Workshop Service Manual

Make

APRICOT

Model

XJ-52228

CONTENTS

ILLUSTRATIONS

SECTION 1. SPECIFICATION

1.1 Power Input

220-240V AC or
100-125/220-240V AC, 48-63Hz
depending on model.
Power consumption: <85W normal operation.
<30W in power saving mode.

1.2 Sync Input

TTL Levels :

Mode	H-Sync	V-Sync	H Freq/kHz	V-Freq/Hz
1	+	-	31.5	70.1
2	-	+	31.5	70.1
3	-	-	31.5	59.9
4	+	+	37.9	60.3
5	+	-	37.8	84.1
6	-	+	37.7	84.0
7	-	-	37.8	72.8
8	+	+	48.1	72.0
9	+/-	+/-	48.4	60.0
10	-	-	56.5	70.1
11	+/-	+/-	57.0	70.7

(P models only) Presence of sync. signals determines the power saving status.

1.3 Signal Cable

1 metre long with 15-way sub-miniature 'D' connector

1.4 Cathode Ray Tube

14" (13V) Diagonal landscape mode or
15" (14V) diagonal FST landscape mode.
Dot pitch 0.28mm, anti-glare screen.
V models only:
VLMF (Very Low Magnetic Field emissions).
VA models only:
Anti-static and VLMF

1.5 Operating Ranges

Temperature: 10-35°C.
Humidity: 20-85% (non-condensing).

1.6 Weight

13kg (14kg for 15" model).

1.7 Video Input

RGB Analogue video signal 0.71V positive.

1.8 User Controls

Power On/Off
Contrast
Brightness
Width
V-Centre
Height
H-Phase

1.9 Display Colours

Infinite array

1.10 Display Area

14" 260mm W x 190mm H (approximately)
15" 270mm W x 202mm H (approximately)

1.11 Dimensions

Width- 361mm.
Depth- 382mm.
Height- 380mm with swivel base fitted,
345mm without.

SECTION 2. PRECAUTIONS AND SAFETY

2.1 Observe all cautionary and safety related notes located on the chassis, cabinet and display tube.

2.2 Operation of the monitor with the back cover removed presents a potential shock hazard. Only personnel familiar with the precautions necessary for safe working on high voltage equipment should attempt to carry out servicing.

2.3 Always wear safety approved shatter-proof goggles when removing, installing or generally handling the picture tube. People not so equipped should be kept at a safe distance when any such handling is being undertaken. Do not handle the picture tube by the neck or deflection coil. Do not carry the picture tube resting against the body.

2.4 The picture tube is designed and constructed to limit X-Radiation to a safe level during normal operation. To maintain the required level of protection and safe operation, replacement tubes must be correctly adjusted and any protective circuits **must not be defeated.**

2.5 A.C. Leakage Current Test

After servicing and before returning the display to the customer, perform a thorough safety test to ensure there is no potential shock hazard to the operator. The safety test should consist of a high voltage test (1500V rms, 50/60Hz) between live and neutral joined together and earth for one minute; an earth continuity test at 25 amps between the primary safety earth point (marked with a ⏚ symbol, located near the AC power inlet connector) and the earth terminal of the AC power plug and, if possible, an AC current leakage test on the exposed metallic parts of the cabinet, e.g. signal cable shell and screw heads. Using the test circuit shown in Fig.1, connect the monitor power lead, via an isolating transformer, to the AC supply and switch on.
Measure the AC leakage current between exposed metallic parts of the cabinet and each pole of the isolated supply in turn. The earth leakage current should not exceed 1.0mA rms.

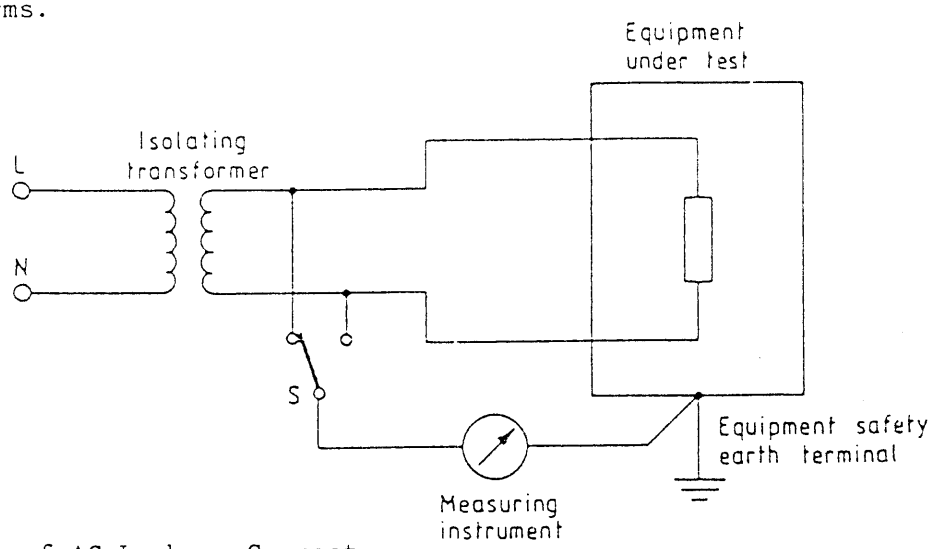


Fig.1. Measurement of AC Leakage Current.

2.6 Critical Safety Components

A number of electrical components in this monitor contribute to operating safety, and the protection afforded by them cannot necessarily be maintained by using replacement components rated for higher voltage, wattage, etc. They are identified by the ⚠ symbol which indicates that only manufacturer's approved replacements are to be used.

2.7 Cabinet Back Removal

a) Place the monitor on its front, protecting the screen and cabinet with some suitable material, and remove the tilt/swivel base by pressing down its retaining clip at the rear of the swivel ball, and at the same time slide the swivel base towards the back of the cabinet to release the bayonet catches.
b) Remove the retaining screw just below and to the right of the power inlet socket.
c) Remove the two retaining screws at the top left-hand and top right-hand corners of the cabinet back (if fitted).
d) Remove the two retaining screws from the bottom left-hand and bottom right-hand corners of the cabinet back.

e) Carefully replace the cabinet on its base. Insert a screwdriver blade into the slot next to each screw (item c) pressing downward and forward to release the retaining tabs whilst easing the cabinet away from the front bezel.

f) The back can now be removed, threading the signal cable through its access opening.

Replace the back by reversing the procedure in steps a to f omitting step e. *Note: when re-assembling the cabinet the retaining tabs mentioned in step e can be locked by pressing the cabinet back and bezel firmly together.*

2.8 Servicing notes

2.8.1 Soldered Connections

Always wrap lead wires around terminals before soldering.

2.8.2 Wire Replacement

Always use the correct wire type.
Run connecting wires along their original routes in order to :

a) Avoid introducing unwanted interference.
b) Avoid them being too close to high voltage or temperature.
c) Maintain safety approval standards.

SECTION 3. OPERATING INSTRUCTIONS

3.1 Connections

The Colour Monitor should be connected to a computer incorporating a VDE or FCC approved USVGA graphics display card which supplies analogue video signals.

Connect the captive signal cable to the 15 pin output socket on the card and secure it in place with the locking screws. Connect the monitor and computer to the AC supply.

3.2 Controls

3.2.1 Power ON/OFF

The ON/OFF switch is located on the right by the 'Power On' LED which should illuminate shortly after switching on. The display should become visible within 30 seconds of switching on.
IMPORTANT. Repeatedly switching ON and OFF should be avoided. This action may activate Safety Protection shut-down circuits. Should this occur or the supply be accidentally interrupted, switch OFF and allow 30 seconds for the circuits to reset before switching on again.

3.2.2 Contrast

This control varies the difference in intensity between black and coloured areas of the screen. After setting the brightness control as described below, set the contrast for the most comfortable display.

3.2.3 Brightness

This sets the average intensity of the whole display. Normally this control will be set at the centre detent position.

3.2.4 Width

Allows the user to vary the display width from 255 to 265mm (14" CRT) or 263 to 277mm (15" CRT) approximately.

3.2.5 V-Centre

Allows the picture to be centred vertically, to compensate for the user's viewing angle.

3.2.6 Height

This control allows the height to be adjusted to compensate for different graphics cards.

3.2.7 H-Phase

This control may have to be adjusted to suit the particular graphics card in use. Some graphics cards may require adjustment when changing modes.

3.2.8 Plinth

The plinth can be rotated or tilted to improve the viewing angle.

SECTION 4. CIRCUIT DESCRIPTION

4.1 Power Supply

The power supply is of the flyback switch mode type and will operate over the input range 110-125V or 220-240V rms ±10% (depending on model). The circuit is based around IC801 (UC3842AN) which directly drives the switching FET Q801 at a fixed frequency synchronized to the line output stage. The output power is regulated by duty cycle control depending on input voltage and load.

European models are designed for 220-240V operation. In these models, diodes D801 - D804 form a full wave bridge rectifier and CE807 provides smoothing.

North American models are designed for 110-120V or 220-240V, switch selectable. With the switch open (220-240V operation), diodes D801-D804 form a full wave bridge rectifier and capacitors CE807 and CE808 in series provide smoothing. With the switch closed (110-120V operation), diodes D801-D804 and capacitors CE807 and CE808 form a voltage doubler so that the rectified voltage at the transformer (T801) primary is the same as for 220-240V operation.

Immediately after switch-on, current derived from the rectified mains input flows through R807, R808 and D830 charging CE812 to approximately 17V. At this point IC801 makes a start attempt relying on stored charge in CE812 to supply current until the power supply starts. Operating current is then derived from a winding on the transformer via D812/R823 at 12.5V. The circuit operates as follows:

Q801 is switched on, causing a linear rise in current in the primary winding 1-3 of T801. After a period determined by the voltage drop across the current limit resistor R828, Q801 is switched off and the energy stored in the flux of T801 is transferred to the secondary circuits. Diodes D815, D816 and D817 conduct until the transformer is demagnetized, at which point after a short delay, Q801 is switched on again as before.

The transformer secondary windings produce 155V, 80V, 21V and 7V d.c. when rectified by D818, D820, D821 and D822 respectively. A protective clamp is incorporated in the 155V rectifier circuit formed by D819, C825 and R833 to prevent damage to D818 under certain conditions. The dv/dt on Q801 drain is limited by D811 which charges C819. In addition, D809/C818 clamps the peak drain voltage to about 500V to prevent damage to Q801.

The main regulation circuit centres around IC803 which conducts heavily when the voltage on the reference pin exceeds 2.5V. The regulation circuit senses the 155V and 21V rails and the control signal is fed back to the error amplifier in IC801 via the opto-isolator IC802. This forms the voltage feedback loop. A current feedback loop is also employed on the primary side to sense the drain current in Q801. The linear ramp voltage across R828 (1V max) is fed into pin 3 of IC801. This is filtered by R826, C813 to remove transient spikes. The current feedback circuit actively limits the peak transformer flux during each cycle and is used to provide feed-forward compensation to improve regulation.

The operating frequency is synchronized to the line output stage using a double-insulated single turn of wire around the flyback transformer core. This sync. pulse is fed into IC801 via TR801, but is momentarily shorted by TR802 at switch on. The power supply is synchronized to line frequency in 31 to 38kHz modes and half line frequency at 48 to 60kHz. (i.e. 24 to 30kHz).

4.2 Power Management (where fitted).

The Power Management control (PMC) circuit selects mains power saving mode when field OR line sync. pulses are absent for approximately one second. This is achieved by removing the 21V supply from the Deflection board (except 12V regulator input) and reducing tube heater voltage.

Horizontal and vertical syncs. are fed to two re-triggerable monostables IC701A and IC701B. The time constant of these are determined by R702/CE702, and R703/CE703 respectively. Provided that sync. pulses are received at the input to monostable A, the output will remain logic high (5V) and be fed to the CLR input of monostable B. Monostable B remains low if its CLR input is high AND sync. pulses detected at its input. The output is fed via a service link to the base of voltage amplifier TR701. To achieve saturation of Q701/Q702 their gate/source voltage must be in excess of approximately 3 volts, therefore, biasing is sourced from the 80V supply via R705 and limited to less than 30V by R706. When IC701B resets, TR701 saturates pulling Q701/Q702 gates to 0V, switching them off. 21V is removed from the Deflection panel disabling the line drive and frame scan circuits etc., reducing overall power consumption to less than 30W.

When the monitor switches to standby the field and line scans rapidly collapse. The spot suppression circuit TR702 switches on pulling the positively charged CE705 +ve to 0V and the -ve side to -155V, cutting off the tube grid which blanks the screen while the EHT collapses. This avoids burning of the tube phosphor which might otherwise occur due to the high intensity spot caused by the collapse of the scan currents.

4.3 B+ Regulator

The horizontal scan coil has to be driven with a constant amplitude sawtooth current at all of the possible scan frequencies. This is done by controlling the B+ voltage applied to the scan coil. The B+ regulator is based on a step-down switched-mode regulator comprising switching FET Q501, flywheel diode D503 and filter L501/CE504/CE517. When the FET is switched on, its source becomes connected to the +155 volt rail and the current in L501 increases.

After a period determined by control IC501, the FET is switched off and the current in L501 decays, flowing via D503 with the voltage at the FET source now falling to about -1 volt. The switched waveform at the source is smoothed by the filtering action of inductor L501 and the reservoir capacitors CE504 and CE517. The average voltage at the output of the filter, depends on the proportion of the time that the Q501 is 'on'. This is controlled by sampling the peak voltage appearing on pin 5 of the line output transformer T402. A rectified and smoothed sample is compared with the internal reference in IC501 and this controls the 'on' time of Q501. The current feedback signal required by IC501 is simulated by the circuit D505, R515, C510 and D506, which creates an artificial current ramp. The output of the IC501 drives output amplifier (TR502/TR503) which in turn drives a pulse transformer whose secondary winding is connected to Q501. The regulator is synchronized to the line timebase by the circuit around TR501. A pulse derived from pin 3 of T402 is fed to the timing capacitor C507 to trigger the oscillator in IC501. The regulator is inhibited from a full start-up until the line output has started working. TR504 is initially off and TR505 is on holding IC501, pin 1 low, reducing the regulator output to zero. Diode D504 allows the output of the B+ regulator to rise to 21 volts, enabling the line output to operate at low level. When the low level pulse output from pin 3 of T402 is present, it turns on TR504 releasing the over-ride in IC501 enabling the regulator to operate as normal.

4.4 Synchronization

The incoming horizontal and vertical sync. pulses are fed to IC630(74LS86) which has the function of providing positive sync. pulses to the line and field oscillators regardless of the polarity of the incoming pulses.

