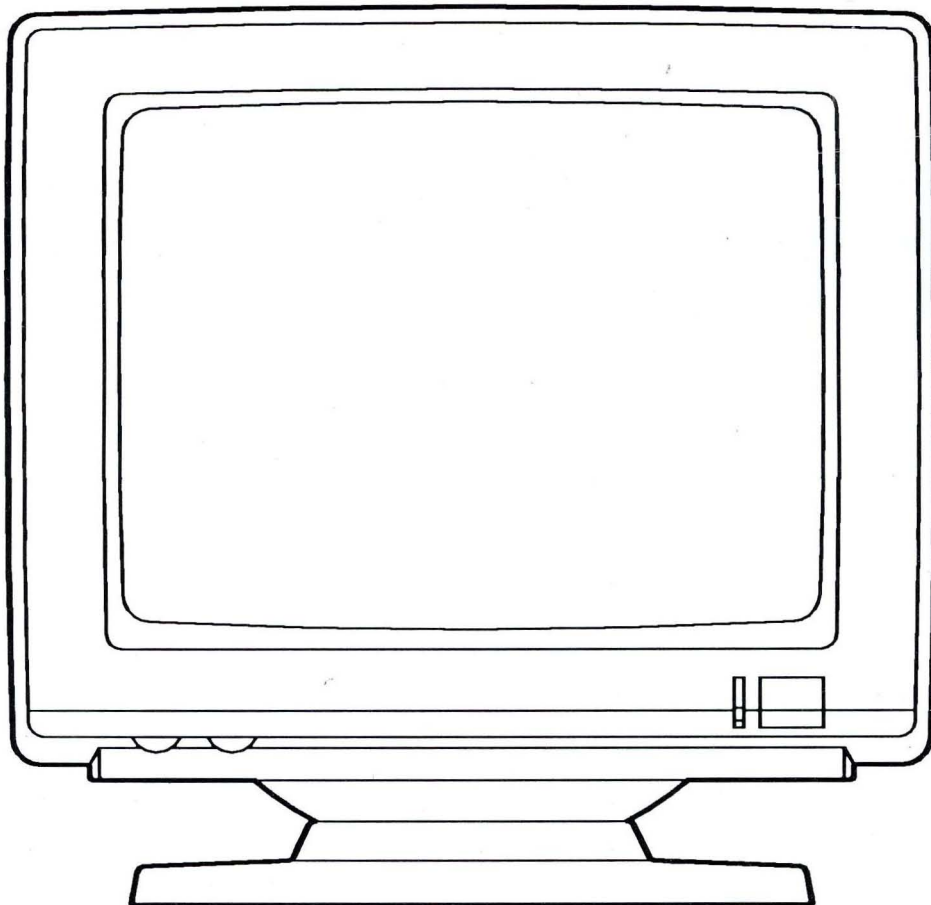




SERVICE MANUAL

EGA COLOR MONITOR

CEA455*



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SPECIFICATION

DESCRIPTION	NOMINAL	LIMIT												
1. Power input	AC 120V,60Hz (AC 220V/240V 50Hz option)													
2. Power consumption	70W MAX													
3. CRT	14" 90' deflection / P22 / Medium Decay <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">MODEL</th> <th style="text-align: center;">CEA4551</th> <th style="text-align: center;">CEA4552</th> <th style="text-align: center;">CEA4553</th> <th style="text-align: center;">CEA4554</th> <th style="text-align: center;">CEA4555</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">CRT</td> <td style="text-align: center;">0.31NG</td> <td style="text-align: center;">0.39G</td> <td style="text-align: center;">0.39NG</td> <td style="text-align: center;">0.41G</td> <td style="text-align: center;">0.41NG</td> </tr> </tbody> </table>	MODEL	CEA4551	CEA4552	CEA4553	CEA4554	CEA4555	CRT	0.31NG	0.39G	0.39NG	0.41G	0.41NG	
MODEL	CEA4551	CEA4552	CEA4553	CEA4554	CEA4555									
CRT	0.31NG	0.39G	0.39NG	0.41G	0.41NG									
4. Input signal														
a)Video	MODE 1 : R,G,B,I separate TTL-Level,Positive MODE 2 : R,G,B,r,g, separate TTL-level,Positive	2.4V-5.0Vpp												
b)Synchronous	MODE 1 : H,V-Sync TTL-Level,Positive MODE 2 : H-Sync TTL-Level,Positive V-Sync TTL-Level,Negative													
5. Resolution	MODE 1 (CGA) : 640 dots x 200 lines (16 colors) MODE 2 (EGA) : 640 dots x 350 lines (64 colors)													
6. Synchronous														
a)Horizontal	MODE 1 : 15.75KHz(overscan) MODE 2 : 21.8KHz(undescan)	±0.3KHz ±0.3KHz												
b)Vertical	50Hz / 60Hz													
7. Display size	9.84" x 6.77" (250mm x 172mm)	+ 4/-2mm												
8. Linearity	7% MAX													
9. High voltage	22kV	±0.5kV												

NOTES : Nominal specs represent the design specs ; all units should be able to approximate, these-some will exceed and some may be drop slightly below these specs.
Limit specs represent the absolute worst condition that still might be considered acceptable ; in no cases should a unit perform to less than any limit specs.

IMPORTANT SERVICE SAFETY PRECAUTIONS

Service work should be performed only by qualified service technicians who are thoroughly familiar with all of the following safety checks and servicing guidelines:

WARNING

1. For continued safety, do not attempt to modify the circuit.
2. Disconnect the AC power before servicing.
3. Semiconductor heat sinks are potential shock hazards when the chassis is operating.

SERVICING THE HIGH VOLTAGE SYSTEM AND PICTURE TUBE

When servicing the high voltage system, remove the static charge by connecting a 10kohm resistor in series with an insulated wire (such as a test probe) between the chassis and the anode lead. (The AC line cord should be disconnected from the AC outlet.)

1. The picture tube in this display monitor employs integral implosion protection.
2. Replace with a tube of the same type and number for continued safety.
3. Do not lift the picture tube by the neck.
4. Handle the picture tube only when wearing shatter proof goggles and after discharging the high voltage anode completely.

X-RADIATION AND HIGH VOLTAGE LIMITS

1. Be sure all service personnel are aware of the procedures and instructions covering X-radiation. The only potential source of X-ray in a current solidstate display monitor is the tube. However, the picture tube does not emit measurable X-ray radiation if the high voltage is as specified in the "high voltage check" instruction. It is only when high voltage is excessive that X-radiation is capable of penetrating the shell of

the picture tube, including the lead in glass material. The important precaution is to keep the high voltage below the maximum level specified.

2. It is essential that servicemen have available at all times an accurate high voltage meter. The calibration of this meter should be checked periodically.
3. High voltage should always be kept at the rated value-no higher. Operation at high voltages may cause a failure of the picture tube or high voltage circuitry and,also under certain conditions,may produce radiation in excess of desirable levels.
4. When the high voltage regulator is operating properly there is no possibility of an X-radiation problem. Everytime a color chassis is serviced,the brightness should be tested while monitoring the high voltage with a meter to be certain that the high voltage does not exceed the specified value and that it is regulating correctly.
5. Do not use a picture tube other than that specified or make unrecommended circuit modifications to the high voltage circuitry.
6. When troubleshooting or taking test measurements on a display monitor with excessively high voltage, avoid being unnecessarily close to the display monitor. Do not operate the display monitor longer than is necessary to locate the cause of excessive voltage.

BEFORE RETURNING THE DISPLAY MONITOR

Fire and Shock Hazard

Before returning the display monitor to the user,perform the following safety checks:

1. Inspect all lead dress to make certain that the leads are not pinched or that the leads are not

lodged between the chassis and other metal parts in the display monitor.

2. Inspect all protective devices such as non-metallic control knobs, insulating materials, cabinet backs, adjustment and compartment covers or shields, isolation resistor-capacitor networks, mechanical insulators, etc.
3. To be sure that no shock hazard exists, check for leakage current in the following manner:
 - Plug the AC line cord directly into a 120 volt AC outlet. (Do not use an isolation transformer for this test)
 - Using two clips leads, connect 1.5 kohm, 10 watt resistor paralleled by a 1.5uF capacitor in series with all exposed metal cabinet parts and a known earth ground such as electrical conduit or electrical ground connected to earth ground.
 - Use a SSVM or VOM with 1000 ohms per-volt or higher sensitivity to measure the AC voltage drop across the resistor. (See Figure 1.)
 - Connect the resistor to all exposed metal parts having a return path to the chassis (metal cabinet, screw heads, knobs and shafts, escutcheon, etc.) and measure the AC voltage drop across the resistor.
 - Any reading of 0.3 volt RMS (this corresponds to 0.5 milliamp. AC) or more is excessive and indicates a potential shock hazard which must be corrected before returning the display monitor to the user.

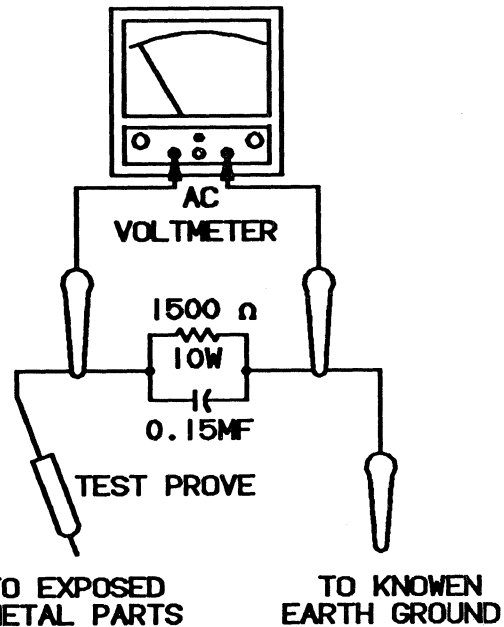


FIG. 1 LEAKAGE CURRENT TEST CIRCUIT

SAFETY NOTICE

Many electrical and mechanical parts which have special characteristics in this chassis often pass unnoticed and the protection afforded by them can not necessarily be obtained by using replacement components rated for higher voltage, wattage, etc.

Replacement parts that have these special safety characteristics are identified in this manual, and its supplement; electrical components having such features are identified by a ! in the Parts List and Schematic Diagrams.

Before replacing any of these components, read the Parts List in this manual carefully. The use of substitute replacement parts that do not have the same safety characteristics as specified in the Parts List may create shock, fire, or other hazards.

THEORY OF OPERATION

GENERAL

CEA4551 is a high resolution color display using a 0.31 dot pitch NON-GLARE CRT. (CEA4552 ; 0.39 glare CRT,CEA4553 ; 0.39 non-glare CRT, CEA4554 ; 0.41 glare CRT , CEA4555 ; 0.41 non-glare CRT) It uses R, G, B, I or R, r, G, g, B, b TTL input Video Signals and separate TTL sync signals.It can operate in 16 colors 640 by 200 overscan mode or 64 colors 640 by 350 underscan mode. This two mode is automatically switched by the polarity of vertical frequency.

VIDEO

I. Video Drive Circuit

The video signals are applied to CUSTOM IC (IC101). The output signals of IC101 are applied to IC103 which is an open-collector Hex-buffer. The output signal level of IC103 (R,r,G,g,B,b) are controlled by the BRIGHTNESS VR and SUB-BRIGHTNESS VR (VR110) and the secondary signals (r, g, b) are controlled by the CONTRAST VR.

The output signals of IC103 are to combine blanking signals (H, V blanking).

Primary signals (R, G, B) and secondary signals (r, g, b) are mixed through R121 and D116,R123

and D117,R125 and D115 respectively in mode 2.Then the signals are applied to the base of pre-amp transistors(Q103,Q104,Q105).

The output signals of IC101 in MODE 1 and MODE 2 are selected by the MODE signal from pin no.8 of IC101 (SL205).

2. VIDEO (R, G, B) OUTPUT

The R,G,B drive system is utilized in the video output circuit of this unit.

In the case of RED signal,the combined color and blanking signals are amplified sufficiently by the cascode transistor (Q109, Q110)

The cut-off levels of the picture tube are controlled by the bias VRs (VR103,VR104,VR105) between 85Vdc and 145Vdc.

These DC voltages are taken from pin no.8 of FBT (T403) and pin no.14 of POWER TRANS (T601).

The color signals and blanking signals of Q103, Q104 and Q105 are supplied to the base of Q110, Q112, Q114.

The screen grid, G2, is common in the case of RED,GREEN and BLUE CATHODE respectively.

The drive control VRs (VR101, VR102) control the base current of Q110, Q114 for white balance adjustment.

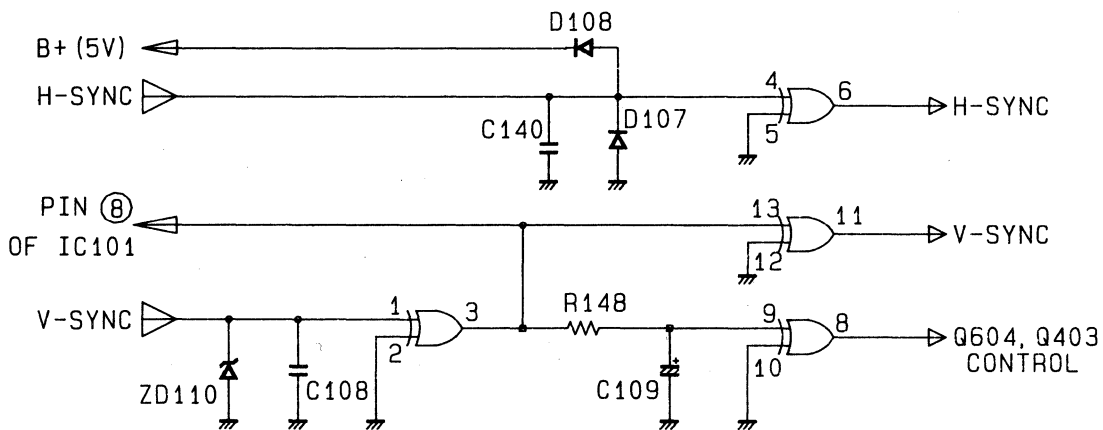


FIG. 2 SYNC INTERFACE CIRCUIT

VERTICAL AND HORIZONTAL DEFLECTION CIRCUIT

1. SYNC INTERFACE CIRCUIT

In MODE 1 (CGA MODE), the polarity of horizontal and vertical sync are both positive but in MODE 2 (EGA MODE) the polarity of horizontal sync is positive and the vertical sync is negative. If the H/V sync signal is applied in MODE 1, then the output voltage level from pin no. 8 of IC102 (EX-OR gate) is 0V and the output voltage level from pin no. 3 of IC102 is positive.

If the H/V sync signal is applied in MODE 2, then the output voltage level from pin no. 8 of IC102 is 3.2V and the output polarity from pin no. 3 of IC102 is negative.

According to the polarity of vertical sync, MODE 1 and MODE 2 are selected automatically.

Vertical Deflection Circuit

Vertical circuit is composed of IC102 (74HCTLS86), IC301 (LA7830), IC401 (LA7851), IC402 (MC14053BCP) and its relative circuits.

The vertical sync signal from IC102 which polarity is positive or negative is applied to pin no. 19 of IC401.

Pin no. 19 of IC401 is connected to the vertical oscillation circuit.

The frequency of oscillator is controlled by the voltage of pin 18 which can be varied by the V-HOLD VR (VR306).

The output circuit of IC301 is controlled by V-SIZE VR (VR 307) to vary the vertical size of the raster, that is related both MODE 1 and MODE 2. But V-SIZE of MODE 1 is only controlled by CGA V-SIZE VR (VR402).

Horizontal Oscillator, AFC and Drive Circuit

The horizontal sync signal with positive polarity is applied to pin 1 of IC401. The output from the flyback transformer (T403) is connected to pin 4 of IC401 as part of the automatic frequency circuit (AFC). H-CENTER VR (VR407) determines the position of picture in MODE 1 and MODE 2 but CGA H-CENTER VR (VR403) controls the position of CGA picture only. The horizontal oscillation frequency is

obtained from pin 12 of IC401 and it is fed to the next horizontal drive circuit. The pulse-switching mode of the drive and output stage is a reverse polarity type and that's done when the drive transistor Q401 is on and the output transistor Q402 is off.

HORIZONTAL OUTPUT AND HV RECTIFIER

Horizontal drive voltage which developed at pin 12 of the deflection processor (IC401) is amplified through the horizontal drive stage (Q401) and coupled to the base of the horizontal output circuit via the horizontal drive transformer (T401). Referring to Fig. 3, the horizontal circuit generates the horizontal scan and high voltage to be applied to the picture tube. The function of the horizontal output stage (Q402) is to serve as a switch for the horizontal output circuit. Refer to Fig. 4.

During the horizontal scanning period, Q operates (S1 is closed, S2 is opened) and the current is applied in one direction through the horizontal coils of the deflection yoke (Ly) and the capacitor (MODE 1: C1, MODE 2: C1, C2). During retrace time, Q becomes to operate (S1 is opened, S2 is closed) and the current is applied in the opposite direction through the damper diode (D),

the horizontal coils of the deflection yoke (Ly) and the capacitor C1, C2.

The high voltage required to be applied to the anode of the picture tube is generated by boosting the pulse from the collector of Q402 through T302 during the flyback (retrace) period and applying this boosted pulse to a series of rectifiers. Referring to Fig. 5, high voltage regulation is accomplished internally in T403.

