

CM-1380F SERIES COLOR DISPLAY SERVICE MANUAL

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SERVICE MANUAL

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* 1.SPECIFICATIONS *

APPLICATION: Typical data display device for personal computer applications.

POWER INPUT: 90 watts (Nominal), AC rated voltage refer to R/C label. A six feet 3-wire grounded line cord is furnished.

VIDEO SIGNALS: 16 color: Red, green, blue and intensity video signals.
64 color: R,G,B, and r,g,b, (intensity) video signals.
All are positive TTL.

SYNC. SIGNALS: Horizontal: 15.75 KHz + 300 Hz (mode 1) or 21.853 KHz + 300 Hz (mode 2) positive TTL, auto-switching by TTL.
Vertical: 47-63 Hz positive TTL at mode 1.
47-63 Hz negative TTL at mode 2.

SIGNAL CONNECTOR: 9-Pin D-shell connector.

DISPLAY TUBE: 13" 90° 575R, 29.1 ϕ neck 0.31mm dot pitch. dot in-line, dark tint non-glare. Type No.: M34JDU30X66

DISPLY AREA: Width: 250mm Height: 170mm

DISPLAY COLOR: Mode 1: 16 colors. Mode 2: 64 colors.

DISPLAY CHARACTER: 2000 characters (80CH. X25 Row on 8x8 dot matrix at mode 1.) (80CH. X25 Row on 8x14 dot matrix at mode 2.)

DISPLAY TIME: Horizontal: mode 1: 44.5 us mode 2: 39.37 us
Vertical: mode 2: 12.58 ms mode 2: 16.01 ms

RETRACE TIME: Horizontal: mode 1: 6.0 us mode 2: 6.0 us
Vertical: mode 1: 1.2 ms mode 2: 0.6 ms

RESOLUTION: Horizontal: 640 dots
Vertical: mode 1: 200 scan lines (non-interlaced)
400 scan lines (interlaced)
mode 2: 350 scan lines (non-interlaced)
700 scan lines (interlaced)

MISCONVERGENCE: 0.5mm Max. within data area.

USER CONTROLS: Power on-off, brightness, contrast, vertical size 1, vertical size 2, set-green/amber switch, horizontal center 1, horizontal center 2.

SERVICE CONTROLS: H-Hold 1, H-Hold 2, H-Width 2, H-Center, V-Center, V-Hold, Focus, Screen, E-W Pincusion, High-Voltage, R-Drive, r-Drive, G-Drive, g-Drive, R-BKG, G-BKG, B 12.75V.

ENVIRONMENTAL:

Operation: 10°C to 35°C ambient
Storage: -40 °C to 50°C
Humidity: 50% to 80% (non-condensing)
Altitude: to 7000 feet above sea level.

DIMENSIONS:

395 (W) X 297 (H) X 400 (D) mm

WEIGHT:

12KG (net)

* 2.PRECAUTIONS AND NOTICES *

2-1 SAFETY PRECAUTIONS

1. Observe all cautions and safety related notes located inside the display cabinet and on the display chassis.
2. Operation of these displays outside the cabinet or with the cover removed, involves a shock hazard from the display power supplies. Work on the display should not be attempted by anyone who is not thoroughly familiar with precautions necessary when working on high voltage equipment.
3. Do not install, remove or handle the picture tube in any manner unless shatter-proof goggles are worn. People not so equipped should be kept away while handling picture tube. Keep picture tube away from the body while handling.
4. The picture tube is constructed to limit X-RADIATION to 0.5 mR/HR at 300 microamperes anode current. For continued protection, use the recommended replacement tube only, and adjust the voltages so that the designated maximum rating at the anode will not be exceeded.
5. Before returning a serviced display to the customer. A thorough safety test must be performed to verify that the display is safe to operate without danger or shock. Always perform an AC leakage current check on the exposed metallic parts of the cabinet, such as screwheads. Test method for current leakage described as follow. (See Fig 2-1).
 - (a) Plug the AC line cord directly into rated AC outlet (do not use a line isolation transformer during this check).
 - (b) Use an AC voltmeter having 5000 ohms per volt or more sensitivity in the following manner. Connect a 1500 ohms 10 watt resistor, paralleled by a 0.15mfd, AC type capacitor between a known good earth ground (water pipe, conduit, etc.) and the exposed metallic parts simultaneously. Measure the AC voltage across the combination of 1500 ohms resistor and 0.15mfd capacitor.
 - (c) Reverse the AC plug at the AC outlet and repeat AC voltage measurements for each exposed metallic part.
 - (d) Voltage measured must not exceed 0.3 volts RMS. This corresponds to 0.2 milliamp AC. Any value exceeding this limit constitutes a potential shock hazard and must be corrected immediately.

2-2 PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety visual inspection and the protection afforded by them cannot necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Before replacing any of these components, read the parts list in this manual carefully. The use of substitute replacement parts which do not have the same safety characteristics as specified in the parts list may create shock, fire, X-RAY radiation or other hazards.

2-3 SERVICE NOTES

1. When replacing parts or circuit boards, clamp the lead wires around

terminals before soldering.

2. When replacing a high wattage resistor (more than 1/2W of metal oxide film resistor) in circuit board, keep the resistor about 10 mm(1/2 in.) away from circuit board.
3. Keep wires away from high voltage or high temperature components.
4. Keep wires in their original position so as to reduce interference.

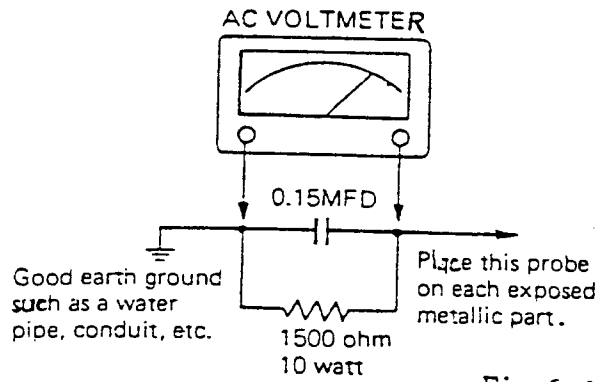
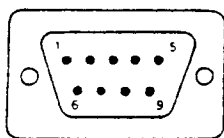


Fig 2-1

* 3. OPERATING INSTRUCTIONS *

This procedure give you instructions for installing and using the CM-1380F color display.

1. Position the display on the desired operating location and connect the three wire grounded plug to a convenient AC outlet. Three-wire power cord must be a shielded and is provided as a safety precaution as it connects the chassis and cabinet to the electrical conduit ground. If the AC outlet in your location do not have provision for the grounded type plug, the installer should attach the proper adapter to ensure a safe ground potential.
2. Connect the 9-pin color display shielded signal cable to your signal system device and lock both screws on the connector to ensure firm grounding. The connector informations are as follow:



9-Pin Color Display
Signal Cable

PIN NO. -----	DESCRIPTION -----	
	MODE 1 -----	MODE 2 -----
1	SHIELD GND.	GROUND
2	SIGNAL GND.	r
3	RED	R
4	GREEN	G
5	BLUE	B
6	INTENSITY	E
7	UNUSED	b
8	HORIZ. SYNC.	HORIZ. SYNC.
9	VERT. SYNC.	VERT. SYNC.

3. Apply power to the display by turning the power switch to the "ON" position and allow about thirty seconds for display tube warmup. The power-ON indicator lights when the display is on.
4. With proper signals fed to the display, a pattern or data should appear on the screen, adjust the brightness and contrast the most pleasing display.
5. Adjust the vertical size 1 control as necessary for proper display height for mode 1.
6. Adjust the vertical size 2 control as necessary for proper display height for mode 2.

7. Adjust the horizontal center 1 (HP 1) as necessary for proper horizontal display for mode 1.
8. Adjust the horizontal center 2 (HP 2) as necessary for proper horizontal display for mode 2.
9. Slide the Set-Green/Amber switch on the rear to appropriate position for desired display.

If your CM-1380F color display requires service, refer to the controls and adjustments informations of this publication and verify that all controls and adjustments on the display are properly set. If your display does require service, it must be returned with the power cord.

 * 4.ADJUSTMENT *

4-1 ADJUSTMENT CONDITIONS AND PRECAUTIONS

1. Approximately 30 minutes should be allowed for warm up before proceeding.
2. Adjustments should be undertaken only on those necessary elements since most of them have been carefully preset at the factory.

4-2 MAINTENANCE ADJUSTMENTS

NO	FUNCATION	LOCATION	DESIGNATION
---	-----	-----	-----
1	+12.75V (B+ adj) DC	PCB-POWER	VR1
2	Vert. Hold	PCB-MAIN	R309
3	Vert. size for mode 1	PCB-MAIN	R306
4	Vert. size for mode 2	PCB-MAIN	R366
5	Vert. center	PCB-MAIN	R326
6	Hor. hold for mode 1	PCB-MAIN	R409
7	Hor. hold for mode 2	PCB-MAIN	R469
8	Hor. width for mode 1	PCB-MAIN	R433
9	Hor. width for mode 2	PCB-MAIN	R493
10	Hor. phase for mode 1	PCB-MAIN	R413
11	Hor. phase for mode 2	PCB-MAIN	R473
12	Hor. center	PCB-MAIN	R435
13	Hor. E-W picusion	PCB-MAIN	R333
14	R,r,G,g drive	PCB-MAIN	R526, R527, R566, R567
15	white balance	PCB-DRIVE	R523, R563, R593
16	brightness level adj.	HV PACK	SCREEN
17	focus adj.	HV PACK	FOCUS
18	sub-brightness	PCB-MAIN	R907
19	brightness	PCB-MAIN	R208
20	contrast	PCB-MAIN	R209
21	convergence adj.	CRT-ASSY	MAGNET

4-3 ADJUSTMENT METHOD

1. +B ADJ VR 1 (+12.75V DC)
 - (1) Connect a DC voltage meter between +12V and ground, then adjust +12.75V with VR1 on the S.M.P.S unit.
 - (2) Set value : +(12.75V + 0.05V) DC.
2. VERT. HOLD: VR R309
 - (1) When a display quivers upward or downwards, turn VR R309 ON the main PCB to stabilize it.
 - (2) VR R309 setting: Turn VR R309 fully clockwise, turn it gradually counter clockwise and determine the position (A) at which the display is stabilized, after this turn VR R309 fully counterclockwise, turn it gradually clockwise, and determine the position (B) at which the display is stabilillized set VR R309 at the point between (A) and (B).
3. VERT. SIZE: VR R306, VR366
 - (1) When the vertical deflection is too large or small (mode 1 or mode 2), turn on VR306 (for mode 1) or VR366 (for mode 2) on the main PCB to adjust it.
 - (2) VR R306, VR R366 setting; Set VR R306 (for mode 1) or VR R366 (for mode 2) so as to make the display height to be 170 + 2 mm

(mode 1 and mode 2).