4.5 Automatic Height Adjustment

The sync. pulses are also applied to two dual monostables, IC631 & IC632 for the mode detection circuits. These monostables are set to 16µs, 19µs, 22µs and 30µs. The monostables are constantly being re-triggered by the line sync. pulses. If the sync. pulse period is shorter than the monostable, it will never reset and the Q output will not go high. If the sync. pulse is longer than the monostable period, the Q output will go high at the end of the timed period until re-triggered by the next sync. pulse. The action of the monostables is shown in the following table:

Freq. kHz	Period µs	IC631/IC632 pins with +ve pulse
31.5	31.7	IC631 pins 5, 13: IC632 pins 5, 13
35-38	28.5-26.3	IC631 pins 5, 13: IC632 pin 5
48	20.8	IC631 pins 5, 13
57	17.5	IC631 pin 5
61	16.4	None of above

The outputs of the 16, 19 and 22µs monostables drive the inputs of inverters in IC634. 'High' outputs from the monostables will give a 'low' at the output of the inverter and discharge the capacitor at the output to give a sustained low.

The sync. pulses and the logic signals from the inverters are decoded in IC633 (quad 2 input NOR), IC635 and IC636 (2 to 4 line decoders). The outputs of the decoders are used to switch one of the bank of resistors R640-R663 across C645. This sets the current flowing in the constant current generator TR635/637/638, controlling the height of the vertical (field) scan to provide automatic height compensation for each mode.

4.6 Vertical Deflection

The incoming sync. signal locks the vertical oscillator to provide a steady, synchronized display. The series combination C311/312 charge from a current out of IC301 pin 9, mirroring the current at pin 7 from TR637 to establish the correct height, producing a field rate ramp voltage on pin 9. The output current from pin 1 flows through the deflection coil CE309 and R307. Feedback from R307 into pin 12 is compared with this internally generated ramp to produce a linear scan.

Vertical shift is achieved by providing positive or negative offset current into the tube deflection coils using R697 and TR634, with RV684 providing user adjustment to centre the display.

4.7 Horizontal Deflection

The horizontal sync. pulse is used to synchronize a phase-lock loop (PLL), IC401, which controls the line output. A variable monostable (TR416/417/418) between the incoming sync. pulse and the PLL (IC401, pin 14) gives a variable delay to the timing pulse. A fixed monostable (TR419/420) is used to delay feedback from the line time-base to the PLL (IC401, pin 3). Altering the delay has the effect of shifting the display horizontally.

The output of the PLL (IC401, pin 4) drives TR423 switching current into the base of the line drive transistor TR422. IC402 is used to provide a start-up delay inhibiting the line driver stage until the PLL is functioning correctly. The output from TR422 is coupled to the line drive transformer whose secondary winding provides the high base current and controlled turn-off required by the line output transistor TR402.

The line output circuit is based on a diode modulator configuration. D403/C407 and D404/C409 form separate tuned flyback circuits with the horizontal deflection coil, and T403/C406 provides fine tuning and the voltage across C410 controls the scan width. In normal operation the voltage across C410 is a parabola with a positive d.c. offset voltage controlled by TR407.

PL406 allows a link selectable offset current to be added to the tube deflection coils to provide horizontal shift, RV414 provides adjustment.

The line output section also includes a beam current limit circuit connected to the contrast control wiper of RV681 so that the screen light output is automatically limited to prevent excessive brightness. The voltage on the wiper is pulled low by TR415 if the beam current exceeds an average of 0.5mA.

4.8 East/West, Keystone and Horizontal Shift

These functions are performed by IC302 and IC303 which control the diode modulator. IC302 generates a parabola from the field current ramp fed into pin 2. This is internally compared with a line rate sawtooth generated at pin 8. The output appears as a pulse-width modulated voltage at pin 5, which is filtered by R327 and C315. This is mixed with a DC control voltage from op-amp IC303 whose output drives the diode modulator controlling transistors TR406, TR426 and TR407.

4.9 Blanking

A pulse derived from the line output stage is applied to C420 giving a sharply defined positive trigger at the start of flyback. This triggers monostable TR410/411 and gives a line flyback blanking signal. This is combined with a field blanking signal derived from the field output (IC301, pin 13) to give a mixed blanking signal which is fed via PL402 to TR210/211/212 on the video panel.

4.10 Video Circuits

The monitor accepts RGB signals of 0.71V amplitude into 75 ohms. The incoming signals are capacitor coupled to the inputs of IC201. The function of IC201 is to provide gain control and clamping (d.c. restoration). The outputs at pins 16, 20 and 25 of IC201 directly drive emitter followers (e.g. TR205 for the red channel), and the output amplifier IC202 which provides the CRT cathodes with an AC coupled, 40V (maximum) drive. D.C. restoration is provided by D201/TR201 (red channel). The individual cut-off points for the tube are set by RV250/251/252.

4.11 Protection Circuits

4.11.1 Power Supply

The mains input fuse FS801 is of the time-delay type. Replacements must be of the same type and rating.

Immediately after the power supply has started D827 is triggered disabling the start-up circuit, so that in the event of a fault the power supply is prevented from attempting to re-start. For example, the power supply will shut down (after a single start attempt) if any output is shorted.

De-magnetization sensing is provided by D814 which feeds a voltage produced by the transformer secondary winding 5-6 into pin 3 of IC801. Diodes D815, D816 and D817 limit the input to 1.8V maximum. This signal is a representation of the transformer flux during the secondary discharge cycle and only when it has fallen to zero can the IC begin another cycle. This circuit is constantly active but normally only limits the flux during the start-up sequence, or in the event of overload, or input undervoltage.

Over-voltage protection has been included for fail-safe operation. The zener diode ZD806 conducts if the IC supply voltage derived from T801 exceeds 16V. This causes D807 to latch on, thus disabling IC801.

4.11.2 B+ Regulator

D504 conducts heavily in the event of the B+ rail being short circuited. This effectively shorts the 21V rail to ground and the power supply shuts down. TR504, by inhibiting the B+ regulator IC501, restricts the B+ voltage to 21V until the line output stage is functional.

4.11.3 Line Drive

FS401 protects against the possible failure of TR422, CE401 or T401.

4.11.4 Line Scan

The EHT is protected from exceeding a safe limit by monitoring the flyback pulse amplitude at pin 3, T402. If it exceeds 35Vpk, ZD420 conducts and triggers D421, simulating high H.T. and resulting in the power supply control IC801 reducing its output until its own supply is too low to function, thereby switching off the PSU. The circuit typically operates at an EHT of 28kV.

The maximum beam current is automatically limited by TR414/TR415 during normal monitor operation. In the event of a fault causing excessive current in the EHT winding, D421 is triggered by current from TR413 which shuts down the PSU as above.

If either the 12V or 5V rail is shorted, TR425 conducts and triggers D421, shutting down the power supply.

4.11.5 East/West

R411 gives protection to the E/W circuit and the diode modulator in the event of a fault.

SECTION 5. ADJUSTMENTS

5.1 Introduction

The monitor incorporates a number of adjustments which are listed below, and will have been correctly aligned before leaving the factory. Any adjustments should be made only if necessary.

5.1.1 Power Supply Panel:

155V Adjust	RV840

5.1.2 Control Panel:

30µs	RV672
19µs	RV680
16µS	RV677
V.Size Mode 8	RV658
V Size adjust	RV628

5.1.3 Deflection Panel:

B+ Adjust	RV512
Phase Balance	RV401
H Shift	RV414
V Lin	RV316
V Freq	RV303
Keystone	RV324
Width Adjust	RV422
E/W Amplitude	RV331
A1/Screen voltage	FBT
Focus	FBT

5.1.4 Video Panel:

Red Gain	RV219
Green Gain	RV218
Blue Gain	RV217
Red Cut-off	RV250
Green Cut-off	RV251
Blue Cut-off	RV252

5.2 Adjustments

N.B. 1. Clockwise (CW) and counter-clockwise (CCW) directions are viewed from component side.

2. Where pots are set to CENTRAL, this need only be approximate.

5.2.1 Equipment Required

1. Signal source capable of producing the timing modes as described in Section 1, item 1.2.
2. D.V.M. (1000V).
3. E.H.T. meter (30kV).
4. Light meter (e.g. Minolta).
5. 20MHz oscilloscope.

5.2.2 Initial Conditions

1. Chassis assembly complete.
2. E.H.T lead (poppy) safely terminated onto the CRT.
3. Set user CONTRAST control (RV681) to MINIMUM.
4. Set user BRIGHTNESS control (RV682) to DETENT.
5. Set A1 to MINIMUM, (fully CCW).
6. Video gain pots RV217,RV218,RV219 not to be adjusted from the setting made in the board test (i.e. 70% of maximum gain).
7. Video cut-off pots RV250, RV251, RV252 to be fully CW.
8. Connect signal lead to Chroma 2000.
9. Locate SK714 in Service Mode (s/c PL704, pins 2/3 [where fitted]).
10. Connect A.C. power supply, 240V rms to inlet socket.
11. Switch A.C. power switch ON using S801.
12. Check green LED illuminates.

5.2.3 Voltage Settings

1. Select mode 3, black video.
2. Measure the voltage at cathode of D818 and adjust RV840 for a voltage of +155V ±0.5V if necessary.
3. Measure the voltage at cathode of D504 and adjust RV512 (B+ Adj), for a voltage of +65.5V ±0.5V.

5.2.4 E.H.T. Voltage Measurement ⚠

1. Connect E.H.T. meter to poppy and check that the voltage is 24.5kV ±1kV.
   Note: Ground EHT meter to CRT Dag braid.

5.2.5 Focus Settings

1. Select Mode 3, focus pattern green.
2. Set CONTRAST to CENTRAL and BRIGHTNESS to DETENT.
3. Adjust focus control until thin black lines can be clearly defined. Adjust for optimum focus.

5.2.6 Sync Decoding Logic Presets

1. Select Mode 3, white video.
2. Connect scope probe to pin 13, IC631.
3. Adjust RV672 (30µs) for a 1.30µs, ±0.1µs negative going pulse.
4. Connect scope probe to pin 4, IC632.
5. Adjust RV680 (19µs) for a 19µs, ±0.5µs negative going pulse.
6. Connect scope probe to pin 12, IC632.
7. Adjust RV677 (16µs) for a 16µs, ±0.5µs negative going pulse.

5.2.7 Horizontal Raster Centre

1. Select Mode 10, black video.
2. Set CONTRAST to CENTRAL and BRIGHTNESS to MAXIMUM.
3. With reference to pages 16/17. If necessary, adjust PL406 and RV414 (H.Shift) to centralize the RASTER. a-b <3mm.

5.2.8 Modulator Setting

1. Select Mode 3, white video, no border.
2. Set RV683 (width) to DETENT.
3. Measure the voltage at junction of C410 and L404, adjust RV422 (WIDTH ADJ) for 5.0V, ±0.1V.

5.2.9 Horizontal Phase

1. Select Mode 3, 4 x 4 grid.
2. Set CONTRAST to MAXIMUM and BRIGHTNESS to DETENT.
3. Adjust RV686 (user H.PHASE) until the display is centralized.
4. Select Mode 10, 4 x 4 grid.
5. Adjust RV401 (PHASE BALANCE) fo a centralized display.
6. Repeat steps 1 to 5 until the phase difference between modes 3 and 10 is less than 2mm, with reference to pages 16/17.

5.2.10 Horizontal Width {}TM5401 []TM5501

1. Select mode 10, white video, no border.
2. Set CONTRAST to MAXIMUM and BRIGHTNESS to DETENT.
3. Set RV683 (WIDTH) to DETENT.
4. Check the width is {260mm} [270mm] ±1mm. Adjust RV512 (B+ ADJ) slightly if necessary.

5.2.11 Geometric Distortion

1. Select mode 10, 4 x 4 grid.
2. Set CONTRAST to MAXIMUM and BRIGHTNESS to DETENT.
3. Adjust RV331 (E/W AMP) for straight vertical edges.
4. Adjust RV324 (KEYSTONE) for parallel vertical edges, to give a rectangular display.

5.2.12 Re-check Line Adjustments

1. Repeat 5.2.9, 5.2.10 and 5.2.11 as necessary.
2. Select Mode 3, black video.
3. Check the B+ voltage is within the range 65.5 ±4V. If not repeat 5.2.10.

5.2.13 User Width Distortion Check

1. Select Mode 10, white video, no border.
2. Adjust RV683 (WIDTH) to give minimum width.
3. Check there are no geometric distortions, with reference to pages 16/17.
4. Should any be apparent, increase the width slightly using RV422 (WIDTH ADJ).
5. Select Mode 3, white video, no border.
6. Adjust RV683 (WIDTH) to give maximum width.
7. Check there are no geometric distortions, with reference to pages 16/17.
8. Should any be apparent, reduce the width slightly using RV422 (WIDTH ADJ).
9. If RV422 has been adjusted repeat 5.2.10 to 5.2.13 to minimize geometric distortions.

5.2.14 Vertical Hold

1. Select a signal with a 50Hz field rate.
2. Set CONTRAST to MAXIMUM and BRIGHTNESS to DETENT.
3. Adjust RV303 (V.FREQ) fully CCW. Then slowly turn CW until the display becomes stable. STOP TURNING RV303 IMMEDIATELY.

5.2.15 Horizontal Linearity

1. Select mode 10, crosshatch.
2. Set CONTRAST to MAXIMUM and BRIGHTNESS to DETENT.
3. Set RV683 (WIDTH) to DETENT.
4. With reference to pages 16/17, measure the width of the squares above the horizontal centre line. The linearity error defined on page 16/17 must be <5%.
5. Select mode 3, crosshatch.
6. With reference to pages 16/17, measure the width of the squares above the horizontal centre line. The linearity error defined on page 16/17 must be <5%.

5.2.16 Vertical Linearity

1. Select mode 10, 4 x 4 grid.
2. Set CONTRAST to MAXIMUM and BRIGHTNESS to DETENT.
3. With reference to pages 16/17, adjust RV316 (V.LIN) so that the difference in height between the smallest and largest square is <2.0mm. (Adjust for optimum linearity).

5.2.17 Vertical Centre

1. Select mode 10, 4 x 4 grid.
2. Set CONTRAST to MAXIMUM and BRIGHTNESS to DETENT.
3. Adjust RV684 (V.CENTRE). Check that the display can be shifted up and down.
4. With reference to pages 16/17 adjust RV684 (V.CENTRE) to centralize the display. c-d <4.0mm.

5.2.18 Vertical Size (Height) {}TM5401 []TM5501

1. Select mode 10, white video, no border.
2. Set CONTRAST to MAXIMUM and BRIGHTNESS to DETENT.
3. Set RV685 (V.SIZE) to DETENT.
4. Adjust RV628 to give a display size of {190mm} [202mm] ±1mm.
5. Select Mode 8, white video, no border.
6. Adjust RV658 for a display size of {190mm) [202mm] ±3mm.
7. Select in turn Modes 1, 2, 3, 4, 5, 6, 7, 9, and 11, white video, no border. In each case check that the display is locked to the vertical sync. and that the height is {190mm} [202mm] ±3mm. If not, re-adjust RV628 and check height is within specification for all modes (1-11).
8. Select IBM 8514/A interlaced mode, white video, no border. Check that height can be adjusted to nominal {190mm} [202mm] ±3mm with user control RV685. Then display text (to include circular characters) and check picture quality.
9. Repeat 5.2.16, 5.2.17 and 5.2.18 as necessary.