HIGH VOLTAGE SHUT-DOWN SYSTEM

The shut-down circuit prevents the high voltage from rising above a presence level. Under normal operating conditions, this circuit is inactive. Operation of the protector circuit depends upon an AFC pulse, which appears at pin 3 of the horizontal output transformer (T403). It monitors an AFC pulse subjected to rectification by D406. Since it is in proportion to the voltage of that AFC pulse, if the incoming high voltage increases and exceeds its limit, the AFC pulse voltage also increases. As a result, there is a larger voltage produced to R422 so that its potential will eventually be higher than the voltage (+8.2V) of

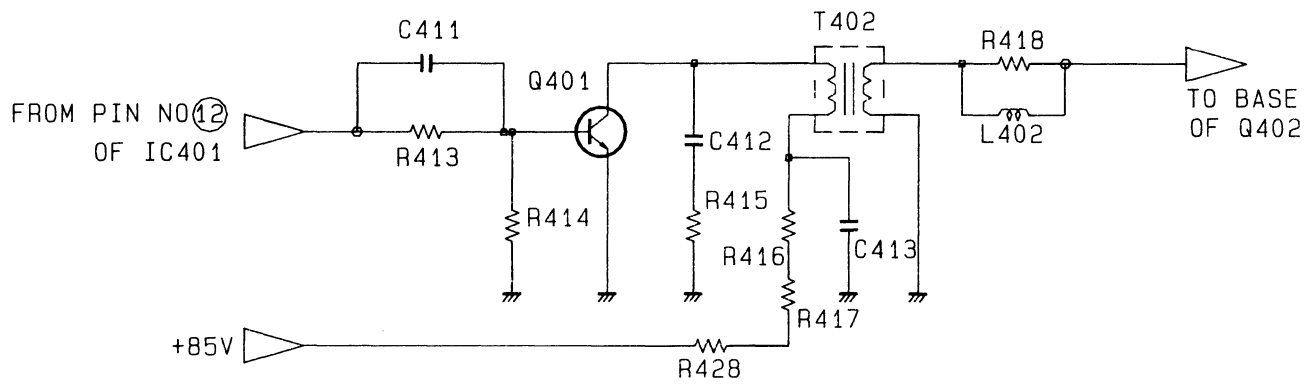


FIG. 3 HORIZONTAL DRIVE CIRCUIT

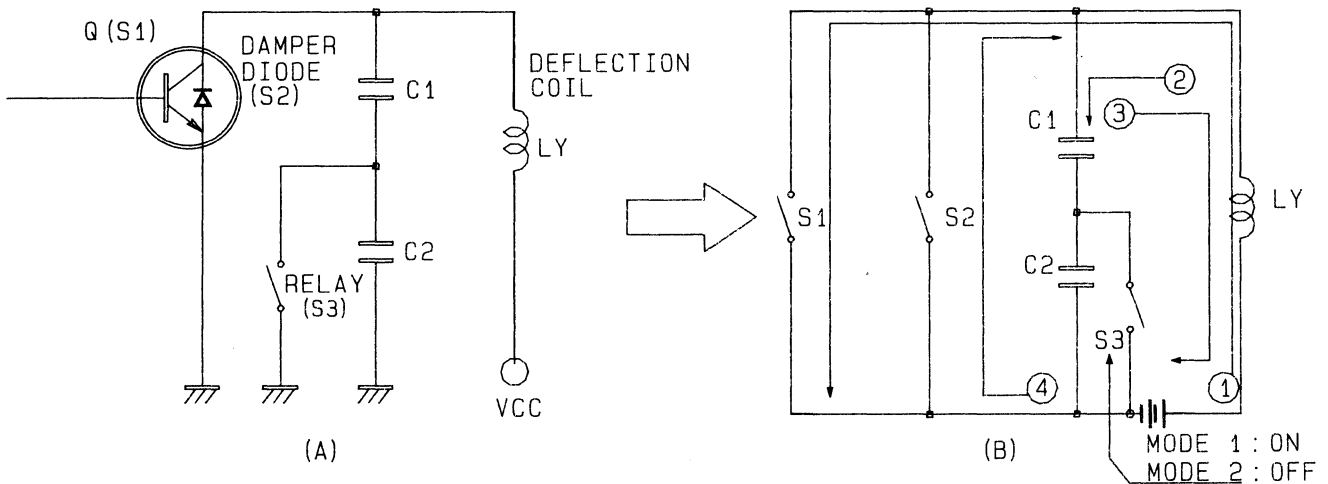


FIG. 4 EQUIVALENT CIRCUIT OF HORIZONTAL OUTPUT CIRCUIT

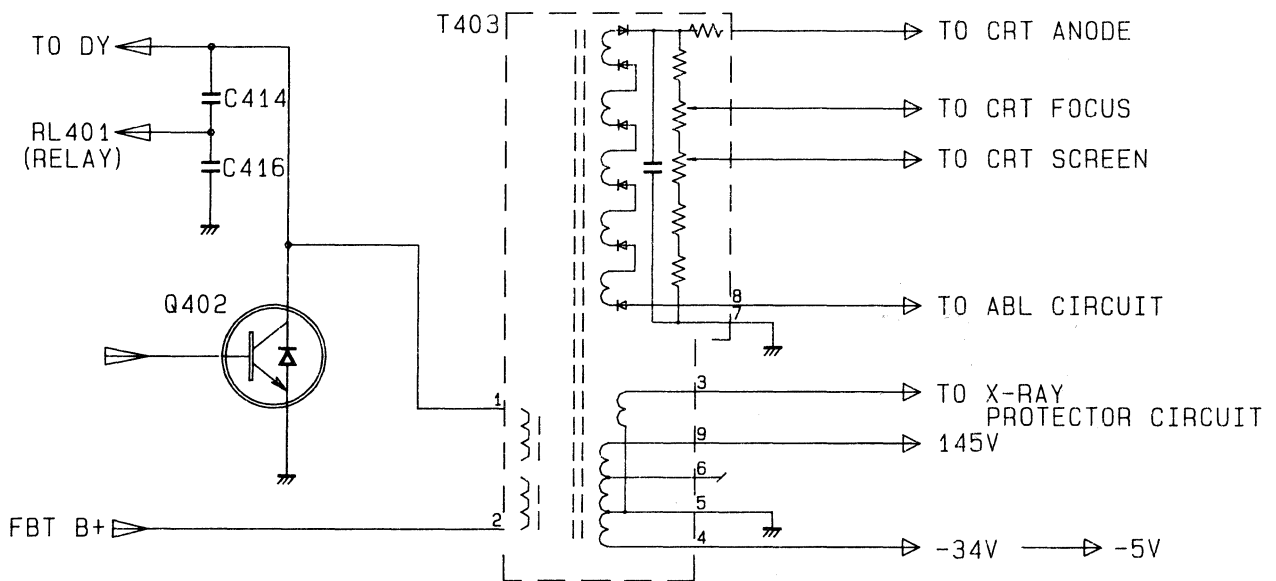


FIG. 5 HORIZONTAL OUTPUT AND HV RECTIFIER CIRCUIT

the Zener diode(ZD401) turning it ON. With D401 turned ON, the X-ray protector of IC401 operates to stop the horizontal oscillation, shutting down the resultant high voltage.

POWER SUPPLY

The AC voltage is full-wave rectified by the rectified-smoother circuit and then changed to DC voltage by smoothing capacitor C610. When the power is turn on, a small current flows into the base of output transistor (included in IC601) via the start-up resistor (R603). As a result, the collector current flows through the primary windings (pin 1 and pin 3 of the power transformer T601) and then it produces an electromagnetic force. Therefore some voltage is

induced between pin 6 and pin 7 (driving winding) of the power tranormer. The induced voltage is positively feedback to the base of the output transistor (included in IC601) to increase the base current of this transistor. As a result of this base current, the collector current of that transistor is increased. The above operation occurs instaneously to impress suffieient base current. The small signal transistor(Q601) protects IC601 from the surge current and Q602 is trigger transistor. The FBT B+ is selected by the MODE detecting circuit. In CGA MODE, the FBT B+ voltage comes from pin 10 of T601 but in EGA MODE the FBT B+ comes from pin 11 of T601 by auto mode sensing circuit. Here the mode sensing circuit let Q604 and Q603 operate.

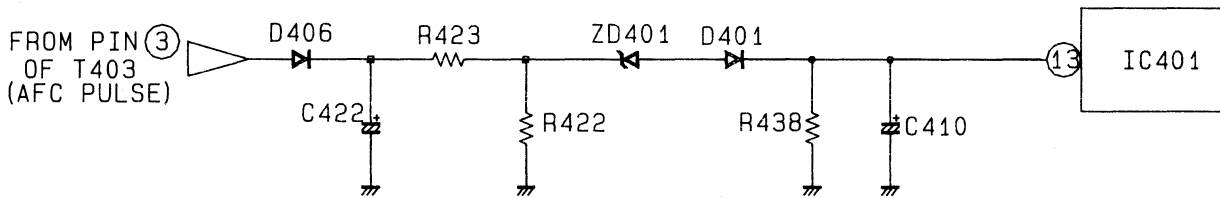


FIG.6 HIGH VOLTAGE SHUT DOWN SYSTEM CIRCUIT

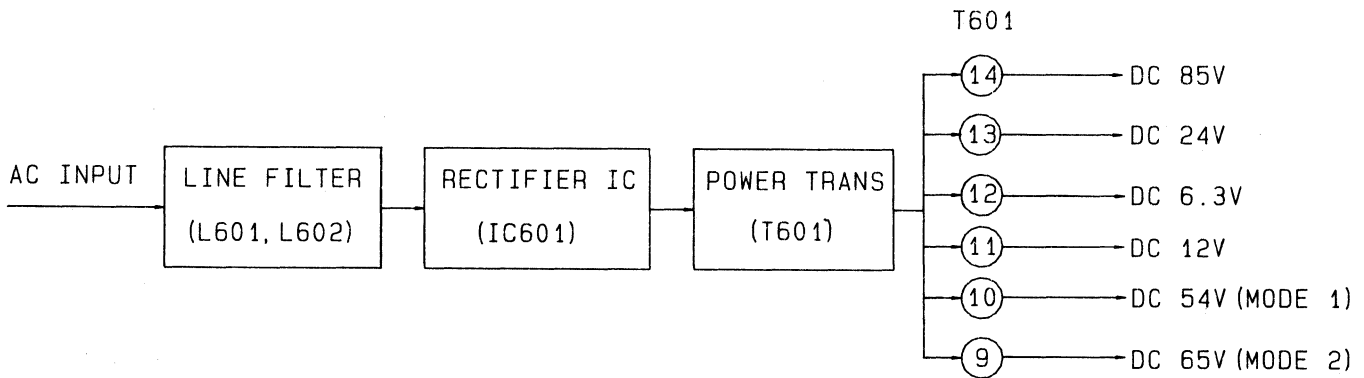


FIG. 7 POWER SUPPLY BLOCK DIAGRAM

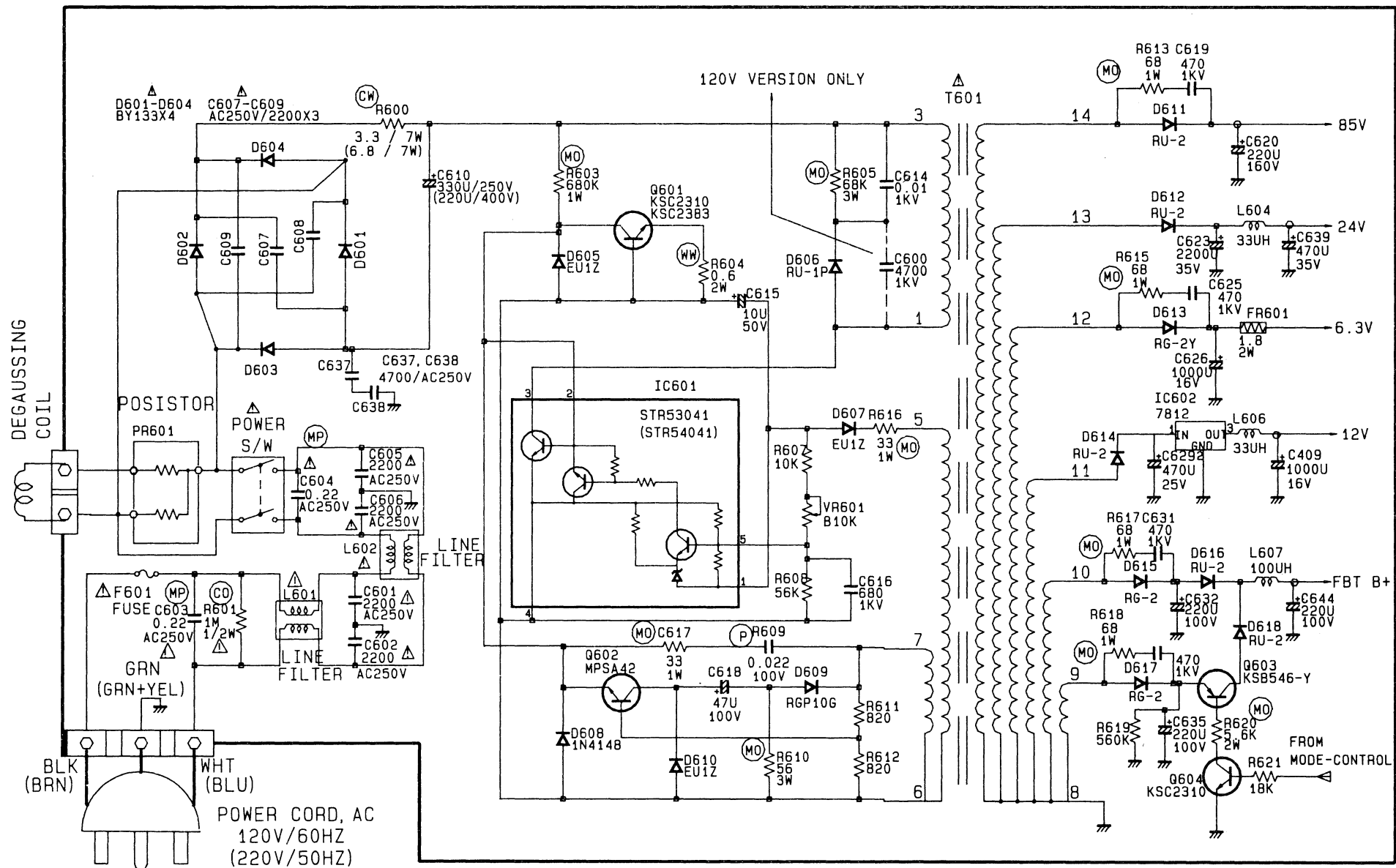
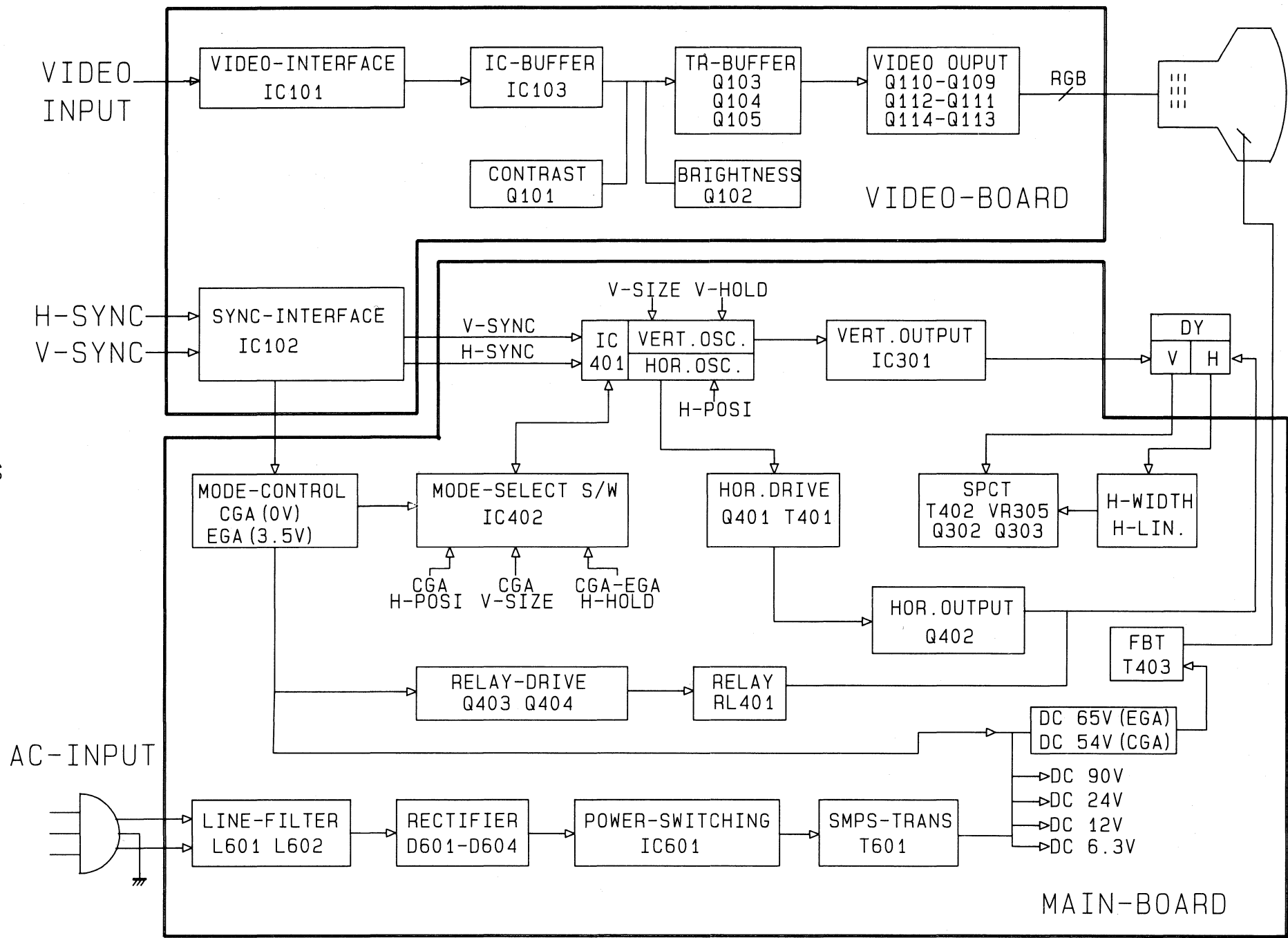


