



SERVICE INFORMATION
MODEL CM-1480
COLOUR DISPLAY MONITOR

CM-1480 SERIES COLOUR DISPLAY MONITOR
SERVICE MANUAL

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CHAPTER 1

SPECIFICATIONS

| | |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| APPLICATION: | Typical data display device for personal computer applications. |
| POWER INPUT: | 90 watts (Nominal), AC rated voltage-refer to backcover label. A 2 metre 3-wire mains cord is supplied. |
| VIDEO SIGNALS: | 16 colour: Red, green, blue and intensity video signals. 64 colour: R,G,B, and r,g,b, (intensity) video signals. All are positive TTL. |
| SYNC. SIGNALS: | Horizontal: 15.75kHz +/- 300Hz (mode 1) or 21.853kHz +/- 300Hz (mode 2) positive TTL, autoswitching by TTL. Vertical: 47-63Hz positive TTL at mode 1. 47-63Hz negative TTL at mode 2. |
| SIGNAL CONNECTOR: | 9-Pin D-shell connector. |
| DISPLAY TUBE: | 14", 90 deflection, 29.1mm neck, 0.31mm dot pitch. dot inline, dark tint non-glare. Type No.: M34JDU30X66 |
| DISPLAY AREA: | Width: 250mm Height: 170mm |
| DISPLAY COLOUR: | Mode 1: 16 colours. Mode 2: 64 colours. |
| DISPLAY CHARACTER: | 2000 characters (80CH. X25 Row on 8x8 dot matrix) |
| DISPLAY TIME: | Horizontal: mode 1: 44.5us mode 2: 39.37us Vertical: mode 1: 12.58ms mode 2: 16.01ms |
| RETRACE TIME: | Horizontal: mode 1: 6.0us mode 2: 6.0us Vertical: mode 1: 1.2ms mode 2: 0.6ms |
| RESOLUTION: | Horizontal: 640 dots Vertical: mode 1: 200 scan lines (non-interlaced) mode 2: 350 scan lines (non-interlaced) |
| MISCONVERGENCE: | 0.5mm Max. within data area. |
| USER CONTROLS: | Power on-off, brightness, contrast, vertical size 1, vertical size 2, Multi colour switch, horizontal centre 1, horizontal centre 2. video reverse switch, power voltage 120VAC/240VAC selector. |
| SERVICE CONTROLS: | H-Hold 1, H-Hold 2, H-Width 2, H-Centre, V-Centre, V-Hold, Focus, Screen, E-W Pincusion, set EHT, 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: | 365 (W) X 315 (H) X 400 (D) mm |
| WEIGHT: | 13.5kg (net) |

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CHAPTER 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. 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. 2-1, 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.

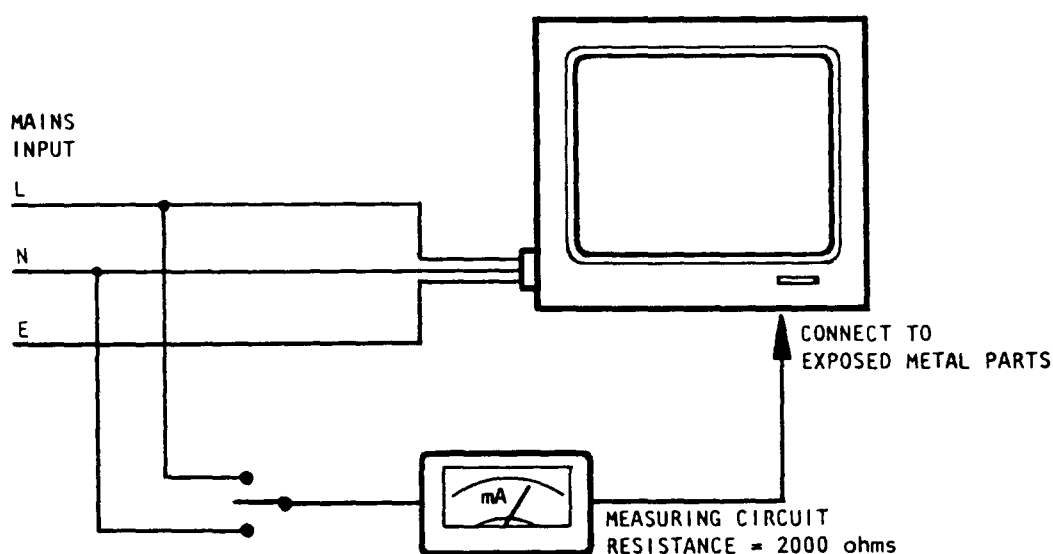


Fig 2-1 AC LEAKAGE CURRENT TEST CIRCUIT

2-2 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.

2-3 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

CHAPTER 3

OPERATING INSTRUCTIONS

3-1 CONTROLS AND CONNECTIONS

- * POWER: The power rocker switch turns the monitor on or off.
- * MULTI COLOUR INDICATOR: A green LED lights when the monitor is switched on with colour displayed on the normal state. Push Multi-colour switch on the front to appropriate position for desired display.
- * BRIGHTNESS: The brightness control sets the overall or average intensity of illumination of the display
- * CONTRAST: The contrast control sets the intensity of the data displayed.
- * 120/240VAC SELECTOR: The selector switch adapts the monitor for operation from the local AC power source.
- * V. SIZE (1 and 2): The vertical size adjustments (mode 1 and mode 2) set the amount of vertical (top to bottom) raster deflection.
- * H. PHASE (1 and 2): The horizontal phase adjustments (mode 1 and mode 2) set the horizontal (left to right) position of the display within the raster area.
- * POWER INPUT JACK: A 3-pin power connector is located on the rear panel.
- * POWER LEAD: A 2m 3-wire mains lead connects power to the monitor.
- * VIDEO SIGNAL CABLE: A 1.5m cable, terminated with a 9 Pin D-type connector, supplies video and sync. signals to the monitor. The cable is attached to the monitor and is not detachable. Fig 3-1 illustrates the D-type connector. Table 3-1 lists the connector signal for each mode of operation.
- * VIDEO REVERSE SWITCH: Move the switch to reverse the background and image colours.

3-2 Set up and Operation:

Perform the following steps to set up and operate the monitor.

1. Place the monitor on a flat surface near the computer and near an AC power outlet. Be certain that the ventilation slots in the cabinet are not blocked or obstructed.
2. Connect the video signal cable from the monitor to the computer.
3. Plug the power cord into the monitor and then into an AC outlet. Be certain that the 120/240 VAC selector switch on the rear panel is set to the correct position.

WARNING: Removing the earth from the AC power source may present a potentially lethal shock hazard.

4. Turn on the computer and the monitor. The front panel green LED should light. The system prompt for the computer should be displayed.
5. Adjust the left panel brightness and contrast controls to obtain a comfortable display.

If your CM-1480 monitor requires service, refer to the controls and adjustments information of this publication and verify that all controls and adjustments on the display are correctly set. If your monitor does require service, it must be returned with the mains lead.

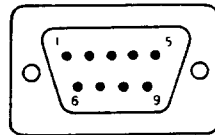


Fig 3-1 9-Pin Colour Monitor
Signal Cable

Table 3-1

| 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 | g |
| 7 | Unused | b |
| 8 | Horiz. sync. | Horiz. sync. |
| 9 | Vert. sync. | Vert. sync. |

CHAPTER 4

ADJUSTMENTS

4-1

This chapter contains instructions for performing the various monitor adjustments. Because these adjustments are performed while the monitor is switched on, observe proper precautions to avoid personal injury. Specific warnings are included where necessary.

Paragraph 4-2 lists the various adjustment devices and their component numbers. They are arranged according to the circuit board or location where they can be found. If a particular adjustment does not correct a problem, refer to section 5 for additional information.

4-2 Monitor Adjustment Devices

| DEVICE ----- | DESCRIPTION ----- |
|------------------------|---------------------------------------|
| EXTERNAL | |
| R208 | Left panel brightness control |
| R209 | Left panel contrast control |
| VIDEO BOARD (PWB-1324) | |
| R526 | Primary red drive |
| R527 | Secondary red drive |
| R566 | Primary green drive |
| R567 | Secondary green drive |
| CRT BOARD (PWB-1337) | |
| R523 | Red cut-off |
| R563 | Green cut-off |
| R593 | Blue cut-off |
| MAIN BOARD (PWB-1337) | |
| R309 | Vertical hold |
| R306 | Vertical size, mode 1 (Rear panel) |
| R366 | Vertical size, mode 2 (Rear panel) |
| R326 | Vertical centring |
| R408 | Horizontal hold, mode 1 |
| R468 | Horizontal hold, mode 2 |
| R433 | Horizontal width, mode 1 |
| R493 | Horizontal width, mode 2 |
| R413 | Horizontal phase, mode 1 (Rear panel) |
| R473 | Horizontal phase, mode 2 (Rear panel) |
| R435 | Horizontal centring |
| R333 | E-W pincusion |
| R907 | Sub-brightness |
| R451 | 22.5kV EHT |
| POWER SUPPLY | |
| * R813 | B+ 12.8 +/-0.1V |
| OTHER | |
| Focus | VR High voltage resistor block |
| G2 | VR High voltage resistor block |

4-3 PREPARATION

Perform the following steps to prepare the monitor for adjustment:

- (1) Remove the cabinet back to access internal adjustments.
- (2) Turn the monitor on and allow it to warm up for approximately 30 minutes.
- (3) Read each adjustment procedure before performing it.

1. B+ ADJUSTMENT

The switch-mode power supply has a B+ output voltage adjustment located within the unit. Variable resistor R813 sets the 12.80 VDC output.

WARNING: The switch-mode power supply contains circuits that generate dangerous high-frequency, high amplitude signals that present a potentially lethal shock hazard. Exercise extreme caution when adjusting or working near this unit.

Using a DVM, measure the 12.80V B+ voltage and adjust R813 to obtain a reading of 12.80V, +/-0.1V. R813 may be accessed through a hole labeled B-ADJ in the side of the power supply enclosure.

2. VERTICAL HOLD

The vertical hold adjustment prevents the display from rolling upwards or downwards. Adjust R309 to stabilize the display by turning it first to one extreme and then backing off until the display just stabilizes. Repeat this procedure from the opposite extreme until the display just stabilizes. Set R309 between the two settings that stabilize the display.

3. VERTICAL SIZE

The vertical size adjustment sets the amount of vertical (top to bottom) raster deflection. The vertical size adjustments for both mode 1 and mode 2 are located externally on the rear panel. To adjust vertical size;

- (1) Turn the G2 control clockwise until the raster just appears.
- (2) Adjust R306 (V. SIZE 1) or R366 (V.SIZE 2) for a raster height of 170mm +/-2mm in each mode 1 or mode 2 respectively.
- (3) Turn the G2 control counterclockwise until the raster just disappears.

4. VERTICAL CENTRING

The vertical centring adjustment shifts the whole display up or down within the raster. To adjust centring:

- (1) Verify that the vertical size is correct. Adjust if necessary.
- (2) Turn the G2 control clockwise until the raster just appears.
- (3) Adjust R326, the vertical centring pot, so that the display is centred from top to bottom within the raster.

- (4) Turn the G2 control counterclockwise until the raster just disappears.

5. HORIZONTAL HOLD

The horizontal hold adjustment prevents the display from shifting horizontally and breaking up in diagonal segments. To adjust the horizontal hold:

- (1) Connect a jump lead from test point TP22 to earth.
- (2) Adjust R408 (mode 1) or R468 (mode 2) to eliminate horizontal tearing and restore horizontal hold.
- (3) Remove the jump lead from TP22.

6. HORIZONTAL WIDTH

The horizontal width adjustment sets the amount of horizontal (left to right) raster deflection. To adjust horizontal width:

- (1) Turn the G2 control clockwise until a raster just appears.
- (2) Adjust R433 (mode 1) or R493 (mode 2) so that the display width is 250mm +/- 2mm in each mode.
- (3) Turn the G2 control counterclockwise until the raster just disappears.

7. HORIZONTAL PHASE

The horizontal phase adjustment sets the left-to-right position of the display within the raster area. To adjust horizontal phase:

- (1) Turn the G2 control clockwise until the raster just appears.
- (2) Adjust R413 (mode 1) or R473 (mode 2) to centre the display from left to right within the raster.
- (3) Turn the G2 control counterclockwise until the raster just disappears.

8. HORIZONTAL CENTRING

The horizontal centring adjustment shifts the whole raster from left to right for mode 2. This adjustment is only present for mode 2. To adjust horizontal centring:

- (1) Turn the G2 control clockwise until the raster just appears.
- (2) Adjust R435 to centre the raster from left to right for mode 2.
- (3) Turn the G2 control counterclockwise until the raster just disappears.

9. RGB DRIVE

The red and green drive adjustments set the amplitudes of the red and green CRT drive voltages relative to the blue drive voltage. (There is no blue drive adjustment.) When set properly, all three

(RGB) drive voltages will be the same. To adjust the red and green drive voltages:

- (1) Display a white field.
- (2) Set the left panel contrast and brightness controls to maximum.
- (3) Using an oscilloscope, measure and record the amplitude of the blue drive voltage at TP52B on the CRT drive board. This value should be approximately 60 Vp-p.
- (4) Next, measure the amplitude of the red drive voltage at TP52R. If necessary, adjust the two red (R and r) drive pots (R526 and R527) so that the amplitude of the red drive voltage matches that of the blue drive voltage recorded in step 3.
- (5) Measure the amplitude of the green drive voltage at TP52G. If necessary, adjust the two green (G and g) drive pots (R566 and R567) so that the amplitude of the green drive voltage matches that of the blue drive voltage recorded in step 3.

10. HORIZONTAL LINE PRECISION

The horizontal line precision adjustment sets the relative contributions of the R, G, and B bias controls to produce a white horizontal line. This adjustment should be performed under low light. To adjust the horizontal line precision:

- (1) Remove the input signal from the monitor. (Disconnect video cable from the computer.)
- (2) Set the left panel contrast control to maximum and the left panel brightness control to minimum.
- (3) Set the R, G, and B cutoff controls (R523, R563, and R593) to mid-position.
- (4) Set sub-brightness control R907 to its mid-position.
- (5) Adjust G2 for 500 VDC. G2 voltage may be measured from the foil side of the CRT drive board.
- (6) Connect a jump lead between points M and N on the main board.
- (7) Turn the R cutoff control (R523) counterclockwise until a red horizontal line just appears.
- (8) Turn the G and B controls (R563 and R593) counterclockwise until a white line is displayed.
- (9) Remove jump lead connecting points M and N.
- (10) Perform the brightness level adjustment procedure in the following section.

