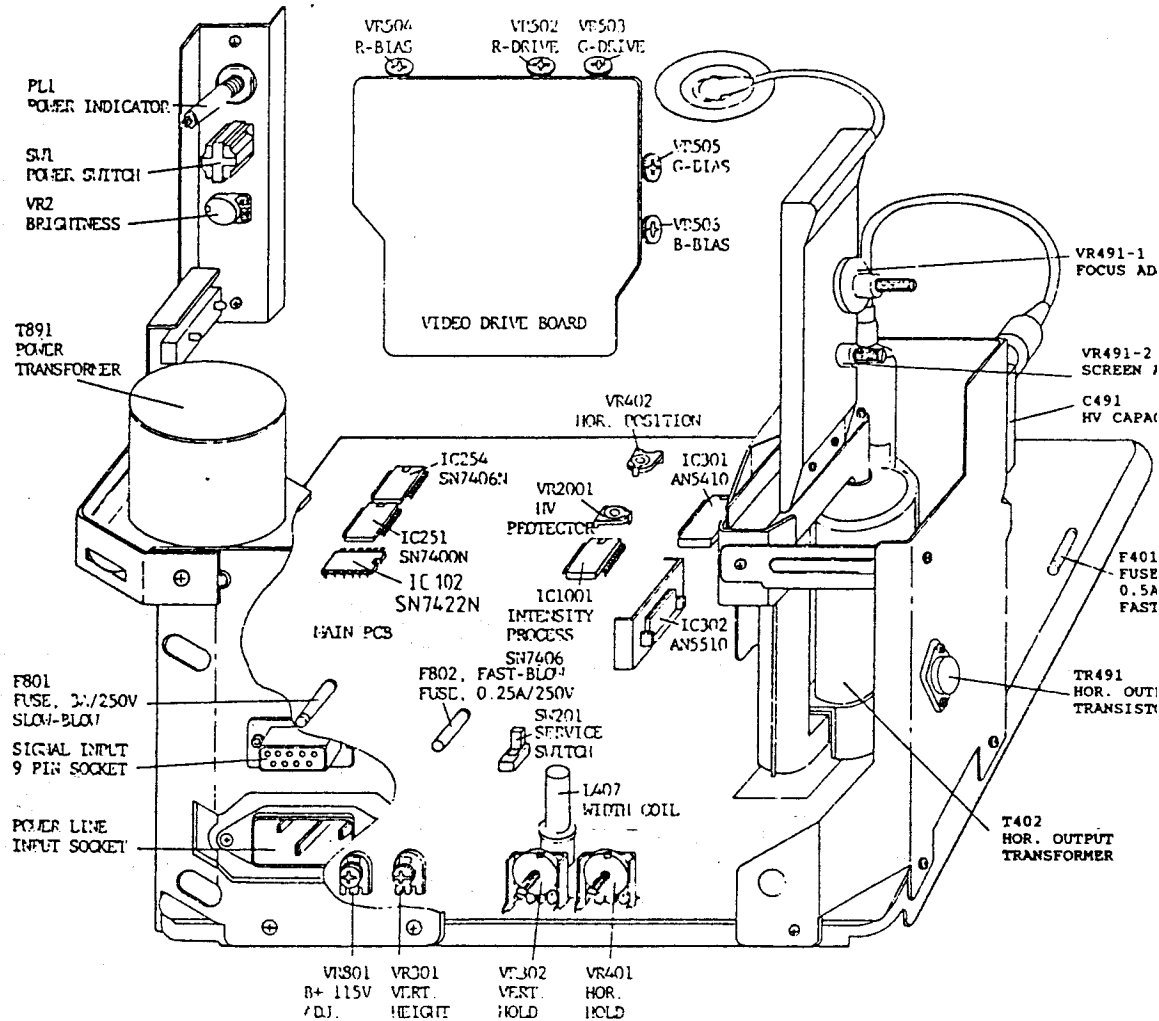
FAILURE OF IC254
FAILURE OF AMBIENT

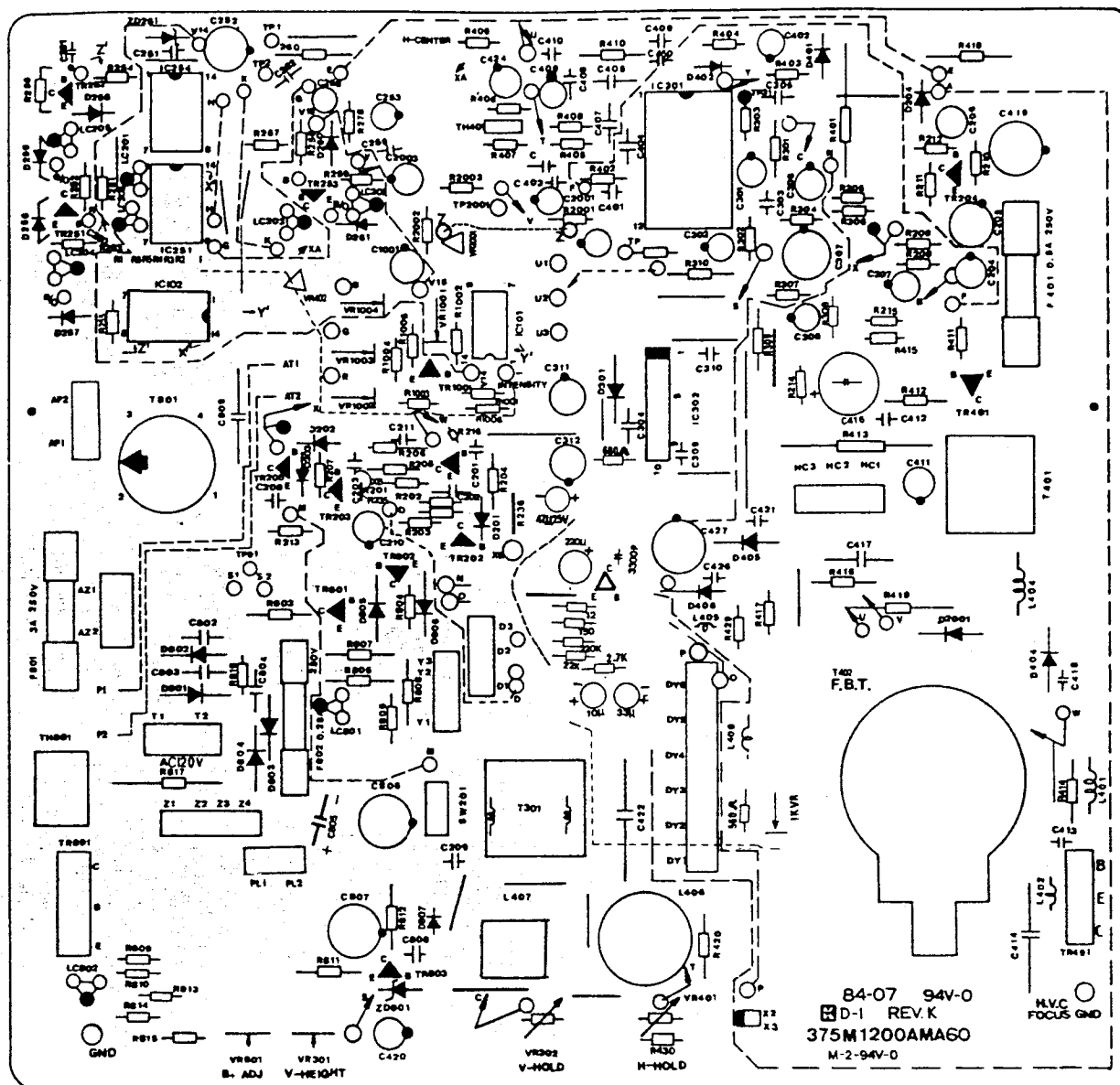
CHECK PINS 4, 6, 10 OF
IC254

HIGH

FAILURE OF TR251, TR252
TR253, TR1001
FAILURE OF AMBIENT CIRCUIT

Critical Components Layout





[illegible]

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Please be thoroughly familiar with all of the following safety checks and servicing guidelines before any service work is performed.

