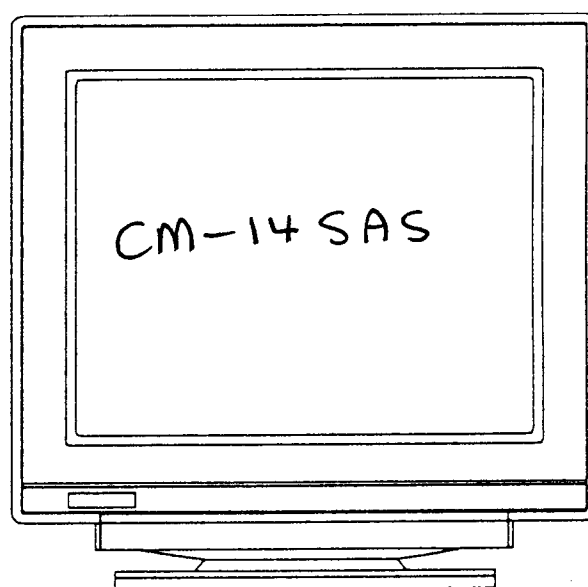


# Service Manual

14" SUPER-VGA(2S)  
COLOR MONITOR



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# 1. PRECAUTIONS AND NOTICES

## 1-1. 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 0.5mR/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. Proceed as follows:

Connect the monitor power lead to the mains supply, via an isolation transformer, and switch on. Using the test circuit shown in Fig. 1-1, measure the AC leakage current between each pole (L and N of the supply and all accessible metal parts. The earth leakage current must not exceed 3.5mA.

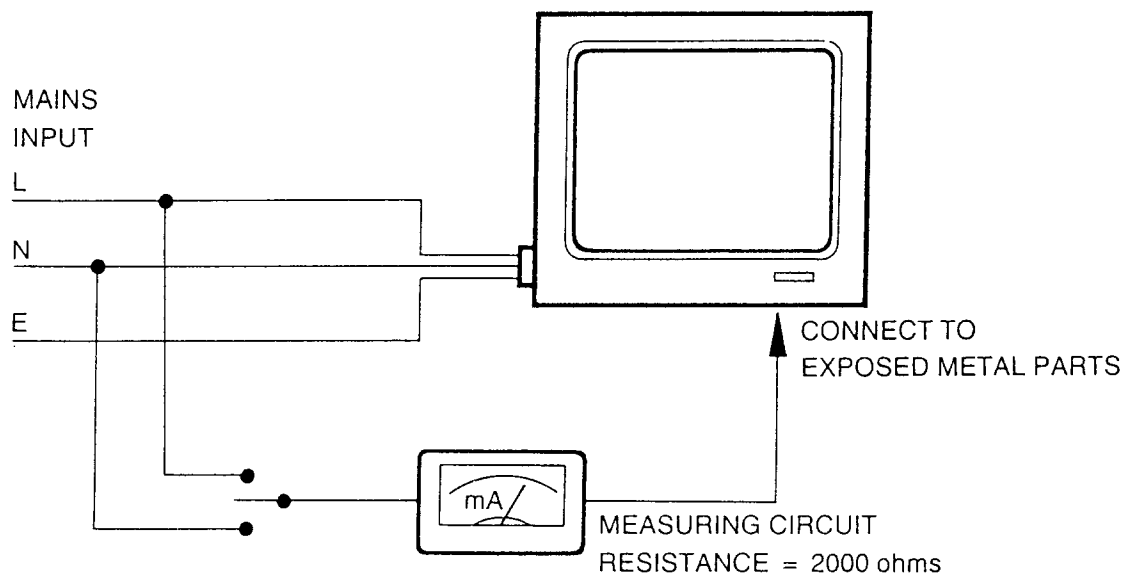


Fig 1-1 AC LEAKAGE CURRENT TEST CIRCUIT

## 1-2. PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in this chassis provide special visual safety protection. 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.

## 1-3. SERVICE NOTES

- <1> When replacing parts or circuit boards, wrap the wires around terminals before soldering.
- <2> When replacing a high wattage resistor (more than 1/2W) on a circuit board, Keep the resistor about 10mm (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.

WARNING
---------

CHECK POWER VOLTAGE SELECTOR IS CORRECT !  
120 VAC OR 240 VAC

## 2. SPECIFICATIONS

**2-1. APPLICATION:** Typical data display device for personal computer applications.

### 2-2. MECHANICAL DESCRIPTION

Dimensions

Height : 12.9" (328mm) (W/O Base)

Width : 14.5" (367mm)

Depth : 15.2" (385mm)

WEIGHT

Net Weight : 11.5 Kg (25.3 lbs)

### 2-3. DISPLAY TUBE CHARACTERISTICS

Size: 14" diagonal (13" visual), 90°, 29.1mm neck

Dot pitch: 0.28mm/0.39mm

Gun: In-line

Surface/Transmission: Non-glare/glare, tinted

Phosphor/Persistence: X OR P22

Type No: M34KBV80 × 11/M34KDD50 × 02/M34AFA60 × 03 — 0.28mm pitch, Non-glare.

E2971B22-TC42ET (glare)/E2971B22-TC42ETHT (Non-glare) — 0.39mm pitch.

### 2-4. ELECTRIC PERFORMANCE

<1> Power Supply

Input Voltage: AC 110-125V/200~240V

Input Frequency: 50-60 Hz

Input Current: 1.2A max (at 120VAC)/0.6A max (at 220VAC)

Consumption: 80W

A six feet 3-wire grounded line cord is furnished

<2> Input Signals:

Video Signal: Red/Green/Blue. All are positive analogue.

Input levels: 0-0.7 Vp-p (MAX.)

Sync Signals:

MODE	Hor-Frequency	Vert-Frequency	Hor-Sync	Vert Sync	Resolution
1	31.5 KHz	70 Hz	+	-	640 × 350
2	31.5 KHz	70 Hz	-	+	720 × 400
3	31.5 KHz	60 Hz	-	-	640 × 480
4	35.5 KHz	87 Hz	+	+	1024 × 768
5	35.2 - 38 KHz	55 - 62 Hz	+/-	+/-	800 × 600

<3> Display Color:

256 colors from a palette of over 262144

<4> Display Size:

Horizontal: 9.69" (246mm) typical

Vertical : 7.28" (185mm) typical

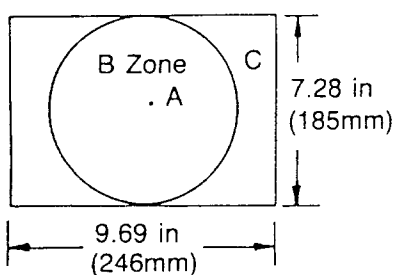
# <5> PRESET TIMING

	Mode 1	Mode 2	Mode 3	Mode 4	Mode 5
fh (kHz)	31.47	31.47	31.47	35.520	35.156
A $\mu$ s (Line time total)	31.78	31.78	31.78	28.150	28.44
B $\mu$ s (Sync. pulse)	3.81	3.81	3.81	3.919	2.00
C $\mu$ s (Back porch)	1.91	1.91	1.91	1.247	3.556
D $\mu$ s (Active)	25.42	25.42	25.42	22.810	22.22
E $\mu$ s (Front porch)	0.64	0.64	0.64	0.173	0.667
fv (Hz)	70	70	60	86.960	56.25
P ms (Frame time total)	14.27	14.27	16.68	11.50	17.78
Q ms (Sync. pulse)	0.064	0.064	0.064	0.113	0.057
R ms (Back porch)	1.907	1.112	1.049	0.563	0.626
S ms (Active)	11.12	12.71	15.25	10.81	17.01
T ms (Front porch)	1.176	0.381	0.318	0.014	0.028
	Separate Sync.	Separate Sync.	Separate Sync.	Separate Sync.	Separate Sync.
H. Sync. Polarity	Positive	Negative	Negative	Positive	Positive/Negative
V. Sync. Polarity	Negative	Positive	Negative	Positive	Positive/Negative

<6> Resolution: Horizontal: 1024 dots  
Vertical : 768 lines

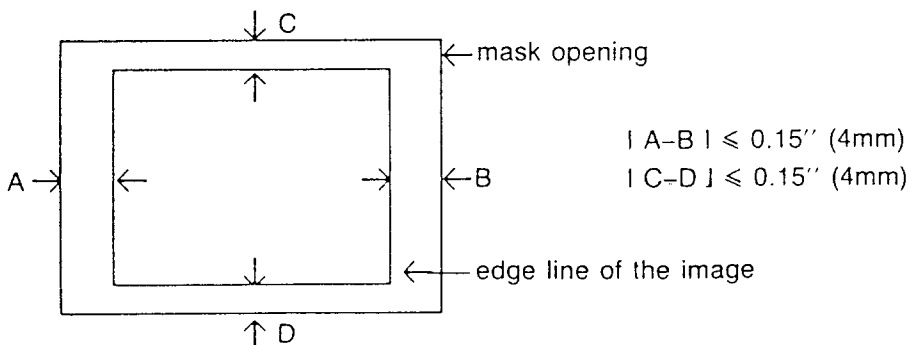
MODE	Horizontal (dots)	Vertical (lines)
1	640	350
2	640	400
3	640	480
4	1024	768
5	800	600

<7> Misconvergence:



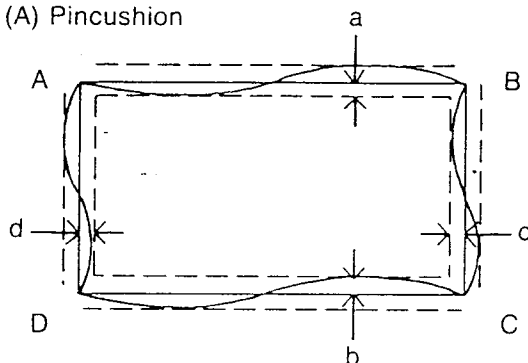
- ① For 0.28mm Pitch CRT.  
 A point  $\leq 0.005''$  (0.15mm) max  
 B Zone  $\leq 0.012''$  (0.3mm)  
 C Zone  $\leq 0.016''$  (0.4mm)
- ② For 0.39mm Pitch CRT  
 A point  $\leq 0.012''$  (0.3mm)  
 B Zone  $\leq 0.020''$  (0.5mm)  
 C Zone  $\leq 0.024''$  (0.6mm)

<8> Image position:



## <9> Distortion

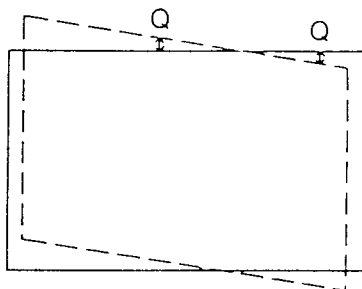
(A) Pincushion



$$a, b \leq 0.098'' (2.5\text{mm})$$

$$c, d \leq 0.098'' (2.5\text{mm})$$

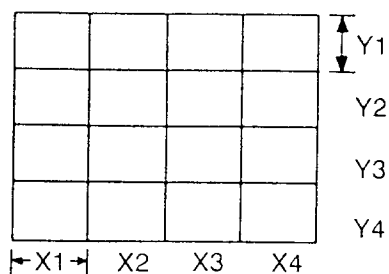
(B) Tilt



$$Q \leq 0.5^\circ\text{C}$$

$$\leq 0.718'' (2\text{mm})$$

(C) Linearity



$$\text{Horizontal linearity} = \frac{|X - \bar{X}|}{\bar{X}} \times 100\% \leq 7\%$$

$$\text{Vertical linearity} = \frac{|Y - \bar{Y}|}{\bar{Y}} \times 100\% \leq 5\%$$

$$\bar{X} = \frac{X1 + X2 + X3 + X4}{4} \quad \bar{Y} = \frac{Y1 + Y2 + Y3 + Y4}{4}$$

Note: Input Signal is a crosshatch pattern

## 2-5. ENVIRONMENTAL CHARACTERISTICS

Operation: 10°C to 35°C ambient

Humidity : 5% to 80% (non-condensing)

Altitude : to 7000 feet above sea level

Storage : -40°C to 65°C

## 2-6. USER CONTROLS

Power-off, Brightness, Contrast, V.Center, V. Height, H.Width.

H.PHASE 1 for mode 1,2 and 3 (VGA Standard)

H.PHASE 2 for mode 5 only (800 × 600 Mode)

H.PHASE 3 for mode 4 only (1024 × 768 Interlace Mode)

SUB. H.PHASE 2 for mode 5 only (800 × 600 Mode)

## **2-7. SIGNAL CONNECTOR**

15-pin D shell connector

## **2-8. SAFETY SPECIFICATION**

UL UL1950 D3 Diviations.

FCC CLASS B

CSA C22.2 NO: 220

GS EN60 950: 1988

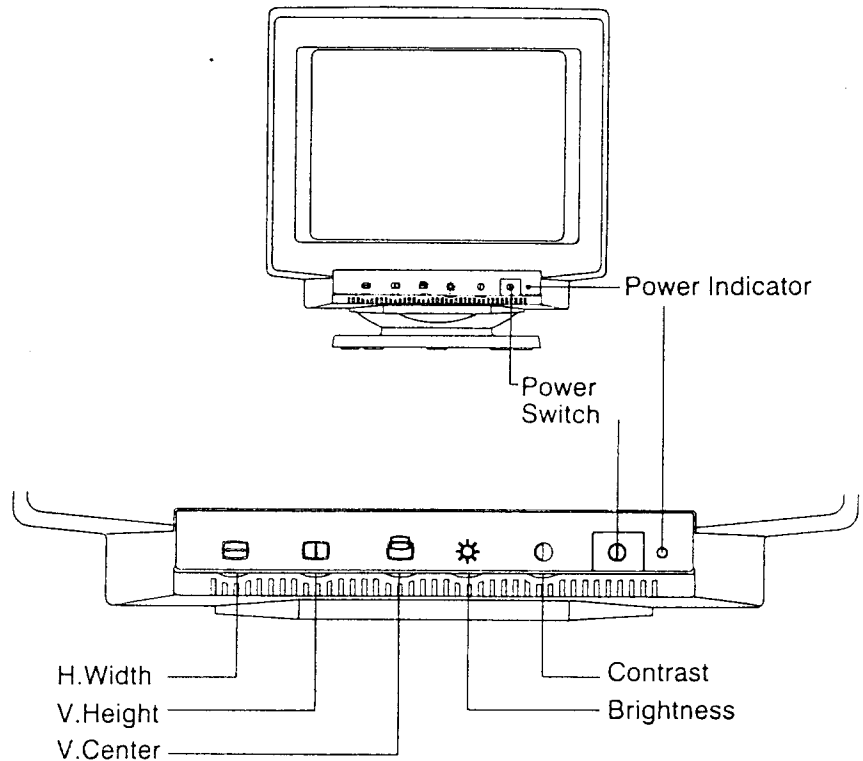
ZH1/618/10.80

FTZ CLASS B

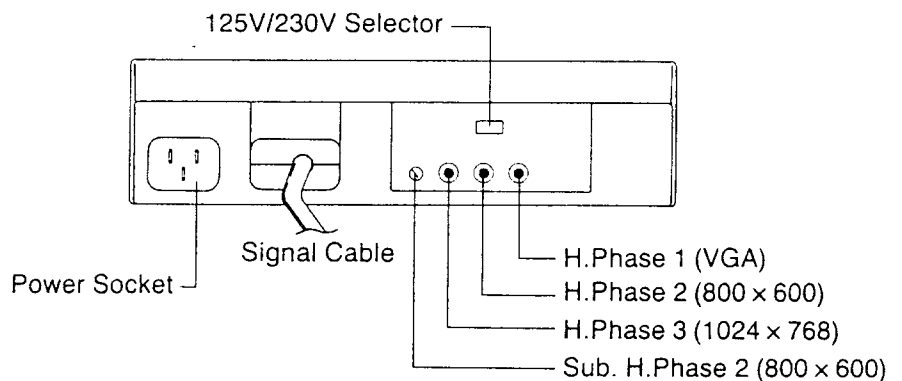
# 3. CONTROL LOCATIONS AND OPERATIONS

## 3-1. CONTROL LOCATIONS

<1> FRONT VIEW



<2> REAR VIEW



## 3-2. OPERATIONS

- <1> POWER SWITCH : Turn the display ON/OFF by the switch. When the display is ON, the power indicator lights.
- <2> CONTRAST CONTROL : Adjust the display for proper contrast level.
- <3> BRIGHTNESS CONTROL: Adjust the display for proper brightness level.
- <4> WIDTH CONTROL : Adjust the display for the horizontal width (Normally, it set on center detent position).
- <5> HEIGHT CONTROL : Adjust the display for the vertical height (Normally, it set on center detent position).
- <6> V. CENTER CONTROL : Adjust the display for proper vertical position.
- <7> H. PHASE 1 CONTROL : Adjust the display only for the horizontal position of standard VGA modes.
- <8> H. PHASE 2 and SUB. H. PHASE 2 CONTROL : Adjust the display for proper horizontal position of 800 x 600 mode.
- <9> H. PHASE 3 CONTROL : Adjust the display for proper horizontal position of 1024 x 768 mode.

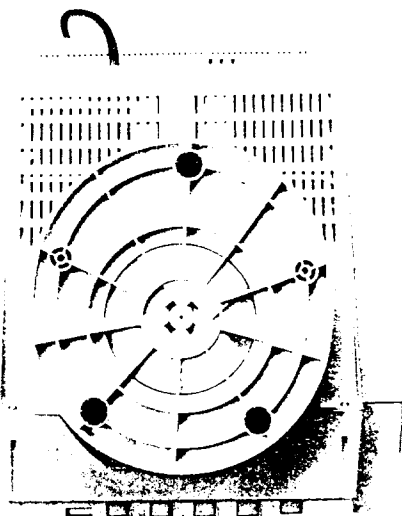


# 4. DISASSEMBLY INSTRUCTIONS

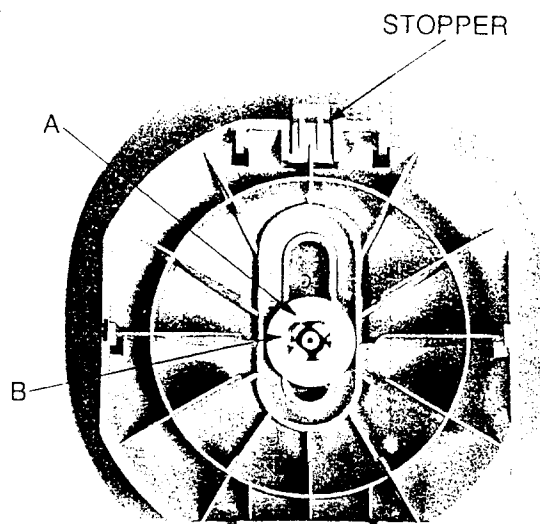
## <1> SWIVEL BASE REMOVAL

First press the stopper then slide the swivel ball down and move it. (Fig. 1,2)

- <2> Press 4 claw stoppers (A) to remove the fastening ring (B) and then separate the swivel ball and swivel base. (Fig. 2)



(Fig. 1)



(Fig. 2)

## <3> BACK COVER REMOVAL

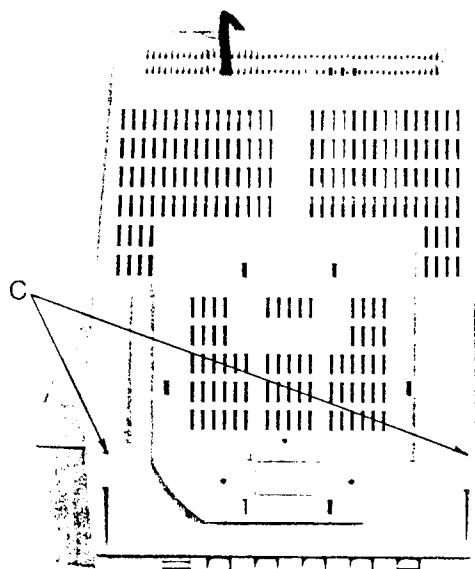
- a) Remove 2 screws (C) from the bottom of back cover (Fig. 3) and 2 screws (D) from the back cover. (Fig. 4)

- b) Remove the back cover.

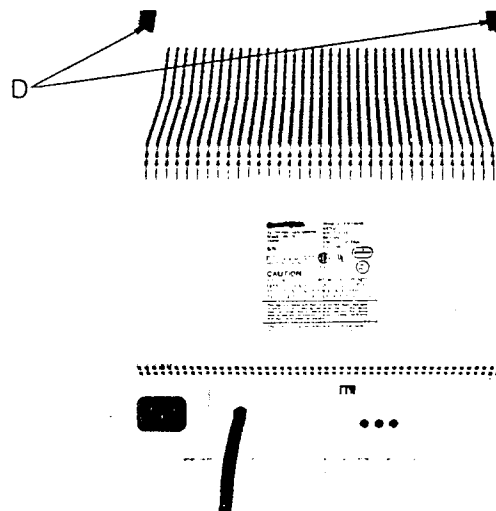
## <4> PCB ASSEMBLY REMOVAL

Caution: When serving or replacing the CRT. Disconnect the anode and discharge the anode completely. As high voltage (24KV) may remain on the anode for an extended time after power off.

- a) Unplug the drive board from the CRT neck.  
b) Unplug the DY connector, AC connector, degaussing coil connector and CRT grounding connector from the main board.  
c) Discharge the remaining static electricity by shorting between anode CRT ground.  
d) Remove 2 screws (E) from the FBT bracket and 1 connector (F) from heat sink (Fig. 5,6)  
e) To drag 1 claw stopper (G) from the bottom of front cover to remove the bracket main. (Fig. 7)  
f) Remove CRT drive board (H) from CRT neck. (Fig. 6)

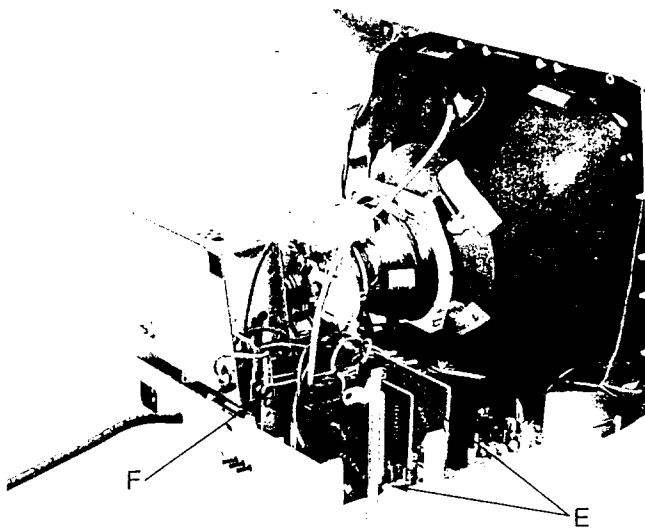


(Fig. 3)

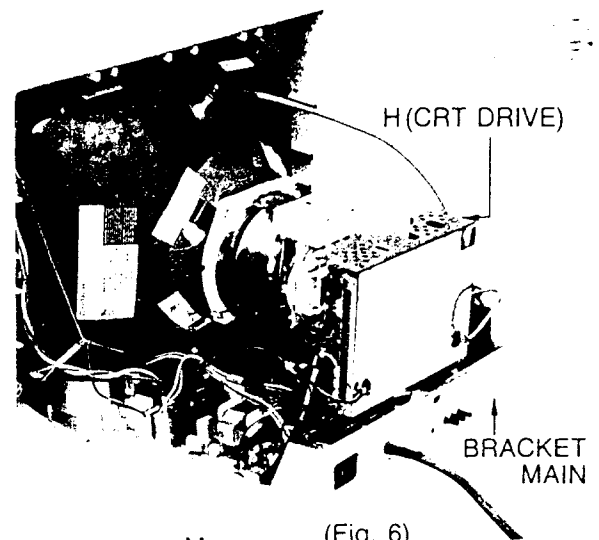


(Fig. 4)

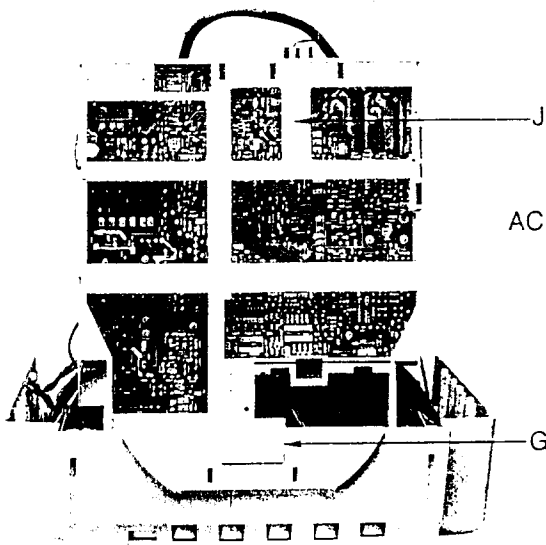
- g) Remove 2 screws (I) from bracket main to remove the bracket signal cable. (Fig. 8)
- h) Remove 1 screw (J) and 2 SCREWS (M) and 1 bracket switch (K) and press 2 claw stoppers (L) and from bracket main to remove the PCB main board. (Fig. 7,8)



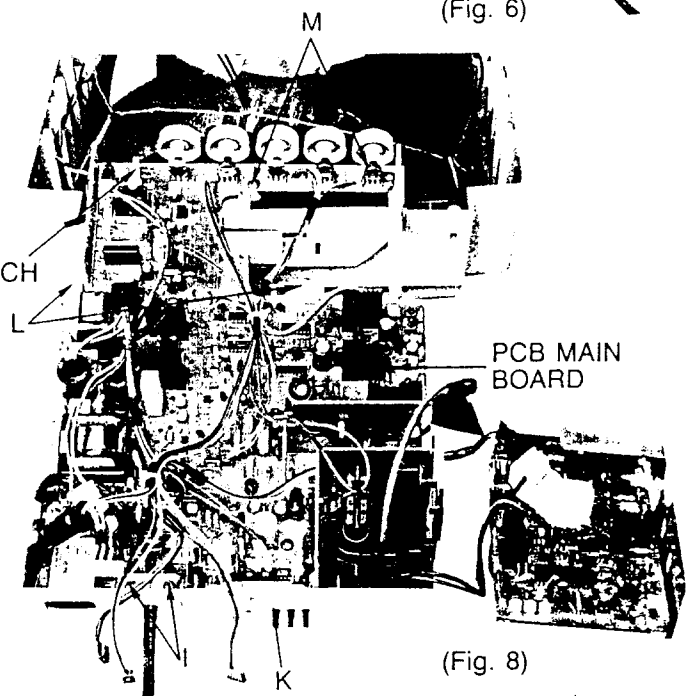
(Fig. 5)



(Fig. 6)



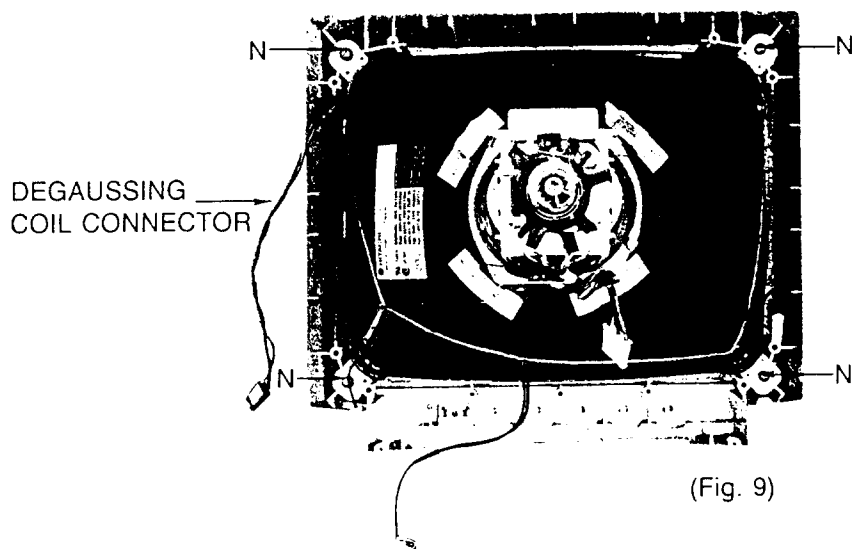
(Fig. 7)



(Fig. 8)

#### <5> CRT REMOVAL (Fig. 9)

- a) CRT is supplied as ITC.
- b) Remove 4 screws (N) from the front cover to move the CRT.
- CAUTION: Do not lift the CRT by the neck.