11. BRIGHTNESS LEVEL

The sub-brightness control (R907) sets the threshold for the front panel brightness control. This control should be adjusted with the monitor in mode 2. Adjustment should be performed under low light.

To adjust the brightness level:

- (1) Display a white field on the entire screen.
- (2) Set the front panel brightness control to minimum.
- (3) Adjust R907 so that the display just disappears.

12. E-W PINCUSHION

The E-W pincushion adjustment reduces the horizontal pincushion distortion of the raster. (Pincushion distortion is characterized by sides of the display which bow inward, especially toward the centre of the display.)

This control should be adjusted with the monitor in mode 2. To adjust the E-W pincushion:

- (1) Display a crosshatch pattern.
- (2) Adjust R333 so that any horizontal pincushion distortion is corrected.

13. FOCUS

The focus adjustment (the upper control on high-voltage resistor block) varies the focus voltage to produce the sharpest display detail. To adjust the focus:

- (1) Display a dot test pattern.
- (2) Set the front panel contrast and brightness controls for a comfortable display.
- (3) Adjust the focus control for best overall focus. Check the centre, top centre, bottom centre, left centre, and right centre areas of the display for good focus.
- (4) Verify acceptable overall focus using the fill screen test with such characters as @ and #.

14. STATIC CONVERGENCE

Static convergence adjustment refers to setting each electron beam so that all three beams (red, green and blue) hit the same spot. When all three beams hit the same spot on the CRT mask with equal intensity, a white dot appears on the screen. This adjustment should be performed under low light.

NOTE: Read the entire procedure thoroughly before performing this adjustment.

To adjust static convergence:

- (1) Locate the convergence magnets on the neck of the CRT. Identify the 4-pole, 6-pole and purity magnets.
- (2) Mark the present position of the magnets by drawing a pencil line along the sides of all the magnets. This will give you a reference point in case the adjustment becomes difficult.
- (3) Carefully remove the clear adhesive glue which holds the magnets in place. The glue may be scraped away, but be careful not to damage the CRT neck.

- (4) Rotate the 4-pole and 6-pole magnets slightly to loosen them. Do not force them: slowly work them back and forth until they can be moved with only moderate effort. Do not rotate the purity magnet.
- (5) Turn the monitor on and allow it to warm up for approximately 30 minutes.
- (6) Display a crosshatch pattern.
- (7) Separate the three colours (red, green, and blue) horizontally and vertically. This is accomplished by rotating the 4-pole and 6-pole magnets until the three colours are visible. The resulting display shows three distinct horizontal lines (red, green, and blue) instead of one white horizontal line throughout the display. Similarly, the white vertical lines are now split into three distinct vertical lines (red, green, and blue).
- (8) Superimpose the red and blue horizontal lines at the centre of the screen. This is accomplished by rotating both tabs of the 4-pole magnets simultaneously until the red and blue lines overlap to form one magenta line. Use a 10X or better magnifier to more precisely adjust the overlap once the line appears magenta to the unaided eye.
- (9) Superimpose the red and blue vertical lines at the centre of the screen. This is accomplished by changing the angle between the 4-pole magnets until the red and blue lines overlap to form one magenta line. Use a 10x or better magnifier to more precisely adjust the overlap once the line appears magenta to the unaided eye.
- (10) Verify that the red and blue horizontal and vertical lines are now superimposed and appear magenta. Because these adjustments are magnetic in nature, they are somewhat interactive. Repeat the previous two steps if necessary.
- (11) Superimpose the magenta and green horizontal lines at the center of the screen. This is accomplished by rotating both tabs of the 6-pole magnets simultaneously until the magenta and green lines overlap to form one white line. Use a 10x or better magnifier to more precisely adjust the overlap once the line appears white to the unaided eye.
- (12) Superimpose the magenta and green vertical lines at the centre of the screen. This is accomplished by changing the angle between the 6-pole magnets until the magenta and green lines overlap to form one white line. Use a 10x or better magnifier to more precisely adjust the overlap once the line appears white to the unaided eye.
- (13) Verify that the magenta and green horizontal and vertical lines are now superimposed and appear white. Because these adjustments are magnetic in nature, they are somewhat interactive. Repeat the previous two steps if necessary.

- (14) Verify overall convergence by once again examining the cross-hatch pattern. Check the horizontal and vertical lines at the centre of the screen for proper convergence. Repeat any steps as necessary.

15. ADJUSTMENT AND TEST LOCATION

- (1) PCB-MAIN adjustment and test location. (See Fig 4-1)
- (2) PCB-VIDEO DRIVE adjustment and test location. (See Fig 4-2)
- (3) PCB-CRT DRIVE adjustment and test location. (See Fig 4-3)
- (4) PCB-POWER adjustment and test location. (See Fig 4-4)

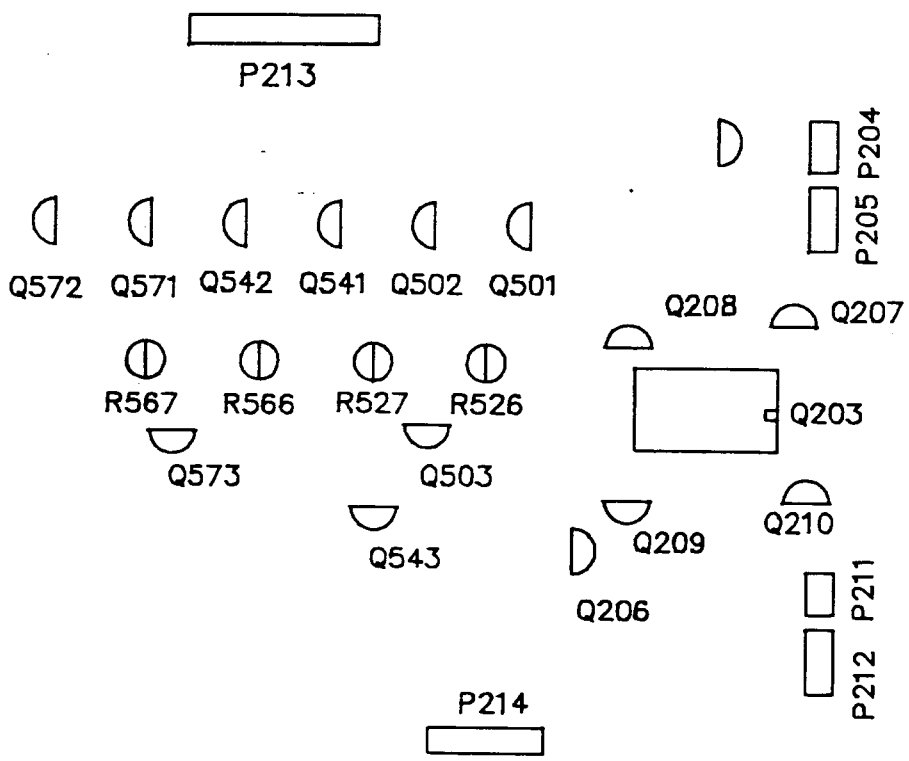


Fig 4-2 PCB-VIDEO DRIVE adjustment and test location

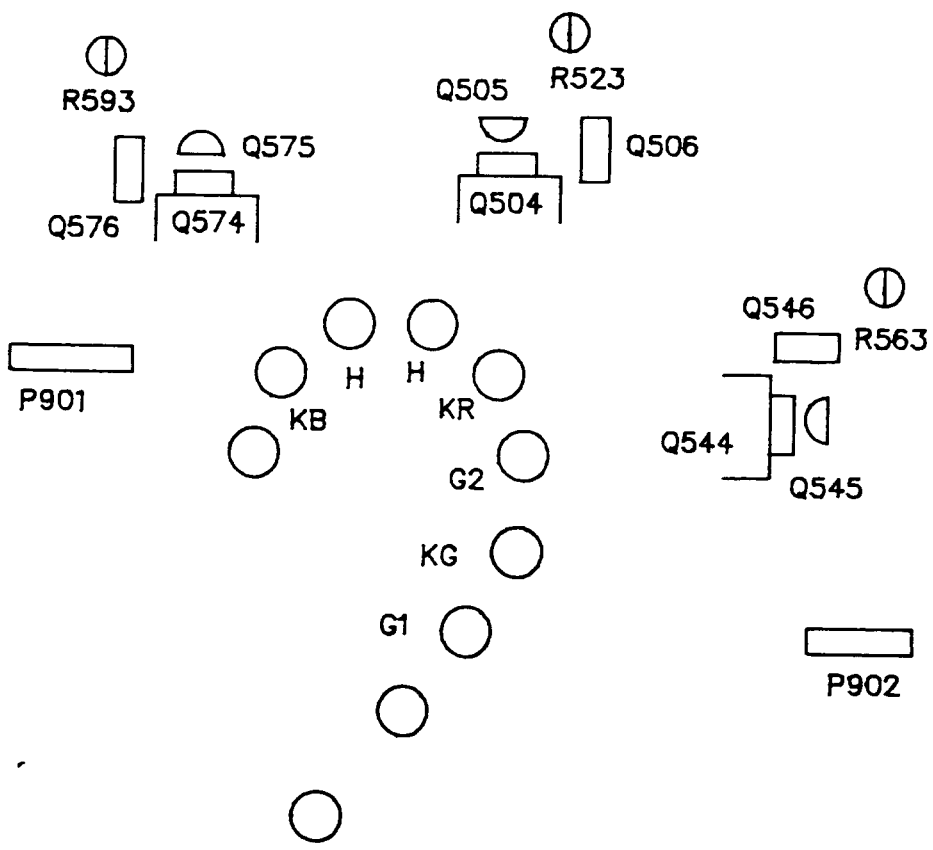


Fig 4-3 PCB-CRT DRIVE adjustment and test location

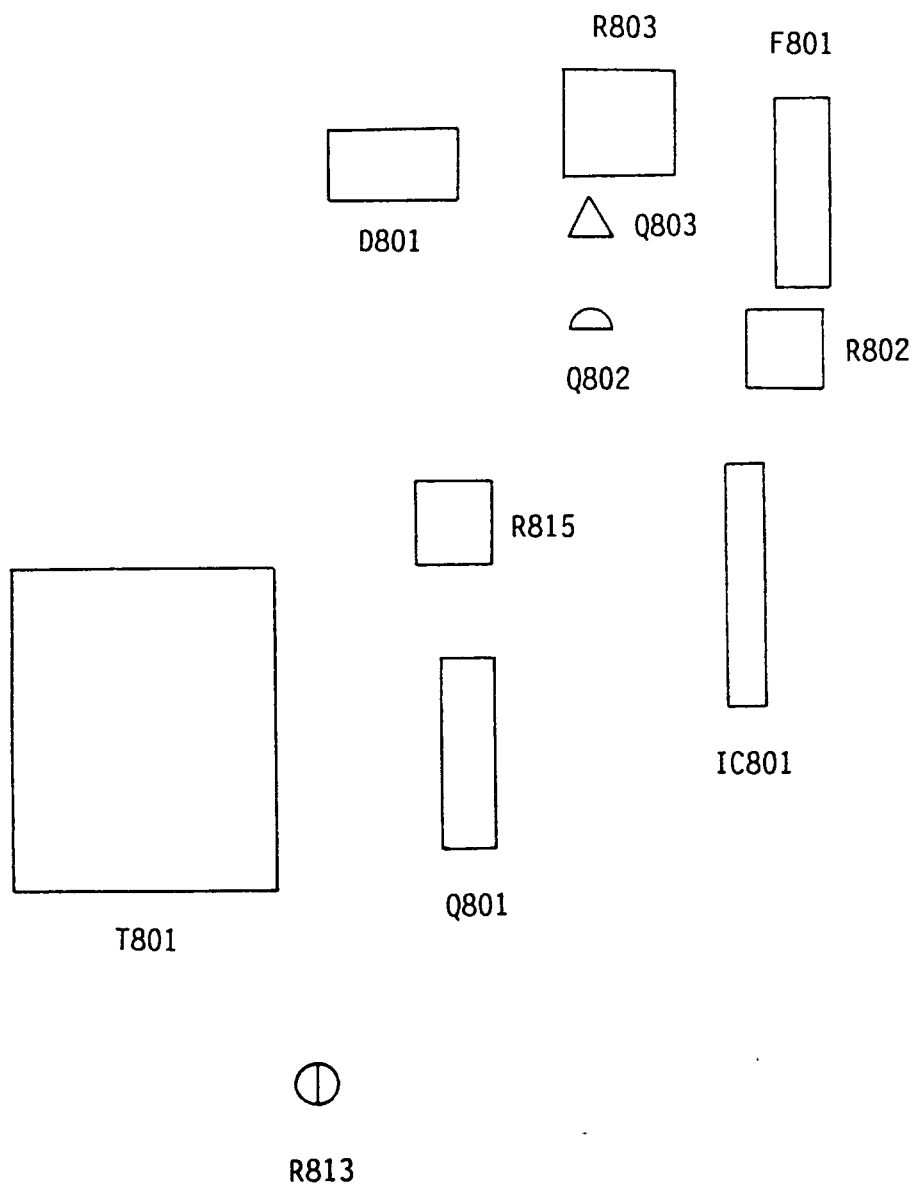


Fig 4-4 PCB-POWER adjustment and test location

CHAPTER 5

TROUBLESHOOTING

This chapter provides information on troubleshooting the CM-1480 colour display monitor. Enough information is included to assist in diagnosing most faults to the major component level.

5-1 ORGANIZATION

General troubleshooting information is included in the each paragraph of this section. Read these paragraphs before proceeding. They contain safety guidelines, tests and diagnostics, and other important information.

Following this general information is a series of troubleshooting flowcharts. These charts are designed to assist in diagnosing faults to the major component level. Always begin with the General Troubleshooting Chart. This chart will direct you to an adjustment or to a more detailed chart.

5-2 SAFETY GUIDELINES

Read the following safety notes carefully before attempting to troubleshoot or repair this monitor.

WARNING: The anode of the CRT retains a potentially lethal voltage when the monitor is turned off. Perform repairs only after the CRT has been properly discharged. Refer to Fig 5-1 and the following procedure to discharge the CRT anode:

- (1) Connect a clip lead or heavy gauge wire to chassis ground.
- (2) Connect the other end of the lead to the stem of a flat blade screwdriver that has an insulated handle.
- (3) Insert the blade of the screwdriver under the rubber insulation that covers the anode lead on the CRT and make contact with the anode terminal. Depending on the quantity of charge present on the anode, a distinct snap may be heard as the CRT discharges. Allow approx 3 seconds for the CRT to discharge completely.

