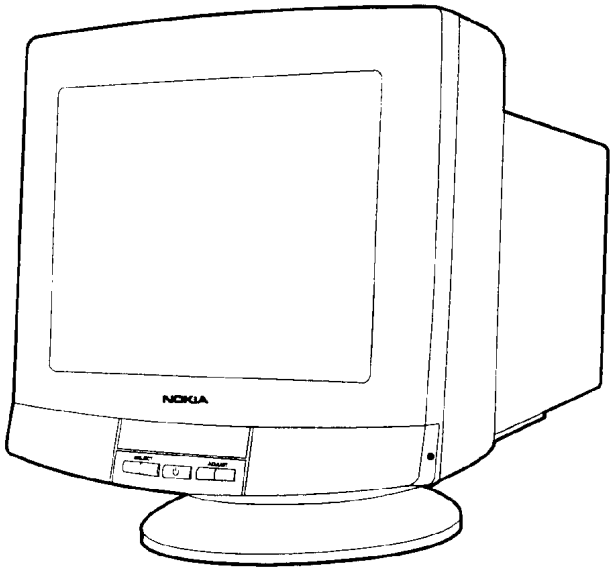
Service Manual

15" Colour Monitor Chassis 449X



Main Board Assy	6831135300 REV: 02
RGB Board Assy	6831136800

SPECIFICATIONS

Application	A typical data display device for graphics & text PC applications
Power Input	100 watts (nominal) AC rated voltage. 100V to 264V AC
Video Signals	Analog: 0.7 Vp-p, RGB positive
Synchronization Signals	Separate Sync: horizontal/vertical, TTL, positive or negative
Synchronization Frequencies	Horizontal: 30 to 70 KHz Vertical: 48 to 120 Hz
Signal Connectors	15-pin, D-shell connector
Display Tube	SONY Trinitron 15", 90 degrees, cylindric surface, 0.26mm dot pitch, strip type black matrix, non-glare, anti-static Type no. M36LDJ15XX
Display Area	270 x 202 mm (H x V) typical
Display Colors	Infinite
Display Characters	80 char. x 60 rows on a 10 x 10 matrix.
Maximum Resolution	1024 dots x 768 lines
Misconvergence	Center area: ≤ 0.3 mm Corner area: ≤ 0.4mm
User Controls	Power on/off, contrast, brightness, volume, default, Preset recall, language, vertical center, vertical size, horizontal phase, horizontal width, pincushion, trapezoid, orthogonality, tilt, color temperature, red, blue, moire, degauss
Service Controls	PWB-1368: R-bias (VR910), G-bias (VR940), B-bias (VR970)

Service Controls (continued)	PWB-1353: power voltage adjust (VR801) high voltage adjust (VR802) horizontal hold (VR408) static focus (T402) ABL adjust (VR401) raster adjust (VR402) dynamic focus (VR101) TCO voltage adjust (VR403)
Preset Modes	7 (see "Timing Chart" for details)
Environmental Conditions	Operation: 5°C to 35°C ambient Storage: -20°C to 65°C ambient Humidity: 8% to 80% (non-condensing) Altitude: up to 7000 ft. above sea level
Dimensions	381 x 362 x 400 mm (H x W x D)
Gross Weight	17 kgs
Net Weight	14 kgs

POWER MANAGEMENT

State*	LED Color	H. Sync	V. Sync	Power Consumption
ON	Green	Pulse	Pulse	Normal
STANDBY	Yellow	Pulse	No Pulse	< 60 watts
SUSPEND	Yellow	No Pulse	Pulse	< 15 watts
OFF	Amber	No Pulse	No Pulse	< 5 watts

***Note** : These power-saving states exceed the Environmental Protection Agency (EPA) Energy Star requirements and the Video Electronics Standard Association (VESA) methodology for Display Power Management Signals.

TCO version

The monitor should meet TCO 92/95, NUTEK energy saving, electric & magnetic field requirements.

T. C. O. requirements

Emission due to magnetic and electric field must be in compliance with the limits specified by the Swedish National Board for Measurement and Testing commonly known as MPR 1990 recommendations. These limits are summarized in the following table.

	VLF	**ELF**
	TCO	**TCO**
Magnetic Field	25 nT	200 nT
Electric Field	1 V/m	10 V/m
Frequency Range	2 ~ 400 KHz	5 ~ 2000 Hz
Value	RMS	RMS
Distance	30 cm	30 cm
Electrostatic Potential	+ / - 500V	+ / - 500V

The monitor had been designed with selected CRT and carefully routed wires around CRT, make sure exact same routing scheme is used if CRT replacement is necessary.

SIGNAL CABLE PIN CONNECTIONS

Pin	Signal	Pin	Signal
1	red signal	9	no pin
2	green signal	10	digital ground
3	blue signal	11	ground
4	ground	12	SDA
5	NC*	13	horizontal synchronization
6	red return	14	vertical synchronization/VCL
7	green return	15	SCL
8	blue return		

* This pin is used for power saving detection; at PC side, this pin has to be connected to ground.

SAFETY PRECAUTIONS AND NOTICES

Safety Precautions

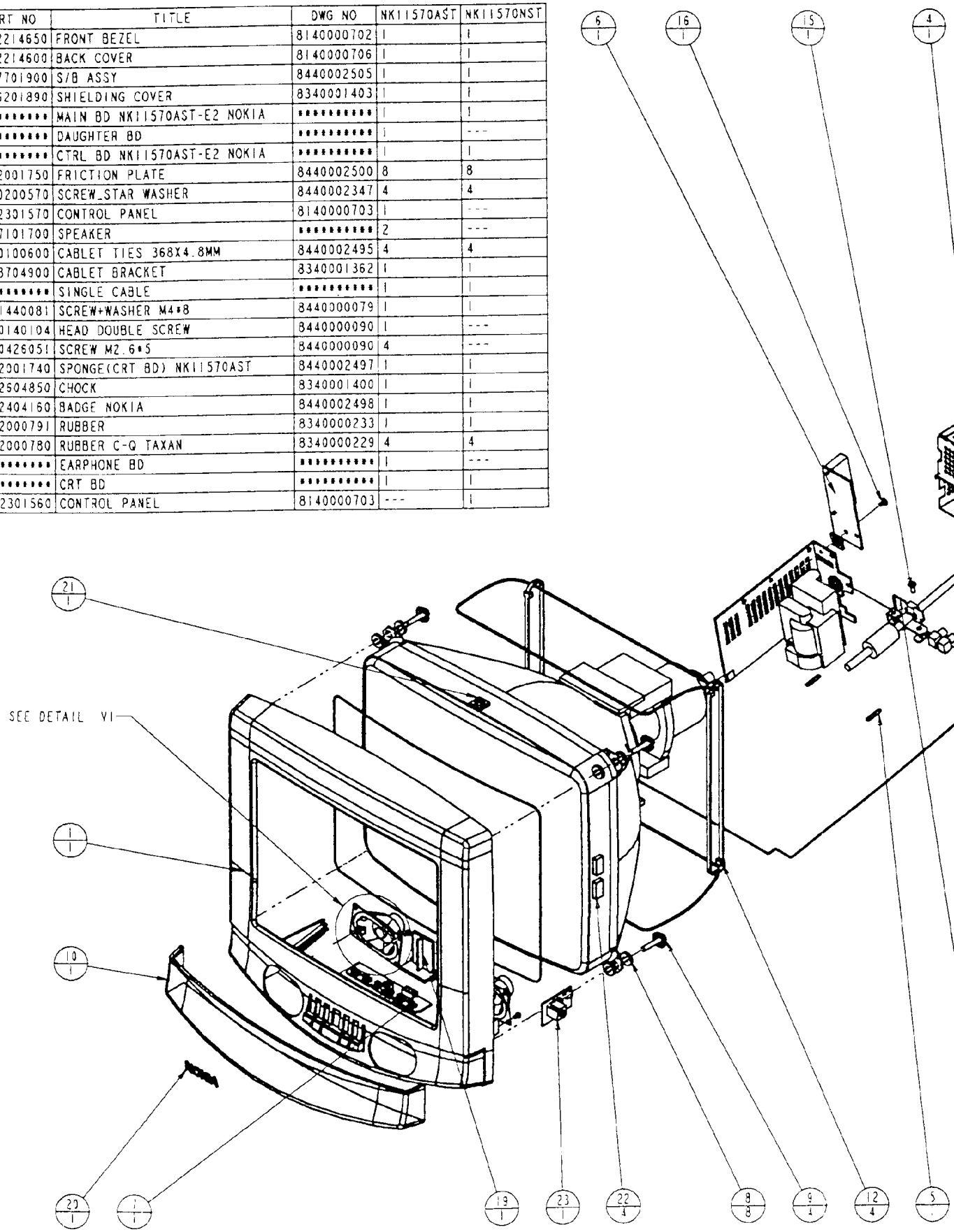
1 Observe all cautions and safety related notes located inside the monitor cabinet and on the monitor chassis.

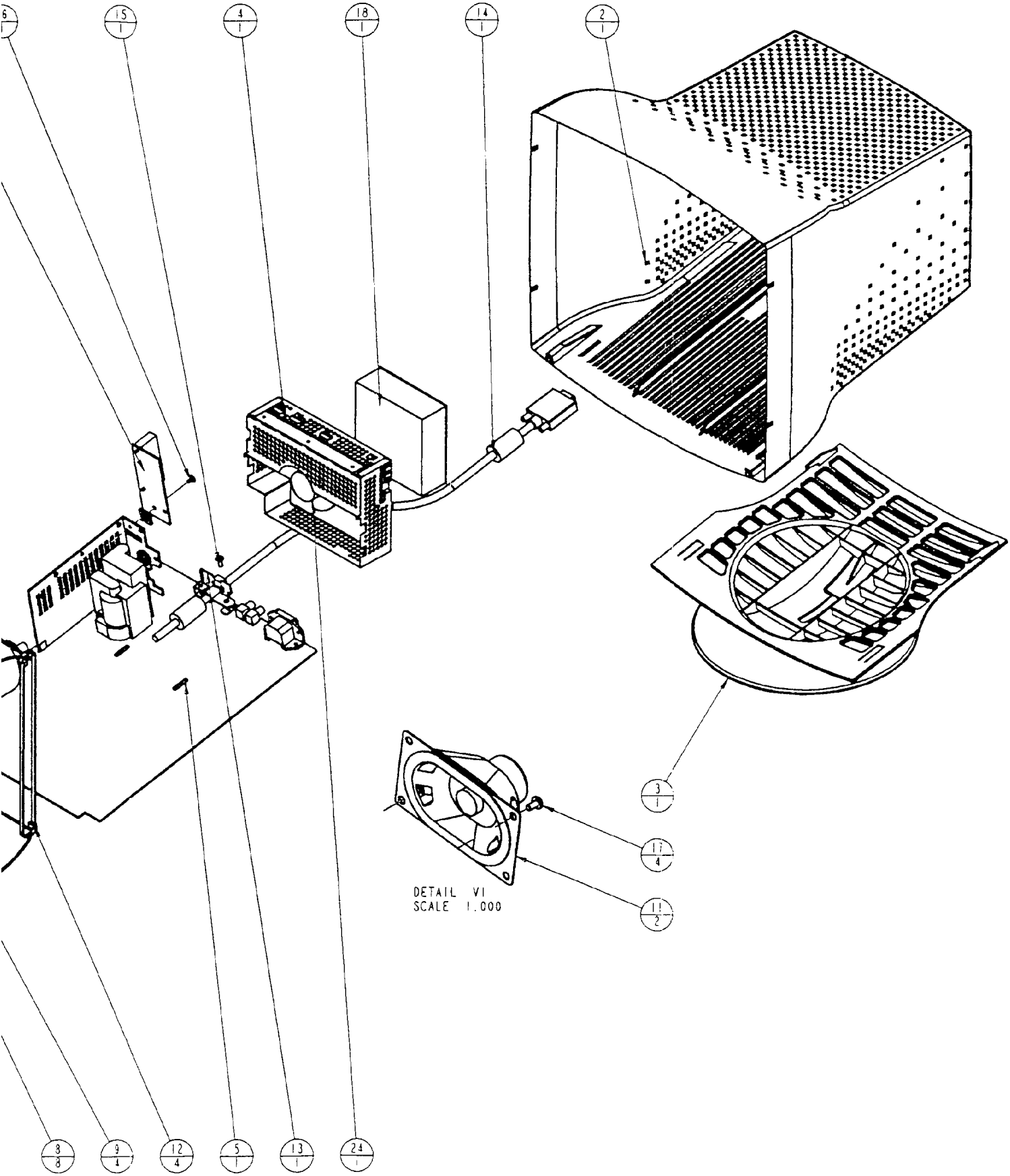
2 Operation of the monitor outside its cabinet or with the cover removed involves the risk of shock from the monitor power supply. Repair work on the monitor should not be attempted by anyone who is not thoroughly familiar with all necessary safety precautions and procedures for working on high voltage 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 at a distance during handling of the picture tube. Keep the picture tube away from the body during handling.

