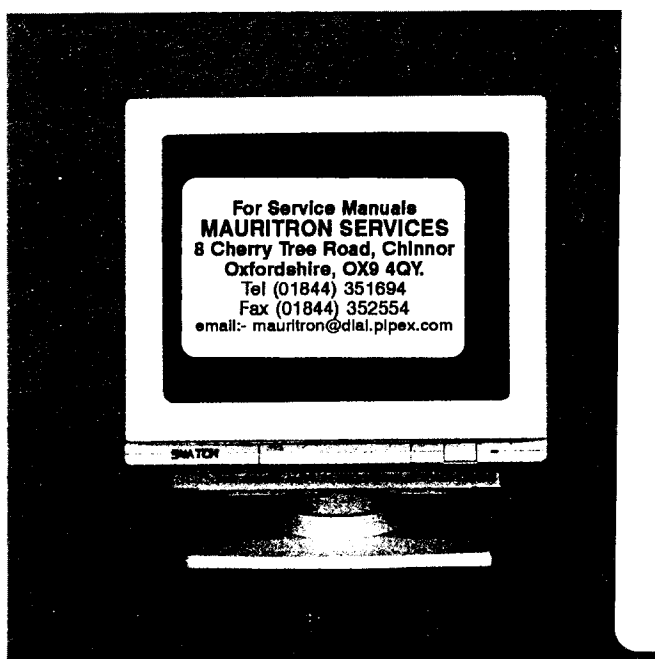


VGA MONOCHROME MONITOR

SERVICE MANUAL

SM-470



SPECIFICATIONS

- Power source AC 115V \pm 15% / 60Hz, 230V \pm 15% / 50Hz
- Power consumption 50Watts Max.
- Input connector 15 Pin D-sub connector
- Video signal input Analog 0.7p-p
- Horizontal sync TTL level positive, Negative
- Vertical sync TTL level negative, Negative
- Picture tube 14" diagonal, 90° deflection
14HBY \times \times N Phosphor P 39, PLA. PWD. Available
- Scanning frequency Horizontal-31. 47 KHz
Vertical-60 / 70Hz
- Active video period Horizontal-26.48 μ S
Vertical-16.07ms
- Resolution Horizontal-720 dots
Vertical-480 lines
- Active display area 235 (H) \times 175 (V)mm
- Display character 80 characters with 30 line (7 \times 9 dots)
- Dimensions 324(W) \times 338(H) \times 320(D)mm
- Weight 9kg Approx.

***NOTE :** Specification are subject to change without notice

CONTENTS

SPECIFICATIONS

CONTENTS

SAFETY PRECAUTION	
GENERAL INFORMATION	
CONTROLS AND TERMINAL IDENTIFICATIONS	
IMPORTANT NOTICE FOR SERVICE PERSONNEL BEFORE SERVICING	
SERVICE INFORMATION	
BLOCK DIAGRAM	
THEORY OF OPERATION(CIRCUIT DESCRIPTION)	
VIDEO INPUT SIGNAL(TIMING CHART)	1
WHEN SIGNALS OTHERS THAN THE RECOMMENDED SIGNAL ARE RECEIVED	1
TROUBLE SHOOTING INFORMATION CHART	1
TROUBLE SHOOTING FOR RESPECTIVE SYMPTOMS	1
VOLTAGE CHART	1
ADJUSTER & CONNECTORS FOR MAIN PC-BOARD	1
WIRING DIAGRAM(COMPONENT SIDE)	1
PC-BOARD ASSEMBLY(SOLDER SIDE)	1
SCHEMATIC DIAGRAM	2
PCB COMPONENT LOCATION	2
ASSEMBLY DRAWING	2
REPLACEMENT PARTS LIST	2

1. GENERAL INFORMATION

(1) SAFETY PRECAUTION

WARNING : Service should not be attempted anyone unfamiliar with the necessary precautions on this unit.
The following precautions are necessary during servicing.

1. Some parts such as a picture tube in this unit have special safety-related characteristics for X-RAY RADIATION protection.

For continued safety, the parts replacement should be undertaken referring to item 2 below.

2. Many electrical mechanical parts in this unit have special safety-related characteristics for protection against shock hazard and others.

These characteristics are often passed unnoticed by a visual inspection and the protection afforded by them cannot necessarily be obtained by using replacement components rated for higher voltage wattage, etc.

Replacement parts which have these special characteristics are identified in the manual and supplements by shading on the schematic diagram and the parts list.

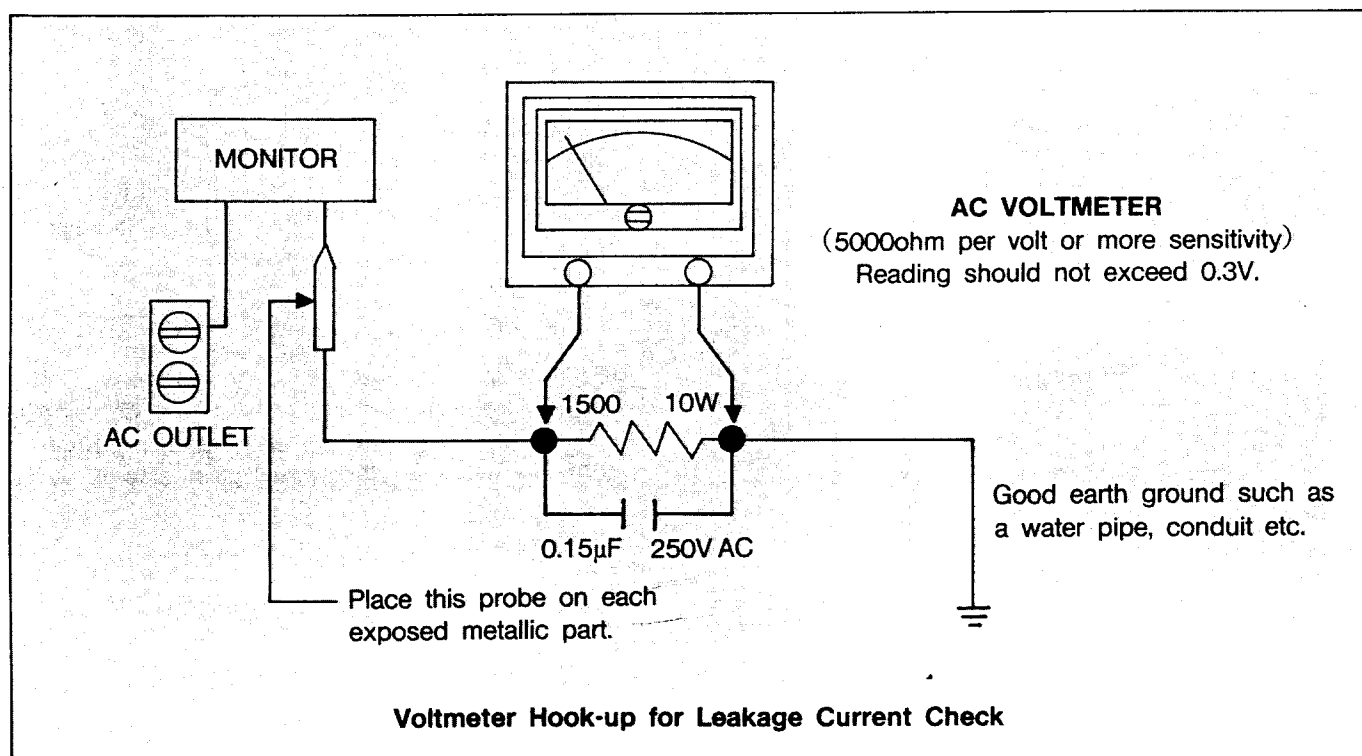
Before replacing of these components read the parts list in this manual, carefully.

3. When replacing chassis in the cabinet, always be certain that all the protective devices are installed properly, such as insulating covers, strain relief, etc.
4. Before replacing the back cover of the set, thoroughly

inspect inside the cabinet to see that no stray parts or tools have been left inside.

5. Before returning the set to the customer always perform an AC leakage current check on the exposed metallic parts of the cabinet, such as terminal, screws, metal overlays, control shafts, etc. To be sure the set is to operate without danger of electrical shock. Plug the AC line cord directly into a 115v AC outlet (do not use a line isolation transformer during this check) Use an AC voltmeter having 5000 ohms per volt or more sensitivity in the following manner.

Connect a 1500 ohm, 10 watt resistor, paralleled by a 0.15mfd (F), 250V AC capacitor, between a known good earth ground (water pipe, conduit, etc.) and the exposed metallic parts, one at a time. Measure the AC voltage across the combination of 1500 ohm resistor and 0.15 mfd (F) capacitor. Reverse the AC plug at the AC outlet and repeat AC voltage measurements for each exceed 0.3V RMS. This corresponds to 0.2mA AC and value exceeding this limit constitutes a potential shock hazard and must be corrected immediately.



GENERAL INFORMATION

• MONITOR DESCRIPTION

This 14" Flat screen CRT display monitor is operated in TTL drive mode, Analog video mode input

• OPERATING CONTROLS

1) External controls

• Front

Power switch, LED lamp, contrast, Brightness.

• Rear

15Pin D-sub connector, inlet socket for AC power input, H-shift

2) Service controls(internal controls)

V-linearity, H-width, V-size1,2,3, focus, sub-brightness, horiz. & vert. Centring magnet, H-Hold + B Adjust.

• DISPLAY MONITOR ELECTRICAL CHARACTER

1) AC Power Input : AC115V/230V

Power consumption is 35W under normal viewing condition and uses internal fuse protection.

2) video

-Input : 0.7Vp-p, Analog

-Band width : 30MHZ(-3dB)

3)Horizontal Electrics

-Hold Range : 30.5KHZ-32.5KHZ
AUTO-Adjustment Range

-Retrace Time : 4.5 μ s(Includes retrace and delay time)

4)Vertical Electrics

-Hold Range : 45Hz to 90Hz

-Retrace Time : 600ms min(includes retrace and delay time)

5)Adjustment size range: 235(H) \times 175(V)mm

(Horizontal, vertical from 5% over scan to 5% under scan)

• MECHANICAL SPECIFICATION

Figure-I shows the mechanical specification for the flat screen CRT display monitor,

• CRT DISPLAY CHARACTERISTICS

1) Cathode Ray Tube Specification

-Size : 14" diagonal

-Deflection Angle : 90
-Implosion Protection : Shrinkage band with mounting lug
-Phosphor : P 39, PLA. PWD.
-Display size : 253(H) \times 195(V)(mm)
-Face : Direct Etched
-Anode Voltage : 13.4 \pm 1KV

2) Picture Quality

-Resolution : 1100TV line at center, 900TV line at corner at 3. foot lambert with full "E" character.

-Geometric Distortion : The perimeter of display pattern approaches and ideal rectangle to within $\pm 1.5\%$ of the rectangle height.

-Linearity : Character height or width shall be within 10% of that of and adjacent character and within 20% of the for any character on the screen.