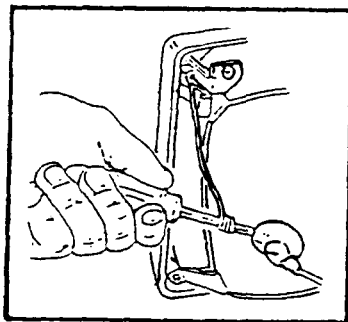
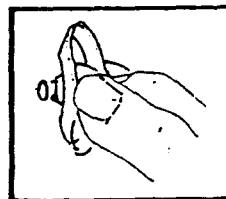


Fig 5-1 CAREFULLY SLIDE A GROUNDED FLAT SCREWDRIVER TIP UNDER THE LIP OF THE ANODE LEAD.



AFTER DISCHARGING THE VOLTAGE DISCONNECT THE ANODE LEAD FROM THE CRT.

WARNING: Operation of the CRT at voltages higher than 25kV may produce X-rays. Always verify that the anode voltage is at normal level when servicing the monitor. Do not operate the monitor with excessively high voltage any longer than is necessary to locate the cause of the excessive voltage.

WARNING: The switch mode power supply contains circuits that generate dangerous high-frequency, high amplitude signals that present a potentially lethal shock hazard. Do not attempt to troubleshoot the power supply. If the power supply requires service, return it to the manufacturer.

WARNING: Parts of the power supply circuitry are not isolated. To prevent both personal injury and equipment damage, an isolation transformer must be used while troubleshooting this monitor.

CAUTION: All components should be replaced only with types identical to those in the original circuit, and their physical location, wiring and lead dress must conform to the original layout upon completion of repairs.

5-3 AC LEAKAGE TEST

The repair and reassembly of the monitor can inadvertently cause a loss of electrical isolation between the AC power wires and the exposed metal parts of the monitor. If this isolation is lost or significantly reduced, electrical shock can result.

Carry out the AC leakage current tests detailed in chapter 2, paragraph 2-1 to verify the safety of the equipment.

5-4 SUGGESTED TOOLS AND EQUIPMENT

The following tools and supplies are recommended for servicing the monitor.

- * Flat-blade screwdriver, 6mm blade
- * Philips screwdrivers, No. 1 and No. 2 tips
- * Plastic alignment tools.
- * Diagonal cutters
- * Wire strippers
- * Long nose pliers
- * Soldering iron, 25 to 40 watt
- * Solder, 60/40 (HE-490-185)
- * Desoldering braid (HE-354-59)

The following equipment is recommended for troubleshooting the monitor as described in this chapter:

- * PC-AT computer or equivalent
- * CGA and EGA video cards
- * Oscilloscope: DC to 100MHz, dual trace triggered sweep.
- * Oscilloscope probe: low capacitance, 4 ns rise time.
- * Digital voltmeter: high impedance input, zero to 1000 volts, zero to 1 megohm.
- * High-voltage probe: zero to 40kV.
- * 10x magnifying glass (or better)
- * Isolation transformer

5-5 INSPECTION AND PREPARATION

Before turning the monitor on, inspect the power lead, video cable, and all connectors for damaged insulation or loose pins. Inspect the exterior of the monitor for signs of damage. If physical damage is evident, remove the cabinet back and inspect further before proceeding.

If these preliminary checks do not indicate a problem, proceed as follows:

- (1) Connect the video cable from the monitor to the computer.
- (2) Insert Tatung test floppy disc.
- (3) Turn computer and monitor on. Observe display for faults and refer to the troubleshooting section only after reading the remaining procedures in this section.
- (4) Allow the monitor to warm up for approximately 30 minutes, unless a fault diagnosed in (3) prevents this.

5-6 COLOUR BAR TEST

1. Press F1 or F2.
2. Press shift 6
3. Colour bars should now be displayed.

Use this test in conjunction with the troubleshooting charts which follow this section.

5-7 WHITE FIELD

- (1) Press F1 or F2
- (2) Press F4 or F5, F6, F7, F8.

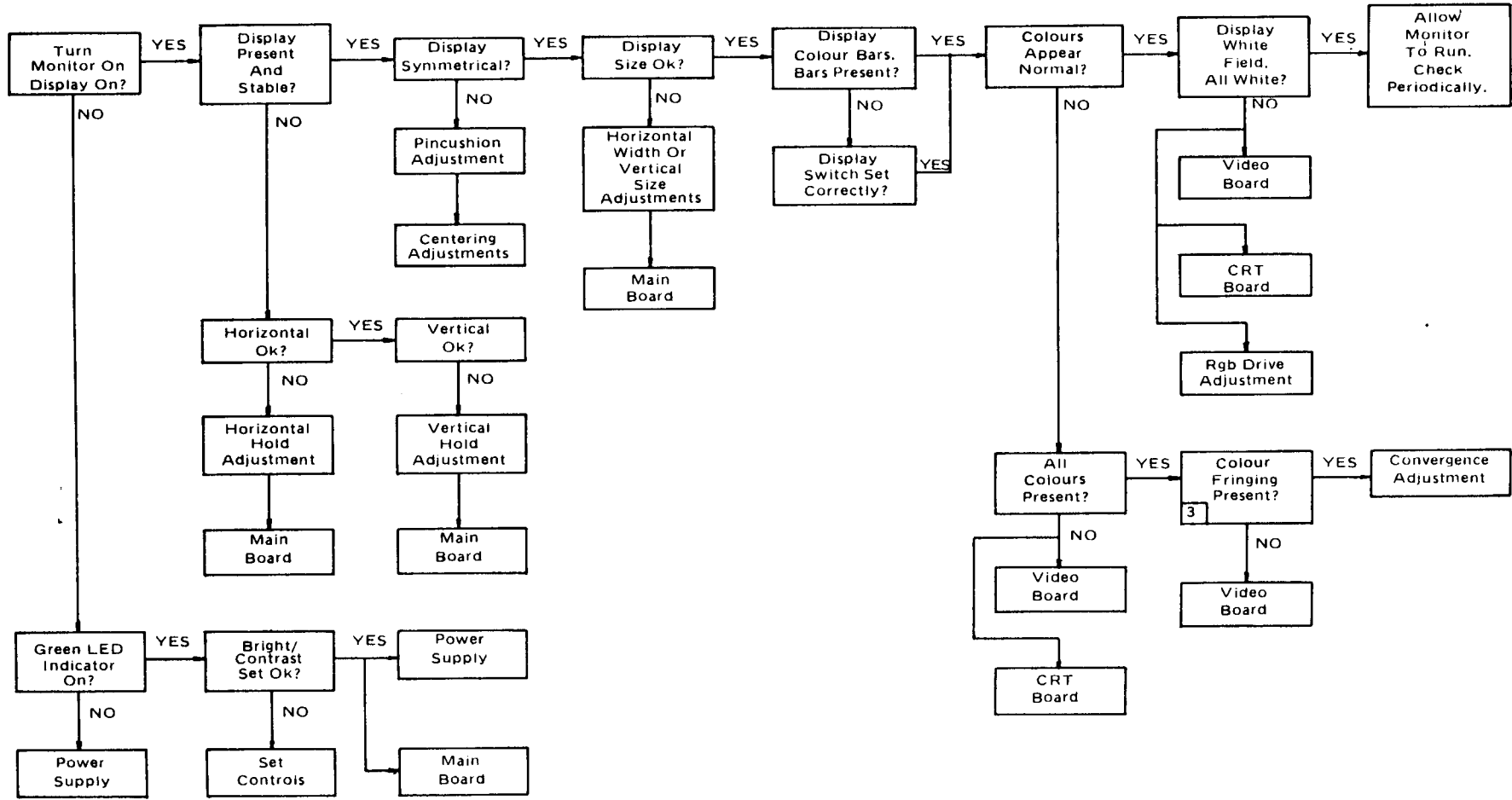
5-8 TROUBLESHOOTING CHARTS

This section contains a series of troubleshooting charts designed to assist in diagnosing faults to the major component level. Always begin with the General Troubleshooting Chart. This chart will then direct you to check a particular item, perform an adjustment or consult a more detailed chart. The charts are:

- General Troubleshooting Chart (Fig 5-2)
- Power Supply Troubleshooting Chart (Fig 5-3)
- Video Board Troubleshooting Chart (Fig 5-4)
- CRT Board Troubleshooting Chart (Fig 5-5)
- Main Board Troubleshooting Chart (Fig 5-6)

NOTE: Always refer to the appropriate schematic as you work through the steps of a troubleshooting chart. These charts are designed to assist in diagnosing faults, but they cannot substitute for the information contained in the schematics.

Fig 5-2 General Troubleshooting Chart



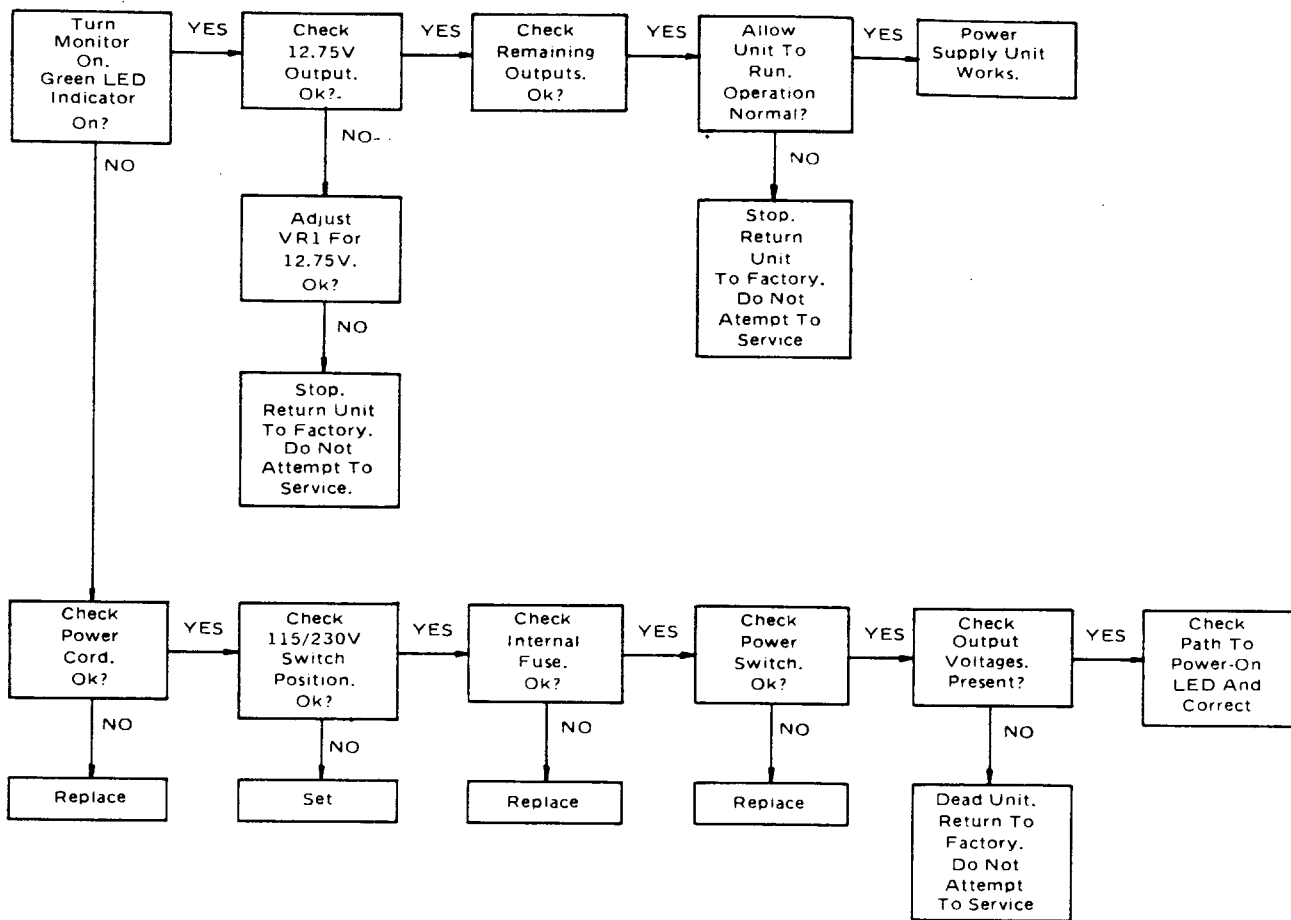


Fig 5-3 Power Supply Troubleshooting Chart

Notes

1. R813 may be accessed through a hole labeled B-ADJ in the side of the power supply enclosure.
2. The video board must be removed to access the internal fuse. The fuse is located below and to the left of R813.