WARNING

1. For continued safety and service, do not attempt to modify any circuits.
2. Disconnect the AC plug from the AC outlet before servicing unit.
3. The semiconductor heat sinks are potential shock hazards when the chassis is in operation.

SERVICING OF HIGH VOLTAGE SYSTEM AND PICTURE TUBE

When attempting to service the high voltage system, remove the static charge by placing a 10K ohm resistor in series with an insulated wire, such as a test probe, between the chassis and the anode lead.

1. The picture tube in this monitor uses integral implosion protection.
2. Always replace the tube with the same type and number.
3. Be careful not to lift the picture tube by the neck.
4. Only handle the picture tube after discharging the high voltage completely and when wearing shatter-proof goggles.

X RADIATION AND HIGH VOLTAGE LIMITS

1. X radiation can be potentially hazardous and should be approached with extreme caution.
2. The only potential sources of X-ray are in the picture tube. If the high voltage is kept at factory set levels, there are no measurable X-ray emissions from the picture tube. However, only if the high voltage exceeds factory set levels is the X-radiation capable of penetrating the shield of the lead filled picture tube. Therefore, it is vital to maintain the high voltage at the preset levels.
3. Operation at higher voltages could also cause failures in the picture tube or high voltage circuitry, aside from excess radiation.
4. When servicing a monitor with excessive high voltage, avoid being unnecessarily close to the monitor when making measurements. Also, do not operate the monitor longer than is necessary to locate the cause of the excessive voltage.
5. Everytime a color chasis is serviced, the brightness should be tested while the high voltage is being monitored with a meter. This is necessary to be certain that the high voltage is not excessive and that the high voltage regulators are operating properly.
6. An accurate high voltage meter, which has been checked periodically should be available at all times. Replace a picture tube only with the model specified and do not make unrecommended circuit modifications in the high voltage circuitry.

FIRE AND SHOCK HAZARD

Please perform the following checks before returning unit to customer:

1. Check to see that there is no hardware lodged between the chassis and any metal parts in the monitor. Also make certain that no leads are pinched.
2. Check all the non-metallic protective devices such as control knobs, cabinet backs, insulating fishpapers, compartment covers, isolation resistor, capacitor networks, mechanical insulators, etc.
3. To insure against shock hazards, check for leakage of current in the following manner:
 - Plug the AC cord directly into a 120 volt AC outlet. Do not use an isolation transformer for this test.
 - While using two clip leads, connect a 1.5K ohm, 10 watt resistor paralleled by a 0.15 μ f capacitor in series with all exposed metal cabinet parts with a known ground, such as a water pipe.
 - While using a VTVM or VOM with 1000 ohm per volt (or higher) sensitivity, measure the AC voltage drop across the resistor (see Figure 1 overleaf).
 - Move the resistor connection to the earth exposed metal part while having a return path to the chassis (metal cabinet, screw leads, knobs, etc.) and measure the AC drop across the resistor.
 - Repeat the checks with the AC cord plug connector reversed. It may be necessary to use a non-polarized adaptor plug to perform these checks.
 - Any reading of 0.3 volt RMS (equal to 0.2 milliamps AC) or more is dangerous and indicates a potential shock hazard to the customer and must be corrected.