FIG.8 POWER SUPPLY SCHEMATIC

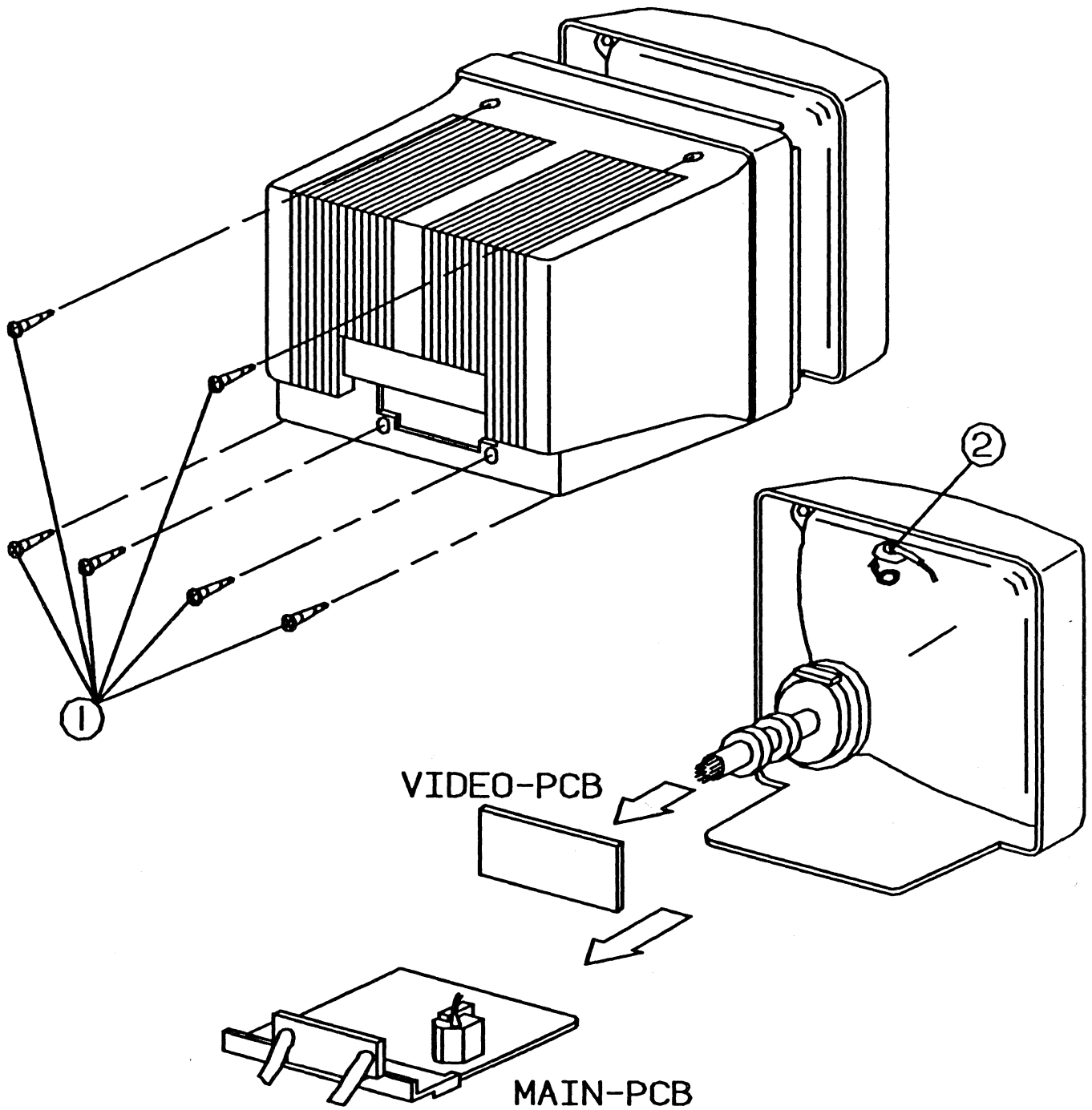


BLOCK DIAGRAM

DISASSEMBLY INSTRUCTION

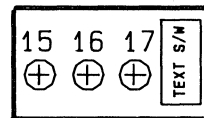
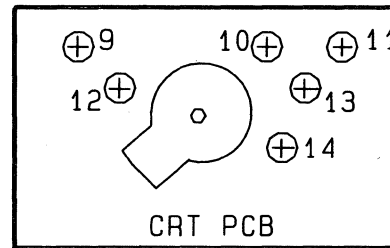
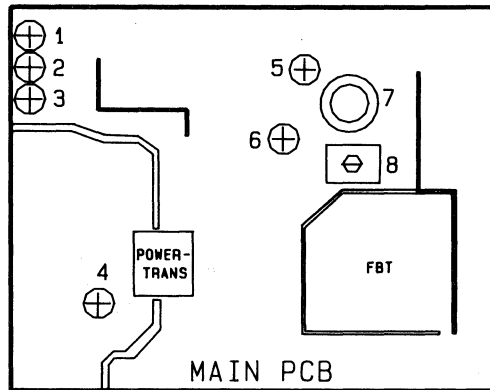
1. Remove the 6 screws #1 retaining the rear cabinet.
2. (1) Remove the CRT's anode cap #2 from the CRT.
(2) Remove the CRT-PCB after disconnecting the ground connector.
(3) Disconnect all of the connectors from the PCBs.
(4) Remove the main PCB and LED PCB from the front cabinet.

NOTE : Refer to the EXPLODED VIEW for a more detailed disassembly procedure.



ALIGNMENT INSTRUCTIONS

PARTS LOCATION AND CONTROL FUNCTION



BACK CONTROL PCB

NO	REF.NO	CONTROL FUNCTION	NO	REF.NO	CONTROL FUNCTION
1	VR405	H-HOLD (MODE1/MODE2)	10	VR103	R-CUTOFF
2	VR403	H-POSI (MODE 1)	11	VR104	G-CUTOFF
3	VR402	V-SIZE (MODE 1)	12	VR102	B-DRIVE
4	VR601	FBT B+ ADJUSTMENT	13	VR101	R-DRIVE
5	VR305	SIDE PINCUSHION	14	VR110	SUB-BRIGHT
6	VR306	V-POSI (MODE1/MODE2)	15	VR301	V-SIZE (MODE 2)
7	L402	H-WIDTH COIL	16	VR302	V-HOLD (MODE1/MODE2)
8	L403	H-LINEARITY COIL	17	VR303	H-POSI (MODE 2)
9	VR105	B-CUTOFF			

ALIGNMENT PROCEDURE (UNIT FACING EAST)

Power supply voltage is 120VAC / 60Hz or 220VAC (240VAC) / 50Hz (OPTION)

1. POWER SUPPLY OUTPUT VOLTAGE (FBT B +)
Connect a DVM to the anode of D615 (GT pin is standing) and adjust the voltage to 54V using VR601.
CONDITION :
 - 1). NO SIGNAL
 - 2). CONTRAST, BRIGHTNESS is MINIMUM (0 BEAM)
2. MAIN PCB ADJUSTMENT
Unless special comment, adjust the EXT VR at the mechanical center point.
 - 2-1) H-RASTER CENTERING
Turn the SCREEN VR so that background raster can be seen and control the H-CENTER S/W (SW401) so that the background raster is on the center of CRT. This must be done in EGA MODE (MODE 2 / 21.8KHz).
 - 2-2) H-HOLD ADJUSTMENT
 - (a) Disconnect the signal cable
 - (b) Connect the frequency counter at the H-DY WIRE (RED wire) and adjust the frequency in range of 15.700KHz +/-50Hz using CGA/EGA H-HOLD VR (VR405).
* Frequency of EGA (MODE 2/21.8KHz) is adjusted automatically.
 - 2-3) V-HOLD ADJUSTMENT
 - (a) Disconnect the signal cable.
 - (b) Connect the frequency counter at R304(side of IC301) and adjust the frequency in the range of 56Hz +/-1Hz using V-HOLD VR(VR306).
* If the vertical frequency from PC is 50Hz,adjust the vertical frequency at 46Hz +/-1Hz.
 - 2-4) H-LINEARITY ADJUSTMENT
 - (a) Connect the signal cable.
 - (b) Adjust L403 to the optimum linearity in MODE 1 and MODE 2 linearity pattern.
 - 2-5) H-POSITION
 - (a) Adjust H-CENTER VR (VR407) to the center of the picture when the signal of MODE 2 is applied.
 - (b) Change mode to CGA MODE (MODE 1/15.75KHz) and adjust H-CENTER VR using CGA H-POSI VR(VR403).
 - 2-6) SIDE PINCUSHION
Adjust the side pincushion to the optimum side pincushion using VR305.
 - 2-7) H-WIDTH
 - a) Adjust the H-WIDTH using width coil (L402) so that H-WIDTH is adjusted in the range 250 +4/-2MM in MODE 2 .
 - b) Check the H-WIDTH of MODE 1.
* H-WIDTH of MODE 1 is adjusted in the range 250 +/-4MM automatically.
 - 2-8) V-POSITION
Adjust the center of vertical using V-POSI VR(VR306).
* The V-POSI VR (VR306) can control vertical center of MODE 1,MODE 2 together.
 - 2-9) V-SIZE
 - a) Adjust V-SIZE using V-SIZE VR (VR 307) so that vertical size is 172MM in MODE 2.
 - b) Change to MODE 2 and adjust vertical size to 172MM, equal to MODE 2 vertical size, using CGA V-SIZE(VR402).
 - 2-10) FOCUS ADJUSTMENT
Adjust the focus control to the optimum position.
 - 2-11) BLACK AND WHITE TRACKING
 - a) Turn the screen control fully clockwise. Turn the red,green and blue bias controls mechanical centers.Set the brightness control and the red and blue drive controls at the center positions.
 - b) Turn the SW301 to the left.

- c) Rotate the screen control counterclockwise until a raster (either the red, green or blue) appears dimly on the screen.

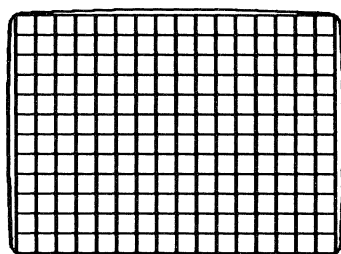
Notes:

Adjust VR104 and VR105 if red is appears.
 Adjust VR103 and VR105 if green is appears.
 Adjust VR103 and VR104 if blue is appears.

- d) Return the SW301 to its original position.
- e) Operate the computer in such a way that the entire screen is R, G, B white.
- f) Rotate the RED and BLUE drive controls until the raster is white.
- g) Set the brightness control at its maximum position and adjust the sub-brightness control until a reading of 20 +/- 2F/L appears.
- h) Turn the brightness control in either direction to check that the picture maintains a good white balance.
- i) Repeat steps (a) thru (h) for readjustment.
 Horizontal: 12 Lines Min.
 Vertical: 16 Lines Min.

2-12) STATIC (CENTER) CONVERGENCE

- a) Switch the display monitor ON and allow it to warm up 15 minutes.
- b) Operate the computer in such way that the entire screen is a crosshatch pattern on the center of the CRT screen (FIG.9).



HORIZONTAL:
12 LINES MIN.
VERTICAL:
16 LINES MIN.

FIGURE 9. CROSSHATCH PATTERN

Proceed as follows:

- b-1) Locate the pair of four-pole magnet rings. Rotate the individual rings.(change spac-

ing between tabs) to converge the vertical RED and BLUE lines. Rotate the pair of rings (maintaining spacing between tabs) to converge the horizontal RED and BLUE lines.

Refer to FIG.10.

- b-2) After completing the RED and BLUE center convergence, locate the pair of six-pole magnet rings. Rotate the individual rings(change spacing between tabs) to converge the vertical RED and BLUE (magenta) and GREEN lines. Rotate the pair of rings(maintaining spacing between tabs) to converge the horizontal RED and BLUE (magenta) and GREEN lines. Refer to FIG.11

2-13) DYNAMIC CONVERGENCE

Dynamic convergence (convergence of the three color fields at the edges of the CRT screen) is accomplished by the proper insertion and positioning of three rubber wedges between the edge of the deflection yoke and the funnel of the CRT.

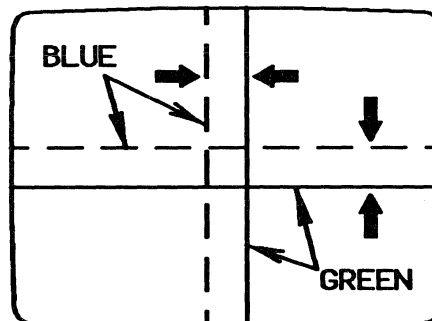


FIGURE 10. STATIC CONVERGENCE A

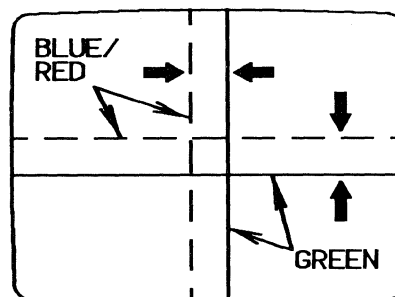


FIGURE 11. STATIC CONVERGENCE B

This is accomplished in the following manner:

- a) Switch the display monitor ON and allow it to warm up for 15 minutes.
- b) Apply the crosshatch pattern (FIG.9) from the computer to the display monitor. Observe spacing between lines around the edges of the CRT.
- c) Tilt the deflection yoke up and down. Insert tilt adjustment wedge 1 and 2 between the deflection yoke and the CRT until the misconvergence illustrated in FIG.12 has been corrected.
- d) Tilt the deflection yoke right and left. Insert tilt adjustment wedge 3 between the deflection yoke and the CRT until the misconvergence illustrated in FIG.13 has been corrected.
- e) Alternately change the spacing between, and depth of insertion of, the three wedge until proper dynamic convergence is obtained.
- f) Check purity and readjust, if necessary.

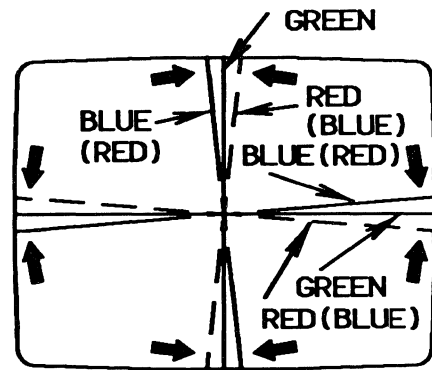


FIGURE 12. DYNAMIC CONVERGENCE A

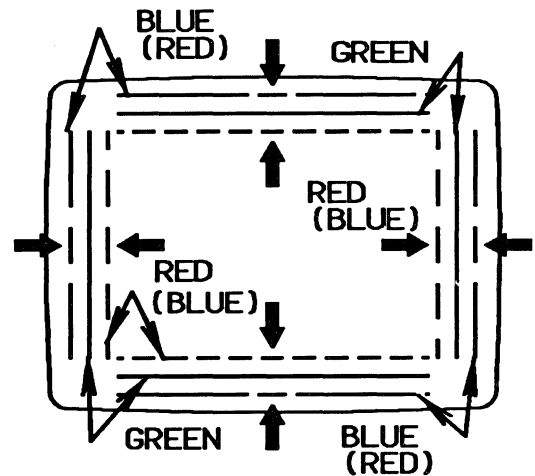


FIGURE 13. DYNAMIC CONVERGENCE B

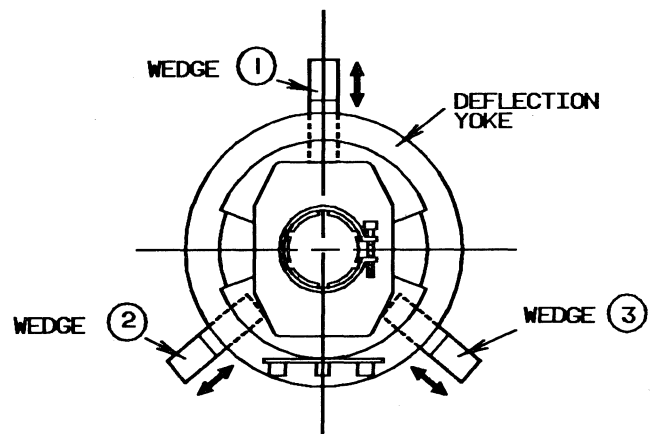
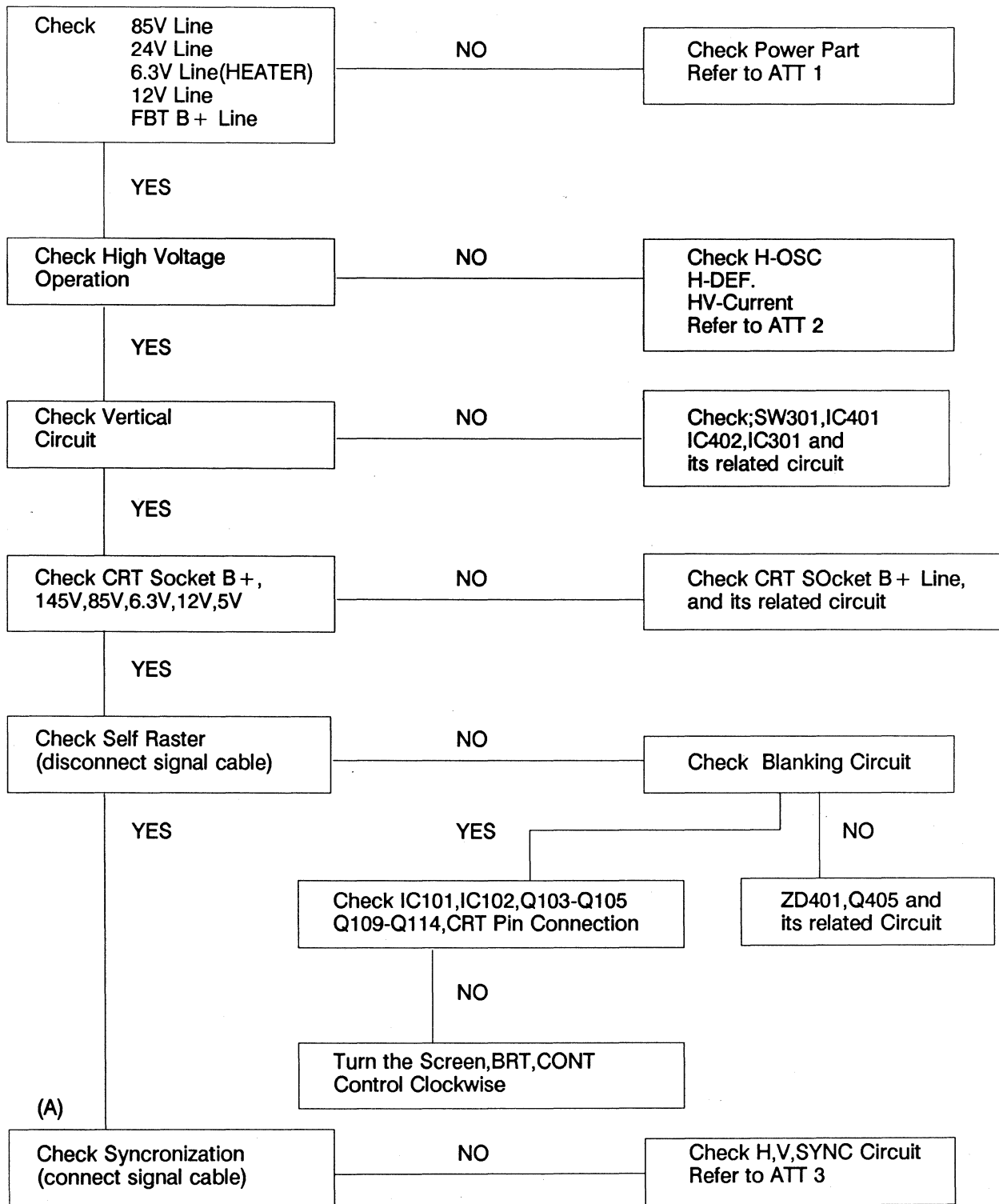