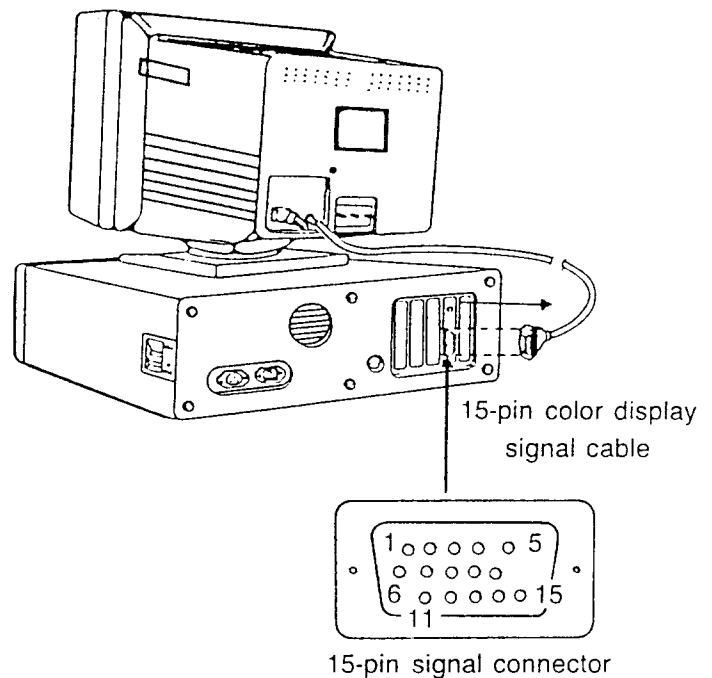
(Fig. 9)

# 5. GENERAL CONNECTION & APPLICATIONS

Procedure for installing and using this Model of Color Display

- <1> Place the display on the desired operating location, plug the power cord into the monitor and then an AC outlet. Be certain that the AC outlet is 100-125 VAC/200~240 VAC.
- <2> The three-wire power cord is provided as a safety precaution as it connects the chassis and cabinet to the electric conduct ground. If the AC outlet in your location does not have provision for the grounded type plug, the installer should attach the proper adapter to ensure a safe ground potential.
- <3> Connect the 15-pin color display shielded signal cable to the video adapter output on your computer and lock both screws on the connector to ensure them grounding. The connector appears as follows:

Pin No	Description
1	Red Signal
2	Green Signal
3	Blue Signal
4	Jumper to Pin 10
5	Self Test
6	Red Return
7	Green Return
8	Blue Return
9	No Pin
10	Digital Ground
11	Jumper to Pin 10
12	No Pin
13	Horizontal Sync.
14	Vertical Sync.
15	No Pin



- <4> Turn on the computer power switch.
- <5> Apply power to the display by turning the color display switch to the "ON" position and allow about thirty seconds for display tube warm up. The normal indicator lights when the display is on. After a two seconds, data should appear on the screen. Adjust the brightness and contrast for the best readability.

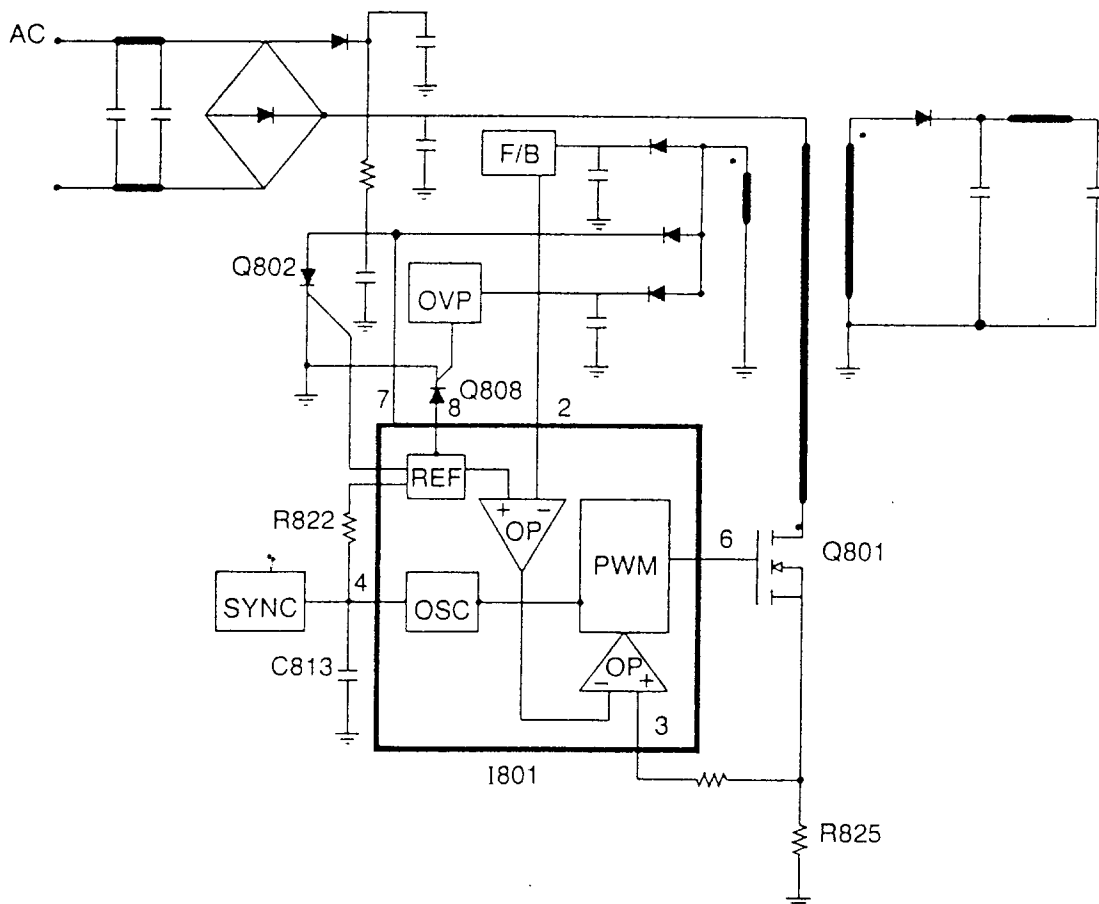
- <6> Adjust the horizontal phase as necessary for proper horizontal display.
- A) The H.Phase 1 control includes all of standard VGA modes (M1, M2 and M3).
  - B) The H.Phase 2 and SUB. H.Phase control super VGA 800 × 600 mode only.
  - C) The H.Phase 3 control 8514/A 1024 × 768 interlace mode only.
- <7> V size can adjust to give you a proportional display height.
- <8> H-width control the horizontal width. If the H-width did not meet your requirement, turn this control continuously until a suitable width is resulted.

If Your Color Display require service, refer to the controls and adjustment information of publication and verify that all controls and adjustment on the display are property set. If your display does require service it must be returned with the power cord.

# 6. ELECTRONIC CIRCUIT DESCRIPTION

## 6-1. SWITCHING MODE POWER SUPPLY (SMPS)

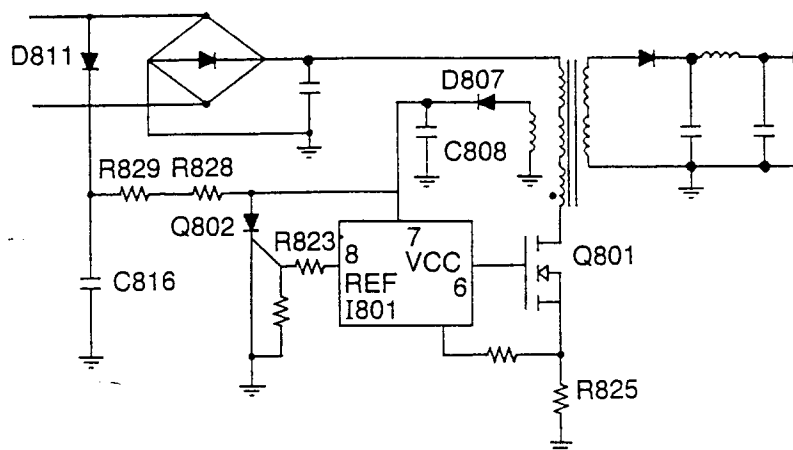
### <1> Circuit Diagram



### <2> Circuit Description

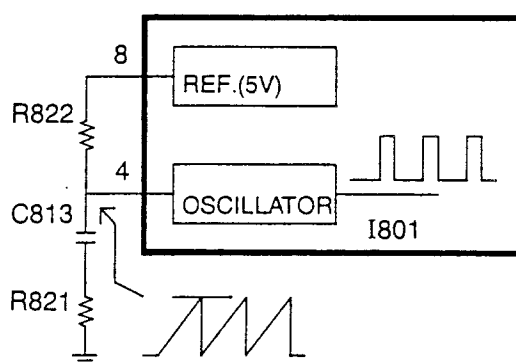
#### 1. Start Circuit

Prior to starting a low current drained from AC line via D811 R828 R829 to pin 7 of I801, it charge the C808. The I801 operates immediately, when C808 voltage over 16V. Then Q802 is triggered by the reference voltage (5v) from pin 8 of I801 at the same time, Q801 turn ON, there is a primary current flow through the primary winding and energy stored in the primary winding. During Q801 turns off, the stored energy transfer to secondary winding, the auxiliary winding is well-coupled and in phase with the secondary winding, it will provide voltage on C808 and supply to pin 7 of I801, to keep I801 working, C808 voltage must be over 10V.



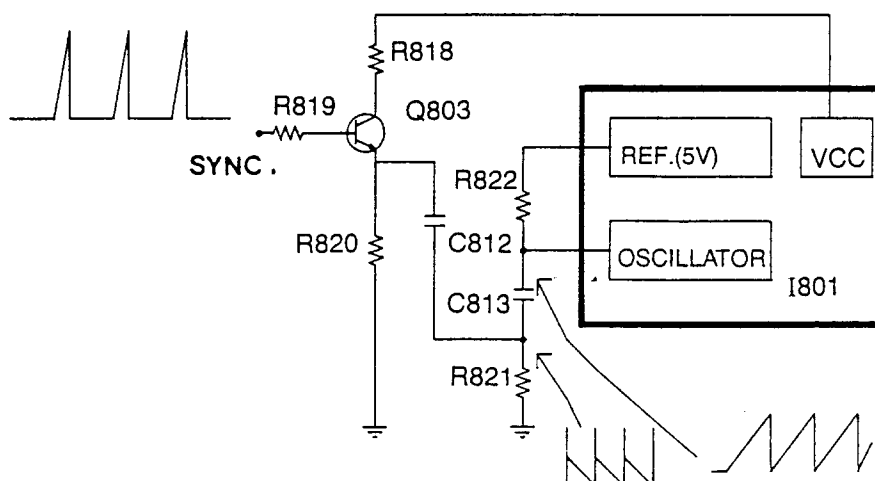
## 2. Sawtooth Oscillator Circuit

The oscillating frequency is around 30KHz, it is determined by the timing components R822 and C813, C813 being charged to 2.8V from the REF. Voltage (5V) through R822, and it discharged to 1.2V. During the discharge time interval. The oscillator generates a series of blanking pulses that causes the low output state (pin 6 of I801).



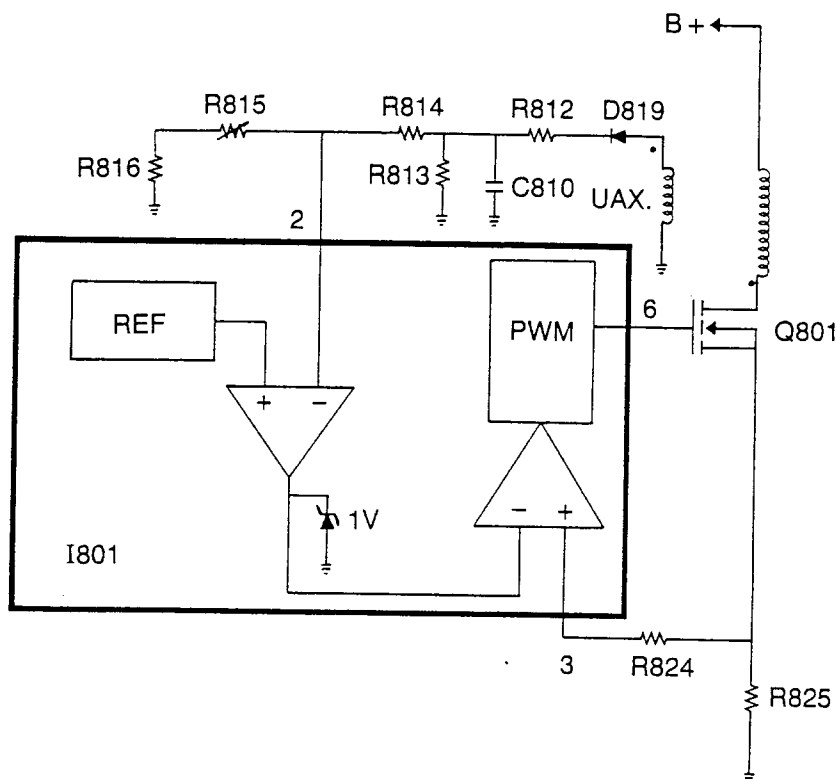
## 3. Synchronization

The oscillating frequency can be synchronized by pulses coupled from flyback transformer of horizontal circuit. The pulse provides a basic current to drive ON Q803, and collector current of Q803 flow to R818, Q803, and R820. The needle-pulse feed to pin 4 of I801, via C812, R821, and C813, so the voltage of C813 being forced to discharge early. This operation makes oscillating frequency in phase with the horizontal frequency.



#### 4. Pulse Width Control

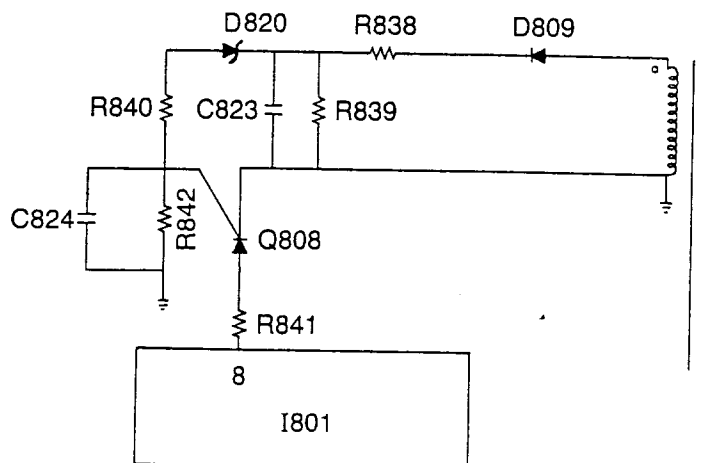
The primary auxiliary winding is well-coupled and in phase with the secondary winding. It supplies the power to pin 7 of I801 and reflects the load and line regulation to pin 2 of I801, via D819, R812 and R814, the voltage ON pin 2 of I801 compares with the internal reference voltage (2.5V), and generates an error voltage to another internal one, the error voltage will compare with the voltage drop of R825 while Q801 turns ON. When the voltage of R825 reached to the error voltage the Q801 turns OFF. Therefore the error voltage can control the duty cycle of PWM to obtain the regulated voltage for outputs.



## 5. Protection Circuit

The power supply has a full protective circuit against output overload, short circuit and over voltage. Once the over load or short circuit occurred at the secondary, the voltage of R825 reaches to 1 Vp-p rapidly. It blocks the power output, so the pin 7 of I801 voltage decreased below 10V, I801 turns OFF. The power circuit shut down and latched by Q802.

On abnormal conditions, if the over voltage presents at auxiliary winding, the zener diode (D820) will be conducted through D809 and R838, the current flows to R840, R842 and then the Q808 is triggered. The voltage ON pin 8 of I801 clamped to low state, I801 turn OFF, the power circuit shut down and latched by Q802.



## 6-2. AUTOMATIC DEGAUSSING CIRCUIT

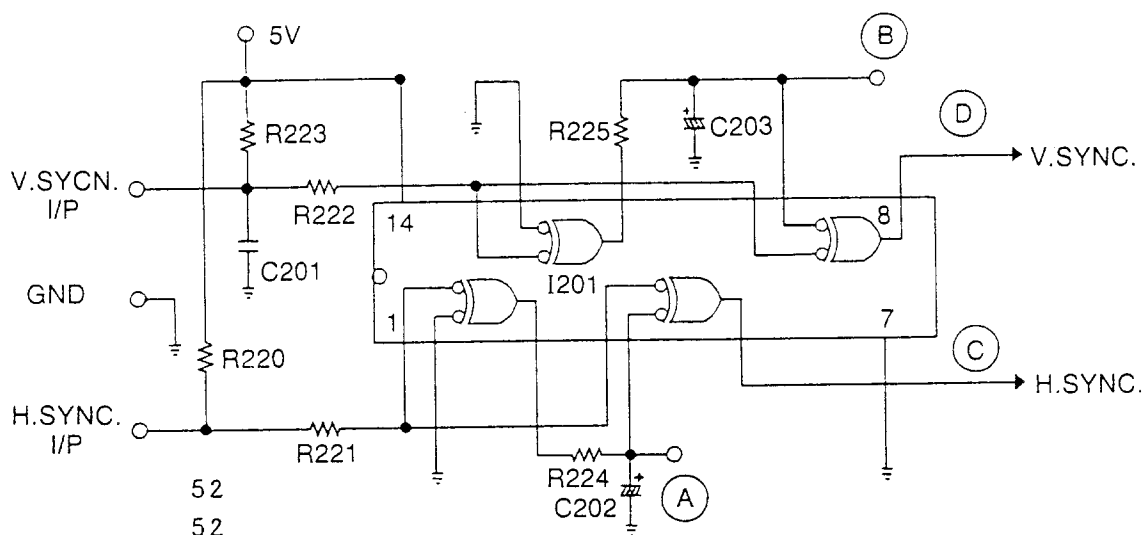
Posistor R803 and degaussing coil compose an automatic degaussing circuit to demagnetic the shadow mask and internal shield in the CRT.

Posistor shows low resistance value ( $20\Omega$ ) in normal temperature, when apply AC line voltage, big current flows into degaussing coil, only few seconds, resistance of posistor increase rapidly due to rising in heat, degaussing current thus decrease to less than 100 mA p-p rapidly, degaussing functions is completed.

## 6-3. MODE CONTROL CIRCUIT

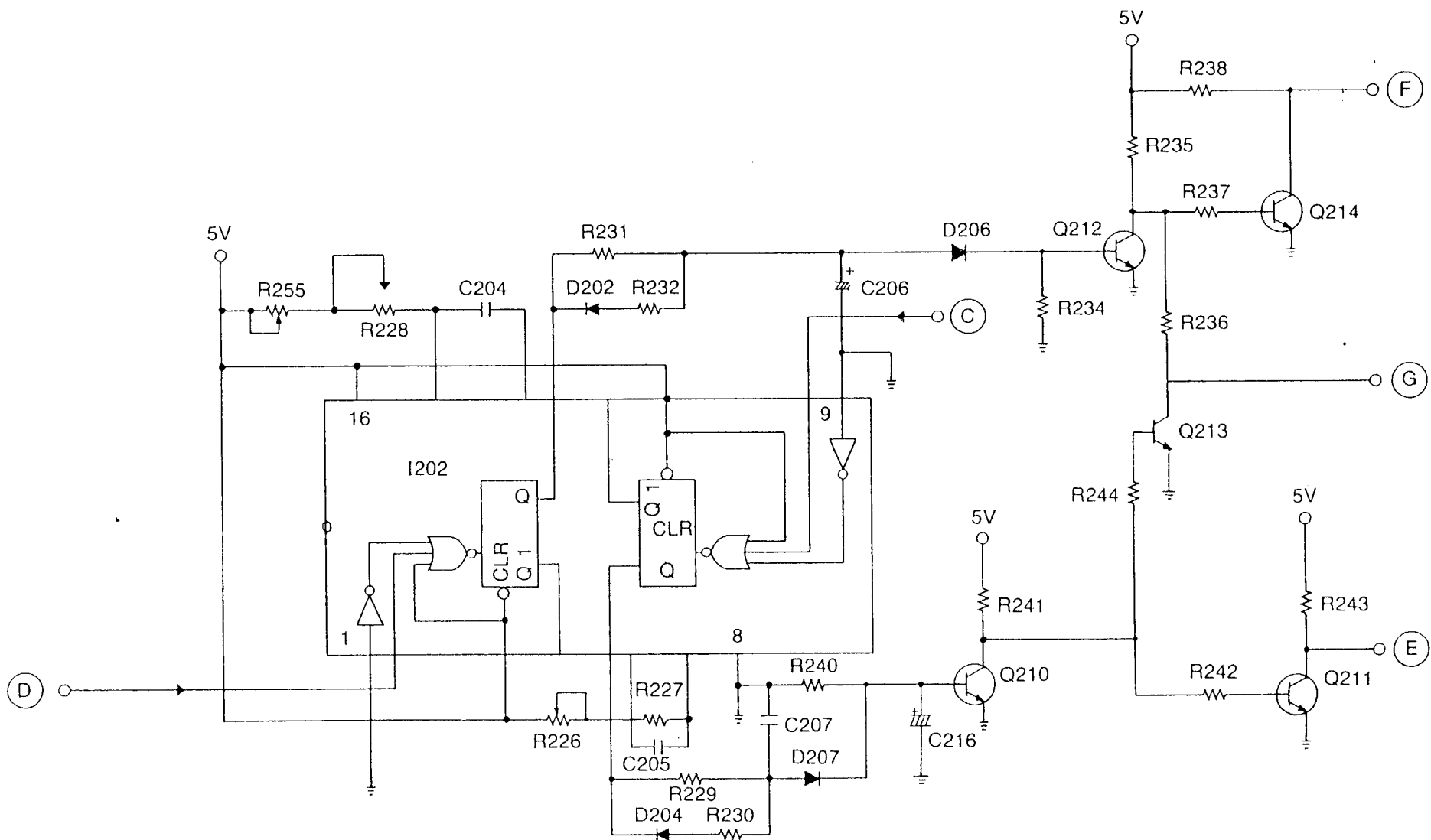
<1> Sync. Control

In spite of the polarities of both horizontal and vertical Sync. pulse, I201 generates the positive Sync. pulse.