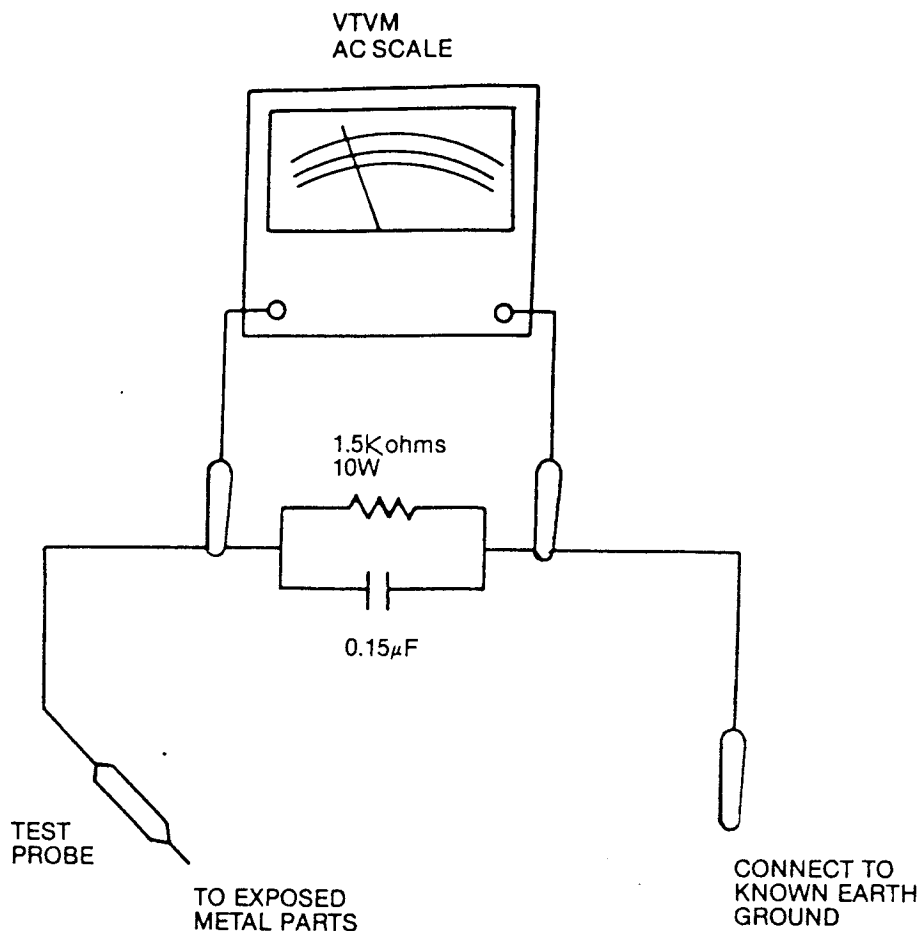
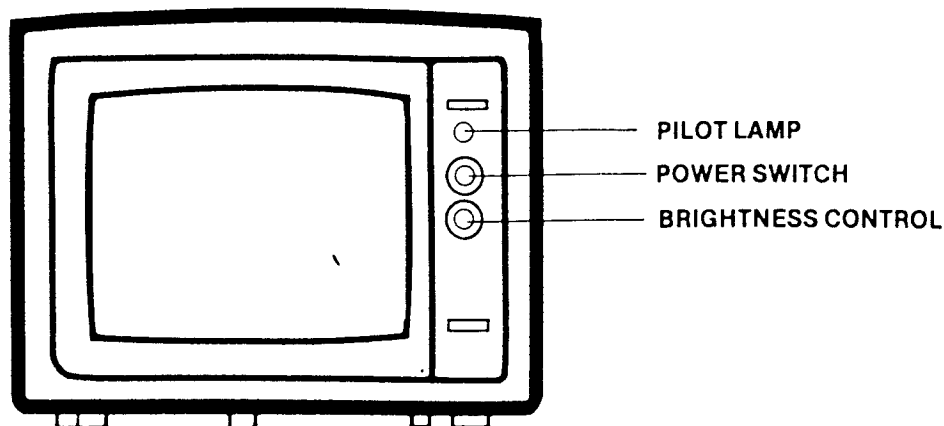


FIGURE 1.

SAFETY NOTICE

Many electrical and mechanical parts in display monitors have special safety-related characteristics. These characteristics are often not evident from visual inspection nor can the protection afforded by them be necessarily increased by using replacement components rated for higher voltage, wattage, etc.