4. VERT. CENTER: VR R326
When a display deviates to the top or bottom, turn VR R326 on the main PCB to adjust it.
5. HOR. HOLD: VR R409, VR R469.
 - (1) When horizontal stripes are displayed (mode 1 or mode 2) turn VR R409 (for mode 1) or VR R469 (for mode 2) on the main PCB to erase them.
 - (2) VR R409 (for mode 1) or VR R469 (for mode 2) setting: Set VR R409 (for mode 1) or VR R469 (for mode 2) at the position to minimize horizontal stripes when TP22 connect to ground.
6. HOR. WIDTH; VR R433, VR R493
 - (1) Adjust VR R433 (for mode 1) or VR R493 (for mode 2) on the main PCB when the horizontal deflection is too large or small.
 - (2) VR R433 (for mode 1) or VR R493 (for mode 2) setting: Set VR R433 (for mode 1) or VR R493 (for mode 2) so as to make the display width to be $250 + 2$ mm. (mode 1 and mode 2)
7. HOR. PHASE: VR R413, VR R473
When a display deviates to the left or right, turn VR R413 (for mode 1) or VR R473 (for mode 2) on the main PCB to center it.
8. HOR. CENTER: VR R435
When a raster deviates to the left or right for mode 2, turn VR R435 on the main PCB to center it.
9. R,r,G,g DRIVE: VR R526, VR R527, VR R566, VR R567
 - (1) Turn the contrast and brightness controls to maximum.
 - (2) Connect the test probe of the scope to TP-52 B on the CRT drive board, check the amplitude of B drive voltage to be A Vp-p and record it.
 - (3) Move the test probe of the scope to TP-52R then adjust R,r drive VR R526, VR R527 (on the main PCB unit) till the amplitude of R drive voltage equal to A Vp-p.
 - (4) Move the test probe of the scope to TP-52G then adjust G,g drive VR R566, VR R567 (on the main PCB unit), till amplitude of G drive voltage equal to A Vp-p.
(In other words, R,G,B output voltage are all the same amplitude.)
 - (6) Reference values of A Vp-p is 60 Vp-p.
10. WHITE BALANCE ADJUSTMENT: VR R523, VR R563, VR R593
 - (1) No signal input, Raster display only
 - (2) Set R,G,B bias control (VR R523,R563,R593) to the mid-position.
 - (3) Set contrast VR R209 to max. position.
 - (4) Set brightness VR R208 to Min position.
 - (5) Set sub-brightness VR R907 to Mid-position.
 - (6) Adjust screen VR (G2) to the DC = 500V.
 - (7) Short "M" and "N" on mainboard by a jumpwire.
 - (8) Rotate the R-bias R523 control on the CRT board gradually counterclockwise until the red line appear sightly on the screen. Then turn the G-bias R563 control and B-bias R593 control gradually counterclockwise, so as to get a white horizontal line.
 - (9) Remove jump wire that connect to M and N on Main board.
11. BRIGHTNESS LEVEL ADJUSTMENT: VR R907

- (1) Connect signal cable to P.C.
- (2) Select a white-field pattern for mode 2
- (3) Set brightness VR R208 to minimum.
- (4) Adjust sub-bright VR R907 on Main PCB, so that brightness of raster is just zero.

12. HOR. E-W PIN-CUSION ADJUSTMENT

- (1) Select a crass-hatch pattern for mode 2.
- (2) Adjust VR R333 on Main-PCB, until the Hor. pin-distortion to minimum.

13. FOCUS ADJUSTMENT

- (1) Select a dot test pattern.
- (2) Adjust the contrast control (R209) and brightness control (R208) for normal display.
- (3) Adjust the focus control located at high voltage resistor block for best overall focus. (See Fig 4-1)

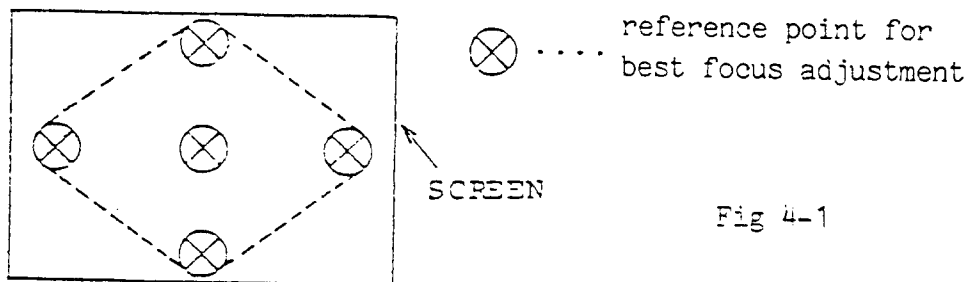


Fig 4-1

14. STATIC CONVERGENCE ADJUSTMENT

NOTE: Before attempting any convergence adjustments, the display should be operate for at least thirty minutes.

- (1) Apply the crosshatch pattern to the display.
- (2) Adjust the BRIGHTNESS and CONTRAST controls for will defined pattern.
- (3) Refer to the structure of picture tube (See Fig 4-2) to make sure the relative position of the convergence magnet.

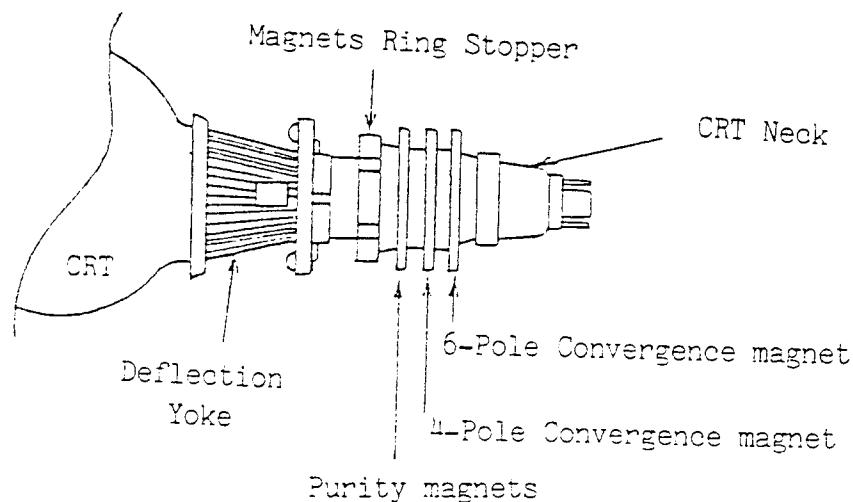


Fig 4-2

- (4) Adjust two tabs of the 4-Pole Magnets to change the angle them and superimpose red and blue vertical lines in the center area of the picture screen. (See Fig 4-3)
- (5) Turn both tabs at the same time keeping their angles constant to superimpose red and blue horizontal lines at the center of the screen. (See Fig 4-3)
- (6) Adjust two tabs of 6-Pole Magnets to superimpose red/blue line with green one Adjusting the angle affects the vertical lines and rotating both magnets affects the horizontal lines. (See Fig 4-4)
- (7) Repeat adjustments (4).(5).(6) until best convergence is obtained, since 4-Pole Magnets and 6-Pole Magnets interact each other, it makes dots movement complex.

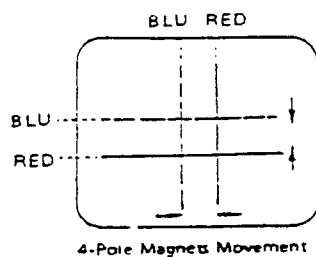


Fig 4-3

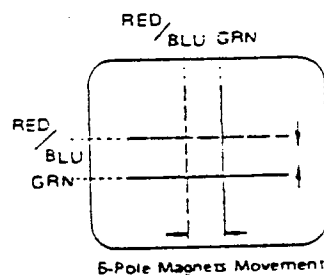


Fig 4-4

4-4 ADJUSTMENT AND TEST LOCATION

1. PCB-MAIN adjustment and test location. (See Fig 4-5)
2. PCB-DRIVE adjustment and test location. (See Fig 4-6)
3. PCB-POWER adjustment and test location. (See Fig 4-7)