	INPUT				OUTPUT			
	fh	fv	H.Sync.	V.Sync.	A	B	C	D
VGA (Mode1)	31.4KHz	70Hz			LOW	HIGH		
VGA (Mode2)	31.47KHz	70Hz			HIGH	LOW		
VGA (Mode3)	31.47KHz	60Hz			HIGH	HIGH		
8514/A (Mode4)	35.52KHz	87Hz			LOW	LOW		
SVGA (Mode5)	35.1-38KHz	55-61Hz	—	—	—	—		





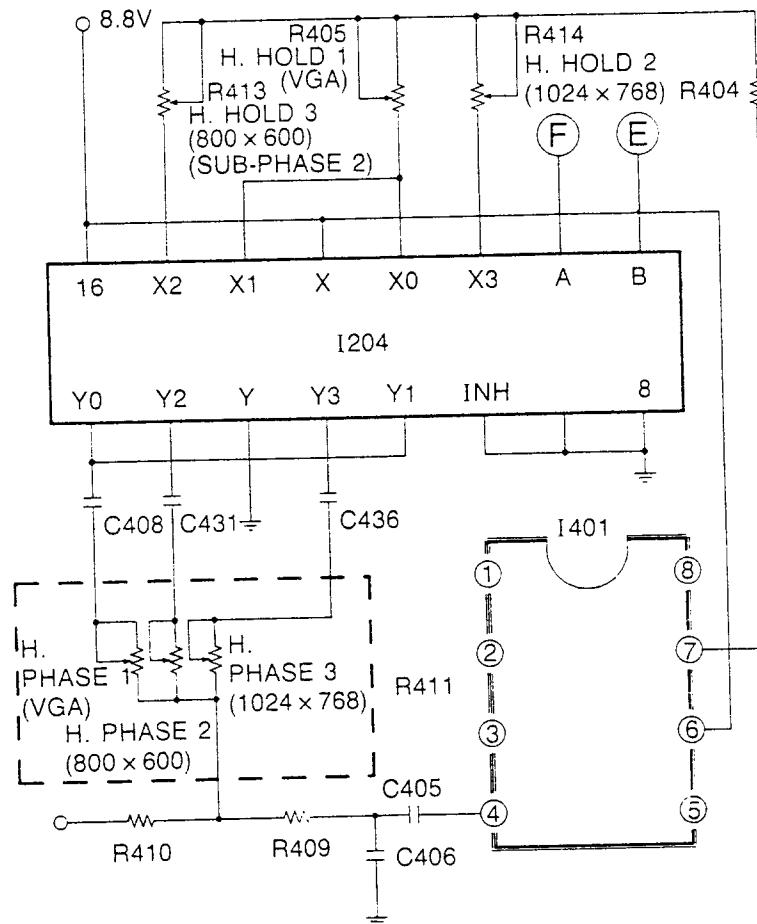
	INPUT				OUTPUT		
	fh	fv	C	D	E	F	G
VGA (Mode1)	31.47KHz	70Hz			0V	0V	0V
VGA (Mode2)	31.47KHz	70Hz			0V	0V	0V
VGA (Mode3)	31.47KHz	60Hz			0V	0V	0V
8514/A (Mode4)	35.52KHz	87Hz			5V	5V	0V
SVGA (Mode5)	35.1-38KHz	55-61Hz			5V	0V	5V

By detecting the Sync. frequency, I202 generates the signal to control the modes of 31K/35K, mode 4 and mode 5.

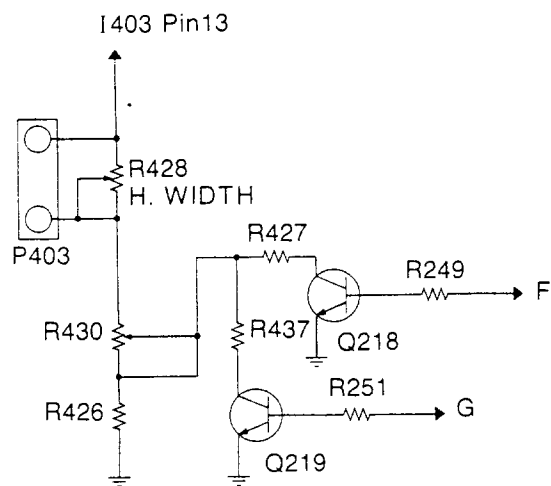
### <3> Horizontal OSC, phase and width control

By use the signal of point E, F and G to control the horizontal OSC, phase and width.

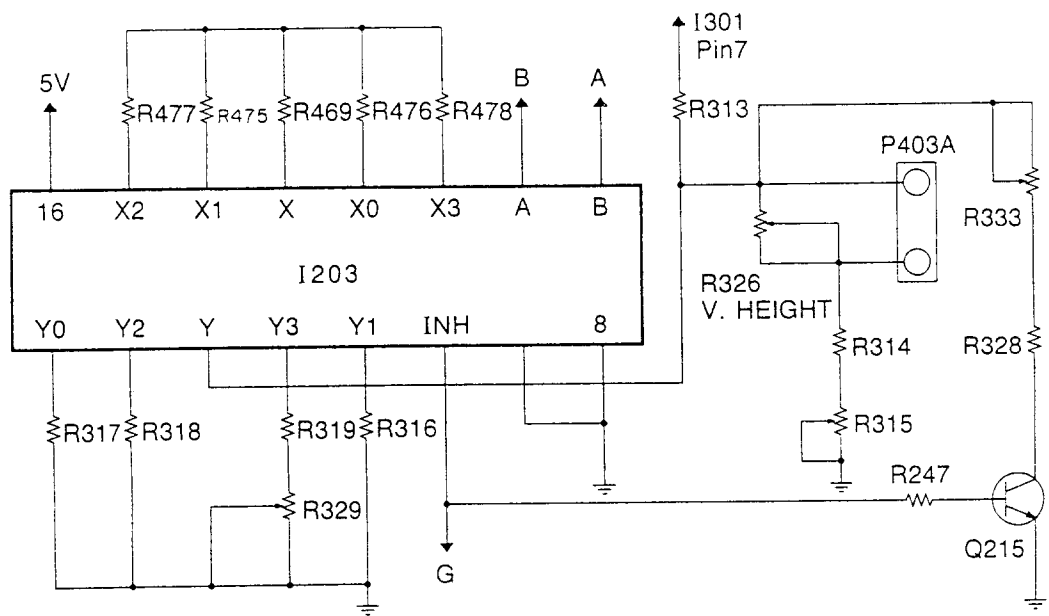
#### 1. OSC and PHASE control



2. WIDTH control



<4> Vertical height and side pincushion correction control by use the signal of points A, B and G to control the vertical height and side pincushion of all modes.



	INPUT			OUTPUT			
	A	B	INHIBIT	X0/Y0	X1/Y1	X2/Y2	X3/Y3
VGA (Mode1)	LOW	HIGH	LOW	OFF	OFF	ON	OFF
VGA (Mode2)	HIGH	LOW	LOW	OFF	ON	OFF	OFF
VGA (Mode3)	HIGH	HIGH	LOW	OFF	OFF	OFF	ON
8514/A (Mode4)	LOW	LOW	LOW	ON	OFF	OFF	OFF
SVGA (Mode5)	—	—	HIGH	OFF	OFF	OFF	OFF

## 6-4. VERTICAL DEFLECTION CIRCUIT

The vertical sync. is applied pin 5 of I301, R302, R304, C310 connected to pin 3, pin 4 and pin 6 determine the freerunning frequency of the oscillator inside I301.

The resistance between pin 7 of I301 and ground defines the current mirror and then the height of the scanning.

Pin 9 of I301 is output of the current mirror that change the series of C305 and C306. This pin is also the input of buffer stage. Pin 10 of I301 is the output of the buffer stage.

Pin 12 of I301 is the inverting input of the amplifier.

R307 and R310 define the DC level across C309, so allowing a correct centering of the output voltage.

R308 and C308 in conjunction with R307 and R310, applied at the feedback input pin 12 of I301, a small part of the parabola, available across C309, and the AC feedback voltage, taken across R312. R305 and R310 produce the linearity correction on the output scanning currently.

The output of power amplifier from the pin 1 of I301 drives the vertical deflection yoke by a negative slope current ramp, R309 and C307 are used to stabilize the power amplifier.

The supply voltage of the power output stage is forced at pin 2. During the trace time the supply voltage is obtained from the main supply voltage by D301, while during the retrace time this pin is supplied from the internal flyback generator.

Pin 15 is the output of the flyback generator that, when driven, jumps from low to high condition.

An external capacitor C302 transfers the jump to pin 2.

Pin 13 is the output of the vertical blanking pulse. This blanking pulse width control by R303.

Pin 14 is the main supply voltage input.

## 6-5. HORIZONTAL DEFLECTION CIRCUIT

The positive horizontal sync. pulse from pin 6 of I201 is converted and amplified by Q407. Then be applied through the differential circuit C407/R408 to pin 3 of the horizontal IC I401.

The positive horizontal flyback pulse derived from C414 (collector pulse of Q403) is integrated by the comparable sawtooth-waveform generator which is composed of R410, R411, C408, C409, and C406, then be applied via C405 to pin 4 of I401.

The discriminator inside the IC I401 detects the phase difference between the sync. input from pin 3 and the sawtooth-waveform from pin 4, the superimposed pulse output from pin 5 of I401 is integrated by the low-pass-filter R407, C404 and C403, AFC voltage is obtained and applied via R406 to pin 7 of I401, thereby controlling the oscillator.

The oscillator inside IC I401 is an RC type with pin 7 used to control the timing. R404, R405, R417 and C402 altogether determine the horizontal oscillating frequency.

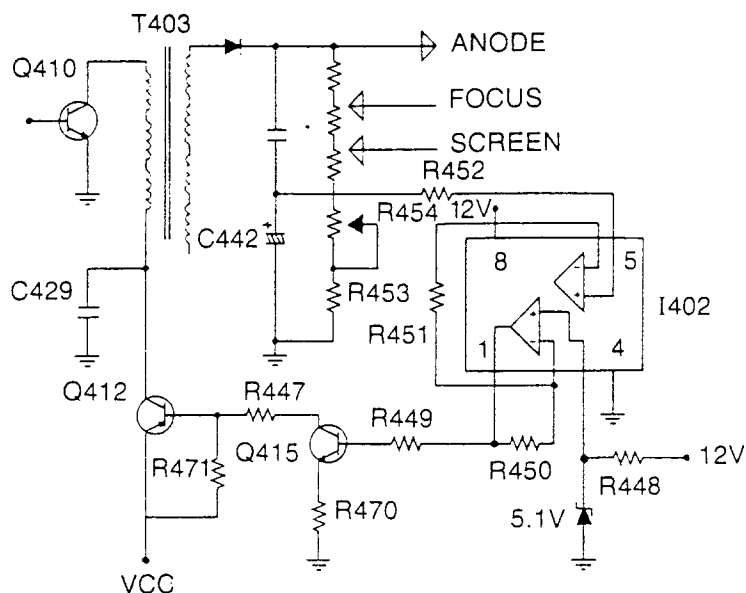
The predriver output of I401 is at pin 1 of which duty cycle is controlled by R402 and R403 at pin 8 of I401.

Regulated voltage applied at pin 6 of I401 is about 8-9 volts.

The output signal from pin 1 of I401 is then amplified by Q402 and coupled by T401 to the horizontal output stage Q403 for ON-OFF control, thus sawtooth-waveform current through the horizontal deflection coil is obtained.

Also from pin 1 of I401 is amplified by Q409 and coupled by T402 to the output stage Q410 for ON-OFF control. During the retrace time, a flyback pulse of about 700 volts is produced at the collector of Q410, this pulse is transferred and rectified by the FBT (T403) to obtain a high voltage of about 23.5KV for anode of CRT.

## 6-6. HIGH VOLTAGE REGULATION CIRCUIT



By detecting the voltage that separated from focus resistor, and applied to I402. To compare with the reference voltage 5.1V, it was amplified by OP Amplifier, then via Q415 and Q412 to control the voltage that applied to the primary coil of FBT for keep the constant H.V.

## 6-7. SIDE PINCUSHION CORRECTION CIRCUIT

The vertical sawtooth waveform from R312 is integrated by C315, R442, R432 and C421 to produce a parabolic waveform. This parabolic voltage is amplified by I403 (OP Amplifier), then via Q404 and Q405 to correct side pincushion.

## 6-8. VIDEO CIRCUIT

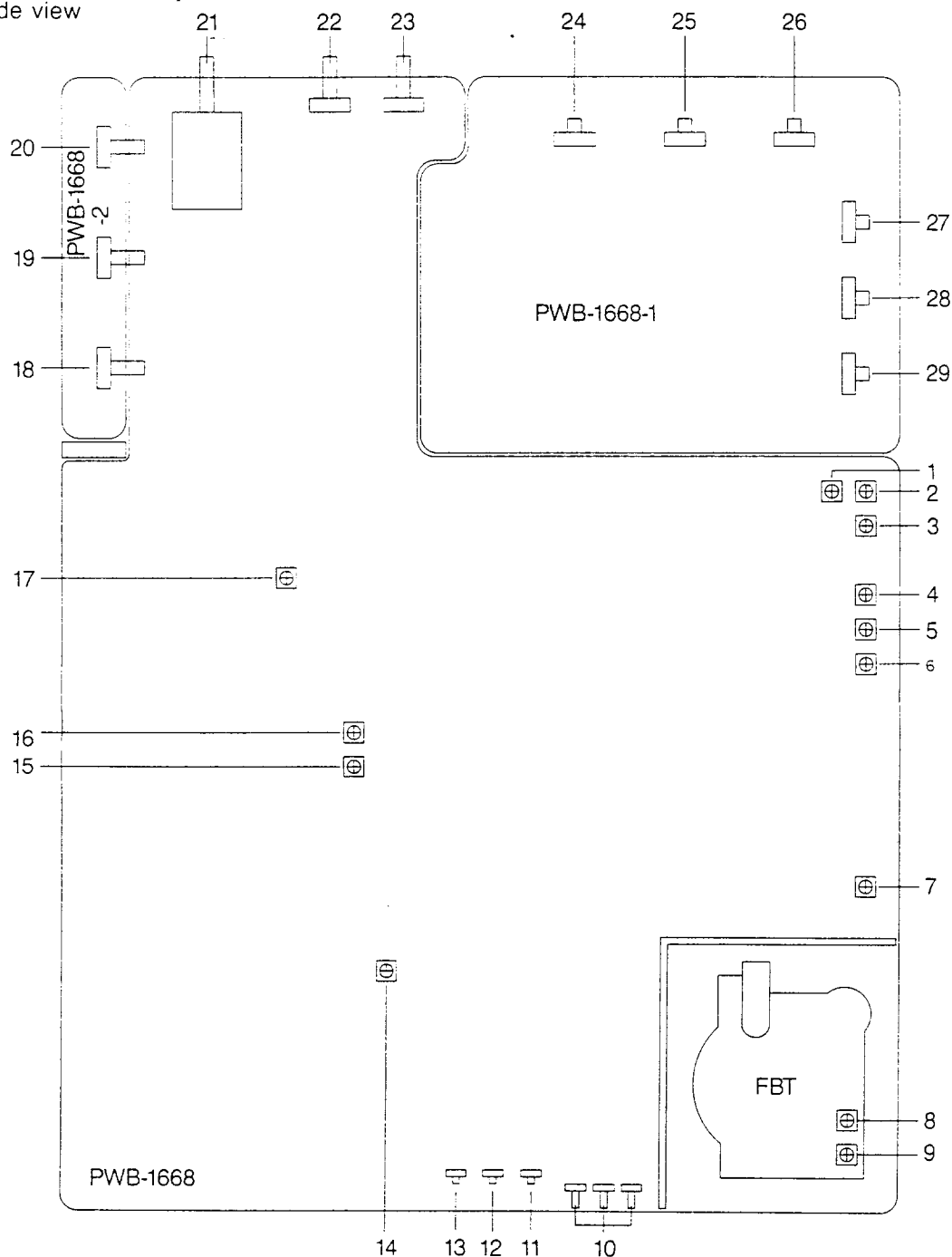
Video amplifier consists of preamplifier (LM1203) output stage, buffer stage and cutoff adjustment circuit.

To adjust the R910, R940 and R970 to control the DC level of cathode. R502, R532 and R562 are used to control the gain of signal.

# 7. ADJUSTMENT

## Service Adjustment Control Locations

Parts side view



1. V. HEIGHT 5 (R333)	11. H. HOLD 3 (R413)	21. ON/OFF SWITCH (S801)
2. V. HEIGHT 3 (R329)	12. H. HOLD 1 (R405)	22. CONTRAST (R590)
3. V. HEIGHT 1 (R315)	13. H. HOLD 2 (R414)	23. BRIGHTNESS (R950)
4. V. LIN. (R311)	14. H. WIDTH ADJ. (R430)	24. B-CUTOFF (R970)
5. V. HOLD (R304)	15. 31 KHz/35 KHz (R228)	25. R-CUTOFF (R910)
6. DPC. ADJ. (R434)	16. 60 Hz/86 Hz (R255)	26. G-CUTOFF (R940)
7. HV. ADJ. (R454)	17. B+ ADJ. (R815)	27. R-DRIVE (R502)
8. FOCUS	18. H. WIDTH (R428)	28. G-DRIVE (R532)
9. SCREEN (G2)	19. V. HEIGHT (R326)	29. B-DRIVE (R562)
10. H. PHASE 1,2,3, (R411)	20. V. CENTER (R324)	

### 7-1. B+ VOLTAGE OUTPUT ADJUSTMENT

- Apply a VGA signal with full white pattern to the unit.
- Apply 120V AC to the unit.
- Turn the brightness VR R950 to its center position. Turn the contrast VR R590 control fully clockwise at Max. position.
- Connect a digital voltage between D812 cathode and ground.
- Turn the unit on.
- Adjust R815 (B+ ADJ) to  $88V \pm 1V$ .
- Confirm the voltage across C822 is  $105V \pm 2V$ .
- Confirm the voltage across C819 is  $19.3V \pm 1V$ .
- Confirm the voltage across C818 is  $6.2V \pm 0.3V$ .

### 7-2. H, HOLD 1, 2 AND 3 ADJUSTMENT

- Apply a VGA, 8514/A (1024 × 768) and Super VGA (800 × 600) signal to the unit.
- Connect a jump lead from Q407 collector to ground.
- Adjust R405 (H. Hold 1 for VGA mode), R414 (H. Hold 2 for 8514/A mode 1024 × 768) and R413 (H. Hold 3 for super VGA 800 × 600 mode) to obtain a stable picture.
- Remove the jump lead from Q407 collector.

### 7-3. H. PHASE ADJUSTMENT

- Apply a VGA, 8514/A (1024 × 768) and Super VGA (800 × 600) signal to the unit.
- Adjust R411 (H. PHASE 1 for VGA, H. Phase 2 for Super-VGA and H. Phase 3 for 8514/A) to move the data area to the center of the screen.
- Adjust R413 (Sub. H. Phase 2) to move the data area if necessary.

### 7-4. HIGH VOLTAGE ADJUSTMENT

- Apply a VGA signal with full white pattern to the unit.
- Turn the brightness VR R950 control fully counter-clockwise at Min. position.
- To measure the high voltage. Use a high impedance high voltage meter.
- Adjust R454 (H.V. ADJ) to set the high voltage to  $23.5 KV \pm 0.5 KV$ .

### 7-5. H.31KHZ/35KHZ CONTROL ADJUSTMENT

- Apply a VGA signal to the unit.
- Use a oscilloscope to test the pulse that between D202 cathode and ground.
- Adjust R228 (H. 31KHZ/35KHZ ADJ) to set the width of the pulse T is  $2.2\mu s \pm 0.2\mu s$ . (Figure 7-2)

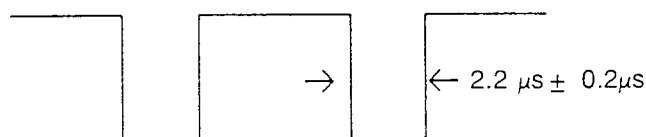


Figure 7-2

### 7-6. V. 56HZ/86HZ CONTROL ADJUSTMENT

- Apply a VGA 70Hz signal (M1 or M2) to the unit.
- To use a oscilloscope to test the pulse that between D204 cathode and ground.
- Adjust R255 to set the width of the pulse T is 1.2~1.5ms (Figure 7-2).

### 7-7. H. WIDTH ADJUSTMENT

- Set the VR R428 (H.WIDTH) that on front cover to the center detent point.
- Apply a VGA signal to the unit.
- Adjust R430 (H. Width) to set the horizontal width of the data area is 246mm.

## 7-8. V. LINEARITY ADJUSTMENT

- Apply a VGA signal with cross hatch pattern to the unit.
- Adjust R311 (V.LIN) to equal the length of A and B.

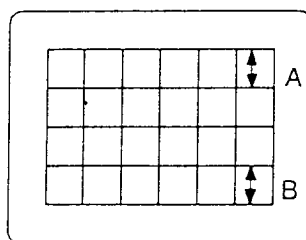


Figure 7-3

## 7-9. V.HEIGHT ADJUSTMENT

- Set the VR R326 (V.Height) that on front cover to the center detent point.
- Apply a VGA and Super VGA (800 x 600) signal.
- Adjust R315 (V.Height 1) to the height of VGA mode 1 be 185mm, then adjust R329 to the height of VGA mode 3 be 185mm and then adjust R333 to the height of Super-VGA be 185mm.

## 7-10. PINCUSHION ADJUSTMENT

- Apply a VGA signal with cross hatch pattern to the unit.
- Adjust R434 (PINCUSHION) to correct the side pincushion correction.
- Ensure that no barrel distortion occurs because of the adjustment.

## 7-11. V.CENTER ADJUSTMENT

- Apply a VGA signal with cross hatch pattern to the unit.
- Adjust R324 (V.CENTER) to set the data area to the vertical center.

## 7-12. V.HOLD ADJUSTMENT

- Apply a 8514/A signal to the unit.
- Adjust R304 (V.HOLD) until the display stabilizes.

## 7-13. FOCUS ADJUSTMENT

- Apply a VGA signal with cross hatch pattern to the unit.
- Adjust the focus VR located at the high voltage resistor block until the display has the best overall focus.

## 7-14. White Balance Adjustment

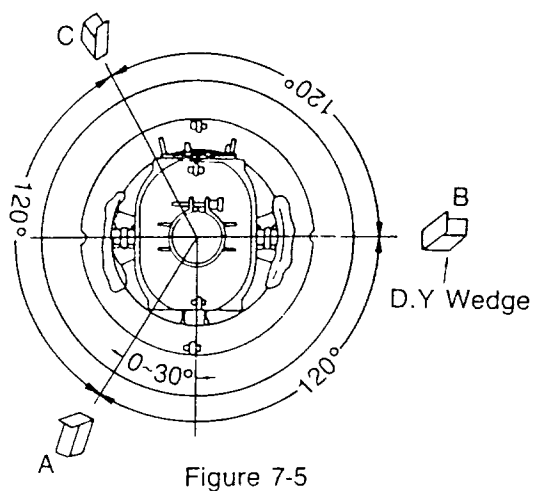
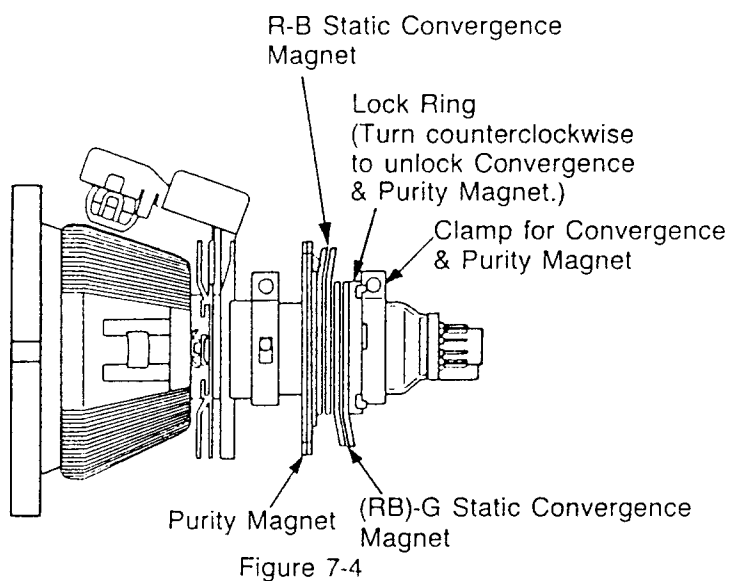
- Apply no signal to the unit.
- Turn the Brightness VR R950 control fully clockwise at max. position.
- Turn VR R910 (R.CUT OFF), R940 (G.CUT OFF), R970 (B.CUT OFF) to 45° position
- Adjust G2 VR to 0.8~1.2 FL.
- Use the color Analyzer. Adjust the R910 (R.CUT OFF) and 970 (B.CUT OFF) until the following display data has obtained:  $X = 0.281$   $Y = 0.311$ .
- Use signal 50mm x 50mm green only pattern to the unit.
- Turn the brightness VR R950 to the center detent position. Turn the contrast VR R590 control fully clockwise at max. position.
- Use the color Analyzer. Adjust the R532 (G.DRIVE) to 30 FL.
- Use signal 50mm x 50mm white pattern to the unit.
- Turn the contrast VR R590 to 15FL.
- Use the color Analyzer. Adjust the R502 (R.DRIVE) and R562 (B.DRIVE) until the following display data has been obtained:  $X = 0.281$   $Y = 0.311$ .



## 7-15. CONVERGENCE ADJUSTMENT

Note: Before adjustment convergence the vertical size, linearity and focus adjustment must be completed.

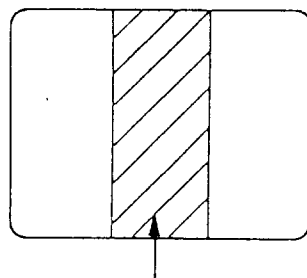
- a) Apply a VGA signal with crosshatch pattern to the unit.
- b) The brightness level should be no higher than necessary to obtain a clear pattern.
- c) Loosen the convergence magnet lock ring converge the red and blue lines at the center of the screen. By rotating the R-B Static Convergence Magnet.
- d) Align the converged red/blue lines with the green lines at the center of the screen by rotating the (RB)-G Static Convergence Magnet. (See figure 7-4)
- e) Tighten the convergence magnet lock ring.
- f) Remove the DY wedges (See figure 7-5) and slightly tilt (do not rotate) the deflection yoke horizontally and vertically to obtain good overall convergence.
- g) Secure the deflection yoke by reinserting the wedges. (See figure 7-5)
- h) If purity error is found, repeat the purity adjustments.



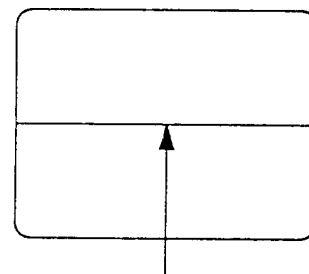
## 7-16. COLOR PURITY ADJUSTMENT

- a) Operate the display for 20 minutes. With the Bright control at max. position to warm up the CRT.
  - b) Degauss the display fully by using an external degaussing coil.
  - c) Roughly adjust convergence.
  - d) Apply a VGA signal with white pattern to the unit.
  - e) Turn red and blue Cut Off controls fully counterclockwise to obtain a green field.  
Adjust Drive controls if green field is not obtained.
  - f) Loosen the deflection yoke clamp screw and move the deflection yoke as close to the purity magnet as possible.
  - g) Loosen the purity magnet lock ring (See figure 7-4) and adjust the purity magnet to set the vertical green raster precisely at the center of the screen. (See figure 7-6) Then tighten the lock ring.
  - h) Slowly move the deflection yoke forward and adjust for the best overall green screen.
  - i) Tighten the deflection yoke clamp screw.
  - j) Produce the blue and red raster by Cut Off controls and observe that good purity is obtained on the respective field.
  - k) Observe that a uniform white raster is obtained by adjusting R.B Cut Off controls. If screen is not uniformly white. Repeat above procedure.
- Note: Purity correction magnet may be effective to control purity slightly.