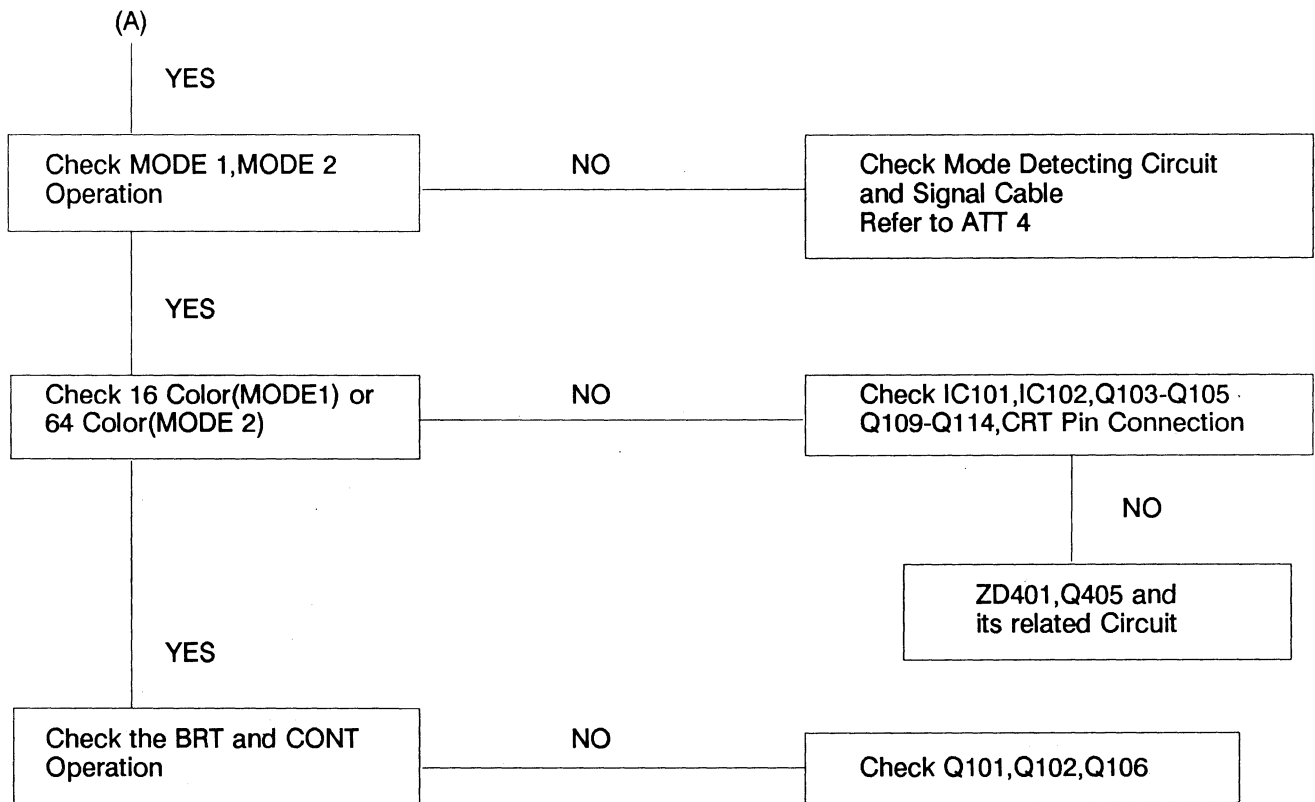
FIGURE 14. DEFLECTION YOKE REAR VIEW

TROUBLE SHOOTING GUIDE

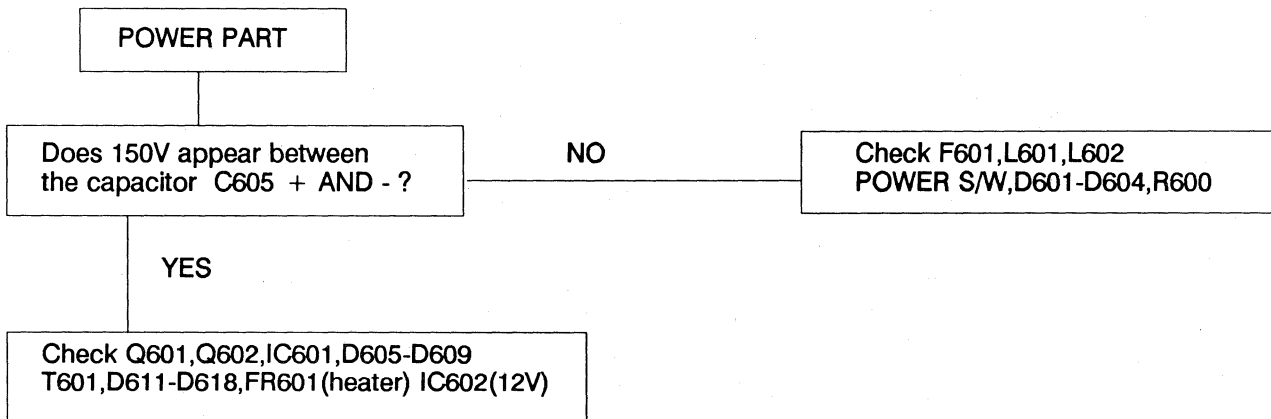
Flow charts and diagrams in this chapter provide you with the information you need for diagnostic problem isolation and component replacement.

NO RASTER (FAIL CHECK PROCEDURE)



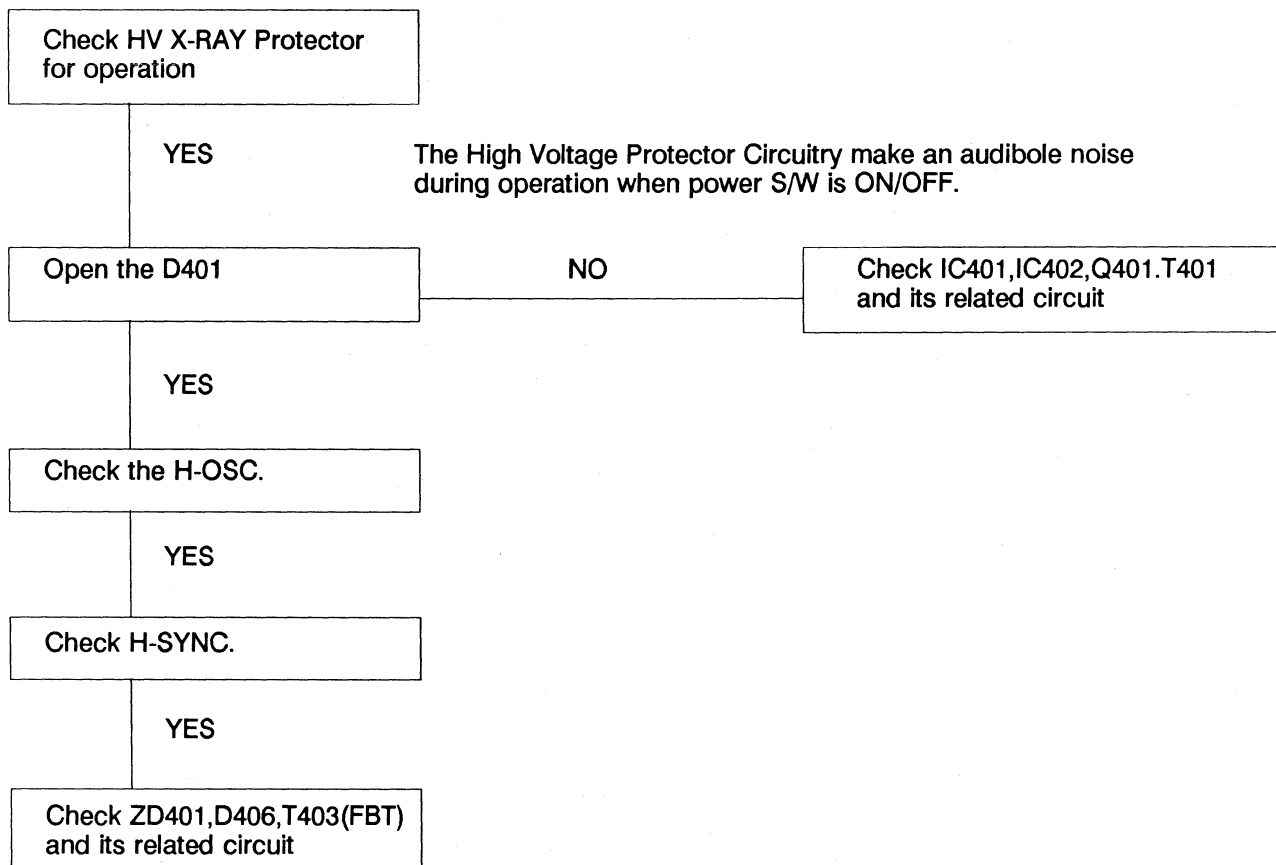


ATT 1. ABNORMAL POWER

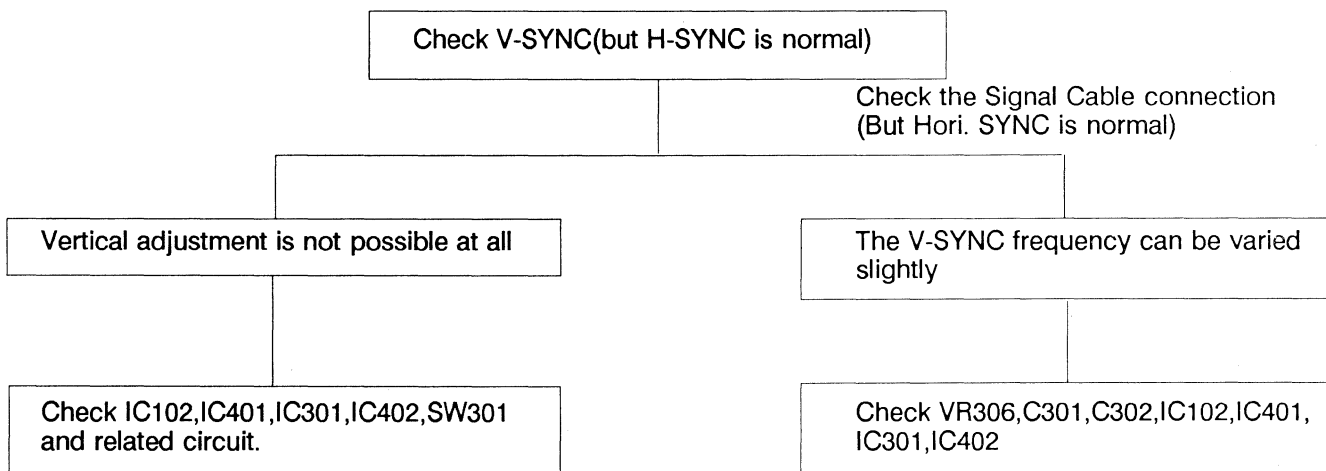
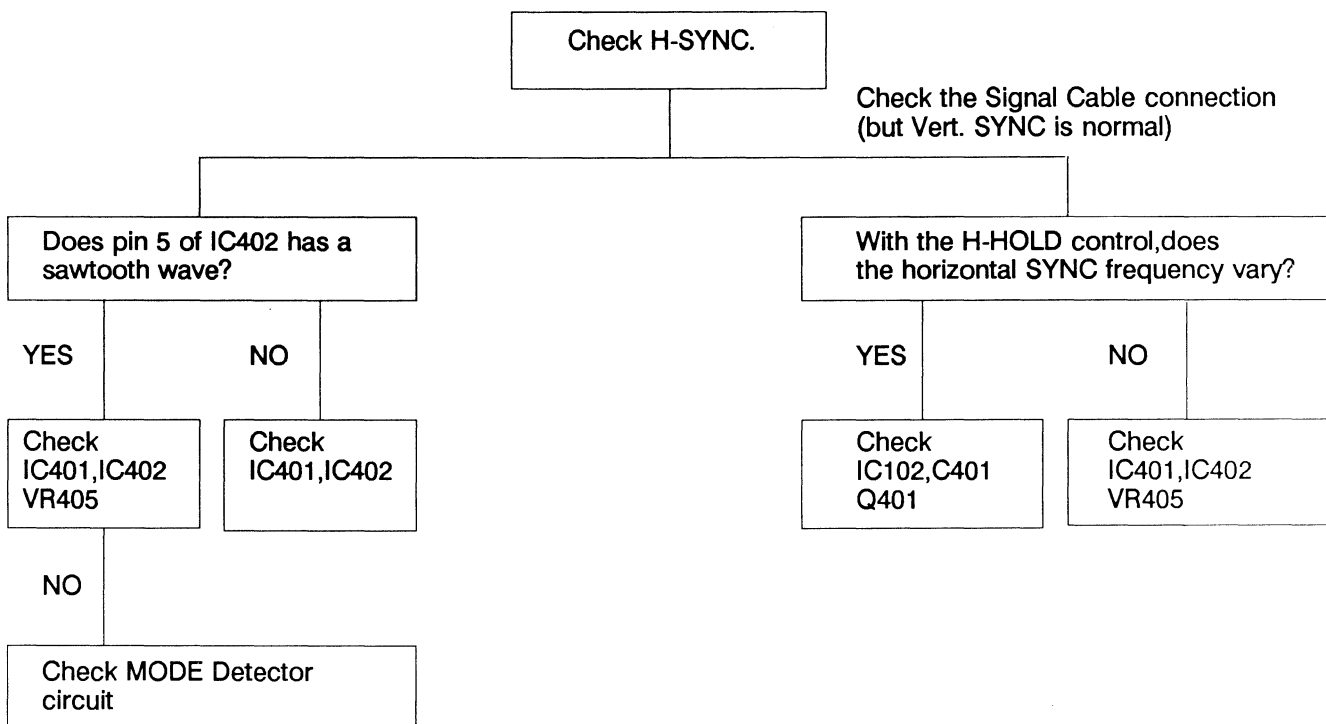