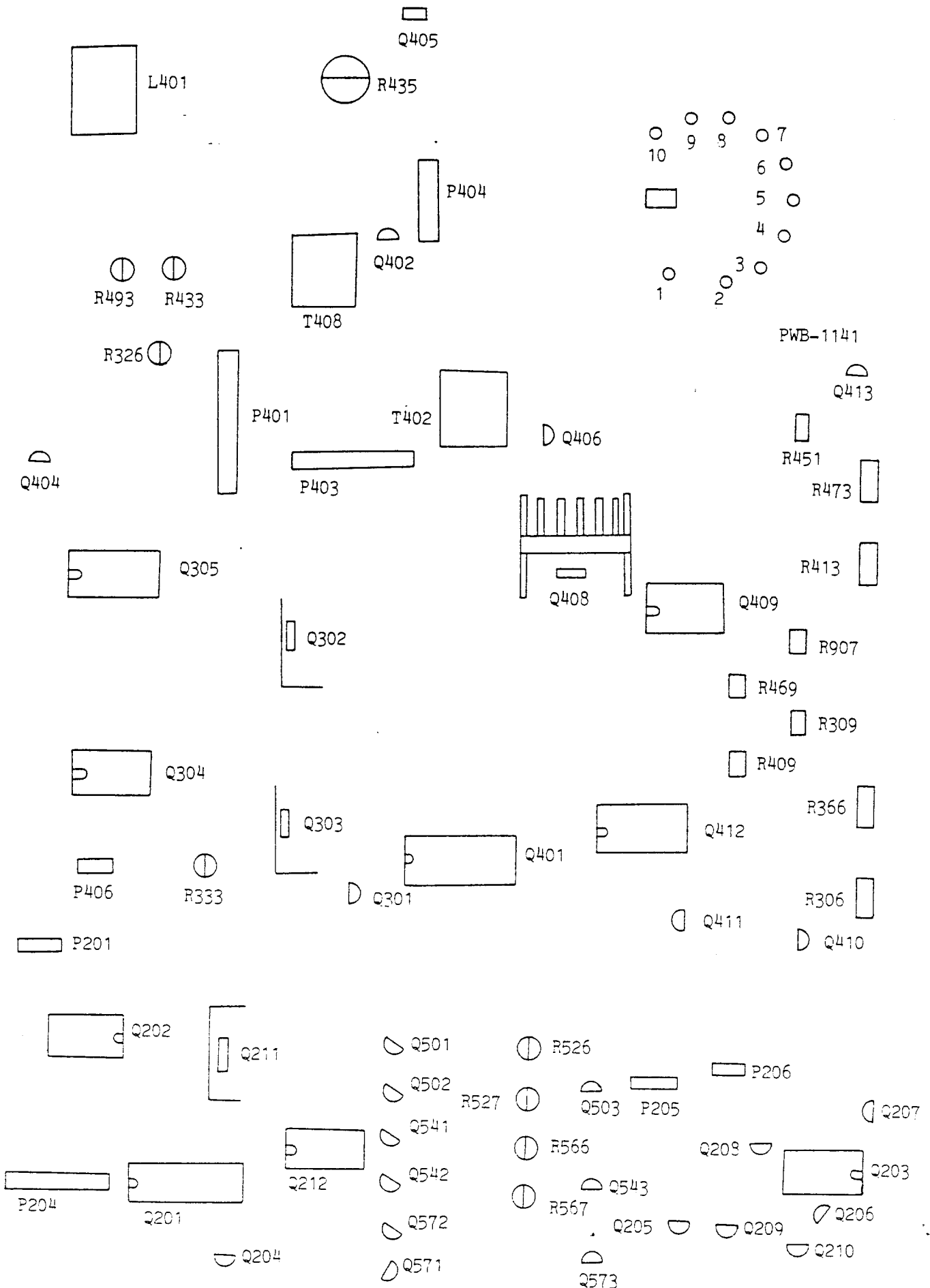


Fig 4-5

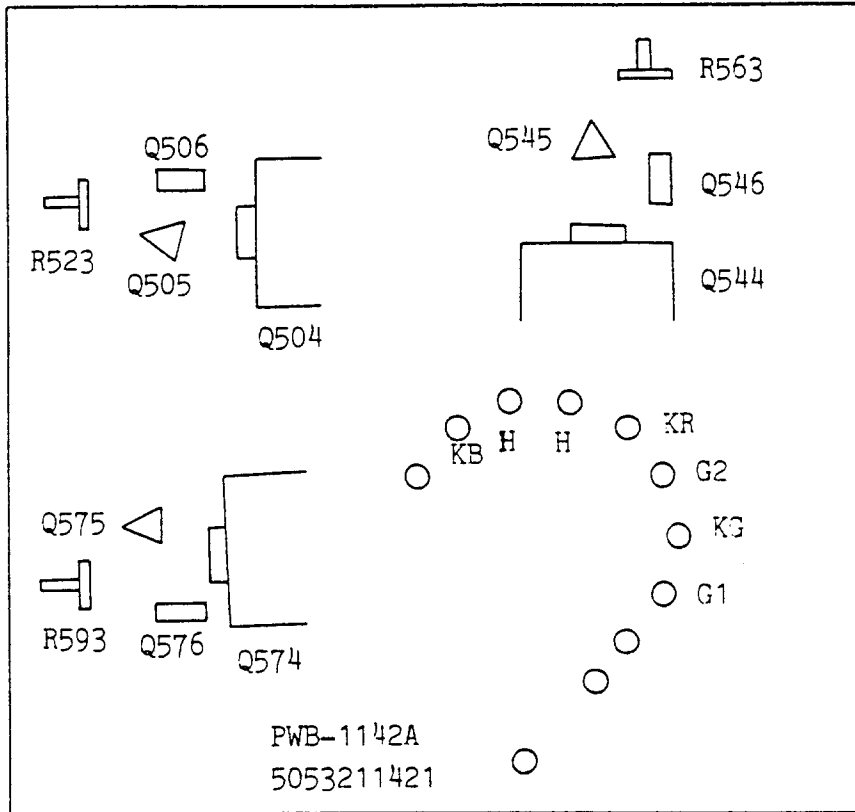


Fig 4-6

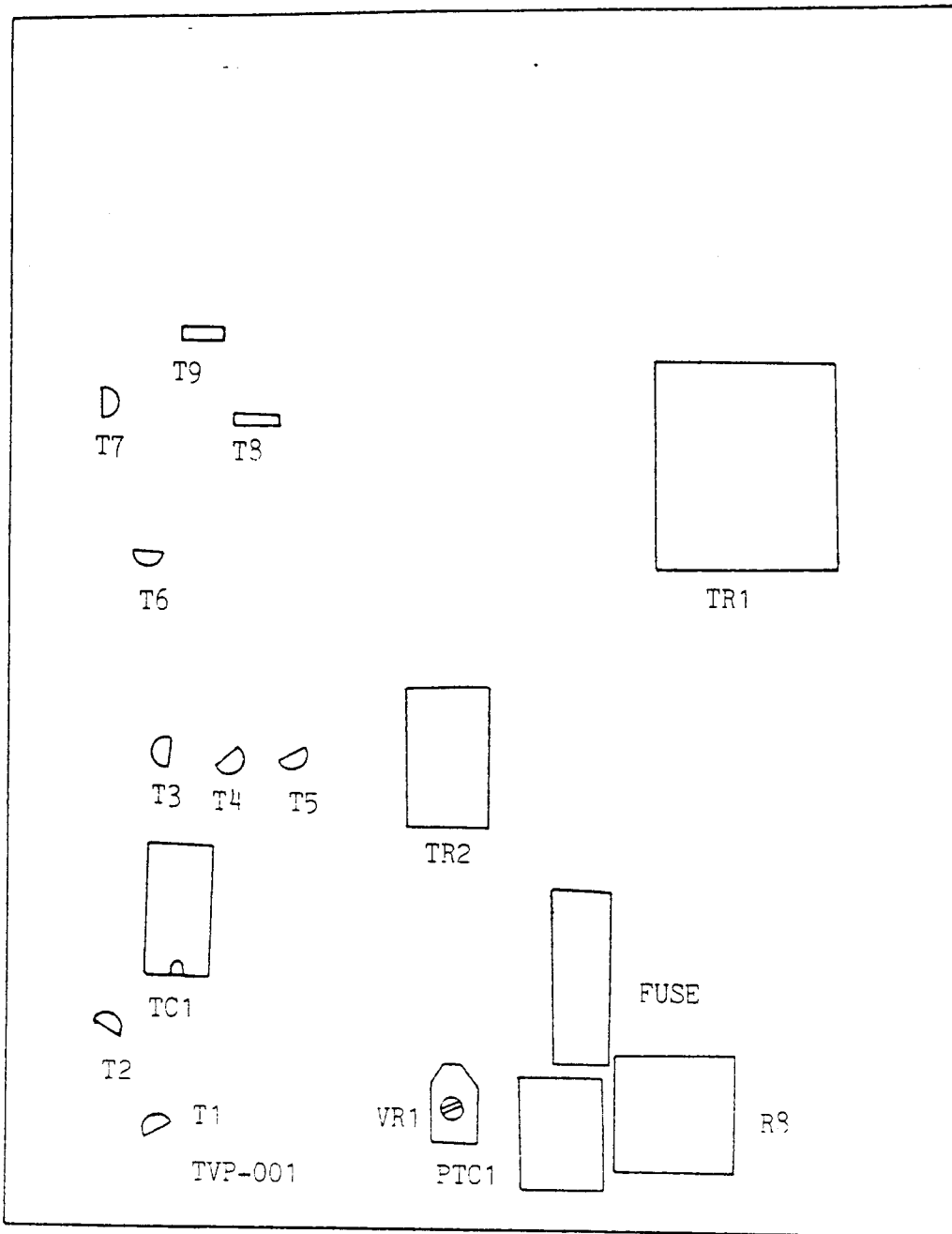


Fig 4-7

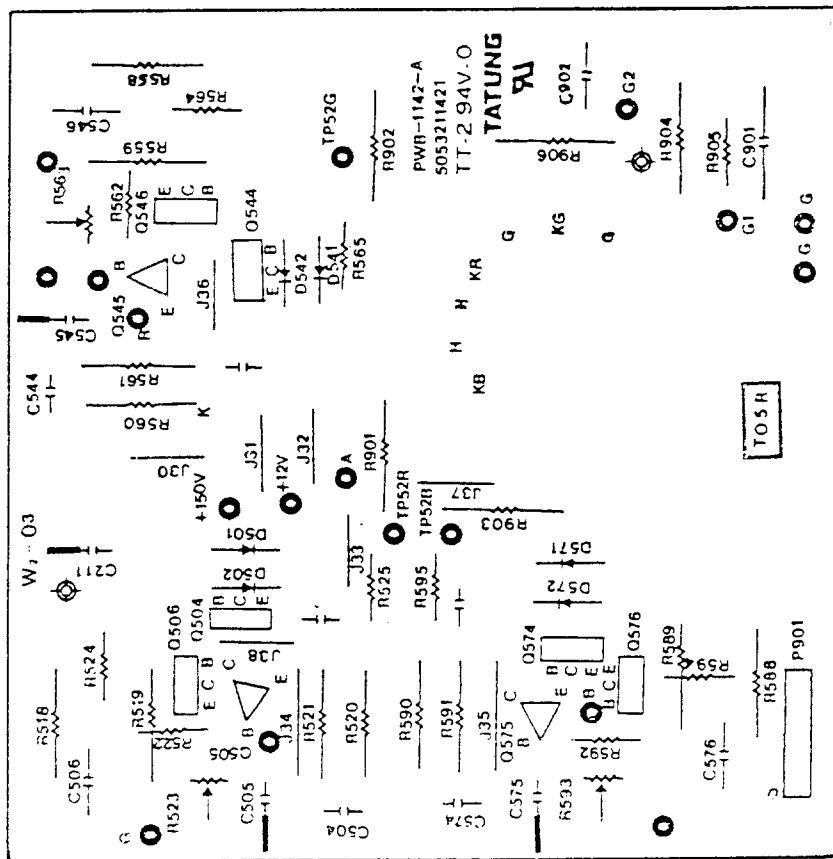
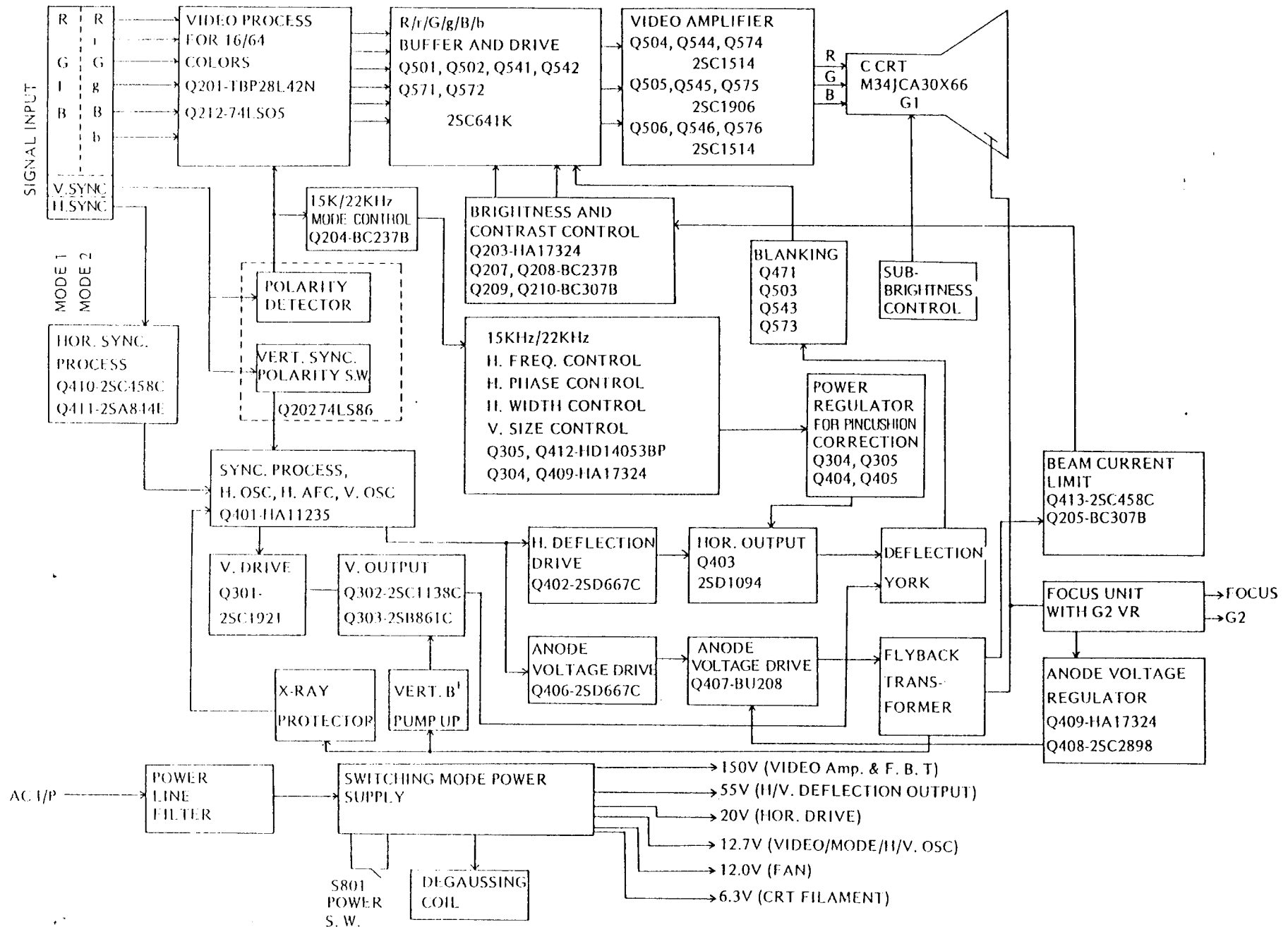