\* "15. Convergence Adjustment" and "16. Color Purity Adjustment" are not necessary when the CRT is replaced as ITC.



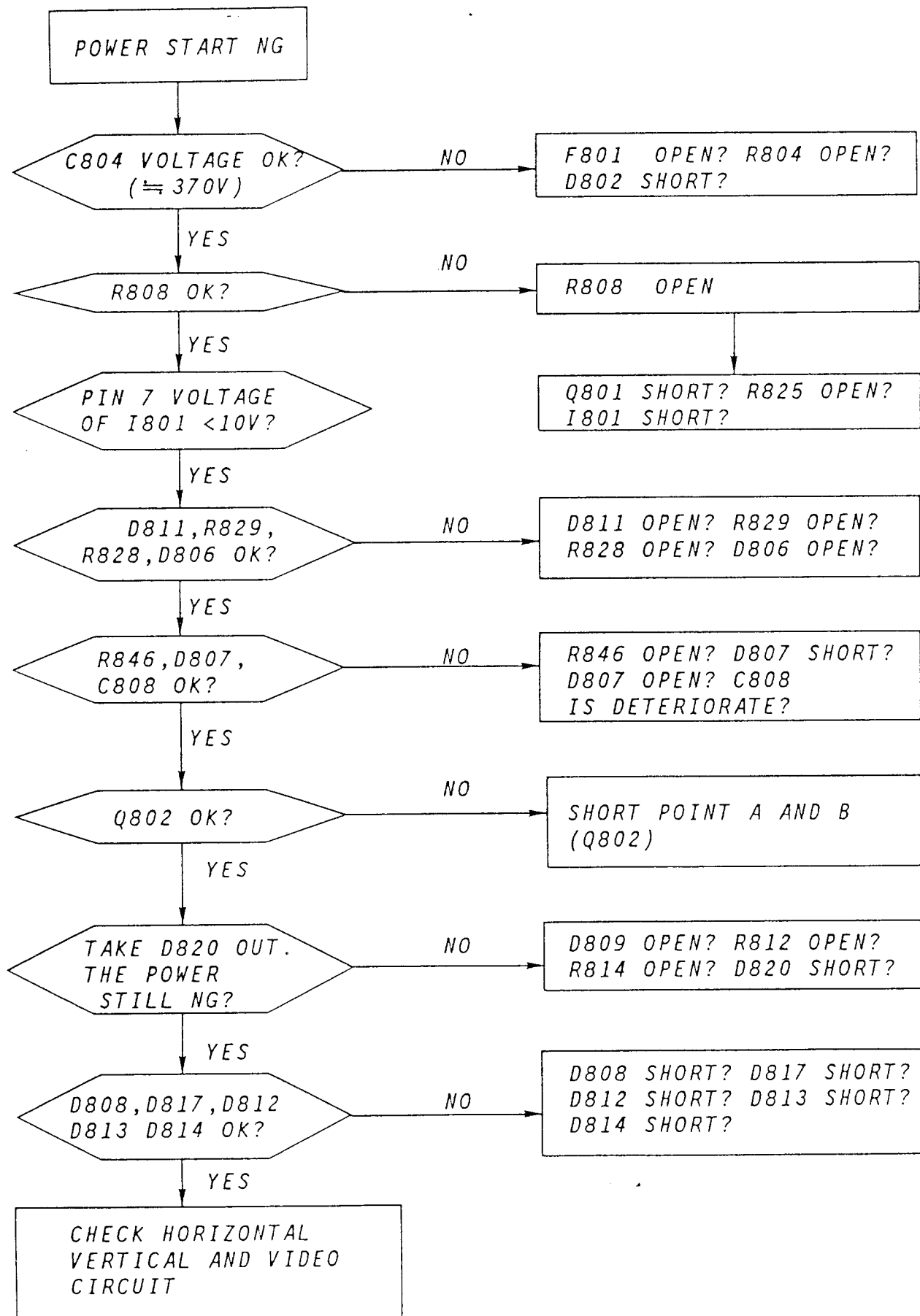
Green Raster  
Figure 7-6



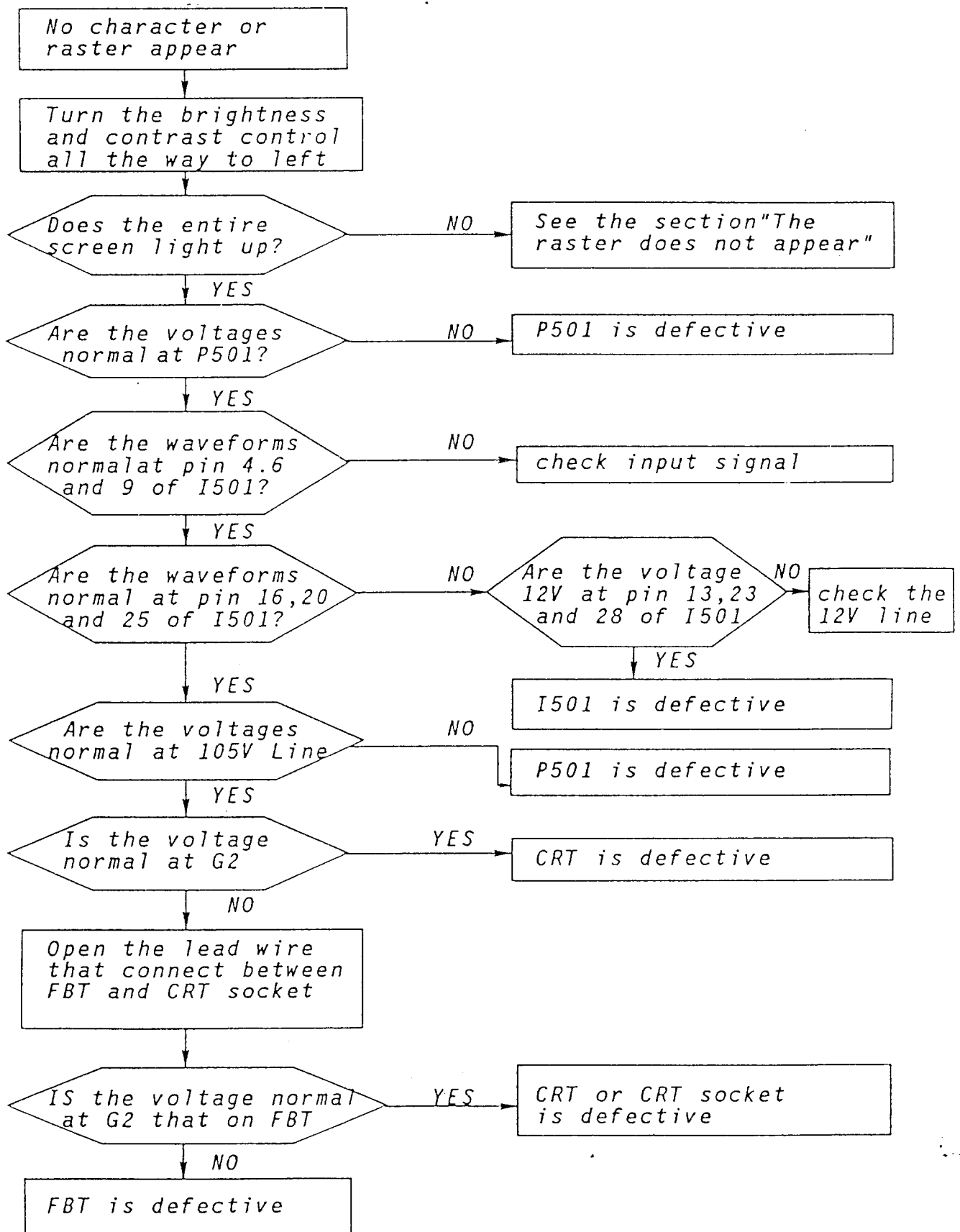
Horizontal Line  
Figure 7-7

# 8. TROUBLESHOOTING FLOW CHART

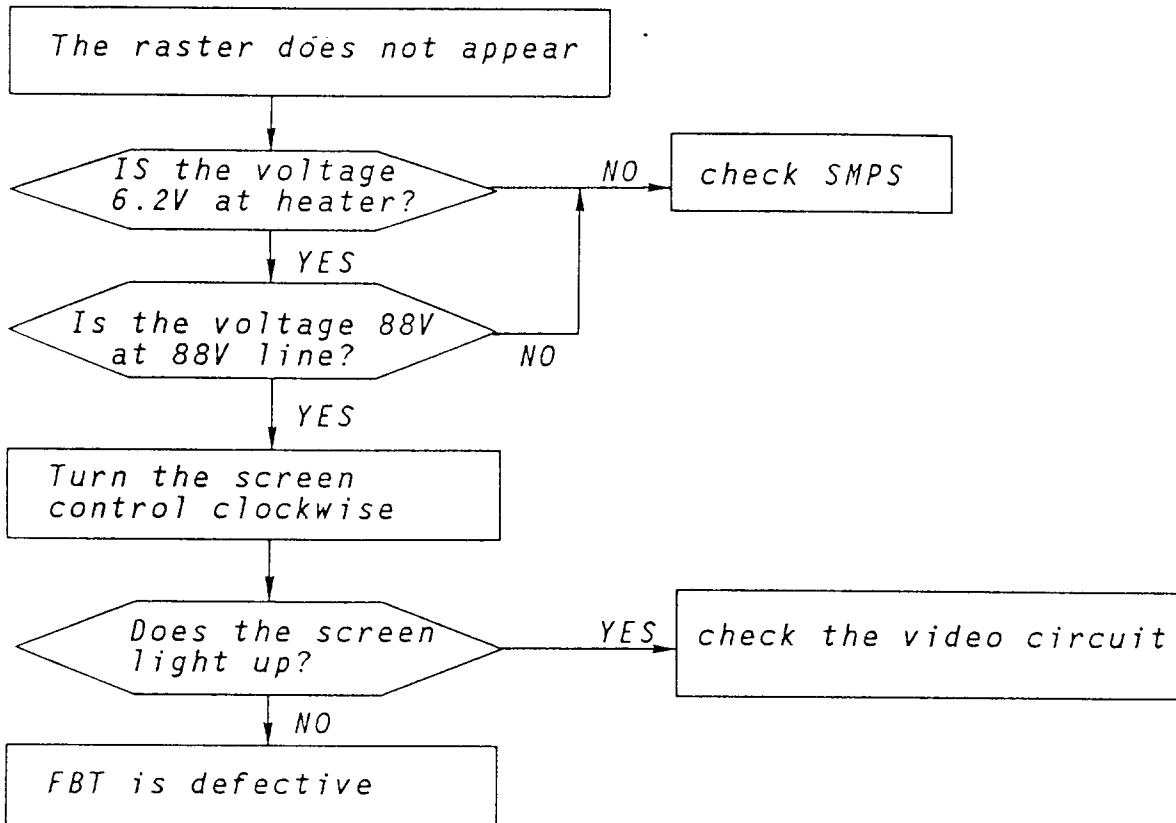
(1)



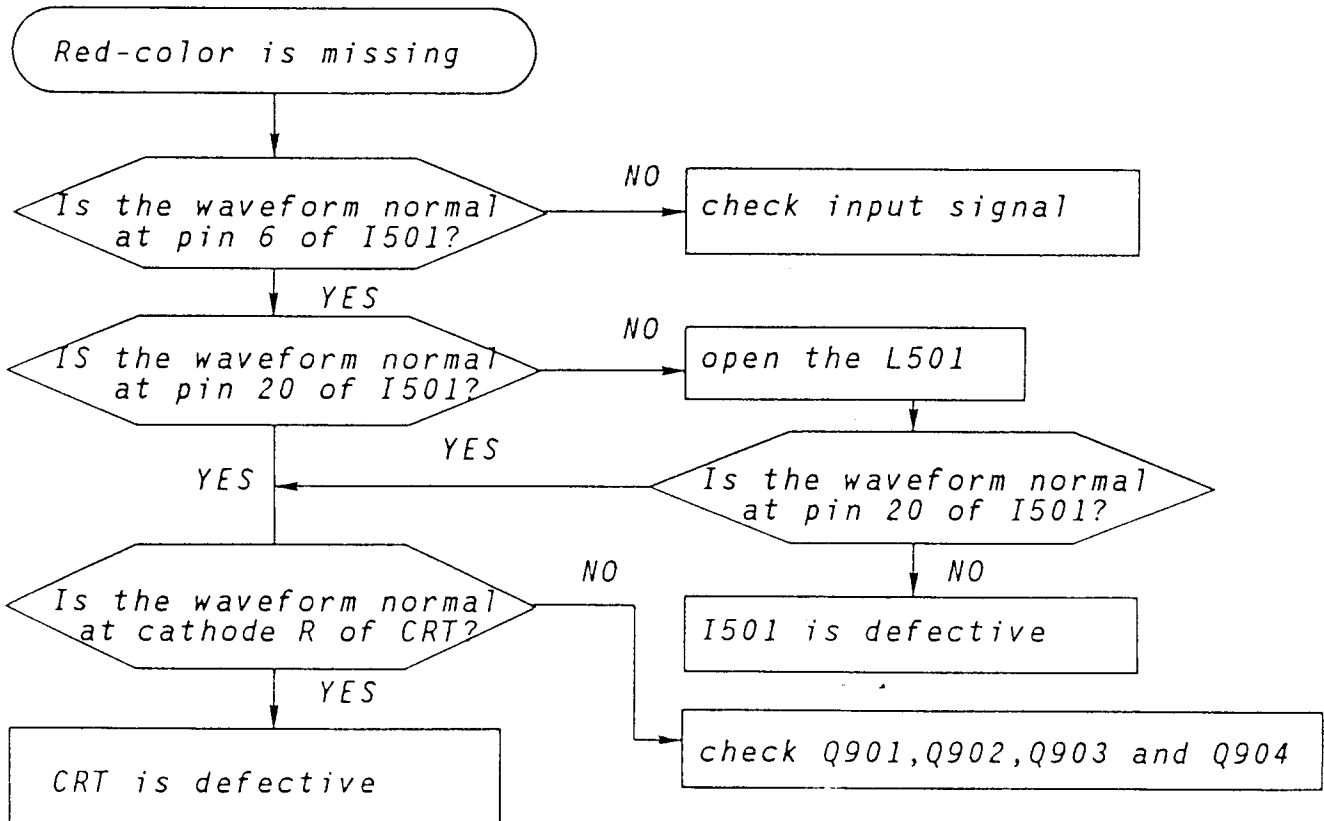
( 2 )



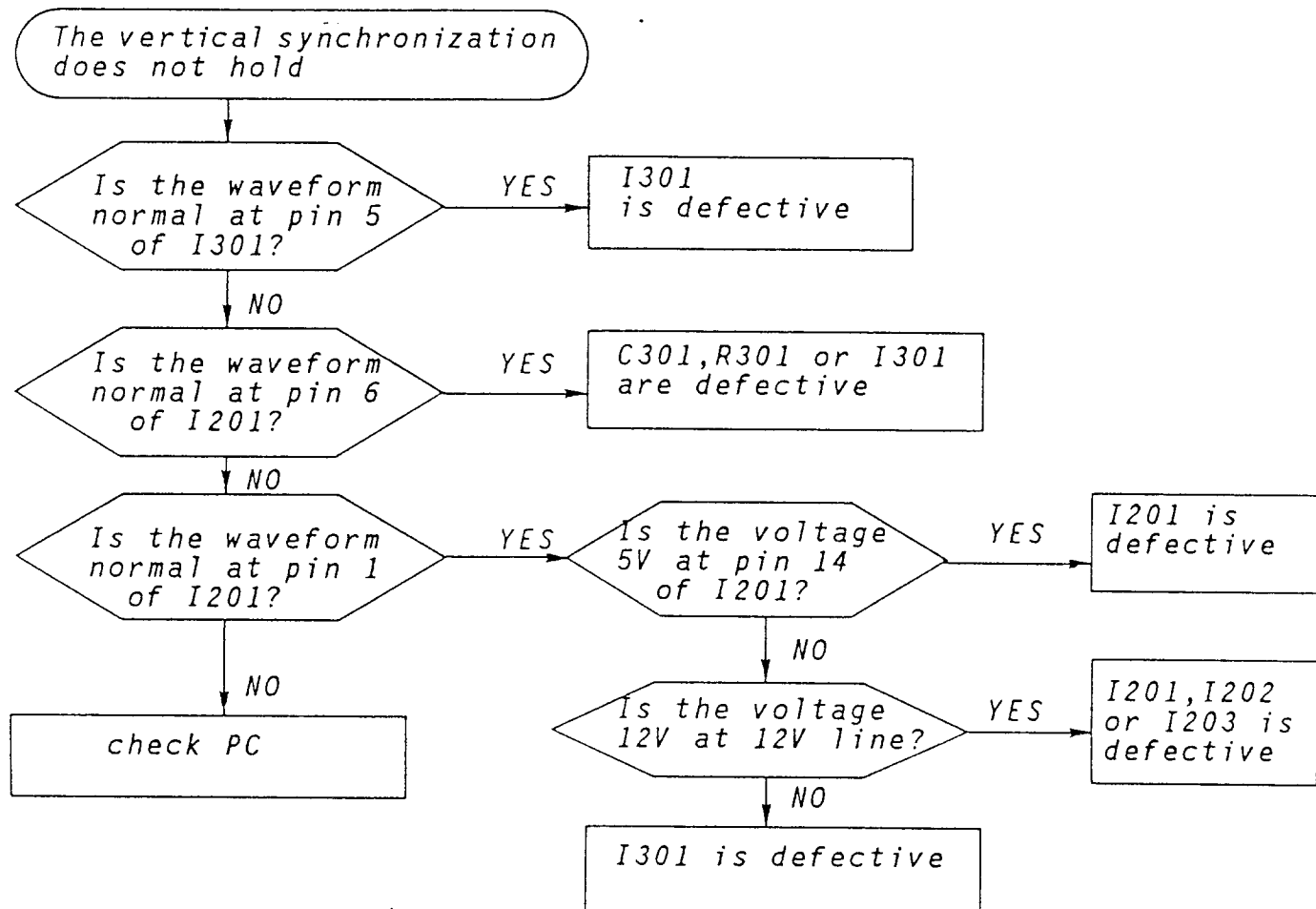
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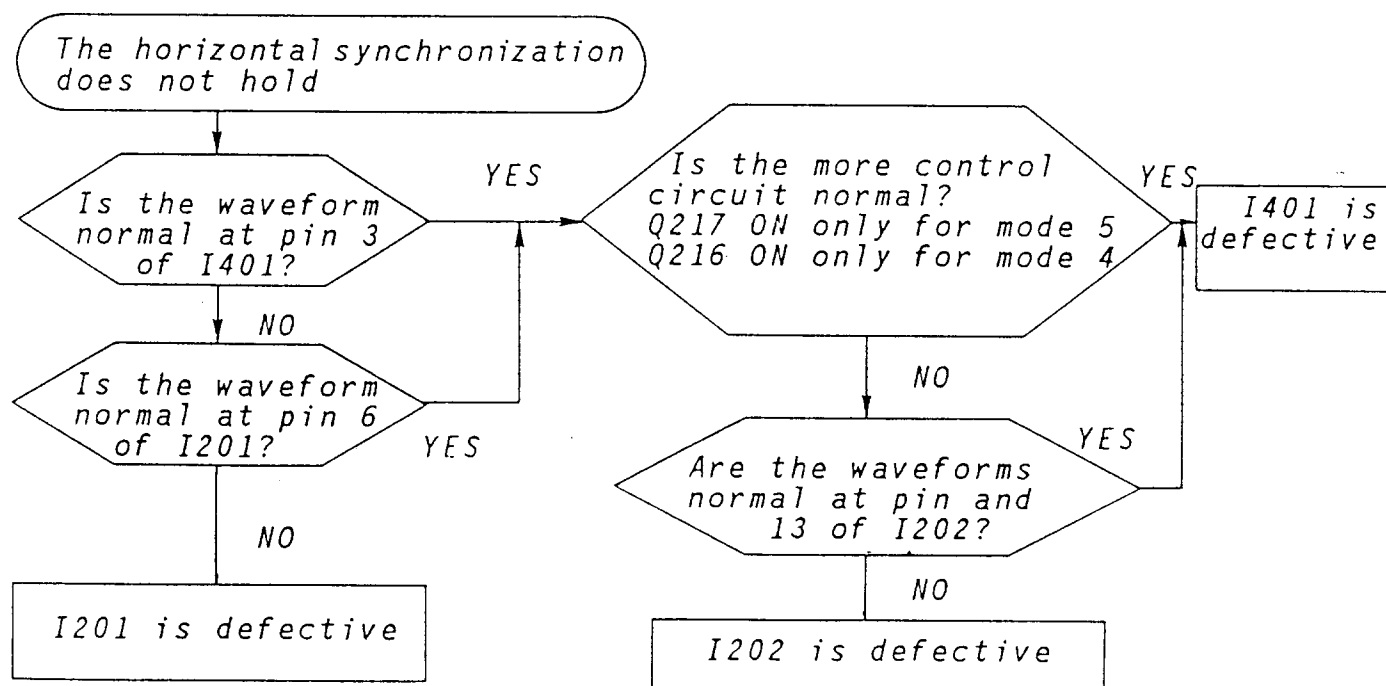
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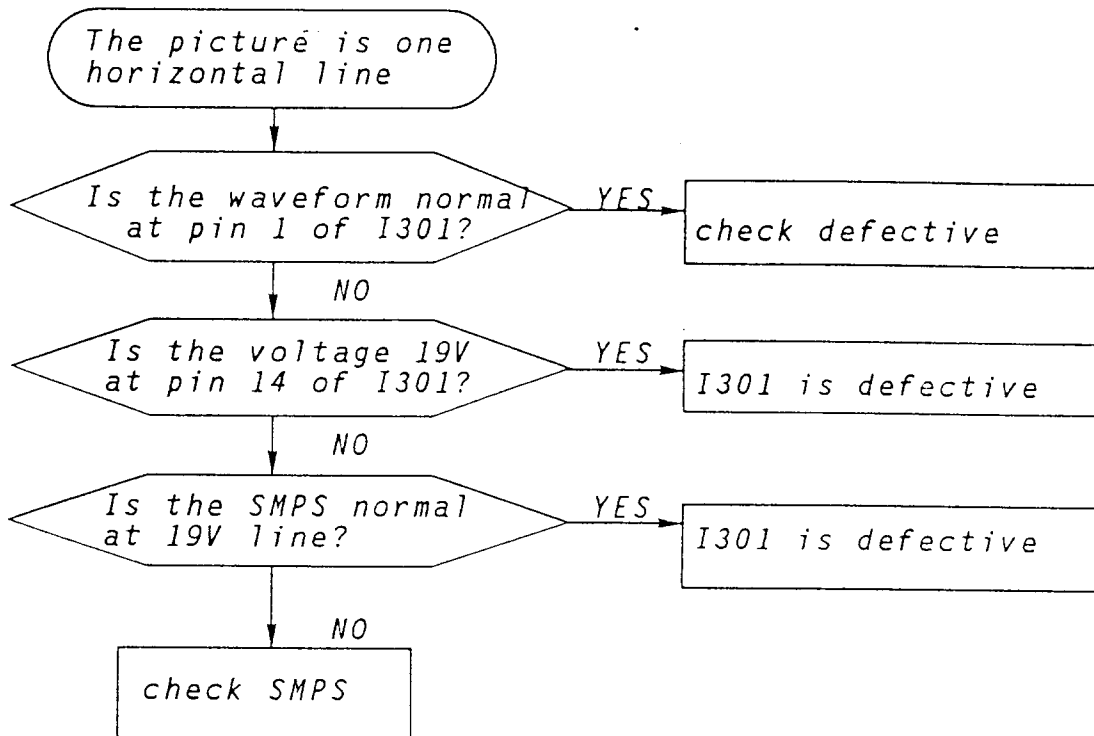
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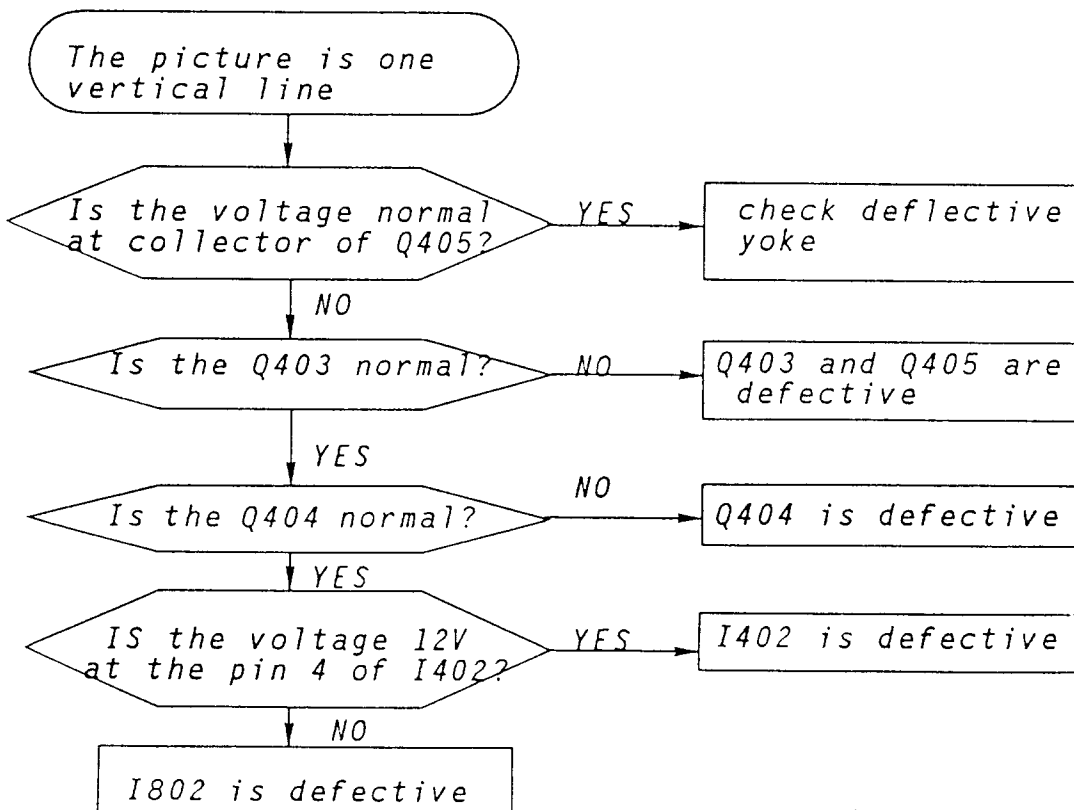
( 6 )