ATT 2. ABNORMAL H-OSC.,H and V CIRCUIT

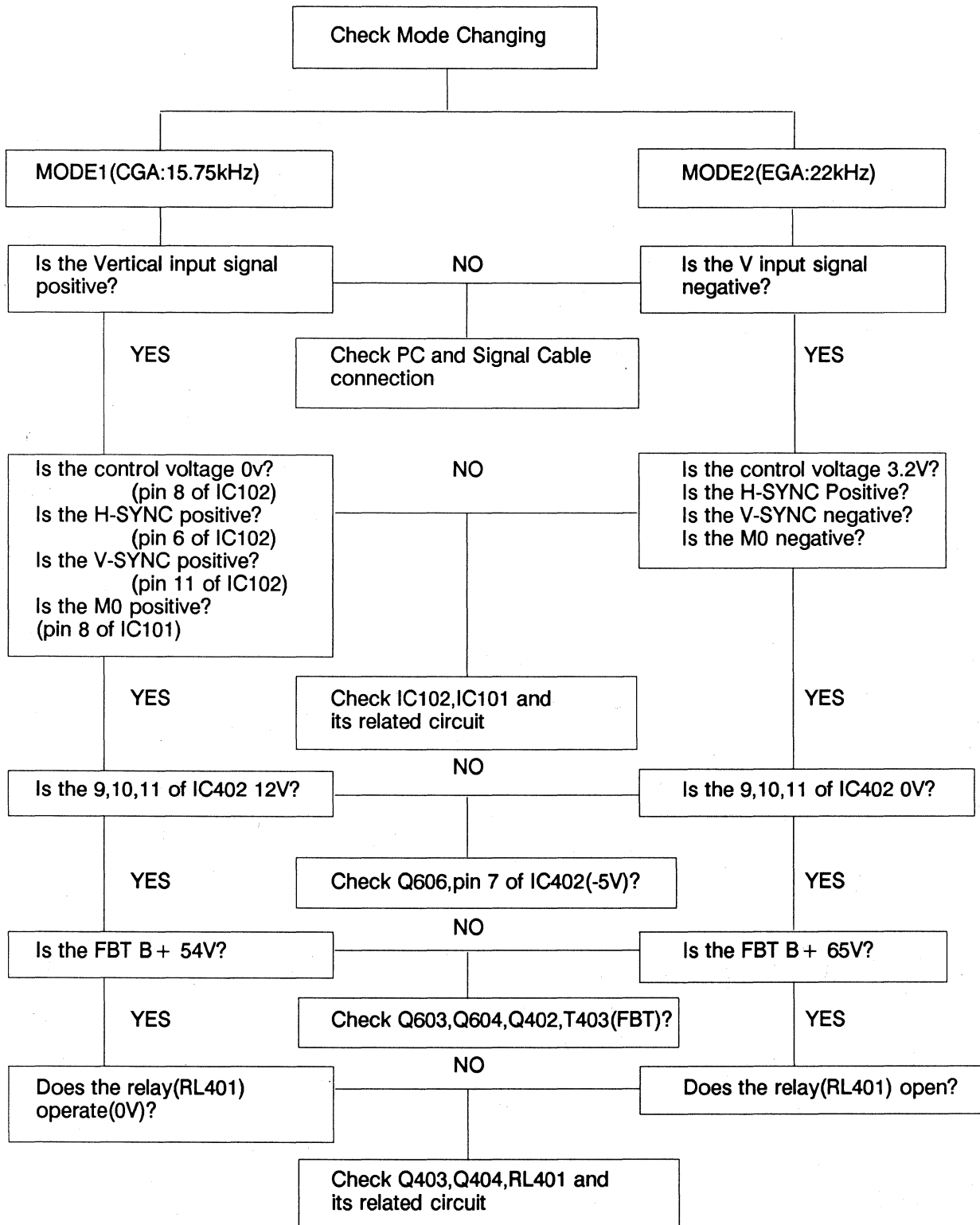
NO RASTER
ABNORMAL PICTURE SIZE
ABNORMAL VIDEO ON THE SCREEN



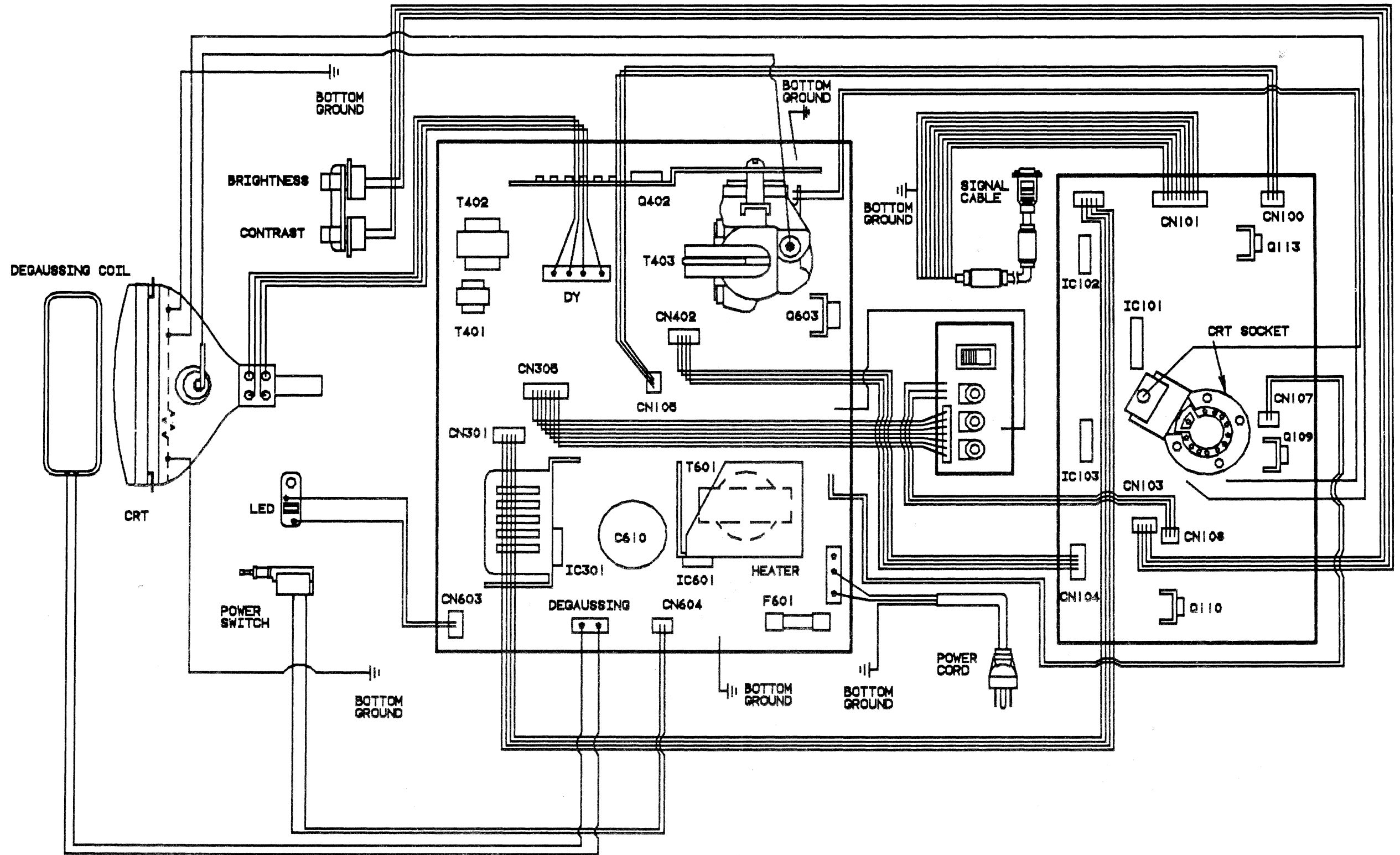
ATT 3.ABNORMAL H,V SYNC



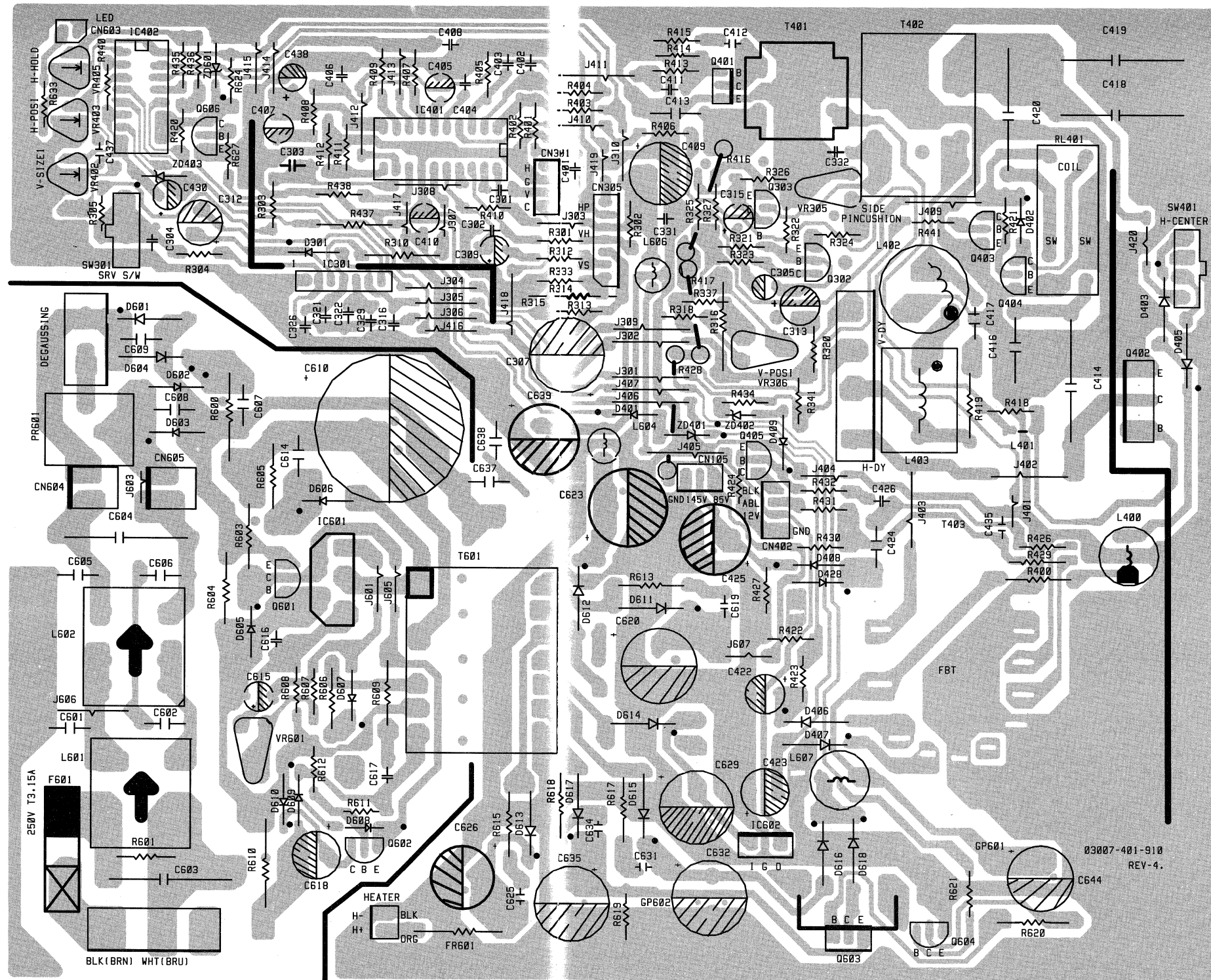
ATT 4. ABNORMAL MODE CHANGING(MODE DETECTING)



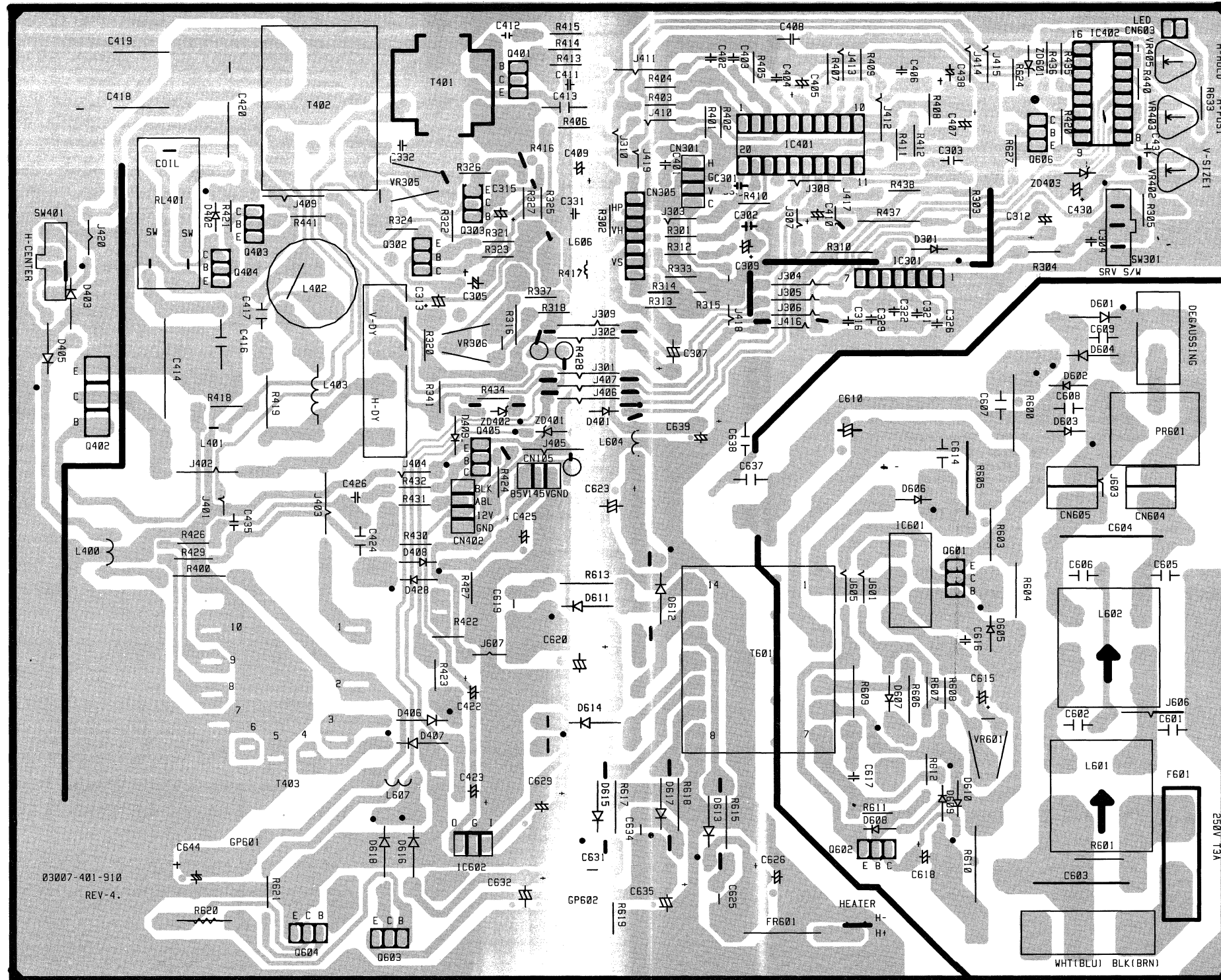
WIRING DIAGRAM AND PARTS



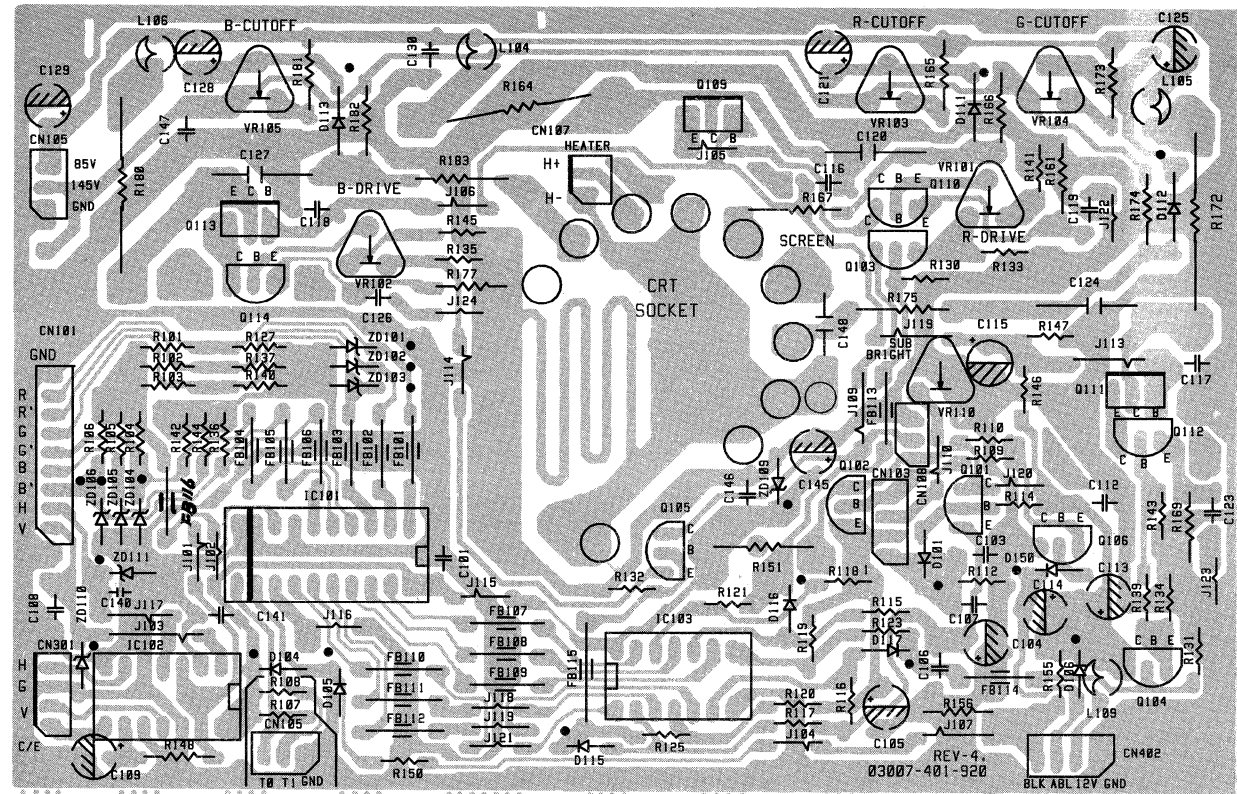
MAIN PCB (TOP VIEW)



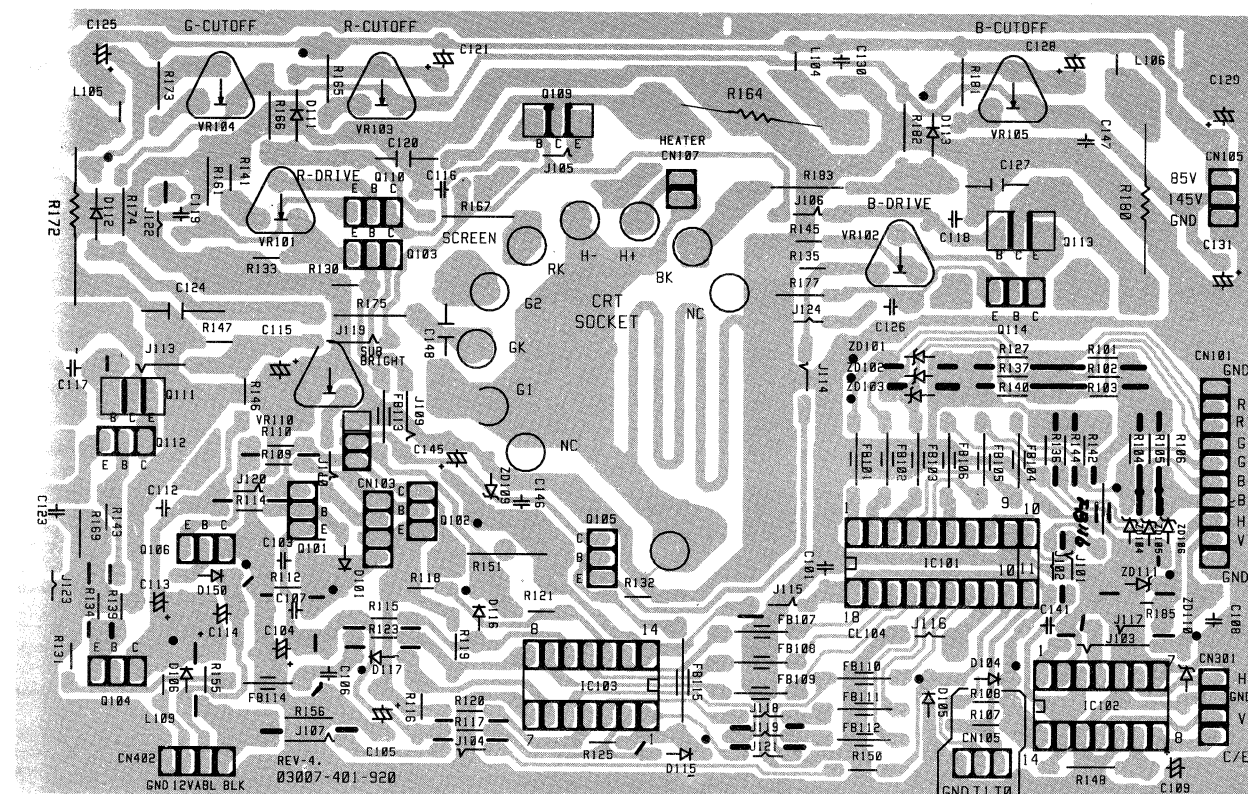
MAIN PCB (BOTTOM VIEW)



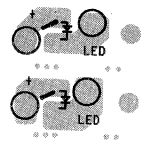
CRT PCB (TOP VIEW)



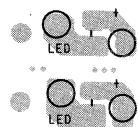
CRT PCB (BOTTOM VIEW)



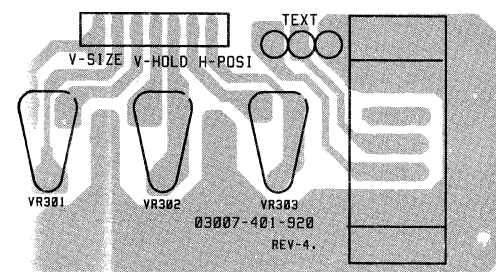
LED PCB (TOP VIEW)



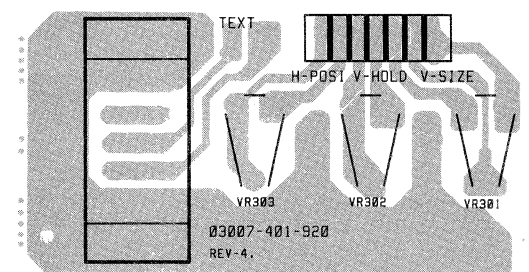
LED PCB (BOTTOM VIEW)



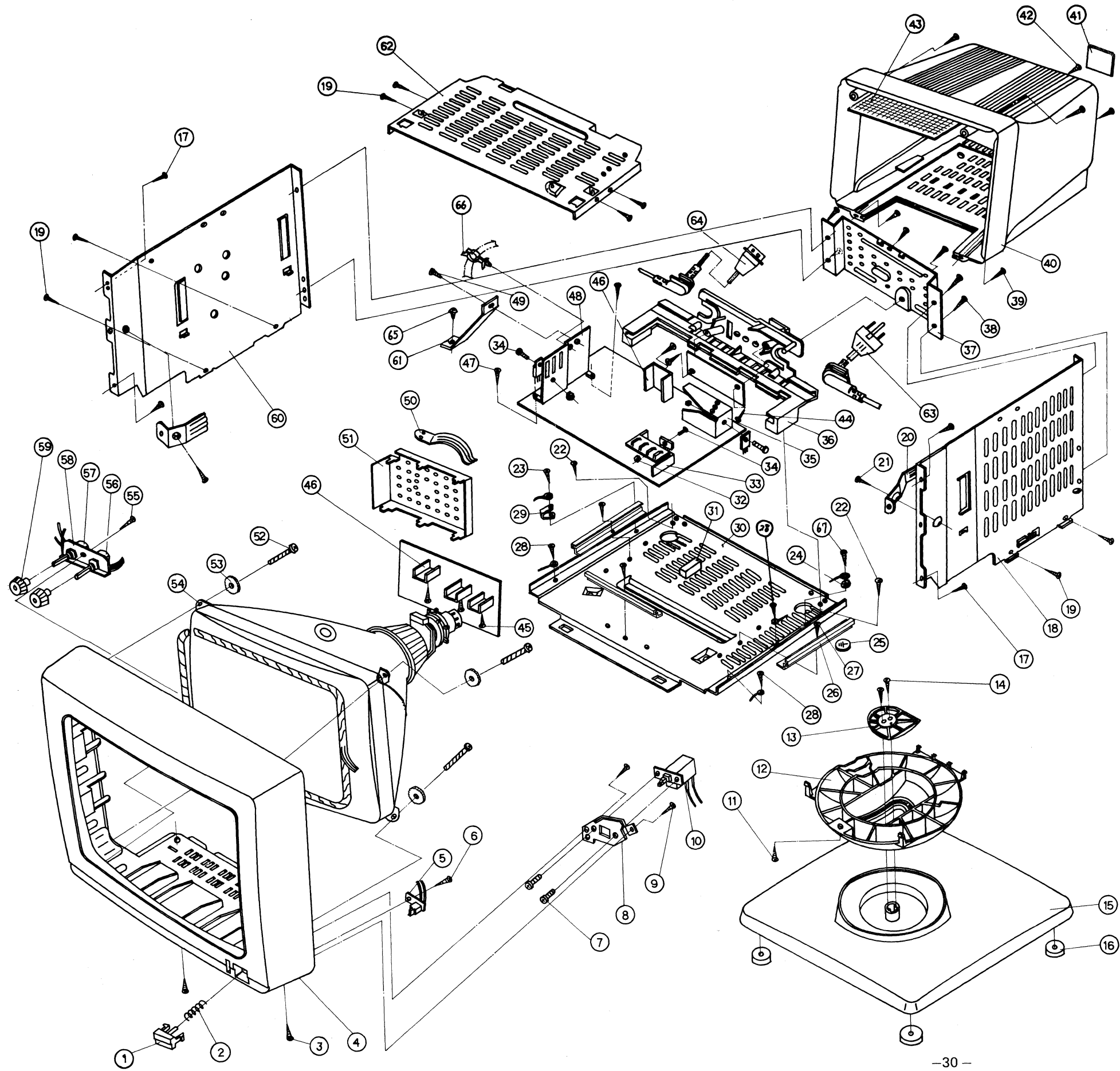
BACK CONTROL PCB (TOP VIEW)