5.2.19 White Balance

1. Set CONTRAST to MINIMUM and BRIGHTNESS to MAXIMUM.
2. Select mode 10, black video.
3. Using a Minolta light meter, adjust A1 until a light output of (Y) 3 ±0.5 Cd/m^2 is obtained.
4. Observe the readings of (x) and (y) and adjust a maximum of two CUT-OFF pots from RV250 (RED), RV251 (GREEN) and RV252 (BLUE) to obtain (x) = 0.281 ±0.005 and (y) = 0.311 ±0.005.
5. Check (Y) is still 3 ±0.5Cd/m^2. Adjust A1 if necessary.
6. Set user BRIGHTNESS to DETENT. Check no raster is visible.
7. Set user CONTRAST to MAXIMUM.
8. Select Mode 10, green block.
9. Adjust RV218 (GREEN) to give a (Y) reading of 97 ±1Cd/m^2.
10. Select Mode 10, white block.
11. Using Minolta light meter,

    Adjust RV217 (BLUE) to give (y) = 0.311 ±0.005
    Adjust RV219 (RED) to give (x) = 0.281 ±0.005

Note: Record (x) and (y) readings.

12. Check (Y) reading is 120 ±10Cd/m^2.
13. Adjust CONTRAST control to give a (Y) reading of 17 ±3Cd/m^2.
    Check that (x) and (y) are within ±0.015 of values noted in 11.
    If out of spec. adjust only the two CUT-OFF pots adjusted in 4 to correct (x) and (y).
14. Repeat 1 to 13 until no further adjustment is required.

5.2.20 Static Convergence

1. Select mode 3, crosshatch.
2. Set CONTRAST to MAXIMUM and BRIGHTNESS to DETENT.
3. With reference to pages 16/17, check that the convergence error of Zone A is <0.30mm and Zone B <0.50mm. If errors are outside these limits, then the convergence rings on the neck of the CRT are to be carefully adjusted.

5.2.21 Purity

1. Set CONTRAST to MAXIMUM and BRIGHTNESS to DETENT.
2. Select mode 3, RED video.
3. Check for any discoloration of the Red raster.
4. Select mode 3, GREEN video.
5. Check for any discoloration of the Green raster.
6. Select mode 3, BLUE video.
7. Check for any discoloration of the Blue raster.

5.2.22 Picture Quality Check

1. Select mode 8, Text pattern (white text).
2. Set CONTRAST to CENTRAL and BRIGHTNESS to DETENT.
3. Check that text is clearly legible.
4. Check that text is free from smearing/streaking effect.
5. Check that text is black and white, especially vertical lines.

5.2.23 Power Management Control Circuit (where fitted)

1. Check SK714 is in operational mode (s/c PL704 pins 1-2 where fitted).
   Switch off line sync. source.
   Connect x10 oscilloscope probe to Q701 source.
   Connect power and check that the voltage rises to 21V for approximately one second and falls to 7.5V ±1.0V.

Note: With signal lead disconnected, 'noise' received by the sync. i/p's may occasionally trigger the monitor into operational mode.

2. Check that the voltage at TR701 collector is <0.1V.
3. Check that tha voltage at TR702 collector is <0.1V.
4. Check that the voltage at Q702 source is:
   For Hitachi 36cm picture tube 5.0V ±0.2V.
   For Toshiba 36cm picture tube 4.0V ±0.15V.
   For Chungwa 34cm picture tube 4.2V ±0.2V.
5. Switch off field sync. pulses.
   Switch on line sync. pulses.
   Check that the voltage at TR701 collector is <0.1V.
6. Swith on field sync. pulses.
   Observe that the picture is displayed within one second.
7. Check that the voltage at TR701 is 25.5V to 29.0V.
8. Check that the volyage between Q701 source and drain is <0.15V
9. Check that the voltage between Q702 source and drain is <0.1V
10. Check that the voltage at Q702 is 6.3V ±0.15V.
11. Remove line sync. pulses.
    Observe that display blanks after approximately one second with no evidence of scan collapse which may result in spot burn damage to the picture tube.

5.2.24 Dual Voltage Version (240/110V)

Note: This section applies to dual voltage models only. For 220-240V models disregard this section.

1. Disconnect 240V A.C. power supply.
2. Switch to 110V operation (SK802 s/c).
3. Connect 110V A.C. power supply.
4. Switch A.C. power ON using S801.
5. Set CONTRAST to MAXIMUM and BRIGHTNESS to DETENT.
6. Select mode 3, white video, no border.
7. Check that display is normal.
8. Switch off S801 and disconnect the 110V A.C. power supply.
9. Switch back to 220-240V operation (SK802 o/c).
10. Connect 240V A.C. power supply.
11. Switch ON A.C. power using S801.
12. Check that display is normal.

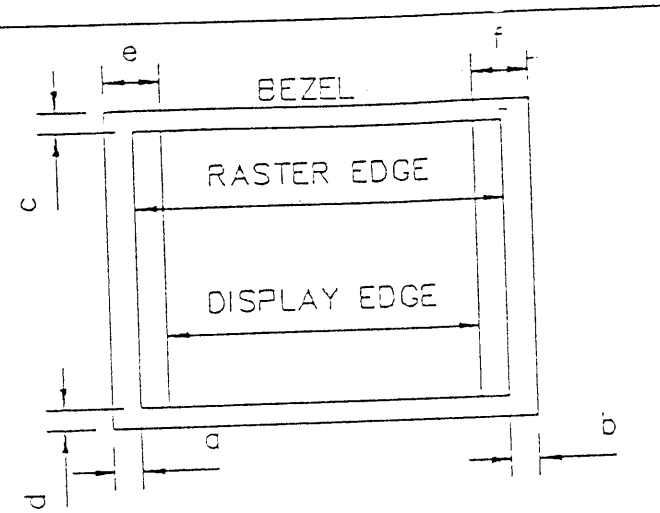
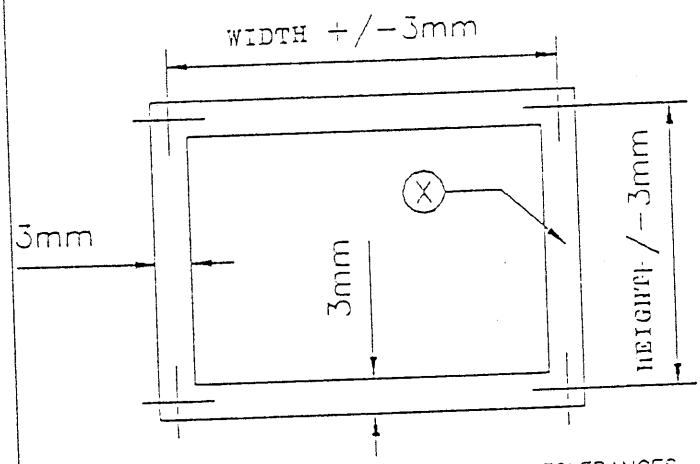
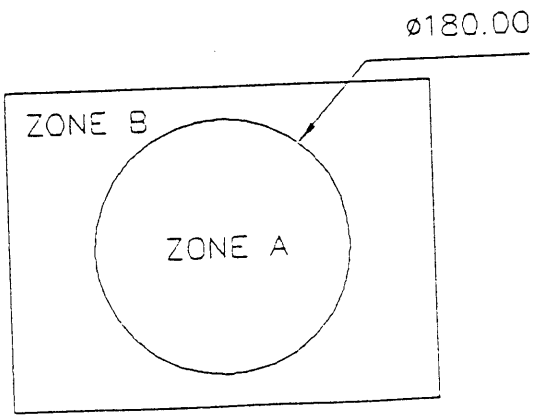
5.2.25 SAFETY TEST (POWER DISCONNECTED, SWITCH S801 ON) ⚠

Note: SAFETY TEST MUST BE CARRIED OUT ON ALL MONITORS. A CHASSIS FAILING IN ANY PART OF THIS SECTION (5.2.23) MUST BE REJECTED.

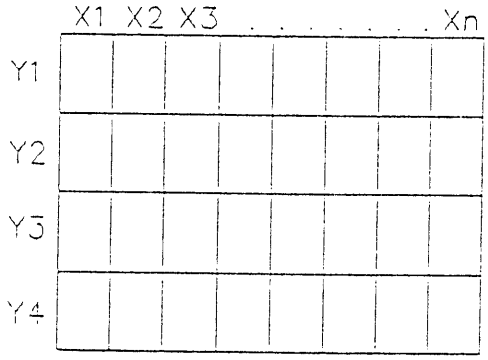
1. CHECK LEAKAGE FROM LIVE AND NEUTRAL TO THE PROTECTIVE EARTH. LEAKAGE CURRENT MUST NOT EXCEED 3.5mA (EN 60950 Paragraph 5.2.3 reference to appendix C). TYPICAL READING 0.5mA

2. THE RESISTANCE OF THE SIGNAL CABLE SHELL TO THE PROTECTIVE EARTH MUST NOT EXCEED 0.1 Ohms.

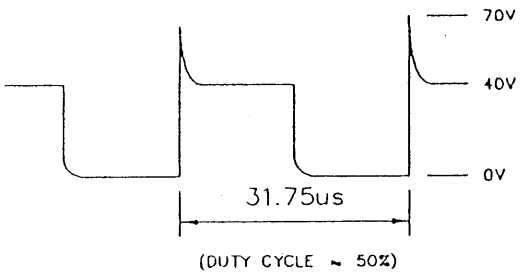
3. HAVING CONNECTED TOGETHER LIVE AND NEUTRAL, A BREAKDOWN TEST OF 2120V D.C. APPLIED BETWEEN LIVE/NEUTRAL AND EARTH MUST NOT RESULT IN AN INSULATION FAILURE OR BREAKDOWN.

PARAMETER		TEST CONDITIONS
RASTER + DISPLAY CENTERING	 $\|a - b\| \leq 3.0mm$ $\|c - d\| \leq 4.0mm$ $\|e - f\| \leq 3.0mm$	HORIZONTAL CENTRE CONTRAST = CENTRAL BRIGHTNESS = MAXIMUM MODE = 10 PATTERN = WHITE RASTER VERTICAL CENTRE CONTRAST = MAXIMUM BRIGHTNESS = DETENT PATTERN = 4 X 4 GRID HORIZONTAL PHASE CONTRAST = MAXIMUM BRIGHTNESS = DETENT MODE = 10 PATTERN = WHITE RASTER
GEOMETRIC DISTORTION	 ALLOWING FOR HEIGHT AND WIDTH SETTING TOLERANCES, TOTAL DISPLAY DISTORTION MUST BE WITHIN AREA ⊗	GEOMETRIC DISTORION CONTRAST = MAXIMUM BRIGHTNESS = DETENT MODE = 10 PATTERN = WHITE RASTER WIDTH = 270mm [15"] 260mm (14") HEIGHT= 202mm [15"] 190mm (14")
CONVERGENCE	 ZONE A < 0.30mm ZONE B < 0.50mm	STATIC CONVERGENCE CONTRAST = MAXIMUM BRIGHTNESS = DETENT PATTERN = CROSS-HATCH

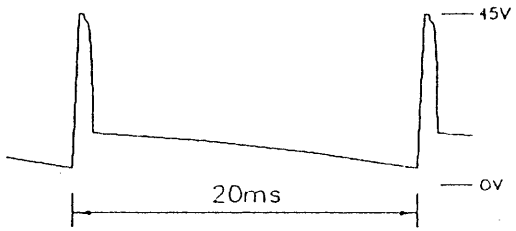
W Series Spec/Limits

PARAMETER		TEST CONDITIONS
LINEARITY	 $\text{AVERAGE } X = \frac{\sum X1 \ldots Xn}{n} = \bar{X}$ $\text{AVERAGE } Y = \frac{\sum Y1 \ldots Y4}{4} = \bar{Y}$ $\frac{(X - Xi)}{\bar{X}} \leq 0.05 \quad \text{for } i = 1 \text{ to } n$ $\frac{(Y - Yi)}{\bar{Y}} \leq 0.05 \quad \text{for } i = 1 \text{ to } 4$ *NOTE: NO STEP CHANGES ALLOWED*	VERTICAL LINEARITY CONTRAST = MAXIMUM BRIGHTNESS = DETENT MODE = 10 PATTERN = 4 X 4 GRID HORIZONTAL LINEARITY CONTRAST = MAXIMUM BRIGHTNESS = DETENT MODE = 10 PATTERN = CROSS-HATCH

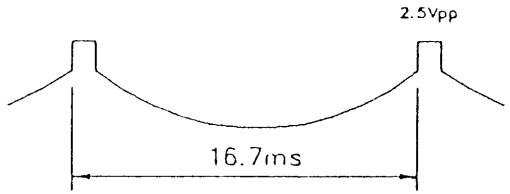
TR422c LINE DRIVE WAVEFORM



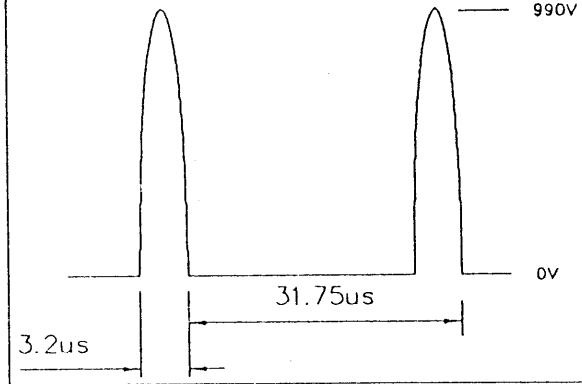
FIELD WAVEFORM IC301 pin 1
PL403 pin 5



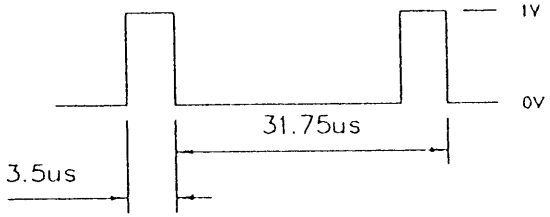
E - W CORRECTIONTR407c



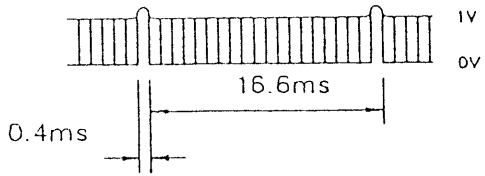
TR402c LINE FLYBACK WAVEFORM



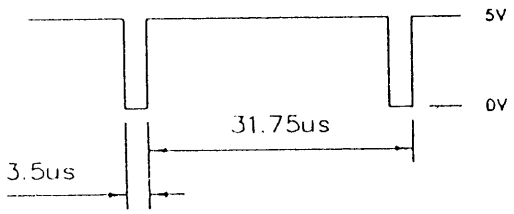
BLANKING PULSE WAVEFORM
(LINE RATE)
PL402 pin 1