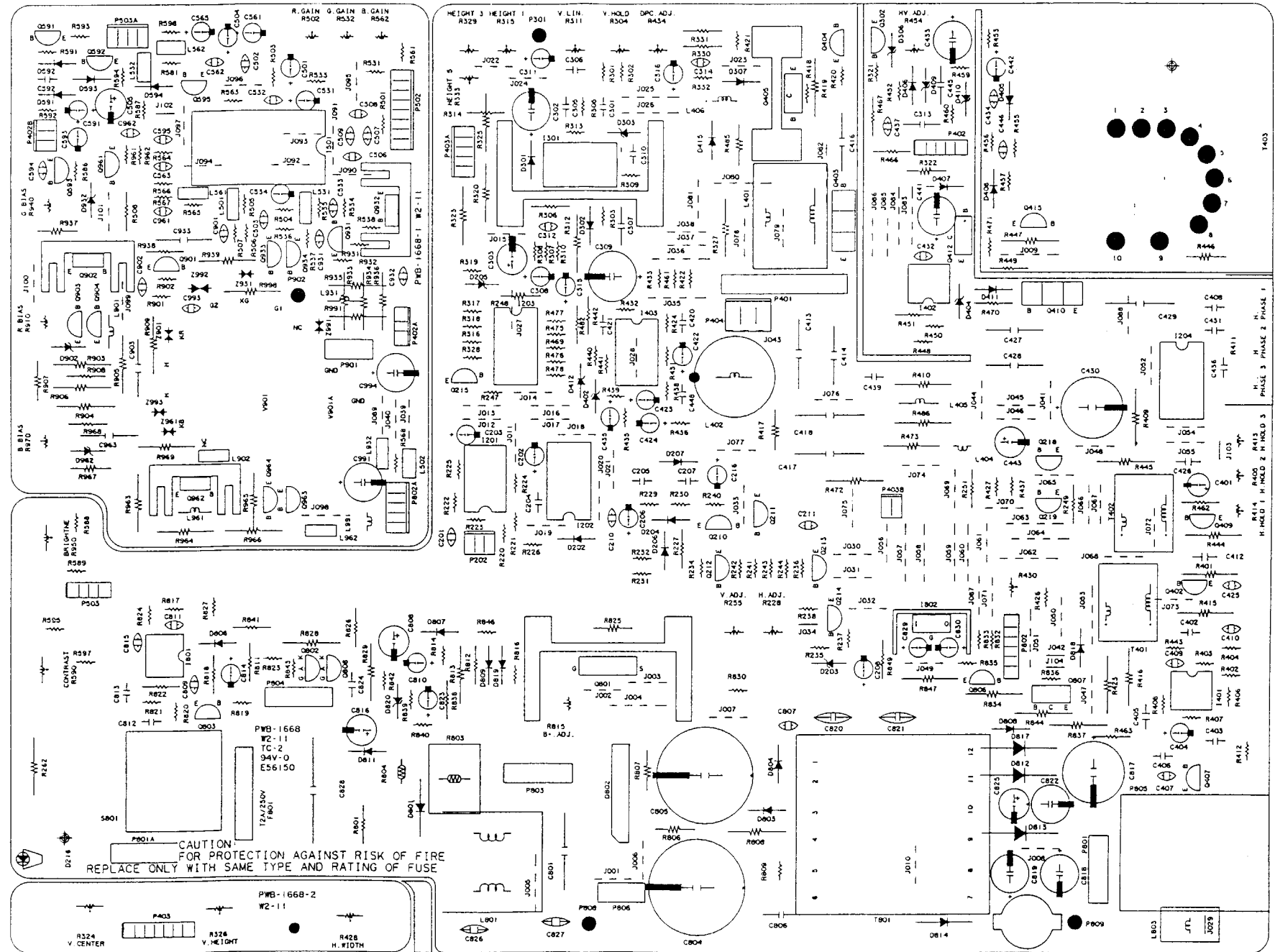
(7)



(8)

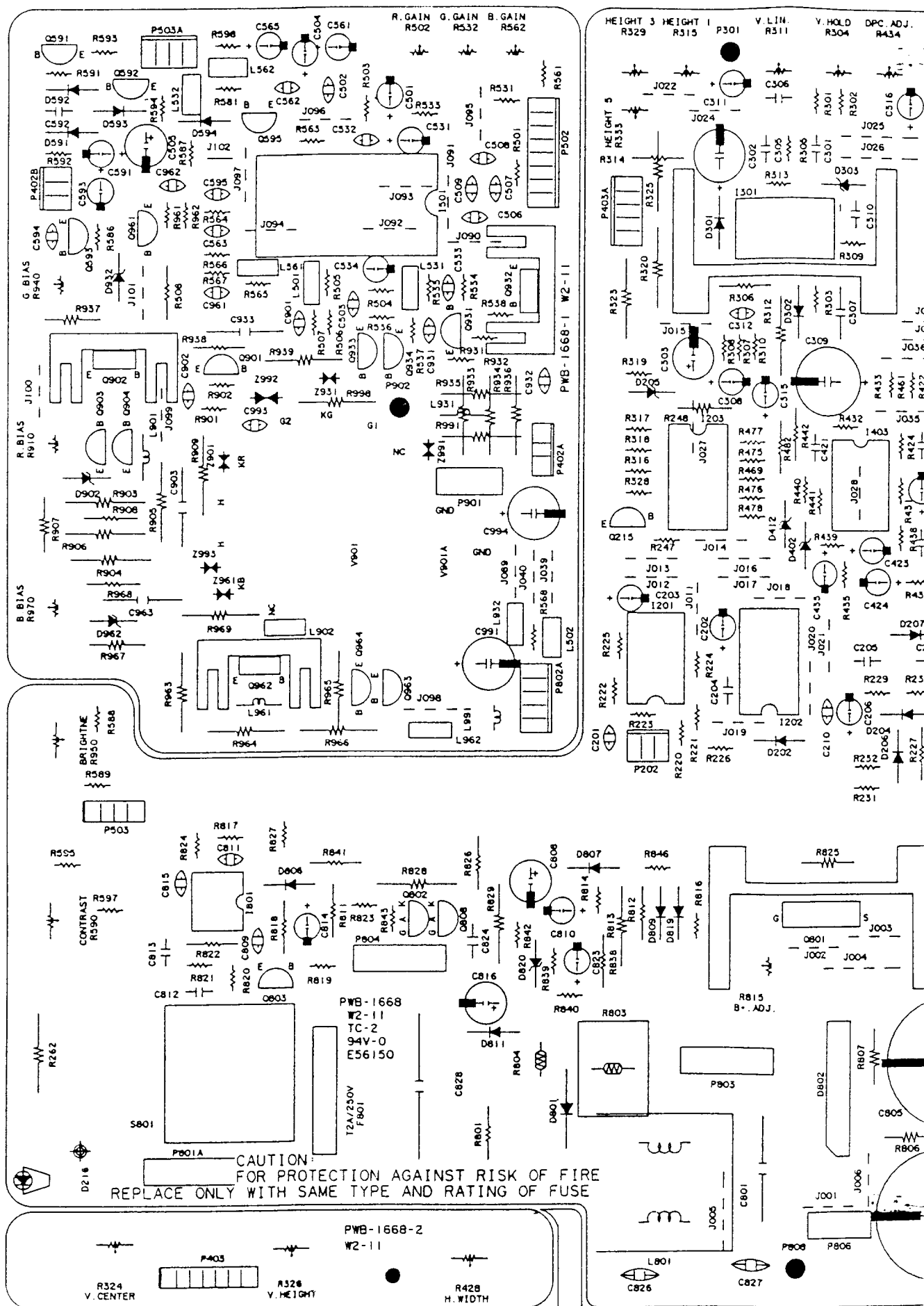


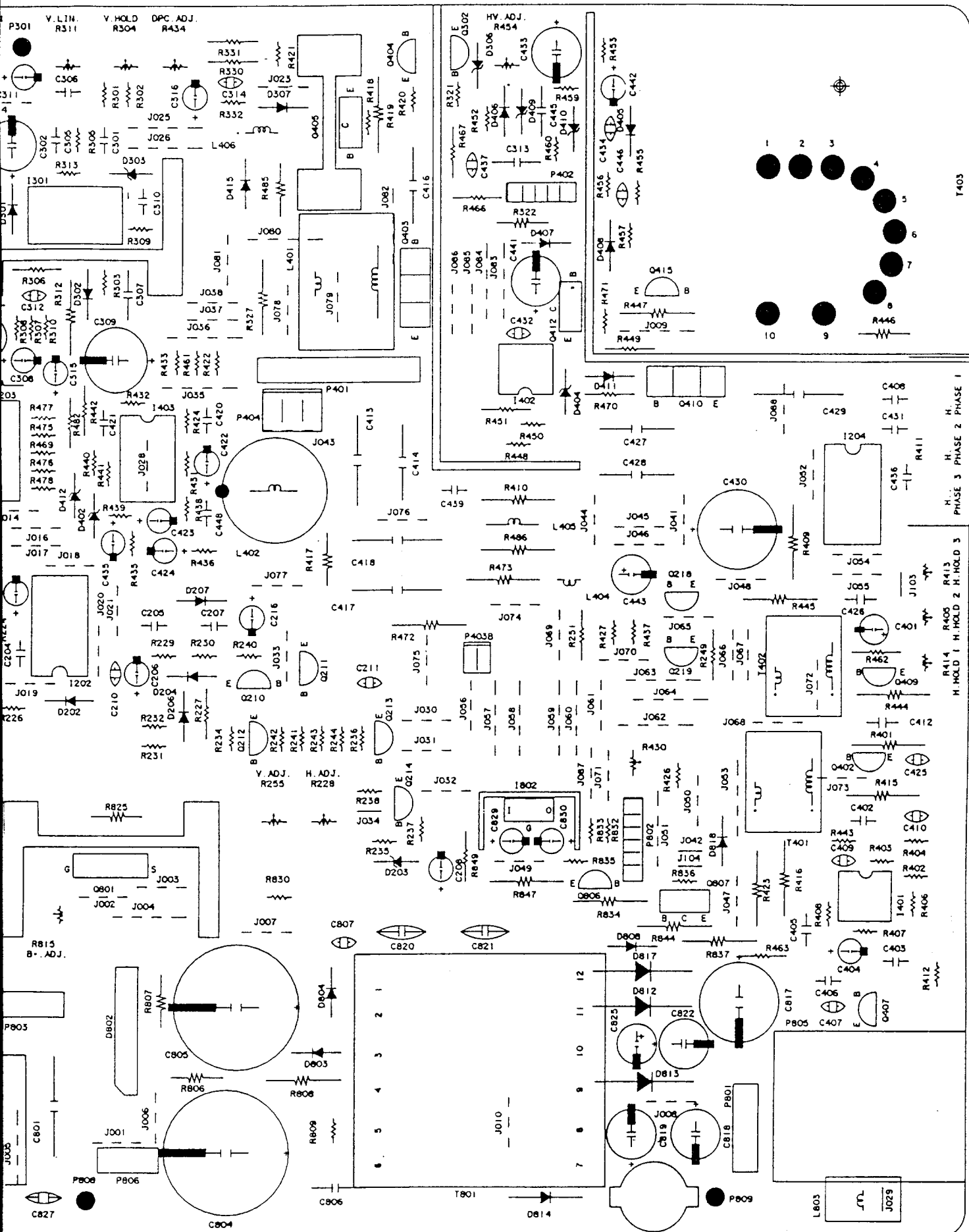
# 10. PCB LAYOUT





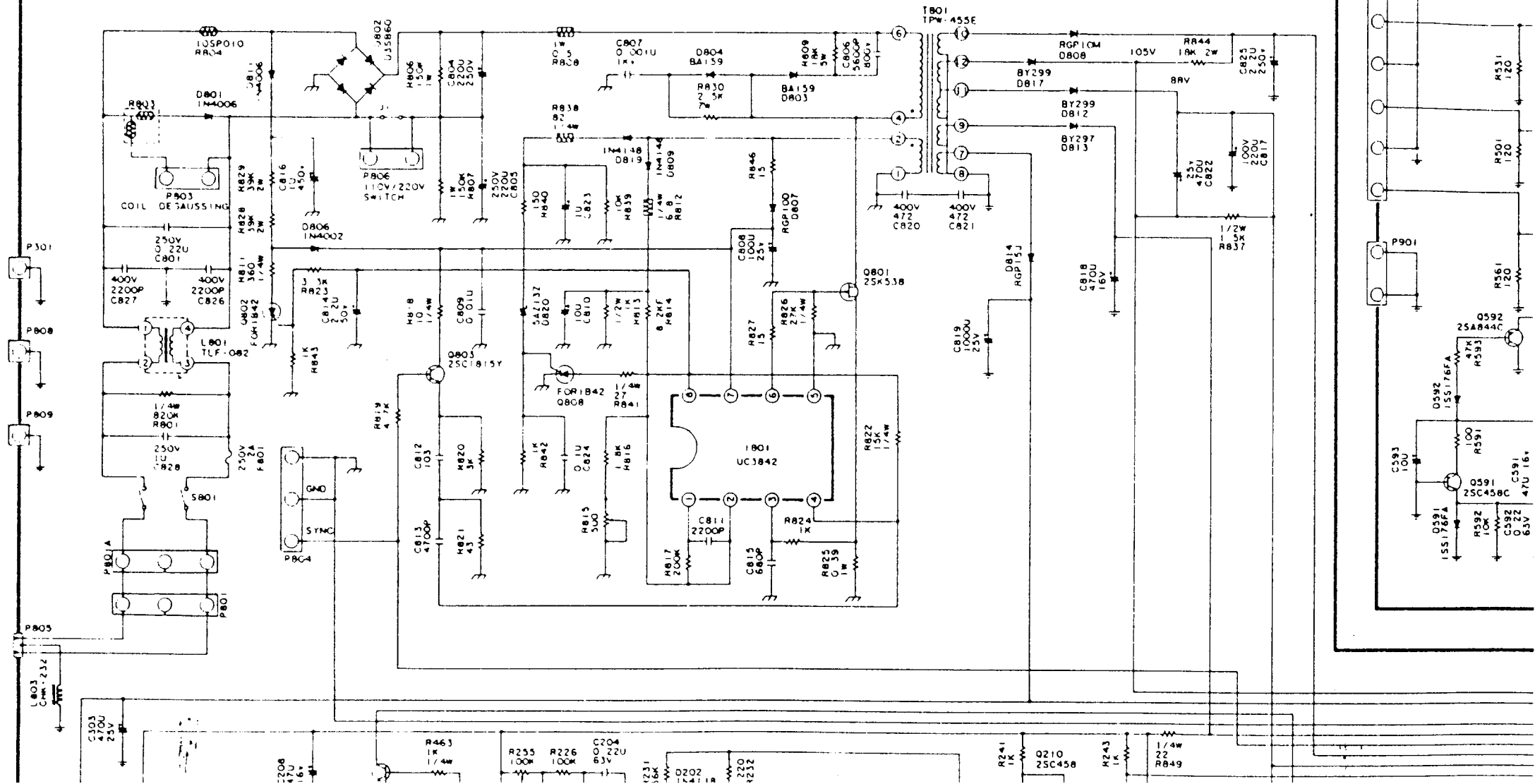
# 10. PCB LAYOUT

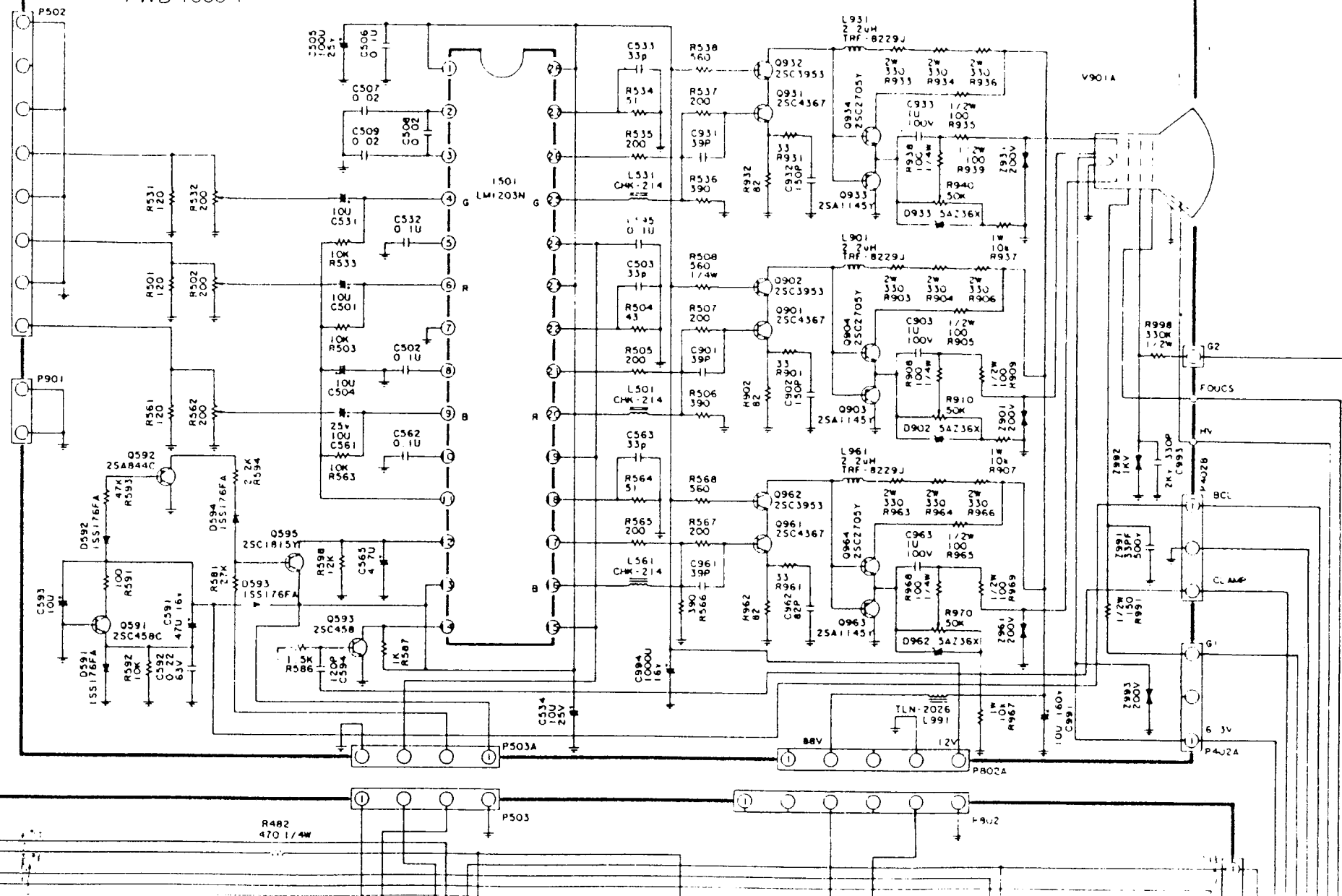




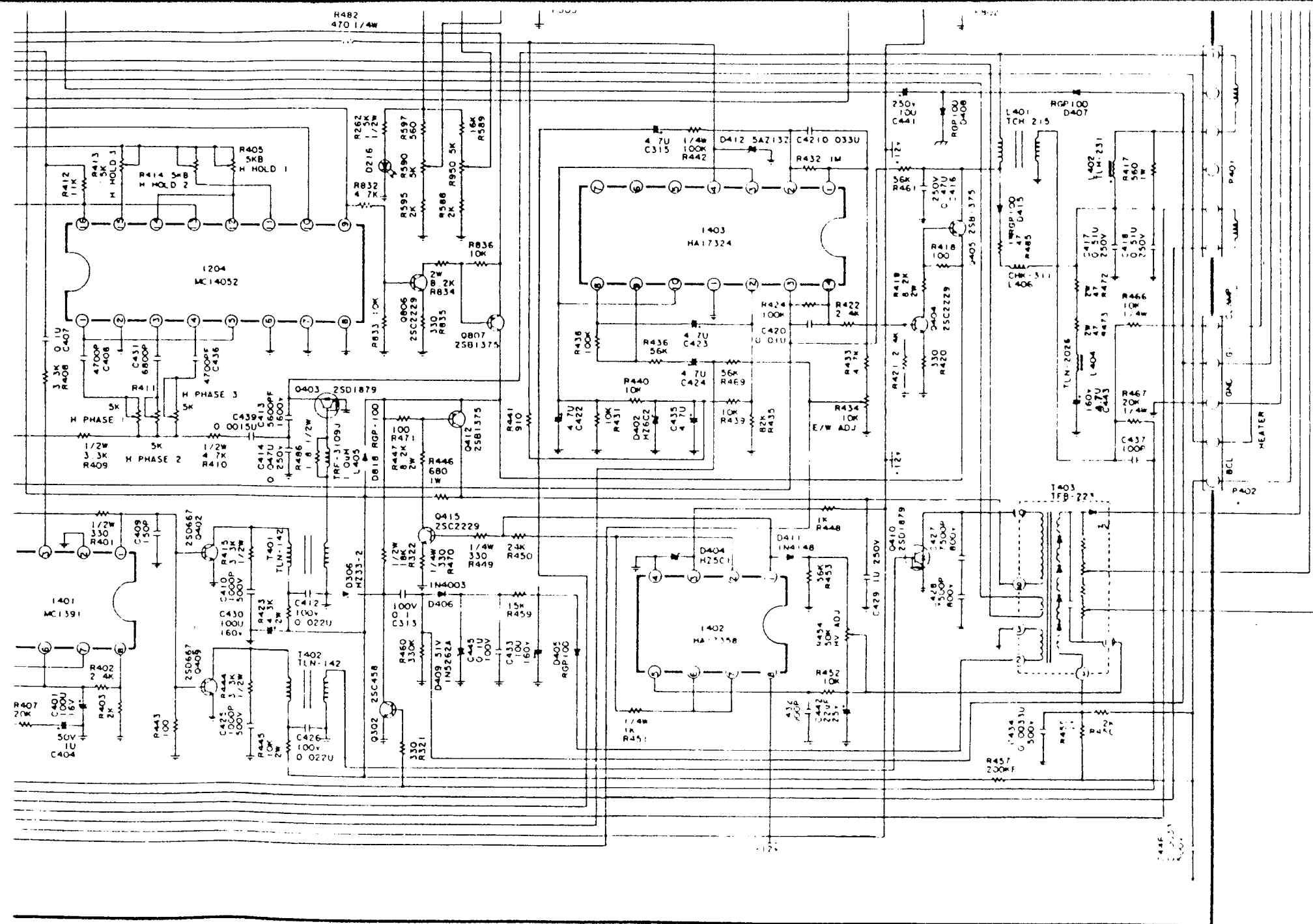
# CM-14SAM-(E)