-Display Capability : 80 Characters \times 30 Rows

• ENVIRONMENTAL SPECIFICATION

The monitor is capable of meeting all performance requirement and operate continuously and reliably during and after exposure to any or all of all of the following environments,

1) Temperature

-Operating : 5 $^{\circ}$ C to +40 $^{\circ}$ C

-Storage : -10 $^{\circ}$ C to +55 $^{\circ}$ C

2) Humidity

: operating 5% ~ 80%
non operating (storage) %

3) Altitude

-Operating : Up to 10,000 FT

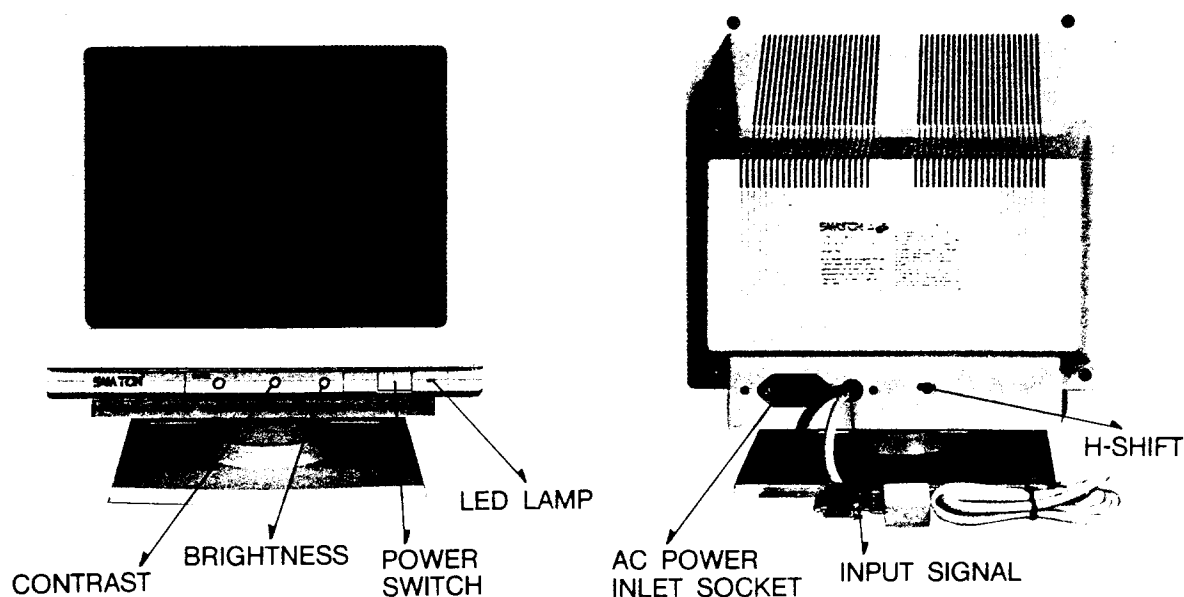
-Non Operation : Up to 50,000 FT

• X-RADIATION

The monitor shall meet the applicable requirement of D.H.H.S regulations (21CER. SUBCHAPTER J) for X-radiation emission.

• WEIGHT : Approx 9kg

CONTROLS AND TERMINAL IDENTIFICATION



IMPORTANT NOTICE FOR SERVICES PERSONNEL BEFORE SERVICING

PLEASE READ BEFORE ATTEMPTING SERVICE

1. Line voltage must be kept within 115V/230V range.
2. Do not discharge, arc, or measure high voltage when high voltage lead is connected to CRT. Discharge 2nd anode of CRT only after high voltage lead has been disconnected.
Do not discharge high voltage lead at any time, damage to transistors may result.
3. While the monitor is in operation, do not attempt to connect or disconnect any wires.
4. Disconnect all power before attempting any repairs.
5. When the power is on, do not attempt to short any part of the circuit.
This shorting may cause damage to the transistors in the monitor.

ADJUSTMENT

Apply power, TTL sync and Analog video input signal (alphanumeric) to the data display.

CENTERING

1. Loosen the deflection yoke clamp and carefully move the yoke on the neck of the picture tube as far forward as possible.

2. Rotate the yoke until the top bottom edges of the raster are straight. Tighten the centering magnets.

FOCUS

Adjust focus control VR 332 for providing the best focus.

HORIZONTAL WIDTH

1. Horizontal width coil to obtain the optimum width for full information.
If the recommended input signal format is used, the width should be 235mm.
2. When character width variation is observed in character of one row, turn the core of the horizontal linearity control until the character width is uniform.

HORIZONTAL WIDTH

1. Automatically synchronize the vertical frequency to the information signal.
2. Adjust vertical linearity control VR 214 for the best linearity VR 205 for mode 2 (400 lines) VR 206 for Mode 3 (350 lines) and size control VR 211 for mode 1 (480 lines), to obtain the optimum height.
If the recommended input signal format is used, the height should be 175mm.

SERVICE INFORMATION ADJUSTMENTS

● BRIGHTNESS

Normally, the monitor will be used to display alpha-numeric or other black and white information moreover, the video polarity is usually white characters on a black background.

The brightness control VR 330 should be adjusted at a point where the white raster is just extinguished.

The CRT will then be at its cutoff point, and a maximum contrast ratio can be obtained when a video signal is applied fully.

● VERTICAL ADJUSTMENTS

There is slight interaction among the vertical frequency height and linearity controls. A change in the height of the picture may affect linearity.

- 1) Automatically set the vertical-hold when apply the vertical signal to obtain optimum height.
- 2) Adjust the vertical linearity control VR 214 for best vertical linearity.
- 3) Adjust the vertical height control VR 221, 205, 206 for desired height.
- 4) Recheck height and linearity, and readjust, if necessary.

● HORIZONTAL ADJUSTMENTS

Raster width is affected by a combination of the DC power supply, horizontal width coil.

- 1) Horizontal frequency Hold
Measure the voltage wave frequency of IC

302 pin 7 by oscilloscope or frequency counter and adjust the Horizontal hold control VR 3 until the voltage frequency 31.5 KHz at no signal

2) Horizontal width

Adjust horizontal width by turning the core with a plastic hexdriver for the desired width. 301)

● DEFLECTION YOKE ASSEMBLY ADJUSTMENTS

1) RASTER CENTERING

If the raster is not properly centered, it may be repositioned by rotating the ring magnets behind the deflection yoke.

The ring magnets should not be used to offset the raster from its nominal center position because it would degrade the resolution of the display if the picture is tilted rotate the entire yoke.

2) GEOMETRIC CORRECTIONS

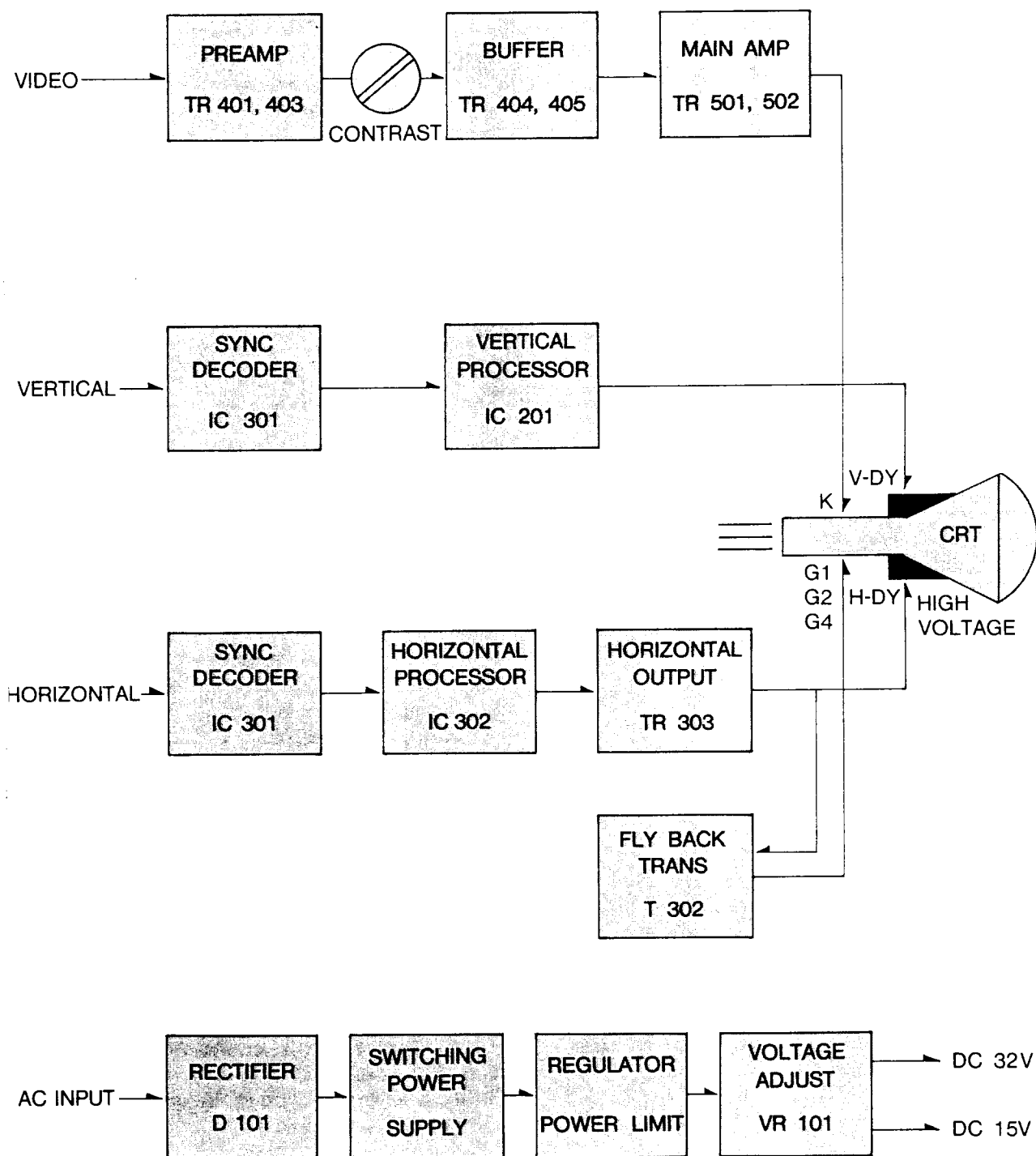
The magnets on the yoke assembly shall be polarized so as to provide adjustment of pin-cushion, barreling and other geometric deformities by simply rotating the magnets until the desired display is achieved readjust if necessary.

● FOCUS ADJUSTMENTS

Although the focus control, VR 332 does not have a large effect on focus because of the CRT gun assembly construction.

So there is a dynamic focus which does not control if provides some adjustment for maintaining the best overall display focus.

BLOCK DIAGRAM



THEORY OF OPERATION (CIRCUIT DESCRIPTION)

1. VIDEO AMP

This circuit is ANALOG amplifier, consist of pre amplifier and main amplifier.

Video signal applied R402, C401 is filterable capacitor

Q401 and Q403 driven signal and connected contrast volume (VR413)

Level of video signal via contrast volume shift to Q402

Q501 and Q502 are connected cascode amplifier
Finally signal is applied to CRT cathode through cascode amplifier.

2. VERTICAL PROCESS CIRCUIT

Vertical deflection circuit consist of two stage, IC201, IC301 which accomplishes all active vertical sync functions .

Vertical sync input applied pin #10, 13 of pin of IC301, voltage of pin #9.11 of IC 301 changed logic (0), (1)

Only positive waveform generated at pin #8 of 301

This waveform synchronoze vertical synchroni zation that applied pin #9 IC 201

The oscillator Generates non-symmetrical square wave with a short duty cycle at approximately 45HZ. components R 209 and 205, determine the frequency. This square wave signal is applied to a ramp generator whose slope and amplitude is determined by VR 211, 214 and R205, VR206, R210, R212.

The ramp voltage signal is applied to a buffer stages witch isolates the ramp generator form the output stages and reduces any Loding on the previous stages.

Component R216, 213, VR214, C211, C212, C210 reshape the ramp voltage signal to make it exitremely linear.

The output signl from the buffer stage is applied to a per-amp stage, for amplification and then to a Power-ramp stage which drived the vertical deflection solus display via coupling capacitor C209, C 213, R218, R217, R219, R221, R216 and AC and DC feedback for the output stages to maintain proper gain and linearity.

2. HORIZONTAL PROCESS CIRCUIT

Horizontal defiection circuit consist of two stage
Horizontal sync input applied pin #4, 10 of IC 301
Voltage of pin #5,3 of IC301 changed logic(0), only positive Wave-form generated at pin #6 of IC301.

This waveform synchronize horizontal synchronioz tion that applied pin #3, IC 302 after differentiat by C305 and R316.

The free running frequency of the oscillator is determined by VR317, R316, R318, R319, C305, C306 and C307 connected to pin 7 and 5 of IC302 respectively.

To generate the line frequency outut pulses, two thresholds are fixed along the fall ramp of the triangu waveform of the oscillator.

The oscillator is synchronised by comparing t phase of the sync pulses in the oscillator after has been filtered properly with an external Low-pass circuit.

The outputs of IC302 are suitable for driving transistor output stages, they deliver positive pulse at pin 1 of IC 301

The rise and fall times of the output pulses are about 150 nS

So that interference due to radiation are avoided
The outputs of IC302 is applied to base of Q3 via R338

The horizontal output transistor Q302 is turned on and off at the horizontal scan rate by the drive signal applied to its base.

A sawtooth current through the deflection coil is required to sweep the beam lineary across the CRT screen.

This happens when TR302 is turned on and its collector voltage drops to near zero

And then, C316 becomes discharging the deflection yoke coil which deflect the beam to the right edge of the CRT.