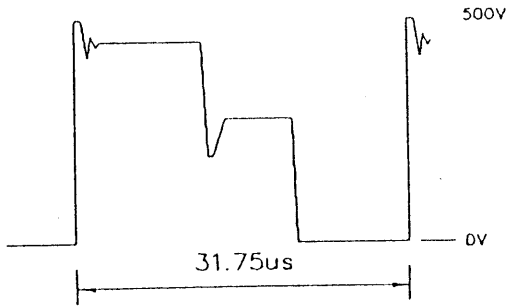
BLANKING PULSE WAVEFORM
(FIELD RATE)
PL402 pin 1



CLAMP PULSE WAVEFORM
PL402 pin 2

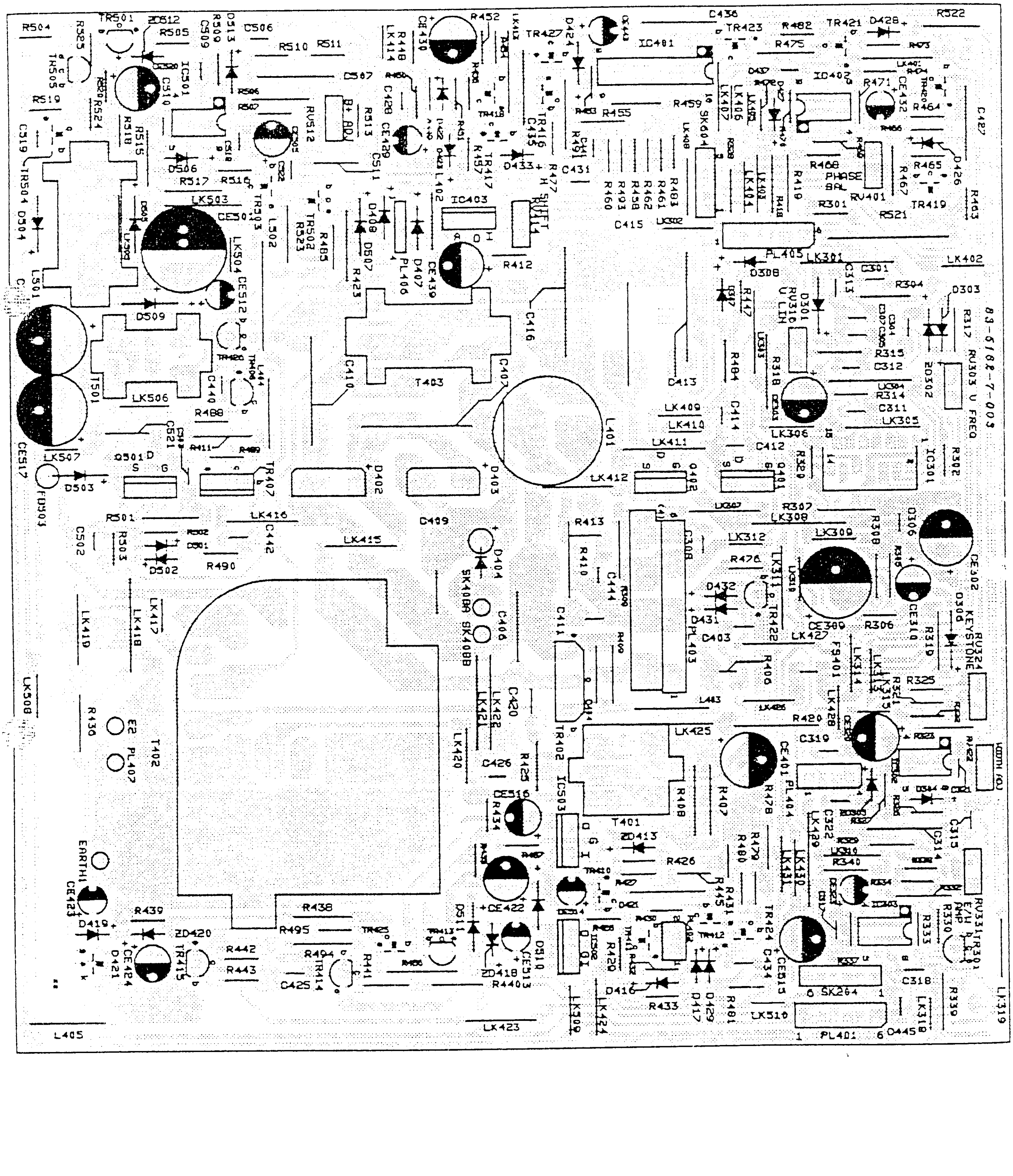


Q801 DRAIN WAVEFORM
SMPS WAVEFORM Q801d

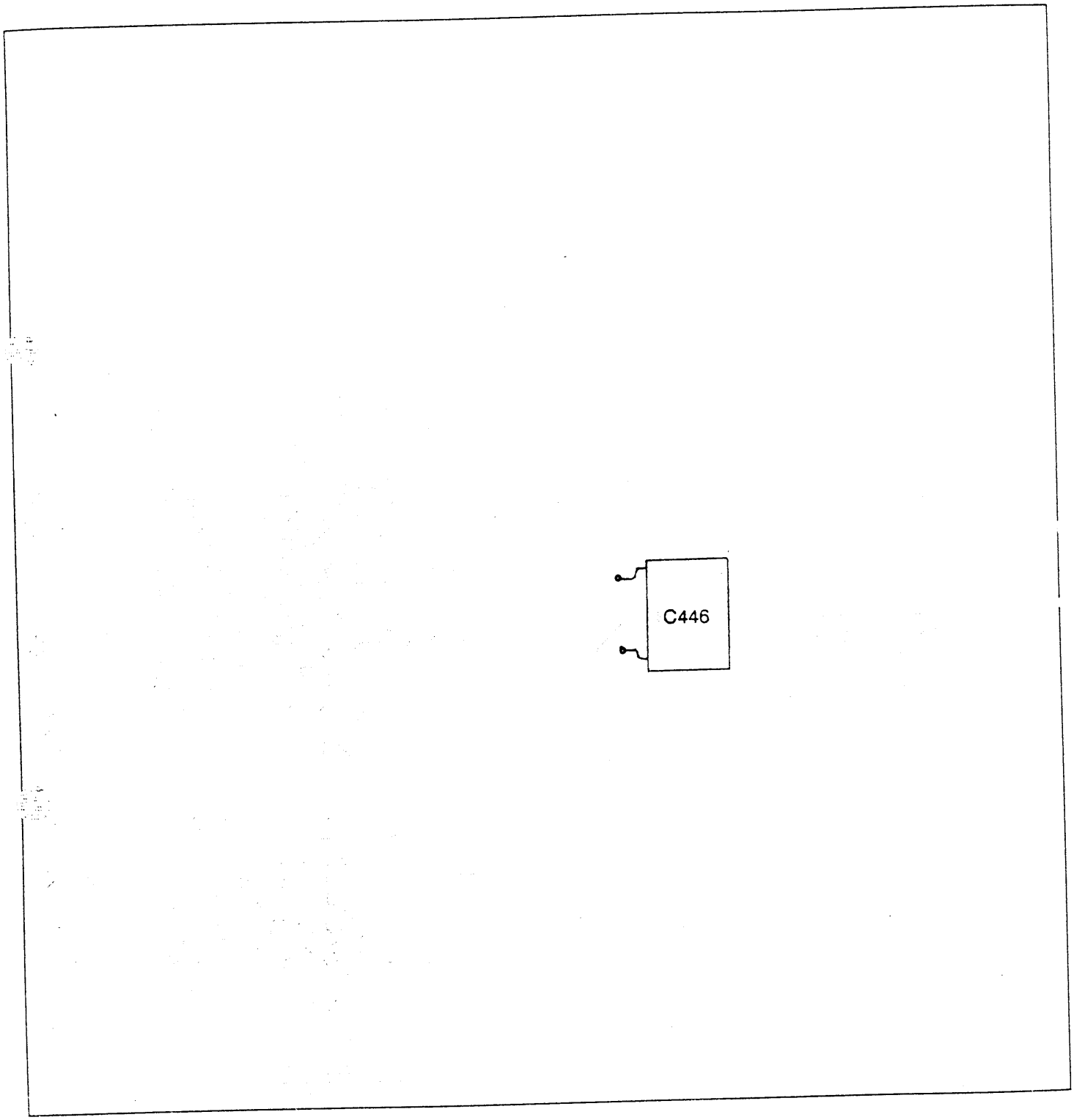


SECTION 7 PCB COMPONENT LAYOUT

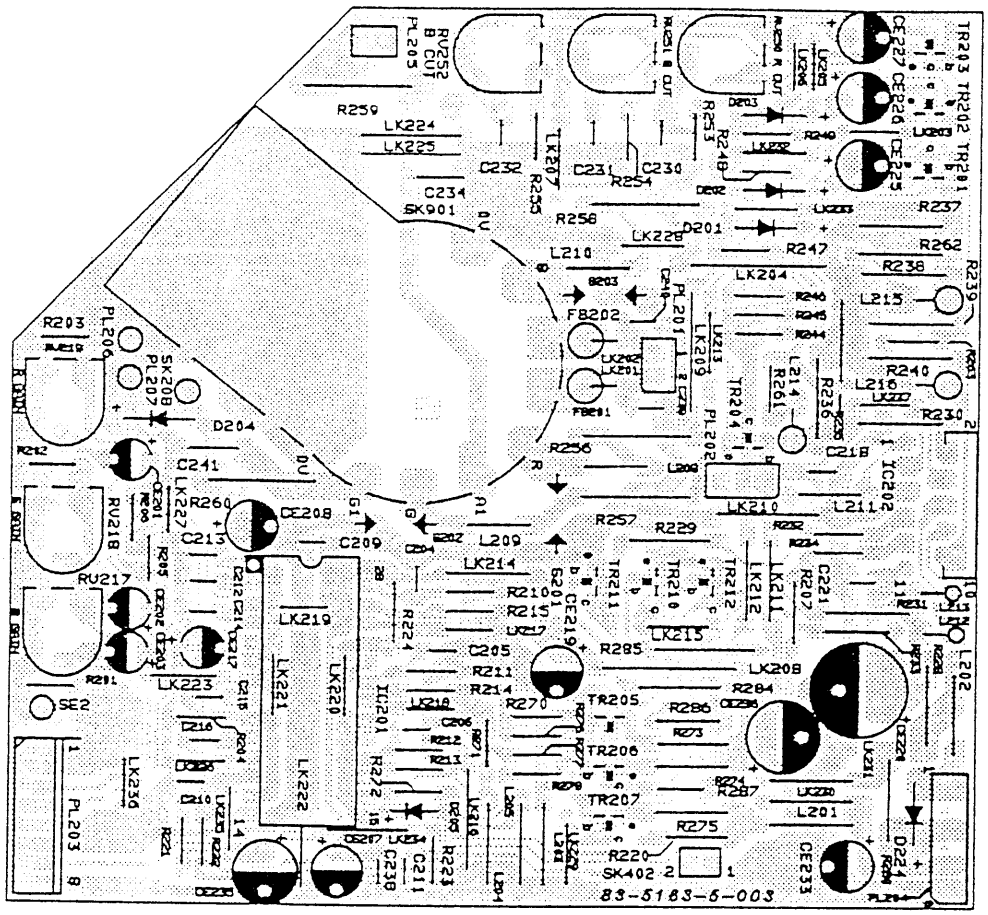
DEFLECTION PANEL (Component side)



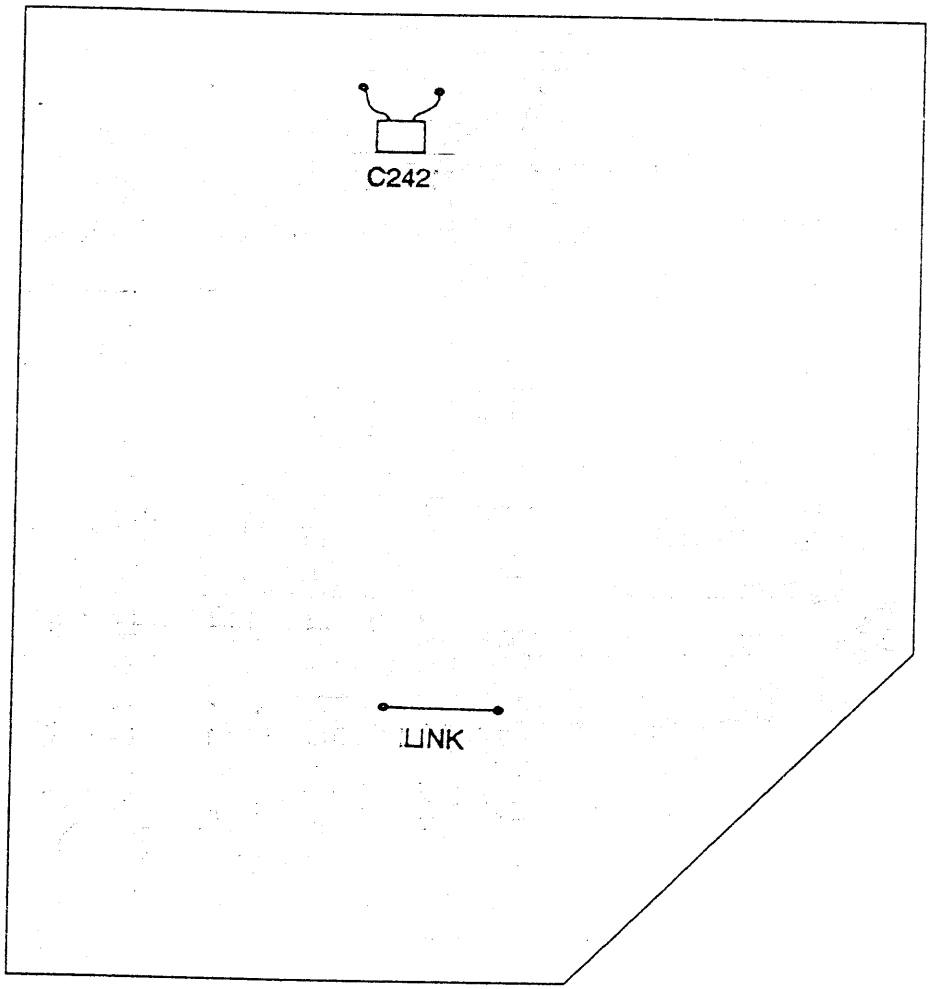
DEFLECTION PANEL (Track side)