PWB-1668



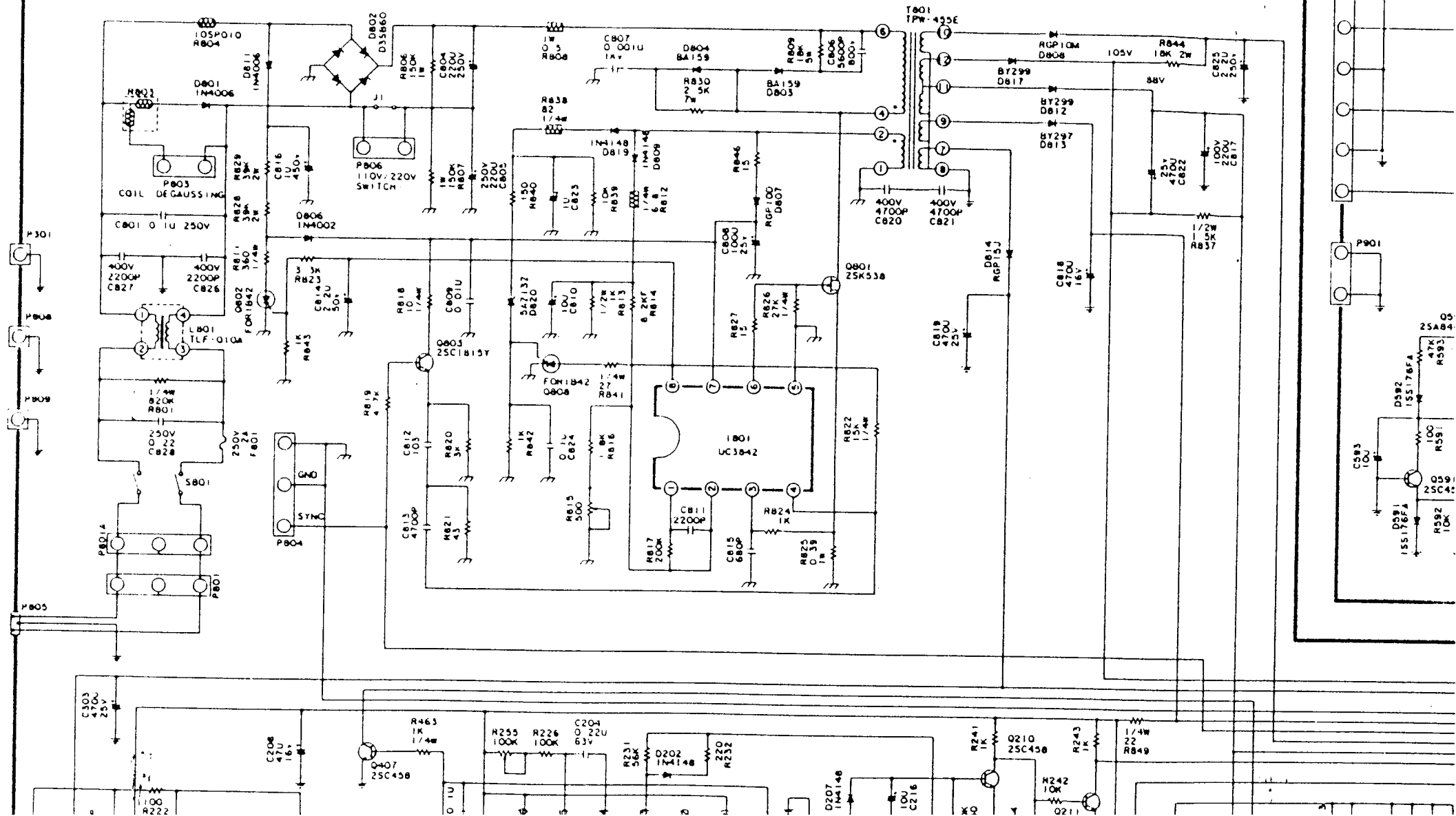


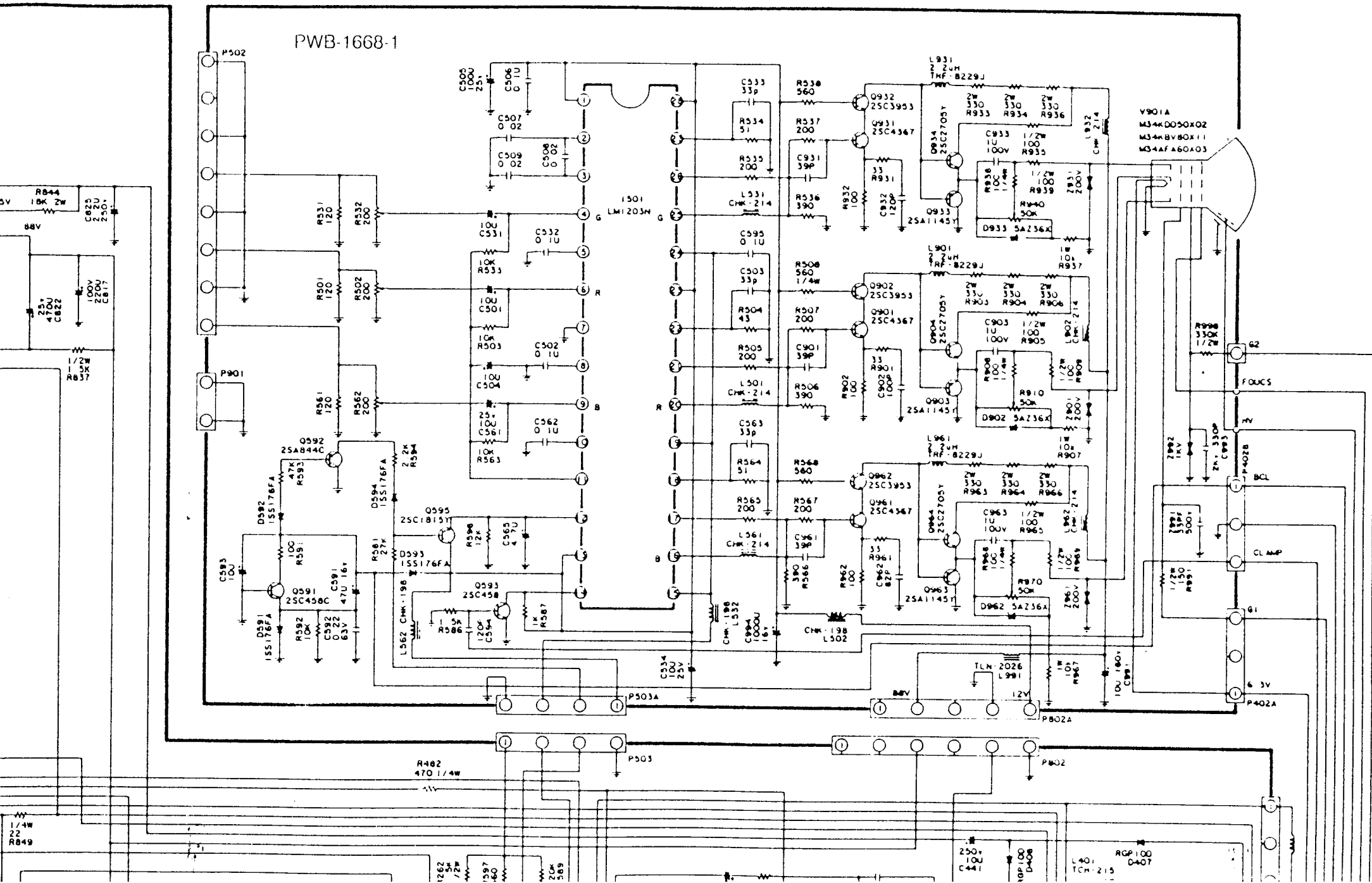




# CM-14SAS-(U)

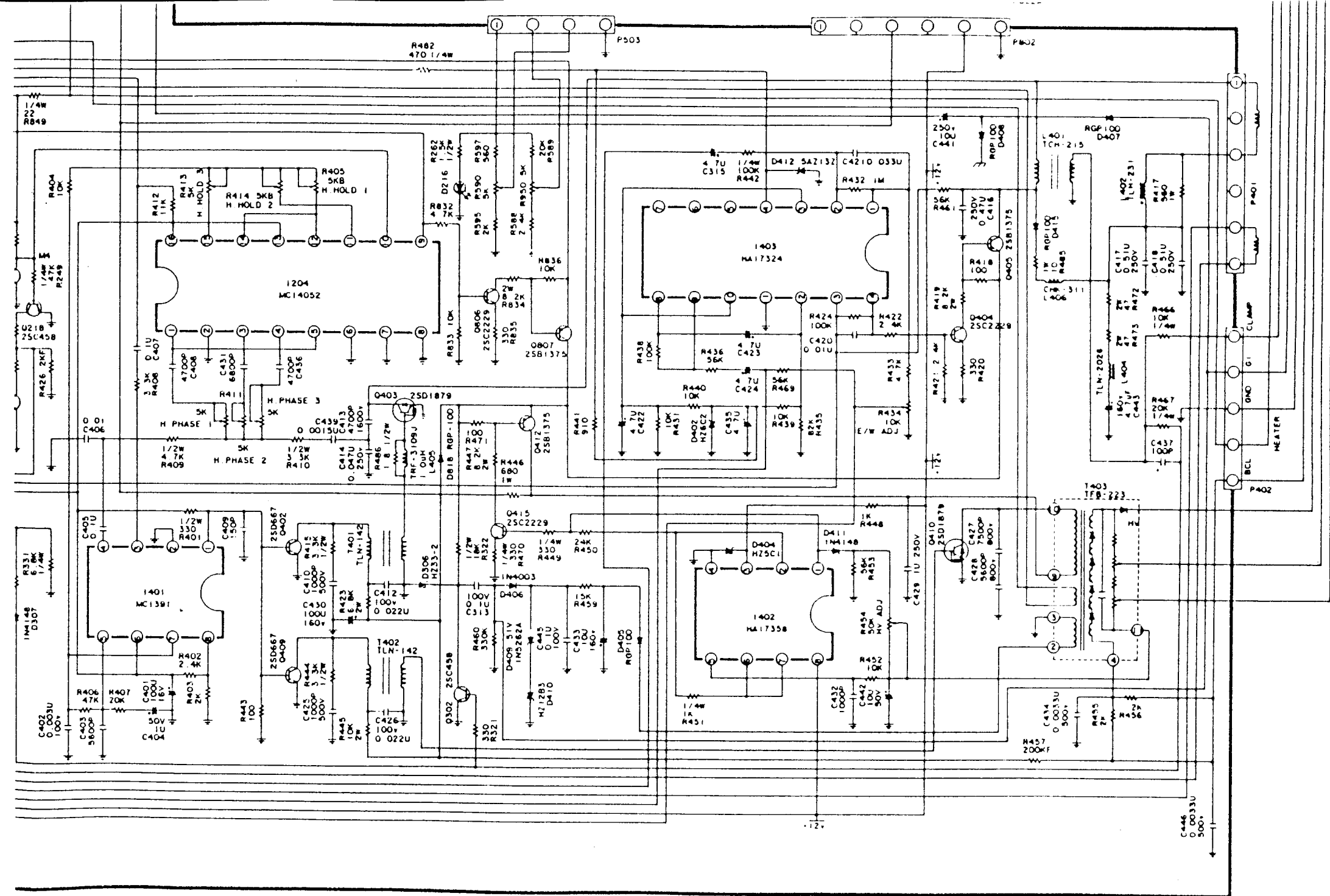
PWB-1668





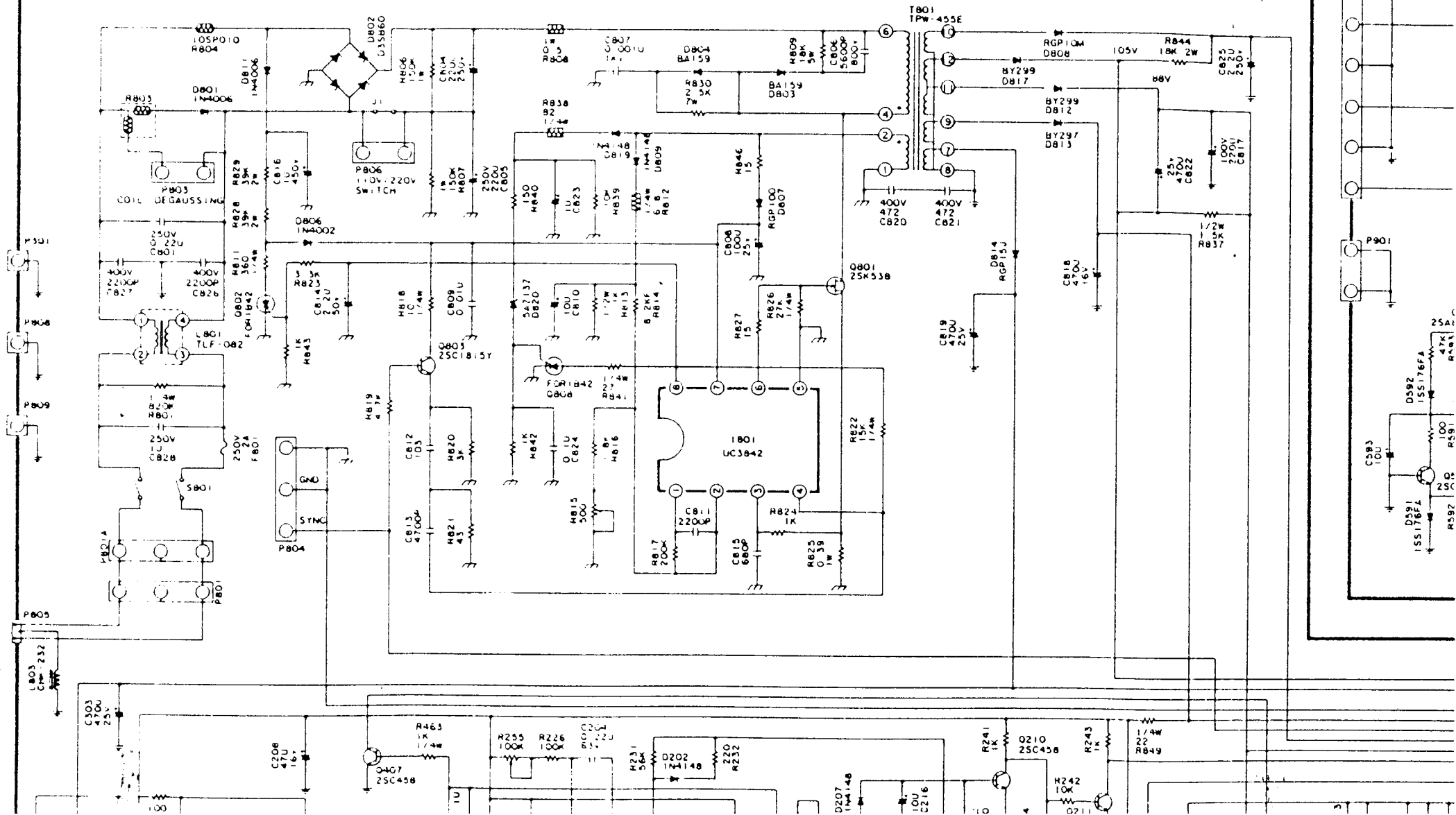




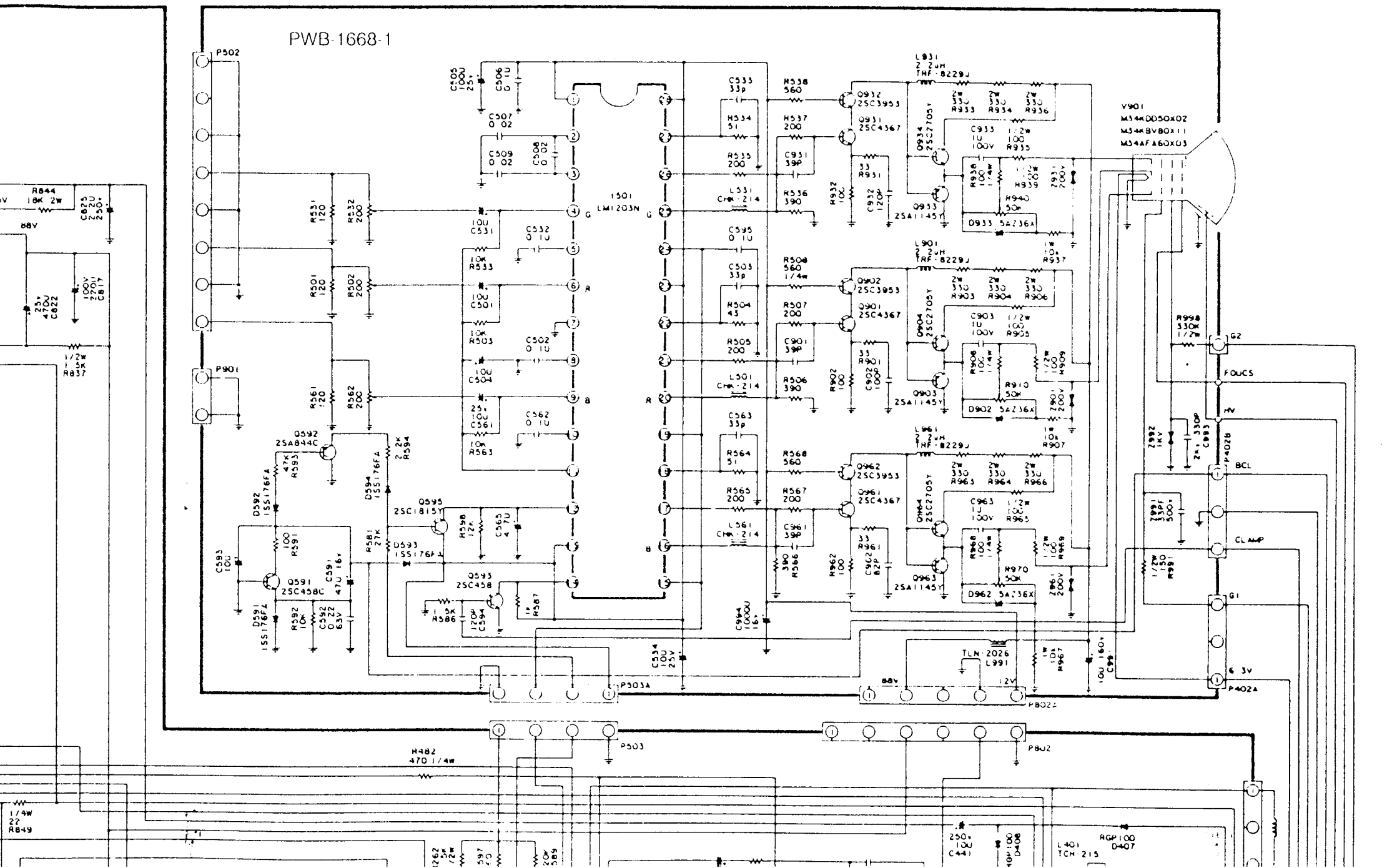


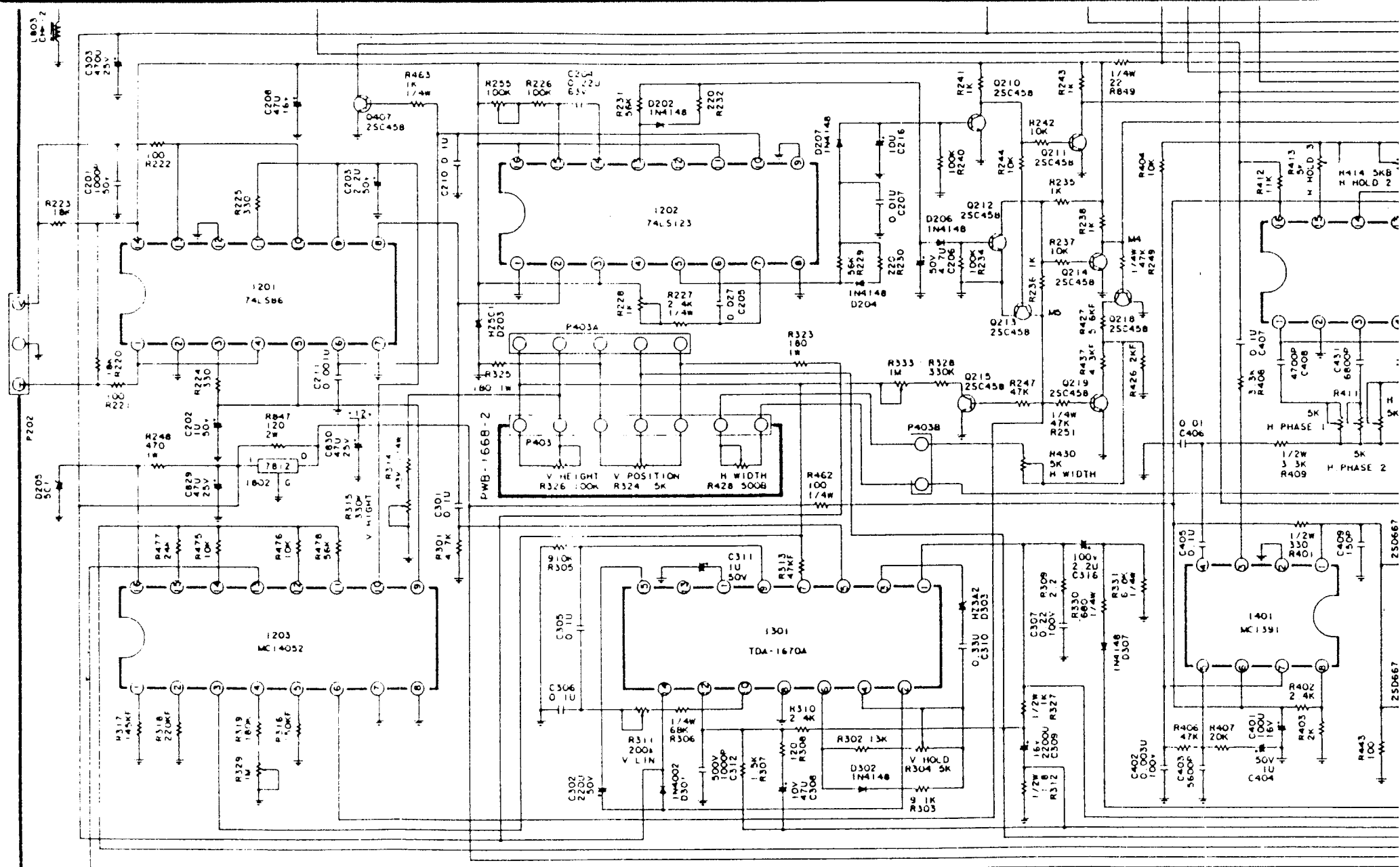
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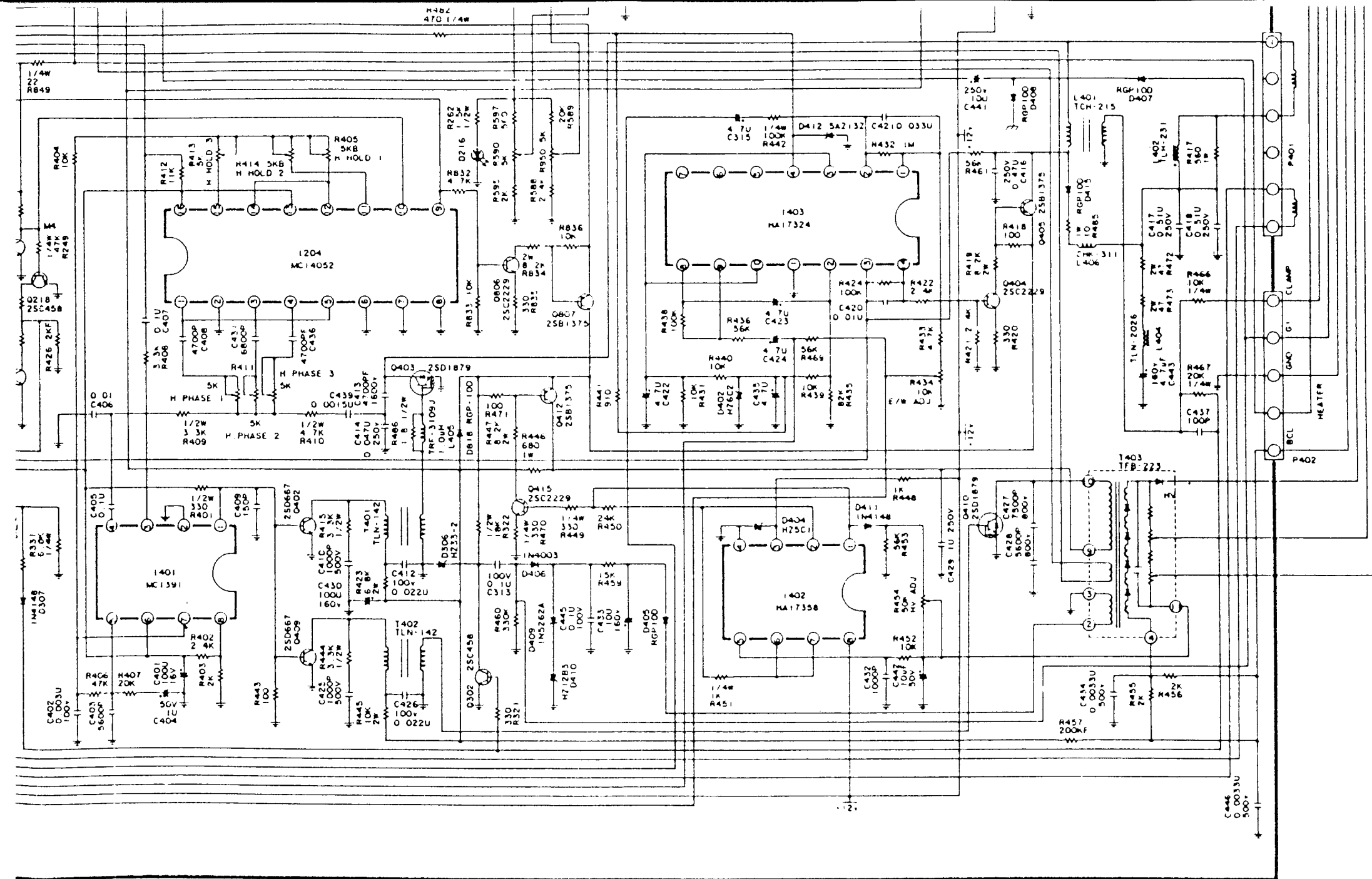
PWB-1668