At that time, TR302 cuts off and C316 causes supply current to the deflection coil.

However, an induced voltage appear across the deflection yoke coil as the magnetic field collapses and an oscillation then occurs in the deflection coils and C316

During the first half cycle of this oscillation the induced voltage is felt across

The collector of now cut TR302, C316 and the primary of T302 (FBT)

This voltage is stepped up by T302 and rectified to produce high voltage that is applied to the 2nd anode at the CRT.

During the second half cycle of the deflection coil C316 oscillation, the voltage on the collector still cut off TR 302 becomes negative.

At this time damper diode D300, D304. becomes forward bias and begins conduction,

The DC operating voltage for the CRT with the exception of the heater voltage are all obtained by rectifying of the horizontal flyback pulse.

D305 and C323 rectify and filter the flyback pulse across L303 to produce a G2 voltage.

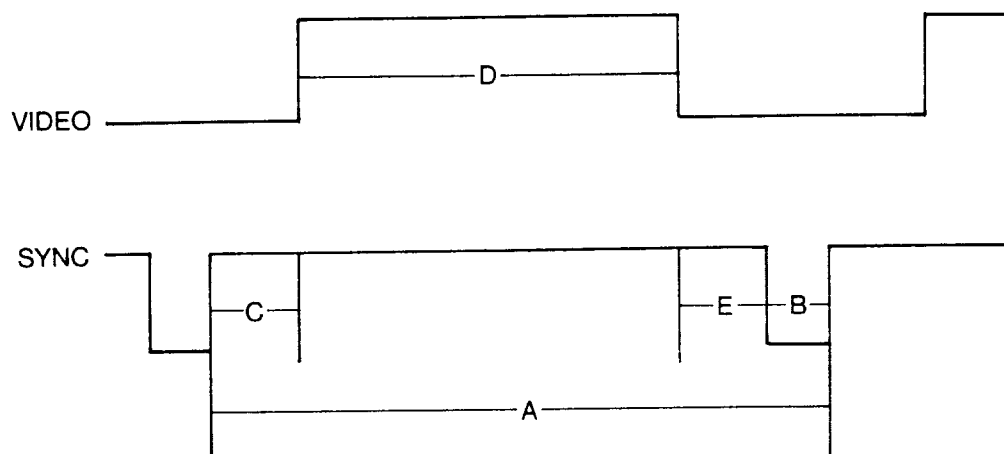
This voltage also feeds to the flyback pulse that rectified and filtered by D306 and C322 to produce voltage which is used as the source voltage for G1 control raster brightness.

Also, the CRT anode voltage is developed by T301 This voltage is typically 13.40KV for 14" normal size.

VIDEO INPUT SIGNAL(TIMING CHART)

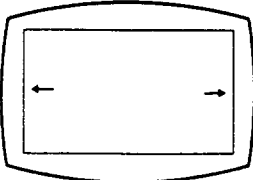
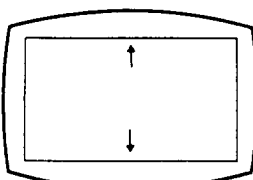
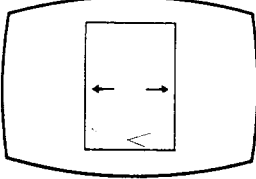
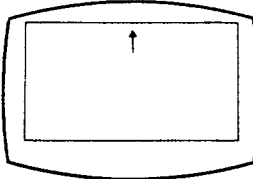
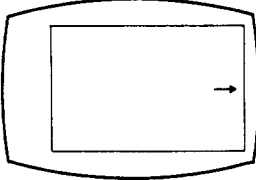
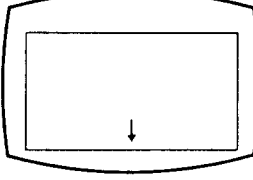
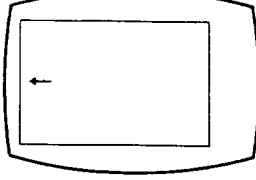
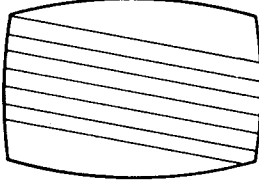
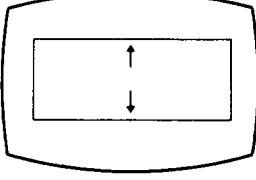
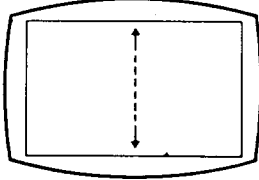
FIGURES

1. SIGNAL TIMING CHART

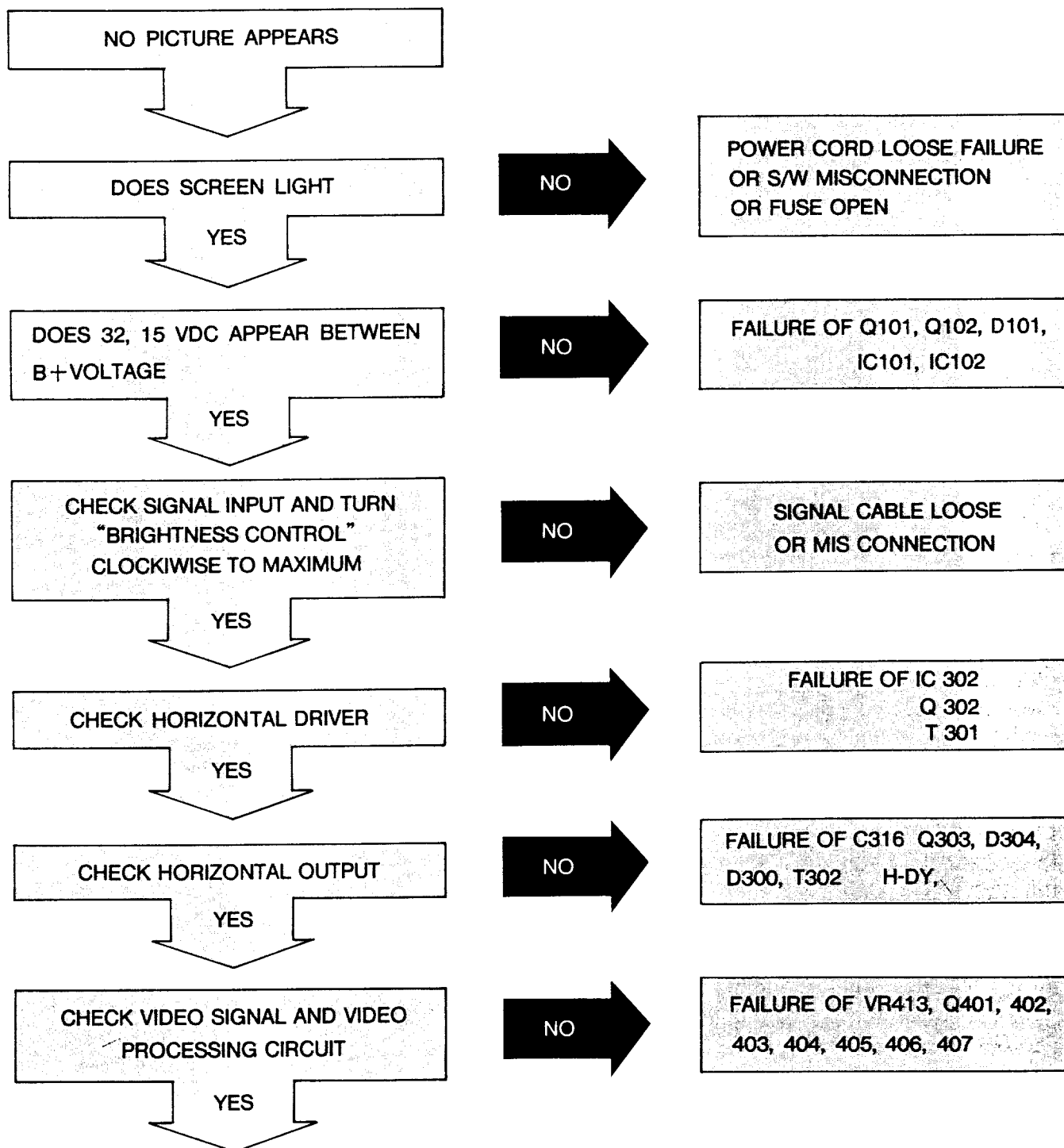


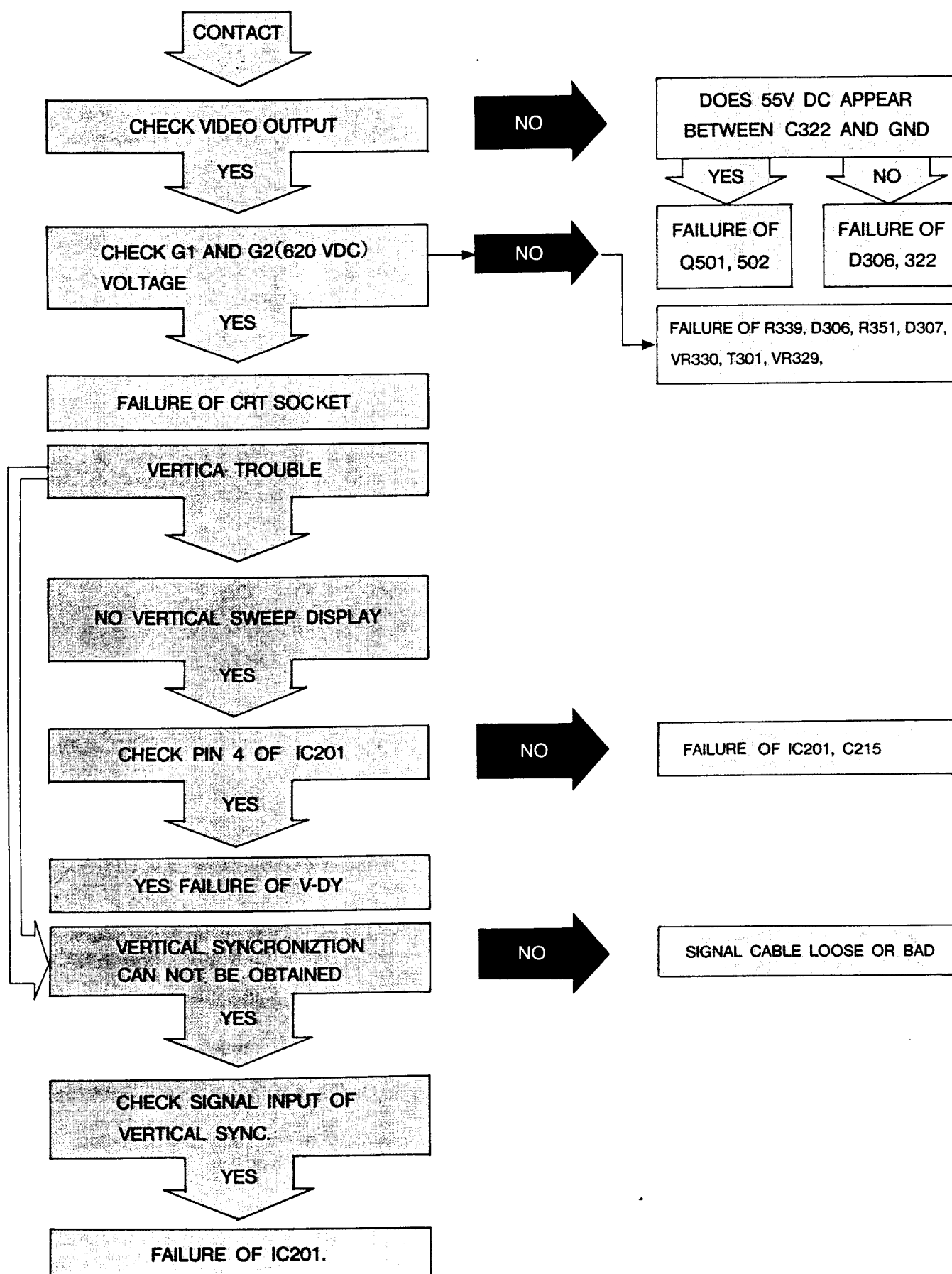
		MODE-1(480 LINES)	MODE-2(400 LINES)	MODE-3(350 LINES)
H	A	31.8uSEC	31.8uSEC	31.8uSEC
	B	3.8uSEC	3.8uSEC	3.8uSEC
	C	1.9uSEC	1.9uSEC	1.9uSEC
	D	25.4uSEC	25.4uSEC	25.4uSEC
	E	0.7uSEC	0.7uSEC	0.7uSEC
	SYNC.P	NEGATIVE	NEGATIVE	POSITIVE
V	A	16.683mSEC	14.268mSEC	14.268mSEC
	B	0.064mSEC	0.064mSEC	0.064mSEC
	C	0.793mSEC	0.890mSEC	1.716mSEC
	D	15.762mSEC	13.155mSEC	11.52mSEC
	E	0.064mSEC	0.159mSEC	0.985mSEC
	SYNC.P	NEGATIVE	POSITIVE	NEGATIVE
VIDEO		ANALOG	ANALOG	ANALOG