For continued protection, replacement parts must be identical to those used in the original circuit. The use of a substitute replacement part which does not have the same safety characteristics as the factory recommended replacement parts shown in this service manual, may create shock, fire, X-radiation or other hazards.



Location of Controls

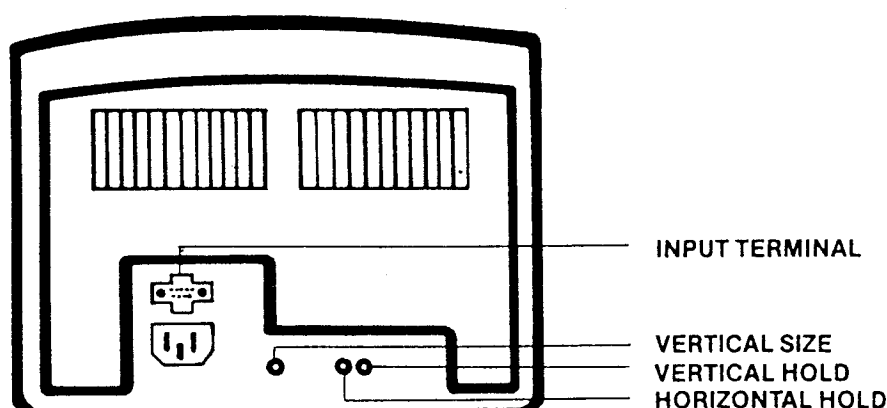


FIGURE 2.

1. B + VOLTAGE ADJUSTMENT: VR801.

Attach the DC voltmeter (with a range of 150 volts) between TP91 of the printed wiring board (PWB) and each ground. Then adjust the VR801 until the voltage reads 115V.

2. HORIZONTAL HOLD ADJUSTMENT: VR 401

Connect TP31 of the PWB to the ground. Next, adjust the Horizontal Hold until the display slowly sweeps horizontally across the screen. Once this is done, remove the jumper and turn the power switch off and on, to test the synchronization.

3. VERTICAL HOLD ADJUSTMENT: VR302

Adjust the Vertical Hold until synchronization is obtained.

4. VERTICAL HEIGHT ADJUSTMENT: VR301

Display any characters filling the screen and adjust the Vertical Height until the maximum height is obtained.

5. HORIZONTAL POSITIONING CONTROL: VR502.

This controls the left-right movement of the picture. Adjust it so that the picture is centered.

The following 4 adjustments should be made when the focus or white balance is greatly out of tune, due to replacement of the picture tube.

6. FOCUS ADJUSTMENT: VR491-1

Adjust the focus until the picture is sharpest.

Adjustment of Semi-Fixed Controls

6

7. WHITE BALANCE ADJUSTMENT:

- Red bias (VR504)
- Green bias (VR505)
- Blue bias (VR506)
- Red Drive (VR502)
- Blue Drive (BR503)
- Screen (VR491-2)
- Service Switch (SW201)

- a) Remove 9 pin (DB9) input signal plug and check that the screen emits light.
- b) Set VR504, VR505, VR506, and VR491-2 all to the counterclockwise direction.
- c) Set VR502 & VR503 to the mechanical center.
- d) Set SW201 to "service" side and turn VR491-2 slowly in a clockwise direction in order to obtain a slight horizontal line.
- e) Turn the bias control for the color which does not emit light (blue, green or red) in order to obtain a white balance horizontal line.
- f) In a clockwise direction, turn VR491-2 slightly so that the horizontal line of the color most difficult to see, emits light slightly.
- g) Set service switch at "normal" and adjust the Red and Blue Drive controls to get a white color.
- h) Lastly, check to see that the white color is present in both bright and dark intensities by turning the brightness control.
- i) If not, repeat Step g).

8. PURITY ADJUSTMENT:

- a) Check to see that the spacing between the static magnet and stem top conforms to the illustration in Fig. 3.
- b) Remove the G-Y tip from the main printed wiring board, thus attaining a magenta color.
- c) Adjust the picture so it is a magenta color, by turning the two overlapping pawls on the purity magnet in opposite directions. Move them until they are at the same angle, 9 o'clock and 3 o'clock position respectively.