P502

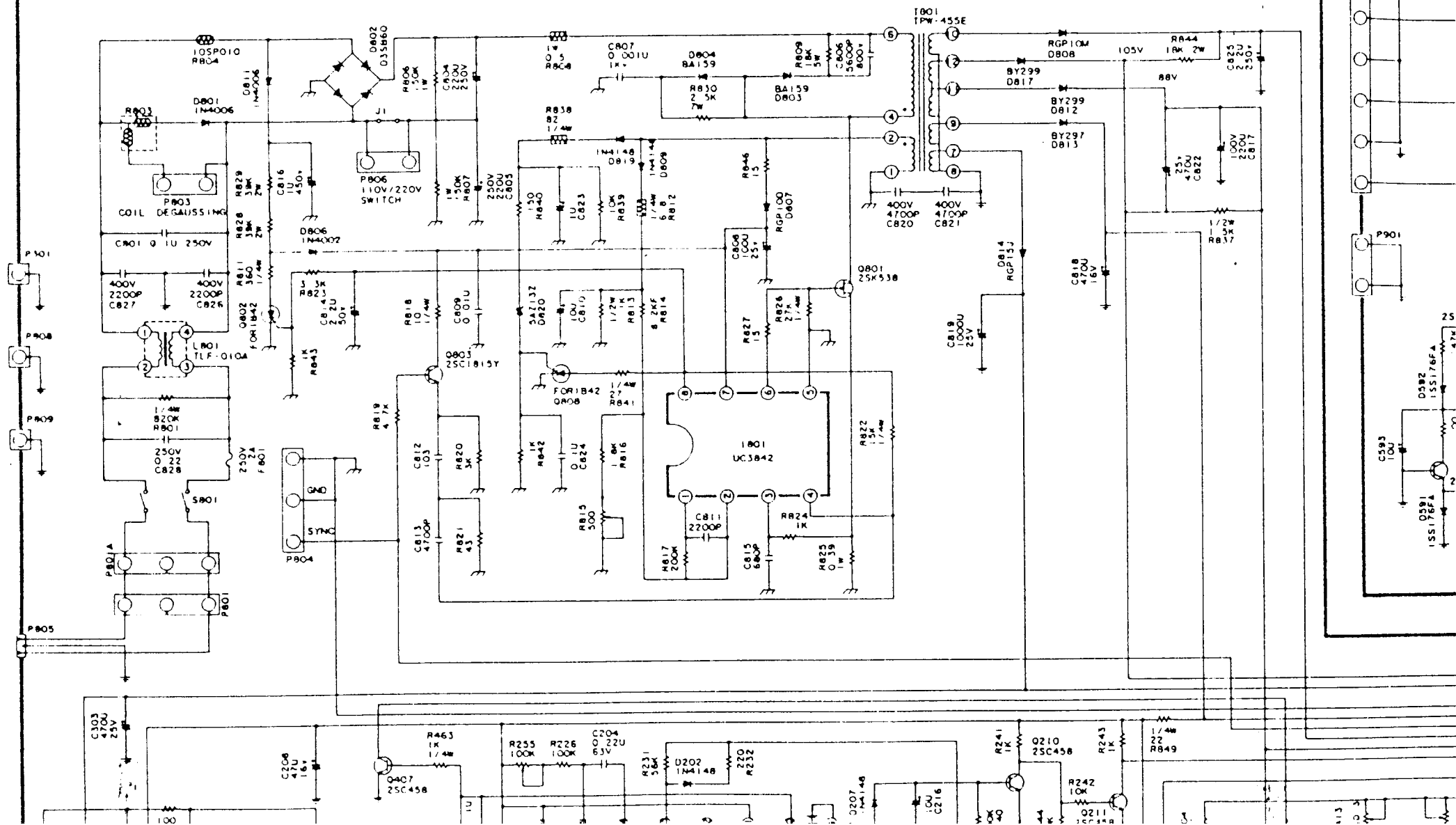




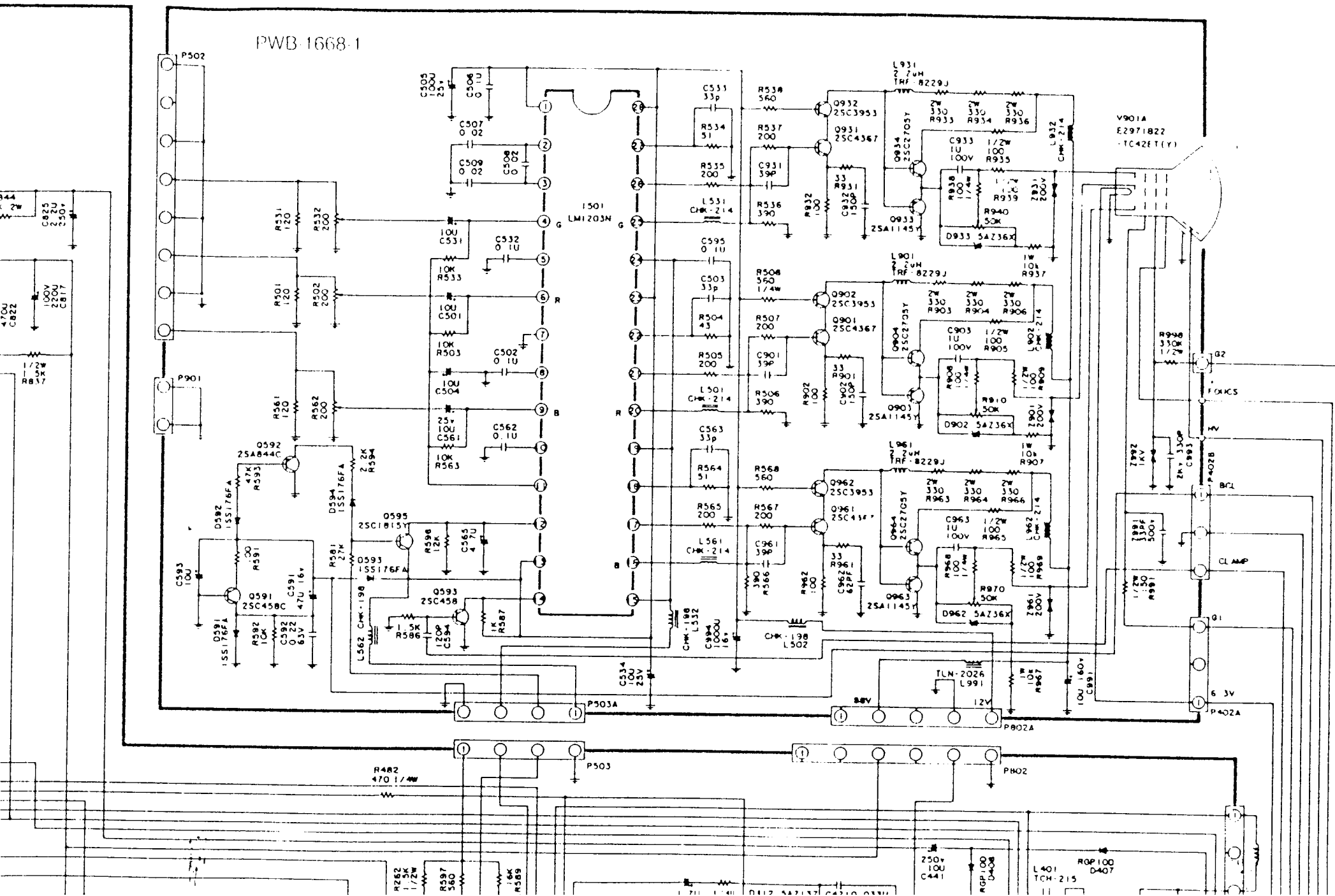


CM-14SAM-(U)

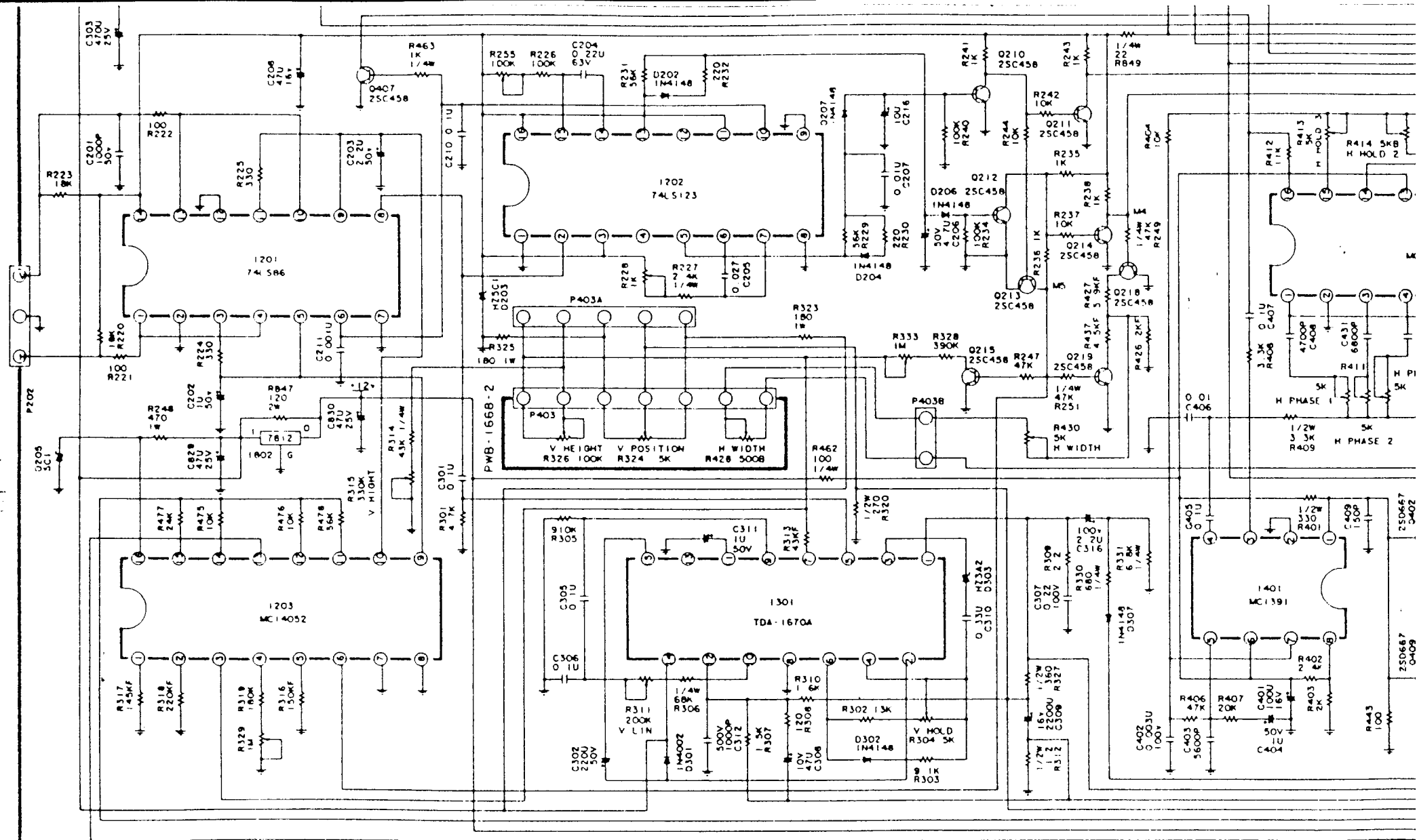
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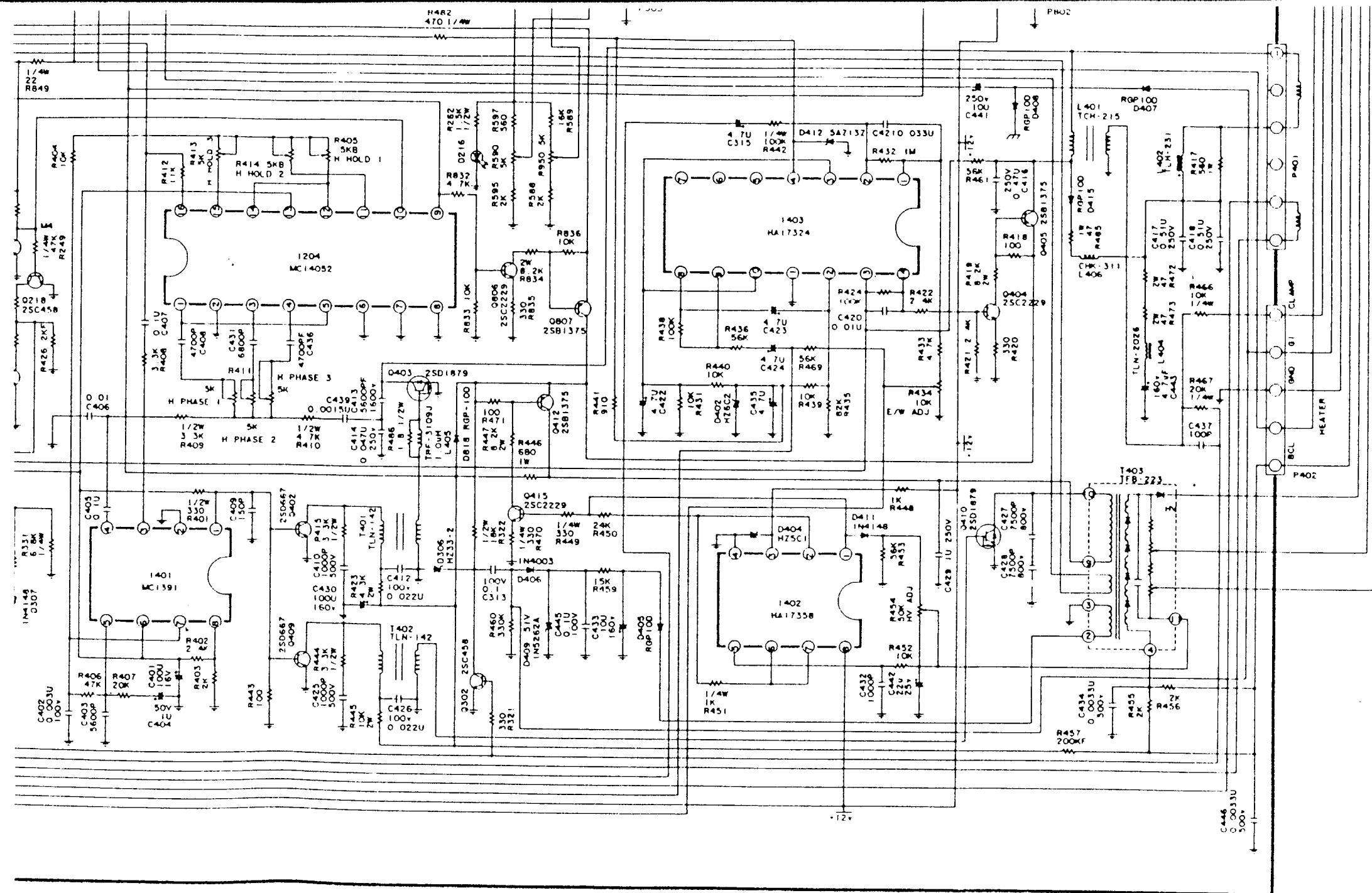


PWB-1668-1

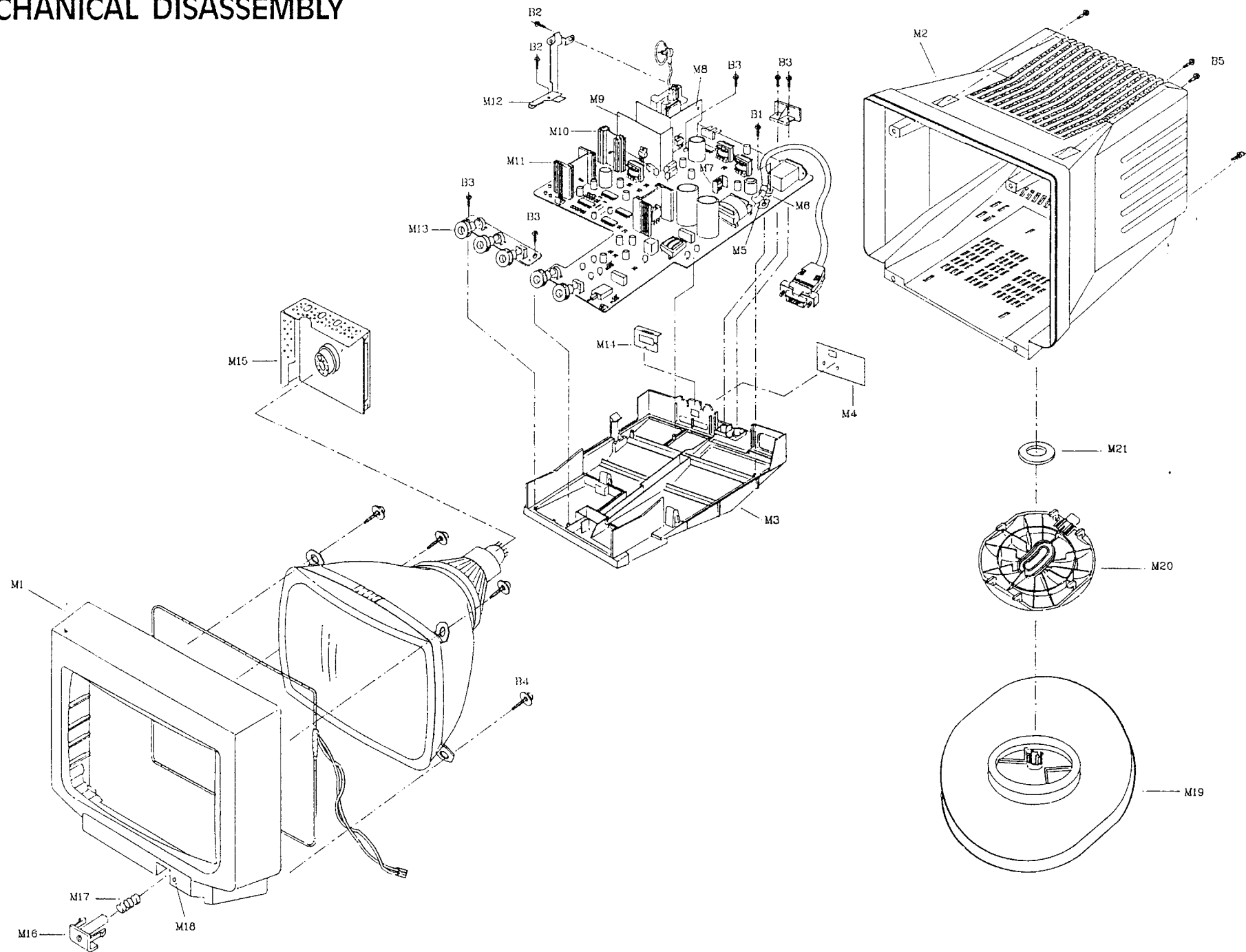








# 12. MECHANICAL DISASSEMBLY



# 13. 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 or 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:

### RESISTOR

PART NAME & DESCRIPTION			
TYPE		ALLOWANCE	
CF	Carbon Film	F	$\pm 1\%$
CC	Carbon Composition	G	$\pm 2\%$
MOF	Metel Oxide Film	J	$\pm 5\%$
FU	Fusible	K	$\pm 10\%$
MF	Metal Film	M	$\pm 20\%$
VR	Variable Resistor		
CR	Cement Resistor		

### CAPACITOR

PART NAME & DESCRIPTION			
TYPE		ALLOWANCE	
CE	Ceramic	F	$\pm 1\%$
FL	Electrolytic	G	$\pm 2\%$
PO	Polyester	J	$\pm 5\%$
TA	Tantalum	K	$\pm 10\%$
PP	Polypropylene	M	$\pm 20\%$
ME	Metallized	P	+ 100% - 0%
BL	Barrier layer	Z	+ 80% - 20%

(S) : 0.28mm Pitch CRT

(M) : 0.39mm Pitch CRT

(U) : UL, CSA

(E) : TUV

(C) : Universal

## ASSEMBLY PCB-MAIN (PWB-1668)

Sch NO.	Part NO.	Description
CAPACITOR		
C201	5231310291	CE 50V 10000PF K
C202	5213601091	EL 50V 1.0UF M
C203	5213622991	EL 50V 2.2UF M
C204	5275122401	ME 63V 0.22UF J
C205	5221127391	PO 50V 27000PF J
C206	5213647991	EL 50V 4.7UF M
C207	5221110301	PO 50V 10000PF J
C208	5213347091	EL 16V 47UF M
C210	5236310491	BL 50V 0.1UF Z
C211	5231310291	CE 50V 1000PF K
C216	5213610091	EL 50V 10 UF M
C301	5222110491	PO 50V 0.1 UF J
C302	5213622112	EL 50V 220UF M
C303	5214005001	EL 25V 470UF(105°C)
C305	5222610491	PO 50V 0.1UF J (MINI)
C306	5222610491	PO 50V 0.1UF J (MINI)
C307	5222522401	PO 100V 0.22UF K
C308	5213247091	EL 10V 47UF M
C309	5213322212	EL 16V 2200 UF M
C310	5275133401	ME 63V 0.33UF J
C311	5213610191	EL 50V 1.0UF M
C312	5232310291	CE 500V 1000PF K
C313	5271310401	ME 100V 0.1UF M
C315	5213647991	EL 50V 4.7UF M
C316	5214122991	EL 100V 2.2UF M
C401	5213310191	EL 16V 100UF M
C402	5227330291	PO 100V 3000PF J
C403	5221156291	PO 50V 5600PF J
C404	5213601091	PO 50V 1UF M
C405	5221110401	PO 50V 0.1UF J
C406	5221110391	PO 50V 10000PF J
C407	5236310491	BL 50V 0.1UF Z
C408	5221147291	PO 50V 4700PF J
C409	5247015191	CE 50V 150PF J
C410	5222310291	CE 500V 1000PF K
C412	5227322301	PP 100V 22000PF J
C413 (S)	5223747201	PP 1600V 4700PF J
C413 (M)	5223756202	PP 1600V 5600PF J
C414	5223447301	PP 250V 47000PF J
C416	5272147402	ME 250V 0.47UF J
C417	5270351401	ME 250V 0.51UF J
C418	5270351401	ME 250V 0.51UF J
C420	5222110391	PO 50V 10000PF J
C421	5222147391	PO 50V 47000PF J

C422	5213647991	EL 50V 4.7UF M
C423	5213647991	EL 50V 4.7UF M
C424	5213647991	CE 50V 4.7UF M
C425	5232310291	CE 500V 1000PF K
C426	5227322301	PP 100V 22000PF J
C427	5223075201	PP 800V 7500PF J
C428 (U)	5223056201	PP 800V 5600PF J
C428 (M)	5223075201	PP 800V 7500PF J
C429	5272110501	ME 250V 1UF J
C430	5214210112	EL 160V 100UF M
C431	5221168291	PO 50V 6800PF J
C432	5231310291	CE 50V 1000PF K
C433	5214210012	EL 160V10UF M
C434	5232333291	BL 500V 3300PF K
C435	5213647991	EL 50V 4.7UF M
C436	5221147291	PO 50V 4700PF J
C437	5231310191	CE 50V 100PF K
C439	5221115291	PO 50V 1500PF J
C441	5214410012	EL 250V 10UF M
C442 (S)	5213610091	EL 50 10UF M
C442 (M)	5213422091	EL 25V 22UF M
C443	5214247991	EL 160V 4.7UF M
C445	5271310401	ME 100V 0.1UF J
C446	5232333291	CE 500V 3300PF K
C801 (RA) (U)	5270101401	ME 250V 0.1UF M
C801 (RB) (U)	5270102601	ME 250V 0.1UF M
C801 (RA) (E,C)	5270106201	ME 250V 0.1UF M
C801 (RB) (E,C)	5270102701	ME 250V 0.1UF M
C804	5210308000	EL 250V 220UF M (105°C)
C805	5210308000	EL 250V 220UF M (105°C)
C806	5223056201	PP 800V 5600PF J
C807	5233301201	CE 1KV 1000PF K
C808	5213410191	EL 25V 100UF M
C809	5231310391	CE 50V 10000PF K
C810	5213610091	EL 50V 10UF M
C811	5231322291	CE 50V 2200PF K
C812	5231310391	CE 50V 10000PF J
C813	5221147291	PP 50V 4700PF J
C814	5213622991	EL 50V 2.2UF M
C815	5231368191	CE 50V 680PF K
C816	5214701091	EL 450V 1UF M
C817	5216122112	EL 100V 220UF M (105°)
C818	5213003591	EL 16V 470UF M (105°)
C819 (S)	5214005001	EL 25V 470UF M (105°)
C819 (M)	5216005501	EL 25V 1000UF M (105°)
C820	5230102701	CE 400V 4700PF M
C821	5230102701	CE 400V 4700PF M
C822	5213447112	EL 25V 470UF M
C823	5213610191	EL 50V 1.0UF M

C824	5221110401
C825	5214422991
C826	5230101801
C827	5230101801
C828(U)	5270106201
C828(E,C)	5270106401
C829	5213447091
C830	5213447091

# SEMICONDUCTOR

D202	6613003032
D203	6615007834
D204	6613003032
D205	6615007834
D206	6613003032
D207	6613003032
D216	6618010702
D301	6611007230
D302	6613003032
D303	6615016430
D306 (RA)	6615010933
D306 (RB)	6615013831
D307	6613003032
D402	6615009756
D404	6615007834
D405	6613002234
D406	6611007330
D407	6613002234
D408	6613002234
D409 (RA)	6615021431
D409 (RB)	6615021430
D410 (S)	6615003736
D411	6613003032
D412	6615003736
D415	6613002234
D801	6611007640
D802 (RA)	6611028900
D802 (RB)	6611024705
D803 (RA)	6611011439
D803 (RB)	6611012834
D804 (RA)	6611011439
D804 (RB)	6611012834
D806 (RA)	6611007234
D806 (RB)	6611007234
D807 (RA)	6613002234
D807 (RB)	6613002234
D808	6611012831
D809	6613003032
D811	6611007630
D812 (RA)	6613003841

PO	50V 0.1UFJ
EL	250V 2.2UF M
CE	400V 22000PF M
CE	400V 2200PF M
ME	250V 0.22UFM
ME	250V 1.0UFM
EL	25V 47UFM
EL	25V 47UFM

DIODE SWITCHING	1N4148
DIODE ZNRRT	HZ5C1
DIODE SWITCHING	1N4148
DIODE ZNRRT	HZ5C1
DIODE SWITCHING	1N4148
DIODE SWITCHING	1N4148
DIODE LED	
DIODE RECTIFIER	1N4002
DIODE SWITCHING	1N4148
DIODE ZENER	HZ3A2
DIODE ZENER	05AZ36X
DIODE ZENER	HZ33
DIODE SWITCHING	1N4148
DIODE ZENER	HZ6C2
DIODE ZENER	HZ5C1
DIODE SWITCHING	RGP10D
DIODE SWITCHING	1N4003
DIODE SWITCHING	RGP10D
DIODE SWITCHING	RGP10D
DIODE ZENER	1N5262A
DIODE ZENER	BZX79C51
DIODE ZENER	HZ12B3
DIODE SWITCHING	1N4148
DIODE ZENER	HZ12B3
DIODE SWITCHING	RGP10D
DIODE RECTIFIER	1N4006
DIODE RECTIFIER	03SB60
DIODE RECTIFIER	GBL06L
DIODE RECTIFIER	BA159-T-R
DIODE RECTIFIER	BA159
DIODE RECTIFIER	BA159-R
DIODE RECTIFIER	BA159
DIODE RECTIFIER	1N4002
DIODE RECTIFIER	1N4002
DIODE SWITCHING	RGP10D
DIODE SWITCHING	1N4935
DIODE RECTIFIER	RGP10M
DIODE SWITCHING	1N4148
DIODE SWITCHING	1N4006
DIODE SWITCHING	RG3J