WHEN SIGNALS OTHERS THEN THE RECOMMENDED SIGNAL ARE RECEIVED

PHENOMENON	CAUSE	PHENOMENON	CAUSE
Picture width too wide. 	Data display period is more than $25.4\mu s$	Height of picture too much extended. 	Vertical flyback period is less than $600\mu s$
Picture width too narrow. 	Data display period is less than $25.4\mu s$	Picture deviates up ward. 	Picture until that vertical sync signal period or more.
Picture deviates to the right 	Value of front porch is more than $1.9\mu s$ or value of back porch is less than $1.9\mu s$	Picture deviates down ward. 	Picture until that vetical sync signal period or less.
Picture deviates to the left. 	Value of front porch is less than $0.7\mu s$ or value of back porch is more than $0.7\mu s$	Picture becomes lateral stripes. 	Horizontal sync. frequency is not set to 31.47KHz
Height of picture too shortened. 	Vertical flyback period is more than $600\mu s$	Picture flows vertically (upward and down ward) 	Vertical sync. frequency is not set to 60 or 70Hz 60Hz: 480lines 70Hz: 400lines 350lines

TROUBLE SHOOTING INFORMATION CHART





TROUBLE SHOOTING FOR RESPECTIVE SYMPTOMS

● NO POWER

Check the B+ Voltage of power part

- 1) If B+ voltage not obtained;
Check open or short of F101, D101, IC101, IC102, Q101, Q102.
- 2) If B+ voltage obtained;
Proceed to next check item.

● NO RASTER

- 1) Turn the internal brightness control clockwise fully if raster appears: Good
If raster does not appear: No good to next check item.
- 2) Is CRT heater on?
It is not on: Check CRT-heater voltage, power supply circuit and CRT socket for normality.
It is on: proceed to next check item.
- 3) Check high-voltage voltmeter.
High voltage is not obtained:
Check of flyback transformer T302 check the collector pulse of Q303, base pulse of Q303,
High voltage is obtained: to next check item.
- 4) Check respective CRT electrode voltage for normality with a multi-tester.

-G1	: -100-10V
-G2	: 550-650V
-G4	: 0V-400V
-K	: 50V-60V

 -When voltage of G2 and G4 are not obtained:
Check of D305, D307, D306, T302, wire breakdown.
-Voltage of G1 is not obtained: Check of D307, D306, R315, R331, VR329, VR330
-Voltage of K is not obtained:
Check of D307, D306, C322, C321, R315 wire breakdown.
-Voltage of G2, G4 and K are normal:
CRT is faulty, replace CRT

- Only one raster line appears in horizontal direction:
Check of deflection yoke vertical coil is shorted or opened. Deflection yoke is faulty and should be replaced.

- Only one raster line appears in vertical direction:
Check for wire broken in deflection yoke horizontal coil, H-DY, width line open, Q303 is short or open.

- Raster is deformed abnormally: Rare shorting of deflection yoke coil, replace deflection yoke.

- when power is turned off spot remains: Check C506, C322 and CRT for deflection.

- Brightness range is abnormal:
Deterioration of R506, or CRT, check of G2 voltage, check of heater voltage, Check of Q501, Q502, an SG1 and C322

- Raster size is small and picture is abnormally bright (high voltage is abnormally high) check of C31 or T302.

- Vertical sync, is not achieved:
Check of IC301, IC201

- Raster position is deviated relative to CRT face: Turn deflection yoke centering magnet so that raster should be positioned at center.

- Picture or character do not appear, contrast is unachievable:

-Check of Q401, Q402, Q403 and associated components.

-Check of input signal

-Check of CRT

-Check of VR413, and D501

- Picture characters are displayed but inclined:
-Loosen clamp screw on deflection yoke.

Rectify the inclination by turning the entire deflection yoke.

- Fine lines (noise) appear in the picture and character shiver:

-Check high-voltage portion for leakage.

-Check connectors for complete contact

-Check FBT for wire breakdown.

- It takes long for Picture to appear (more than 10 seconds) service life of CRT has reached replace CRT.

- Sync noise not related with input data appears in picture:

-Check grounding wire for poor contact video grounding for incompleteness input signal for normality and power supply return for incompleteness.

- Picture appear and disappear alternately:

-Check of input signal.

-Check of video circuit for poor soldering.

-Check of CRT socket.

- Horizontal linearity is not achieved:
 - Check of C314, Q303 Linearity Coil and deflection yoke horizontal coil(L302)
- Not holding of horizontal sync.
 - Check the sync. signal of IC301 pin #6, IC302 pin #1
 - 1) If sync signal not obtained : Fail of signal cable.
 - 2) If sync signal obtained ; Check the VR312, C309, IC302
- Vertical linearity is not achieved :
 - Check of IC201, VR214, C211, C212
- Not holding of vertical sync.
 - Check the sync signal of IC201 Pin #9
 - 1) If sync. signal not obtained ; Fail of signal cable or C204
 - 2) If sync signal obtained ; Check IC201, C205, R209
- Focusing is not achievable:
 - Check of Voltage G2 and G4.
 - Readjustment of VR332
 - Check of high voltage
 - Check of D307, D306

When all above items are normal, CRT is faulty and should be replaced.

VOLTAGE CHART

1. TRANSISTOR

Measured with high impedance
V.T.V.M or circuit tester under
line voltage 120V (230V) reading
May vary $\pm 10\%$

CKT NO.	Type	Function	Operating Condition	Base	Emitter	Collector	Measurement
Q101	2N2369A	Switching Drive	NO Signal Signal input	0.2 0.2	0 0	0.3 0.3	Digital Volt Meter
Q102	2SC5027	Switching Output	"	0.3 0.3	0.1 0.1	290 290	"
Q201	2SC1815	Switching	"	3.3 3.3	0 0	40 40	"
Q202	2SC1815	Switching	"	0.1 0.1	0 0	40 40	"
Q301	2N3904	Horiz-Synch Drive	"	0.1 0.1	0 0	13 13	"
Q302	2SC1507	Horiz Drive	"	0.4 0.4	0 0	30 30	"
Q303	SGSF461	Horiz Output	"	-0.5 -0.5	0 0	31 31	"
Q401	PN2222	Video Drive	"	1.4 1.4	0 0	4.3 4.3	"
Q402	PN2222	"	"	1.4 1.4	4.3 4.3	14.9 14.9	"
Q403	PN2222	"	"	5 4.9	4.3 4.3	12.6 12.6	"
Q404	2SA733	"	"	12.2 12.2	12.9 12.9	4.1 4.1	"
Q405	2SC945	"	"	4.1 4.1	3.4 3.4	14.8 14.8	"
Q406	2SC945	"	"	-1.3 -1.3	1.3 1.3	2.1 2.1	"
Q407	2SC945	"	"	2.2 2.2	1.6 1.6	14.9 14.9	"
Q501	2N2369A	"	"	1.6 1.6	0 0	7.5 7.5	"
Q502	2SC3502	Video Output	"	8.1 8.1	7.5 7.5	50 50	"

* MEASUREMENT OF TEXT MODE (640 * 400)

(Unit : V)

1. IC

PIN NO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
--------	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----

IC 101 (4N 35)

No Signal	30	29.7	0	0.2	5.2	0										
Signal Input	30	29.7	0	0.2	5.2	0										

IC 102 (TL 431)

No Signal	29.7	0	2.4													
Signal Input	29.7	0	2.4													

IC 301 (74 HCTLS 86)

No Signal	0.5	0	0.5	0.5	0.5	0.5	0	0	5	3.5	5	0	3.5	5		
Signal Input	0.5	0	0.5	0.5	0.5	0.5	0	0	5	3.5	5	0	3.5	5		

IC 302 (MC 1391P)

No Signal	0.3	0	2.5	2.2	3.9	8.6	3.7	3.5								
Signal Input	0.3	0	2.5	2.2	3.9	8.6	3.7	3.5								

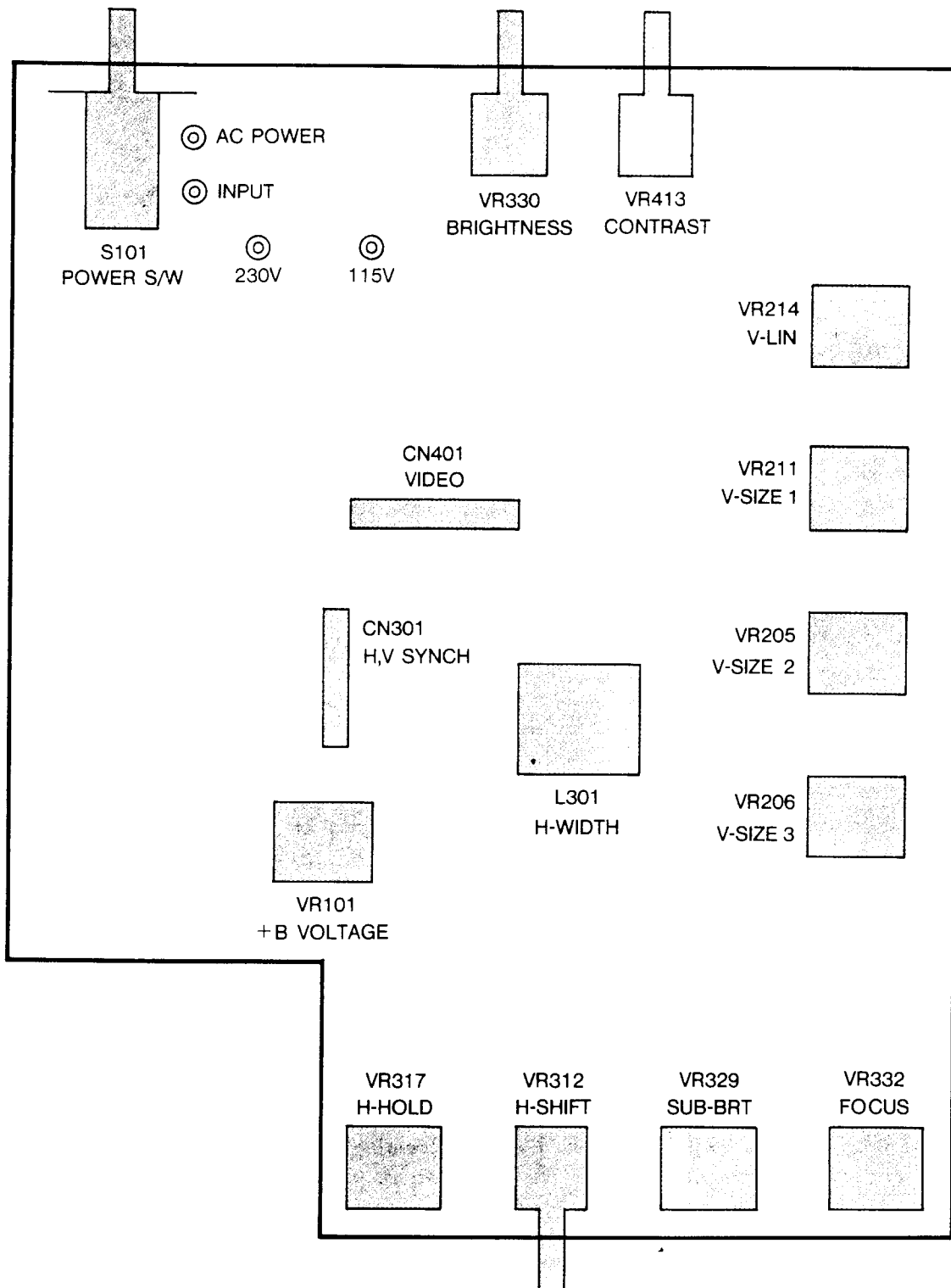
IC 201 (TDA 1170N)