9. STATIC CONVERGENCE ADJUSTMENT:

- a) Receive cross hatch signal and then adjust brightness to desired intensity.
- b) Allow only the red and blue to emit light by pulling out the G-Y tip from the main printed wiring board.
- c) Open the two pawls of the 4-pole magnets to allow the red and blue vertical lines to unite.
- d) Open and rotate the two pawls at a constant angle so that the red and blue horizontal lines unite.
- e) If the vertical line deviates, open the pawl at the deviation position and make a minor adjustment by changing its angle.
- f) Allow the three colors to light up by restoring the G-Y tip to its original position.
- g) Make the magenta and green vertical lines at the center unite by opening the two hexode pawls.
- h) Rotate the two pawls at a constant angle in order to unite the red and blue horizontal lines with the green.
- i) If the vertical lines deviate, change the angle of the pawls from the deviation position.

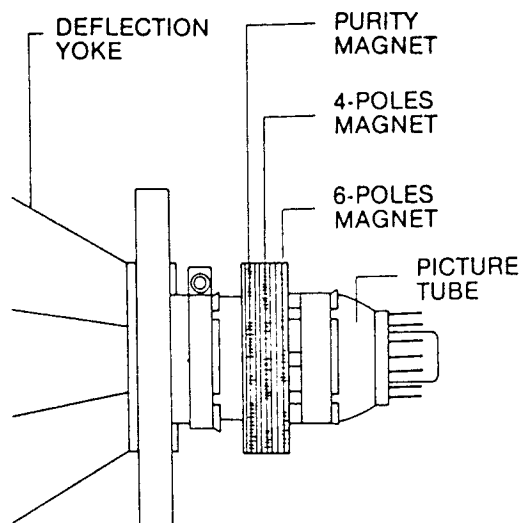


FIGURE 3.

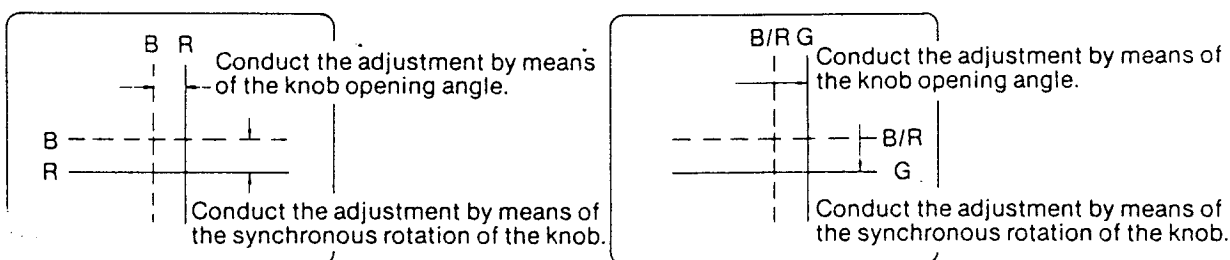
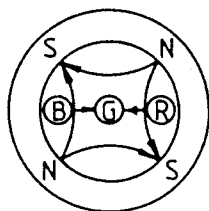
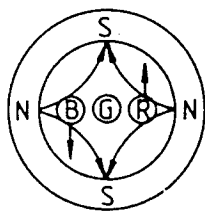


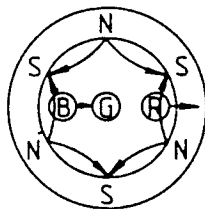
FIGURE 4.



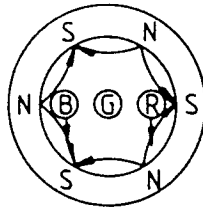
Beam migration in application of 4-pole magnets.



Beam migration in application of 4-pole magnets rotated.



Beam migration in application of 6-pole magnets.



Beam migration in application of 6-pole magnets rotated.

FIGURE 5.