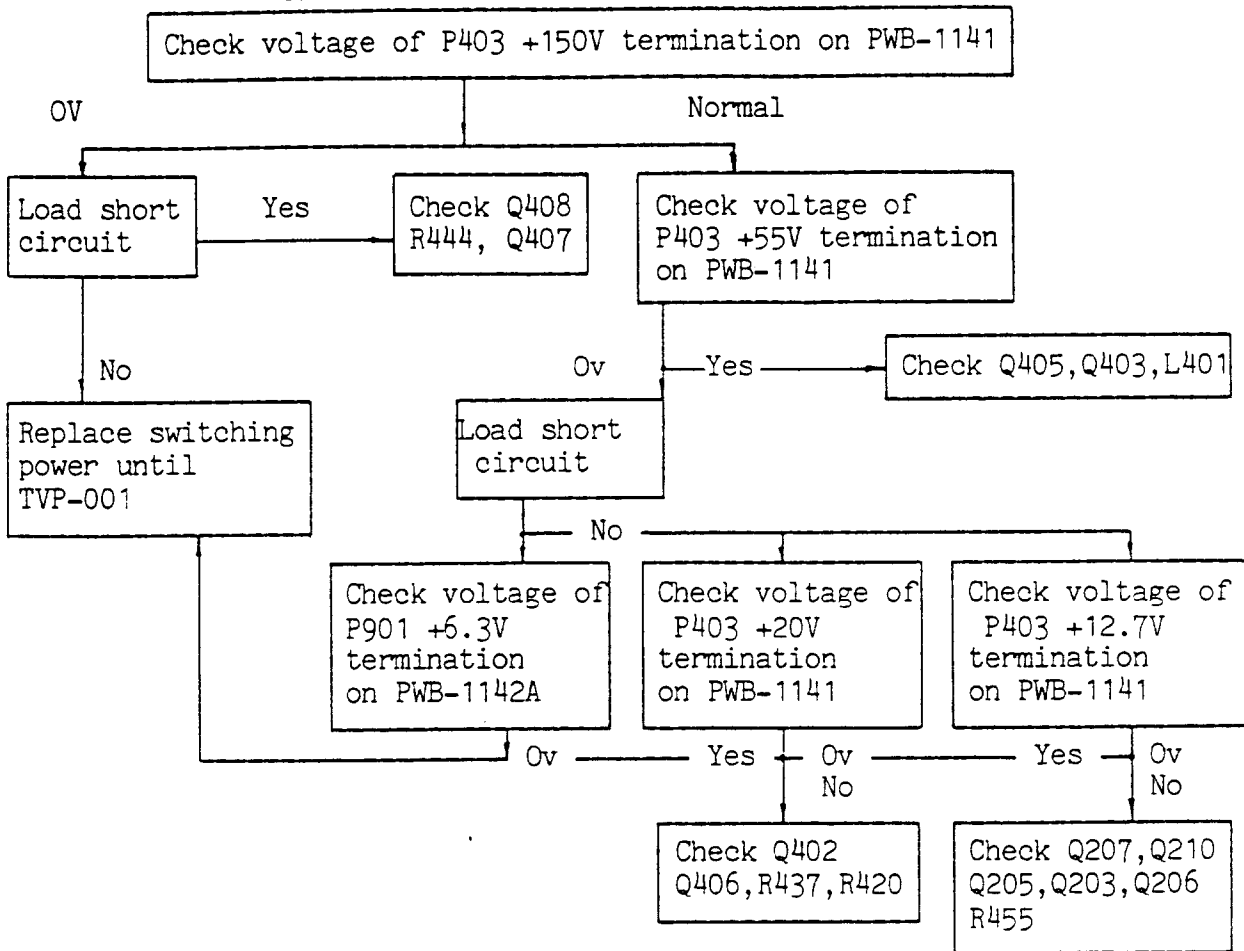
Fig 5-2 PCB-CRT COMPONENTS LAYOUT

6. CM-1380F BLOCK DIAGRAM

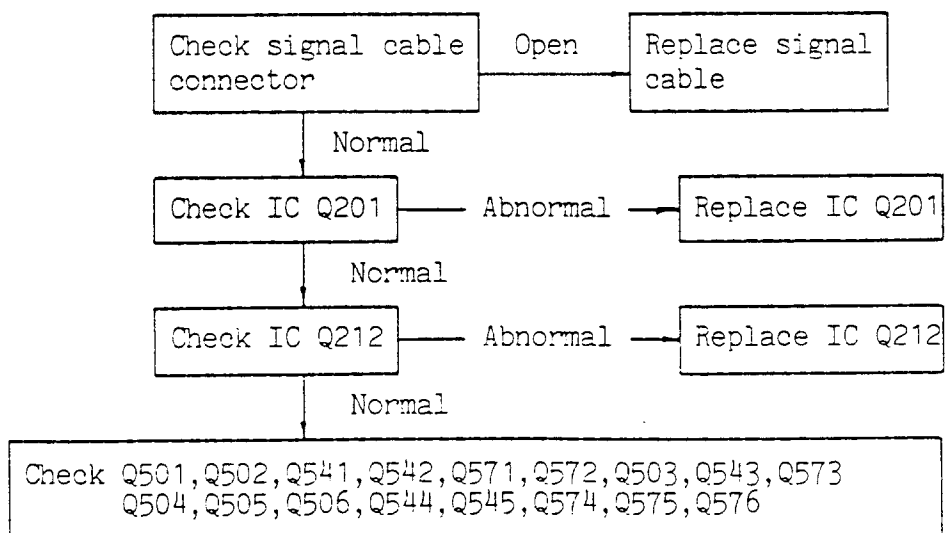


 * 7.TROUBLE-SHOOTING CHART *

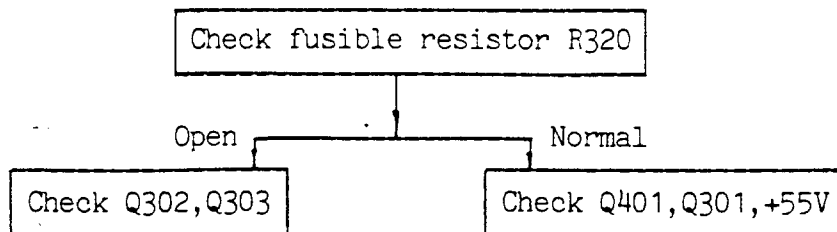
PICTURE AND RASTER MISSING



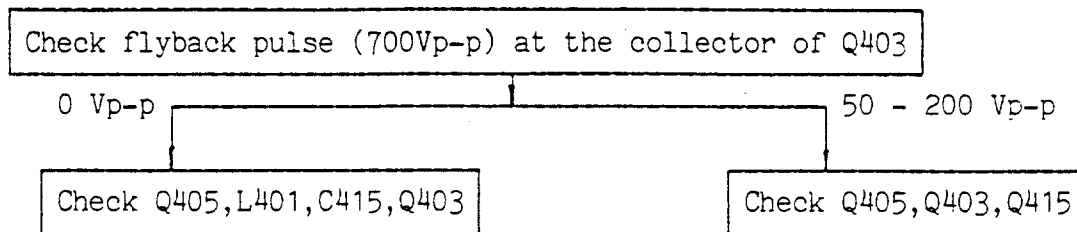
PICTURE OR SOME COLOR MISSING



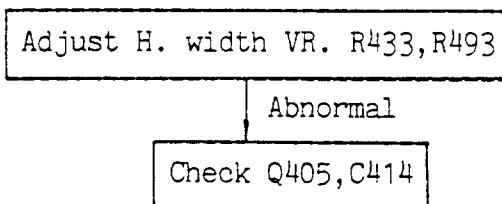
NO VERT. SCAN (ONE HORIZ. LINE RASTER)



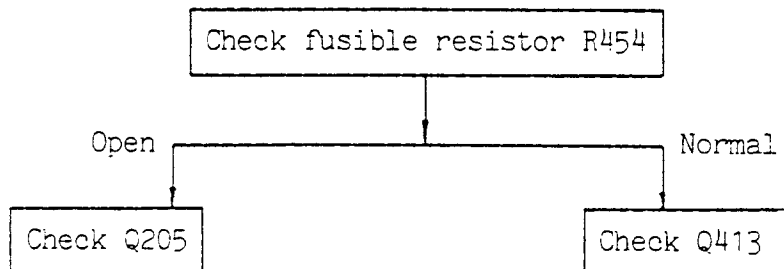
NO HOR. SCAN (ONE VERT. LINE RASTER)