No Signal	3.8	14.8	0.5	8.8	14.6	6.5	6.6	NC	2.4	2	0.6	3				
Signal Input	3.8	14.8	0.5	8.8	14.6	6.5	6.6	NC	2.4	2	0.6	3				

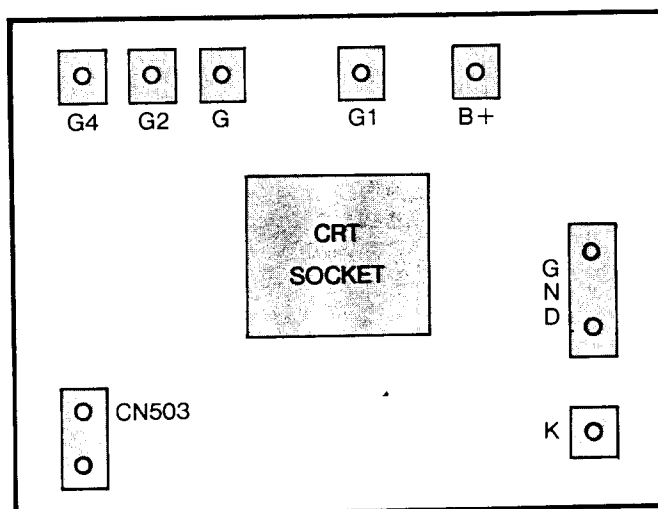
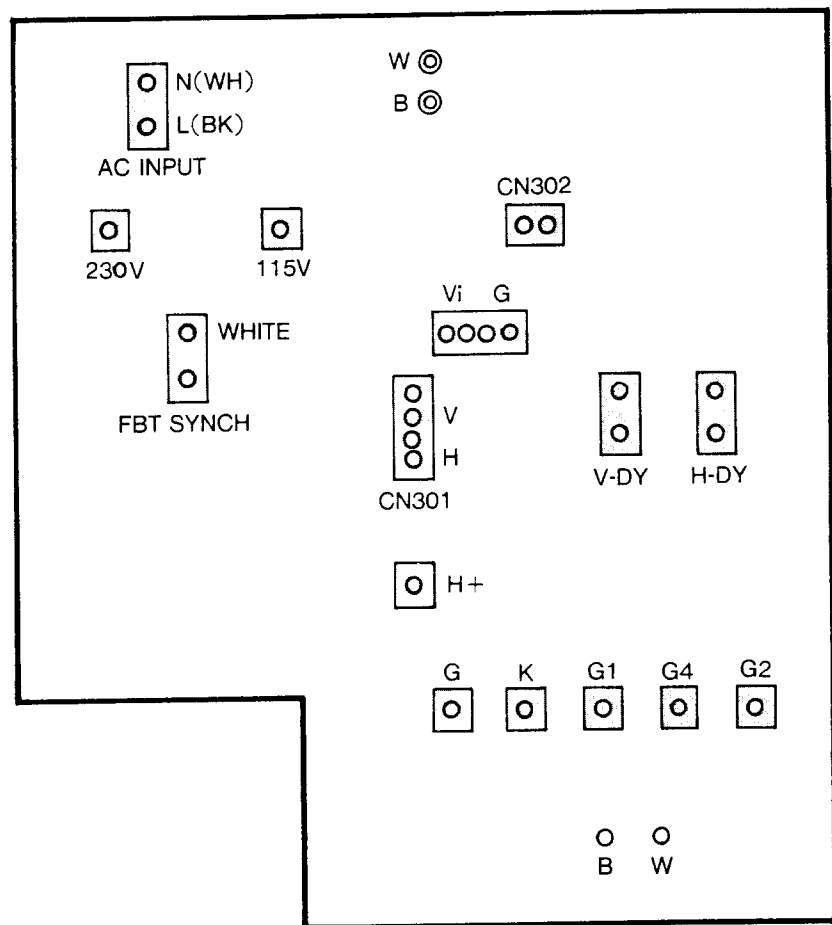
* MEASUREMENT OF TEXT MODE (640 * 400)

(Unit : V)

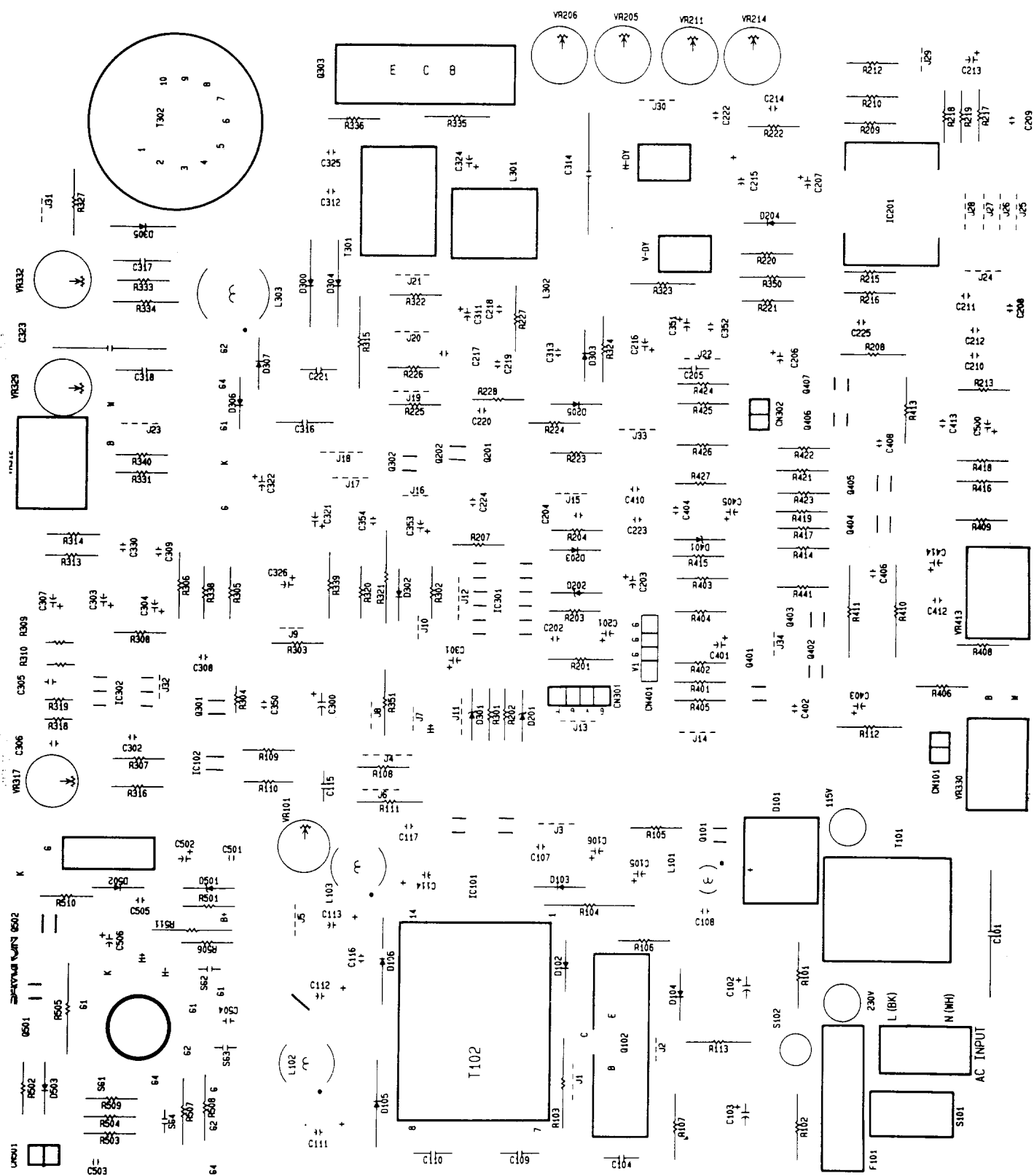
ADJUSTER AND CONNECTOR FOR MAIN PC BOARD



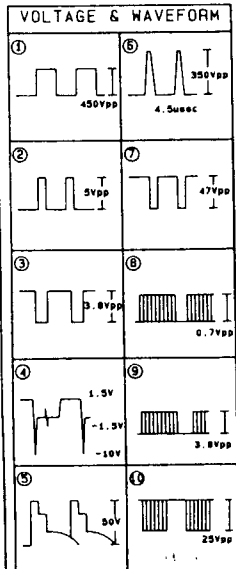
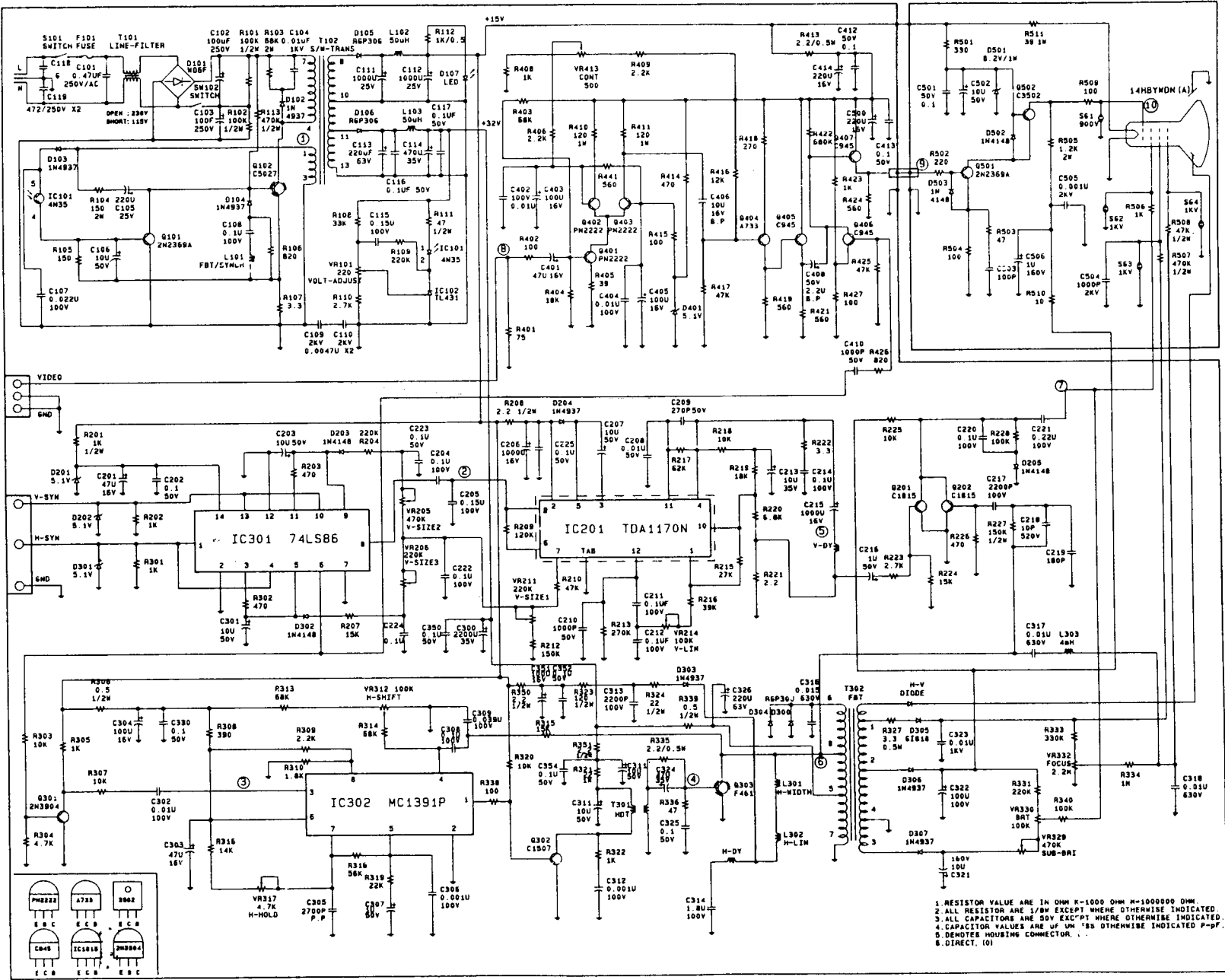
WIRNG DIAGRAM(COMPONENT SIDE)