D812 (RB)	6613007940	DIODE SWITCHING BY299
D813 (RA)	6613003841	DIODE SWITCHING RG3J
D813 (RB)	6613008040	DIODE SWITCHING BY 297
D814	6611013043	DIODE RECTIFIER RGP15J
D817 (RA)	6613003841	DIODE SWITCHING RG3J
D817 (RB)	6613007940	DIODE SWITCHING BY299
D818	6613002234	DIODE SWITCHING RGP10D
D819	6613003032	DIODE SWITCHING 1N4148
D820	6615010638	DIODE ZENER 05AZ13Z
I201	6646009922	IC HD74LS86
I202	6646007081	IC 74LS123P
I203	6645013302	IC HD14052BP
I204	6645013302	IC HD14052BP
I301	6644045203	IC TDA1675A
I401	6644032900	IC MC1391P
I402	6644073000	IC HA17358
I403	6644042900	IC HA17324
I801	6644063102	IC UC3842AN
I802	6640001800	IC HA17812P
Q210	6621003230	TR 2SC458C
Q211	6621003230	TR 2SC458C
Q212	6621003230	TR 2SC458C
Q213	6621003230	TR 2SC458C
Q214	6621003230	TR 2SC458C
Q215	6621003230	TR 2SC458C
Q218	6621003230	TR 2SC458C
Q219	6621003230	TR 2SC458C
Q302	6621003230	TR 2SC458C
Q402	6622013330	TR 2SD667C
Q403	6622002800	TR 2SD1879
Q404 (RA)	6621014634	TR 2SC2229
Q404 (RB)	6621034430	TR 2SC3467E
Q405 (RA)	6624000500	TR 2SB1375
Q405 (RB)	6624000701	TR 2SB1133
Q407	6621003230	TR 2SC458C
Q409	6622003330	TR 2SD667C
Q410 (BA)	6622002800	TR 2SD1879
Q410 (AA)	6622020880	TR 2SD2125
Q412 (RA)	6624000500	TR 2SB1375
Q412 (RB)	6624000701	TR 2SB1133
Q415 (RA)	6621014634	TR 2SC2229
Q415 (RB)	6621034430	TR 2SC3467E
Q801 (BA)	6626001400	TR 2SK538
Q802 (RB)	6626000300	TR 2SK1461
Q802	6631001731	THYRISTOR SCR SFOR1B42
Q803	6621015332	2SC1815Y
Q806 (RA)	6621014634	TR 2SC2229
Q806 (RB)	6621034430	TR 2SC3467E
Q807 (RA)	6624000500	TR 2SB1375



Q807 (RB) 6624006201  
Q808 6631001731

TR 2SB856  
THYRISTOR SCR SGOR1B42

#### COIL AND TRANSFORMER

L401 5062221500  
L402 5062223100  
L404 5062202300  
L405 5064010929  
L406 5062110300  
L801 (U) 5061102202  
L801 (E,C) 5061108801  
L803 (E) 5062123200  
L803 (C) 5062123201  
L401 5062414200  
L402 5062414200  
L403 (RA) 5062622301  
L403 (RB) 5062622302  
L403 (RA) 5062622304  
L403 (RD) 5062622305  
T801 5061345505

LOIL HOR CHOKEN TCH-215  
LOIL HOR LINEARITY TLH-231  
LOIL CHOKE TLN-2026  
LOIL PEAKING TRF-3109J  
LOIL CHOKE CHK-311  
LOIL FILTER TLF-010A  
LOIL FILTER TLF-088A  
LOIL CHOKE CHK-232  
LOIL CHOKE CHK-232A  
TRANS TLN-142  
TRANS TLN-142  
TRANS FLYBACK TFB-223A  
TRANS FLYBACK TFB-223B  
TRANS FLYBACK TFB-223D  
TRANS FLYBACK TFB-223E  
TRANS POWER TPW-455E

#### RESISTOR

R220 5142118395  
R221 5142110195  
R223 5142110195  
R223 5142118395  
R224 5142133195  
R225 5142133195  
R226 5142133495  
R227 5142824295  
R228 5162161020  
R229 5142156395  
R230 5142122195  
R231 5142156395  
R232 5142122195  
R234 5142110495  
R235 5142110295  
R236 5142110295  
R237 5142110395  
R238 5142110295  
R240 5142110495  
R241 5142110295  
R242 5142110395  
R243 5142110295  
R244 5142147395  
R247 5142147395  
R248 5130347103  
R249 1542847395  
R251 5142847395

CF 1/6W 18K J  
CF 1/6W 100K J  
CF 1/6W 100 J  
CF 1/6W 18K J  
CF 1/6W 330 J  
CF 1/6W 330 J  
CF 1/6W 100 J  
CF 1/6W 2.4K J  
VR 1K  
CF 1/6W 56K J  
CF 1/6W 220 J  
CF 1/6W 56K J  
CF 1/6W 220 J  
CF 1/6W 100K J  
CF 1/6W 1K J  
CF 1/6W 1K J  
CF 1/6W 10K J  
CF 1/6W 1K J  
CF 1/6W 100K J  
CF 1/6W 1K J  
CF 1/6W 10K J  
CF 1/6W 10K J  
CF 1/6W 1K J  
CF 1/6W 10K J  
CF 1/6W 47K J  
MOF 1W 470 J  
CF 1/4W 47K J  
CF 1/4W 47K J

R255	5162162820	VR 100K
E262	5142515290	CF 1/2W 1.5KJ
R301	5142147295	CF 1/6W 4.7K J
R302	5142113395	CF 1/6W 13K J
R303	5142191295	CF 1/6W 9.1K J
R304	5162161720	VR 5K
R305	5142191495	CF 1/6W 910K J
R306	5142868395	CF 1/4W 68K J
R307	5142115295	CF 1/6W 1.5K J
R308	5142115295	CF 1/6W 120 J
R309	5142122995	CF A/6W 2.2 J
R310(S)	5142124295	CF 1/6W 2.4K J
R310(M)	5142116295	CF 1/6W 1.6K J
R311	5162163020	VR 200K
R312(S)	5142518990	CF 1/2W 1.8 J
R312(M)	5142412990	CF 1/2W 1.2 J
E313(S)	5134747028	MF 1/6W 47K F
R313(M)	5134753028	MF 1/6W 43K F
R314	5142843395	CF 1/4W 43K J
R315	5162163320	VR 330K
R316	5134715038	MF 1/6W 150K F
R317	5134714538	MF 1/6W 145K F
R318	5134722038	MF 1/6W 220K F
R319	5142118495	CF 1/6W 180K J
R321	5142133195	CF 1/6W 330 J
R322	5130311307	MOF 1W 11K J
R323	5130318103	MOF 1W 180 J
R325	5130318103	MOF 1W 180 J
R327(S)	5142410290	CF 1/2W 1K J
R327(M)	5142436190	CF 1/2W 360 J
R328	5142133495	CF 1/6W 330K J
R329	5162163720	VR 1M
R330	5142868195	CF 1/4W 680 J
R331	5142868295	CF 1/4W 6.8K J
R333	5162163720	VR 1M
R401	5142533190	CF 1/2W 330 J
R402	5142124295	CF 1/6W 2.4K J
R403	5142120295	CF 1/6W 2K J
R404	5142111395	CF 1/6W 11K J
R405	5162161750	VR 5K
R406	5142147395	CF 1/6W 47K J
R407	5142120395	CF 1/6W 20K J
R408	5142133295	CF 1/6W 3.3K J
R409	5142433290	CF 1/2W 3.3K J
R410	5142447290	CF 1/2W 4.7K J
R411	5160103317	VR 5K-3R
R412	5142140395	CF 1/6W 10K J
R413	5162171771	VR 5K
R414	5162161750	VR 5K

R415	5142433290	VF 1/2W 3.3K J
R417	5130356103	MOF 1W 560 J
R418	5142110195	CF 1/6W 100J
R419	5130482203	MOF 2W 8.2K J
R420	5142133195	CF 1/6W 330 J
R421	5142124295	CF 1/4W 2.4K J
R422	5142124295	CF 1/4W 2.4K J
R423(S)	5130468203	MOF 2W 6.8K J
R423(M)	5130443203	MOF 2W 4.3K J
R424	5142110495	CF 1/6W 100K J
R426	5142120295	CF 1/6W 2K J
R426	5142120295	CF 1/6W 2K J
R427(S)	5134756018	MOF 1/6W 5.6K F
R427(M)	5134759018	MOF 1/6W 5.9K F
R430	5162161720	VR 5K
R431	5142110395	CF 1/6W 10K J
R432	5142110595	CF 1/6W 1M J
R433	5142147295	CF 1/6W 4.7K J
R434	5162161920	VR 10K
R435	5142182395	CF 1/6W 82K J
R436	5142156395	CF 1/6W 56K J
R437(S)	5134743018	MOF 1/6W 4.3K F
R437(M)	5134745018	MOF 1/6W 4.5K F
R438	5142110495	CF 1/6W 100K J
R439	5142110395	CF 1/6W 10K J
R440	5142110395	CF 1/6W 10K J
R441	5142191195	CF 1/6W 910 J
R442	5142810495	CF 1/4W 100K J
R443	5142110195	CF 1/6W 100 J
R444	5142433290	CF 1/2W 3.3K
R445	5130410303	MOF 2W 10K J
R446	5130368103	MOF 1W 680 J
R447	5130482203	MOF 2W 8.2K J
R448	5142110295	CF 1/6W 1K J
R449	5142833195	CF 1/4W 330 J
R450	5145124395	CF 1/6W 24K J
R451	5142810295	CF 1/4W 1K J
R452	5142110395	CF 1/6W 10K J
R453	5142156395	CF 1/6W 56K J
R454	5162162620	VR 50K
R455	5142120295	CF 1/6W 2K J
R456	5142120295	CF 1/6W 2K J
R457	5135720038	MOF 1/6W 200K F
R459	5142115395	CF 1/6W 15K J
R460	5142133495	CF 1/6W 330K J
R461	5142156395	CF 1/6W 56K J
R462	5142810195	CF 1/4W 100 J
R463	5142810295	CF 1/4W 1K J
R466	5142810396	CF 1/4W 10K J

R467	5142820395	CF 1/4W 20K J
R469	5142156395	CF 1/6W 56K J
R470	5142833195	CF 1/4W 330 J
R471	5142110195	CF 1/6W 100 J
R472	5130447003	MOF 2W 47 J
R473	5130447003	MOF 2W 47 J
R475	5142110395	CF 1/6W 10K J
R476	5142110395	CF 1/6W 10K J
R477	5142124395	CF 1/6W 24K J
R478	5142156395	CF 1/6W 56K J
R482	5142847195	CF 1/4W 470 J
R485(S)	5130310003	MOF 1W 10J
R485(M)	5130347003	MOF 1W 47 J
R486	5142418990	CF 1/2W 1.8 J
R801	5142882495	CF 1/4W 820K J
R803	5101106900	POSISTOR
R804	5101108400	THERMISTOR
R806	5130315403	MOF 1W 150K J
R807	5130315403	MOF 1W 150K J
R808	5133250803	FU 14A/1W 0.5 J
R809	5154418325	CR 5W 18K J
R811	5142836195	CF 1/4W 360 J
R812	5133868903	FU 14A 1/4W 6.8 J
R813	5142410290	CF 1/2W 1K J
R814	5134782018	MF 1/6W 8.2K F
R815	5142140820	VR 500
R816	5142118295	CF 1/6W 1.8K J
R817	5142120495	CF 1/6W 200K J
R818	5142810095	CF 1/4W 10 J
R819	5142147295	CF 1/6W 4.7K J
R820	5142130295	CF 1/6W 3K J
R821	5142143095	CF 1/6W 43 J
R822	5142815395	CF 1/4W 15K J
R823	5142133295	CF 1/6W 3.3K J
R824	5142110295	CF 1/6W 1K J
R825	5130339803	MOF 1W 0.39 J
R826	5142827295	CF 1/4W 27K J
R827	5142115095	CF 1/6W 15 J
R828	5130439303	MOF 2W 39K J
R829	5130439303	MOF 2W 39K J
R830	5154525225	CR 7W 2.5K J
R832	5142147295	CF 1/6W 4.7K
R833	5142110395	CF 1/6W 10K J
R834	5130482203	MOF 2W 8.2K
R835	5142133195	CF 1/6W 330 J
R836	5142110395	CF 1/6W 10K J
R837	5142415290	CF 1/2W 1.5K J
R838	5133882003	FU 14A 1/4W 82 J
R839	5142110395	CF 1/6W 10K J

R840	5142115195	CF 1/6W 150 J
R841	5142827095	CF 1/4W 27 J
R842	5142110295	CF 1/6W 1K J
R843	5142110295	CF 1/6W 1K J
R844	5130418303	MOF 2W 18K J
R846	5142115095	CF 1/6W 15 J
R847	5130412103	MOF 2W 120 J
R849	5142822095	CF 1/4W 22 J

#### ASSEMBLY PCB-CRT (PWB-1668-1)

Sch NO.	Part NO.	Description
CAPACITOR		
C501	5213610091	EL 50V 10UF M
C502	5236310491	BL 50V 0.1UF Z
C503	5247033091	CE 50V 33PF J
C504	5213610091	EL 50V 10UF M
C505	5213410191	EL 25V 100UF M
C506	5236310491	BL 50V 0.1UF Z
C507	5231820391	CE 50V 20000PF Z
C508	5231820391	CE 50V 20000PF Z
C809	5231820391	CE 50V 20000PF Z
C531	5213610091	EL 50V 10UF M
C532	5236310491	BL 50V 0.1UF M
C533	5247033091	CE 50V 33PF J
C534	5213610091	EL 50V 10UF M
C561	5213610091	EL 50V 10UF M
C562	5236310491	BL 50V 0.1UF Z
C563	5247033091	CE 50V 33PF J
C565	5213647991	EL 50V 4.7UF M
C591	5213347091	EL 16V 47UF M
C592	5275122401	ME 63V 0.22UF J
C593	5213610095	EL 50V 10UF M
C594	5249012191	CE 50V 120PF K
C595	5236310491	BL 50V 0.1UF Z
C901	5247039091	CE 50V 39PF J
C902(S)	5247010191	CE 50V 100PF J
C902(M)	5247015191	CE 50V 150PF J
C903	5271110501	ME 100V 1UF J
C931	5247039091	CE 50V 39PF J
C932(S)	5247012191	CE 50V 120PF J
C932(M)	5247015191	CE 50V 150PF J
C933	5271110501	ME 100V 1UF J
C961	5247039091	CE 50V 39PF J
C962(S)	5237082091	CE 50V 82PF J
C962(M)	5247062091	CE 50V 62PF J

C963 5271110501  
 C991 5214210012  
 C993 5234333101  
 C994 5213310212

ME 100V 1UF J  
 EL 160 10UF M  
 CE 2KV 330PF K  
 EL 16V 1000UF M

#### COIL

L501(U,C) 5062121400  
 L502(U,C) 5062119800  
 L531(U,C) 5062121400  
 K532(U,C) 5062119800  
 L561(U,C) 5062121400  
 L562(U,C) 5062119800  
 L901 5064422925  
 L902 5062121400  
 L931 5064422925  
 L932 5062121400  
 L961 5064422925  
 L962 5062121400  
 L991 5062202300

COIL CHOKE CHK-214  
 COIL CHOKE CHK-198  
 COIL CHOKE CHK-214  
 COIL CHOKE CHK-198  
 COIL CHOKE CHK-214  
 COIL CHOKE CHK-198  
 COIL PEAKING TRF-8229J  
 COIL CHOKE CHK-214  
 COIL PEAKING TRF-8229J  
 COIL CHOKE CHK-214  
 COIL PEAKING TRF-8229J  
 COIL CHOKE CHK-214  
 COIL CHOKE TLN-2026

#### SEMICONDUCTOR

D591 6613003032  
 D592 6613003032  
 D593 6613003032  
 D594 6613003032  
 D902(RA) 6615010933  
 D902(RB) 6615013831  
 D932(RA) 6615010933  
 D932(RB) 6615013831  
 D962(RA) 6615010933  
 D962(RB) 6615013831  
 I501 6644069400  
 Q591 6621003230  
 Q592 5523001130  
 Q593 6621003230  
 Q595(RA) 6621015334  
 Q595(RB) 6621015332  
 Q901 6621036330  
 Q902(AA) 6621003400  
 Q902(BA) 6621006300  
 Q903(AA) 6624010630  
 Q903(BA) 6623008500  
 Q904(AB) 6622018430  
 Q904(BB) 6621025800  
 Q931 6621036330  
 Q932(AC) 6621003400  
 Q932(BB) 6621006300  
 Q933(AA) 6624010530  
 Q933(BA) 6623008500

DIODE SWITCHING 1N4148  
 DIODE SWITCHING 1N4148  
 DIODE SWITCHING 1N4148  
 DIODE SWITCHING 1N4148  
 DIODE ZENER 05AZ36X  
 DIODE ZENER HZ33  
 DIODE ZENER 05AZ36X  
 DIODE ZENER HZ33  
 DIODE ZENER 05AZ36X  
 DIODE ZENER HZ33  
 IC LM1203N  
 TR 2SC458C  
 TR 2SA844C  
 TR 2SC458C  
 TR 2SC1815  
 TR 2SC1815Y  
 TR 2SC4367  
 TR 2SC3953  
 TR 2SC4439  
 TR 2SB716AD  
 TR 2SA1145Y  
 TR 2SD756AD  
 TR 2SC2705Y  
 TR 2SC4367  
 TR 2SC3953  
 TR 2SC4439  
 TR 2SB716AD  
 TR 2SA1145Y

Q934(AB)	6622018430	TR	2SD756AD
Q934(BB)	6621025800	TR	2SC2705Y
Q961	6621036330	TR	2SC4367
Q962(AE)	6621003400	TR	2SC3953
Q962(BC)	6621006300	TR	2SC4439
Q963(AA)	6624010530	TR	2SB716AD
Q963(BA)	6623008500	TR	2SA1145Y
Q964(AB)	6622018430	TR	2SD756AD
Q964(BB)	6621025800	TR	2SC2705Y

# RESISTOR

R501	5142112195	CF	1/6W 120 J
R502	5162160380	VR	200
R503	5142110395	CF	1/6W 10K J
R504	5142143095	CF	1/6W 43 J
R505	5142120195	CF	1/6W 200 J
R506	5142139195	CF	1/6W 390 J
R507	5142120195	CF	1/6W 200 J
R508	5142156195	CF	1/6W 560 J
R531	5142112195	CF	1/6W 120 J
R532	5162160380	VR	200
R533	5142110395	CF	1/6W 10K J
R534	5142151095	CF	1/6W 51 J
R535	5142120195	CF	1/6W 200 J
R536	5142139195	CF	1/6W 390 J
R537	5142120195	CF	1/6W 200 J
R538	5142125195	CF	1/6W 560 J
R561	5142112195	CF	1/6W 120 J
R562	5162160380	VR	200
R563	5142110395	CF	1/6W 10K J
R564	5142151095	CF	1/6W 51 J
R565	5142120195	CF	1/6W 200 J
R566	5142139195	CF	1/6W 390 J
R567	5142120195	CF	1/6W 200 J
R568	5142156195	CF	1/6W 560 J
R581	5142127395	CF	1/6W 27K J
R586	5142115295	CF	1/6W 1.5K J
R587	5142110295	CF	1/6W 1K J
R588(S)	5142124295	CF	1/6W 2.4K J
R588(M)	5142120295	CF	1/6W 2.0K J
R589(S)	5142120395	CF	1/6W 20K J
R589(M)	5142116395	CF	1/6W 16K J
R590	5160810217	VR	5K
R591	5142110195	CF	1/6W 100 J
R592	5142110395	CF	1/6W 10K J
R593	5142147395	CF	1/6W 47K J
R594	5142122295	CF	1/6W 2.2K J
R595	5142120295	CF	1/6W 2K J
R597	5142156195	CF	1/6W 560 J

R598	5142112395	CF 1/6W 12K J
R901	5142133095	CF 1/6W 33 J
R902	5142110195	CF 1/6W 100 J
R903	5130433103	MOF 2W 330 J
R904	5130433103	MOF 2W 330 J
R905	5142410190	CF 1/2W 100 J
R906	5130433103	MOF 2W 330 J
R907	5130310307	MOF 1W 10K
R908	5142810195	CF 1/4W 100 J
R909	5111210190	CC 1/2W 100 J
R910	5162162650	VR 50K
R931	5142133095	CF 1/6W 33 J
R932	5142110195	CF 1/6W 100 J
R933	5130433103	MOF 2W 330 J
R934	5130433103	MOF 2W 330 J
R935	5142410190	CF 1/2W 100 J
R936	5130433103	MOF 2W 330 J
R937	5130310307	MOF 1W 10K J
R938	5142810195	CF 1/4W 100 J
R939	5111210190	CC 1/2W 100 J
R940	5162162650	VR 50K
R950	5162087867	VR 5K
R961	5142133095	CF 1/6W 33 J
R962	5142110195	CF 1/6W 100 J
R963	5130433103	MOF 2W 330 J
R964	5130433103	MOF 2W 330 J
R965	5142410190	CF 1/2W 100 J
R966	5130433103	MOF 2W 330 J
R967	5130310307	MOF 1W 10K J
R968	5142810195	CF 1/4W 100J
R969	5111210190	CC 1/2W 100 J
R970	5162162650	VR 50K
R991	5142415190	CF 1/2W 150 J
R998	5111233490	CC 1/2W 330K J
Z901	5202201991	SPARK GAP DSP-201M 200V 1PF
Z931	5202201991	SPARK GAP DSP-201M 200V 1PF
Z961	5202201991	SPARK GAP DSP-201M 200V 1PF
Z991	5247333091	CE 500V 33PF J
Z992	5202200501	SPARK GAP SG05G 1KV 1PF



# ASSEMBLY PCB-CONTROL (PWB-1668-2)

Sch NO.	Part NO.	Description
R324	5160810217	VR 0.15W 5K
R326	5160807878	VR 100K
R428	5160807858	VR 500

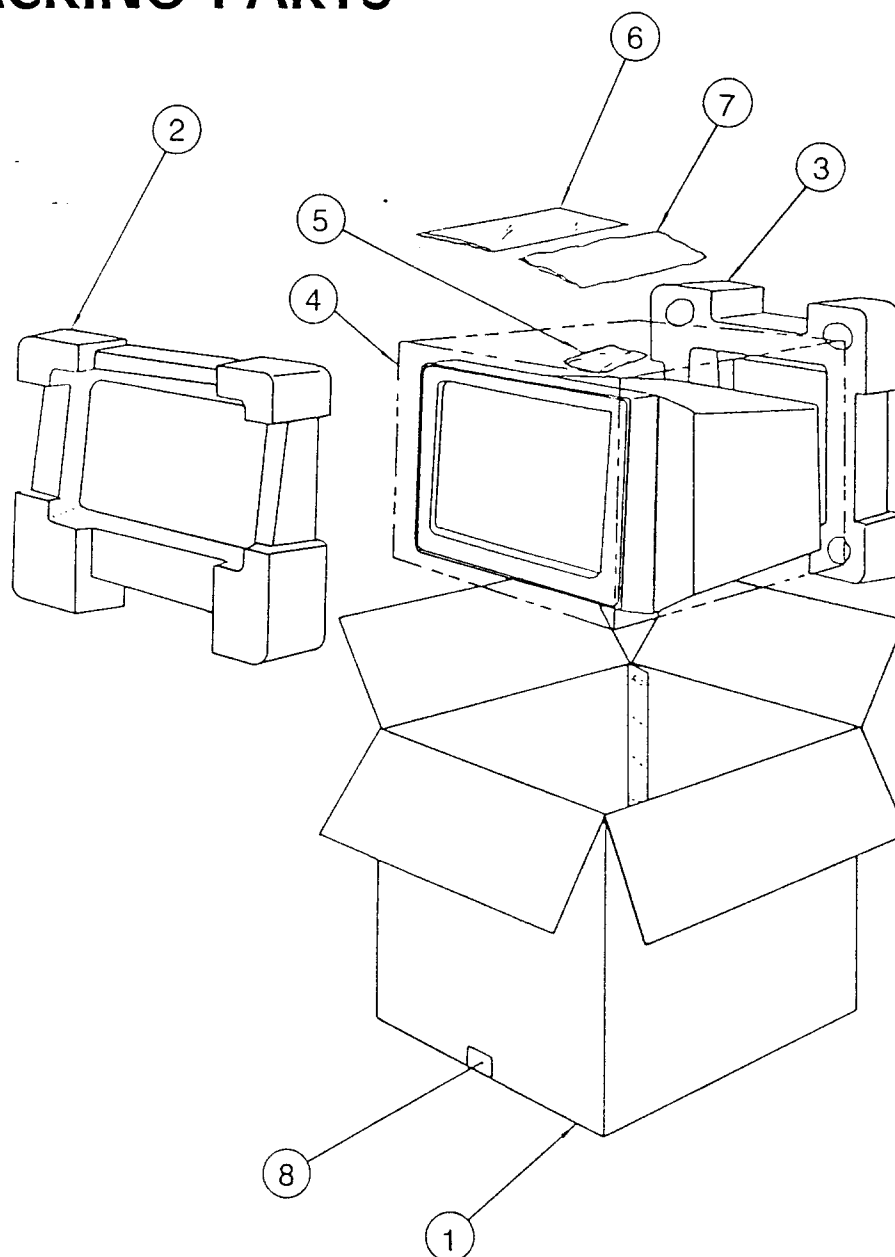
## ASSEMBLY CRT

Sch NO.	Part NO.	Description
L991	5060114410	DEGAUSSING COIL TSB-144J
V901(AA)(S)	5051226400	CCRT M34KBV80X11 (PANASONIC)
V901(BA)(S)	5051226400	CCRT M34KDD50X02 (HITACHI)
V901(CA)(S)	5051226406	CCRT M34AFA60X03 (CPT)
V901(M)(U)	5051228000	CCRT E2971B22-TC42ET (CPT)
V901(M)(E,C)	5051228010	CCRT E2971B22-TC42ETH(CPT)

## OTHERS

Sch NO.	Part NO.	Description
F801	5054420031	FUSE 250V 2A
P505	5057409202	SINGAL CABLE

## 14. PACKING PARTS



NO.	PART NO.	DESCRIPTION
1		PACKING CARTON
8	9560137612	OPP TAPE
7	9554100400	PE BAG FOR POWER CORD
6	9554141000	PE BAG FOR INSTRUCTIONS MANUAL
5	8802019083	DRIER SILICA GEL
4	9553172119	PE BAG FOR UNIT
3	9521380456	EPS (BACK)
2	9521380356	EPS (FRONT)