BACK CONTROL PCB (BOTTOM VIEW)



EXPLODED VIEW



EXPLODED VIEW PART LIST

NO	DESCRIPTION; SPECIFICATION	CODE-NO	Q'TY	REMARKS
1	KNOB-POWER; PPO V0 BGE #70805	07623-709-050	1	
2	SPRING-POWER; SUS-302 WPA Ø0.5	06674-715-220	1	
3	SCREW-TAP, TH; 2S-4X10 FE FZW	07128-540-102	2	
4	COVER-FRONT; PPO V0 BGE #70805	06001-921-010	1	
5	LED; KLG 208E	02309-110-090	1	
6	SCREW-TAP, RH; 2S-3X8 FE FZY	07148-530-081	1	
7	SCREW-PH; +M3X6 FE FZY	07008-130-061	2	
8	BRACKET-POWER; SECC-1 T1.0	06614-725-510	1	
9	SCREW-TAP, RH; 2S-3X12 FE FZY	07148-530-121	2	
10	POWER-SWITCH; JPW-1101	03529-705-010	1	
11	SCREW-TAP, TH; 2S-4X10 FE FZY	07128-540-102	1	
12	STAND-TOP; PPO V0 BGE #70805	08301-702-140	1	
13	STAND-STOPPER; ACETAL HB HTR	08302-700-110	1	
14	SCREW-TAP, RH; 2S-3X16 FE FZY	07148-530-161	2	
15	STAND-1464; PPO V0 BGE #70805	08301-701-040	1	
16	FOOT-STANT; CR HB GRY	06834-702-710	4	
17	SCREW-TAP, RH; 2S-4X12 FE FZY	07148-540-121	4	
18	BRACKET-RIGHT; SECC-1 T1.0	06611-702-513	1	*
19	SCREW-TAP, RH; 2S-4X8 FE FZY	07148-540-081	8	
20	EARTH-PLATE; PBP3 SP-H T0.3	04554-702-210	2	*
21	SCREW-TAP, PH; 2S-3X6 FE FZY W/W	07108-126-041	2	
22	SCREW-TAP, FH; 2S-4X8 FE FZB	07118-540-083	2	
23	SCREW-TAP, RH; 2S-4X8 FE FZY	07148-540-081	1	
24	WASHER-TOOTHED; B PI6XPI14XT0.5	07328-204-001	1	
25	NONE	NONE		
26	RAIL PCB; PPO V0 BGE	06023-702-020	3	
27	SCREW-TAP, PH; 2S-3X8 FE FZY W/W	07154-230-081	3	
28	SCREW-TAP, PH; 2S-3X8 FE FZY W/W	07154-230-081	3	
29	CLAMP CABLE; A1050S-HI4 T0.8	06634-204-001	1	
30	CHASSIS-BOTTOM; SECC-1 T1.2	06121-703-110	1	
31	SPONGE-PCB; CHL/RUBBER FROM, BLK	06803-700-311	1	
32	NUT-HEX; I-M3 FE FZY	07208-113-001	3	
33	HEAT-SINK, VER; A1050S-HI4 T2.0	05682-706-410	1	

NO	DESCRIPTION; SPECIFICATION	CODE-NO	Q'TY	REMARKS
34	SCREW-RH; +3X10 FE FZY	07048-130-101	3	
35	HEAT-SINK, IC; A1050S-HI4 T2.0	05682-703-020	1	
36	TERMINAL-BOARD; PPO V0 #70805	03301-700-610	1	
37	SHIELD-REAR; SECC-1 T0.5	04542-710-410	1	*
38	SCREW-TAP, RH; 2S-3X10 FE FZY	07148-530-101	6	
39	SCREW-TAP, TH; 2S-4X16 FE FZW	07128-540-162	4	
40	COVER-REAR; PPO V0 BGE #70805	06001-922-010	1	
41	LABEL-RATING; POLYESTER T0.1	08033-737-710	1	
42	SCREW-TAP, FH; 2S-4X15 FE FZW	07118-540-152	2	
43	SHIELD-TOP; SBC-1 FZW T0.5	04541-701-810	1	*
44	SCREW-TAP, RH; 2S-3X12 FE FZY	07148-530-121	2	
45	SCREW-TAP, RH; 2S-3X6 FE FZY	07148-530-061	4	
46	HEATSINK-V.OUT; SPC-1 T1.0 FZ2	05684-705-010	4	
47	SCREW-TAP, RH; 2S-3X8 FE FZY	07148-530-081	2	
48	HEAT-SINK, TR; A1050S-HI4 T2.0	05682-705-810	4	
49	SCREW-TAP, TH; 2S-4X10 FE FZY	07128-540-102	1	
50	SPRING-GND; SPS3 T0.3	06673-703-310	1	
51	SHIELD-VIDEO, ASSY; SPT-1 T0.3	04542-710-510	1	*
52	SCREW-TAP, RH; 2S-5X25 FE FZY	07154-700-410	4	
53	WASHER-SPRING; SPC-1 T1.6 FZY2	07334-700-710	4	
54	CRT+DY; 14" COLOR	02019-234-310	1	
55	SCREW-TAP, TH; 2S-4X10 FE FZW	07128-540-102	1	
56	VR-ROUND, SIGNAL; CONTRAST	01201-102-022	1	
57	VR-ROUND, SIGNAL; BRIGHTNESS	01201-102-005	1	
58	BRACKET-CONTROL; SECC-1 T0.8	06613-711-910	1	
59	KNOB-VR; ABS V0 GRY #8240	07623-707-610	2	
60	BRACKET-LEFT, M; SECC-1 T1.0	06611-704-010	1	*
61	HOLDER-FBT; PVC V0 BLK T0.8	06603-704-810	1	
62	BRACKET-TOP; SECC-1 T1.0	06611-702-810	1	*
63	POWER-CORD; LP34A-LP	03051-801-010	1	
64	SIGNAL-CABLE, ASSY; 2464 #24 C9	03051-401-610	1	
65	SCREW-TAP, TH; 2S-4X16 FE FZY	07128-540-061	1	
66	HOLDER-CORD; NYLON 6/6 NATURAL	06604-708-410	1	
67	SCREW-RH; +M4X6 FE FZY	07048-140-061	1	

REMARK : * MARKED PARTS ARE ONLY USED IN THE CASE OF THE UL/CSA/FCC/TUV/FTZ etc.

REPLACEMENT PARTS LIST

(ELECTRICAL PARTS)

IMPOTANT SAFETY NOTICE

Components identified by the symbol ! have special characteristics which is important for safety. When replacing any of these components use only manufacturer's specified parts.

NOTE (Tolerance) :

F ; +/-1%, J ; +/-5%, K ; +/-10%, M ; +/-20%, P ; +100% -0%, Z ; +80% -20%

REF NO	DESCRIPTION	PART NO	REMARK
RESISTORS			
R101	R-CARBON;RD 1/4T 220-J	01018-277-221	
R102	R-CARBON;RD 1/4T 220-J	01018-277-221	
R103	R-CARBON;RD 1/4T 220-J	01018-277-221	
R104	R-CARBON;RD 1/4T 220-J	01018-277-221	
R105	R-CARBON;RD 1/4T 220-J	01018-277-221	
R106	R-CARBON;RD 1/4T 220-J	01018-277-221	
R109	R-METAL,FILM;RM 1/8T 4.7K-J	01048-177-472	
R110	R-METAL,FILM;RM 1/8T 1K-J	01048-177-102	
R112	R-METAL,FILM;RM 1/8T 2.7K-J	01048-177-272	
R114	R-METAL,FILM;RM 1/8T 10K-J	01048-177-103	
R115	R-METAL,FILM;RM 1/8T 560-J	01048-177-561	
R116	R-METAL,FILM;RM 1/8T 560-J	01048-177-561	
R117	R-METAL,FILM;RM 1/8T 560-J	01048-177-561	
R118	R-METAL,FILM;RM 1/8T 560-J	01048-177-561	
R119	R-METAL,FILM;RM 1/8T 560-J	01048-177-561	
R120	R-METAL,FILM;RM 1/8T 560-J	01048-177-561	
R121	R-METAL,FILM;RM 1/8T 1.5K-J	01048-177-152	
R123	R-METAL,FILM;RM 1/8T 1.5K-J	01048-177-152	
R125	R-METAL,FILM;RM 1/8T 1.5K-J	01048-177-152	
R127	R-METAL,FILM;RM 1/8T 1.2K-J	01048-177-122	
R130	R-METAL,FILM;RM 1/8T 5.6K-J	01048-177-562	
R131	R-METAL,FILM;RM 1/8T 5.6K-J	01048-177-562	
R132	R-METAL,FILM;RM 1/8T 5.6K-J	01048-177-562	
R133	R-METAL,FILM;RM 1/8T 1K-J	01048-177-102	
R134	R-METAL,FILM;RM 1/8T 1K-J	01048-177-102	

REF NO	DESCRIPTION	PART NO	REMARK
R135	R-METAL,FILM;RM 1/8T 1K-J	01048-177-102	
R136	R-METAL,FILM;RM 1/8T 1.2K-J	01048-177-122	
R137	R-METAL,FILM;RM 1/8T 1.2K-J	01048-177-122	
R139	R-METAL,FILM;RM 1/8T 100-J	01048-177-101	
R140	R-METAL,FILM;RM 1/8T 1.2K-J	01048-177-122	
R141	R-METAL,FILM;RM 1/8T 470-J	01048-177-471	
R142	R-METAL,FILM;RM 1/8T 1.2K-J	01048-177-122	
R143	R-METAL,FILM;RM 1/8T 560-J	01048-177-561	
R144	R-METAL,FILM;RM 1/8T 1.2K-J	01048-177-122	
R145	R-METAL,FILM;RM 1/8T 470-J	01048-177-471	
R146	R-METAL,FILM;RM 1/8T 2.2K-J	01048-177-222	
R147	R-METAL,FILM;RM 1/8T 3.9K-J	01048-177-392	
R148	R-METAL,FILM;RM 1/8T 2.2K-J	01048-177-222	
R150	R-METAL,FILM;RM 1/8T 1K-J	01048-177-102	
R151	R-METAL,OXIDE;RS 2P 56-J(S)	01085-527-560	
R155	R-METAL,FILM;RM 1/8T 3.3K-J	01048-177-332	
R156	R-METAL,FILM;RM 1/8T 2.7K-J	01048-177-272	
R161	R-CARBON;RD 1/4T 120-J	01018-277-121	
R164	R-CEMENT,WIRE;RW 3P 1.8K-J	01039-427-182	
R165	R-CARBON;RD 1/4T 22K-J	01018-277-223	
R166	R-CARBON;RD 1/4T 270K-J	01018-277-274	
R167	R-COMPOSITION;RC 1/2T 330-K	01028-378-331	
R169	R-CARBON;RD 1/4T 120-J	01018-277-121	
R172	R-CEMENT,WIRE;RW 3P 1.8K-J	01039-427-182	
R173	R-CARBON;RD 1/4T 22K-J	01018-277-223	
R174	R-CARBON;RD 1/4T 270K-J	01018-277-274	
R175	R-COMPOSITION;RC 1/2T 330-K	01028-378-331	
R177	R-CARBON;RD 1/4T 120-J	01018-277-121	
R180	R-CEMENT,WIRE;RW 3P 1.8K-J	01039-427-182	
R181	R-CARBON;RD 1/4T 22K-J	01018-277-223	
R182	R-CARBON;RD 1/4T 270K-J	01018-277-274	
R183	R-COMPOSITION;RC 1/2T 330-K	01028-378-331	

REF NO	DESCRIPTION	PART NO	REMARK
R301	R-CARBON;RD 1/4T 200K-J	01018-277-204	
R302	R-CARBON;RD 1/4T 820K-J	01018-277-824	
R303	R-CARBON;RD 1/4T 68K-J	01018-277-683	
R304	R-CARBON;RD 1/4T 68K-J	01018-277-683	
R305	R-CARBON;RD 1/4T 22K-J	01018-277-223	
R310	R-CARBON;RD 1/4T 330-J	01018-277-331	
R312	R-CARBON;RD 1/4T 680-J	01018-277-681	
R313	R-CARBON;RD 1/4T 82-J	01018-277-820	
R314	R-CARBON;RD 1/4T 220-J	01018-277-221	
R315	R-METAL,OXIDE;RS 2P 3.3-J	01045-528-339	
R316	R-METAL,OXIDE;RS 2P 220-J(S)	01085-527-221	
R318	R-CARBON;RD 1/2T 150-J(S)	01016-377-151	
R320	R-CARBON;RD 1/4T 10K-J	01018-277-103	
R321	R-CARBON;RD 1/4T 100K-J	01018-277-104	
R322	R-CARBON;RD 1/4T 8.2K-J	01018-277-822	
R323	R-CARBON;RD 1/4T 1K-J	01018-277-102	
R324	R-CARBON;RD 1/4T 220-J	01018-277-221	
R325	R-CARBON;RD 1/4T 5.6K-J	01018-277-562	
R326	R-CARBON;RD 1/4T 22K-J	01018-277-223	
R327	R-CARBON;RD 1/4T 150-J	01018-277-151	
R333	R-CARBON;RD 1/4T 120-J	01018-277-121	
R337	R-CARBON;RD 1/2T 150-J(S)	01016-377-151	
R341	R-CARBON;RD 1/2T 270-J(S)	01016-377-271	
R400	R-METAL,OXIDE;RS 1P 68-J	01045-427-680	
R401	R-CARBON;RD 1/4T 2.2K-J	01018-277-222	
R402	R-CARBON;RD 1/4T 22K-J	01018-277-223	
R403	R-CARBON;RD 1/4T 12K-J	01018-277-123	
R404	R-CARBON;RD 1/4T 1K-J	01018-277-102	
R405	R-CARBON;RD 1/4T 22K-J	01018-277-223	
R406	R-CARBON;RD 1/4T 82K-J	01018-277-823	
R407	R-CARBON;RD 1/4T 33K-J	01018-277-333	

REF NO	DESCRIPTION	PART NO	REMARK
R408	R-CARBON;RD 1/4T 8.2K-J	01018-277-822	
R409	R-CARBON;RD 1/4T 1K-J	01018-277-102	
R410	R-CARBON;RD 1/4T 75K-J	01018-277-753	
R411	R-CARBON;RD 1/4T 12K-J	01018-277-123	
R412	R-CARBON;RD 1/4T 12K-J	01018-277-123	
R413	R-CARBON;RD 1/4T 1K-J	01018-277-102	
R414	R-CARBON;RD 1/4T 470-J	01018-277-471	
R415	R-CARBON;RD 1/2T 4.7K-J(S)	01016-377-472	
R416	R-METAL,OXIDE;RS 2P 330-J	01045-527-331	
R417	R-METAL,OXIDE;RS 2P 330-J	01045-527-331	
R418	R-CARBON;RD 1/4T 8.2-J	01018-277-829	
R420	R-CARBON;RD 1/4T 270-J	01018-277-271	
R421	R-CARBON;RD 1/4T 220K-J	01018-277-224	
R422	R-CARBON;RD 1/4T 2.7K-J	01018-277-272	
R423	R-CARBON;RD 1/4T 6.8K-J	01018-277-682	
R424	R-CARBON;RD 1/4T 1.5K-J	01018-277-152	
R426	R-CARBON;RD 1/4T 4.7-J	01018-277-479	
R427	R-CARBON;RD 1/4T 1M-J	01018-277-105	
R428	R-METAL,OXIDE;RS 2P 270-J	01045-527-271	
R429	R-CARBON;RD 1/4T 1K-J	01018-277-102	
R430	R-CARBON;RD 1/4T 180K-J	01018-277-184	
R431	R-CARBON;RD 1/4T 1K-J	01018-277-102	
R432	R-CARBON;RD 1/4T 22K-J	01018-277-223	
R434	R-CARBON;RD 1/4T 6.8K-J	01018-277-682	
R435	R-CARBON;RD 1/4T 11K-J	01018-277-113	
R436	R-CARBON;RD 1/4T 6.8K-J	01018-277-682	
R437	R-METAL,OXIDE;RS 3P 5.6K-J(S)	01085-627-562	
R438	R-CARBON;RD 1/4T 10K-J	01018-277-103	
R440	R-CARBON;RD 1/4T 56K-J	01018-277-563	
R441	R-CARBON;RD 1/4T 12K-J	01018-277-123	