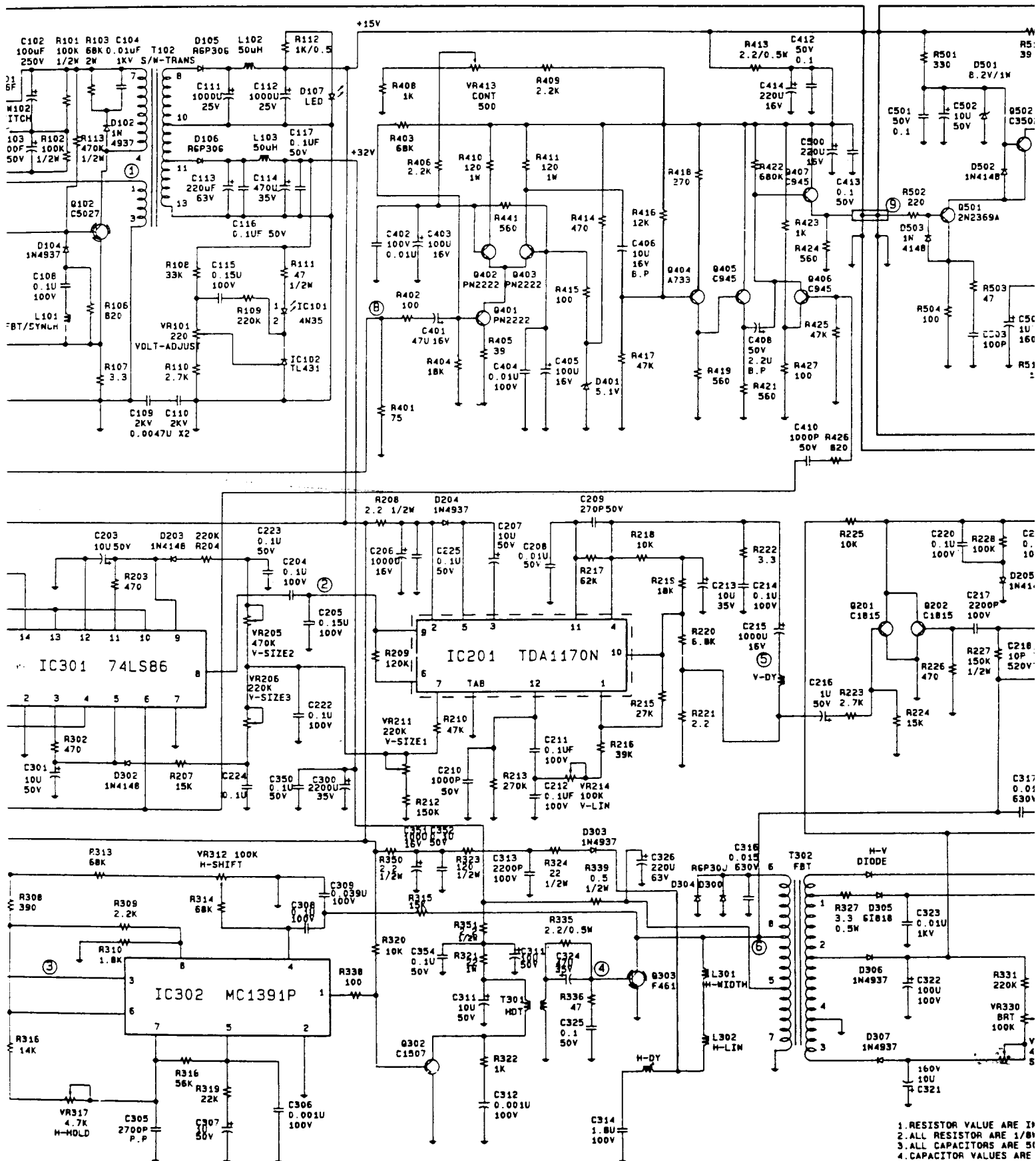


PC BOARD ASSEMBLY (SOLDER SIDE)