4 The picture tube is constructed to limit X-radiation to 0.5mR/HR at 300 microamperes anode current. For continued protection, use the recommended replacement tube only, and adjust the voltages so that the designated maximum rating at the anode will not be exceeded.

ITEM	PART NO	TITLE	DWG NO	NK11570AST	NK11570NST
1	7742214650	FRONT BEZEL	8140000702	1	1
2	7742214600	BACK COVER	8140000706	1	1
3	7737701900	S/B ASSY	8440002505	1	1
4	7746201890	SHIELDING COVER	8340001403	1	1
5	**********	MAIN BD NK11570AST-E2 NOKIA	**********	1	1
6	**********	DAUGHTER BD	**********	1	---
7	**********	CTRL BD NK11570AST-E2 NOKIA	**********	1	1
8	7742001750	FRICTION PLATE	8440002500	8	8
9	7740200570	SCREW_STAR WASHER	8440002347	4	4
10	7742301570	CONTROL PANEL	8140000703	1	---
11	6857101700	SPEAKER	**********	2	---
12	7740100600	CABLET TIES 368X4.8MM	8440002495	4	4
13	7748704900	CABLET BRACKET	8340001362	1	1
14	**********	SINGLE CABLE	**********	1	1
15	7131440081	SCREW+WASHER M4*8	8440000079	1	1
16	7140140104	HEAD DOUBLE SCREW	8440000090	1	---
17	7140426051	SCREW M2.6*5	8440000090	4	---
18	7742001740	SPONGE(CRT BD) NK11570AST	8440002497	1	1
19	7742504850	CHOCK	8340001400	1	1
20	7742404160	BADGE NOKIA	8440002498	1	1
21	7742000791	RUBBER	8340000233	1	1
22	7742000780	RUBBER C-Q TAXAN	8340000229	4	4
23	**********	EARPHONE BD	**********	1	---
24	**********	CRT BD	**********	1	1
20	7742301560	CONTROL PANEL	8140000703	---	1




6 / 1
15 / 1
4 / 1
18 / 1
14 / 1
2 / 1
3 / 1
17 / 4
11 / 2
8 / 8
9 / 4
12 / 4
5 / 1
13 / 1
24 / 1
DETAIL VI
SCALE 1.000

OPERATION THEORY

This is a 15" full digital controlled Multi-Sync color monitor complying with DDC1 and 2B plug & play VESA standard and is capable of following main features:

1. Simple design with minimum components.

2. The Motorola CPU 6805BD7 offers more than 10 PWM outputs to do the conventional geometry correction functions, and contrast/brightness control also.

   In addition, it offers more functions as below :

   (1) Auto-degaussing(power on)
   (2) Sync processor, I/P & O/P
   (3) Self test
   (4) H F/V
   (5) Mute
   (6) Power saving
   (7) DDC1/2B
   (8) I^2C Bus for auto-alignment thru signal cable.

3. Storage capability are 7 factory preset modes and 15 user modes.

4. Powerful NEC 1883 which presents the following useful functions:

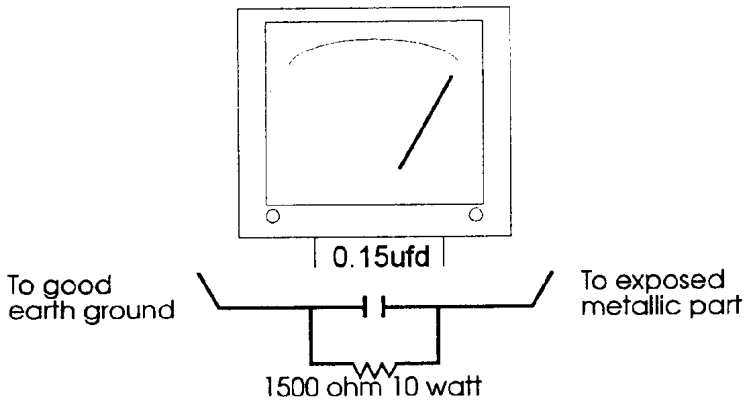
   (1) Pincushion
   (2) Trapezoid
   (3) V-Position
   (4) V-Size
   (5) Orthogonality
   (6) V-with "C" and "S" correction - not adjustable
   (7) Pincushion correction with V. position - not adjustable
   (8) Corner correction - factory adjustable.
   (9) Unbalance correction - factory adjust
   (10) H-phase

5. Software controlled auto shut off function if fH < = 29KHz and fH > =70KHz.

6. Two B+ (+ / -) sources for vertical O/P to simply the vertical centering circuit.

3 Reverse the AC plug at the AC outlet and repeat the steps for AC voltage measurements for each exposed metallic part.

4 Voltage measured must not exceed 0.3 volts RMS. This corresponds to 0.2 milli-amps AC. Any value exceeding this limit constitutes a potential shock hazard and must be corrected immediately.



Product Safety Notice

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

Service Notes

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

2 When replacing a high wattage resistor (> 0.5W metal oxide film resistor) in the circuit board, keep the resistor about 1 cm(1/2") away from the circuit board.

3 Keep wires away from high voltage or high temperature components.

4 Keep wires in their original positions so as to minimize interference.

Safety Test

Before returning a serviced monitor to customer, a thorough safety test must be performed to verify that the monitor is safe to operate without danger of shock. Always perform the AC leakage current check on the exposed metallic parts, such as screw heads, as follows:

1 Plug the AC line cord directly into a rated AC outlet. Do not use a line isolation transformer during this check.

2 Use an AC voltmeter having at least 5000 ohms per volt sensitivity as follows:

Connect a 1500 ohms 10 watt resistor, paralleled by a 0.15uF, AC type capacitor between a known good earth ground (such as water pipe or conduit etc.) and the exposed metallic part simultaneously. Measure the AC voltage across the combination of 1500 ohms resistor and 0.15uF capacitor.

7. Full operation range of AC input and simplified line filter design.

A. Microcontrol Section

NKI1570AST uses Motorola MC68HC05BD7 CPU, it has 14 PWM O/P s, 8 I/O in port A, 6 I/O in port B, 2 ports for I^2C and H/V sync I/O processor. When H/V sync thru signal cable P502A enter pin 39 & pin 40, CPU makes polarity detection and frequency calculation and sends H/F/V to PWM port, then reads the suitable data (mode, size etc.) from I702 (E^2PROM) and writes to each PWM ports (size, phase, pin,trap, contrast, bright, DPM, DEG, mute, etc.), the above operation takes about 500 ms, R703, ZD701, Q701, Q702 and D701 comprises a B+ reset circuitry for CPU. This circuitry will guarantee CPU to work without error in disturbed B+ conditions. As mentioned above, pin 9 will send a high level signal to turn on Q802 & RL801 for degaussing function about 3-5 seconds.

The functon controls are available at keypad that connects to pins 10, 11, 12, 13, 14. After applying the signals it takes about 500ms to complete the judgement. The CPU will send H/F/V modulated signal from pin 27 to IC UPC1883 to decide the H. osc freq. About 100ms later, CPU will send H/V sync signals from pin 33/32 to UPC1883 for synchronization. 100us later, the pin 18 (mute) will be high to show up the picture. When CPU detects the power saving modes in freq, pin 16 & 17 will be "low" to turn off Q817 & Q806 and drives the monitor to power saving mode to save power. Pin 24 (SDA), pin 25 (SCL) are I^2C pins for DDC1/2B or auto alignment purposes. After alignment, data will be stored in E^2PROM. The CPU uses 4.0MHz crystal for timing sequence control. Q703, D703, D702 & L701 make "interrupt" function more stable during DDC or I^2C operation.

B. H/V Processor UPC1883 (NEC) I401

The V_{DD} 9V is regulated by Q404 from 12V to pin 16. The main functions are:

a. H/V sync.
b. H/V osc.
c. Geometry controls include * pin 1-corner setting, * pin 2-trap, * pin 3 - pincushion, * pin 4-parallegram, * pin 5-unbalance, * pin 8-V. size, * pin 11-vertical raster compensation vs vertical position, * pin 12-Vertical "S" distortion comp., * pin 13-Vertical "C" distortion, * pin 25-H. position. It is a "all-in-one" processor.

C. Horizontal Section

Pin 19 (H. F/V) received the DC voltage from CPU to determine the H. osc freq., also H. sync comes into pin 26 thru R402. And flyback pulse comes into pin 17 for AFC in close loop.

H. driver (pin 18) O/P to Q401 via R422 and C421. The H. osc freq. is determined by the DC voltage at pin 19 and pin 20, R407 & VR408 setting, C406 is to fix the H. jitter.

AFC filter contains R404, C404, R496, C442 and C403 at pin 24. The parallelogram and unbalance corrections are accomplished by the DC voltage and 26 PWM adjustment from CPU I701 pin 31, then thru the inner loop in I401 pin 28 via C447, C401 to pin 25 for horizontal phase compensation.

D. Vertical Section

Vertical sync from I701 pin 32 divided by R302, R303 to about 3 Vp-p couples to I401 pin 27 thru C301. C309 at pin 6 will decide the V. osc freq., C310 at pin 7 is for AGC compensation due to V. size changing.

Vertical height control: PWM from I701 pin 37 is converted to a control DC (via R321, C312 and R324) which controls pin 8 of I401 for vertical size control. The controlled V. sawtooth is connected to I301 for final amplification thru pin 9 of I401.

Vertical "S" and "C" linearity are optimized by pin 12 and 13. Vertical centering is controlled by a DC from I701 pin 36 PWM to I301 pin 7 (Vref) thru R338, R337, R333, R334, C318. At the same time, pin 7 will send a DC to pin 11 of I401 to correct the trapezoid distortion due to vertical size changing.

Vertical blanking: The V. blanking pulse width is decided by R332 at pin 14 of I401. The blanking pulse comes out from pin 29 I401 thru C324, R345, R344, Q302 and couples thru C327 to G1.

Pincushion and trapezoid correction: UPC1883 has build-in parabola waveform generator and can control E-W or trapezoid correction by pin 2 or pin 3. I401 Pin 10 will send a 0.7 Vpp parabola wave thru R347 to OP Amp I302 and have 12Vpp O/P after amplification. This amplified waveform will be coupled to diode modulator thru C326 for final E-W trapezoid controls.

E. Vertical O/P I301

Pin 1 of I301 receives a sawtooth voltage from pin 9 of I401 thru R339. To have quick vertical flyback time, a retrace pulse is generated by D301 and C322 between pin 3 & 6 of I301. The V. yoke winding will be damped by R342, R341 and C323 to have smooth flyback waveform.

I301 uses positive/negative 12 volts sources and the center DC voltage at pin 7 is around 1 volt for no DC centering shift. The V. centering shift will be obtained by changing the DC voltage level at pin 7 of I301 thru the control loop formed by R337, R333, R334, R359 and I701 pin 36 PWM.

F. E-W/Trapezoid and H. Width Controls

The H. O/P stage uses diode moulator with D409, D411, C416 and C417. Lyoke L402, L404 of H. scan section and with D411, C417, L401, C418 of controlled section. The scan current (yoke current) is determinded by B+ minus Vm (controlled DC at C418) values and the pincushion control is accomplished by Q422, Q410 current amplifiers by coupling a parabola waveform from C326/I302. The DC control level is set at the base of Q422, Q407 and controlled by I701 pin 1 PWM thru R446.,

The DC and the parabola levels are amplified thru Q407, Q422 and Q410 to R411 for H. size/pincushion control to diode modulator control section in the manner of the larger current thru Q410/L401 the smaller the H. size.

The H. width is controlled by PWM I701 pin 1 thru R444, C430, R446 to the I302 of pin 10. One additional loop is added to compensate the H. scan for difference in freq. by pin 21 (CS 1), pin 22 (CS 0), pin 20 (CS 2) of I701 thru D402, D419, D420 to I302 of Pin10.