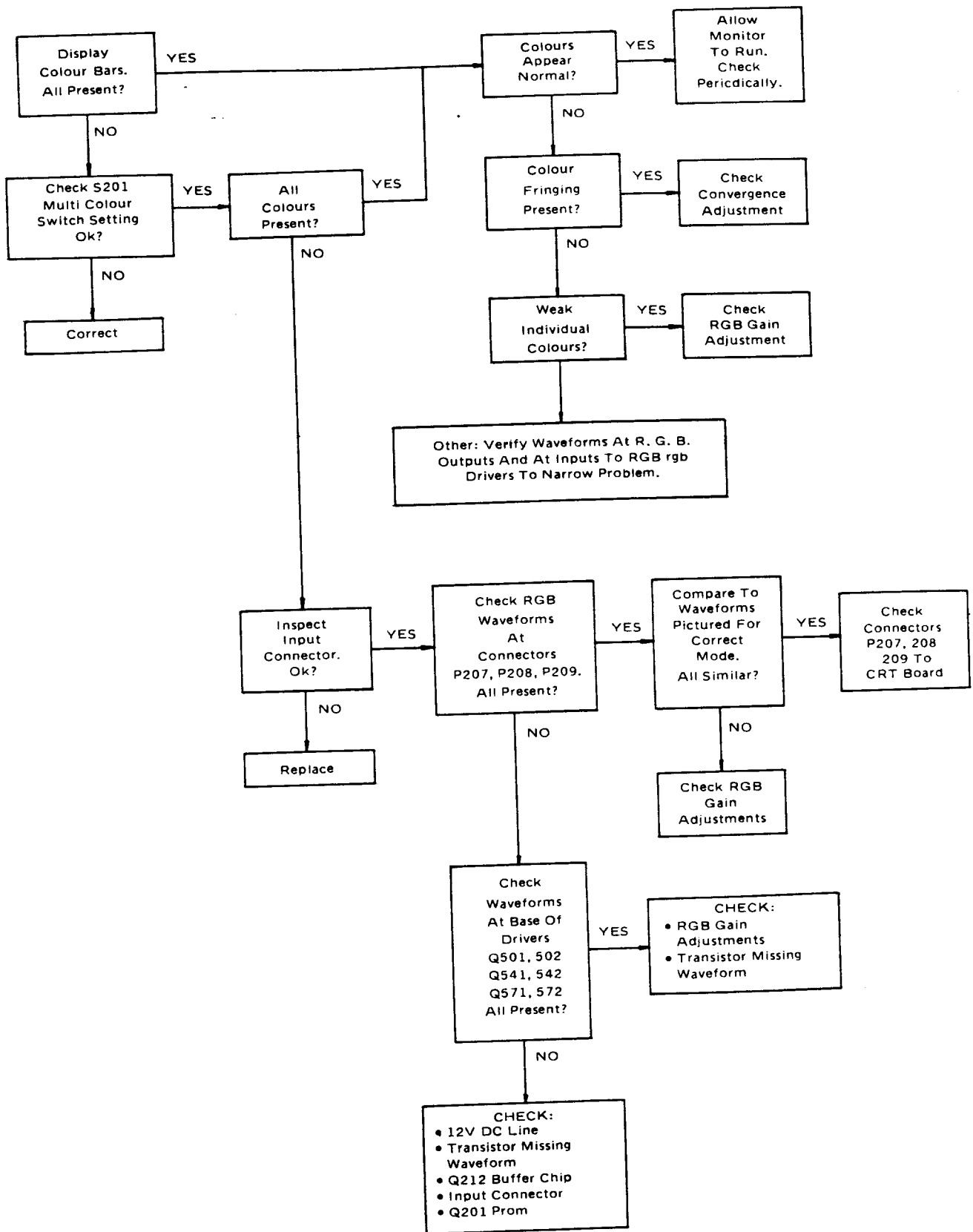


Fig 5-4 Video Board Troubleshooting Chart

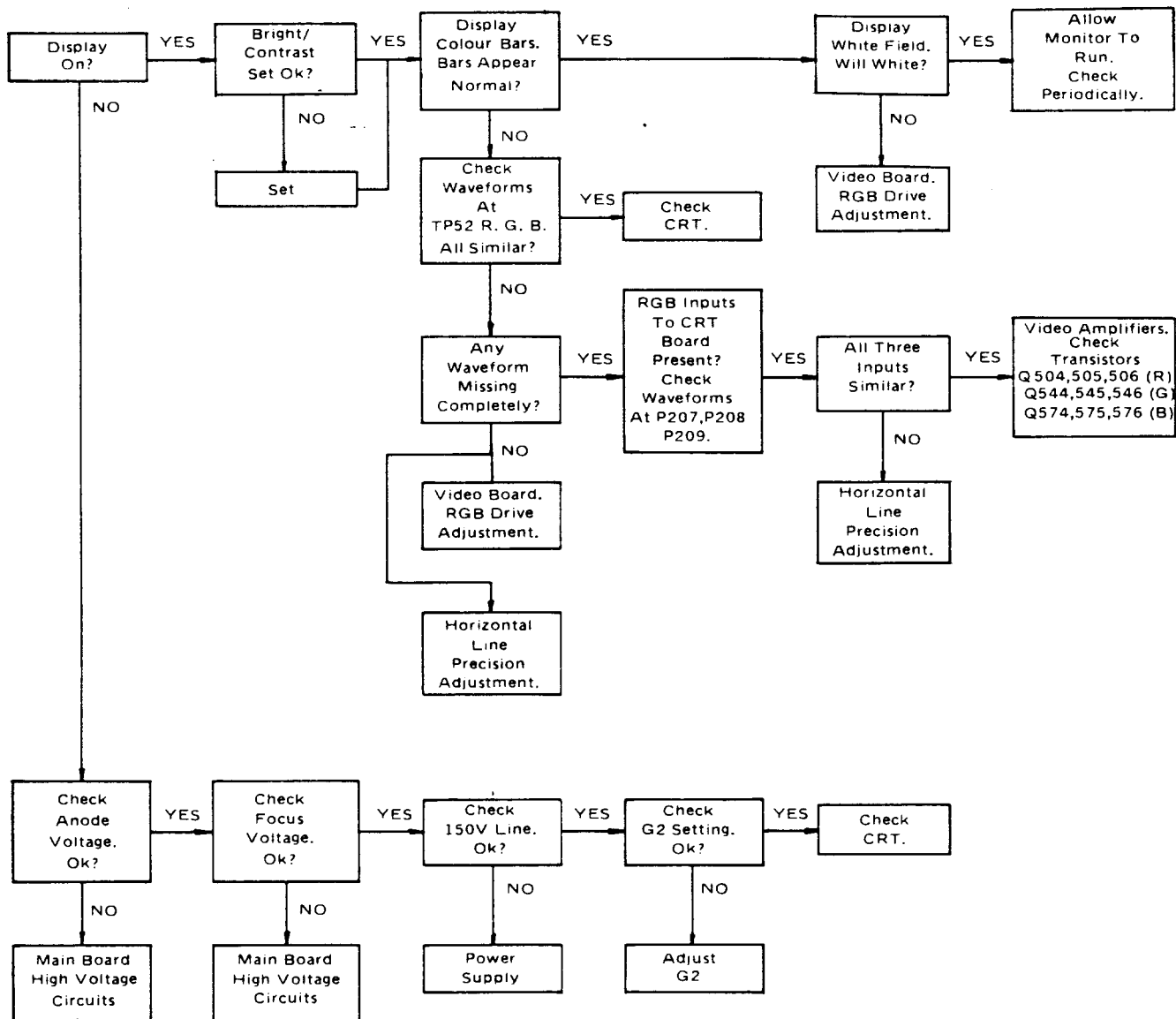


Fig 5-5 CRT Board Troubleshooting Chart

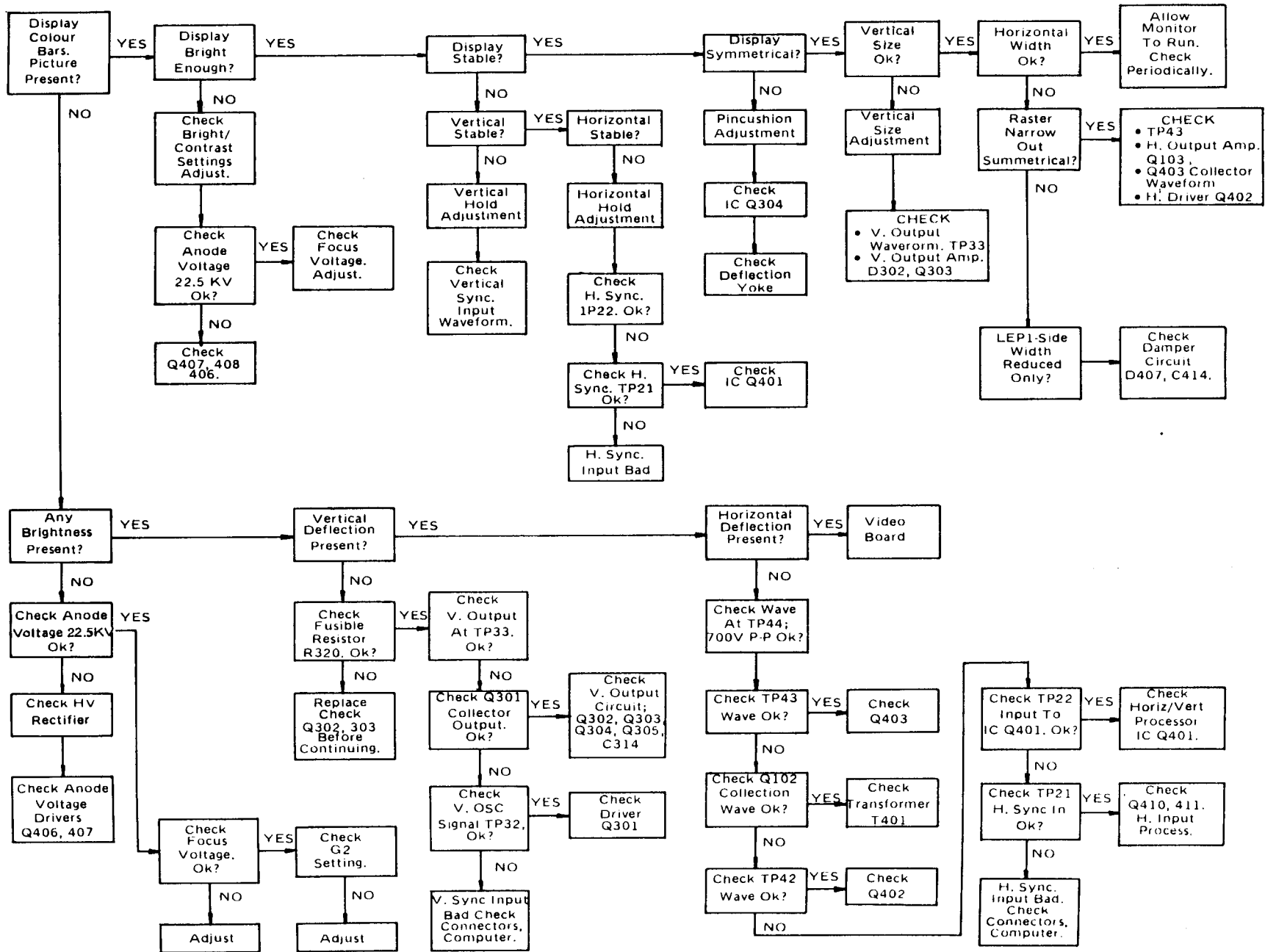


Fig 5-6 Main Board Troubleshooting Chart

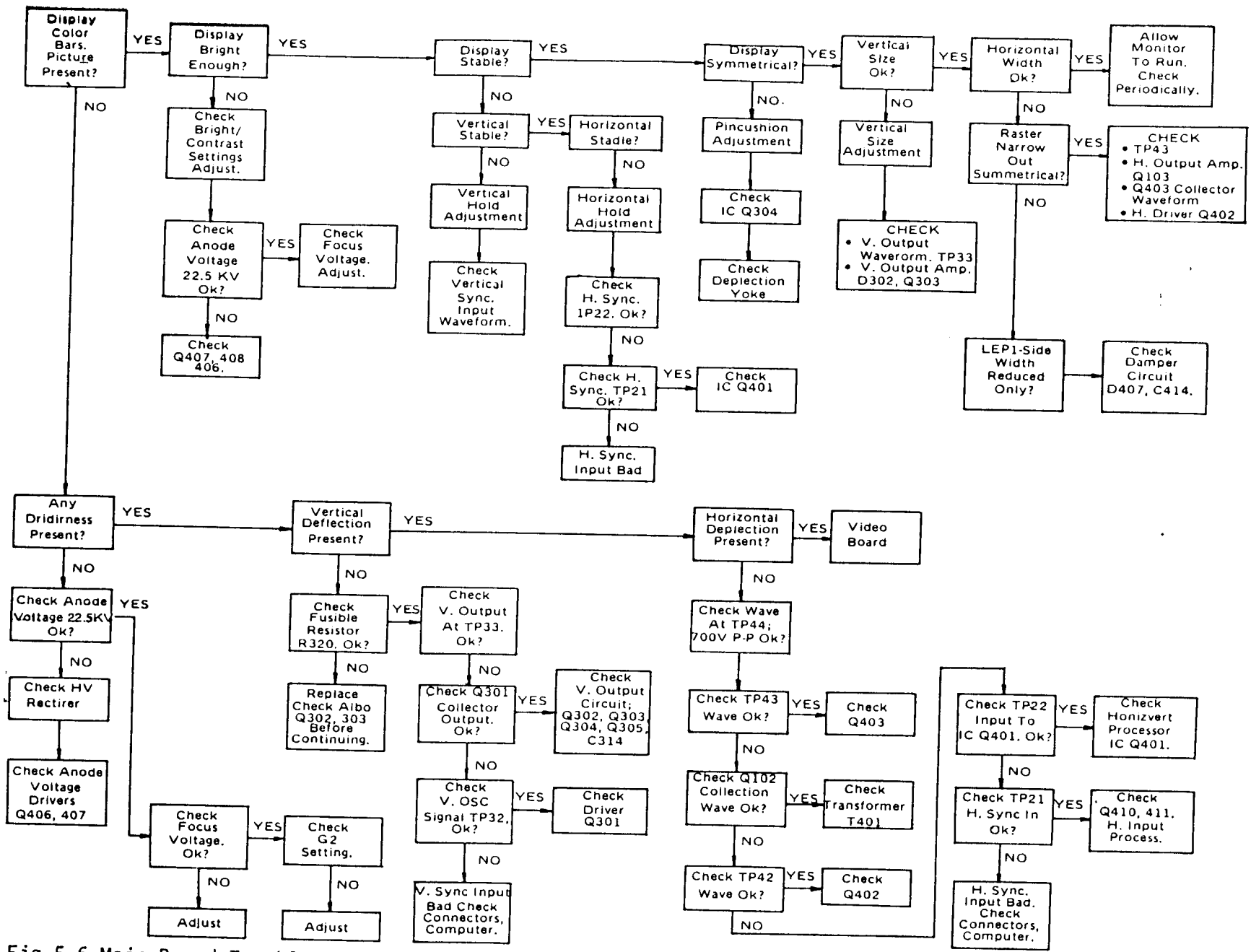


Fig 5-6 Main Board Troubleshooting Chart

CHAPTER 6

P.C.B LAYOUTS

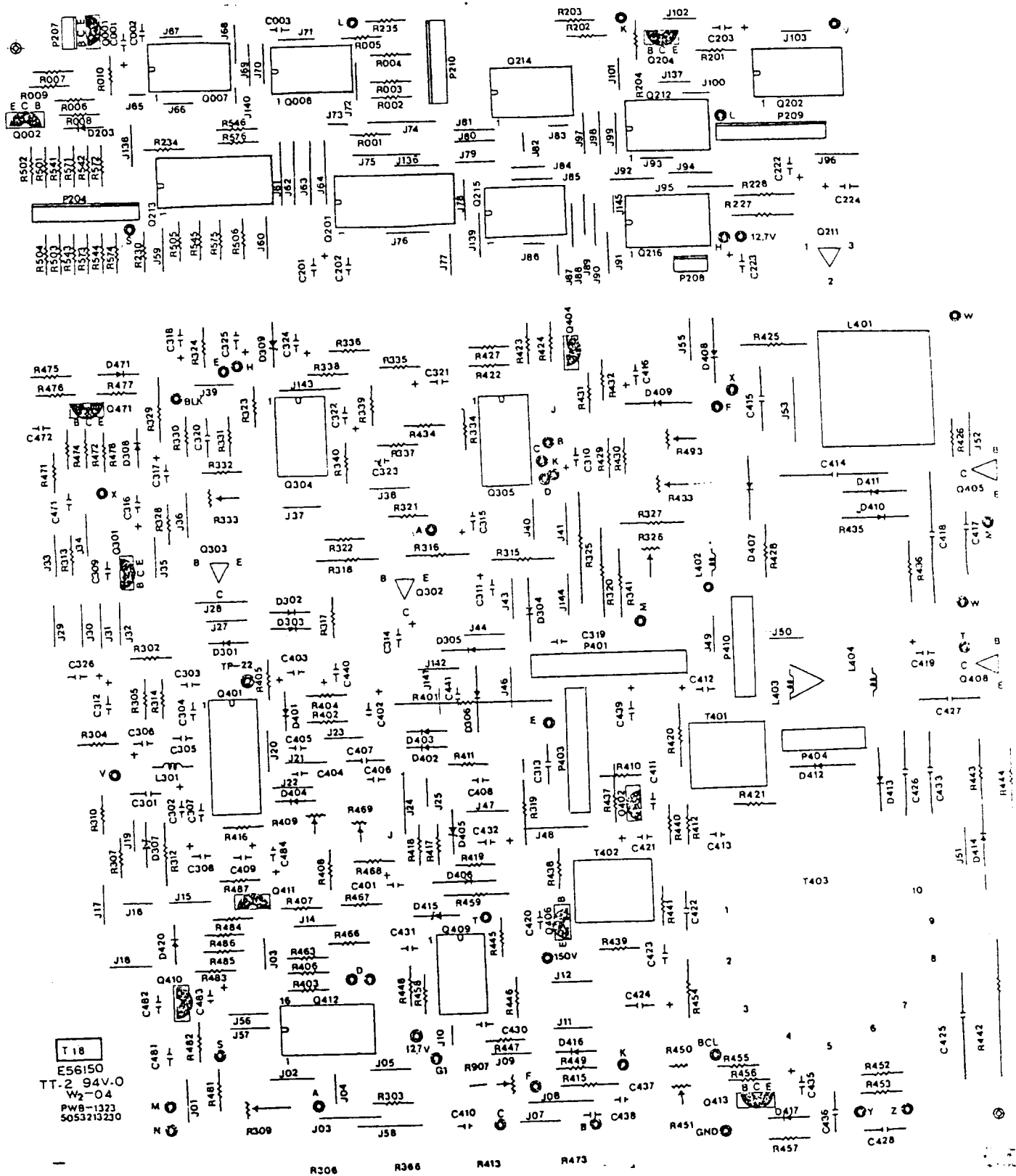


Fig 6-1 PCB-MAIN COMPONENTS LAYOUT

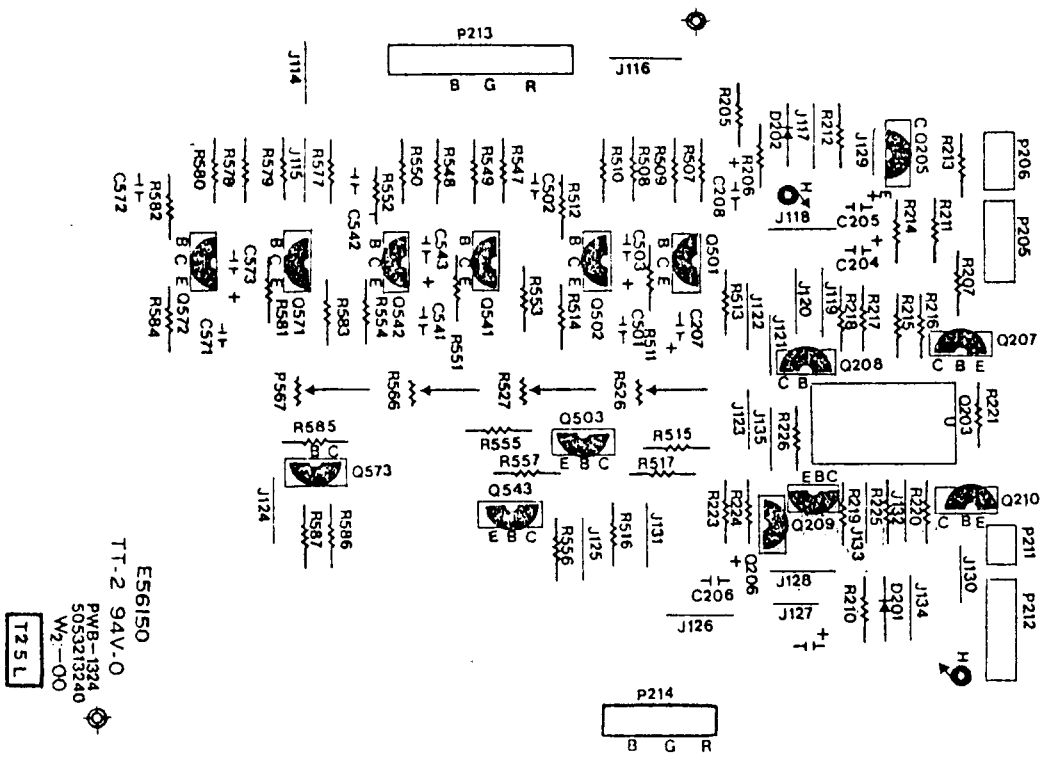


Fig 6-2 PCB-VIDEO DRIVE COMPONENTS LAYOUT

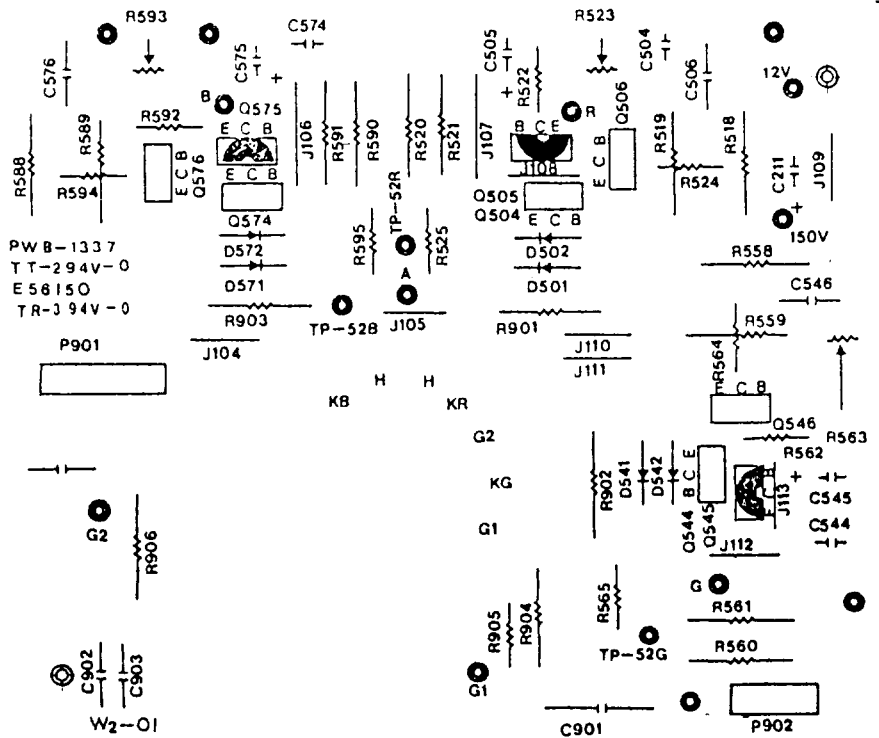


Fig 6-3 PCB-CRT DRIVE COMPONENTS LAYOUT

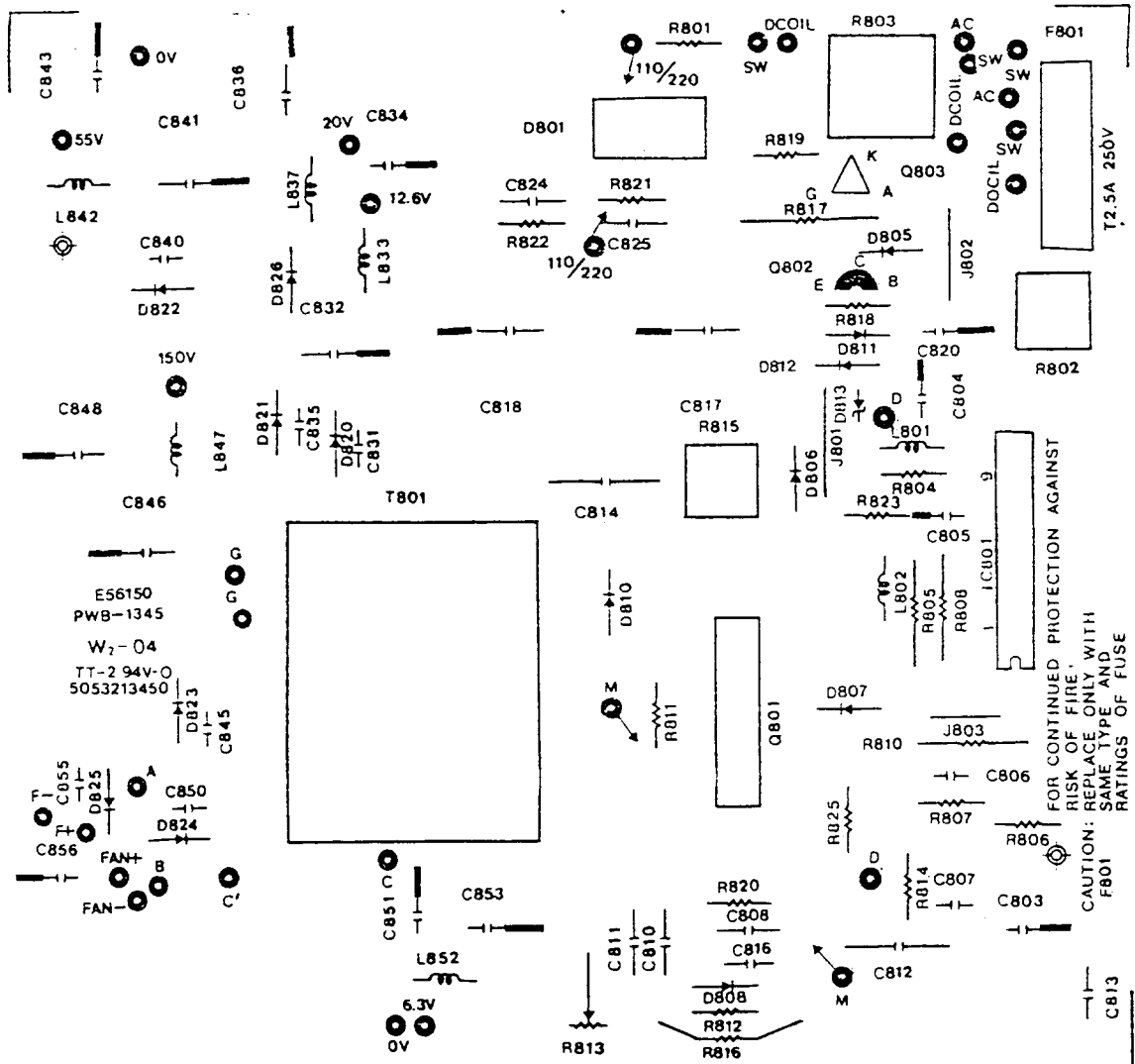


Fig 6-4 PCB-POWER COMPONENTS LAYOUT

CHAPTER 8

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:

| | | |
|-----------------|------------------------|-----------------------|
| CAPACITORS..... | CD: Ceramic Disc | 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 |

| CIRCUIT REF. | PART NUMBER | DESCRIPTION |
|--------------|-------------|-------------|
| ----- | ----- | ----- |

8-1 ASSEMBLY, AS/WS

SEMICONDUCTORS

| | | |
|------|------------|--------------------|
| Q403 | 6622013400 | TR. NPN LF 2SD1094 |
| Q405 | 6624006201 | TR. PNP LF 2SB856 |
| Q407 | 6621015003 | TR. NPN BU208 |
| Q408 | 6621025900 | TR. NPN 2SC2898 |

8-2 ASSEMBLY, CONTROL

RESISTORS

| | | |
|-----------|------------|---------|
| R208, 209 | 5161161914 | VR. 10k |
|-----------|------------|---------|