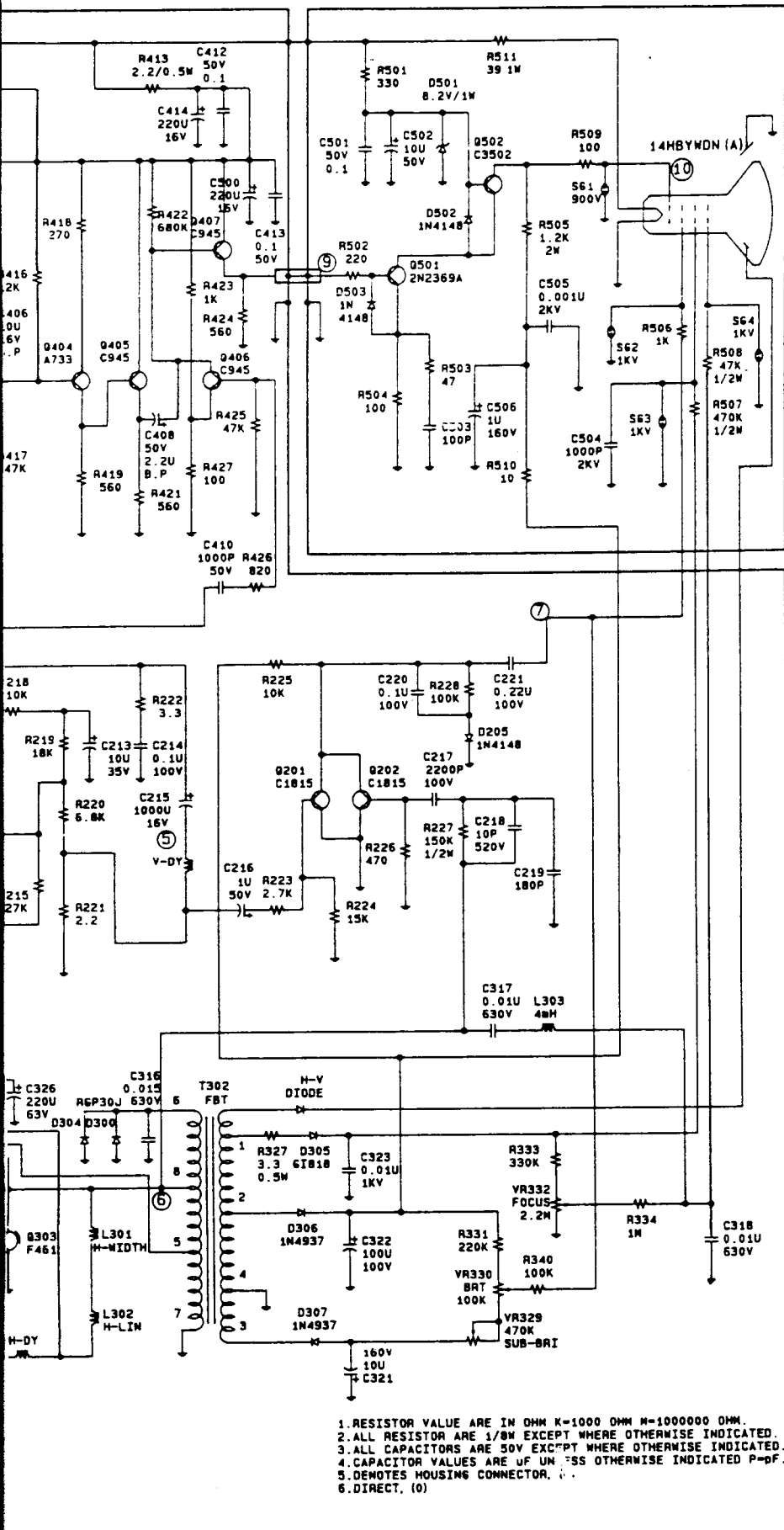



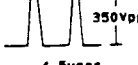

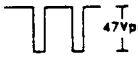


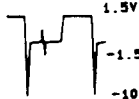


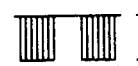
SCHEMATIC DIAGRAM





SCHEMATIC DIAGRAM

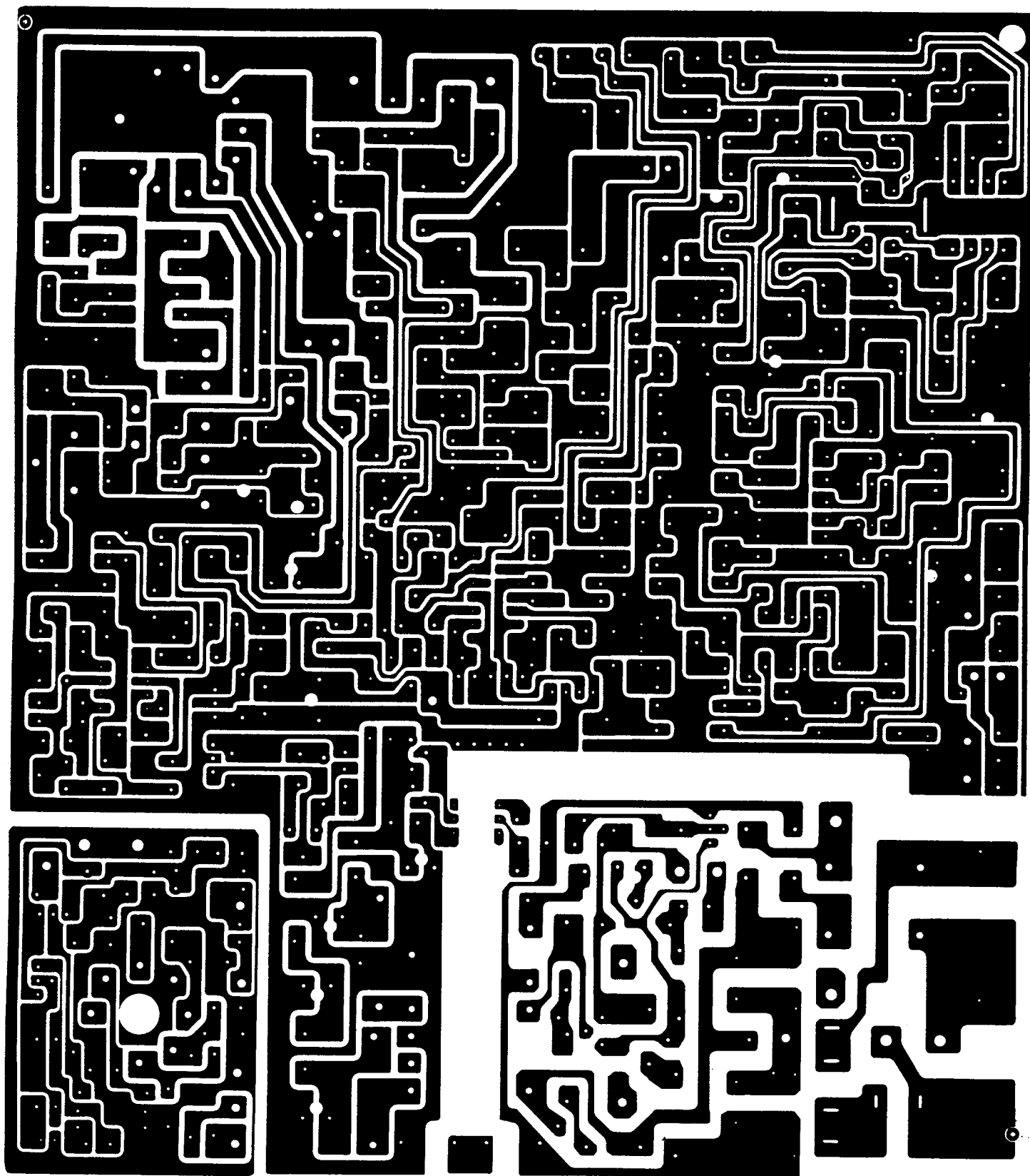


VOLTAGE & WAVEFORM	
①	⑥
	
②	⑦
	
③	⑧
	
④	⑨
	
⑤	⑩
	

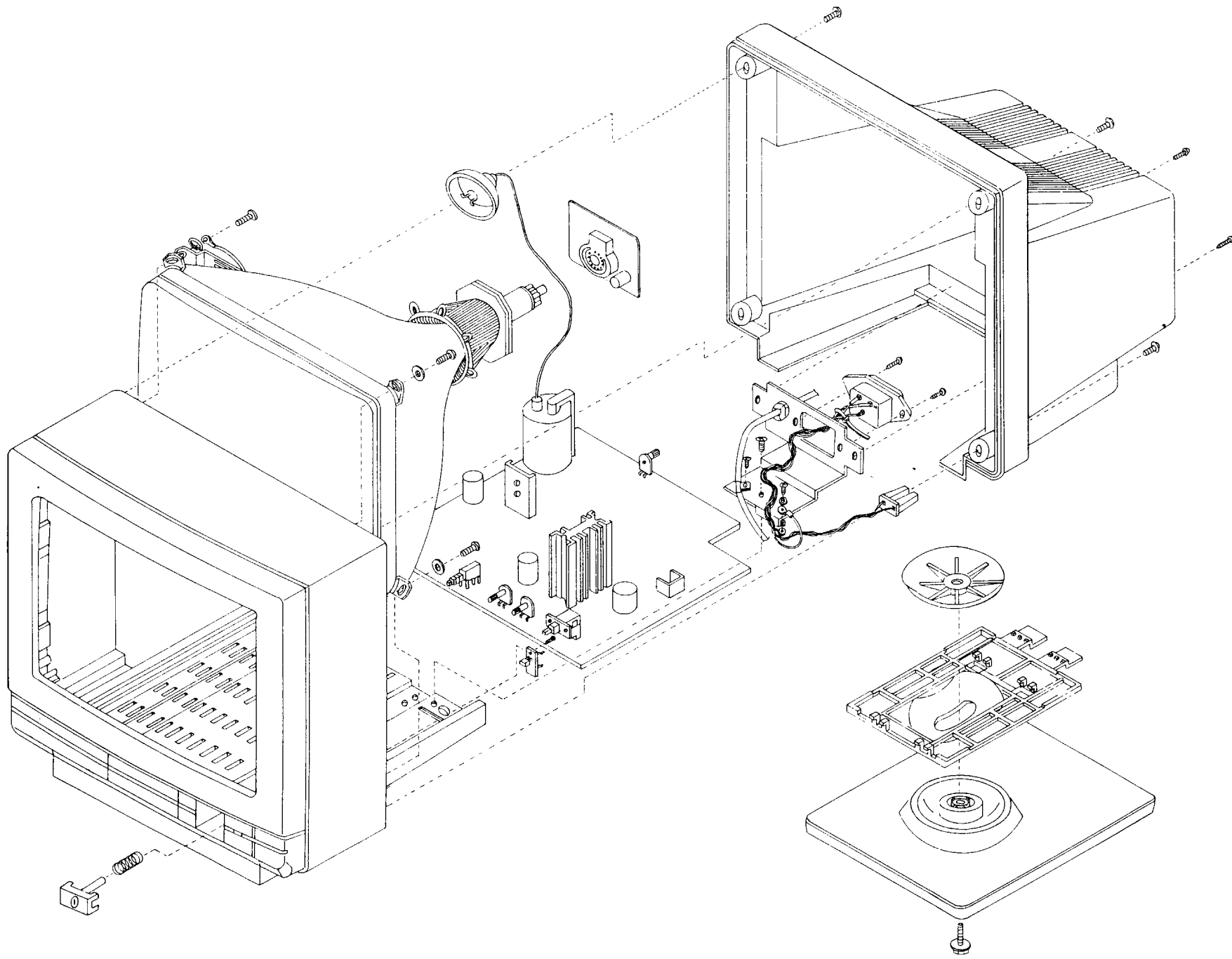
〈MAIN〉



PCB LOCATION (SOLDER SIDE)



ASSEMBLY DRAWING



REPLACEMENT PARTS LIST

S/N	PART NO	DESCRIPTION	LOCATION	UNIT	Q'TY	REMARK
1.	MA-084-00143	MAIN BOARD A/S ASSY		A	1	
2.	01-161-00948	S-ASSY HEAT SINK TR C5027	Q102	A	1	
	21-117-00051	TRNPN TO-220 3A 1100 C5027		P	1	
	31-114-00131	HEAT SINK 32×12.7×35AL		3	1	
	33-142-00012	MS+ PAN W/P M3×8		P	1	
	33-852-00012	NUT HEX M3×0.5P	/	P	1	
3.	01-161-01069	S-ASSY HEAT SINK SGSF 416	Q303	A	1	
	21-117-90286	TR NPN TO-218 15A 850V 125W		P	1	
	31-114-00458	HEAT SINK 35×17×40 AL		P	1	
	33-142-00012	MS+ PAN M3×8		P	1	
	33-852-00012	NUT HEX M3×0.5P		P	1	
4.	11-113-0108B	CAP AL 1000μF 20% 16V	C206, C215	P	2	
5.	11-114-0108B	CAP AL 1000μF 20% 25V	C111, C112	P	2	
6.	11-115-0228B	CAP AL 2200μF 20% 35V	C300	P	1	
7.	11-115-0477B	CAP AL 470μF 20% 35V	C114	P	1	
8.	11-117-0227B	CAP AL 220μF 20% 63V	C113, C326	P	2	
9.	11-118-0107B	CAP AL 100μF 20% 100V	C322	P	1	
10.	11-119-01069	CAP AL 10μF 20% 160V	C321	P	1	
11.	11-122-01072	CAP AL 100μF 20% 250V	C102, C103	P	2	
12.	11-192-0107B	CAP AL 100μF 20% 16V	C414, C500	P	2	
13.	11-193-02277	CAP AL 220μF 20% 25V	C105	P	1	
14.	12-246-01021	CAP CERAMIC 0.001μF 2kV	C504, C505	P	2	
15.	12-285-01033	CAP CERAMIC 0.01μF 1kV	C104	P	1	
16.	12-287-04722	CAP CERAMIC 4700μF 400V AC	C109, C110	P	2	
17.	13-116-01547	CAP IND-P 0.15μF 100V	C115, C205	P	2	
18.	13-152-02241	CAP M-P 0.22μF 100V	C221	P	1	
19.	13-313-01535	CAP PP 0.015μF 630V	C316	P	1	
20.	13-313-11032	CAP PP 0.01μF 630V	C317, C318	P	2	
21.	13-315-01033	CAP PP 0.01μF 1kV	C323	P	1	
22.	13-318-02728	CAP PP 2700PF 50V	C305	P	1	
23.	13-356-01853	CAP MPP 1.8μF 100V	C314	P	1	
24.	13-411-94746	CAP M-PAPER 0.47μF 250V AC	C101	P	1	
25.	13-911-00024	CAP S.G 1KV S-23	SG2, SG3, SG4	P	3	
26.	14-332-01217	RES METAL 120OHM 1W	R410, R411	P	2	
27.	14-332-01535	RES METAL 15kOHM 1W	R315	P	1	
28.	14-336-02202	RES METAL 22OHM 1W	R321	P	1	
29.	14-336-03909	RES METAL 39OHM 1W	R511	P	1	
30.	14-342-01229	RES METAL 1.2k OHM 2W	R505	P	1	
31.	14-342-01511	RES METAL 150 OHM 2W	R104	P	1	
32.	14-342-06832	RES METAL 68kOHM 2W	R103	P	1	
33.	15-212-00048	VAR NO-H 2.2M 0.15W	VR332	P	1	
34.	15-212-00155	RES METAL 4.7k 0.15W	VR317	P	1	
35.	15-212-00167	RES METAL 220KOHM 0.15W	VR101	P	1	
36.	15-262-00024	RES METAL 220KOHM 0.1W	VR211, VR206	P	2	

S/N	PART NO	DESCRIPTION	LOCATION	UNIT	Q'TY	REMARK
37.	15-262-00048	RES METAL 100KOHM 0.1W	VR214	P	1	
38.	15-262-00075	RES METAL 470KOHM 1W	VR205, VR329	P	2	
39.	15-321-00036	VAR HANDLE 500OHM 0.2W	VR413	P	1	
40.	15-321-00208	VAR HANDLE 100KOHM 0.2W	VR312	P	1	
41.	15-321-00235	VAR HANDLE 100K 0.2W	VR330	P	1	
42.	17-116-00211	TRANS SWITCHING SM-470	T102	P	1	
43.	17-121-00339	FBT FM0-14A005	T302	P	1	
44.	17-131-00036	COIL FOCUS 4 mH	L303	P	1	
45.	17-132-00208	COIL TRANS HDT 16 ^{mH} /78 _{μH}	/T302	P	1	
46.	17-211-00048	COIL H-WIDTH 18-50 _{μH}	L301	P	1	
47.	17-222-00087	COIL CHOKE 50 _{μH}	L102, L103	P	2	
48.	17-226-00048	COIL H-LIN 5 _{μH}	L302	P	1	
49.	17-311-00235	FILTER LINE 50mH	T101	P	1	
50.	19-103-00099	Fuse 250V 2A 20MM	F101	P	1	
51.	19-113-00012	Fuse CLIP 5.2×2.8	F101	P	2	
52.	19-131-00024	PUSH S/W 48/32A/250V	S101	P	1	
53.	19-161-90012	NEON LAMP 65V 90V	SG1	P	1	
54.	21-112-90024	TR NPN TO-18 2N2369A	Q101, Q501	P	2	
55.	21-115-00024	TR NPN TO-126 2SC3502E	Q502	P	1	
56.	21-117-00131	TR NPN TO-220 KSC1507Y	Q302	P	1	
57.	22-111-90075	DIODE RGP 30G	D105,D106	P	2	
58.	22-111-90339	DIODE RGP 30J	D300, D304	P	2	
59.	22-113-90048	DIODE BRIDGE W06F	D101	P	1	
60.	23-162-00868	IC 74 HCTLS 86	IC301	P	1	
61.	23-301-90048	IC OPTO SOC815A	IC101	P	1	
62.	23-313-00012	IC REGU TO-92 431C	IC102	P	1	
63.	23-321-90247	IC LINEAR MC1391P	IC302	P	1	
64.	23-329-90024	IC LINEAR TDA1170N	IC201	P	1	
65.	31-111-00048	HEAT SINK TDA1170N	IC201	P	1	
66.	36-211-00541	WIRE FORM IST RED 230 DT	BRT.B	P	1	
67.	36-211-00553	WIRE FORM IST YEL 250 DT	BRT.X + H	P	2	
68.	36-211-00565	WIRE FORM IST BRN 250 DT	GI	P	1	
69.	36-212-00075	WIRE FORM IST VI 100 DT	JUMP A	P	1	
70.	36-273-00024	WIRE FORM IST BK 500 DT	L101	P	1	
71.	36-273-00036	WIRE FORM IST R 260 DT	K	P	1	
72.	36-273-00048	WIRE FORM IST BK 260 DT	GND	P	1	
73.	36-273-00051	WIRE FORM IST W 260 DT	G4	P	1	
74.	36-273-00063	WIRE FORM IST B 260 DT	G2	P	1	
75.	36-412-00502	WIRE HOUSING 113mmTER	S102	P	1	
76.	36-413-00669	WIRE HOUSING280mm BK,R	VIDEO	P	1	
77.	36-437-00155	BRAID WIRE TER D5, 210mm		P	1	
78.	36-614-00012	CONN 3.96ST 5273-02A BK	V-DY	P	1	
79.	36-614-00024	CONN 3.96ST 5273-02A WH	H-DY	P	1	
80.	36-615-00012	CONN 2.5ST 5267-02A	CN101, 302, 501	P	3	
81.	36-615-00036	CONN 2.5ST 5267-04A	CN301, 401	P	2	
82.	36-633-00087	CRT SOCKET 20φ7P	Y	P	1	
83.	39-421-00131	TUBE AWG 7 D 3.7 #7	C112+CHASS1	P	1	