Divider of R450, R451 senses B+ (modes depending) to compensate the H. size variation in different modes.

G. H/V Size Breathing Compensation

In order to compensate the size changes due to high voltage loading (beam current) on signal content, Q406 is added for this purpose.

R461 senses the voltage dependent beam current at R434/C428 to the base of Q406, when beam current increases the Q406 base voltage decreases and collector voltage of Q406 increases. To reduce the vertical size by R363 going to pin 8 (VS) of I401 for size compensation (V. size increase as beam current increases due to high voltage becomes lower, if not compensated).

R460 also senses this ABL signal thru R460 to the pin 12 of I302 for horizontal size compensation at the same manner --- high beam current causes pin 12 of I302 voltage to drop and increases the H. size control DC at the base of Q422 to reduce the size accordingly.

H. Contrast Control and ABL

When the picture becomes brighter, the anode current of CRT increases. In order to prolong the life of CRT, it is necessary to limit the beam current by ABL function. The beam current flows from B+ 12V via R435, R434, flyback H. V. windings to the anode of CRT. When the anode current increases, the voltage drop across R435 increases and voltage on C428 decreases accordingly.

The voltage variation on C428 is sensed by R597/Q593 base to reflect the beam current chang. i.e. when the beam current is large to cause C428 drop enough, the conduction of Q593 increases and the contrast DC level drops to reduce the video gain and the ABL function cmpleted.

The PWM from pin 3 of I701 controls Q591 base thru R593, R594, C592, R595 and R591. The conduction degree of Q591 will decide the contrast control value to the pin 13 of I501. By the auto-alignment, the proper limited values will be obtained and stored at E^2PROM to confine the contrast level being consistent in every sets.

I. Output

1. The H. driver is taken directly from 9V source thru Q401 and T401 to simplify the circuitry and obtain good reliability.

2. Provide video power from flyback pin 10 via D407 and C424 for simplification.

3. Full scan capability.

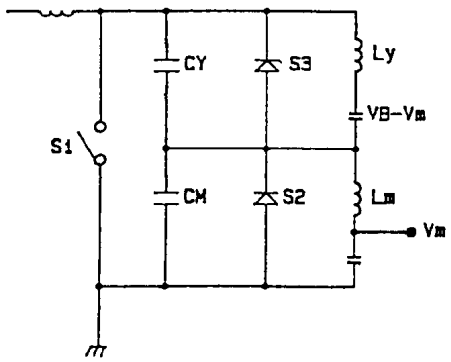
4. Brightness is controlled by Q405 thru micro control PWM, normally sets to -30V for cut off alignment
   -147V is obtained from T402 pin 2 thru D405 rectified and C426 filtered.

5. The spot killer function is accomplished by switching on Q403 which base time constant. R437, C427 is shorter than C426 during power off, so the spot killer activated by driving G1 below - 100V during H. O/P stopping operation.

6. The diode modulation CKT has the following features.

   a. Wide control range, allowing picture width adjustment, E-W raster and width compensation.

   b. Does not affect the high voltage.



During scan S1 and S2 are closed, Ly and Lm connected to V_B and V_m

$$V_{Ly} = V_B - V_m \qquad (1)$$

$$V_{Lm} = V_m \qquad (2)$$

$$iLy = t \frac{(VB-Bm)}{Ly} \qquad (3)$$

$$iLm = t \frac{Vm}{Lm} \qquad (4)$$

And i_{Ly} and i_{Lm} must be zero symmetrical (average zero value 20), the peak value is

$$iLy = Ts \frac{(Vo-Vm)}{2Ly} \qquad (5)$$

$$iLm = \frac{TsVm}{2Lm} \qquad (6)$$

During retrace time S1, S2 open, the energy in Ly, Lm charge to Cy, Cm assume both Lc parts have some resonance freq.

$$Ly\ Cy = Lm\ Cm = Lc \qquad (7)$$

$$E_{Ly} = 1/2\ Ly\ (iLy)^2 \qquad (8)$$

$$Ec = 1/2\ C(Vc)^2 \qquad (9) \text{ ----- with (5), (10)}$$

$$Vc = - Iy \sqrt{\frac{L}{C}} + (Vo - Vm)$$

With (5), (10)

$$V_{Ly} = \frac{-(Vo-Vm)}{\sqrt{LyCy}} \frac{Ts}{2} + (Vo - Vm)$$

$$= (Vo - Vm)\ (1 - \frac{Ts}{\sqrt{2LyCy}}) \qquad (11)$$

With (6), (10)

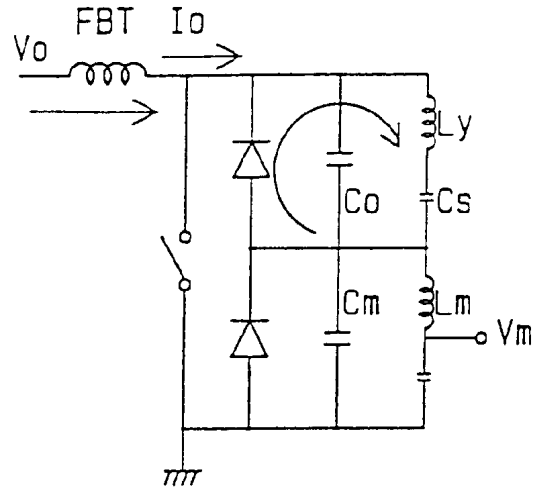
$$V_{Lm} = Vm\ (1 - \frac{Ts}{2\sqrt{Lc}})$$

The resulting peak voltage, during flyback time is

$$V_R = V_{Ly} + V_{Lm} = Vo\ (\frac{Ts}{2\sqrt{Lc}} - 1) \text{ -----> S2 is opened.}$$

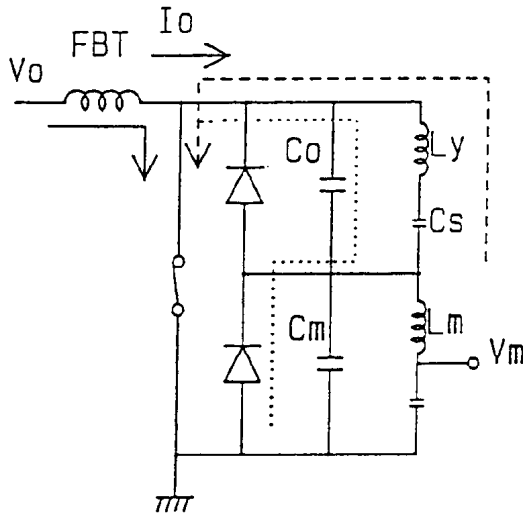
Conclusion: V_R is independent of Vm and I_{Ly} can be charged via Vo.

J. Horiz. Driver Waveform



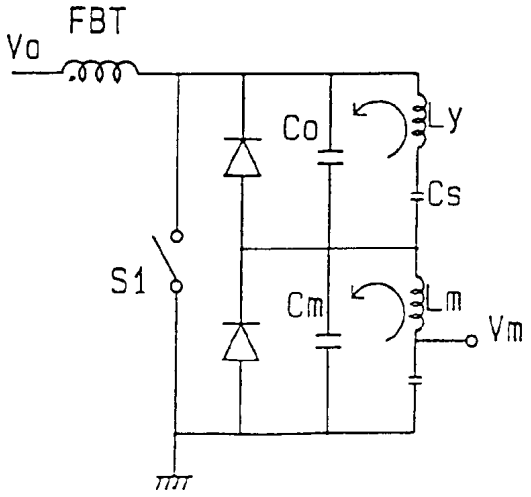
Current During 1st

Part Of Scan Period

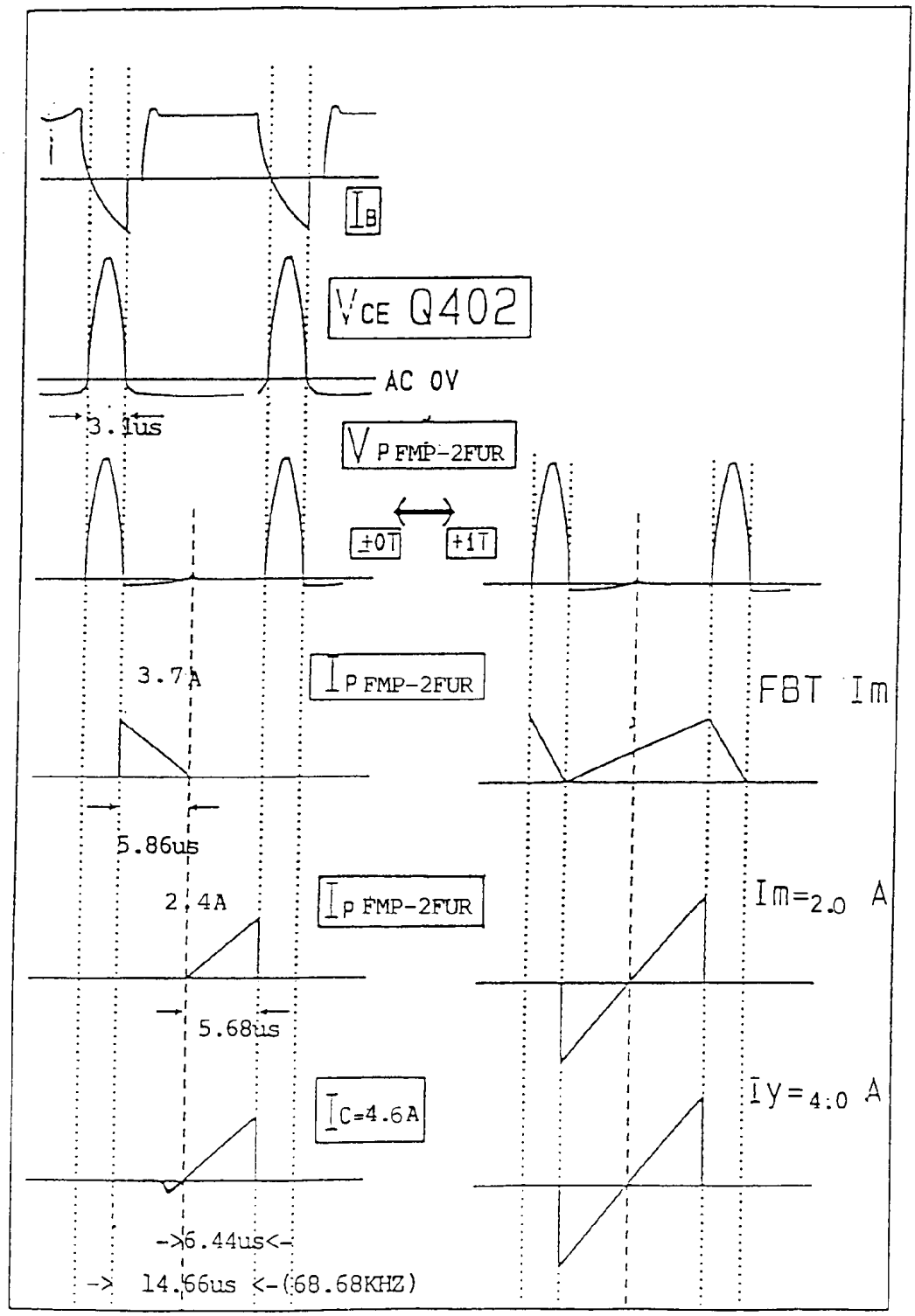


Current During 2nd

Part Of Scan Period



Current During Flyback


IB
VCE Q402
AC 0V
3.1us
V P FMP-2FUR
±0T
+1T
3.7A
I P FMP-2FUR
FBT Im
5.86us
2.4A
I P FMP-2FUR
Im=2.0 A
5.68us
IC=4.6A
Iy=4.0 A
->6.44us<-
-> 14.66us <-(68.68KHZ)

K. Dynamic Focus Circuitry

The dynamic focus is applied to improve the corner focus performance, it includes horizontal and vertical portions:

A Horizontal Dynamic Focus

It is composed of I101/A, 101/B, I101/C, Q101, Q102 and Q103, Q104, Q105, Q108.

1. Sampling/Triggering

   Q101 (A1015) is the switch of the triggering circuit, when input pulse is positive, Q101 is Off, when input is negative, Q101 On, C102 will discharge, when Q101 turn Off again, C102 will charge to a triangle wave form.