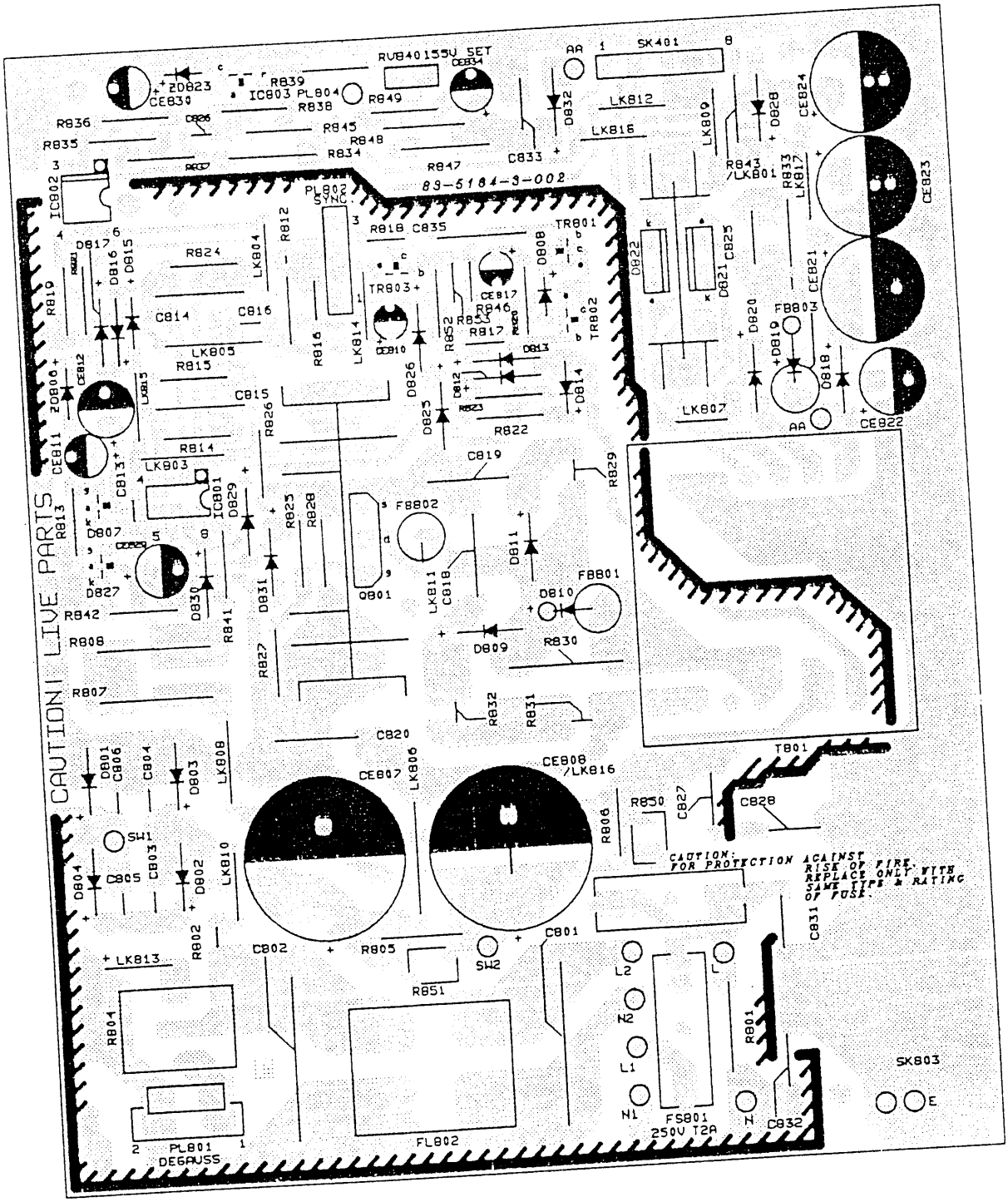
VIDEO PANEL (Component side)



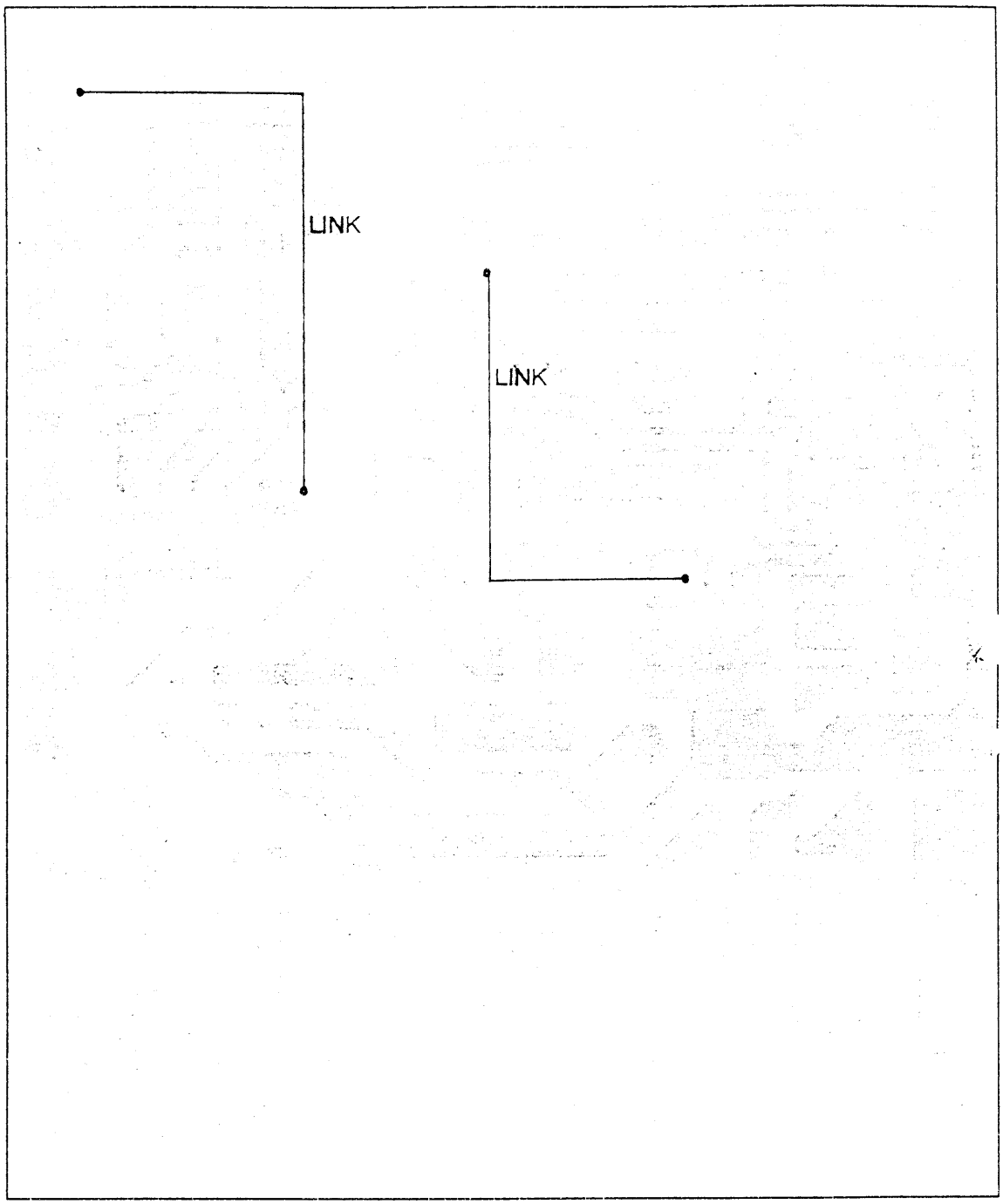
VIDEO PANEL (Track side)



POWER SUPPLY PANEL (Component side)

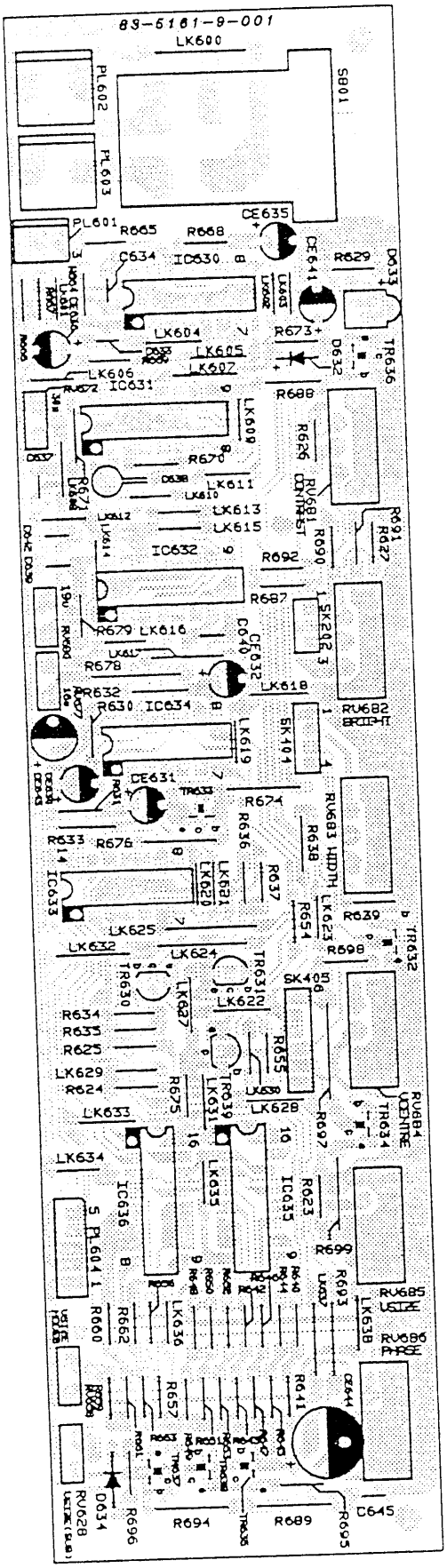


POWER SUPPLY PANEL (Track side)