S/N	PART NO	DESCRIPTION	LOCATION	UNIT	Q'TY	REMARK
84.	11-192-0107B	CAP AL 100μF 20% 16V	C304, 351, 403, 405	P	4	
85.	11-192-0476B	CAP AL 47μF 20% 16V	C201, 303, 401,	P	3	
86.	11-194-0476B	CAP AL 47μF 20% 35V	C324	P	1	
87.	11-195-01057	CAP AL 1μF 20% 50V	C216, C307	P	2	
88.	11-195-01069	CAP AL 10μF 20% 50V	C106, 207, 213, 311	P	8	
			301, 203, 353, 502			
89.	11-197-01057	CAP AL 1μF 20% 160V	C506	P	1	
90.	11-561-01069	CAP AL BP-D 10μF 20% 16V	C406	P	1	
91.	11-562-02253	CAP AL BP-D 2.2μF 20% 50V	C408	P	1	
92.	12-182-01814	CAP CERAMIC 180PF 5% 50V	C219	P	1	
93.	12-182-02716	CAP CERAMIC 270PF 5% 50V	C209	P	1	
94.	12-191-01018	CAP CERAMIC 100PF 10% 50V	C210, 410, 503	P	3	
95.	12-193-01006	CAP CERAMIC 10PF 50% 500V	C218	P	1	
96.	12-371-01033	CAP CERAMIC 0.01μF 50V	C208, 402, 404	P	3	
97.	12-371-01045	CAP CERAMIC 0.1μF 50V	C116, 117, 202, 223	P	13	
			224, 225, 330, 352			
			354, 412, 413			
			350, 501			
98.	13-126-01021	CAP IND-P 0.001μF 10% 100V	C306, C312	P	2	
99.	13-126-01033	CAP IND-P 0.01μF 10% 100V	C302	P	1	
100.	13-126-01045	CAP IND-P 0.1μF 10% 100V	C108, 204, 308	P	9	
			C211, 212, 214			
			220, 222, 325			
101.	13-126-02226	CAP IND-P 0.0022μF 100V	C217, 313	P	2	
102.	13-126-02238	CAP IND-P 0.022μF 10% 100V	C107	P	1	
103.	13-126-03936	CAP IND-P 0.039μF 10% 100V	309	P	1	
104.	14-134-01006	RES CARBON 10 ¼ W 5%	R510	P	1	
105.	14-134-01018	RES CARBON 100 ¼ W 5%	R338, 509, 402	P	5	
			415, 427			
106	14-134-01021	RES CARBON 1K ¼ W 5%	R202, 301, 305	P	7	
			322, 408, 423, 506			
107	14-134-01033	RES CARBON 10K ¼ W 5%	R225, 320, 218	P	5	
			R303, R307			
108	14-134-01045	RES CARBON 100K ¼W 5%	R228, 340	P	2	
109	14-134-01232	RES CARBON 12K ¼W 5%	R416	P	1	
110	14-134-01244	RES CARBON 120K ¼W 5%	R209	P	1	
111	14-134-01431	RES CARBON 14K ¼W 5%	R316	P	1	
112	14-134-01511	RES CARBON 150 ¼W 5%	R105, R504	P	2	
113	14-134-01535	RES CARBON 15K ¼W 5%	R224, 207	P	2	
114	14-134-01547	RES CARBON 150K ¼W 5%	R212	P	1	
115	14-134-01838	RES CARBON 18K ¼W 5%	R219, 404	P	2	
116	14-134-02R22	RES CARBON 2.2 ¼W 5%	R221	P	1	
117	14-134-02214	RES CARBON 220 ¼W 5%	R502	P	1	
118	14-134-02226	RES CARBON 2.2K ¼W 5%	R406, 409	P	2	
119	14-134-02214	RES CARBON 220K ¼W 5%	R109, 204, 331	P	3	
120	14-134-02716	RES CARBON 270 ¼W 5%	R418	P	1	
121	14-134-02728	RES CARBON 2.7K ¼W 5%	R110, 223	P	2	

S/N	PART NO	DESCRIPTION	LOCATION	UNIT	Q'TY	REMARK
122	14-134-02731	RES CARBON 27K ¼W 5%	R215	P	1	
123	14-134-02743	RES CARBON 270K ¼W 5%	R213	P	1	
124	14-134-03R31	RES CARBON 3.3 ¼W 5%	R222	P	1	
125	14-134-03315	RES CARBON 330 ¼W 5%	R501	P	1	
126	14-134-03339	RES CARBON 33K ¼W 5%	R108	P	1	
127	14-134-03342	RES CARBON 330K ¼W 5%	R333	P	1	
128	14-134-03909	RES CARBON 39 ¼W 5%	R405	P	1	
129	14-134-03912	RES CARBON 390 ¼W 5%	R308	P	1	
130	14-134-03936	RES CARBON 39K ¼W 5%	R216	P	1	
131	14-134-04707	RES CARBON 47 ¼W 5%	R336, 503	P	2	
132	14-134-04719	RES CARBON 470 ¼W 5%	R203, 226	P	4	
			302, 414			
133	14-134-04734	RES CARBON 47K ¼W 5%	R210, 417, 425	P	3	
134	14-134-05612	RES CARBON 560 ¼W 5%	R424, 441, 419	P	4	
			R421			
135	14-134-06235	RES CARBON 62K ¼W 5%	R217	P	1	
136	14-134-06829	RES CARBON 6.8K ¼W 5%	R220	P	1	
137	14-134-06832	RES CARBON 68K ¼W 5%	R313, 314, 403	P	1	
138	14-134-06844	RES CARBON 680K ¼W 5%	R422	P	1	
139	14-134-07508	RES CARBON 75 ¼W 5%	R401	P	1	
140	14-134-08214	RES CARBON 820 ¼W 5%	R106, 426	P	2	
141	14-142-0R508	RES CARBON 0.5 ½W 5%	R306, 339	P	2	
142	14-142-01021	RES CARBON 1K ½W 5%	R112, 201	P	2	
143	14-142-01045	RES CARBON 100K ½W 5%	R101, 102	P	2	
144	14-142-01057	RES CARBON 1M ½W 5%	R334	P	1	
145	14-142-01217	RES CARBON 120 ½W 5%	R323	P	1	
146	14-142-01547	RES CARBON 150K ½W 5%	R227	P	1	
147	14-142-02R22	RES CARBON 2.2 ½W 5%	R208, 413, 335	P	5	
			R350, 351			
148	14-142-02202	RES CARBON 22 ½W 5%	R324	P	1	
149	14-142-03R31	RES CARBON 3.3 ½W 5%	R107, R327	P	2	
150	14-142-04707	RES CARBON 47 ½W 5%	R111	P	1	
151	14-142-04734	RES CARBON 47K ½W 5%	R508	P	1	
152	14-142-04746	RES CARBON 470K ½W 5%	R507,113	P	2	
153	14-412-01826	RES METAL 1.8K ⅛W 5%	R310	P	1	
154	14-412-02226	RES METAL 2.2K ⅛W 5%	R309	P	1	
155	14-412-02238	RES METAL 22K ⅛W 5%	R319	P	1	
156	14-412-04722	RES METAL 4.7K ⅛W 5%	R304	P	1	
157	14-412-05636	RES METAL 56K ⅛W 5%	R318	P	1	
158	16-129-00024	PCB MAIN 1.6T SM-470		P	1	
159	21-114-00012	TR NPN TO-92 KSC 945 Y	Q405, 406, 407	P	3	
160	21-114-00048	TR NPN TO-92 KSC 1815 Y	Q201, 202	P	2	
161	21-114-00063	TR NPN TO-92 PN 2222A	Q401, 402, 403	P	3	
162	21-114-00259	TR NPN TO-92 2N3904	Q301	P	1	
163	21-124-00024	TR PNP TO-92 KSA 733Y	Q404	P	1	
164	22-111-90012	DIODE 1A 1000V GI818	D305	P	1	

S/N	PART NO	DESCRIPTION	LOCATION	UNIT	Q'TY	REMARK
165	22-111-90087	DIODE 1A 600V IN4937	D102, 103, 104, 306	P	7	
			307, 303, 204			
166	22-121-00051	ZENER DIODE 5.1V 0.5W	D201, 202, 301, 401	P	4	
167	22-121-00087	ZENER DIODE 8.2V 0.5W	D501	P	1	
168	22-132-00048	SWITCHING DIODE IN4148	D203, 205, 302	P	5	
			502, 503			
169	31-131-00012	BEAD PIN 2,36φ		P	6	
170	36-181-00012	WIRE BARE		P	34	
171	32-111-01838	PUSH EXT-H REAR		P	1	
172	32-329-00012	PUSH-LATCH		P	1	
173	32-611-02384	PLA KNOB CAP 9×16		P	2	
174	32-611-02401	PLA SPINDLE 80×74		P	1	
175	32-611-02413	PLA NECK 170×188×41		P	1	
176	32-611-02425	PLA STAND 245×230×26		P	1	
177	32-611-02437	PLA COVER 10×19×112		P	1	
178	33-172-00024	MS+ ZPW M3×10		P	2	
179	33-612-00259	PS+ PAN M4,5×14		P	4	
180	33-642-00024	PS+ HEX ZPW M4.5×24		P	1	
181	34-111-01892	BOX SM-470 380×385×375		P	1	
182	34-211-00339	S/FORM 360×340×98		P	1	
183	34-311-00419	VINYL S/CABLE 400×100		P	2	
184	34-311-00446	VINYL BAG SET 670×750		P	1	
185	34-311-00485	VINYL BAG SET 290×350		P	1	
186	35-111-02253	LABEL PACKLNG LIST WHITE		P	1	
187	35-111-06327	LABEL PRODUCT 220-240V		P	1	230V
188	35-111-06315	LABEL PRODUCT 115V		P	1	115V
189	35-211-00274	LOGO SAMTRON 46.6×13.5		P	1	
190	35-311-02078	MANNAL USERS 230V		P	1	230V
191	02-141-00909	MANNAL USERS ASSY 115V		P	1	115V
192	36-521-90048	CORD POWER 250V BK 6FT		P	1	230V
193	36-521-00104	CORD POWER 115V		P	1	115V
194	F3-140-36006	D/CRT 14HBYWDN (A)		P	1	
195	01-111-00327	SUB ASSY DY		A	1	
	17-231-00211	DY MONO DMK-1493QL (1)		P	1	
	36-412-00012	WIRE CONN HOUSING 180M/M		P	1	
	36-412-00211	WIRE CONN HOUSING 190M/M		P	1	
	39-422-00024	TUBE-SHRINK 4φ			1	
	41-113-00012	SOLD WIRE SN 60%			1	
196	01-174-00051	SUB ASSY BACK CHASSIS		A	1	
	13-154-94722	CAB METAL 4700PF 250V AC		P	2	
	19-173-00099	CORE RING 29φ		P	2	
	31-211-00868	GND CLIP 0.3T		P	1	
	31-211-01642	MET BACK PLATE 1.2T		P	1	
	32-311-00012	CABLE TIE L101.6×W 25		P	5	
	32-315-00048	CABLE BUSH D13,5 5N6		P	1	
	33-168-00024	MS+ BND ZPW M4×8		P	1	
	33-172-00024	MS+ C/S ZPW		P	2	

S/N	PART NO	DESCRIPTION	LOCATION	UNIT	Q'TY	REMARK
196	33-422-00012	TS+ BND 2.ZPW M3×6		P	1	
	33-732-00048	WHR ZPW 4.3×8.5		P	1	
	33-852-00036	NUT HEX ZPW M4×0.7		P	1	
	36-431-00327	WIRE RING G/Y D4,36		P	1	
	36-541-00063	CABLE 15P 1400M/M		P	1	
	36-634-00036	AC INPUT SOKET 10A/250V		P	1	
	43-111-90024	ADHESIVE MELT 3764. #2			1	
197	31-121-00012	SPRING S/W FST D 9.5×L23		P	1	
198	31-124-00012	GND-LUG 52.5×18.1 0.35T		P	1	
199	01-183-00167	SUB ASSY LED		A	1	
	16-111-00924	PCB FR-I 1.6t LE-D		P	1	
	22-152-00048	LED GREEN 25mA 25MG3		P	1	
	36-413-00657	WIRE CONN/HOUSING 230 M/M		P	1	
	39-421-00131	TUBE INSULATION AWG7 3.7			1	
200	32-111-01826	PLA EXT-H FRONT		P	1	
201	32-311-00012	CABLE TIE L101.6×W25		P	10	
202	32-611-02396	PLA S/W CAP 27×13,6×20		P	1	
203	33-425-00012	TS+ BND ZPW M3×8		P	1	
204	33-612-00048	PS+ ZPW M3.5×8		P	2	
205	33-642-00012	PS+ HEX M4×18		P	4	
206	35-111-00075	LABEL WPRNING HIV 60×20		P	1	
207	35-111-02779	LABEL WPRNING DHHS 14KV		P	1	
208	36-437-00211	BRAID TER 430 M/M		P	1	