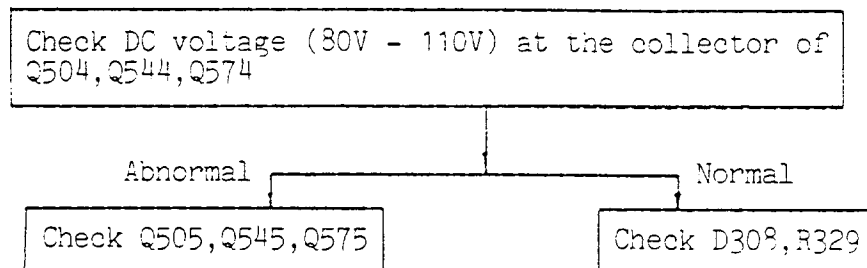
PICTURE TOO WIDE

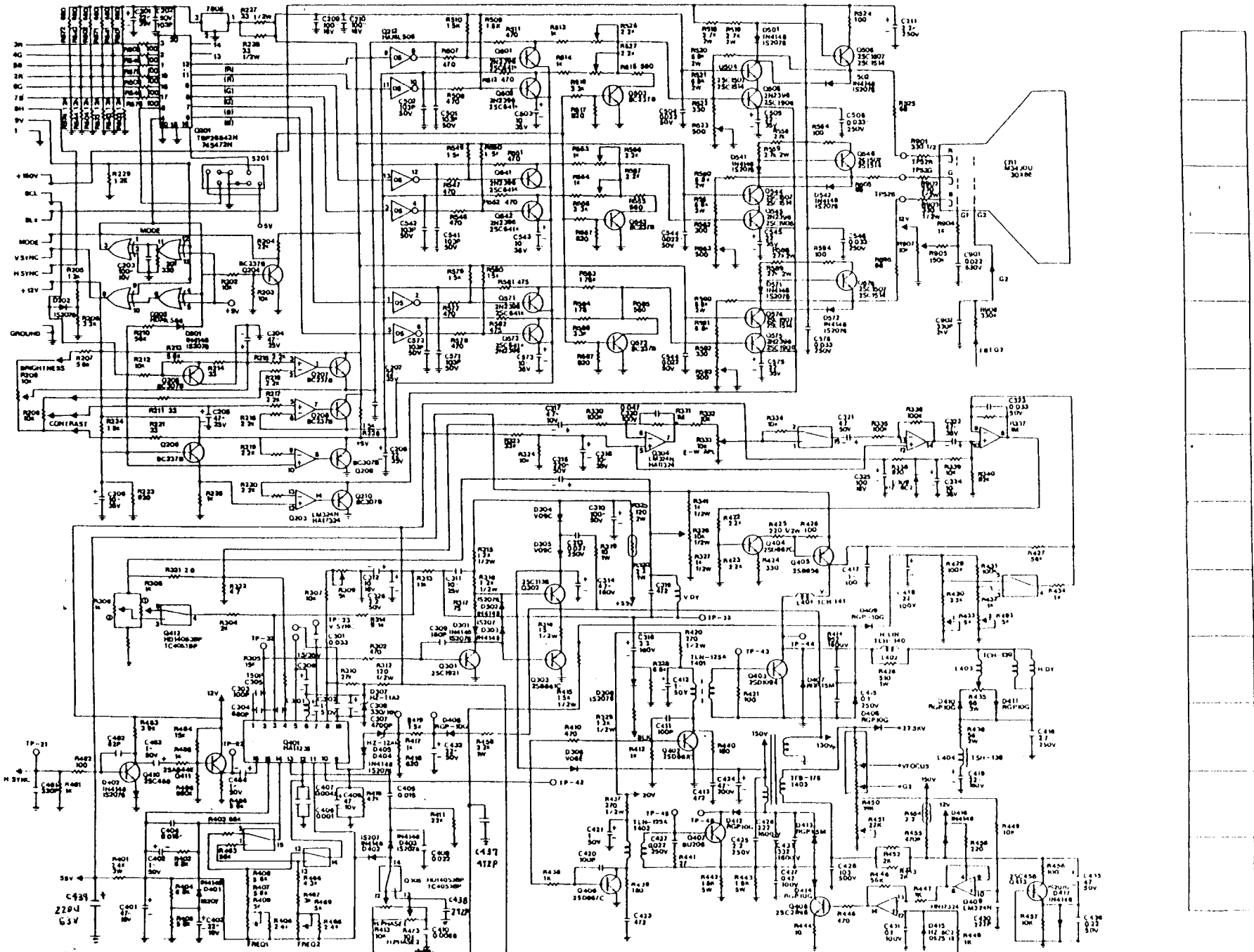


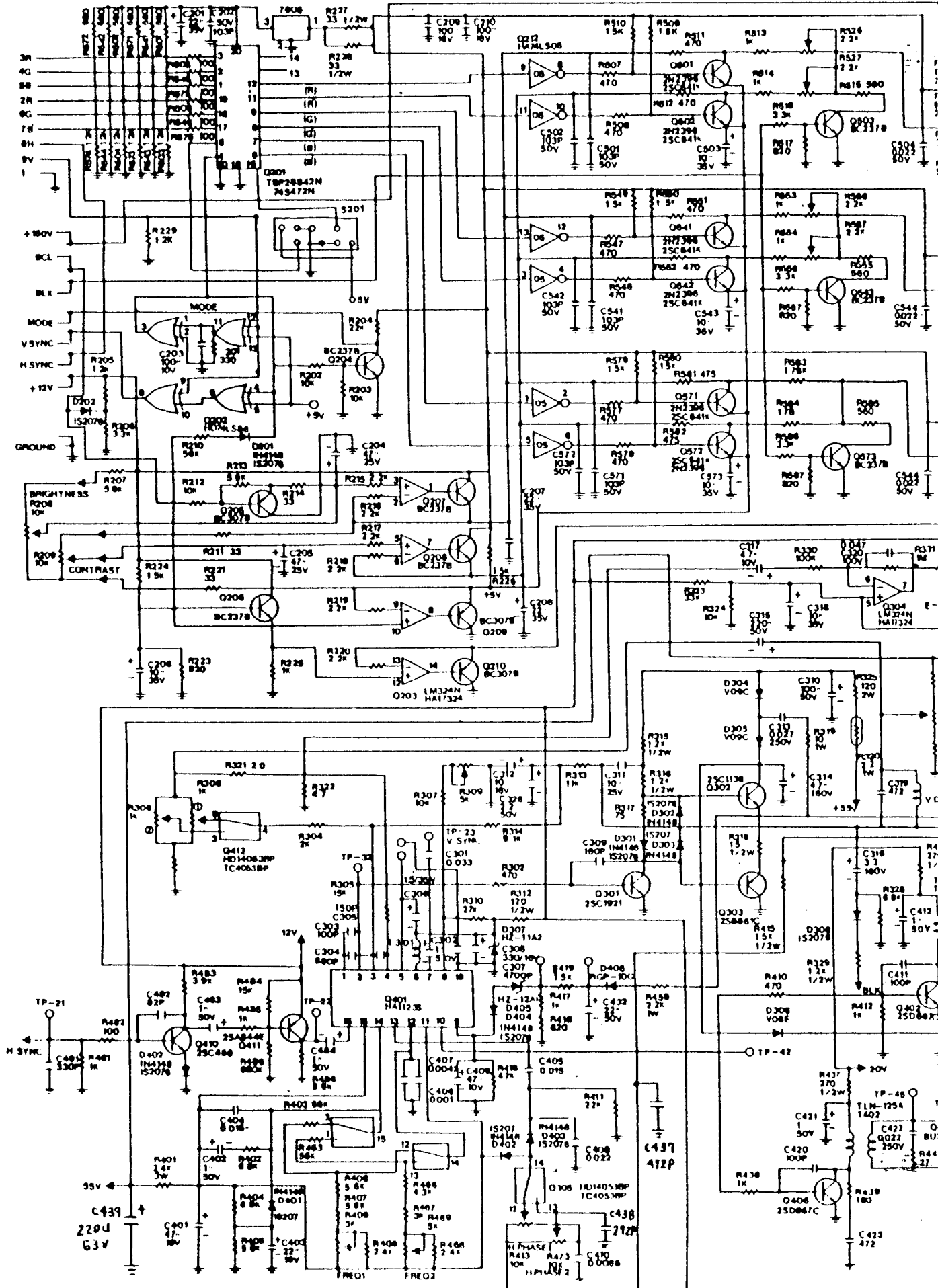
AUTOMATIC BRIGHTNESS LIMITER OUT OF WORK



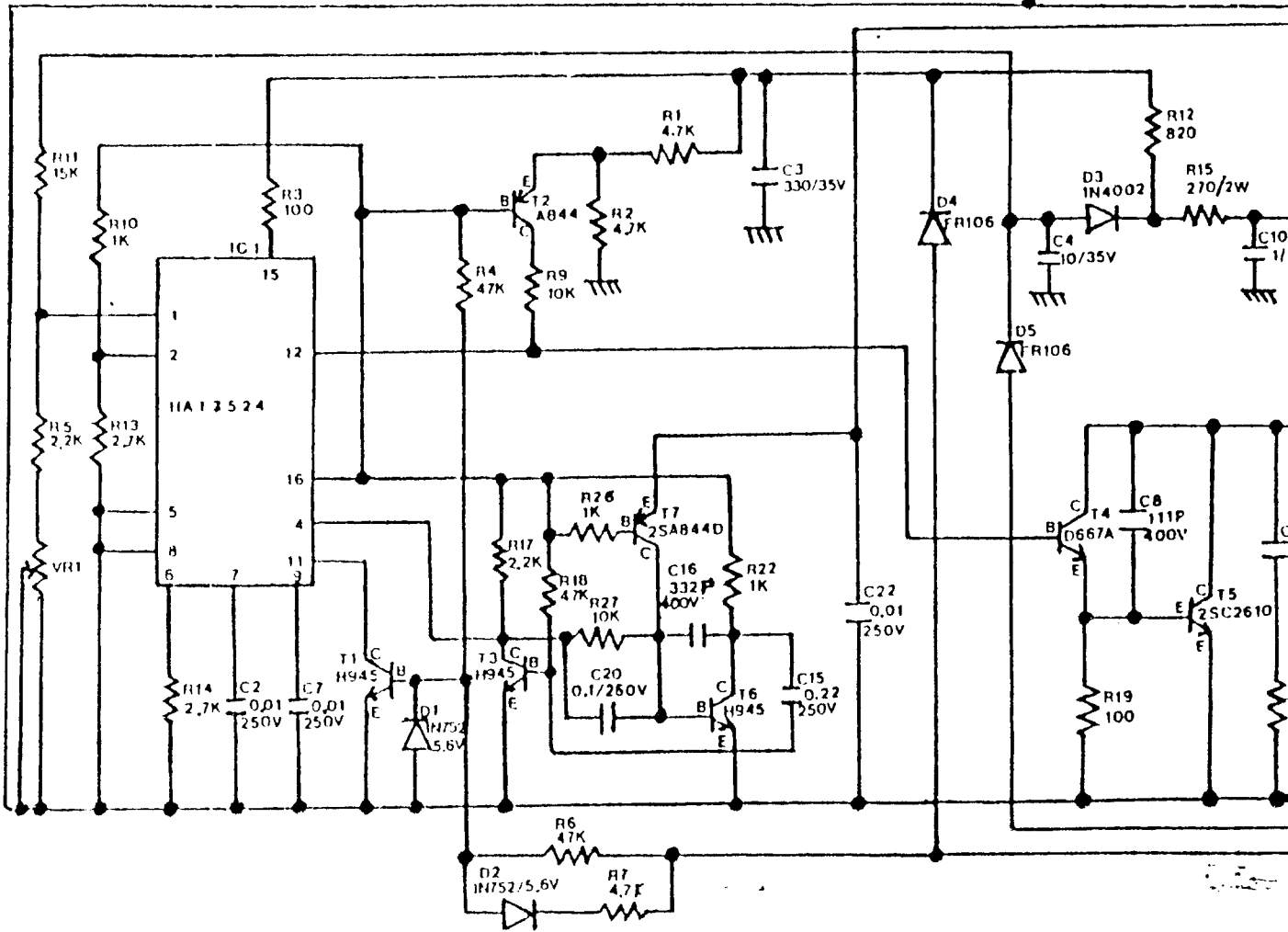
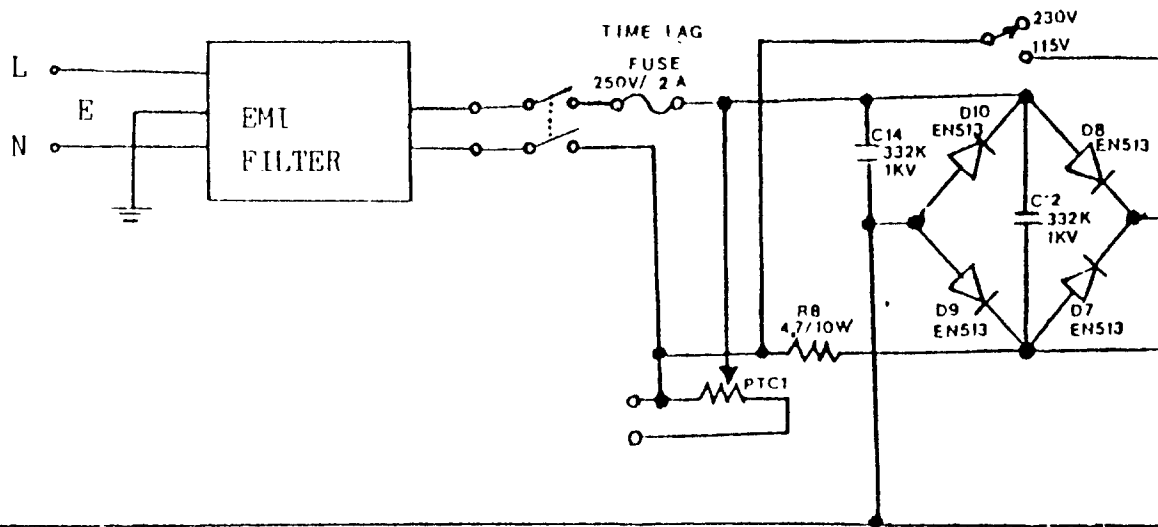
VERTICAL RETRACE LINE DISPLAY IN SCREEN