ASSEMBLY, PCB-MAIN PWB-1323-02

CAPACITOR

| | | |
|-----------|------------|----------------------------------|
| C001 | 5213322091 | EL. 16V 22u |
| C002, 003 | 5231810391 | CD. 50V 10n. Z5U |
| C201 | 5213310191 | EL. 16V 100u |
| C202 | 5231810391 | CD. 50V 10n |
| C203 | 5213210191 | EL. 10V 100u |
| C222 | 5213310191 | EL. 16V 100u |
| C223 | 5213347112 | EL. 16V 470u |
| C224 | 5213310191 | EL. 16V 100u |
| C301 | 5222233391 | CD. 50V 33n, 10% Z5U |
| C302 | 5213601091 | EL. 50V 1u0 |
| C303 | 5247010191 | CD. 50V 100p 5%, NPO |
| C304 | 5231368191 | CD. 50V 680p 10%, NPO |
| C305 | 5247015191 | CD. 50V 150p 5%, NPO |
| C306 | 5210202691 | TA. 35V 1.5u. 10% |
| C307 | 5231347291 | CD. 50V 4n7, 10% |
| C308 | 5213333112 | EL. 16V 330u |
| C309 | 5232318191 | CD. 500V 180p 10%, NPO |
| C310 | 5213610112 | EL. 50V 100u |
| C311 | 5213510091 | EL. 35V 10u |
| C312 | 5210401391 | EL. 16V 10u, 10% |
| C313 | 5223433301 | POLYPROPYLENE, 250V 27n+/-10% |
| C314 | 5213000901 | EL. 160V 4.7u |
| C315 | 5213622112 | EL. 50V 220u |

| CIRCUIT REF. | PART NUMBER | DESCRIPTION |
|--------------|-------------|---------------------------------|
| C316 | 5214233991 | EL, 160V 3.3u |
| C317 | 5213647991 | EL, 50V 4.7u |
| C318 | 5213510091 | EL, 35V 10u |
| C319 | 5232747291 | CD, 500V 4n7 |
| C320 | 5271147301 | POLYESTER, 100V 47n, 5% |
| C321 | 5213647991 | EL, 50V 4u7 |
| C322 | 5213647012 | EL, 50V 47u |
| C323 | 5231847291 | CD, 50V 4n7 |
| C324 | 5213510091 | EL, 35V 10u |
| C325 | 5213310191 | EL, 16V 100u |
| C326 | 5210400391 | EL, 50V 2u2 |
| C401 | 5213347091 | EL, 16V 47u |
| C402 | 5213601091 | EL, 50V 1u0 |
| C403 | 5213322091 | EL, 16V 22u |
| C404 | 5221268291 | POLYESTER, 50V 6n8, 10% |
| C405 | 5221215391 | POLYESTER, 50V 15n, 10% |
| C406 | 5221110291 | POLYESTER, 50V 1n0, 5% |
| C407 | 5223647201 | POLYPROPYLENE, 630V 4n7 5% |
| C408 | 5221127291 | POLYESTER, 50V 2n7, 5% |
| C409 | 5213347091 | EL, 16V 47u |
| C410 | 5221168291 | POLYESTER, 50V 6n8, 5% |
| C411 | 5247010191 | CD, 50V 100p 5% |
| C412 | 5213601091 | EL, 50V 1u0 |
| C413 | 5231847291 | CD, 50V 4n7 |
| C414 RA | 5223795201 | POLYPROPYLENE, 1600V 9n5, 5% |
| C414 RB | 5223295202 | POLYPROPYLENE, 1600V 9n5, 5% |
| C415 | 5223410401 | POLYPROPYLENE, 250V 0u1 |
| C416 | 5214122012 | EL, 100V 22u |
| C417 | 5271110501 | POLYESTER, 100V 1u0, 5% |
| C418 | 5272127501 | MF, 250V 2u7, 5% |
| C419 | 5214210012 | EL, 160V 10u |
| C420 | 5247010191 | CD, 50V 100p 5% |
| C421 | 5213601091 | EL, 50V 1u0 |
| C422 | 5224422301 | POLYPROPYLENE, 250V 22n, 10% |
| C423 | 5231847291 | CD, 50V 4n7 |
| C424 | 5216347001 | EL, 200V 47u |
| C425 | 5272122501 | POLYESTER, 250V 2u2 |
| C426 RA | 5223722201 | POLYPROPYLENE, 1600V 2n2, 5% |
| C426 RB | 5223222201 | POLYPROPYLENE, 1600V 2n2, 5% |
| C427 | 5271147401 | POLYESTER, 100V 0u47, 5% |
| C428 | 5232710301 | CD, 500V 10n, |
| C430 | 5231322291 | CD, 50V 2n2, 10% |
| C431 | 5221410401 | POLYESTER, 100V 0u1, 5% |
| C432 | 5213622091 | EL, 50V 22u |
| C433 RA | 5223733201 | POLYPROPYLENE, 1600V 3n3, 5% |
| C433 RB | 5223233201 | POLYPROPYLENE, 1600V 3n3, 5% |
| C435 | 5213547091 | EL, 35V 47u |
| C436 | 5221122401 | POLYESTER, 50V 0u22, 5% |
| C437 | 5222147291 | POLYESTER, 50V 4n7, 5% |
| C438 | 5221127291 | POLYESTER, 50V 2n7, 5% |
| C439 | 5213722110 | EL, 63V 220u, 5% |

| CIRCUIT REF. | PART NUMBER | DESCRIPTION |
|--------------|-------------|------------------------|
| C471 | 5221147291 | POLYESTER, 50V 4n7, 5% |
| C472 | 5221122391 | POLYESTER, 50V 22n, 5% |
| C481 | 5231333191 | CD, 50V 330p, 10% |
| C482 | 5247082091 | CD, 50V 82p, 5% |
| C483, 484 | 5213601091 | EL, 50V 1u0 |
| RESISTORS | | |
| R001 | 5142830195 | CF, 1/4W 300 R |
| R002 - R005 | 5142833295 | CF, 1/4W 3k3 |
| R006 | 5142839195 | CF, 1/4W 390 R |
| R007 | 5142833295 | CF, 1/4W 3k3 |
| R008 | 5142839195 | CF, 1/4W 390 R |
| R009 | 5142833295 | CF, 1/4W 3k3 |
| R010 | 5142891195 | CF, 1/4W 910 R |
| R201 | 5142833195 | CF, 1/4W 330 R |
| R202, 203 | 5142810395 | CF, 1/4W 10k |
| R204 | 5142822395 | CF, 1/4W 22k |
| R227, 228 | 5142433090 | CF, 1/2W 33 R |
| R230 | 5142812295 | CF, 1/4W 1k2 |
| R234 | 5142810195 | CF, 1/4W 100 R |
| R235 | 5142822195 | CF, 1/4W 220 R |
| R302 | 5142847195 | CF, 1/4W 470 R |
| R303 | 5142827195 | CF, 1/4W 270 R |
| R304 | 5142820295 | CF, 1/4W 2k0 |
| R305 | 5142815395 | CF, 1/4W 15k |
| R306 | 5160806110 | VR, 1k0 |
| R307 | 5142810395 | CF, 1/4W 10k |
| R309 | 5162171720 | VR, 5k0 |
| R310 | 5142827395 | CF, 1/4W 27k |
| R312 | 5142412190 | CF, 1/2W 120 R |
| R313 | 5142811395 | CF, 1/4W 11k |
| R314 | 5142891295 | CF, 1/4W 9k1 |
| R315, R316 | 5130212204 | MOF, 1/2W 1k2 |
| R317 | 5142875095 | CF, 1/4W 75 R |
| R318 | 5130215904 | MF, 1/2W 1R5 |
| R319 | 5130310004 | MOF, 1W 10 R |
| R320 | 5133222907 | FU, 1W 2R2 |
| R321 | 5142802095 | CF, 1/4W 2R0 |
| R322 | 5142847995 | CF, 1/4W 4R7 |
| R323 | 5142833395 | CF, 1/4W 33k |
| R324 | 5142810395 | CF, 1/4W 10k |
| R325 | 5130412104 | MOF, 2W 120 R |
| R326 | 5162171920 | VR, 10k |
| R327 | 5142410290 | CF, 1/2W 1k0 |
| R328 | 5142868295 | CF, 1/4W 6k8 |
| R329 | 5142412290 | CF, 1/2W 1k2 |
| R330 | 5142810495 | CF, 1/4W 100k |
| R331 | 5142810595 | CF, 1/4W 1M0 |
| R332 | 5142810395 | CF, 1/4W 10k |
| R333 | 5162171920 | VR, 10k |
| R334 | 5142810295 | CF, 1/4W 1k0 |
| R335, R336 | 5142810495 | CF, 1/4W 100k |
| R337 | 5142810595 | CF, 1/4W 1M0 |
| R338 | 5142882195 | CF, 1/4W 820R |
| R339 | 5142810395 | CF, 1/4W 10k |
| R340 | 5142882395 | CF, 1/4W 82k |
| R341 | 5142410290 | CF, 1/2W 1k0 |
| R366 | 5160806110 | VR, 1k0 |

| CIRCUIT REF. | PART NUMBER | DESCRIPTION |
|------------------|-------------|----------------|
| R401 | 5136524200 | MOF, 3W 2k4 |
| R402 | 5142868295 | CF, 1/4W 6k8 |
| R403 | 5142868395 | CF, 1/4W 68k |
| R404 | 5142868295 | CF, 1/4W 6k8 |
| R405, R406, R407 | 5142856295 | CF, 1/4W 5k6 |
| R408 | 5142824295 | CF, 1/4W 2k4 |
| R409 | 5162171710 | VR, 5k0 |
| R410 | 5142847195 | CF, 1/4W 470 R |
| R411 | 5142822395 | CF, 1/4W 22k |
| R412 | 5142810295 | CF, 1/4W 1k0 |
| R413 | 5160806119 | VR, 10k |
| R415 | 5142415290 | CF, 1/2W 1k5 |
| R416 | 5142847295 | CF, 1/4W 4k7 |
| R417, R418 | 5142810295 | CF, 1/4W 1k0 |
| R419 | 5142815295 | CF, 1/4W 1K5 |
| R420 | 5130427103 | MOF, 2W 270 R |
| R421 | 5142810195 | CF, 1/4W 100 R |
| R422, R423 | 5142822295 | CF, 1/4W 2k2 |
| R424 | 5142833195 | CF, 1/4W 330 R |
| R425 | 5142422190 | CF, 1/2W 220 R |
| R426 | 5142810195 | CF, 1/4W 100 R |
| R427 | 5142856395 | CF, 1/4W 56k |
| R428 | 5130351107 | MOF, 1W 510 R |
| R429 | 5142810495 | CF, 1/4W 100k |
| R430 | 5142833295 | CF, 1/4W 3k3 |
| R431 | 5142810495 | CF, 1/4W 100k |
| R432 | 5142810295 | CF, 1/4W 1k0 |
| R433 | 5162171720 | VR, 5k0 |
| R434 | 5142810295 | CF, 1/4W 1k0 |
| R435 | 5162901402 | VR, 3W 60 R |
| R436 | 5130456003 | MOF, 2W 56 R |
| R437 | 5130427103 | MOF, 2W 270 R |
| R438 | 5142810295 | CF, 1/4W 1k0 |
| R439, R440 | 5142818195 | CF, 1/4W 180 R |
| R441 | 5142827095 | CF, 1/4W 27 R |
| R442, R443 | 5130718200 | MOF, 5W 1k8 |
| R444 | 5130310007 | MOF, 1W 10 R |
| R445 | 5142847195 | CF, 1/4W 470 R |
| R446 | 5142856395 | CF, 1/4W 56k |
| R447, R448 | 5142810295 | CF, 1/4W 1k0 |
| R449 | 5142810395 | CF, 1/4W 10k |
| R450 | 5145839390 | CF, 1/4W 39k |
| R451 | 5162172210 | VR, 22k |
| R452, R453 | 5142820295 | CF, 1/4W 2k0 |
| R454 | 5133122907 | FU, 1/2W 2R2 |
| R455 | 5142847495 | CF, 1/4W 470k |
| R456 | 5142810195 | CF, 1/4W 100 R |
| R457 | 5142810395 | CF, 1/4W 10k |
| R458 | 5142822195 | CF, 1/4W 220 R |
| R459 | 5130322207 | MOF, 1W 2k2 |
| R463 | 5142827395 | CF, 1/4W 27k |
| R466 | 5142843295 | CF, 1/4W 4k3 |
| R467 | 5142830295 | CF, 1/4W 3k0 |
| R468 | 5142824295 | CF, 1/4W 2k4 |
| R469 | 5162171710 | VR, 5k0 |
| R471 | 5142847195 | CF, 1/4W 470 R |
| R472 | 5142811195 | CF, 1/4W 110 R |
| R473 | 5160806119 | VR, 10k |

| CIRCUIT REF. | PART NUMBER | DESCRIPTION |
|--------------|-------------|----------------|
| R474 | 5142868395 | CF, 1/4W 68k |
| R475, R476 | 5142810295 | CF, 1/4W 1k0 |
| R478 | 5142810395 | CF, 1/4W 10k |
| R481 | 5142810295 | CF, 1/4W 1k0 |
| R482 | 5142810195 | CF, 1/4W 100 R |
| R483 | 5142839395 | CF, 1/4W 39k |
| R484 | 5142845395 | CF, 1/4W 15k |
| R485 | 5142810295 | CF, 1/4W 1k0 |
| R486 | 5142868495 | CF, 1/4W 680k |
| R487 | 5142856295 | CF, 1/4W 5k6 |
| R493 | 5162171720 | VR, 5k0 |
| R501, R502 | 5142868195 | CF, 1/4W 680 R |
| R503, R504 | 5142812295 | CF, 1/4W 1k2 |
| R505, R506 | 5142810195 | CF, 1/4W 100 R |
| R541, R542 | 5142868195 | CF, 1/4W 680 R |
| R543, R544 | 5142812295 | CF, 1/4W 1k2 |
| R545, R546 | 5142810195 | CF, 1/4W 100 R |
| R571, R572 | 5142868195 | CF, 1/4W 680 R |
| R573, R574 | 5142812295 | CF, 1/4W 1k2 |
| R575, R576 | 5142810195 | CF, 1/4W 100 R |
| R907 | 5162171920 | VR, 10k |