REF NO	DESCRIPTION	PART NO	REMARK
R600	SEE TABLE 1 ON PAGE		
R601	R-COMPOSITION;RC 1/2T 1M-K	01028-378-105	
R603	R-METAL,OXIDE;RS 1P 680K-J(S)	01085-427-684	
R604	R-WIRE,WOUND;RW 2P 0.6-J	01038-327-069	
R605	R-METAL,OXIDE;RS 3P 68K-J(S)	01085-627-683	
R606	R-METAL,OXIDE;RS 1P 33-J	01045-427-330	
R607	R-CARBON;RD 1/4T 10K-J	01018-277-103	
R608	R-CARBON;RD 1/4T 56K-J	01018-277-563	
R609	R-METAL,OXIDE;RS 1P 33-J	01045-427-330	
R610	R-METAL,OXIDE;RS 3P 5.6-J	01085-627-560	
R611	R-CARBON;RD 1/4T 820-J	01018-277-821	
R612	R-CARBON;RD 1/4T 820-J	01018-277-821	
R613	R-METAL,OXIDE;RS 1P 68-J	01045-427-680	
R615	R-METAL,OXIDE;RS 1P 68-J	01045-427-680	
R617	R-METAL,OXIDE;RS 1P 68-J	01045-427-680	
R618	R-METAL,OXIDE;RS 1P 68-J	01045-427-680	
R619	R-CARBON;RD 1/4T 560K-J	01018-277-564	
R620	R-METAL,OXIDE;RS 2P 5.6K-J(S)	01085-527-562	
R621	R-CARBON;RD 1/4T 18K-J	01018-277-183	
R624	R-CARBON;RD 1/4T 1.8K-J	01018-277-182	
R627	R-CARBON;RD 1/4T 100-J	01018-277-101	
R633	R-CARBON;RD 1/4T 1K-J	01018-277-102	
FR601	R-FUSIBLE;RF 2P 1.8-J	01057-527-189	
D IODE			
D101	DIODE;1N4148(T)	02169-301-417	
D104	DIODE;1N4148(T)	02169-301-417	
D105	DIODE;1N4148(T)	02169-301-417	
D106	DIODE;1N4148(T)	02169-301-417	
D107	DIODE;1N4148(T)	02169-301-417	
D108	DIODE;1N4148(T)	02169-301-417	
D111	DIODE;1SS83	02169-202-080	
D112	DIODE;1SS83	02169-202-080	
D113	DIODE;1SS83	02169-202-080	

REF NO	DESCRIPTION	PART NO	REMARK
D115	DIODE;1N4148(T)	02169-301-417	
D116	DIODE;1N4148(T)	02169-301-417	
D117	DIODE;1N4148(T)	02169-301-417	
D150	DIODE;1N4148(T)	02169-301-417	
D301	DIODE;BA158	02169-304-270	
D401	DIODE;1N4148(T)	02169-301-417	
D402	DIODE;1N4148(T)	02169-301-417	
D403	DIODE;TVR-06G	02169-302-060	
D405	DIODE;TVR-06G	02169-302-060	
D406	DIODE;TVR-06G	02169-302-060	
D407	DIODE;TVR-06G	02169-302-060	
D408	DIODE;BA158	02169-304-270	
D409	DIODE;1N4148(T)	02169-301-417	
D428	DIODE;TVR-06G	02169-302-060	
D601	DIODE;BY133	02169-306-430	
D602	DIODE;BY133	02169-306-430	
D603	DIODE;BY133	02169-306-430	
D604	DIODE;BY133	02169-306-430	
D605	DIODE;EU1Z	02169-304-260	
D606	DIODE;SI.RU1P	02169-206-240	
D607	DIODE;EU1Z	02169-304-260	
D608	DIODE;1N4148(T)	02169-301-417	
D609	DIODE;RGP1OG(T)	02169-219-107	
D610	DIODE;EU1Z	02169-304-260	
D611	DIODE;RU-2	02169-219-417	
D612	DIODE;RU-2	02169-219-417	
D613	DIODE;RG2Y	02169-219-330	
D614	DIODE;RU-2	02169-219-417	
D615	DIODE;RG-2	02169-219-340	
D616	DIODE;RU-2	02169-219-417	
D617	DIODE;RG-2	02169-219-340	
D618	DIODE;RU-2	02169-219-417	

REF NO	DESCRIPTION	PART NO	REMARK
ZD101	DIODE-ZENER;UZ 5.1B(T)	02169-404-767	
ZD102	DIODE-ZENER;UZ 5.1B(T)	02169-404-767	
ZD103	DIODE-ZENER;UZ 5.1B(T)	02169-404-767	
ZD104	DIODE-ZENER;UZ 5.1B(T)	02169-404-767	
ZD105	DIODE-ZENER;UZ 5.1B(T)	02169-404-767	
ZD106	DIODE-ZENER;UZ 5.1B(T)	02169-404-767	
ZD109	DIODE-ZENER;UZ 5.1B(T)	02169-404-767	
ZD110	DIODE-ZENER;UZ 5.1B(T)	02169-404-767	
ZD111	DIODE-ZENER;UZ 5.1B(T)	02169-404-767	
ZD401	DIODE-ZENER;ZPD8.2	02169-403-830	
ZD402	DIODE-ZENER;UZ-27BM	02169-404-690	
ZD403	DIODE-ZENER;UZ 5.1B(T)	02169-404-767	
ZD601	DIODE-ZENER;UZ-12BM(11.6-12.4)(T)	02169-404-677	
LED	LED;KLG208E	02309-110-090	
INTEGRATED CIRCUITS			
IC101	IC-GATE;SL205	02109-301-540	
IC102	IC;KS74HCTLS86	02109-104-700	
IC103	IC-TTL;SN74LS07	02109-101-880	
IC301	IC;LA7830	02119-101-490	
IC401	IC;LA7851	02119-101-080	
IC402	IC-CMOS;14053B(MOTOROLA)	02109-104-120	
IC601 !	SEE TABLE 1 ON THE PAGE		
IC602	IC-REGULATOR;MC7812C,SST	02119-601-700	
TRANSISTORS			
Q101	TRANSISTOR;KSC1008-(T)	02149-301-437	
Q102	TRANSISTOR;KSC1008-(T)	02149-301-437	
Q103	TRANSISTOR;2N3904(T)	02139-301-347	
Q104	TRANSISTOR;2N3904(T)	02139-301-347	
Q105	TRANSISTOR;2N3904(T)	02139-301-347	
Q106	TRANSISTOR;KSA733-Y(T)	02139-103-384	
Q109	TRANSISTOR;KSC1507-Y	02139-301-240	
Q110	TRANSISTOR;2N3904(T)	02139-301-347	

REF NO	DESCRIPTION	PART NO	REMARK
Q111	TRANSISTOR;KSC1507-Y	02139-301-240	
Q112	TRANSISTOR;2N3904(T)	02139-301-347	
Q113	TRANSISTOR;KSC1507-Y	02139-301-240	
Q114	TRANSISTOR;2N3904(T)	02139-301-347	
Q302	TRANSISTOR;KSC945-Y(T)	02139-302-747	
Q303	TRANSISTOR;KSA614-Y	02139-103-570	
Q401	TRANSISTOR;KSC1507-Y	02139-301-240	
Q402 !	TRANSISTOR;2SD1879(SANYO)	02149-401-780	MULTI-2
Q402 !	TRANSISTOR;2SD1555(TOSHIBA)	02159-401-550	
Q402 !	TRANSISTOR;2SD1556(TOSHIBA)	02159-401-560	MULTI-1
Q403	TRANSISTOR;KSC945-Y(T)	02139-302-747	
Q405	TRANSISTOR;KSC945-Y(T)	02139-302-747	
Q601	TRANSISTOR;KSC2310(T)	02139-302-247	
Q601	TRANSISTOR;KSC2383(T)		
Q602	TRANSISTOR;MPSA42	02139-204-030	
Q603	TRANSISTOR;KSB546-Y(SST)	02149-201-470	
Q604	TRANSISTOR;KSC2310(T)	02139-302-247	
Q606	TRANSISTOR;KSC945-Y(T)	02139-302-747	
VARIABLE RESISTORS			
VR305	VR-SEMI;CET 92A B500	01241-108-002	
VR306	VR-SEMI;CET 92A B3K	01241-108-005	
VR601	VR-SEMI;CET 92A B10K	01241-108-007	
VR402	VR-SEMI;CET 117A B500	01241-110-001	
VR403	VR-SEMI;CET 117A B50K	01241-110-005	
VR405	VR-SEMI;CET 117A B3K	01241-110-012	
VR110	VR-SEMI;CET 117A B5K	01241-110-003	
VR101	VR-SEMI;CET 117A B200	01241-118-004	
VR102	VR-SEMI;CET 117A B200	01241-118-004	
VR103	VR-SEMI;CET 117A B25K	01241-110-007	
VR104	VR-SEMI;CET 117A B25K	01241-110-007	
VR105	VR-SEMI;CET 117A B25K	01241-110-007	
BRI.	VR-ROUND,SGL;18SN 20F B10K	01201-102-005	BRIGHT VR

REF NO	DESCRIPTION	PART NO	REMARK
CONT.	VR-ROUND,SGL;18SN 20F B5K	01201-102-022	CONTRAST VR
V-SIZE	VR-SEMI;CET 92A B500	01241-108-002	ON BACK-
V-HOLD	VR-SEMI;CET 92A B250K	01241-108-010	CONTROL-
V-POSI	VR-SEMI;CET 92A B10K	01241-108-018	PCB
TRANS & COIL			
T401 !	TRANS-HOR,DRIVE;19x7.6MM	02849-032-410	H.D.T.
T402	TRANS-SIDE PIN CUSHION;EI28x20MM	02779-111-510	S.P.C.T.
T403 !	TRANS-FLYBACK;FCO1412L02	02859-129-110	F.B.T.
T601 !	SEE TABLE 1 ON THE PAGE		
L104	COIL-FILTER;15uH-K	02429-202-060	
L105	COIL-FILTER;15uH-K	02429-202-060	
L106	COIL-FILTER;15uH-K	02429-202-060	
L109	COIL-FILTER;33uH	02429-060-510	
L400	COIL-CHOKE;1MH	02429-060-310	
L401	COIL-PEAKING;2.7uH	02429-855-210	
L402	COIL-WIDTH;32uH + -40%(CEA4551)	02449-435-410	H-WIDTH COIL
L403	COIL-H,LINEARITY;45uH	02449-734-210	H-LINEARITY
L601	SEE TABLE 1 ON THE PAGE		
L602	SEE TABLE 1 ON THE PAGE		
L604	COIL-FILTER;33uH	02429-060-510	
L606	COIL-FILTER;33uH	02429-060-510	
L607	COIL-CHOKE;100uH-K(10 PI) N.Y.	02429-052-020	
DEGA	COIL-DEGAUSSING;CN4551A(120V 60Hz)	02479-014-110	DEGAUSSING
OTHERS			
SW301	SWITCH-LEVER;EVQ-R1A L13	03549-015-010	SVC S/W
SW401	SWITCH-LEVER;JRS-1301	03549-007-010	H-CENTER S/W
SW601	SEE TTABLE 1 ON THE PAGE		
RL401	RELAY;HR-CR323 DC024	04724-102-810	
SOCKET	SOCKET-CRT(H.FOCUS);I-CSH 6112 V-O WHT	03354-705-310	CRT SOCKET
TEXT S/W	SWITCH-SLIDE;KSA2222	03519-106-210	
F601	SEE TABLE 1 ON THE PAGE		

REF NO	DESCRIPTION	PART NO	REMARK
FB101	COIL-CHOKE;1.5uH + -20%	02429-048-010	FERRITE BEAD
FB102	COIL-CHOKE;1.5uH + -20%	02429-048-010	FERRITE BEAD
FB103	COIL-CHOKE;1.5uH + -20%	02429-048-010	FERRITE BEAD
FB104	COIL-CHOKE;1.5uH + -20%	02429-048-010	FERRITE BEAD
FB105	COIL-CHOKE;1.5uH + -20%	02429-048-010	FERRITE BEAD
FB106	COIL-CHOKE;1.5uH + -20%	02429-048-010	FERRITE BEAD
FB107	COIL-CHOKE;1.5uH + -20%	02429-048-010	FERRITE BEAD
FB108	COIL-CHOKE;1.5uH + -20%	02429-048-010	FERRITE BEAD
FB109	COIL-CHOKE;1.5uH + -20%	02429-048-010	FERRITE BEAD
FB110	COIL-CHOKE;1.5uH + -20%	02429-048-010	FERRITE BEAD
FB111	COIL-CHOKE;1.5uH + -20%	02429-048-010	FERRITE BEAD
FB112	COIL-CHOKE;1.5uH + -20%	02429-048-010	FERRITE BEAD
FB113	COIL-CHOKE;1.5uH + -20%	02429-048-010	FERRITE BEAD
FB114	COIL-CHOKE;1.5uH + -20%	02429-048-010	FERRITE BEAD
FB115	COIL-CHOKE;1.5uH + -20%	02429-048-010	FERRITE BEAD
FB116	COIL-CHOKE;1.5uH + -20%	02429-048-010	FERRITE BEAD
CN101	CONNECTOR-WAFER;5267-09A(MOLEX)	03344-156-190	SIGNAL CABLE
CN101	SIGNAL-CABLE ASSY;L1000(CEA4551)	03051-401-610	SIGNAL CABLE
CN103	CONNECTOR-WAFER;5267-04A(MOLEX)	03344-156-140	BRI./CONT. LINE
CN103	CON-4P ASSY;H-5264-04 450MM	03054-646-150	BRI./CONT. LINE
CN107	CONNECTOR-WAFER;5267-02A(MOLEX)	03344-156-120	HEATER LINE
HEATER	CONN-2P ASSY;5264-02 L = 300MM	03054-617-660	HEATER LINE
CN301	CONNECTOR-WAFER;5267-04A(MOLEX)	03344-156-140	SYNC LINE
CN301	CONNECTOR 4P ASSY;5264-04 L300	03054-646-140	SYNC LINE
CN305	CONNECTOR-WAFER;5267-07A(MOLEX)	03344-156-170	
CN305	CONNECTOR-7P ASSY;5264(5294)-07 L350	03054-655-310	
CN402	CONNECTOR-WAFER;5267-04A(MOLEX)	03344-156-140	ABL/BLK/12V LINE
CN402	CONNECTOR-4P ASSY;5264-04 L300	03054-646-140	ABL/BLK/12V LINE
CN105	CONNECTOR-WAFER;5267-03A(MOLEX)	03344-156-130	145V/85V LINE
CN105	CONNECTOR-3P ASSY;5264-03 L300	03054-645-930	145V/85V LINE
CN603	CONNECTOR-WAFER;5267-02A(MOLEX)	03344-156-120	LED LINE
LED	CONNECTOR-HEATER ASSY	03053-605-720	LED LINE

REF NO	DESCRIPTION	PART NO	REMARK
CN604	CONNECTOR-WAFER;B2P-VH(2P 3.96MM)	03344-131-010	POWER S/W LINE
CN605	SEE TABLE 1 ON THE PAGE		
POWER	CONNECTOR-PIN BASE;B3P-LV-TN JST	03344-155-930	
DY	CONNECTOR-PIN BASE;B4P-LV-TN	03344-155-940	
	GROUND-CRT ASSY;CD-1464	03054-641-410	CRT GND
	GROUND,WIRE-ASSY;MD-1260R	03054-640-040	GND LINE
DEGAUS	CONNECTOR-WAFER;B2P-LV-TN JST	03344-156-320	DEGAUSSING
CAPACITORS			
C101	C-CERAMIC,HK;CK45(T)F 50V 0.1M-Z	01417-344-104	
C103	C-CERAMIC,HK;CK45(T)F 50V 0.01M-Z	01417-344-103	
C104	C-ELECTROLYTIC;CE04W(T) 16V 10M	01608-903-110	
C105	C-ELECTROLYTIC;CE04W(T) 16V 100M	01608-903-101	
C106	C-CERAMIC,HK;CK45(T)F 50V 0.1M-Z	01417-344-104	
C107	C-CERAMIC,HK;CK45(T)F 50V 0.01M-Z	01417-344-103	
C108	C-CERAMIC,TEMP;CC45(T) SL 50V 270-J	01407-017-271	
C109	C-ELECTROLYTIC;CE04W(T) 16V 47M	01608-903-470	
C112	C-CERAMIC,HK;CK45(T)F 50V 0.1M-Z	01417-344-104	
C113	C-ELECTROLYTIC;CE04W(T) 16V 100M	01608-903-101	
C114	C-ELECTROLYTIC;CE04W(T) 16V 10M	01608-903-110	
C115	C-ELECTROLYTIC;CE04W(T) 16V 22M	01608-903-220	
C116	C-CERAMIC,HK;CK45(T)F 50V 0.1M-Z	01417-344-104	
C117	C-CERAMIC,HK;CK45(T)F 50V 0.1M-Z	01417-344-104	
C118	C-CERAMIC,HK;CK45(T)F 50V 0.1M-Z	01417-344-104	
C119	C-CERAMIC,HK;CK45(T)B 50V 270-K	01417-318-271	
C120	C-M,POLYESTER;CF922M 250V 0.22M-J	01517-383-224	
C121	C-ELECTROLYTIC;CE04W 100V 10M(105'C) RA/KM	01607-908-100	
C123	C-CERAMIC,HK;CK45(T)B 50V 270-K	01417-318-271	
C124	C-M,POLYESTER;CF922M 250V 0.22M-J	01517-383-224	
C125	C-ELECTROLYTIC;CE04W 100V 10M(105'C) RA/KM	01607-908-100	
C126	C-CERAMIC,HK;CK45(T)B 50V 270-K	01417-318-271	
C127	C-M,POLYESTER;CF922M 250V 0.22M-J	01517-383-224	
C128	C-ELECTROLYTIC;CE04W 100V 10M(105'C) RA/KM	01607-908-100	
C129	C-ELECTROLYTIC;CE04W(T) 160V 1M	01608-909-109	

REF NO	DESCRIPTION	PART NO	REMARK
C130	C-CERAMIC,HK;CK45B 500V 4700-K	01416-468-472	
C140	C-CERAMIC,TEMP;CC45(T) SL 50V 270-J	01407-017-271	
C141	C-CERAMIC,HK;CK45(T)F 50V 0.1M-Z	01417-344-104	
C145	C-ELECTROLYTIC;CE04W(T) 35V 4.7UF(4x7)	01608-905-472	
C146	C-CERAMIC,HK;CK45(T)F 50V 0.1M-Z	01417-344-104	
C147	C-CERAMIC,HK;CK45B 500V 4700-K	01416-468-472	
C148	C-CERAMIC,HK;CK45B 1KV 0.01M-K	01419-901-100	
C301	C-POLYESTER;CQ921M(T) 100V 1200PF-J	01504-723-122	
C302	C-POLYESTER;CQ921M(T) 100V 0.1M-J	01505-723-104	
C303	C-POLYPROPYLENE;CQ922M 100V 6800-J	01502-323-682	
C304	C-POLYESTER;CQ921M(T) 100V 0.022-J	01505-723-223	
C305	C-ELECTROLYTIC;CE04W 100V 0.68M-M	01609-403-050	
C307	C-ELECTROLYTIC;CE04W 25V 1000M	01609-401-720	
C309	C-TAN,SOLID;CS35V 0.68UF-K	01628-375-684	
C312	C-ELECTROLYTIC;CE04W 35V 100M	01609-402-100	
C313	C-ELECTROLYTIC;CE04W(T) 25V 100M	01608-904-101	
C315	C-ELECTROLYTIC;CE04W(T) 35V 22M(105°C) RA	01607-905-220	
C316	C-POLYESTER;CQ921M(T) 100V 0.1M-J	01505-723-104	
C321	C-CERAMIC,HK;CK45(T)B 500V 560-K	01417-468-561	
C322	C-CERAMIC,HK;CK45(T)B 500V 100-K	01417-468-101	
C326	C-POLYESTER;CQ921M(T) 100V 0.047-J	01505-723-473	
C329	C-CERAMIC,HK;CK45(T)B 50V 1000-K	01417-318-102	
C332	C-CERAMIC,HK;CK45(T)B 50V 1000-K	01417-318-102	
C401	C-CERAMIC,TEMP;CC45(T) SL 50V 100-J	01407-017-101	
C402	C-POLYPROPYLENE;CQ922M 100V 2200PF-J	01502-512-222	
C403	C-CERAMIC,TEMP;CC45(T) SL 50V 270-J	01407-017-271	
C404	C-POLYESTER;CQ921M(T) 100V 0.0068-J	01505-723-682	
C405	C-ELECTROLYTIC;CE04W(T) 50V 1M	01608-906-109	
C406	C-POLYESTER;CQ921M(T) 100V 0.01-J	01505-723-103	
C407	C-ELECTROLYTIC;CE04W(T) 50V 1M	01608-906-109	
C408	C-POLYESTER;100V 682K(TDX)	01505-524-682	
C409	SEE TABLE 1 ON THE PAGE		
C410	C-ELECTROLYTIC;CE04W(T) 16V 47M	01608-903-470	