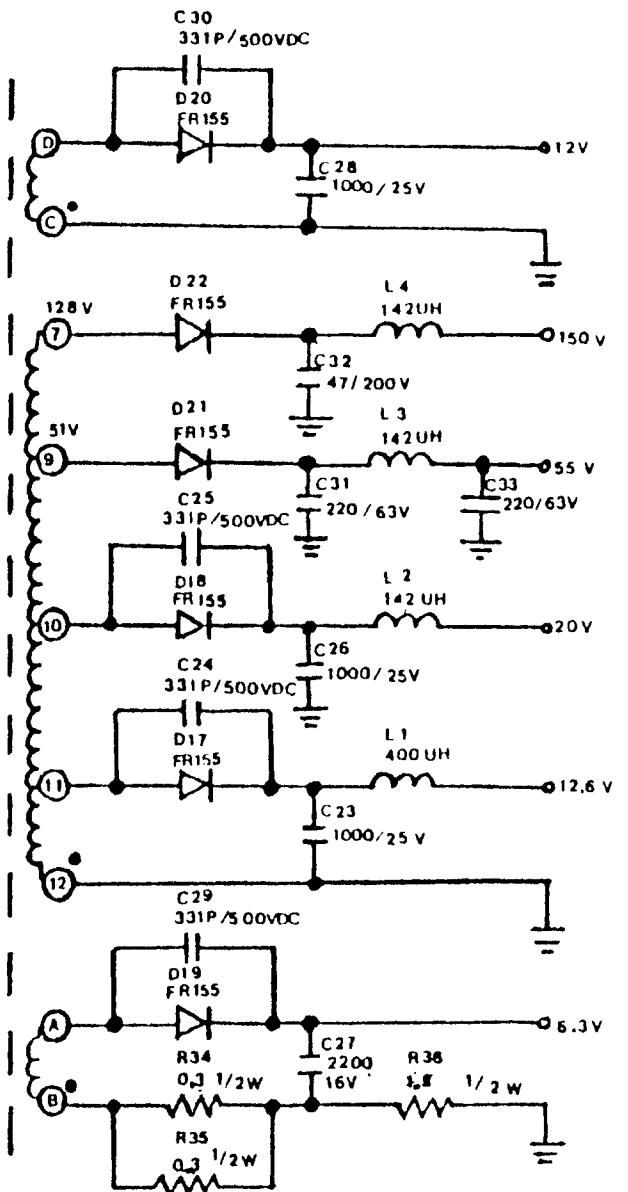
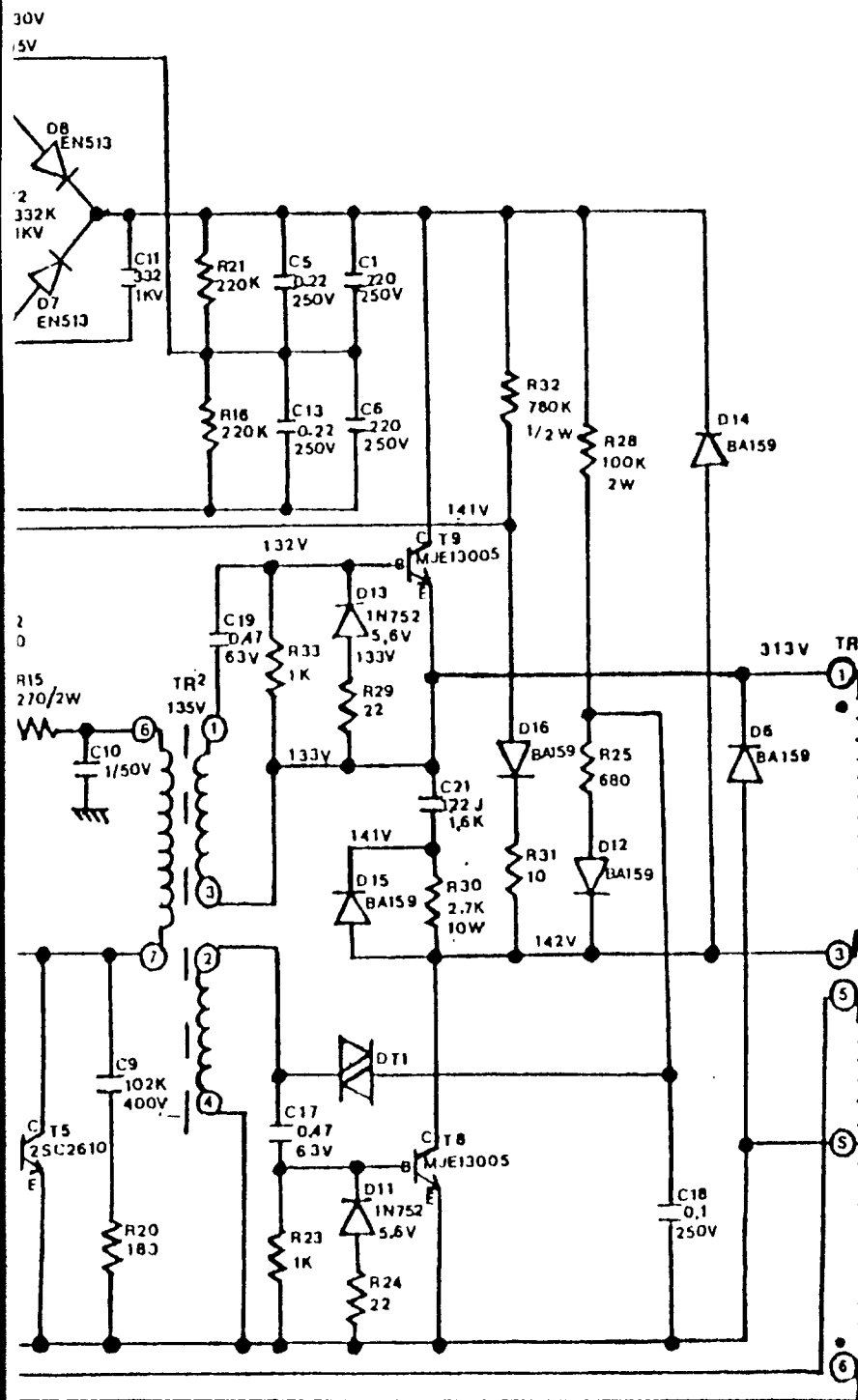






AC INPUT
VOLTAGE





 * 9.REPLACEMENT PARTS LIST *

WARNING: Replacement parts which have special characteristics important to safety should be replaced only with types identical to those in the original circuit kor specified in the parts list before replacing any of these components, read carefully the product safety precaution, do not degrade the safety of the display through improper servicing.

ABBREVIATIONS:

CAPACITORS.....CD: Ceramic Disk PF: Plastic Film
 EL: Electrolytic TA: Tantalum
 RESISTORS.....CF: Carbon Film VR: Variable Resistor
 CC: Carbon Composition FU: Fusible
 MOF: Metal Oxide Film MF: Metal Film

SCHMATIC LOCATION	PART NUMBER	DESCRIPTION
-----	-----	-----
	ASSEMBLE, PCB-MAIN, PWB-1141	
CAPACITOR		
C201	5213310112	EL, 16V 100mft
C202	5231810391	CD, 50V 10000pf
C203	5213310191	EL, 16V 100mft
C204	5213447091	EL, 25V 47mft
C205	5213447091	EL, 25V 47mft
C206	5213510091	EL, 35V 10mft
C207	5213522091	EL, 35V 22mft
C208	5213522091	EL, 35V 22mft
C209	5213310191	EL, 16V 100mft
C210	5213310191	EL, 16V 100mft
C211	5231810391	CD, 50V 10000pf
C212	5213347112	EL, 16V 470mft
C215	5213310191	EL, 16V 100mft
C301	5222233301	POLYESTER, 50V 33000pfk
C302	5213601091	EL, 50V 1mf
C303	5247010191	CD, 50V 100pfj
C304	5231368191	CD, 50V 680pfk
C305	5247015191	CD, 50V 150pfj
C306	5210202601	TA, 35V 1.5mfk
C307	5231347291	CD, 50V 4700pfk
C308	5213333112	EL, 16V 330mft
C309	5232318191	CD, 500V 180pfk
C310	5213610112	EL, 50V 100mft
C311	5213510091	EL, 35V 10mft
C312	5210401391	EL, 16V 10mfk
C313	5223427301	POLYPROPYLENE, 250V 27000pfj
C314	5213000901	EL, 160V 4.7mf
C315	5213622112	EL, 50V 220mft
C316	5214233991	EL, 160V 3.3mf
C317	5213647991	EL, 50V 4.7mf
C318	5213510091	EL, 35V 10mft
C319	5232747291	CD, 500V 4700pfp
C320	5271147301	MF, 100V 47000pfj
C321	5213647991	EL, 50V 4.7mf
C322	5213647012	EL, 50V 47mft
C323	5231833301	CD, 50V 33000pfpz
C324	5213510091	EL, 35V 10mft
C325	5213310191	EL, 16V 100mft

SCHMATIC LOCATION	PART NUMBER	DESCRIPTION
C326	5210400391	EL, 50V 2.2mfk
C401	5213347091	EL, 16V 47mft
C402	5213601091	EL, 50V 1mf
C403	5213322091	EL, 16V 22mft
C404	5221215391	POLYESTER, 50V 15000pfk
C405	5221215391	POLYESTER, 50V 15000pfk
C406	5221110291	POLYESTER, 50V 1000pfj
C407	5223647201	POLYPROPYLENE, 630V 4700pfj
C408	5221127291	POLYESTER, 50V 2700pfj
C409	5213347091	EL, 16V 47mft
C410	5221168291	POLYESTER, 50V 6800pfj
C411	5247010191	CD, 50V 100pfj
C412	5213601091	EL, 50V 1mf
C413	5231847291	CD, 50V 4700pfz
C414	5274195201	MF, 1600V 9500pfj
C415 RA	5270303301	MF, 250V 0.1mfj
C415 RB	5223410401	MF, 250V 0.1mft
C416	5214122012	EL, 100V 22mft
C417	5271110501	MF, 100V 1mfj
C418	5272127501	MF, 250V 2.7mfj
C419	5214222012	EL, 160V 22mft
C420	5247010191	CD, 50V 100pfj
C421	5213601091	EL, 50V 1mf
C422	5224422301	POLYPROPYLENE, 250V 22000pfk
C423	5231847291	CD, 50V 4700pfz
C424	5216347001	EL, 200V 47mft
C425	5272122501	MF, 250V 2.2xmfj
C426	5274122201	MF, 1600V 2200pfj
C427	5271147401	MF, 100V 0.47mfj
C428	5232710301	CD, 500V 10000pfp
C430	5231322291	CD, 50V 2200pfk
C431	5221410401	POLYESTER, 100V 0.1mfj
C432	5213622091	EL, 50V 22mft
C433	5274133201	MF, 1600V 3300pfj
C435	5213547091	EL, 35V 47mft
C436	5221122401	POLYESTER, 50V 0.22mfj
C437	5222147201	POLYESTER, 50V 4700pfj
C438	5221127201	POLYESTER, 50V 2700pfj
C439	5213722110	EL, 63V 220mfj
C481	5231333191	CD, 50V 330pf
C482	5247082091	CD, 50V 82pfj
C483	5213601091	EL, 50V 1mf
C484	5213601091	EL, 50V 1mf
C501	5231810391	CD, 50V 10000pfz
C502	5231810391	CD, 50V 10000pfz
C503	5213510091	EL, 35V 10mft
C541	5231810391	CD, 50V 10000pfz
C542	5231810391	CD, 50V 10000pfz
C543	5213510091	EL, 35V 10mft
C571	5231810391	CD, 50V 10000pfz
C572	5231810391	CD, 50V 10000pfz
C573	5213510091	EL, 35V 10mft
RESISTOR		
R201	5142833195	CF, 1/4W 330 ohm
R202	5142810395	CF, 1/4W 10K ohm
R203	5142810395	CF, 1/4W 10K ohm
R204	5142822395	CF, 1/4W 22K ohm