SEMICONDUCTIORS

| | | |
|----------------------------|------------|-------------------------|
| D203, D301, D302, D303 | 6613001760 | DIODE, SWITCHING 1S2076 |
| D304, D305 RA | 6613002233 | DIODE, SWITCHING V09C |
| D304, D305 RB | 6613002234 | DIODE, SWITCHING RGP10D |
| D306 RA | 6611013231 | DIODE, RECTIFIER V06E |
| D306 RB | 6611013233 | DIODE, RECTIFIER GP15G |
| D307 | 6615007930 | DIODE, ZENER HZ11A-2 |
| D308 | 6613001760 | DIODE, SWITCHING 1S2076 |
| D309 RA | 6615009711 | DIODE, ZENER HZ6C-2LTE |
| D309 RB | 6615006431 | DIODE, ZENER E0A01-065B |
| D401 - D404 | 6613001760 | DIODE, SWITCHING 1S2076 |
| D405 | 6615005800 | DIODE, ZENER HZ12A1 |
| D406, D408 - D412, D414 RA | 6611017600 | DIODE, RECTIFIER V19E |
| D406, D408 - D412, D414 RB | 6611017400 | DIODE, RECTIFIER RGP10G |
| D407, D413 | 6611013031 | DIODE, RECTIFIER RGP15M |
| D415 RA | 6615009703 | DIODE, ZENER HZ5C-2TE |
| D415 RB | 6615007831 | DIODE, ZENER 05Z5.1X |
| D416, D417, D420 | 6613001760 | DIODE, SWITCHING 1S2076 |
| D471 | 6613001760 | DIODE, SWITCHING 1S2076 |
| Q001, Q002 | 6621015302 | TR, NPN 2SC1815Y |
| Q007, Q008 RA | 6646006717 | IC, DM74LS74 |
| Q007, Q008 RB | 6646006708 | IC, HD74LS74AP |
| Q201 RA | 6647028100 | IC, TBP28S42N |
| Q201 RB | 6646043000 | IC, 74S472N |
| Q202 | 6646009922 | IC, HD74LS86 |
| Q204 | 6621003200 | TR, NPN 2SC458C |
| Q211 RA | 6640000410 | IC, HA17805P |
| Q211 RB | 6640001400 | IC |
| Q211 RC | 6640001900 | IC, AN7805 |
| Q212 RA | 6646008000 | IC, HD74S05P |
| Q212 RB | 6646008213 | IC, SN74LS05N |
| Q213 | 6646012713 | IC, 74LS244P |
| Q214, Q215 | 6646009922 | IC, HD74LS86 |
| Q216 | 6646009400 | IC, HD74LS11P |
| Q301 | 6621013800 | TR, NPN 2SC1921 |
| Q302 | 6622007400 | TR, NPN 2SD1138C |

| CIRCUIT REF. | PART NUMBER | DESCRIPTION |
|------------------|-------------|-----------------|
| Q303 | 6624007400 | TR, PNP 2SB861C |
| Q304 RA | 6644042900 | IC, HA17324 |
| Q304 RB | 6644006703 | IC, LM324N |
| Q305 RA | 6645009002 | IC, HD14053BP |
| Q305 RB | 6645009001 | IC, HEF4053BP |
| Q401 | 6644012400 | IC, HA11235 |
| Q402, Q404, Q406 | 6622013300 | TR, NPN 2SD667C |
| Q409 RA | 6644042900 | IC, HA17324 |
| Q409 RB | 6644006703 | IC, LM324N |
| Q410 | 6621003200 | TR, NPN 2SC458C |
| Q411 | 6623001102 | TR, PNP 2SA844E |
| Q412 RA | 6645009002 | IC, HD14053BP |
| Q412 RB | 6645009001 | IC, HEF4053BP |
| Q413, Q471 | 6621003200 | TR, NPN 2SC458C |
| TRANSFORMERS | | |
| T401 | 5062412501 | TLN-125A |
| T402 | 5062412501 | TLN-125A |
| △T403 | 5062617610 | TFB-176G 300M R |

8-3 ASSEMBLY, PCB-VIDEO PWB-1324-02

| CAPACITORS | | |
|-------------|------------|------------------|
| C204, C205 | 5213447091 | EL, 25V 47u |
| C206 | 5213510091 | EL, 35V 10u |
| C207, C208 | 5213522091 | EL, 35V 22u |
| C501, C502 | 5231810391 | CD, 50V 10n, Z5U |
| C503 | 5213510091 | EL, 35V 10u |
| C541, C542 | 5231810391 | CD, 50V 10n, Z5U |
| C543 | 5213510091 | EL, 35V 10u |
| C571, C572 | 5231810391 | CD, 50V 10n, Z5U |
| C573 | 5213510091 | EL, 35V 10u |
| RESISTORS | | |
| R205 | 5142812295 | CF, 1/4W 1k2 |
| R206 | 5142833295 | CF, 1/4W 3k3 |
| R207 | 5142856295 | CF, 1/4W 5k6 |
| R210 | 5142856395 | CF, 1/4W 56k |
| R211 | 5142833095 | CF, 1/4W 33 R |
| R212 | 5142810395 | CF, 1/4W 10k |
| R213 | 5142856295 | CF, 1/4W 5k6 |
| R214 | 5142833095 | CF, 1/4W 33 R |
| R215 - R220 | 5142822295 | CF, 1/4W 2k2 |
| R221 | 5142833095 | CF, 1/4W 33 R |
| R223 | 5131782008 | MF, 1/4W 820 R |
| R224 | 5131715018 | MF, 1/4W 1k5 |
| R225 | 5142810295 | CF, 1/4W 1k0 |
| R226 | 5142815295 | CF, 1/4W 1k5 |
| R507, R508 | 5142847195 | CF, 1/4W 470 R |
| R509, R510 | 5142815295 | CF, 1/4W 1k5 |
| R511, R512 | 5136147195 | MF, 1/4W 470 R |
| R513, R514 | 5131710018 | MF, 1/4W 1k0 |
| R515 | 5142856195 | CF, 1/4W 560 R |
| R516 | 5142833295 | CF, 1/4W 3k3 |
| R517 | 5142882195 | CF, 1/4W 820 R |
| R526, R527 | 5162907602 | VR, 2k0 |
| R547, R548 | 5142847195 | CF, 1/4W 470 R |
| R549, R550 | 5142815295 | CF, 1/4W 1k5 |

| CIRCUIT REF. | PART NUMBER | DESCRIPTION |
|--------------|-------------|----------------|
| R551, R552 | 5136147195 | MF, 1/4W 470 R |
| R553, R554 | 5131710018 | MF, 1/4W 1k0 |
| R555 | 5142856195 | CF, 1/4W 560 R |
| R556 | 5142833295 | CF, 1/4W 3k3 |
| R557 | 5142882195 | CF, 1/4W 820 R |
| R566, R567 | 5162907602 | VR, 2k0 |
| R577, R578 | 5142847195 | CF, 1/4W 470 R |
| R579, R580 | 5142815295 | CF, 1/4W 1k5 |
| R581, R582 | 5131747508 | MF, 1/4W 475 R |
| R583, R584 | 5131717818 | MF, 1/4W 1k78 |
| R585 | 5142856195 | CF, 1/4W 560 R |
| R586 | 5142833295 | CF, 1/4W 3k3 |
| R587 | 5142882195 | CF, 1/4W 820 R |

SEMICONDUCTIORS

| | | |
|------------------|------------|-------------------------|
| D201, D202 | 6613001760 | DIODE, SWITCHING 1S2076 |
| Q203 RA | 6644042900 | IC, 17324 |
| Q203 RB | 6644006703 | IC, LM324N |
| Q205 RA | 6624005104 | TR, PN BC307B KEC |
| Q205 RB | 6624005102 | TR, PNP BC307B |
| Q206, Q207, Q208 | 6622002901 | TR, NPN BC237B |
| Q209 RA | 6624005104 | TR, PNP BC307B KEC |
| Q209 RB | 6624005102 | TR, PNP BC307B |
| Q210 RA | 6624005104 | TR, PNP BC307B KEC |
| Q210 RB | 6624005102 | TR, PNP BC307B |
| Q501 AA | 6621004500 | TR, NPN 2N2369 |
| Q501 BA | 6621026300 | TR, NPN 2SC641K |
| Q502 AB | 6621004500 | TR, NPN 2N2369 |
| Q502 BB | 6621026300 | TR, NPN 2SC641K |
| Q503 | 6622002901 | TR, NPN BC237B |
| Q541 AF | 6621004500 | TR, NPN 2N2369 |
| Q541 BF | 6621026300 | TR, NPN 2SC641K |
| Q542 AG | 6621004500 | TR, NPN 2N2369 |
| Q542 BG | 6621026300 | TR, NPN 2SC641K |
| Q543 | 6622002901 | TR, NPN BC237B |
| Q571 AN | 6621004500 | TR, NPN 2N2369 |
| Q571 BN | 6621026300 | TR, NPN 2SC641K |
| Q572 AO | 6621004500 | TR, NPN 2N2369 |
| Q572 BO | 6621026300 | TR, NPN 2SC641K |
| Q573 | 6622002901 | TR, NPN BC237B |

8-4 ASSEMBLY, PCB-CRT DRIVE PWB-1337-02

CAPACITORS

| | | |
|------------|------------|-----------------------------|
| C211 | 5214422912 | EL, 250V 2u2 |
| C504 | 5222222391 | POLYESTER, 50V 22n, 10% |
| C505 | 5213522091 | EL, 35V 22u |
| C506 | 5223433301 | POLYPROPYLENE, 250V 33n, 5% |
| C544 | 5222222391 | POLYESTER, 50V 22n, 10% |
| C545 | 5213522091 | EL, 35V 22u |
| C546 | 5223433301 | POLYPROPYLENE, 250V 33n, 5% |
| C574 | 5222222391 | POLYESTER, 50V 22n, 10% |
| C575 | 5213522091 | EL, 35V 22u |
| C576 | 5223433301 | POLYPROPYLENE, 250V 33n, 5% |
| C901 | 5223622301 | POLYPROPYLENE, 630V 22n, 5% |
| C902, C903 | 5232000701 | CD, 2kV 4n7, 20% |

| CIRCUIT REF. | PART NUMBER | DESCRIPTION |
|------------------|-------------|----------------|
| RESISTORS | | |
| R518, R519 | 5130427203 | MOF, 2W 2k7 |
| R520, R521 | 5130468203 | MOF, 2W 6k8 |
| R522 | 5142833195 | CF, 1/4W 330 R |
| R523 | 5162170810 | VR, 500 R |
| R524 | 5142810195 | CF, 1/4W 100 R |
| R525 | 5142868095 | CF, 1/4W 68 R |
| R558, R559 | 5130427203 | MOF, 2W 2k7 |
| R560, R561 | 5130468203 | MOF, 2W 6k8 |
| R562 | 5142833195 | CF, 1/4W 330 R |
| R563 | 5162907600 | VR, 500 R |
| R564 | 5142810195 | CF, 1/4W 100 R |
| R565 | 5142868095 | CF, 1/4W 68 R |
| R588, R589 | 5130427203 | MOF, 2W 2k7 |
| R590, R591 | 5130468203 | MOF, 2W 6k8 |
| R592 | 5142833195 | CF, 1/4W 330 R |
| R593 | 5162170810 | VR, 500 R |
| R594 | 5142810195 | CF, 1/4W 100 R |
| R595 | 5142868095 | CF, 1/4W 68 R |
| R901, R902, R903 | 5111233190 | CC, 1/2W 330 R |
| R904 | 5111210290 | CC, 1/2W 1k0 |
| R905 | 5142815495 | CF, 1/4W 150k |
| R906 RA | 5111282490 | CC, 1/2W 820k |
| R906 RB | 5142482490 | CF, 1/2W 820k |

SEMICONDUCTIORS

| | | |
|-------------------------|------------|-------------------------|
| D501, D502, D541, D542, | | |
| D571, D572 | 6613001730 | DIODE, SWITCHING 1S2076 |
| Q504 AC | 6621026000 | TR, NPN 2SC1507 |
| Q504 BC | 6621013700 | TR, NPN 2SC1514 |
| Q505 AD | 6621004500 | TR, NPN 2N2369 |
| Q505 BD | 6621014530 | TR, NPN 2SC1906 |
| Q506 AE | 6621026000 | TR, NPN 2SC1507 |
| Q506 BE | 6621013700 | TR, NPN 2SC1514 |
| Q544 AH | 6621026000 | TR, NPN 2SC1507 |
| Q544 BH | 6621013700 | TR, NPN 2SC1514 |
| Q545 AI | 6621004500 | TR, NPN 2N269 |
| Q545 BI | 6621014530 | TR, NPN 2SC1906 |
| Q546 AJ | 6621026000 | TR, NPN 2SC1507 |
| Q546 BJ | 6621013700 | TR, NPN 2SC1514 |
| Q574 AK | 6621026000 | TR, NPN 2SC1507 |
| Q574 BK | 6621013700 | TR, NPN 2SC1514 |
| Q575 AL | 6621004500 | TR, NPN 2N2369 |
| Q575 EL | 6621014530 | TR, NPN 2SC1906 |
| Q576 AM | 6621026000 | TR, NPN 2SC1507 |
| Q576 BM | 6621013700 | TR, NPN 2SC1514 |

8-5 ASSEMBLY, PCB-POWER PWB-1345-02

CAPACITORS

| | | |
|------|------------|--------------------------|
| C803 | 5215310101 | EL, 16V 100u |
| C804 | 5215347101 | EL, 16V 470u |
| C805 | 5215310101 | EL, 16V 100u |
| C806 | 5247033001 | CD, 50V 33p |
| C807 | 5231322201 | CD, 50V 2n2, 10% |
| C808 | 5221110391 | POLYESTER, 50V 10n, 5% |
| C810 | 5271115401 | POLYESTER, 100V 0u15, 5% |
| C811 | 5272110401 | POLYESTER, 250V 0u1, 5% |

| CIRCUIT REF. | PART NUMBER | DESCRIPTION |
|--------------|-------------|---------------------------------|
| C812 | 5223715200 | POLYPROPYLENE, 1600V 1n5, 5% |
| C813 | 5221110391 | POLYESTER, 50V 10n, 5% |
| C814 | 5223647301 | POLYPROPYLENE, 630V 47n 5% |
| C816 | 5221110391 | POLYESTER, 50V 10n, 5% |
| C817, C818 | 5210601001 | EL, 250V 220u, 20% |
| C820 | 5215310101 | EL, 16V 100u |
| C824, C825 | 5232347291 | CD, 500V 4n7, 10% |
| C831 | 5232333101 | CD, 500V 330p, 10% |
| C832 | 5210403501 | EL, 35V 1000u |
| C835 | 5232333101 | CD, 500V 330p, 10% |
| C836 | 5215410201 | EL, 25V 1000u |
| C840 | 5232310201 | CD, 500V 1n0, 10% |
| C841 | 5216122101 | EL, 100V 220u |
| C845 | 5232310201 | CD, 500V 1n0, 10% |
| C846 | 5216347001 | EL, 200V 47u |
| C850 | 5232333101 | CD, 500V 330p, 10% |
| C851 | 5215347101 | EL, 16V 470u |
| C855 | 5232333101 | CD, 500V 330p, 10% |
| C856 | 5215422101 | EL, 25V 220u |

RESISTOR

| | | |
|------------|------------|---------------------|
| R801 | 5101106800 | POWER. THERMISTOR |
| R802 | 5150107301 | CEMENT, 10W 5k0 |
| R803 | 5101106900 | POSISTOR, 200V 20 R |
| R804 | 5142812995 | CF, 1/4W 1R2 |
| R805 | 5142439490 | CF, 1/2W 390k |
| R806 | 5142820195 | CF, 1/4W 200 R |
| R807 | 5142812295 | CF, 1/4W 1k2 |
| R808 | 5142412490 | CF, 1/2W 120k |
| R810 | 5142415490 | CF, 1/2W 150k |
| R811 | 5142827095 | CF, 1/4W 27 R |
| R812 | 5142810395 | CF, 1/4W 10k |
| R813 | 5162101920 | VR, 1/4W 10k |
| R814 | 5142882295 | CF, 1/4W 8k2 |
| R815 | 5150107302 | CEMENT, 10W 45k |
| R816 | 5136310107 | MOF, 1W 100 R |
| R817 RA | 5130315404 | MOF, 1W 150k |
| R817 RB | 5142515401 | CF, 1W 150k |
| R818 | 5142818295 | CF, 1/4W 1k8 |
| R819 | 5142824195 | CF, 1/4W 240 R |
| R820 | 5142882295 | CF, 1/4W 8k2 |
| R821, R822 | 5142822495 | CF, 1/4W 220k |
| R823 | 5142801094 | CF, 1/4W 1R0 |
| R830 | 5145827290 | CF, 1/4W 2k7 |