REF NO	DESCRIPTION	PART NO	REMARK
C411	C-CERAMIC,HK;CK45(T)B 50V 1000-K	01417-318-102	
C412	C-CERAMIC,HK;CK45(T)B 500V 560-K	01417-468-561	
C413	C-CERAMIC,HK;CK45B 500V 0.01M-K	01419-106-250	
C414	C-M,POLYPROPYLENE;CF922M 1.6KV 0.0068UF-J	01518-373-682	
C416	C-POLYPROPYLENE;CQ922M 400V 0.018UF-J	01502-543-183	
C417	C-CERAMIC,HK;CK45B 2KV 1000-K	01416-768-102	
C418	C-M,POLYPROPYLENE;CF922M 200V 0.39UF-K	01518-334-394	
C419	C-M,POLYPROPYLENE;CF922M 200V 0.68UF-K	01518-334-684	
C420	C-M,POLYPROPYLENE;CF922M 200V 0.39UF-K	01518-334-394	
C422	C-ELECTROLYTIC;CE04W 100V 22M	01603-908-220	
C423	C-ELECTROLYTIC;CE04W 100V 22M	01603-908-220	
C424	C-POLYPROPYLENE;CQ922M 200V 0.022M-K	01502-534-223	
C425	C-ELECTROLYTIC;CE04W 200V 47M	01603-915-470	
C426	C-CERAMIC,HK;CK45(T)B 500V 100-K	01417-468-101	
C430	C-ELECTROLYTIC;CE04W(T) 10V 47M	01608-902-470	
C435	C-POLYESTER;CQ921M(T) 100V 0.1-J	01505-723-104	
C437	C-POLYESTER;CQ921M(T) 100V 0.0022-J	01505-723-222	
C438	C-ELECTROLYTIC;CE04W 16V 220M	01609-401-482	
C600	SEE TABLE 1 ON THE PAGE		
C601 !	C-CERAMIC,AC;CK45B 250V 2200-M	01461-136-806	
C602 !	C-CERAMIC,AC;CK45B 250V 2200-M	01461-136-806	
C603 !	C-M,POLYESTER;CQS922M 250V 0.22M-M(U/C)	01566-513-224	
C604 !	C-M,POLYESTER;CQS922M 250V 0.22M-M(U/C)	01566-513-224	
C605 !	C-CERAMIC,AC;CK45B 250V 2200-M	01461-136-806	
C606 !	C-CERAMIC,AC;CK45B 250V 2200-M	01461-136-806	
C607	C-CERAMIC,AC;CKS45B 250V 2200P-Z	01461-169-806	
C608	C-CERAMIC,AC;CKS45B 250V 2200P-Z	01461-169-806	
C609	C-CERAMIC,AC;CKS45B 250V 2200P-Z	01461-169-806	
C610	SEE TABLE 1 ON THE PAGE		
C613	C-CERAMIC,TEMP;CC45 DY5T 1KV 4700-M	01409-902-010	
C614	C-CERAMIC,HK;CK45B 1KV 0.01M-K	01419-901-100	
C615	C-ELECTROLYTIC;CD04W(T) 50V 10M	01608-906-100	

REF NO	DESCRIPTION	PART NO	REMARK
C616	C-CERAMIC,HK;CK45B 1KV 680	01419-901-360	
C617	C-POLYESTER;CQ921M(T) 100V 0.022-J	01505-723-223	
C618	C-ELECTROLYTIC;CE04W 100V 47M	01609-403-090	
C619	C-CERAMIC,HK;CK45B 1KV 470	01419-901-090	
C620	C-ELECTROLYTIC;CE04W 160V 220M	01603-909-221	
C623	C-ELECTROLYTIC;CE04W 35V 2200U	01603-905-222	
C625	C-CERAMIC,HK;CK45B 1KV 470	01419-901-090	
C626	C-ELECTROLYTIC;CE04W 16V 1000M	01609-401-510	
C629	C-ELECTROLYTIC,VENT;CE04W 25V 470M(13x20)	01603-904-471	
C631	C-CERAMIC,HK;CK45B 1KV 470	01419-901-090	
C632	C-ELECTROLYTIC;CE04W 100V 220M	01609-403-120	
C634	C-CERAMIC,HK;CK45B 1KV 470	01419-901-090	
C635	C-ELECTROLYTIC;CE04W 100V 220M	01609-403-120	
C637	C-CERAMIC,HK;DE7150F 472M VA-1-KC	01416-649-472	
C638	C-CERAMIC,HK;DE7150F 472M VA-1-KC	01416-649-472	
C639	C-ELECTROLYTIC;CE04W 35V 470M	01603-905-471	

TABLE1. PART COMPARISON LIST FOR AC POWER INPUT

PARTS&LOCATION		AC POWER INPUT			
		120V		220V/240V	
LOC. NO	DESCRIPTION	CODE NO.	SPECIFICATION	CODE NO.	SPECIFICATION
R600	R-CEMENT,WIRE	01039-627-339	RP 7P 3.3-P	01039-627-689	RW 7P 6.8-J
T601	TRANSE-SMPS	02879-004-710	110V 60Hz(CEA4551)	02879-004-810	220V 50Hz(CEA4551)
C610	C-ELECTROLYTIC	01603-910-331	CE04W 16V 220M	01603-912-470	CE04W 400V 220M
L601	COIL-LINE,FILTER	02449-622-010	HL38	02429-639-010	15MH
L602	COIL-LINE,FILTER	02449-622-010	HL38	02429-639-010	15MH
F601	FUSE	04709-088-060	250V 3A 51S	04709-084-970	50T 250V 3.15A 20MM
PR601	POSISTOR	2189-605-040	PTH451C06BG080N140	02199-003-120	PTH451C02BG200N270
IC601	IC	02119-601-540	STR53041	02119-601-660	STR54041
C600	C-CERAMIC,HK	01416-768-472	CK45B 2KV 4700-K	-	-

TABLE2. CRT LIST FOR MODEL NO.

MODEL NO.	CODE NO.	SPECIFICATION	REMARK
CEA4551	02019-234-310	3709B22(ST)-TC09	0.31NG
CEA4552	02019-237-510	37GGA44X-TC01	0.39G
CEA4553	02019-237-610	37SGA44X-TC01	0.39NG
CEA4554	02019-237-810	37GGA54X-TC10	0.41G
CEA4555	02019-237-710	37SGA54X-TC08	0.41NG

TABLE3. AC POWER CORD LIST FOR NATIONALITY

LOC.NO	CODE NO.	DESCRIPTION	SPECIFICATION	NATIONALITY OR MODEL NO.
	03051-801-010	POWER-CORD,AC ASSY	LP31 L1700	(120V VERSION)
	03051-801-310	POWER-CORD,AC ASSY	LP34 CEA4551F	EUROPIAN TYPE
	03052-800-810	POWER-CORD,AC ASSY	BASEC CEA4551U	ONLY FOR U.K.
	03052-800-710	POWER-CORD,AC ASSY	LP23 CEA4551AU	AUSTRALIAN TYPE

SCHEMATIC DIAGRAM AND WAVE FORM(120V/220V/240V VERSION)

SCHEMATIC DIAGRAM

MODEL NO: CEA455*

CHASSIS NO: T.W.Q.

WARNING :

BEFORE SERVICING CHASSIS, READ "X-RAY RADIATION PRECAUTION", "SAFETY PRECAUTION", "PRODUCTION SAFETY NOTICE".

CAUTION :

1. THE SHADED AREAS AND * MARKS IN THE SCHEMATIC DIAGRAM AND THE PART-LIST DESIGNATE COMPONENTS WHICH HAVE SPECIAL CHARACTERISTICS IMPORTANT FOR SAFETY AND SHOULD BE REPLACED ONLY WITH TYPES IDENTICAL TO THOSE IN THE ORIGINAL CIRCUIT OR SPECIFIED IN THE PART-LIST. BEFORE REPLACING ANY OF THESE COMPONENTS, READ CAREFULLY THE "PRODUCT SAFETY NOTICE".

2. DURING A NUMEROUS MEASUREMENT OF THIS RECEIVER MATTERS THAT DEMAND SPECIAL ATTENTION IS FOLLOWING:

1) DO NOT USE YOUR INSTRUMENT BETWEEN PRIMARY GROUND (SYMBOL ↓) AND SECONDARY CIRCUIT.

2) DO NOT USE YOUR INSTRUMENT BETWEEN SECONDARY GROUND (SYMBOL ↓) AND PRIMARY CIRCUIT.

3. THE SHADED AREAS IS A PRIMARY SECTION (HOT PART)

WARNING :

"THIS EQUIPMENT CONTAINS SAFETY CRITICAL COMPONENTS ALL PARTS SHOWN IN THE SHADED AREAS OF THE SCHEMATIC ARE SAFETY REPLACEMENT SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURERS RECOMMENDED PARTS LIST FOR EXACT REPLACEMENTS."

AVERTISSEMENT :

"CE RECEPTEUR EST EQUIPE DE COMPOSANTS CRITIQUES"

POUR LA SECURITE TOUTES LES PIECES INDIQUEES DANS LES ZONES OMBREES DU SCHEMA SONT CRITIQUE POUR LA SECURITE POUR MAINTENIR LE DEGRE DE SECURITE DE L'APPAREIL NE REMPLACER LE FABRICANT DONT LE FONCTIONNEMENT EST CRITIQUE QUE PAR DES PIECES RECOMMANDEES PAR LE FABRICANT CONSULTER LA NOMENCLATURE DES PIECES POUR TROUVER LES PIECES DE RECHANGE EXACTES.

NOTES :

1. RESISTANCE IS SHOWN IN K=1,000 M=1,000,000.

RATED POWER OF RESISTOR NOT NOTED IN SCHEMATIC DIAGRAM IS 1/4W

2. CAPACITANCE IS SHOWN "UF" AND NOT NOTED CAPACITANCES IS SHOWN "UF". 1UF=1,000,000UF.

RATED VOLTAGE OF CAPACITOR NOT NOTED IN SCHEMATIC DIAGRAM IS 50V.

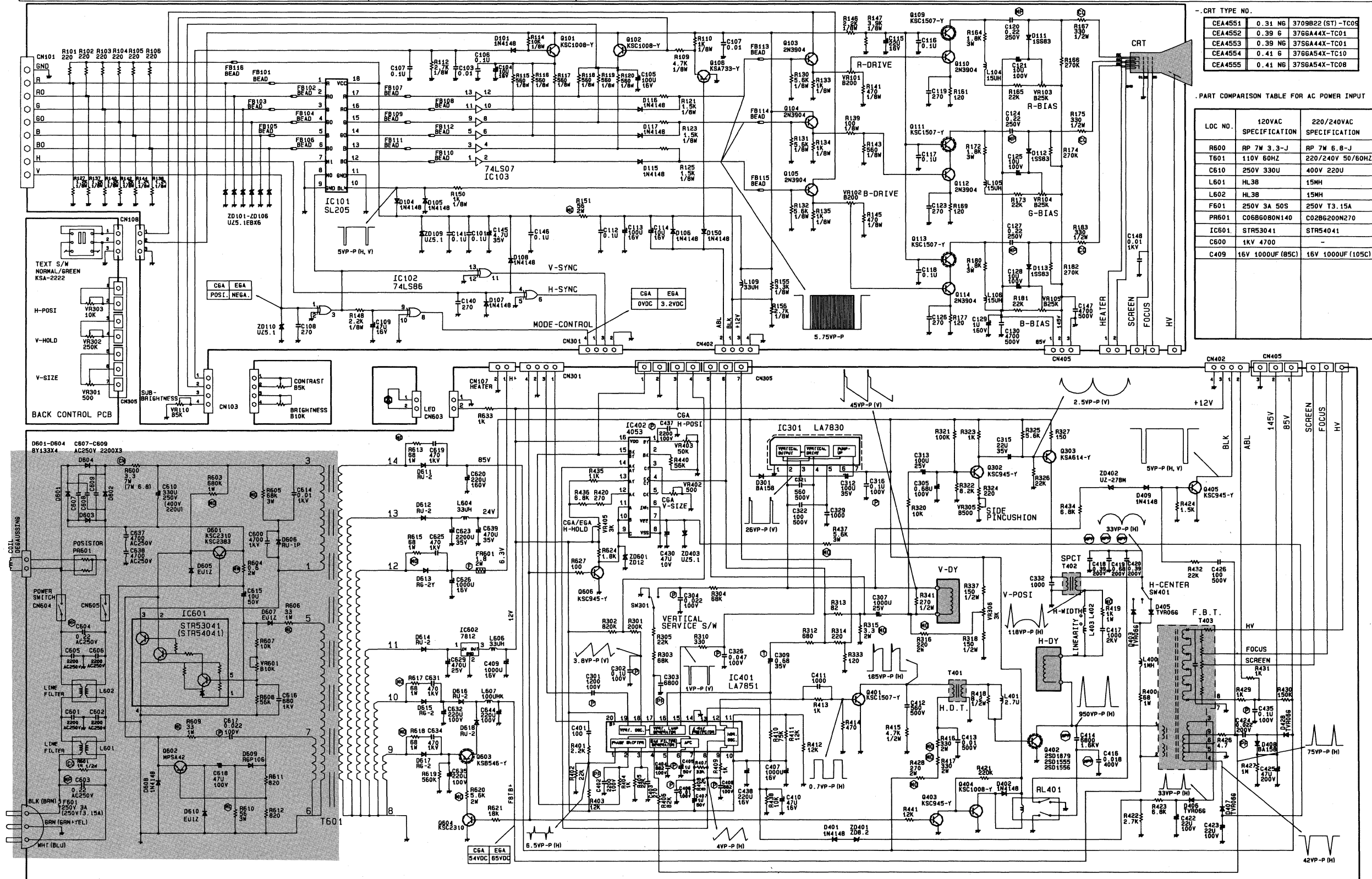
3. ABBREVIATION AND SYMBOL

M: R-METAL OXIDE
F: R-FUSIBLE
CO: R-COMPOSITION
CM: R-CEMENT WIRE
WM: R-WIRE WOUND
*: COLD GROUND

P: C-POLYESTER
PP: C-POLYPROPYLENE
MP: C-METAL POLYESTER
MPP: C-METAL POLYPROPYLENE
T: C-TANTALUM
*: HOT GROUND

4. THE SECONDARY VOLTAGE IS READ WITH VTVM FROM INDICATED POINT TO COLD GROUND (↓). THE PRIMARY VOLTAGE IS READ WITH VTVM FROM INDICATED POINT TO HOT GROUND (↑).

5. THIS SCHEMATIC DIAGRAM IS SUBJECT TO CHANGE WITHOUT NOTICE FOR FURTHER IMPROVEMENT.



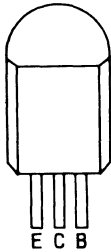
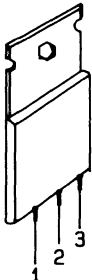
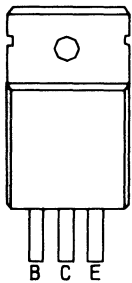
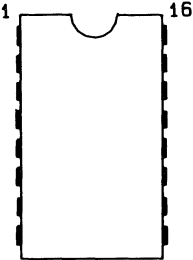
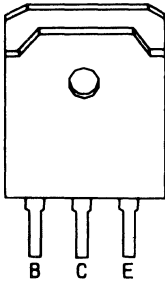
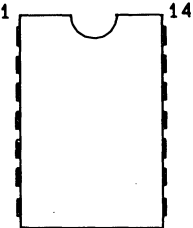
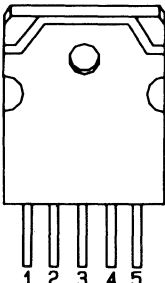
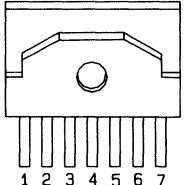

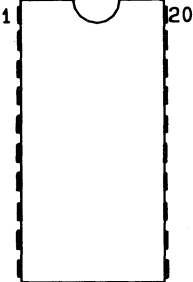
- CRT TYPE NO.

CEA4551	0.31 N6	3709B22 (ST)-TC05
CEA4552	0.39 G	3766A44X-TC01
CEA4553	0.39 N6	3766A44X-TC01
CEA4554	0.41 G	3766A54X-TC10
CEA4555	0.41 N6	3766A54X-TC08

PART COMPARISON TABLE FOR AC POWER INPUT

LOC NO.	120VAC SPECIFICATION	220/240VAC SPECIFICATION
R600	RP 7M 3.3-J	RP 7M 6.8-J
T601	110V 60HZ	220/240V 50/60HZ
C610	250V 330U	400V 220U
L601	HL38	15MH
L602	HL38	15MH
F601	250V 3A 50S	250V T3.15A
PR601	C06B6080N140	C02B6200N270
IC601	STR53041	STR54041
C600	1KV 4700	-
C409	16V 1000UF (85C)	16V 1000UF (105C)

SEMICONDUCTOR LEAD IDENTIFICATION

PARTS	DESCRIPTION	REF.NO	PARTS	DESCRIPTION	REF.NO
	KSC2310 MPSA42	Q601, Q604 Q602		MC7812C	IC602
	KSC1507 KSB546-Y KSA614-Y	Q109, Q111, Q113, Q401 Q603 Q303		MC14053B SL205	IC402 IC101
	2SD1555 2SD1879 2SD1556	Q402		SN7407 74HCTLS86N	IC103 IC102
	STR53041 STR54041	IC601		LA7830	IC301
	2N3904 KSC945 KSC1008 KSA733	Q103, Q104, Q105, Q110, Q112, Q114 Q302, Q403, Q405, Q606 Q101, Q102, Q404 Q106		LA7851	IC401

MEMO