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
R205	5142812201	CF, 1/4W 1.2K ohm
R206	5142833295	CF, 1/4W 3.3K ohm
R207	5142856295	CF, 1/4W 5.6K ohm
R210	5142856395	CF, 1/4W 56K ohm
R211	5142833095	CF, 1/4W 33 ohm
R212	5142810395	CF, 1/4W 10K ohm
R213	5142856295	CF, 1/4W 5.6K ohm
R214	5142833095	CF, 1/4W 33 ohm
R215	5128222295	CF, 1/4W 2.2K ohm
R216	5142822295	CF, 1/4W 2.2K ohm
R217	5142822295	CF, 1/4W 2.2K ohm
R218	5142822295	CF, 1/4W 2.2K ohm
R219	5142822295	CF, 1/4W 2.2K ohm
R220	5142822295	CF, 1/4W 2.2K ohm
R221	5142833095	CF, 1/4W 33 ohm
R223	5131782001	MOF, 1/4W 820 ohm
R224	5131715011	MOF, 1/4W 1.5K ohm
R225	5142810295	CF, 1/4W 1K ohm
R226	5142815295	CF, 1/4W 1.5K ohm
R227	5142433001	CF, 1/2W 33 ohm
R228	5142433001	CF, 1/2W 33 ohm
R229	5142812295	CF, 1/4W 1.2K ohm
R302	5142847195	CF, 1/4W 470 ohm
R303	5142827195	CF, 1/4W 270 ohm
R304	5142820295	CF, 1/4W 2K ohm
R305	5142815395	CF, 1/4W 15K ohm
R306	5162901604	VR, 0.15W 1K ohm
R307	5142810395	CF, 1/4W 10K ohm
R309	5162171711	VR, 1/2W 5K ohm
R310	5142827395	CF, 1/4W 27K ohm
R312	5142412101	CF, 1/2W 120 ohm
R313	5142811395	CF, 1/4W 11K ohm
R314	5142891295	CF, 1/4W 9.1K ohm
R315	5136212207	MOF, 1/2W 1.2K ohm
R316	5136212207	MOF, 1/2W 1.2K ohm
R317	5142875095	CF, 1/4W 75 ohm
R318	5138215907	MF, 1/2W 1.5 ohm
R319	5136310007	MOF, 1W 10 ohm
R320	51332222907	FU, 1W 2.2 ohm
R321	5142802095	CF, 1/4W 2 ohm
R322	5142847995	CF, 1/4W 4.7 ohm
R323	5142833395	CF, 1/4W 33K ohm
R324	5142810395	CF, 1/4W 10K ohm
R325	5136412107	MOF, 2W 120 ohm
R326	5162171921	VR, 1/2W 10K ohm
R327	5142410201	CF, 1/2W 1K ohm
R328	5142868295	CF, 1/4W 6.8K ohm
R329	5142412201	CF, 1/2W 1.2K ohm
R330	5142810495	CF, 1/4W 100K ohm
R331	5142810595	CF, 1/4W 1M ohm
R332	5142810395	CF, 1/4W 10K ohm
R333	5162171921	VR, 1/2W 10K ohm
R334	5142810395	CF, 1/4W 10K ohm
R335	5142810495	CF, 1/4W 100K ohm
R336	5142810495	CF, 1/4W 100K ohm
R337	5142810595	CF, 1/4W 1M ohm
R338	5142892195	CF, 1/4W 820 ohm
R339	5142810395	CF, 1/4W 10K ohm

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
R340	5142882395	CF, 1/4W 82K ohm
R341	5142410201	CF, 1/2W 1K ohm
R366	5162901604	VR, 0.15W 1K ohm
R401	5136524200	MOF, 3W 2.4K ohm
R402	5142868295	CF, 1/4W 6.8K ohm
R403	5142868395	CF, 1/4W 68K ohm
R404	5142868295	CF, 1/4W 6.8K ohm
R405	5142856295	CF, 1/4W 5.6K ohm
R406	5142856295	CF, 1/4W 5.6K ohm
R407	5142856295	CF, 1/4W 5.6K ohm
R408	5142824295	CF, 1/4W 2.4K ohm
R409	5162171711	VR, 1/2W 5K ohm
R410	5142847195	CF, 1/4W 470 ohm
R411	5142822395	CF, 1/4W 22K ohm
R412	5142810295	CF, 1/4W 1K ohm
R413	5162901605	VR, 0.15W 10K ohm
R415	5142415201	CF, 1/2W 1.5K ohm
R416	5142847295	CF, 1/4W 4.7K ohm
R417	5142810295	CF, 1/4W 1K ohm
R418	5142862195	CF, 1/4W 620 ohm
R419	5142815295	CF, 1/4W 1.5K ohm
R420	5130427103	MOF, 2W 270 ohm
R421	5142810195	CF, 1/4W 100 ohm
R422	5142822295	CF, 1/4W 2.2K ohm
R423	5142822295	CF, 1/4W 2.2K ohm
R424	5142833195	CF, 1/4W 330 ohm
R425	5142422101	CF, 1/2W 220 ohm
R426	5142810195	CF, 1/4W 100 ohm
R427	5142856395	CF, 1/4W 56K ohm
R428	5136351107	MOF, 1W 510 ohm
R429	5142810495	CF, 1/4W 100K ohm
R430	5142833295	CF, 1/4W 3.3K ohm
R431	5142810495	CF, 1/4W 100K ohm
R432	5142810295	CF, 1/4W 1K ohm
R433	5162171721	VR, 1/2W 5K ohm
R434	5142810295	CF, 1/4W 1K ohm
R435	5162901402	VR, 3W 60 ohm
R436	5136456007	MOF, 2W 56 ohm
R437	5130427103	MOF, 2W 270 ohm
R438	5142810295	CF, 1/4W 1K ohm
R439	5142818195	CF, 1/4W 180 ohm
R440	5142818195	CF, 1/4W 180 ohm
R441	5142827095	CF, 1/4W 27 ohm
R442	5130718200	MOF, 5W 1.8K ohm
R443	5130718200	MOF, 5W 1.8K ohm
R444	5130310007	MF, 1W 10 ohm
R445	5142847195	CF, 1/4W 470 ohm
R446	5142856395	CF, 1/4W 56K ohm
R447	5142810295	CF, 1/4W 1K ohm
R448	5142810295	CF, 1/4W 1K ohm
R449	5142810395	CF, 1/4W 10K ohm
R450	5142839395	CF, 1/4W 39K ohm
R451	5162172211	VR, 1/2W 22K ohm
R452	5142820295	CF, 1/4W 2K ohm
R453	5142820295	CF, 1/4W 2K ohm
R454	5133122907	FS, 1/2W 2.2 ohm
R455	5142847495	CF, 1/4W 470K ohm
R456	5142810195	CF, 1/4W 100 ohm

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
R457	5142810395	CF, 1/4W 10K ohm
R458	5142822195	CF, 1/4W 220 ohm
R459	5130322207	MOF, 1W 2.2K ohm
R463	5142856395	CF, 1/4W 56K ohm
R466	5142843295	CF, 1/4W 4.3K ohm
R467	5142830295	CF, 1/4W 3K ohm
R468	5142824295	CF, 1/4W 2.4K ohm
R469	5162171711	VR, 1/2W 5K ohm
R473	5162901605	VR, 0.15W 10K ohm
R481	5142810295	CF, 1/4W 1K ohm
R482	5142810195	CF, 1/4W 100 ohm
R483	5142839395	CF, 1/4W 39K ohm
R484	5142815395	CF, 1/4W 15K ohm
R485	5142810295	CF, 1/4W 1K ohm
R486	5142868495	CF, 1/4W 680K ohm
R487	5142856295	CF, 1/4W 5.6K ohm
R493	5162171721	VR, 1/2W 5K ohm
R501	5142868195	CF, 1/4W 680 ohm
R502	5142868195	CF, 1/4W 680 ohm
R503	5142812295	CF, 1/4W 1.2K ohm
R504	5142812295	CF, 1/4W 1.2K ohm
R505	5142810195	CF, 1/4W 100 ohm
R506	5142810195	CF, 1/4W 100 ohm
R507	5142847195	CF, 1/4W 470 ohm
R508	5142847195	CF, 1/4W 470 ohm
R509	5142815295	CF, 1/4W 1.5K ohm
R510	5142815295	CF, 1/4W 1.5K ohm
R511	5136147101	MOF, 1/4W 470 ohm
R512	5136147101	MOF, 1/4W 470 ohm
R513	5131710011	MOF, 1/4W 1K ohm
R514	5131710011	MOF, 1/4W 1K ohm
R515	5142856195	CF, 1/4W 560 ohm
R516	5142833295	CF, 1/4W 3.3K ohm
R517	5142882195	CF, 1/4W 820 ohm
R526	5162171321	VR, 1/2W 2.2K ohm
R527	5162171321	VR, 1/2W 2.2K ohm
R541	5142868195	CF, 1/4W 680 ohm
R542	5142868195	CF, 1/4W 680 ohm
R543	5142812295	CF, 1/4W 1.2K ohm
R544	5142812295	CF, 1/4W 1.2K ohm
R545	5142810195	CF, 1/4W 100 ohm
R546	5142810195	CF, 1/4W 100 ohm
R547	5142847195	CF, 1/4W 470 ohm
R548	5142847195	CF, 1/4W 470 ohm
R549	5142815295	CF, 1/4W 1.5K ohm
R550	5142815295	CF, 1/4W 1.5K ohm
R551	5136147101	MOF, 1/4W 470 ohm
R552	5136147101	MOF, 1/4W 470 ohm
R553	5131710011	MOF, 1/4W 1K ohm
R554	5131710011	MOF, 1/4W 1K ohm
R555	5142856195	CF, 1/4W 560 ohm
R556	5142833295	CF, 1/4W 3.3K ohm
R557	5142882195	CF, 1/4W 820 ohm
R566	5162171321	VR, 1/2W 2.2K ohm
R567	5162171321	VR, 1/12W 2.2K ohm
R571	5142868195	CF, 1/4W 680 ohm
R572	5142868195	CF, 1/4W 680 ohm
R573	5142812295	CF, 1/4W 1.2K ohm

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
R574	5142812295	CF, 1/4W 1.2K ohm
R575	5142810195	CF, 1/4W 100 ohm
R576	5142810195	CF, 1/4W 100 ohm
R577	5142847195	CF, 1/4W 470 ohm
R578	5142847195	CF, 1/4W 470 ohm
R579	5142815295	CF, 1/4W 1.5K ohm
R580	5142815295	CF, 1/4W 1.5K ohm
R581	5131747501	MOF, 1/4W 475 ohm
R582	5131747501	MOF, 1/4W 475 ohm
R583	5131717811	MOF, 1/4W 1.78K ohm
R584	5131717811	MOF, 1/4W 1.78K ohm
R585	5142856195	CF, 1/4W 560 ohm
R586	5142833295	CF, 1/4W 3.3K ohm
R587	5142882195	CF, 1/4W 820 ohm
R907	5162171911	VR, 1/2W 10K ohm
SEMICONDUCTORS		
D201	6613001760	DIODE, SWITCHING, 1S2076
D202	6613001760	DIODE, SWITCHING, 1S2076
D301	6613001760	DIODE, SWITCHING, 1S2076
D302	6613001760	DIODE, SWITCHING, 1S2076
D303	6613001760	DIODE, SWITCHING, 1S2076
D304	6613002203	DIODE, SWITCHING, V09C
D305	6613002203	DIODE, SWITCHING, V09C
D306	6611013201	DIODE, RECTIFIER, V06E 400V 1.1A
D307	6615007900	DIODE, ZENER, 9.7 - 10.1V 0.5W
D308	6613001760	DIODE, SWITCHING, 1S2076
D309	6615009711	DIODE, ZENER, HZ6C-2
D401	6613001730	DIODE, SWITCHING, 1S2076
D402	6613001760	DIODE, SWITCHING, 1S2076
D403	6613001760	DIODE, SWITCHING, 1S2076
D404	6613001760	DIODE, SWITCHING, 1S2076
D405	6615005800	DIODE, ZENER, HZ12A1
D406	6611017600	DIODE, RECTIFIER, V19E
D407	6611013001	DIODE, RECTIFIER,
D408 RA	6611017600	DIODE, RECTIFIER, V19E
D408 RB	6611017400	DIODE, RECTIFIER, RGP10G
D409 RA	6611017600	DIODE, RECTIFIER, V19E
D409 RB	6611017400	DIODE, RECTIFIER, RGP10G
D410	6611017600	DIODE, RECTIFIER, V19E
D411 RA	6611017600	DIODE, RECTIFIER, V19E
D411 RB	6611017400	DIODE, RECTIFIER, RGP10G
D412	6611017600	DIODE, RECTIFIER, V19E
D413	6611013001	DIODE, RECTIFIER,
D414	6611017600	DIODE, RECTIFIER, V19E
D415	6615009703	DIODE, ZENER, HZ5C-2
D416	6613001760	DIODE, SWITCHING, 1S2076
D417	6613001760	DIODE, SWITCHING, 1S2076
D420	6613001760	DIODE, SWITCHING, 1S2076
Q201	6647028100	IC, TBP28S42N
Q202	6646009922	IC, HD74LS86
Q203 RA	6644042900	IC, HA17324
Q203 RB	6644006703	IC, LM324N
Q204	6622002901	TR, NPN, BC237B
Q205	6624005102	TR, PNP, BC307B
Q206	6622002901	TR, NPN, BC237B