SEMICONDUCTORS

| | | |
|--------------------------|------------|-------------------------|
| D801 RA | 6611024700 | DIODE, KBL06 |
| D801 RB | 6611024701 | DIODE, RS405L |
| D805 RA | 6611012701 | DIODE, V19G |
| D805 RB | 6613002206 | DIODE, SWITCHING RGP10J |
| D806 - D808, D811 RA | 6613002202 | DIODE, SWITCHING V09E |
| D806 - D808, D811 RB | 6613002205 | DIODE, SWITCHING RGP10G |
| D810 RA | 6611012701 | DIODE, RECTIFIER V19G |
| D810 RB | 6613002206 | DIODE, SWITCHING RGP10J |
| D812 RA | 6611012701 | DIODE, RECTIFIER V19G |
| D812 RB | 6613002206 | DIODE, SWITCHING RGP10J |
| D820 - D822, D824 - D826 | 6611013006 | DIODE, RECTIFIER RGP15G |

| CIRCUIT REF. | PART NUMBER | DESCRIPTION |
|--------------------------------------------------------|-------------|----------------------------|
| D823 | 6611013033 | DIODE, RECTIFIER RGP15J |
| Q801 | 6621030800 | TR, NPN 2SC3461 |
| Q802 | 6621019101 | TR, NPN 2SC2482 |
| Q803 RA | 6631001800 | THYRISTOR, SCR |
| Q803 RB | 6631001700 | THYRISTOR, SCR |
| IC801 | 6644058800 | IC, TDA4601 |
| FUSE | | |
| △ F801 | 5054410501 | FUSE, 250V 2.5A |
| COIL | | |
| L801 | 5061106600 | CORE, B01-AT1F |
| L802 | 5062102400 | COIL, CHOKE TRF-9229 |
| L833, L837, L842, L847 | 5062217000 | COIL, LOSS TSH-170 |
| L852 | 5062216900 | COIL, LOSS TSH-169 |
| TRANSFORMERS | | |
| △ T801 RA | 5061337101 | TPW-371A |
| △ T801 RB | 5061337102 | TPW-371B |
| 8-6 ASSEMBLY, PCB-POWER LINE FILTER PWB-1254-05 | | |
| CAPACITORS | | |
| △ C827, C828 | 5270101501 | POLYESTER, 250V 0u47 |
| △ C829, C830 | 5230102701 | CERAMIC, 400V 4n7 |
| RESISTOR | | |
| R826 | 5142830490 | CF, 1/4W 300k |
| COILS | | |
| L202 | 5061102900 | TOROID, CORE |
| △ L804 | 5061106900 | LINE CHOKE, 40mH |
| 8-7 ASSEMBLY, PCB-INDICATOR PWB-1357-01 | | |
| SEMICONDUCTORS | | |
| D001 | 6618014200 | DIODE, LED GRN |
| D002 | 6618014300 | DIODE, LED GRN/RED |
| D003 | 6613001760 | DIODE, SWITCHING 1S2076 |
| Q003 - Q006, Q009 | 6621003200 | TR, NPN 2SC458C |
| 8-8 MISCELLANEOUS | | |
| P204 | 5057404103 | CABLE ASSY |
| P205 | 5056505204 | 4 - PIN SOCKET |
| P206 | 5056505104 | 3 - PIN SOCKET |
| P208 | 5056505104 | 3 - PIN SOCKET |
| P400, P500, P900 | 5050200600 | TERMINAL SQUARE PIN |
| P404 | 5056501312 | 3 - PIN SOCKET |
| P410 | 5056501412 | 4 - PIN SOCKET |
| P801 | 5057409802 | 4 - PIN PLUG |
| P802 | 5057402312 | 3 - PIN PLUG |
| S202 | 5054518600 | SLIDER SWITCH |
| △ S801 | 5054519600 | MAINS SWITCH |
| S802 | 5054524414 | SLIDER SWITCH |
| △ V901 RA | 5051218176 | CRT M34JDU30X66 |
| △ V901 RB | 5051219501 | CRT E8034B22-TC67EHT (G7Y) |
| L901 | 5060114401 | DEGAUSSING COIL |

CIRCUIT REF.

PART NUMBER

DESCRIPTION

5057404103

SIGNAL CABLE (D-SUB 9P)

| SCHEMATIC LOCATION | PART NUMBER | DESCRIPTION |
|--------------------|-------------|-------------------------|
| D826 | 6611013006 | DIODE, RECTIFIER RGP15G |
| Q801 | 6621030800 | TR, NPN 2SC3461 |
| Q802 | 6621019101 | TR, NPN 2SC2482 |
| Q803 RA | 6631001800 | THYRISTOR, SCR |
| Q803 RB | 6631001700 | THYRISTOR, SCR |
| IC801 | 6644058800 | IC, TDA4601 |
| FUUSE | | |
| F801 | 5054410501 | FUUSE, 250V 2.5A |
| COIL | | |
| L801 | 5061106600 | CORE, B01-AT1F |
| L802 | 5062102400 | COIL, CHOKE TRF-9229 |
| L833 | 5062217000 | COIL, LOSS TSH-170 |
| L837 | 5062217000 | COIL, LOSS TSH-170 |
| L842 | 5062217000 | COIL, LOSS TSH-170 |
| L847 | 5062217000 | COIL, LOSS TSH-170 |
| L852 | 5062216900 | COIL, LOSS TSH-169 |
| TRANSFORMER | | |
| T801 RA | 5061337101 | TPW-371A |
| T801 RB | 5061337102 | TPW-371B |

ASSEMBLY, PCB-INDICATOR PWB-1357-01

| SEMICONDUCTOR | PART NUMBER | DESCRIPTION |
|---------------|-------------|-------------------------|
| D001 | 6618014200 | DIODE, LED GRN |
| D002 | 6618014300 | DIODE, LED GRN/RED |
| D003 | 6613001760 | DIODE, SWITCHING 1S2076 |
| Q003 | 6621003200 | TR, NPN 2SC458C |
| Q004 | 6621003200 | TR, NPN 2SC458C |
| Q005 | 6621003200 | TR, NPN 2SC458C |
| Q006 | 6621003200 | TR, NPN 2SC458C |
| Q009 | 6621003200 | TR, NPN 2SC458C |

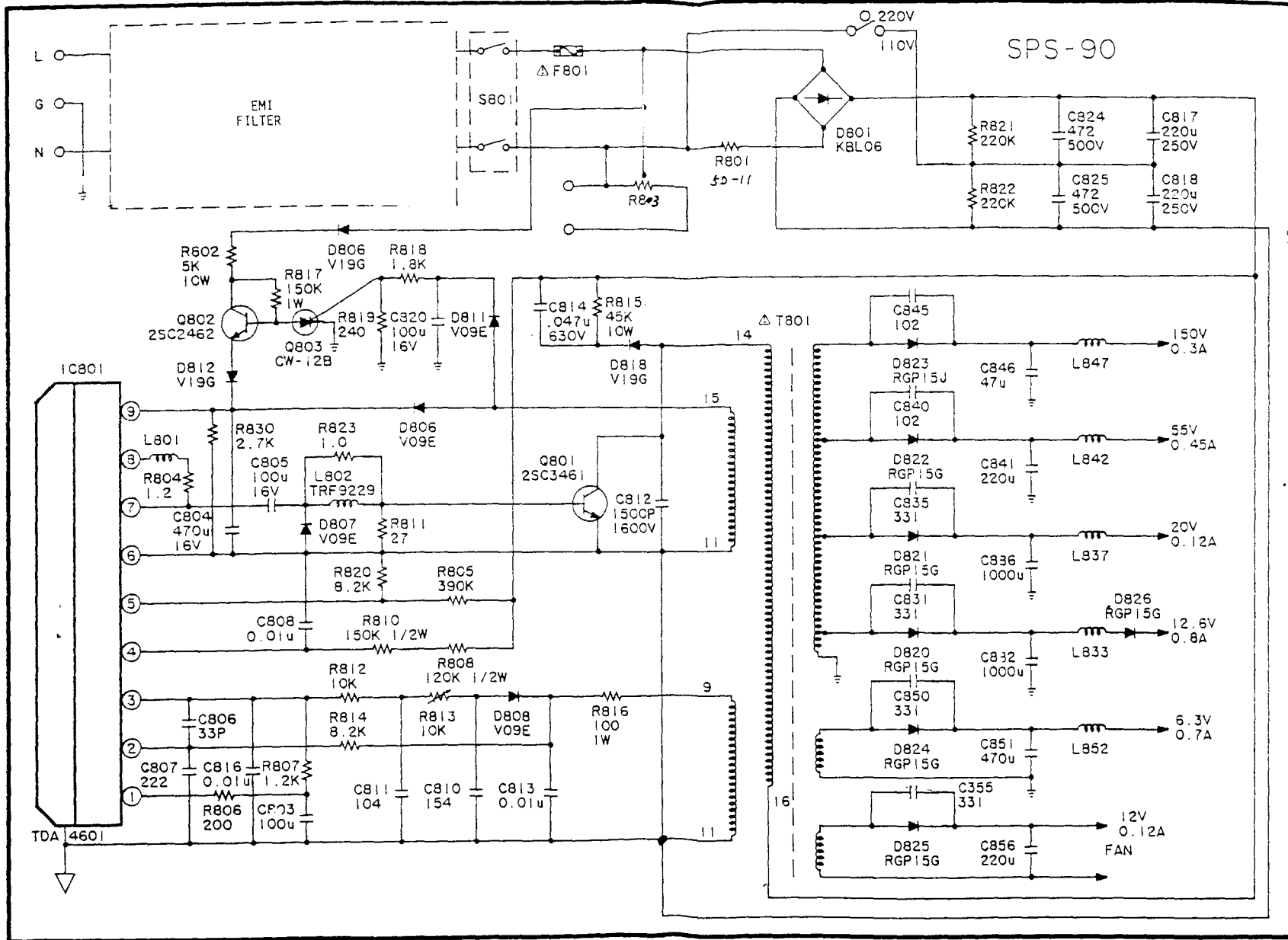


Fig 7-2 POWER CIRCUIT DIAGRAM

CHAPTER 7 SCHEMATIC DIAGRAM

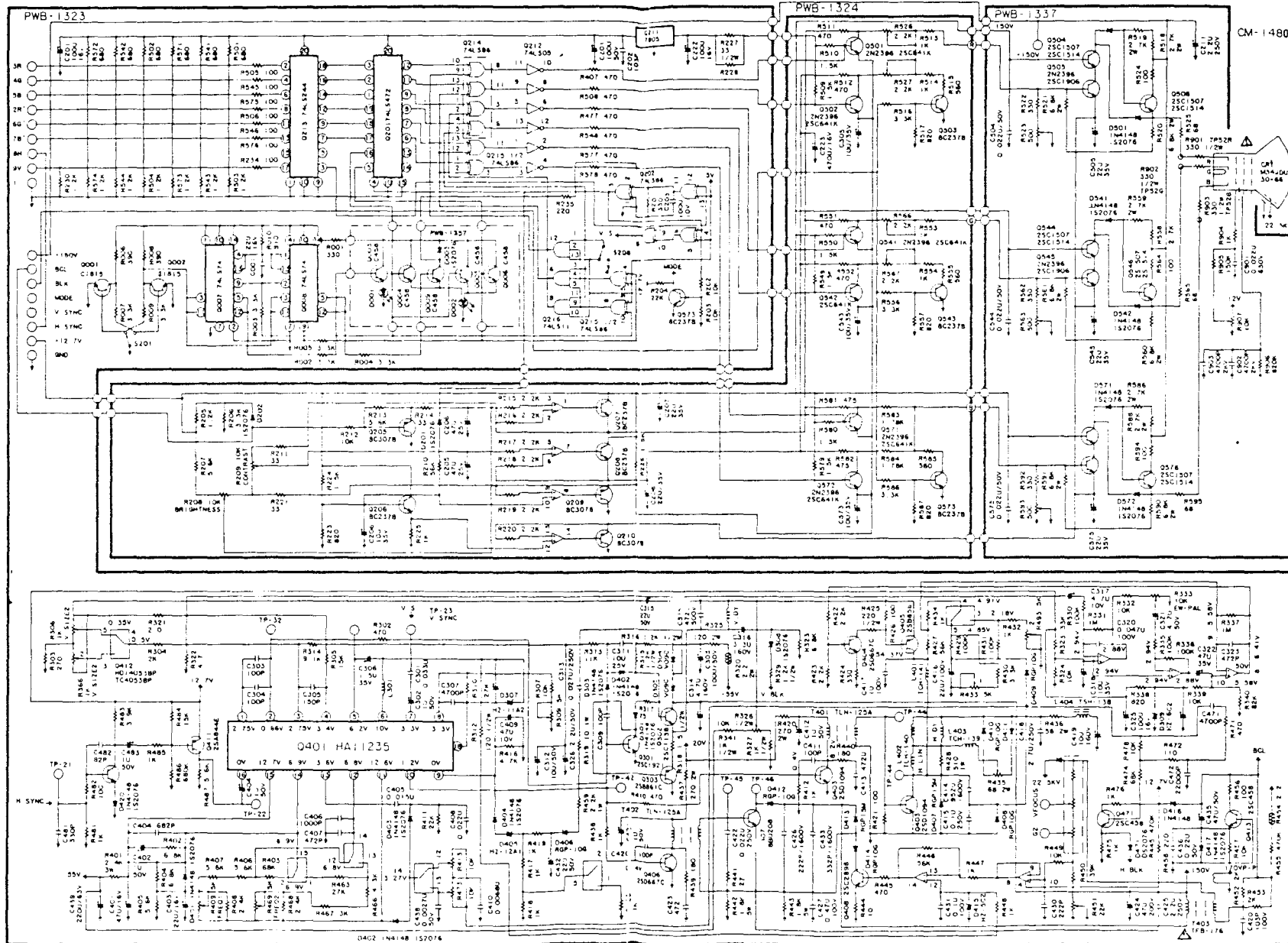


Fig 7-1 MAIN CIRCUIT DIAGRAM
2.1