2. Q102 (C1815) is a common collector to drive later output stages.

3. Comparison/error amplifier

   I101A (KF347) is a high input impedance amplifier, the triangle pulse from Q102 emitter couples through C106 to I101 pin 2, then integrate with R111 to a parabolla, then through I101B pin 6 negative end, positive end is a reference voltage at pin 5, if the horizontal frequency is higher, the voltage at pin 5 is higher, and output at pin 7 becomes higher, Q105 conducts more, the current flows to C102 will be larger, so the triangle pulse amplitude is higher; if the horizontal frequency is lower, the triangle pulse amplitude will be smaller. When the picture active time ratio is higher, the required triangle pulse amplitude becomes larger, so R143, R144 are connected to step up B + plus, this makes the reference voltage at pin 5 goes higher with increasing horizontal frequency, so is the triangle pulse amplitude.

B Vertical Dynamic Focus

3 volts peak to peak sawtooth from R343 of Dy "-" terminal goes thru C120 and R148 to the miller integrator composed of I101/D, R145, C112, the result is a negative going parabola of 1.5Vp-p output of I101 pin 14.

C Output buffer stage

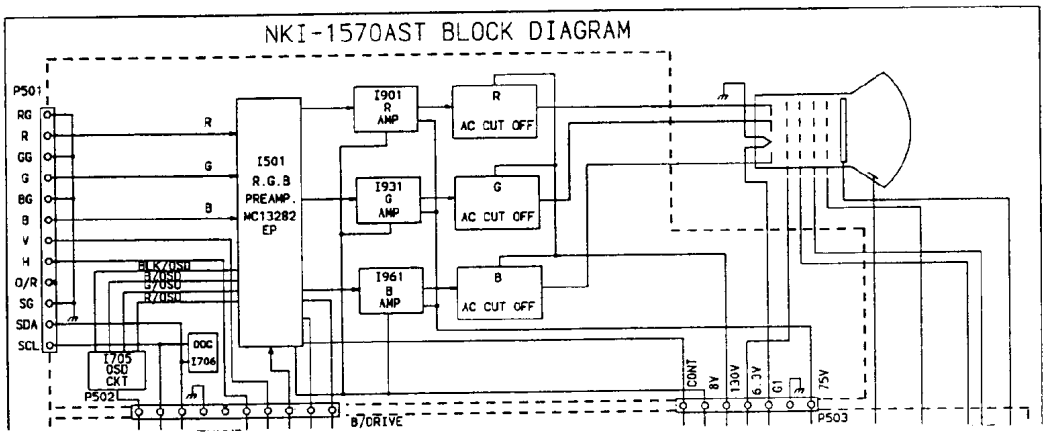
Q103, Q104 are voltage amplifier, Q108 is current amplifier,
Vo/(R130+ R131+ R147) = Vi / R123, when Vi increase, Vo increase, VR101 (Horiz. Focus VR) has to be adjustment to meet requirement.

Horizontal parabola waveform from C118 combine with the vertical parabola waveform from C119. It is amplified by output stage composed of I101/C, Q104, Q103, Q108, and applies to CRT G4.

D X-ray protection

To avoid X-ray hazard, a DC voltage on R420 which is proportional to HV. is generated from FBT pin 5, thru D412, C431 and divided by R419, R420. When this voltage is higher than zener voltage of ZD401, then Q414, Q413 combination will be activated to shutdown the 12V supply by turning off Q804 and Q806. After that all deflection circuitry stop working.

L. Video Block Diagram



(1) V_{IN}: 0.7Vpp

(2) Vpre: 0 ~ 3 Vpp

(3) Vout DC (no video): 60V ~ 90V

(4) Vout AC peak-peak: 40Vmax

(5) Contrast is adjusted by OSD

(6) Raster (no video) white balance is adjusted by VR910, VR940 & VR970.

(7) Video white balance is adjusted by OSD (R, B color temperature)

M. Video Amplifier

R.G.B. signal inputs are terminated by R501, R531 and R561, then pass thru the coupling capacitors C501, C531 and C561 to the IC501 MC13282EP pre-amplifier.

The amplified R.G.B. signals (0~3 Vpp) are adjusted by PWM of I705 pin 12, 13. Pin 13 is for DC contrast control input, pin 23 is for clamping pulse to set up the equal clamp level.

The OSD signals are worked by PWM of I705 pin 20, 21, 22, 23.

The video output stages are cascode amplifiers with buffer of complementary emitter follows, with the IC I901, I931, I961, is TDA9501.

The R.G.B. cathodes cut off are adjusted by VR910, VR940 and VR970 for white balance purpose.

N. OSD on screen display circuit

I705 LXC4397P2 is OSD IC, OSD signals are worked by negative vert. pluse from I701 pin 32 goes thru R727 to I705 pin 18, positive Hor. pluse from T402 pin 6 goes thru R723, Q704 to I705 pin 5, and CPU I701 pin 19, 23 signal transfer to I705 pin 7, 8.

OSD R. G. B. signals and OSD blanking signal are terminated at I705 pin 21, 22, 23, 20, I501 pin 14, 8, 10, 12, then OSD picture appeared.

ALIGNMENT AND ADJUSTMENT

Adjustment Conditions

Power supply: Apply AC 115V or 220V

Warm-up time: The monitor should be powered on for at least 15 minutes before any adjustments are made, except for convergence, which 30 minutes are required.

Signal input:

1. Video — RGB Analog, 0.7Vp-p, positive
2. Synchronization — Horizontal and vertical separate, positive or negative
3. All adjustments should be made using a signal of FH= 31.468 KHz Fv= 60 Hz, unless otherwise defined.

Adjustment Equipment

- Volt-ohm-A meter (Sanwa FD-750C or equivalent)
- 30KV high voltage probe (HP34111A)
- Oscilloscope (TEK2235 or equivalent)
- Minolta Color Analyzer II
- Signal generator (IBM PC with proper display cards or Chroma 2000)
- Screwdriver

Switching Power Supply and Regulator Adjustment

The regulated B+ control has been pre-set in the factory and needs no adjustment. However, if any repairs are made on the power supply section, the following readjustment procedures are recommended.

1 Allow the monitor to warm-up for about 15 minutes.

2 Apply VGA (31.468KHz/60Hz) signal to the monitor with a crosshatch pattern.

3 Connect a DC meter to **TP1** (on the main PCB), and adjust **VR801** for 12 ± 0.1V DC.

4 If a fuse is broken during adjustment, remember to replace it with the exact same type of fuse.

Alignment Procedures

A High Voltage Adjustment

Input signal: Cross Hatch Pattern

Connect DC meter to **TP2** and adjust **VR802** to obtain a DC voltage of:
-147.4 ± 0.1V

B Horizontal Hold Adjustment

Input Signal: Cross Hatch Pattern, 1024 x768, 56.476KHz/70Hz mode

Grounding TP3, adjust **VR408** to get a synchronized picture, check
640 x 480, 31.5KHz/60Hz mode must be synchronized.

C Screen And White Balance Adjustment

Input Signal: Cross Hatch Pattern, 1024 x768, 60.024KHz/75Hz mode

Adjust external pincushion control so that the trapezoid distortion is minimum,

Bias VRs: VR910, VR940, VR970

Input Signal: No video

1a Set Brightness to -30V at TP4.
1b Adjust screen VR to 1 FL.
1c First, adjust VR910, VR940, VR970 to max position
see the R, G, B, who is appeared fix the VR,
then adjust the other VR to X=0.280, Y=0.280

Input signal: 50mm x 50mm white block pattern

2a Set Brightness to cut-off & Contrast to 25 FL
2b First adjust B ON OSD so that Y= 0.311
Then adjust R ON OSD so that X= 0.281

3a Set Brightness to -30V at TP4 & Contrast to maximum.
3b Adjust screen VR to just before the raster disappears.
3c Adjust contrast function key to 35 ± 5 FL.

Input Signal: Full White Pattern

4a Set Brightness to cut-off & contrast to maximum.
4b Adjust **VR401** to 28 FL ≤ X ≤ 35 FL.

5a Check the white balance in the VGA mode at 2FL and 25FL.
5b Repeat steps 1a to 5b until the best white balance is obtained.

D Focus Adjustment

Input signal: Character "e" pattern

1 Set Brightness & Contrast for a normal display.

2 Adjust the static H (at CRT socket), static V (at FBT) & dynamic focus control on the high voltage resistor block to obtain the best focus over the entire display area.

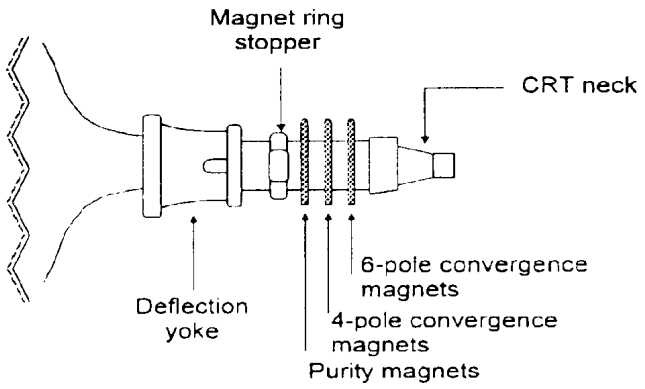
E Static Convergence Adjustment

> **Note** The monitor should be operated for at least 30 minutes before any convergence adjustments are made.

Input Signal: Cross Hatch Pattern

1 Set Brightness & Contrast so that a well-defined pattern is obtained.

2 Ensure that the convergence magnets on the CRT are in the correct position.



3. Turn the 2 tab of the 4-pole magnets independently to adjust their angles. Align the red & blue vertical lines at the center of the screen.

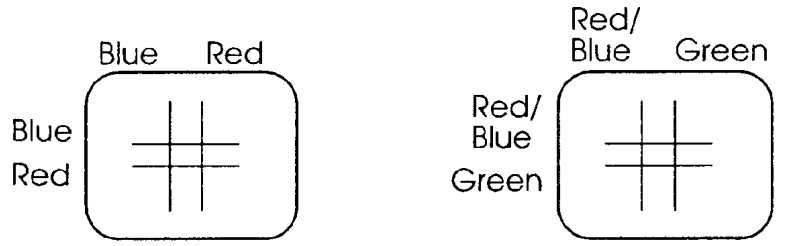
4 Turn the 2 tabs of the 4-pole magnets simultaneously to keep their angles constant. Align the red & blue horizontal lines at the center of the screen.

5 Turn the 2 tabs of the 6-pole magnets independently to superimpose the red or blue vertical line on the green one.

6 Turn the 2 tabs of the 6-pole magnets simultaneously to superimpose the red or blue horizontal line on the green one.

7 Repeat steps 3, 4, 5 & 6 until the best convergence is obtained.

Note The 4-pole magnets & the 6-pole magnets interact, making dot movements complex.



4-pole magnets movement

6-pole magnets movement

F Degaussing

Degaussing is required when poor color purity appears on the screen. This monitor uses an automatic degaussing circuit that is activated at power on. Automatic degaussing will be fully functional within 15 minutes.

The degaussing effect is confined to the picture tube since the coils are mounted at the back of the tube. Should any part of the chassis or cabinet becoming magnetized, it will be necessary to degauss the affected area with a manual degaussing coil.

A manual degaussing function is also equipped which can activate the degaussing at any time.

Manual Degaussing

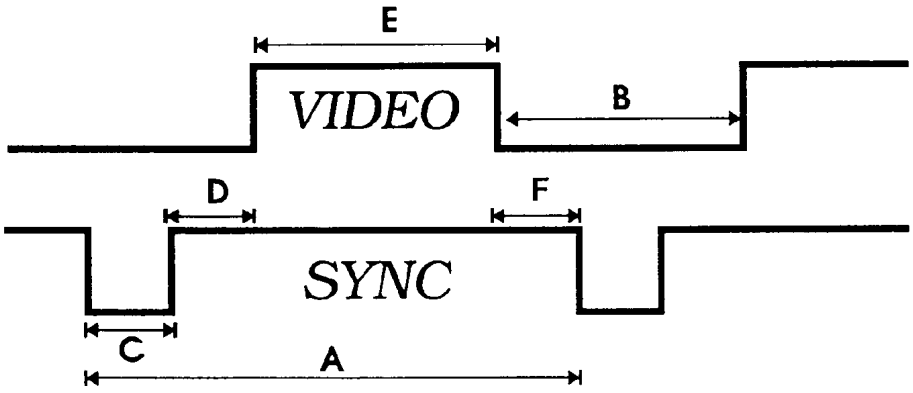
1 Apply line voltage to the degaussing coil and move it in a rotary motion over the front, sides , and top of the monitor. The coil should be kept away from the rear of the monitor to avoid damaging the magnetic neck components.