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
Q207	6622002901	TR, NPN, BC237B
Q208	6622002901	TR, NPN, BC237B
Q209	6624005102	TR, PNP, BC307B
Q210	6624005102	TR, PNP, BC307B
Q211	6640000410	IC, HA17805P
Q212	6646008213	IC, SN74LS05N
Q301	6621013800	TR, NPN, 2SC1921
Q302	6622007400	TR, NPN, 2SD1138C
Q303	6624007400	TR, PNP, 2SB861C
Q304	6644042900	IC, HA17324
Q305	6645009002	IC, HD14053BP
Q401	6644012400	IC, HA11235
Q402	6622013300	TR, NPN, 2SD667C
Q404	6622013300	TR, NPN, 2SD667C
Q406	6622013300	TR, NPN, 2SD667C
Q408	6621025900	TR, NPN, 2SC2898
Q409	6644042900	IC, HA17324
Q410	6621003200	TR, NPN, 2SC458-C
Q411	6623001102	TR, PNP, 2SA844E
Q412	6645009002	IC, HD14053BP
Q413	6621003200	TR, NPN, 2SC458-C
Q501	6621026300	TR, NPN, 2SC641K
Q502	6621026300	TR, NPN, 2SC641K
Q503	6622002901	TR, NPN, BC237B
Q541	6621026300	TR, NPN, 2SC641K
Q542	6621026300	TR, NPN, 2SC641K
Q543	6622002901	TR, NPN, BC237B
Q571	6621026300	TR, NPN, 2SC641K
Q572	6621026300	TR, NPN, 2SC641K
Q573	6622002901	TR, NPN, BC237B
COILS AND TRANSFORMERS		
L301	5062104600	RF, CHK-116, 0.35uh
L401	5062205700	CHOKER, TCH-141
L402	5062205600	HOR LINEARITY, TLH-140
L403	5062205500	CENTER CHOKER, TCH-139
L404	5062205400	LOSS, TSH-138
T401	5062412501	TLN-125A
T402	5062412501	TLN-125A
T403	5062617607	TFB-176G
ASSEMBLY, PCB-CRT DRIVE PWB-1142		
CAPACITOR		
C211	5214422991	EL, 250V 2.2mf
C504	5222222301	PF, 50V 22000pfk
C505	5213522012	EL, 35V 22mft
C506	5223433301	250V 33000pfj
C544	5222222301	50V 22000pfk
C545	5213522012	EL, 35V 22mft
C546	5223433301	PF, 250V 33000pfj
C574	5222222301	PF, 50V 22000pfk
C575	5213522012	EL, 35V 22mft
C576	5223433301	PF, 250V 33000pfj
C901	5223622301	POLYESTER, 630V 22000pfj
C902	5234333101	CD, 2KV 330pfk
RESISTOR		
R518	5130427203	MOF, 2W 2.7K ohm

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
R519	5130427203	MOF, 2W 2.7K ohm
R520	5130468203	MOF, 2W 6.8K ohm
R521	5130468203	MOF, 2W 6.8K ohm
R522	5142833101	CF, 1/4W 330 ohm
R523	5162170811	VR, 1/2W 500 ohm
R524	5142810101	CF, 1/4W 100 ohm
R525	5142868001	CF, 1/4W 68 ohm
R558	5130427203	MOF, 2W 2.7K ohm
R559	5130427203	MOF, 2W 2.7K ohm
R560	5130468203	MOF, 2W 6.8K ohm
R561	5130468203	MOF, 2W 6.8K ohm
R562	5142833101	CF, 1/4W 330 ohm
R563	5162170811	VR, 1/2W 500 ohm
R564	5142810101	CF, 1/4W 100 ohm
R565	5142868001	CF, 1/4W 68 ohm
R588	5130427203	MOF, 2W 2.7K ohm
R589	5130427203	MOF, 2W 2.7K ohm
R590	5130468203	MOF, 2W 6.8K ohm
R591	5130468203	MOF, 2W 6.8K ohm
R592	5142833101	CF, 1/4W 330 ohm
R593	5162170811	VR, 1/2W 500 ohm
R594	5142810101	CF, 1/4W 100 ohm
R595	5142868001	CF, 1/4W 68 ohm
R901	5111233101	CC, 1/2W 330 ohm
R902	5111233101	CC, 1/2W 330 ohm
R903	5111233101	CC, 1/2W 330 ohm
R904	5111210201	CC, 1/2W 1K ohm
R905	5142815401	CF, 1/4W 150K ohm
R906	5136001800	MOF, 1/2W 330K ohm

SEMICONDUCTIORS

D501	6613001700	DIODE, SWITCHING, 1S2076
D502	6613001700	DIODE, SWITCHING, 1S2076
D541	6613001700	DIODE, SWITCHING, 1S2076
D542	6613001700	DIODE, SWITCHING, 1S2076
D571	6613001700	DIODE, SWITCHING, 1S2076
D572	6613001700	DIODE, SWITCHING, 1S2076
Q504	6621013700	TR, NPN, 2SC1514
Q505	6621014500	TR, NPN, 2SC1906
Q506	6621013700	TR, NPN, 2SC1514
Q544	6621013700	TR, NPN, 2SC1514
Q545	6621014500	TR, NPN, 2SC1906
Q546	6621013700	TR, NPN, 2SC1514
Q574	6621013700	TR, NPN, 2SC1514
Q575	6621014500	TR, NPN, 2SC1906
Q576	6621013700	TR, NPN, 2SC1514

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CAPACITORS

C1	5216422112	EL, 220uf
C2	5272110300	MOF, 0.47uf
C3	5215533112	EL, 330uf
C4	5215510012	EL, 10uf
C5	5272122400	MOF, 0.22ufj
C6	5216422112	EL, 220uf
C7	5272110300	MOF, 0.47uf
C8	5247311100	CD, 110pf
C9	5231310201	CD, 1000uf

SCHMATIC LOCATION	PART NUMBER	DESCRIPTION
C10	5215601012	EL, 1uf
C11	5233333200	CD, 3300pf
C12	5233333200	CD, 3300pf
C13	5272122400	MOF, 0.22ufj
C14	5233333200	CD, 3300pf
C15	5272122400	MOF, 0.22ufj
C16	5232733200	CD, 3300pf
C17	5271147400	MOF, 0.47ufj
C18	5272110400	MOF, 0.1ufj
C19	5271147400	MOF, 0.47ufj
C20	5272110400	MOF, 0.1ufj
C21	5274112200	MOF, 1200pf
C22	5272110300	MOF, 0.47uf
C23	5215410212	EL, 1000uf
C24	5232333100	CD, 330pf
C25	5232333100	CD, 330pf
C26	5215410212	EL, 1000uf
C27	5215322212	EL, 2200uf
C28	5215410212	EL, 1000uf
C29	5232333100	CD, 330pf
C30	5232333100	CD, 330pf
C31	5215722112	EL, 220u
C32	5216447012	EL, 47uf
C33	5215722112	EL, 220u

REISTORS

R1	5142847200	CF, 1/4W 4.7kj
R2	5142847200	CF, 1/4W 4.7kj
R3	5142810100	CF, 1/4W 100j
R4	5142847300	CF, 1/4W 47kj
R5	5142822200	CF, 1/4W 2.2kj
R6	5142847300	CF, 1/4W 47kj
R7	5142847200	CF, 1/4W 4.7kj
R8	5154647931	CT, 10W 4.7j
R9	5142810300	CF, 1/4W 10kj
R10	5142810200	CF, 1/4W 1kj
R11	5142815300	CF, 1/4W 15kj
R12	5142882100	CF, 1/4W 820j
R13	5142827200	CF, 1/4W 2.7kj
R14	5142827200	CF, 1/4W 2.7kj
R15	5142627100	CF, 2W 270i
R16	5142822400	CF, 1/4W 220kj
R17	5142822200	CF, 1/4W 2.2kj
R18	5142847300	CF, 1/4W 47kj
R19	5142810100	CF, 1/4W 100j
R20	5142818100	CF, 1/4W 180j
R21	5142822400	CF, 1/4W 220kj
R22	5142810200	CF, 1/4W 1kj
R23	5142810200	CF, 1/4W 1kj
R24	5142822000	CF, 1/4W 22J
R25	5142868100	CF, 1/4W 680j
R26	5142810200	CF, 1/4W 1kj
R27	5142810300	CF, 1/4W 10kj
R28	5142610400	CF, 2W 100kj
R29	5142822000	CF, 1/4W 22j
R30	5154627223	CT, 10W 2.7kj
R31	5142810000	CF, 1/4W 10j
R32	5142478400	CF, 1/2W 780kj

SCHMATIC LOCATION	PART NUMBER	DESCRIPTION
R33	5142810200	CF, 1/4W 1kj
R34	5142403900	CF, 1/2W 0.3j
R35	5142403900	CF, 1/2W 0.3j
R36	5142401200	CF, 1/2W 1.2j
PTC1	5391560067	PTC, PTH45IC02BG200N2700
VR1	5391560086	VR, 1kj
TRANSISTORS		
T1	5391560077	TR, NPN, H945P
T2	5391560078	TR, PNP, 2SA844D
T3	5391560077	TR, NPN, H945P
T4	5391560080	TR, NPN, D667AC
T5	5391560079	TR, NPN, 2SC2610
T6	5391560077	TR, NPN, H945P
T7	5391560077	TR, PNP, 2SA844D
T8	5306012603	TR, NPN, MJE13005
T9	5306012603	TR, NPN, MJE13005
INTEGRATED CIRCUIT		
I.C. 1	5391560075	I.C. PWM, HA17524
DIODES		
D1	5391560003	DIODE, ZENER, 1N752
D2	5391560003	DIODE, ZENER, 1N752
D3	5314002401	DIODE, RECTIFIER, 1N4002
D4	5391560082	DIODE, RECTIFIER, 1N4937GF
D5	5391560082	DIODE, RECTIFIER, 1N4937GP
D6	5391560084	DIODE, RECTIFIER, BA159
D7	5391560083	DIODE, RECTIFIER, EM513
D8	5391560083	DIODE, RECTIFIER, EM513
D9	5391560083	DIODE, RECTIFIER, EM513
D10	5391560083	DIODE, RECTIFIER, EM513
D11	5391560003	DIODE, ZENER, 1N752
D12	5391560084	DIODE, RECTIFIER, BA159
D13	5391560003	DIODE, ZENER, 1N752
D14	5391560084	DIODE, RECTIFIER, BA159
D15	5391560084	DIODE, RECTIFIER, BA159
D16	5391560084	DIODE, RECTIFIER, BA159
D17	5391560081	DIODE, RECTIFIER, FR155
D18	5391560081	DIODE, RECTIFIER, FR155
D19	5391560081	DIODE, RECTIFIER, FR155
D20	5391560081	DIODE, RECTIFIER, FR155
D21	5391560081	DIODE, RECTIFIER, FR155
D22	5391560081	DIODE, RECTIFIER, FR155
DIAC		
DT1	5391560085	DIAC, 32V
COIL AND TRANSFORMERS		
L1	5391560110	TVP74-121
L2	5391560066	TVP74-123
L3	5391560066	TVP74-123
L4	5391560066	TVP74-123
TR1	5316745111	TVP74-51T
TR2	5316745201	TVP74-52
FUSE		
	5391560108	2A/250V

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
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ASSEMBLY, HIGH VOLT		
SMICONDUCTORS		
Q403	6622013400	TR, NPN, 2SD1094
Q405	6624006201	TR, NPN, 2SB856
Q407	6621015003	TR, NPN, BU208
ASSEMBLY, CONTROL		
RESISTOR		
R208	5161161914	VR, 10K ohm
R209	5161161914	VR, 10K ohm
ASSEMBLY, COOLING FAN		
COOLING		
F101	5052500200	FAN, DC 12V FBP-08812L
ASSEMBLY, CA-1		
COIL		
L901	5060114401	COIL, TSB-144A
V901	5051218176	CCRT, M34JDU30X66