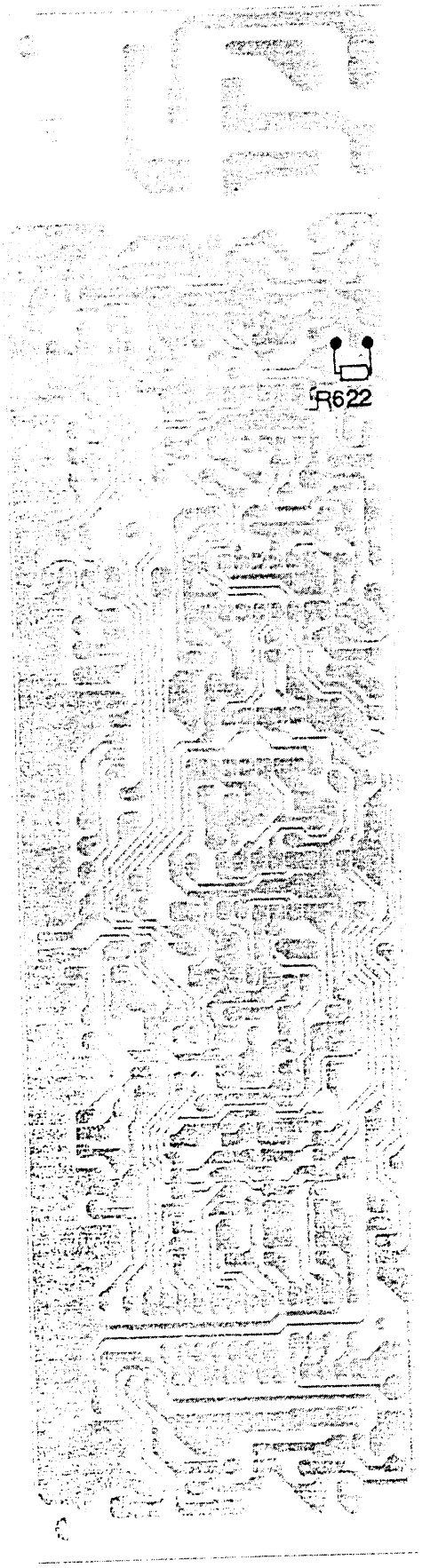


CONTROL PANEL

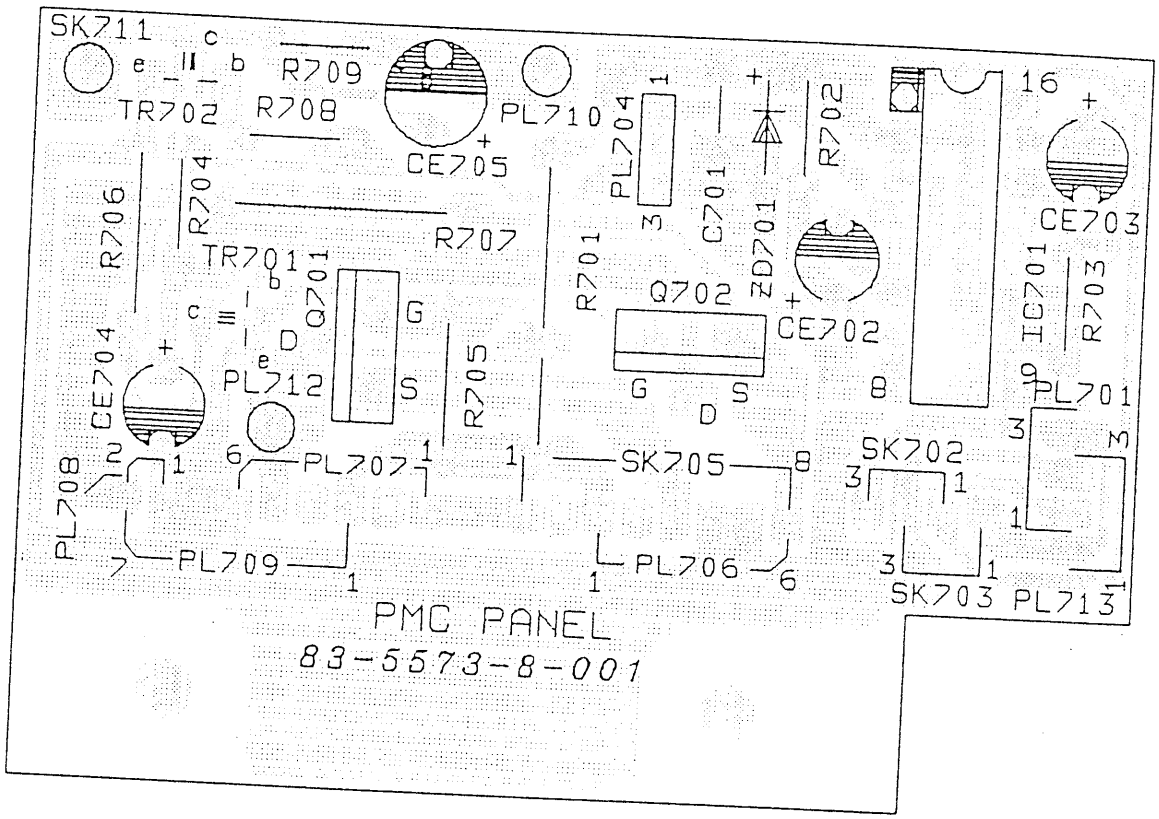
Component side



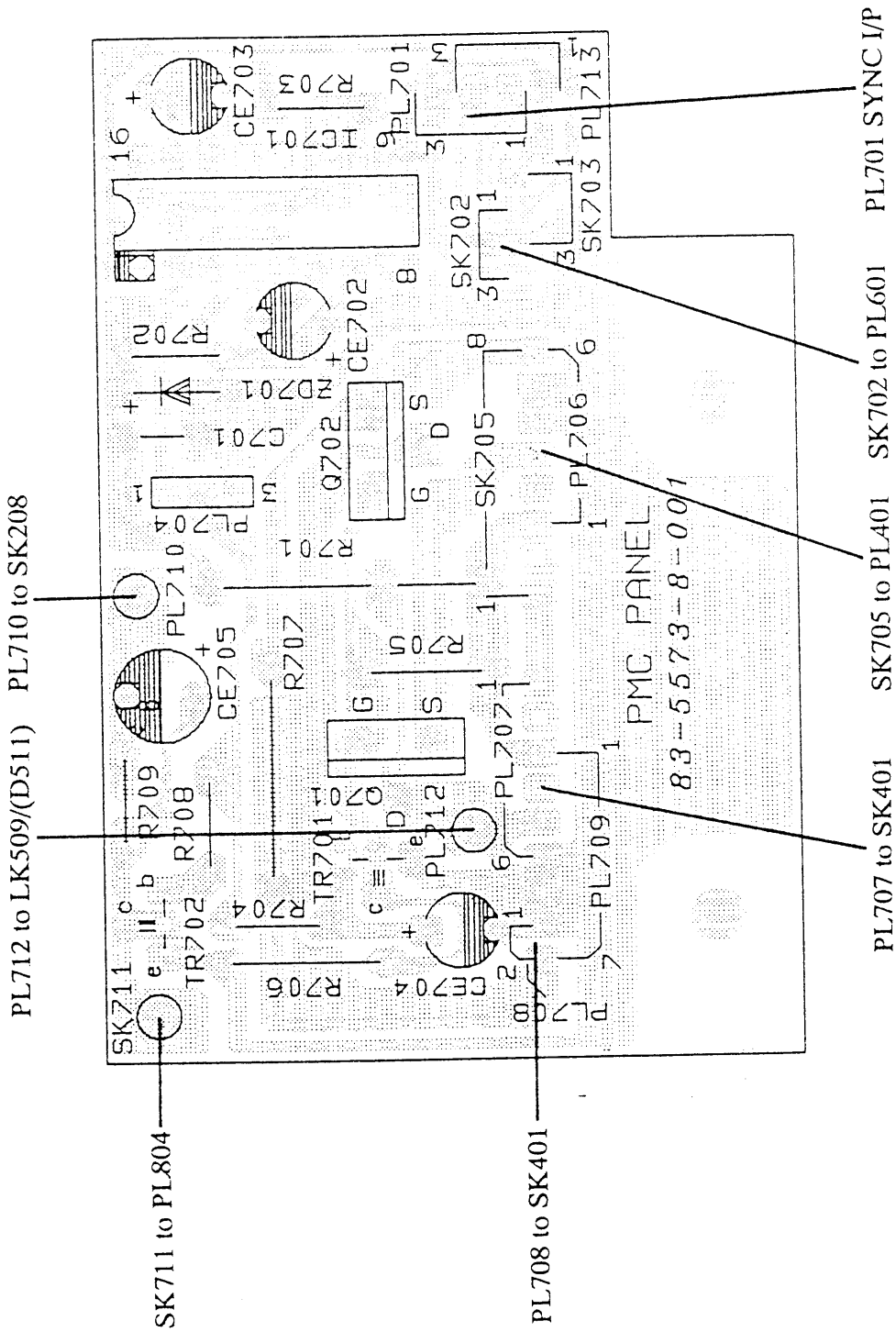
Track side



POWER MANAGEMENT PANEL (Component side)

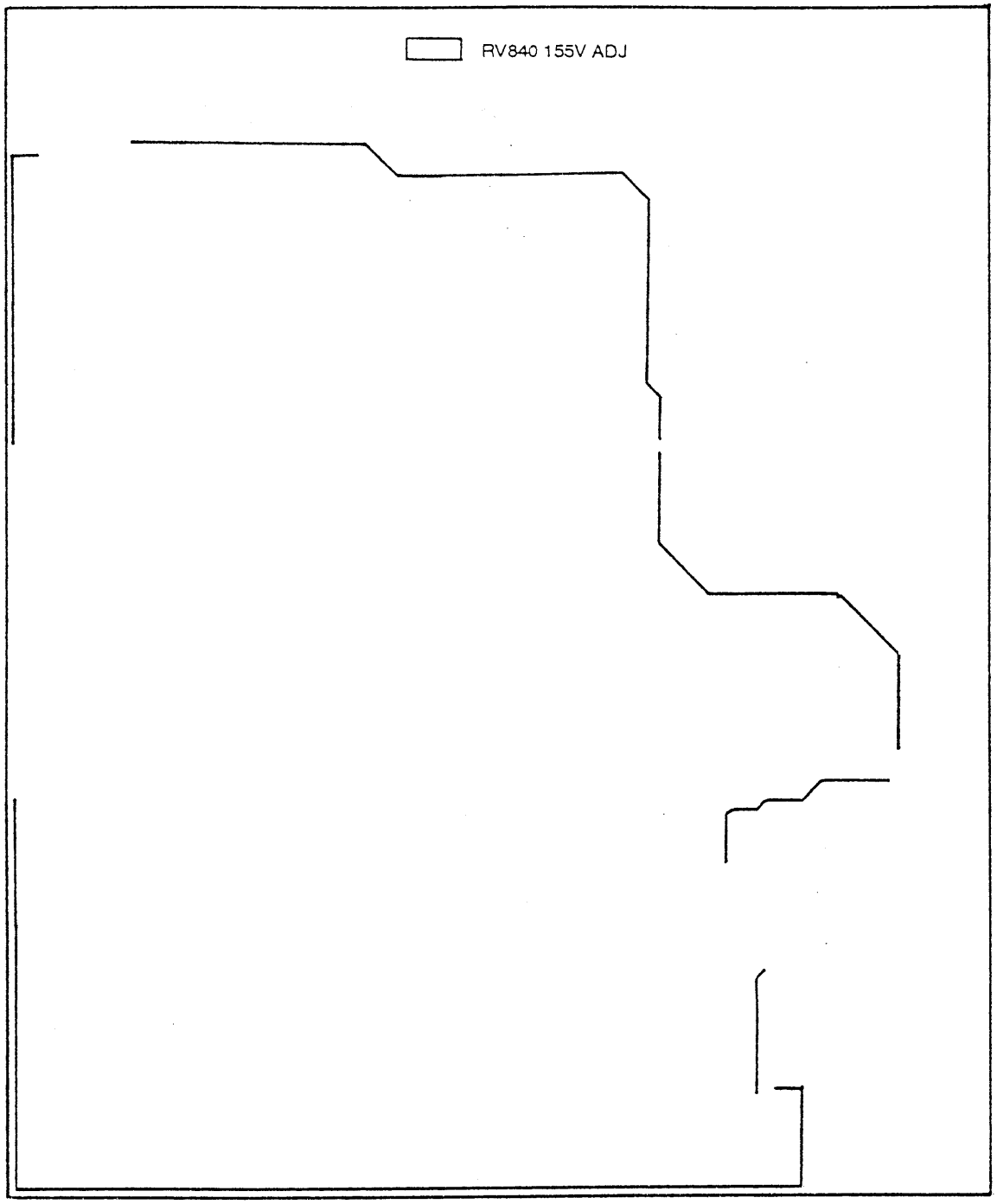


POWER MANAGEMENT PANEL INTERCONNECTIONS

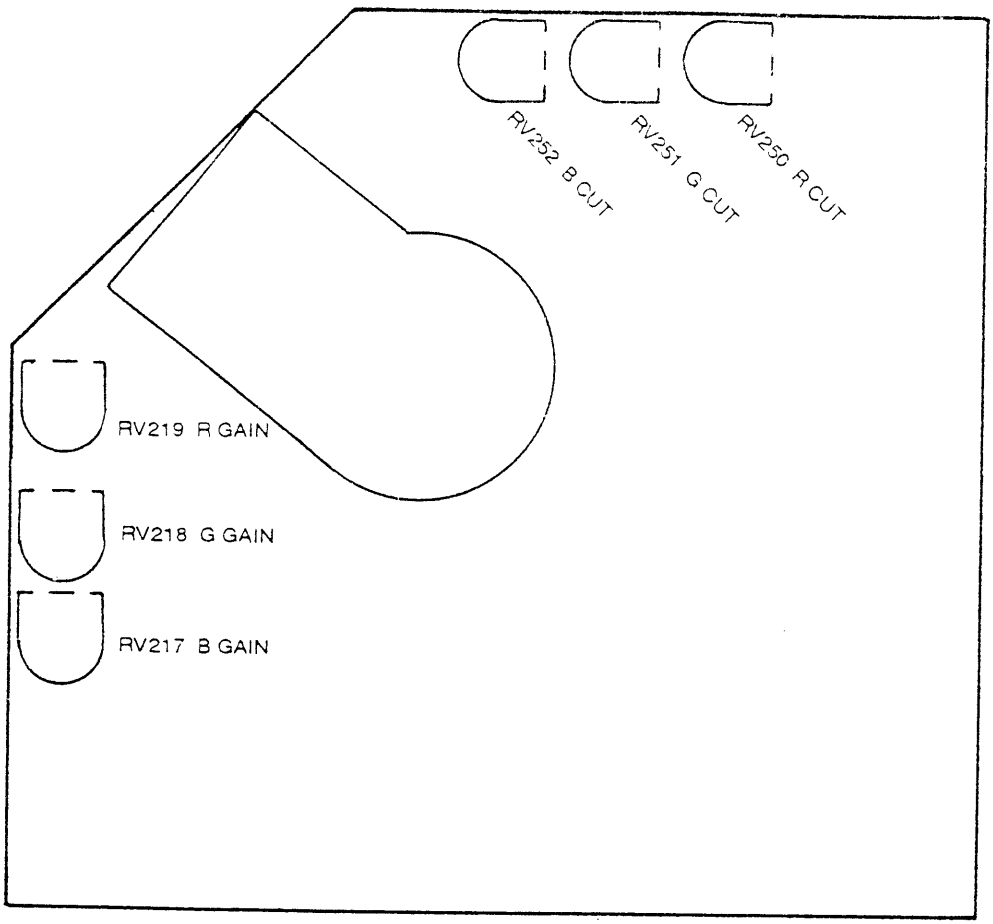


SECTION 8 ADJUSTMENTS

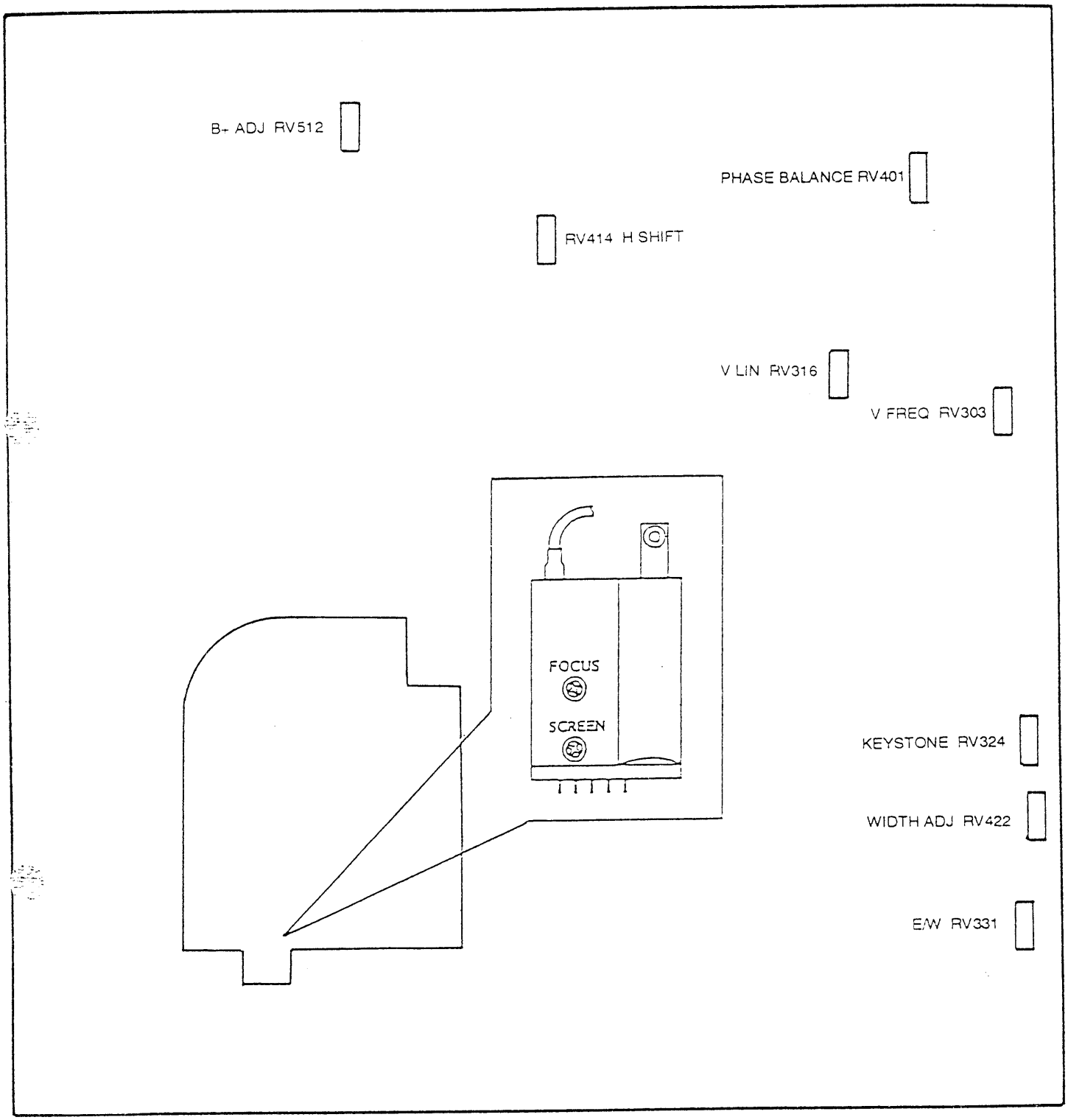
POWER SUPPLY PANEL



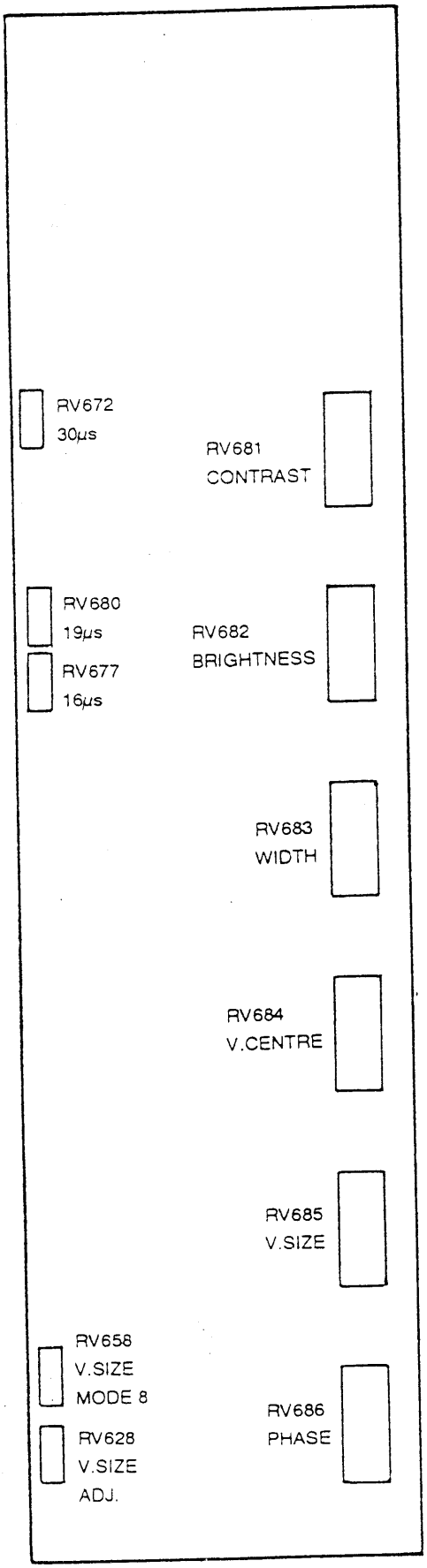
VIDEO PANEL


RV252 B CUT
RV251 G CUT
RV250 R CUT
RV219 R GAIN
RV218 G GAIN
RV217 B GAIN

DEFLECTION PANEL



CONTROL PANEL



SECTION 9 LIST OF COMPONENTS

9.1 RESISTORS

Components which are marked ⚠ in the Parts List and on the circuit diagram are Safety Approved types and should be replaced only with components supplied or approved by the manufacturer's Service Department. It is also recommended that components not marked with the safety symbol should be replaced with parts of the type originally fitted. This applies particularly to those resistors which are stood off the printed circuit board.