2 Slowly rotate and move the coil away from the monitor to about 6 feet beyond the point where no effect on the CRT will be noticeable.

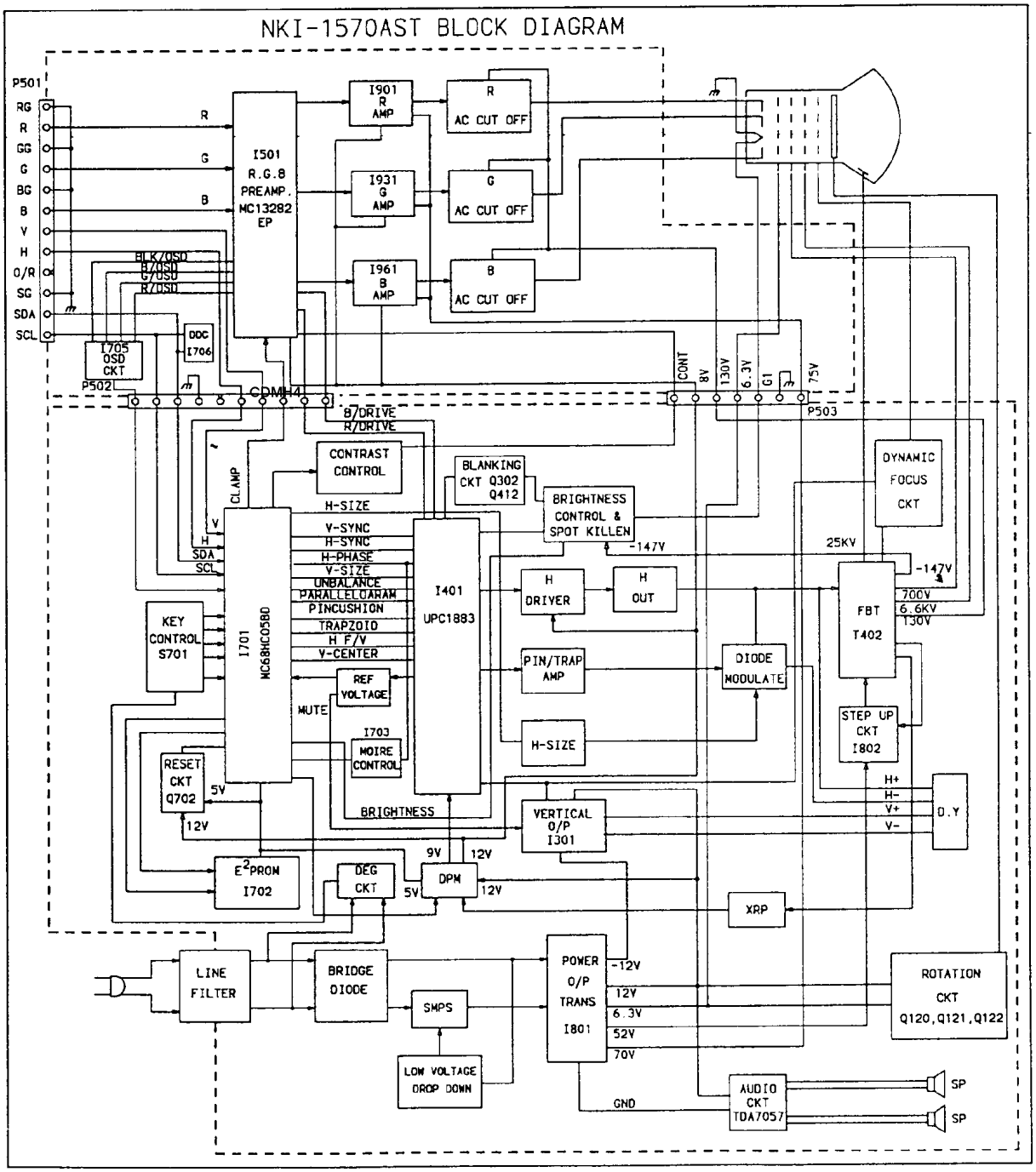
For proper degaussing, it is essential that the field be gradually reduced by moving the coil slowly away from the monitor. The degaussing coil must never be shut off or disconnected while near the monitor, as this would introduce a strong field instead of cancelling the effect of the stray fields.

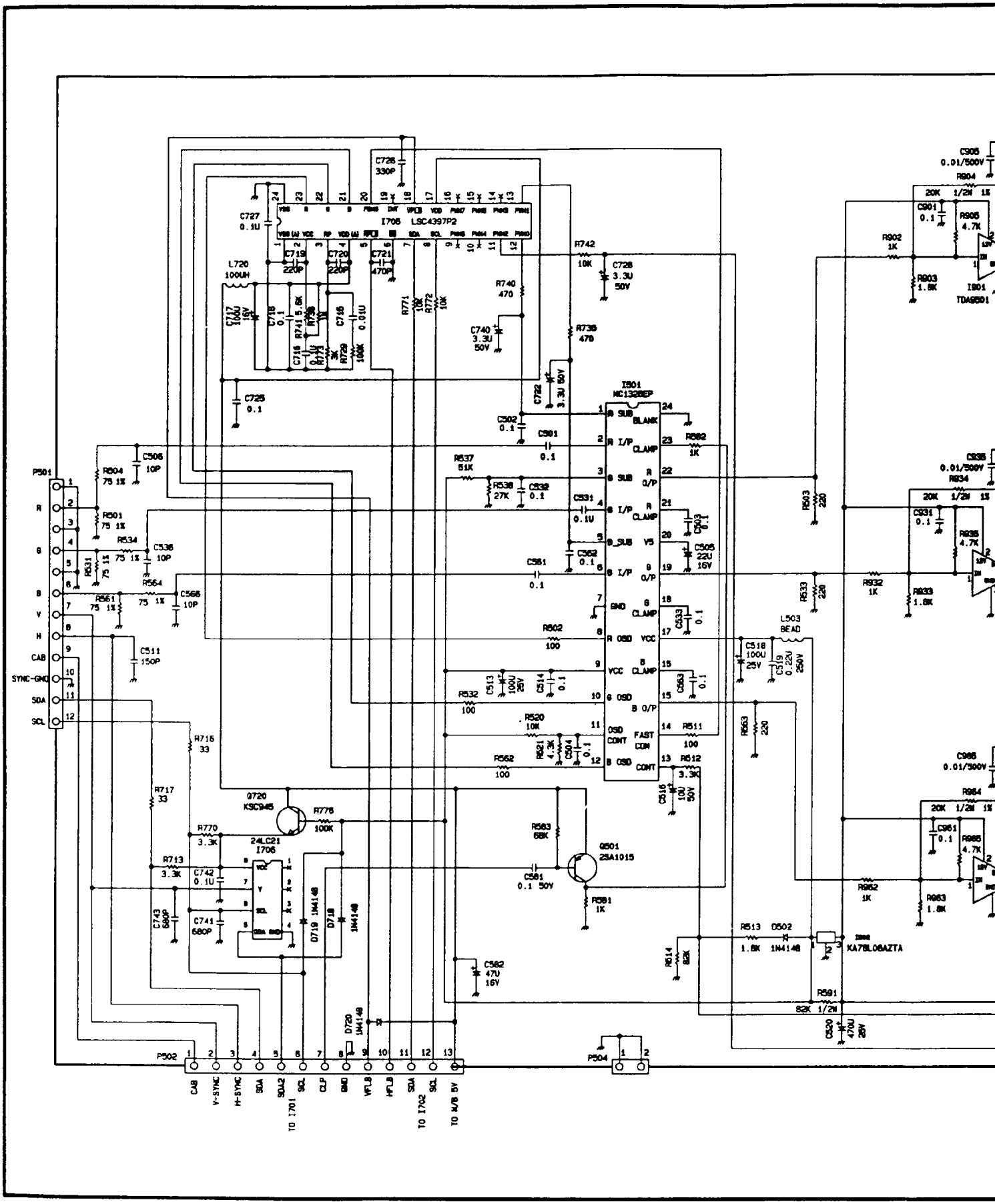
TIMING CHART

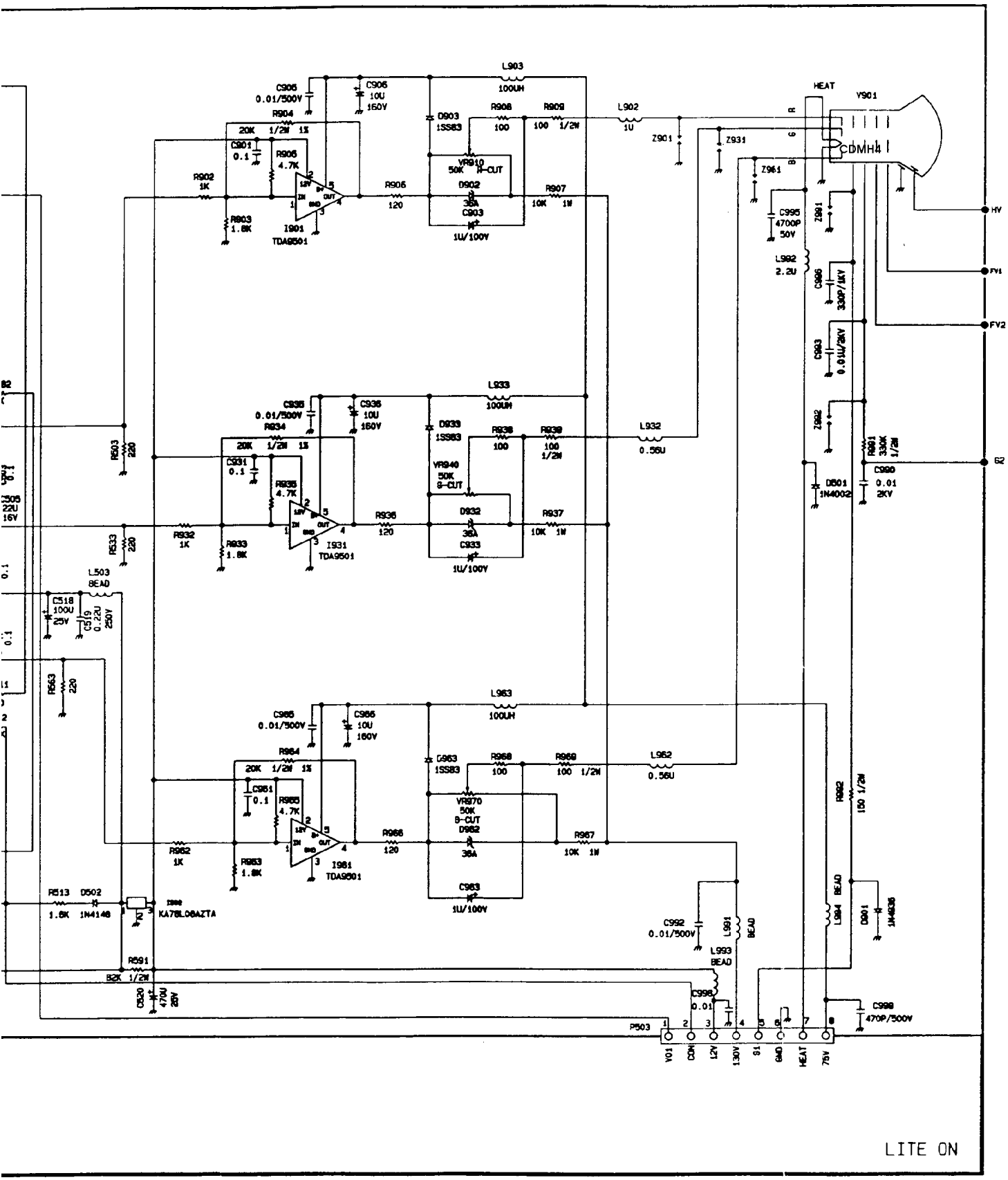
Mode	1	2	3	4	5	6	7
Hori. Dots	640	800	1024	832	1024	1024	1024
Vert. Lines	480	600	768	624	768	768	768
Hori. Freq. (KHz)	31.472	46.875	48.363	49.718	60.02	61.101	68.677
Sync . Polarity	NEG	POS	NEG	NEG	POS	POS	POS
A Period us	31.774	21.333	20.68	20.113	16.66	16.366	14.561
B Blking us	6.354	5.171	4.923	5.586	3.657	4.463	3.725
C Sync. us	3.81	1.616	2.09	1.12	1.22	3.72	1.02
D B.P. us	1.91	3.23	2.46	3.91	2.23	0.66	2.2
E Active us	25.42	16.162	15.75	14.527	13.003	13.191	10.836
F F.P. us	0.634	0.321	0.373	0.556	0.207	0	0.505
Vert. Freq. (Hz)	59.95	75	60	74.54	75.03	75.81	85
Sync. Polarity	NEG	POS	NEG	NEG	POS	POS	POS
A Period ms	16.681	13.333	16.666	13.415	13.328	12.569	11.765
B Blking ms	1.42983	0.533	0.7857	0.8648	0.533	0.6219	0.582
C Sync. ms	0.0635	0.064	0.124	0.06	0.05	0.131	0.04368
D B.P. ms	1.049	0.448	0.6	0.784	0.466	0.49	0.524
E Active ms	15.251	12.8	15.88	12.55	12.795	12.569	11.183
F F.P. ms	0.318	0.021	0.062	0.02	0.066	0	0.01456

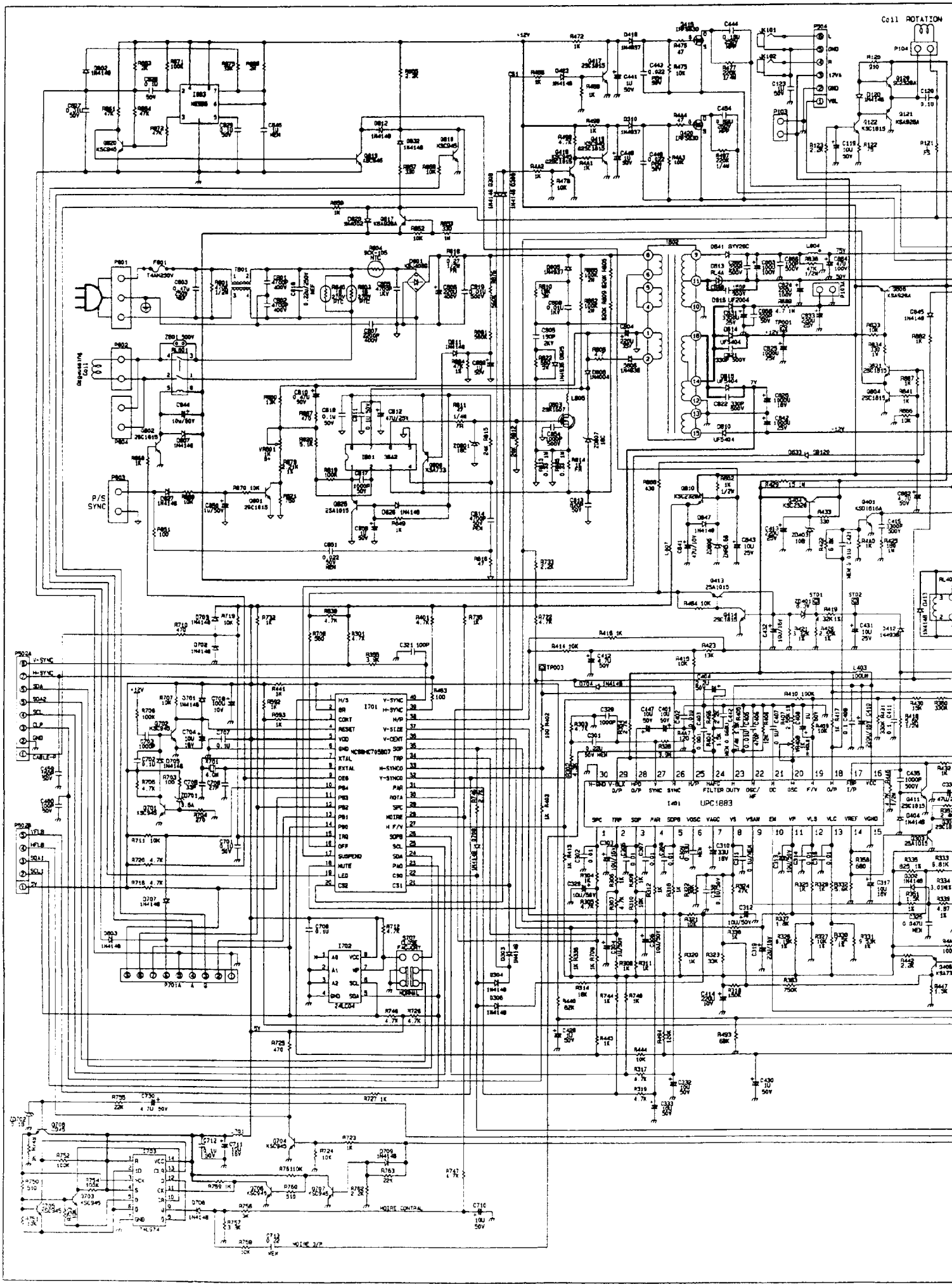


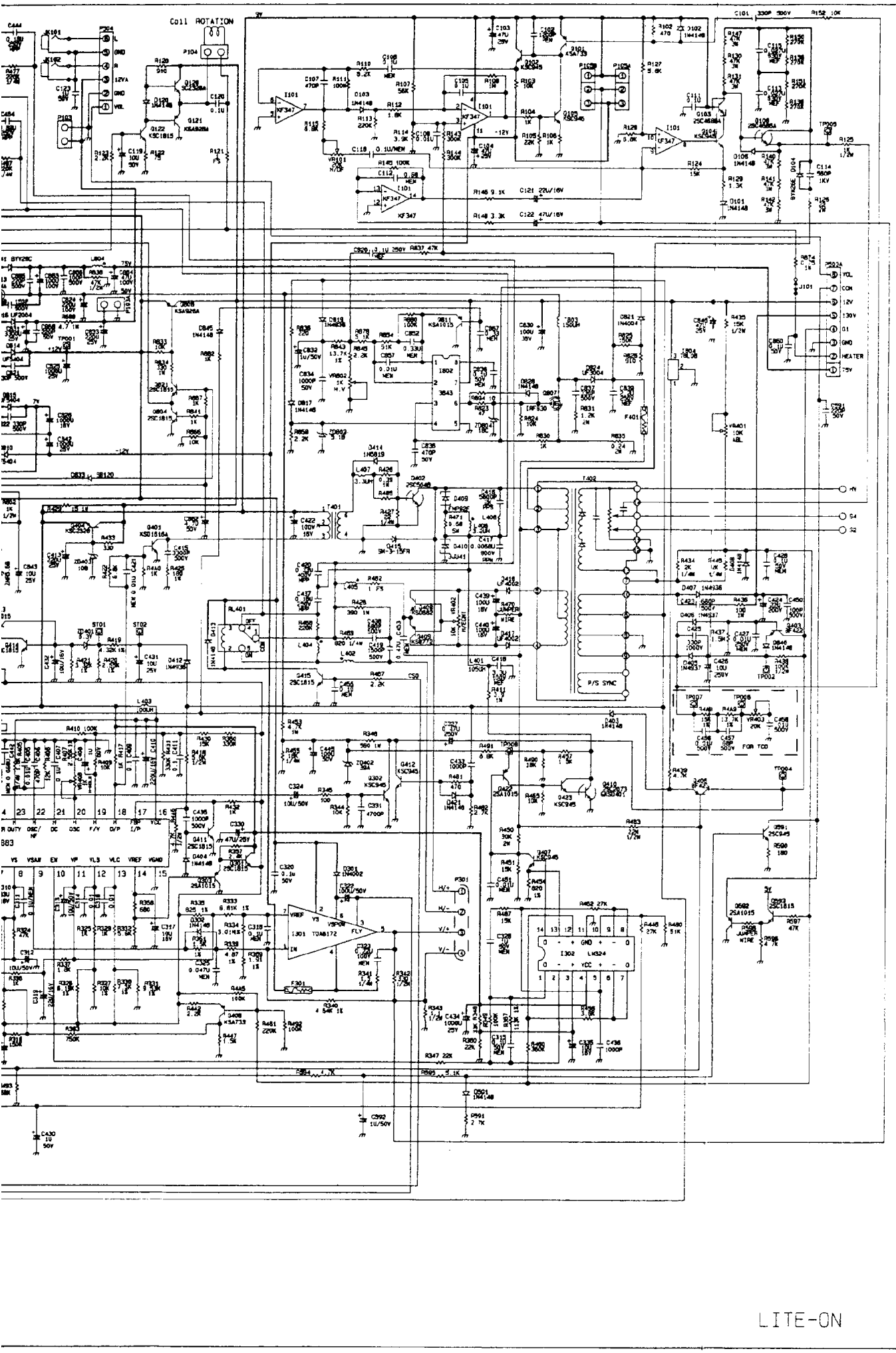
BLOCK DIAGRAM

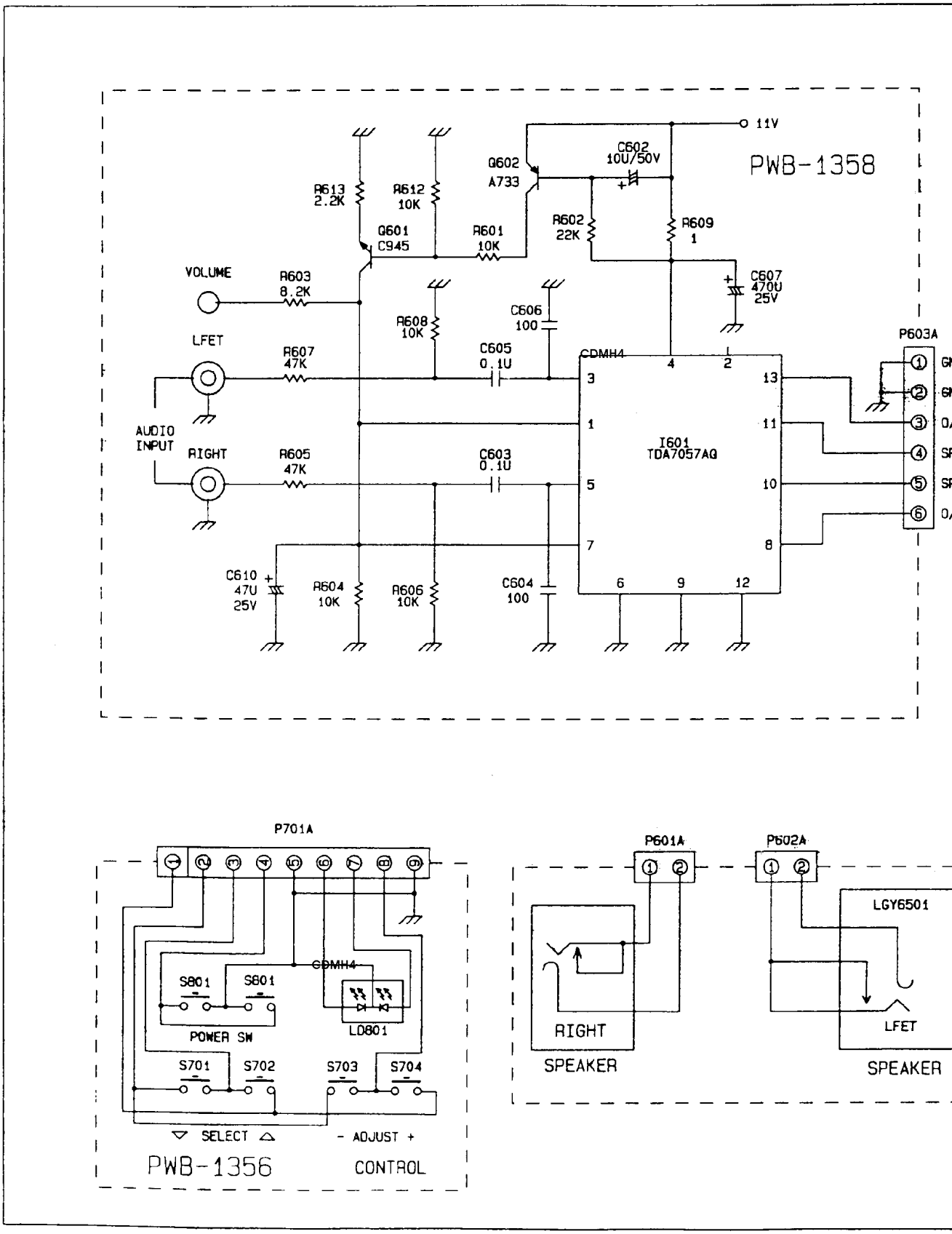


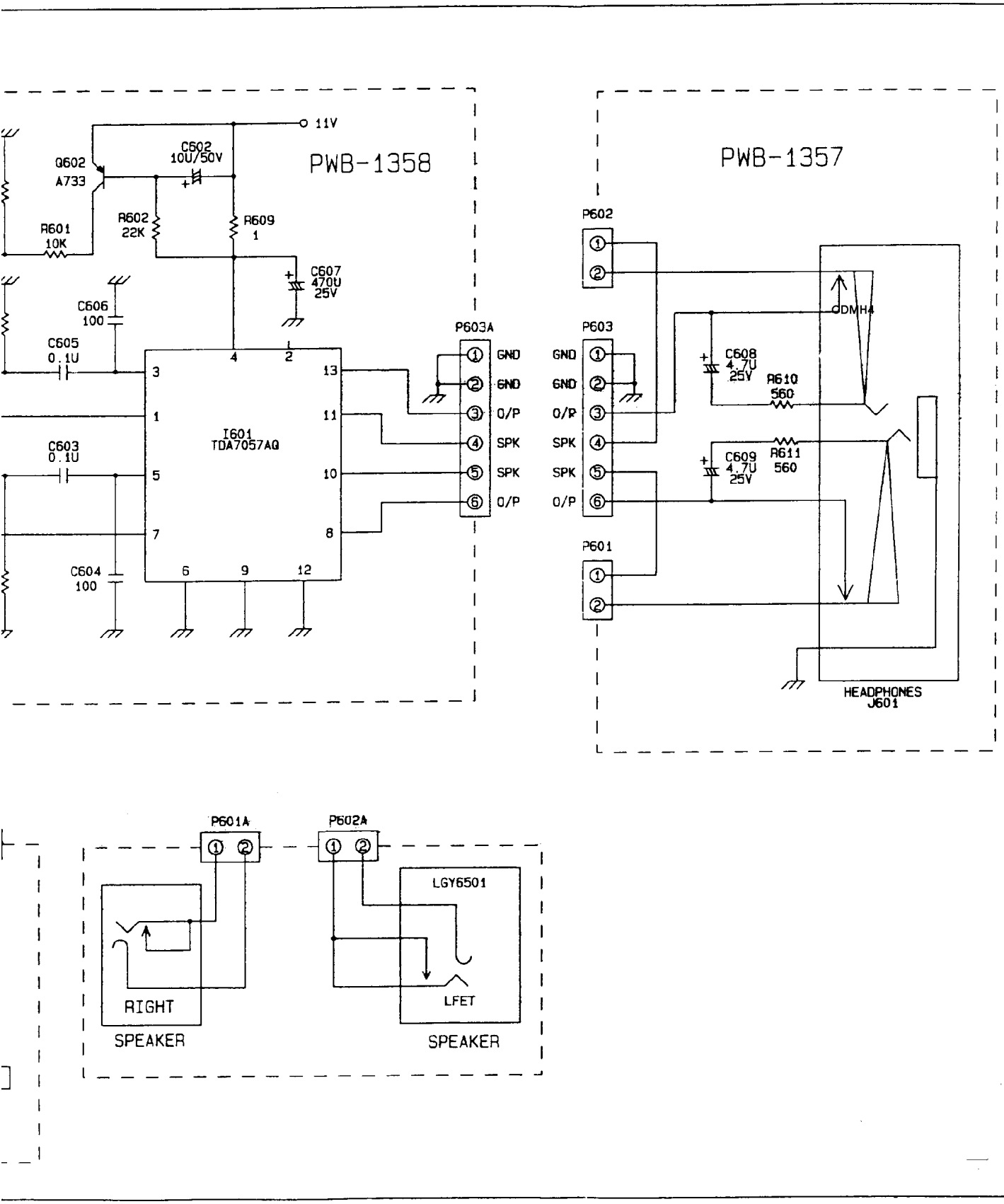

I706 LSC4397P2
I501 MC1328EP
Q720 KSC945
Q501 2SA1015
24LC21 I706
P501
P502
P504
TO I701
TO I702
TO M/B 5V


L903
100UH
C905
0.01/500V
C906
10U
160V
R904
20K 1/2W 1%
C901
0.1
R906
4.7K
R902
1K
R903
1.8K
I901
TDA9501
R905
120
D903
1SS83
R908
100
R909
100 1/2W
L902
1U
VR910
50K B-CUT
D902
36A
C903
1U/100V
R907
10K 1W
Z901
Z931
Z961
HEAT
Y901
CDMH4
R
G
B
HV
FV1
FV2
G2
C995
4700P
50V
L992
2.2U
C996
330P/1KV
C993
0.01U/2KV
Z991
Z992
R991
330K
1/2W
C990
0.01
2KV
D501
1N4002
L933
100UH
C935
0.01/500V
C936
10U
160V
R934
20K 1/2W 1%
C931
0.1
R935
4.7K
R932
1K
R933
1.8K
I931
TDA9501
R936
120
D939
1SS83
R938
100
R939
100
1/2W
L932
0.56U
VR940
50K
B-CUT
D932
36A
C933
1U/100V
R937
10K 1W
R503
220
R533
220
L503
BEAD
C518
100U
25V
C519
0.22U
250V
R563
220
L963
100UH
C965
0.01/500V