The manufacturer reserves the right to modify the design of the product, and to use or supply such alternative components as may be deemed necessary.

Not all components are fitted to every chassis variant. Always replace with the same type as originally fitted or an alternative approved by the manufacturer's Service Department.

The majority of resistors are either 0.125W, 0.25W, 0.4W, 0.5W or 0.6W, 5% or 10% standard carbon or metal film types which are readily available from most component stockists. Replacements should be of the same rating and tolerance as the originals. Refer to the appropriate circuit diagram for values.

The resistors listed below should only be replaced with components approved or supplied by TATUNG Service Department.

Legend of the symbols preceding some components in this parts listing:

*	110/240V switchable version - N3 for America.
Σ	240V only version - N1 for Europe.
θ	Fitted on 300mA heater current Toshiba tubes.

Cct Ref.	Value	Tol%	Wattage	Type	Part Number	
R223	2K2	1	0.125	M/F	11-5657-8	
R224,	12K	1	0.125	M/F	11-5537-7	
⚠R228,411	4R7	5	0.5	M/F FL.RET	11-5291-2	
R256-258	100R	10	0.5	C-COMP	11-5452-4	
R259,260	1K	10	0.5	C-COMP	11-2621-0	
⚠R280	220R	5	0.5	M/F FL.RET	11-5424-9	
R406	220R	5	3.0	W/WOUND	11-5542-3	
R410	470R	10	0.5	C-COMP	11-2715-2	
R426 (14" Tube)	1K	5	0.125	C/F	11-5213-0	
R426 (15" Tube)	150R	5	0.125	S/F	11-5223-8	
R445	11K	1	0.125	M/F	11-5654-3	
R521	39R	5	5.0	W/WOUND	11-5659-4	
R522	82R	5	2.0	W/WOUND	11-5658-6	
⚠R801	270K	5	0.5	M/GLAZE	11-5319-6	
R838	100K	2	0.6	M/F	11-5266-1	
R805,806	220K	5	0.25	C/F	11-3377-2	*
R807,808	33K	5	3.0	M/F	11-5661-6	
R829	2K5	5	7.0	W/WOUND	11-5580-6	
⚠R830	1K	5	2.0	M/OXIDE	11-5612-8	
R831,832	18K	5	5.0	W/WOUND	11-5576-8	
⚠R843	0R68	5	0.5	M/F FL.RET	11-5294-7	θ
R846	24K	1	0.125	M/F	11-5655-1	
R641,659,661,663	39K	1	0.125	M/F	11-5623-3	
R643	62K	1	0.125	M/F	11-5650-0	
R644	3K0	1	0.125	S/F	11-5363-3	
R645,651	51K	1	0.125	M/F	11-5609-8	
R649	43K	1	0.125	M/F	11-5607-1	
R653,655,657,647	33K	1	0.125	M/F	11-5606-3	
R670	18K	1	0.125	M/F	11-5620-9	
R689	100K	1	0.125	M/F	11-5613-6	
⚠R701	1K	5	0.5	M/F FUSIBLE	11-4292-5	
⚠R707 (Toshiba CRT)	6R8	10	2	M/F FL.RET	11-5669-1	
⚠R707 (Hitachi CRT)	0R39	10	2	M/F FL.RET	11-5686-1	
⚠R707 (C.P.T CRT)	2R2	10	2	M/F FL.RET	11-5688-8	
R802		THERMISTOR 10R NTC			11-5529-6	
⚠R804		THERMISTOR DUAL POS			11-3569-4	* * Σ
⚠R804		THERMISTOR DUAL PTC 18R			11-5531-8	* * Σ
⚠R850,851		VARISTOR VL140LA2			11-5643-8	
RV217-219	100R	POT LIN 25%	PST MIN		12-3170-7	
RV250-252	100K	POT LIN 25%	PST MIN		12-3183-9	
RV303,331,658	10K	POT LIN 25%	PST MIN		12-3199-5	
RV316	100K	POT LIN 25%	PST MIN		12-3202-9	

Cct Ref.	Value	Tol%	Wattage	Type	Part Number
RV324,401,672, RV677,680	4K7	POT LIN 25%	PST MIN		12-3204-5
RV414	100R	POT LIN 25%	PST MIN	0.1W	12-4585-6
RV422	22K	POT LIN 25%	PST MIN		12-4588-0
RV512	1K	POT LIN 25%	PST MIN		12-4582-1
RV840	470R	POT LIN 25%	PST MIN		12-3211-8
RV628	47K	POT LIN 25%	PST MIN		12-3205-3
RV681,684,686	10K	POT LIN 20%	R121V0AF15B103		12-3215-0
RV682,683,685	100K	POT LIN 20%	R121V1AF15B104		12-3206-1

9.2 Capacitors

Many of the capacitors are common usage components and can be obtained from most electronic component stockists. Refer to the circuit diagram for values. Replacements must be of the same tolerance and rating as the originals.

Capacitor types are identified according to the following codes:

C - Ceramic; CD - Ceramic Disc; CP - Ceramic Plate; E - Electrolytic; MP - Metallised Polyester; P - Polystyrene; PP - Polypropylene; TC - Tubular Ceramic.

Cct Ref.	Value	Tol%	Voltage	Type	Part Number
C210	10n	-20+80	63	CP	14-6892-8
C221,230-232,440, C308	10n	20	400	MP	14-6838-3
C234,241	10n	-20+50	2kV	CD	14-6954-1
C242,445	100n	5	100	CP	14-7221-6
C315	10n	10	400	MP	14-6994-0
C317,816,301,306	4n7	10	100	CP	14-6894-4
C318	220p	2	50	CP N470	14-7092-2
C321,428,522,634	1n	10	100	CP	14-6934-7
C322,519	10n	-20+80	63	CP	14-6892-8
C403	15n	20	400	MP	14-6933-9
C411	1n	20	400	CD	14-4320-8
C420	56p	5	2kV	CP	14-7215-1
C425	10n	-20+50	100	CP	14-6903-7
C441	470p	10	100	CP	14-6940-1
C442,826	22n	10	250	MP	14-6877-4
C506	3n3	10	100	CP	14-6998-3
C510,637,639,640	10n	5	400	MP	14-6842-1
C521,833	100n	20	250	MP	14-4386-0
C314	180p	1	630	P	14-6014-5
C406	470p	5	1k5	PP	14-6985-1
C407	5n6	5	2kV	PP	14-7222-4
C409	15n	5	630	PP	14-7237-2
C413	390n	5	250	PP	14-7241-0
C415	1μ	5	250	PP	14-7225-9
C416	680n	5	250	PP	14-7236-4
C421,427	470p	1	630	P	14-6999-1
C435	120p	1	630	P	14-4917-6
C436,835	1n0	1	250	P	14-7003-5
C444	220p	20	400	CD	14-4537-5
C446	2n2	5	1600		14-7248-8
C507,814,815,638	3n3	1	160	P	14-4849-8
C511	100n	20	100	MP	14-6864-2
C813	470p	2	100	CP N1500	14-7045-0
⚠C801	1μ	20	250VAC	MAINS	14-6919-3
⚠C802	470n	20	250VAC	CLASS X2	14-7029-9
⚠C806	1n	20	250	C	14-6937-1
C818	33n	10	1kV	PP	14-6991-6
C819	680p	5	1K6	PP	14-7077-9
C820	100n	20	400	MP	14-5003-4
C825	22n	20	400	MP	14-6981-9
⚠C827,828,831,832	4n7	20	250VAC	CLASS Y	14-7209-7
CE225-227,834,705	1μ	20	160	ELECT	14-7212-7
CE220	47μ	20	160	ELECT	14-7120-1
CE236	10μ	20	160	ELECT	14-7044-2
CE501	47μ	20	250	DC LOW ESR	14-6992-4
CE504,517	33μ	20	160	105C ELECT	14-7205-4

Cct Ref.	Value	Tol%	Voltage	Type	Part Number
CE807	100μ	20	400	105C ELECT	14-7079-5 Σ
CE807,808	220μ	20	200	105C ELECT	14-7142-2 *
CE821	100μ	20	160	10CC ELECT	14-7144-9
CE822	47μ	20	100	105C ELECT	14-7201-1
CE823	2200μ	20	25	105C ELECT	14-7204-6
CE824	1000μ	20	25	105C ELECT	14-7210-0

9.3 Integrated Circuits

Cct Ref.	Description	Part Number
IC201	LM1203N NAT SEMI	19-8589-2
IC202	LM2416T NAT SEMI	19-8587-6
IC301	TDA1675A SGS THOMSON	19-8480-2
IC302	TDA4950 SGS THOMSON (14" Tubes)	19-8660-0
IC302	TDA8145 SGS THOMSON (15" Tubes)	19-8698-8
IC303,402	LM358N NAT SEMI	19-8356-3
IC401	4046B MOTOROLA	19-8597-3
IC403	LM317T NAT SEMI	19-8264-8
IC501	UC3842AN UNITRODE	19-8696-1
IC502	REGULATOR +12V, 0.5A, TO220 MOTOROLA, SGS, NAT SEMI	19-8398-9
IC503	REGULATOR +5V, 0.5A, TO220 MOTOROLA	19-8333-4
IC630	74LS86 MOTOROLA	19-8008-4
IC631,632,701	74LS123 MOTOROLA	19-8039-4
IC633	74LS02 MOTOROLA	19-8006-8
IC634	74LS05N NAT SEMI	19-8648-1
IC635,636	74LS156 MOTOROLA	19-8535-3
IC801	UC3842AN UNITRODE	19-8696-1
⚠ IC802	CNY17-2ZW QUAL TECH	19-8644-9
⚠ IC802	Alternative TLP731(D4)-LF2	19-8690-2
IC803	REGULATOR TL431CLPR TEXAS	19-8584-1

9.4 Transistors

Cct Ref.	Description	Part Number
TR201-203	BF423 PHILIPS	19-8293-1
TR204,702	BF422 PHILIPS	19-8150-1
TR205-207, TR406,410,411, TR413,414,416, TR417,419-421, TR423,425,426, TR503,801-803, TR636	2SA1015Y PNP TOSHIBA	19-8591-4
TR210-212,412	PH2369 PHILIPS	19-8324-5
TR301, TR630-635, TR637-639	2SC1815-BL NPN TOSHIBA	19-8646-5
TR415,418,427, TR501,502,504, TR505,701	2SC1815Y NPN TOSHIBA	19-8590-6
TR422	2SD667C HITACHI	19-8601-5
TR407	TIP31C TEXAS,SGS,HARRIS	19-7857-8
TR402	2SC3884A TOSHIBA	19-8467-5
Q501	FET 2SK526	19-8705-4
Q401,402	FET 2SK1035 12A150V MATSUSHITA ELECTRIC FET 2SK525 10A 150V TOSHIBA	19-8602-3 or 19-8704-6
Q701,702	BUK452-60B	19-8710-0
Q801	FET 2SK1649 TOSHIBA	19-8647-3

9.5 Coils and Chokes

Cct Ref.	Description	Part Number
L201,202,402	CHOKE 33μH 10% LALO3 TAIYO YUDEN	15-7818-9
L203-205	CHOKE 2μ2H 10%	15-7800-6
L208-210	CHOKE 150nH 10%	15-7692-5
L211-213	CHOKE 680nH 10%	15-7786-7
L214-216	CHOKE 1μH 10% LAL04 TAIYO YUDEN	15-7842-1
L403	CHOKE 1μH 10%	15-7726-3

Cct Ref.	Description	Part Number
L401	HORIZONTAL LINEARITY COIL, DELTA	15-7830-8 or
	HORIZONTAL LINEARITY COIL, JET SIGNAL	15-7804-9
		15-7723-9
L404	CHOKE 100μH 10%	87-0229-2-001
L501	CHOKE 3mH 10% 1A, KV ELECTRONICS	85-1753-3
L502	CHOKE 10μH (HIGH CURRENT)	87-0235-7-001
L901	DEGAUSSING COIL	

9.6 Diodes

Cct Ref.	Description	Part Number
D201-203,505	1SS83 HITACHI	19-8595-7
D204,224,301, D504,509-511 D825,826,828	1N4003	19-8346-6
D205,303,304, D306-308,416, D417,419,422, D423,426-428, D424,431,432 D433,501, D502,506,808, D814-817,830, D632,634,513	1N4148	19-3992-0
D407,408,507, D812,813	RGP10D GEN INST	19-8603-1
D421,807,827	THYRISTOR TICP106D TEXAS	19-8544-2
D404	UF5404 3A 400V 50ns GEN INST	19-8606-6
D503	RPG10J GEN INST	19-8331-8
D402,403	5A 1600V 5THZ52 TOSHIBA	19-8650-3
D801-804	BY133GP GEN INST	19-8144-7
D809,811,818, D810	RGP15M GEN INST	19-8340-7
D820,832,819	RGP10M GEN INST	19-5135-1
D821,822	BY229-200 PHILIPS	19-8310-5
D633	L.E.D GREEN 90 5mm LEG	19-8505-1
ZD302,413	ZENER 2V7 500mW	19-8598-1
ZD305	ZENER C9V1 5% 345mW V/REG	19-4033-3
ZD418	ZENER C6V8 5% 345mW V/REG	19-4528-9
ZD420	ZENER C33V 5% 345mW V/REG	19-8531-0
ZD512	ZENER C4V7 5% 350mW V/REG	19-8032-7
ZD701	ZENER C5V1 5% 345mW V/REG	19-6295-7
ZD806	ZENER C16V 5% 345mW V/REG	19-4517-3
ZD823	ZENER C12V 5% 350mW V/REG	19-5070-3