C966
10U
160V
R964
20K 1/2W 1%
C961
0.1
R965
4.7K
R962
1K
R963
1.8K
I961
TDA9501
R966
120
G963
1SS83
R968
100
R969
100 1/2W
L962
0.56U
VR970
50K
B-CUT
D962
36A
C963
1U/100V
R967
10K 1W
R992
150 1/2W
R513
1.8K
D502
1N4148
IC501
KA78L08AZTA
R591
82K 1/2W
C520
470U
25V
C992
0.01/500V
L991
BEAD
L993
BEAD
L994
BEAD
D991
1N4936
C998
0.01
C999
470P/500V
P503
1
2
3
4
5
6
7
8
VO1
CDH
12V
130V
S1
GND
HEAT
75V
LITE ON


Coil ROTATION
P/S SYNC
UPC1883
HOIRE CONTROL
HOIRE D/T

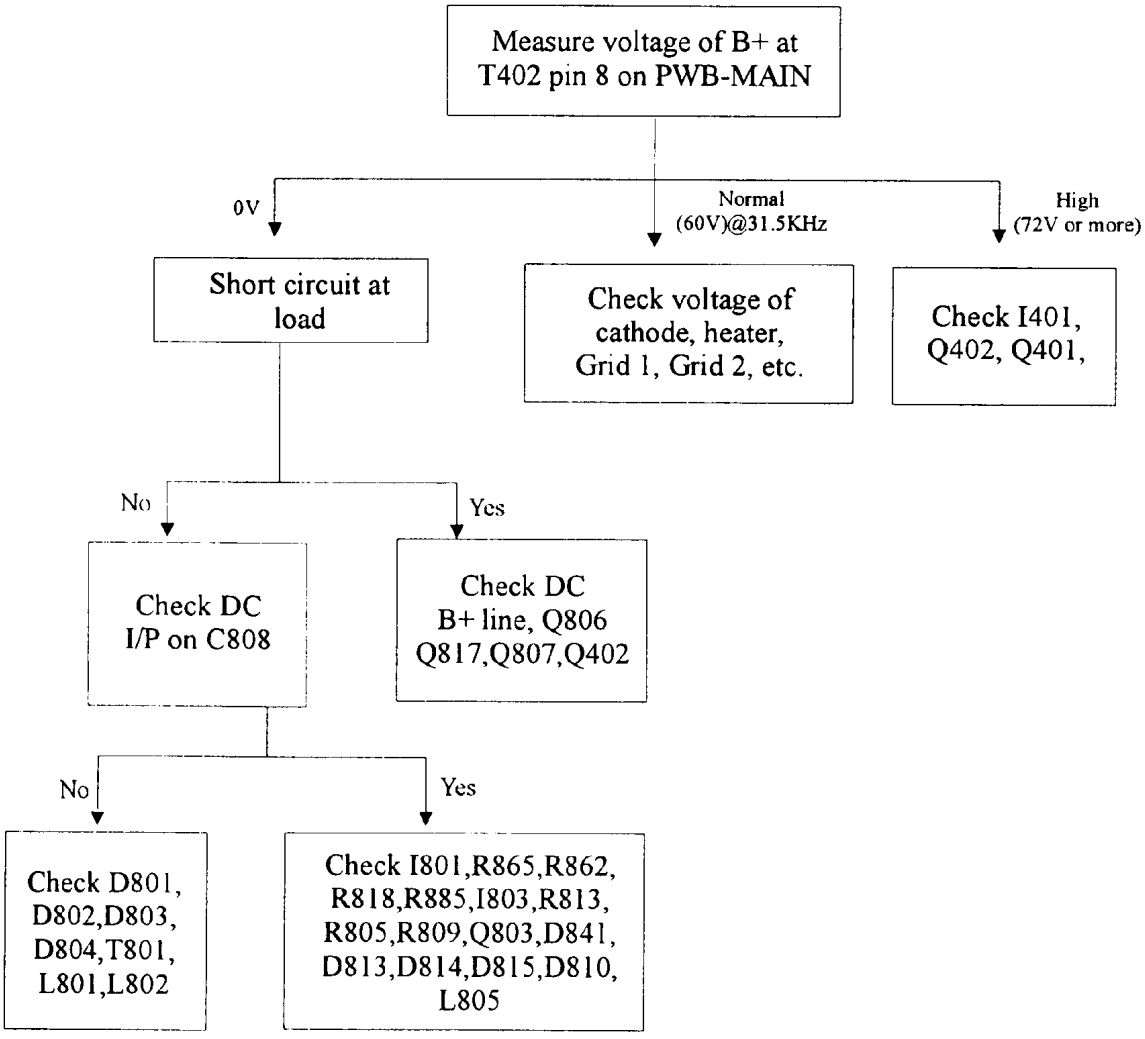

Coil ROTATION
P/S SYNC
FOR TCO
LITE-ON


PWB-1358
11V
C602
10U/50V
Q602
A733
R613
2.2K
R612
10K
Q601
C945
R601
10K
R602
22K
R609
1
VOLUME
R603
8.2K
C607
470U
25V
R608
10K
C606
100
LFET
R607
47K
C605
0.1U
CDMH4
P603A
AUDIO
INPUT
RIGHT
R605
47K
C603
0.1U
I601
TDA7057AQ
C610
47U
25V
R604
10K
R606
10K
C604
100
P701A
CDMH4
S801
S801
POWER SW
LD801
S701
S702
S703
S704
SELECT
ADJUST
PWB-1356
CONTROL
P601A
P602A
LGY6501
RIGHT
SPEAKER
LFET
SPEAKER

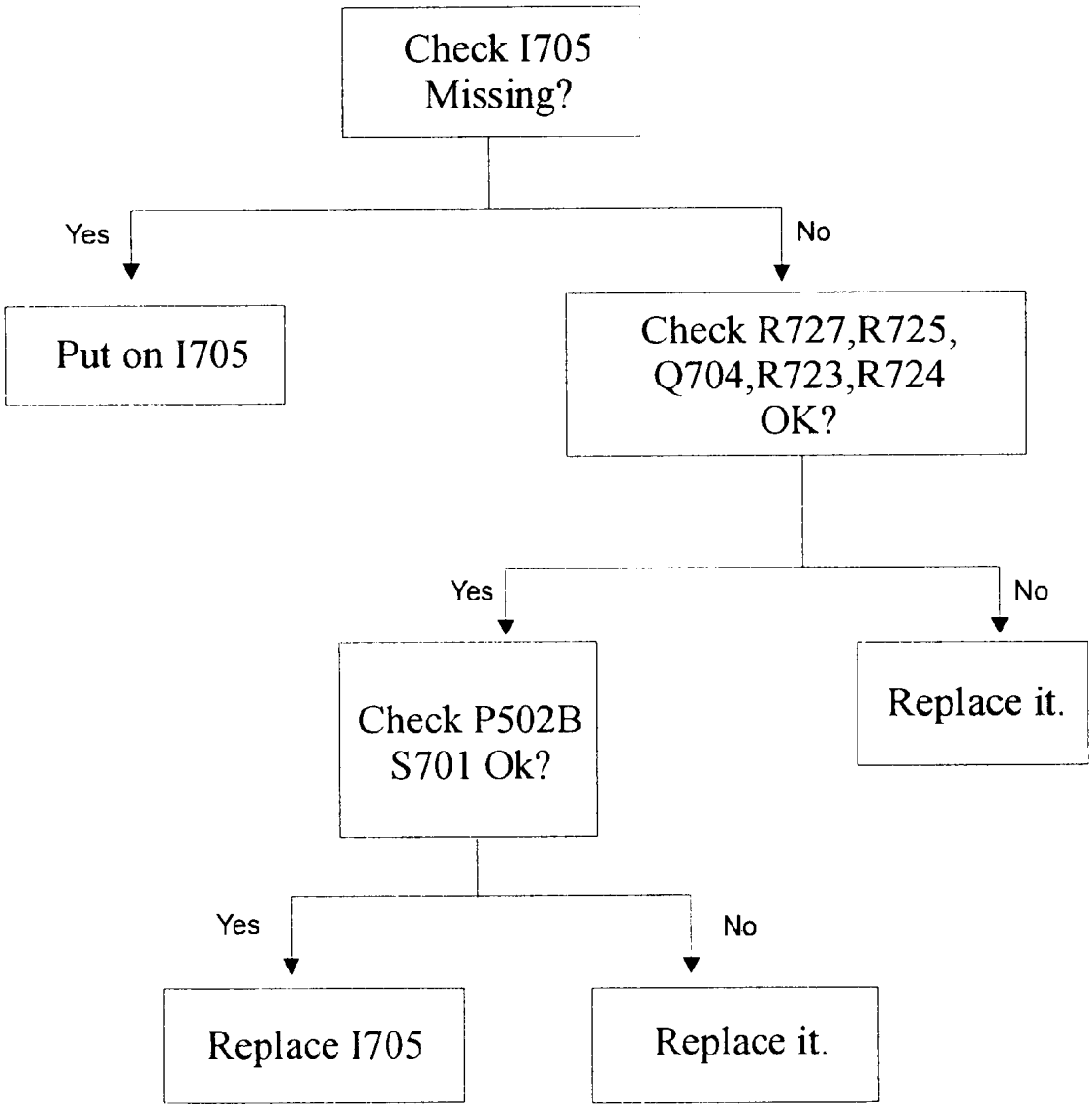

PWB-1358
11V
C602
10U/50V
Q602
A733
R601
10K
R602
22K
R609
1
C607
470U
25V
C606
100
C605
0.1U
C603
0.1U
C604
100
I601
TDA7057AQ
P603A
GND
GND
O/P
SPK
SPK
O/P
PWB-1357
P602
P603
P601
GND
GND
O/P
SPK
SPK
O/P
C608
4.7U
25V
R610
560
C609
4.7U
25V
R611
560
ODMH4
HEADPHONES
J601
P601A
P602A
LGY6501
RIGHT
SPEAKER
LFET
SPEAKER

TROUBLE SHOOTING CHART

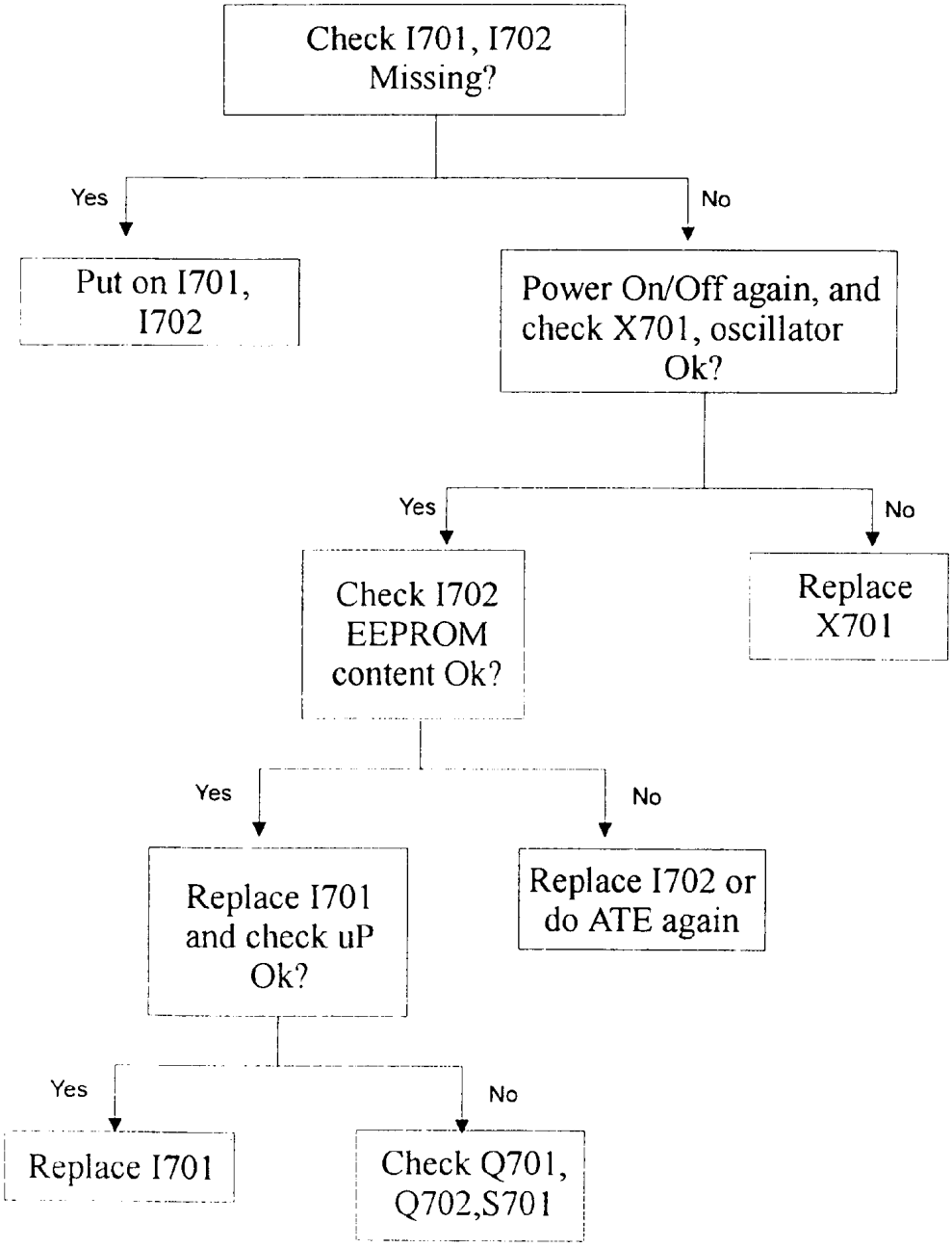
No Raster



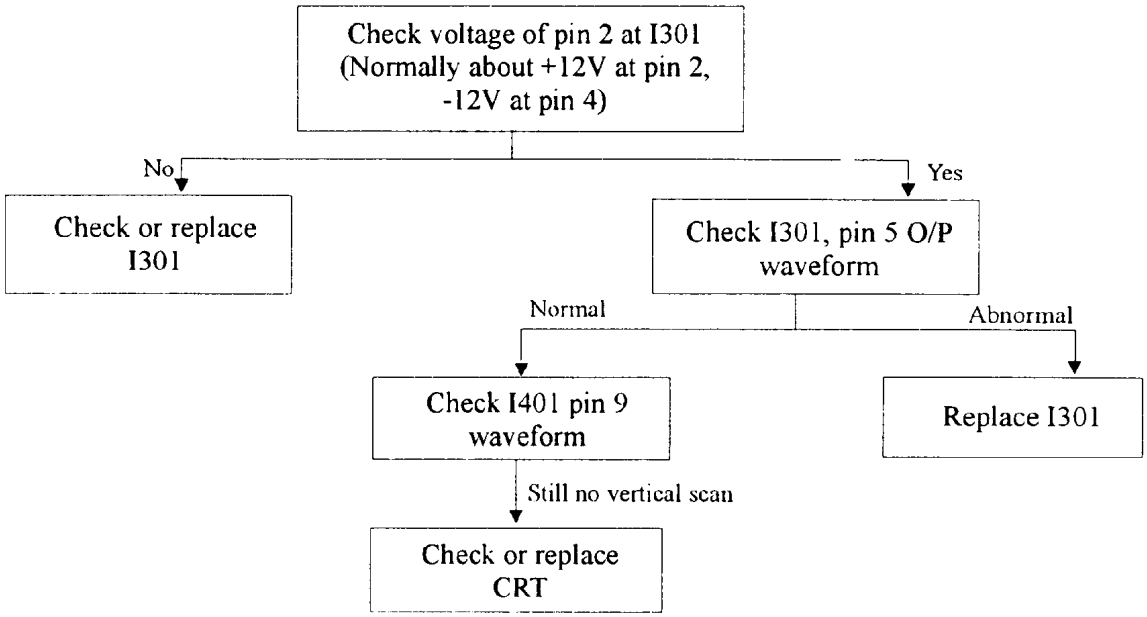
OSD Abnormal



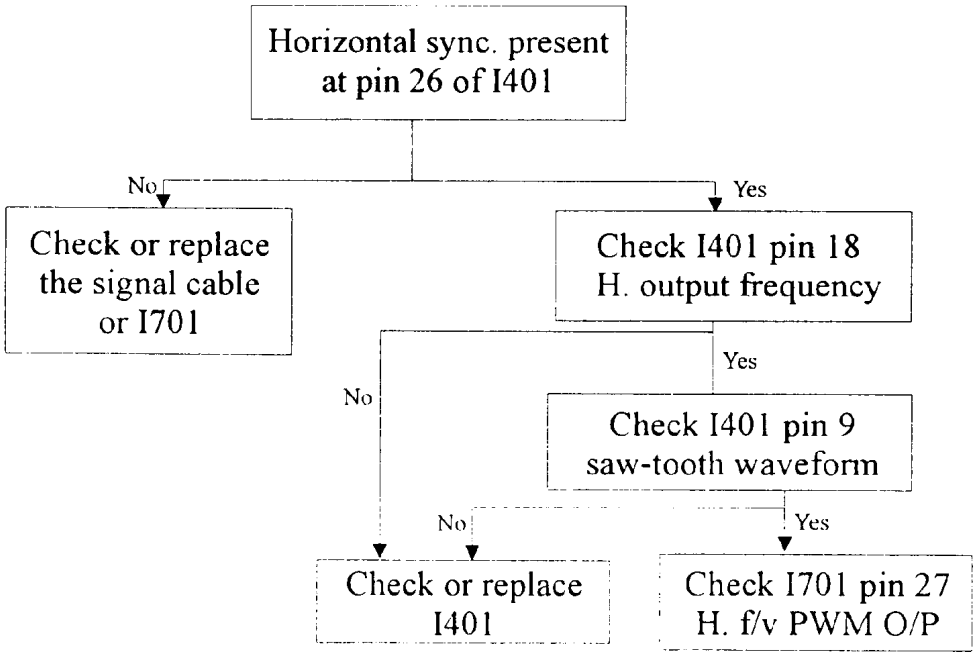
Function Key Abnormal



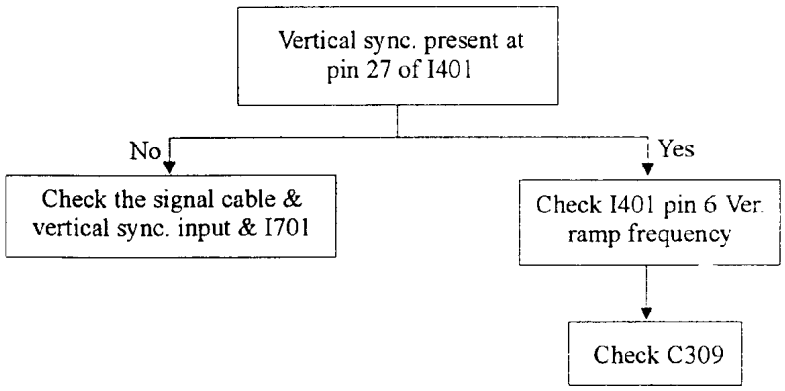
No Vertical Scan (Raster is one horizontal line)



Out of Horizontal Synchronization



Out of Vertical Synchronization



R. G. B. Video AMP Abnormal