9.7 Transformers

Cct Ref.	Description	Part Number
T401	LINE DRIVE	87-0234-9-001
⚠ T402	FLYBACK MURATA	15-7794-8-004 or
	FLYBACK SANYO	15-7792-1-004
T403	DIODE MODULATOR	87-0223-3-003
T501	GATE DRIVE	87-0233-0-001
⚠ T801	SWITCHED MODE	87-0217-9-002

9.8 Crystals, Filters, Delay Lines

Cct Ref.	Description	Part Number
⚠ FL802	FILTER TLF-011 SHINING YUAN	15-7688-7

9.9 Wiring Assemblies

Cct Ref.	Description	Part Number
⚠ SK901	CRT BASE SKT CVT3240-1251 SMK	25-2070-2
SK402	WIRING HARNESS BKG/CMP	83-5207-0-002
SK208	WIRE G1 BIAS	83-5320-4-002
SK406,714	SHUNT TYPE 9610-102-10 METHODE	22-8203-8
SK204	WIRING HARNESS, POWER VIDEO	83-5206-2-002
SK604	WIRING HARNESS, SYNC DECODER	83-5201-1-003
SK401	WIRING HARNESS, POWER DEFL.	83-5205-4-002
SK602,603	WIRING HARNESS, AC POWER	83-5209-7-002

Cct Ref.	Description	Part Number
SK202	WIRING HARNESS, BRI/CONT	83-5208-9-003
SK404	WIRING HARNESS, WIDTH	83-5204-6-003
SK405	WIRING HARNESS, S-CAP	83-5203-8-002
SK409	WIRE OVP DRIVE	83-5711-0-001
SK702	WIRING HARNESS, SYNC. FEED	83-5588-6-001
SK705	WIRING HARNESS, POWER DEFLECTION	83-5205-4-002
SK707	WIRING HARNESS, POWER SOURCE	83-5589-4-001
SK711	WIRING HARNESS, SPOT SUPPRESSION	83-5591-6-001
SK712	WIRING HARNESS, 12V REGULATOR\	83-5590-8-001

9.10 Connectors

Cct Ref.	Description	Part Number
PL201,402,708	2 WAY PLUG	22-8386-7
PL202	3 WAY PLUG	22-8372-7
PL203	8 WAY PLUG JAE	22-8390-5
PL204,401, PL405,707	6 WAY PLUG 5267-06NA MOLEX	22-8352-2
PL205	1 WAY PLUG B1P-LV-TN-JST	22-8280-1
PL206,207,407, PL409,804,710,712	PCB PIN 2.36mm MOLEX 16-06-0005	22-8421-9
PL403	BASE OF PIN 6P. HBR-206C	22-8255-0
PL404	4 WAY PLUG 5267-04	22-8363-8
PL406	4 WAY PLUG 22-03-2041 MOLEX	22-8210-0
PL408	WIRE LINK	83-5517-7-001
PL601,701	3 WAY PLUG JAE	22-8391-3
PL602,603	2 WAY PLUG 5289	22-8402-2
PL604	4 WAY PLUG 5267-05	22-8364-6
PL704	3 WAY PLUG	22-8076-0
PL801	2 WAY PLUS BASE	22-8423-5
PL802	3 WAY PLUG RTB-1.5-3 JST	22-8279-8

9.11 CRT

Description	Part Number
⚠ 14" M34AFA60X33 CHUNGHWA STANDARD	18-1040-5
⚠ 14" M34AFA80X33 CHUNGHWA ANTI-STATIC	18-1049-9
⚠ 15" M36KLH80X17(DH) HITACHI NORMAL	18-1058-8
⚠ 15" M36KLH80X17(YH) HITACHI NORMAL	18-1063-4
⚠ 15" M36KLH680X18 HITACHI VLMF/ANTI-STATIC	18-1056-1
⚠ 15" M36KPN26XX04 TOSHIBA NORMAL	18-1055-3

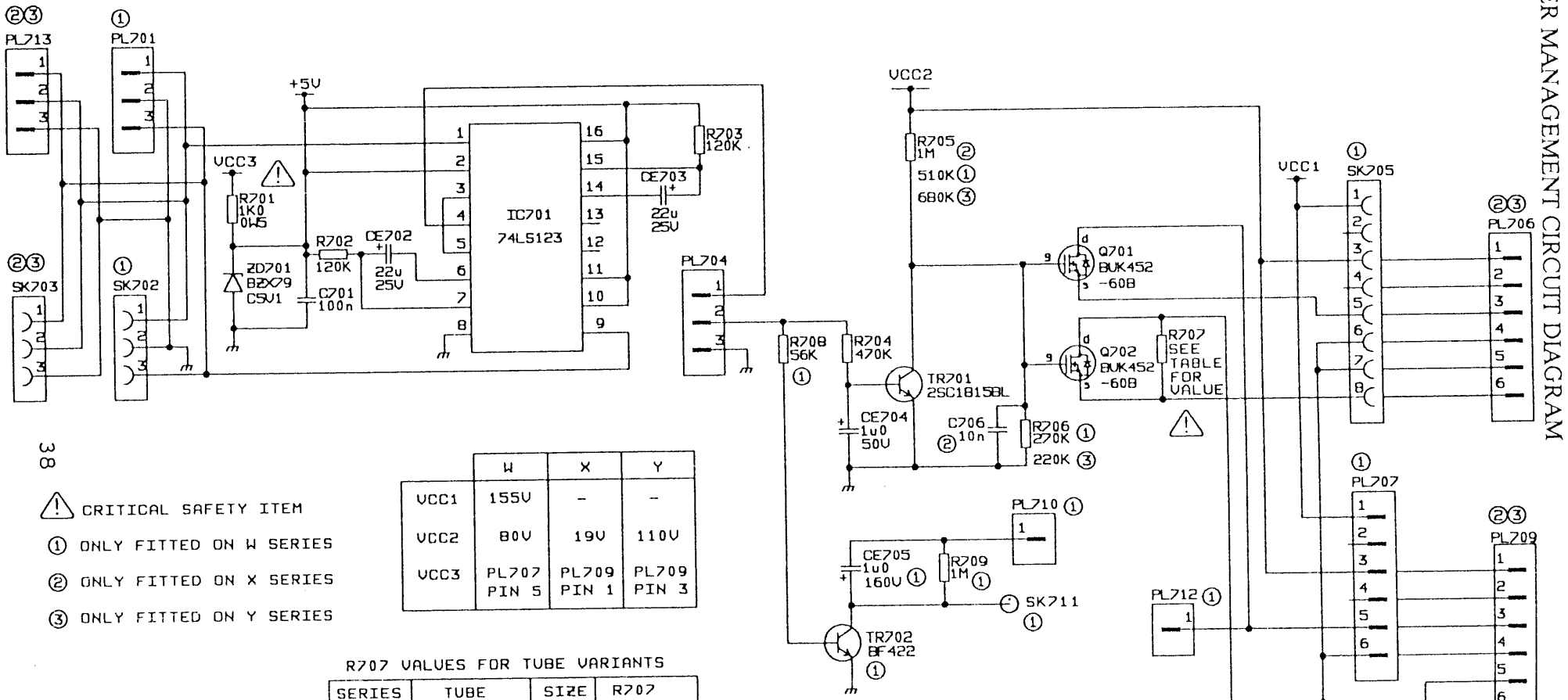
9.12 Miscellaneous

Cct Ref.	Description	Part Number
⚠ SE2	LEAD PRIMARY EARTH (MOLEX)	83-5273-9-001
SE4	LEAD EARTH W SERIES	83-5651-3-001
⚠ FS401	FUSE, T500mA TR5-T 19372/K	21-3713-5
E2	LEAD, E2 (MOLEX)	83-5168-6-001
⚠ F801A	FUSE HOLDER DE611/01	21-3712-7
⚠ FS801	FUSE, TIMELAG 2A CERAMIC	21-3685-6
⚠ SE1	LEAD, PRIMARY EARTH	83-5686-6-001
⚠ S801	SWITCH, 2 POLE PUSH-PUSH POWER	20-4091-3
⚠ S801	ALTERNATIVE, 2 POLE MAINS DPST	20-4089-1
⚠ G201,202,203	SPARK GAP DSP-201M-A11F MITSUBISHI	21-3727-5-26
	⚠ KNOB, V/R ABS	83-4008-0-002
	SIGNAL LEAD	83-5260-7-001
	COVER ESCUTCHEON	83-4306-3/130100
	BRAID EMC	83-5514-2-001
	SWIVEL WASHER	83-4148-6-003
	RUBBER FOOT (WHITE)	83-5020-5-002
	⚠ MAINS CORDSET IEC320, 10A, 1 METRE	22-8366-2
*	⚠ POWER CORDSET UL	22-8355-7
*	SWITCH SLIDE SPDT	20-4090-5
	⚠ CHASSIS RUNNER L.H MX3 ABS	83-4054-4-001
	⚠ CHASSIS RAIL R.H ABS	83-4005-6-003
	⚠ PCB SUPPORT BRACKET MX3 ABS	83-4916-9-001

Cct Ref.	Description	Part Number
(V/VA MODELS)	COIL, MAGNETIC FIELD CANCELLING	83-5323-9-002
(V/VA MODELS)	LEAD DAG COAT EARTH	83-5185-6-003
(V/VA MODELS)	SPRING CONNECTOR DAG COATING	83-5215-1-002
	FOAM PAD	83-4623-2
	HEATSINK/SCREEN VIDEO	83-5013-2-003
	HEATSINK DEFLECTOR	83-5151-1-003
	EARTHING BRAID (14")	83-5303-4-001
	EARTHING BRAID (15")	83-5363-8-001
⚠	LEAD, P-BAND SAFETY EARTH 310mm	83-5286-0-002
⚠	CONNECTOR, AC POWER, IEC320, 10A	22-8322-0
	PRISM	83-4315-2-002
	BRACKET MAINS FILTER	83-4060-9-006
	SCREEN DST MX3	83-4921-5-002
	SCREEN PSU INNER	83-5012-4-001
	CLAMP PLATE	83-5016-7-001
	BRACKET CLAMP DST	83-5150-3-002
	OPERATING INSTRUCTIONS W SERIES	79-1481-4-005A
*	OP' INST'S W SERIES USA/CANADA	79-1527-6-002

N.B. When ordering the following parts you will need the serial and model numbers of the monitor to ensure you receive the correct part. Because of different batch numbers there may be slight variations in colour when ordering the following designated replacement parts.

⚠	FRONT COVER MX3 (14")	83-4052-8
⚠	FRONT COVER MX3 (15")	83-4050-1
⚠	BACK COVER MX3 (14"/15")	83-4053-6
	SWIVEL BASE MX2/MX3	83-5024-8
	SWIVEL TOP MX2/MX3	83-4057-9
⚠	KNOB ON/OFF MX3	83-4055-2



	W	X	Y
VCC1	155V	-	-
VCC2	80V	19V	110V
VCC3	PL707 PIN 5	PL709 PIN 1	PL709 PIN 3

⚠ CRITICAL SAFETY ITEM

① ONLY FITTED ON W SERIES

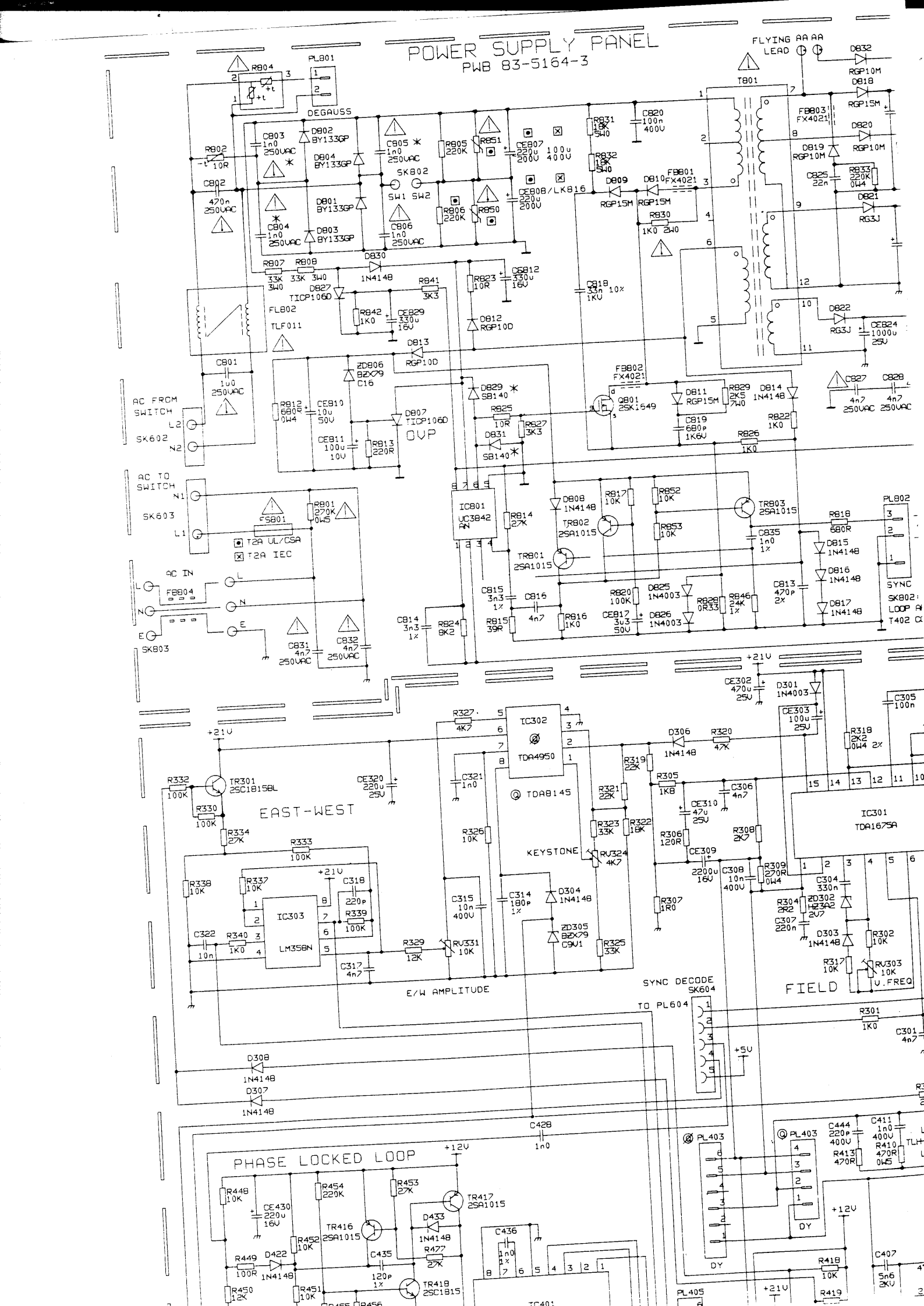
② ONLY FITTED ON X SERIES

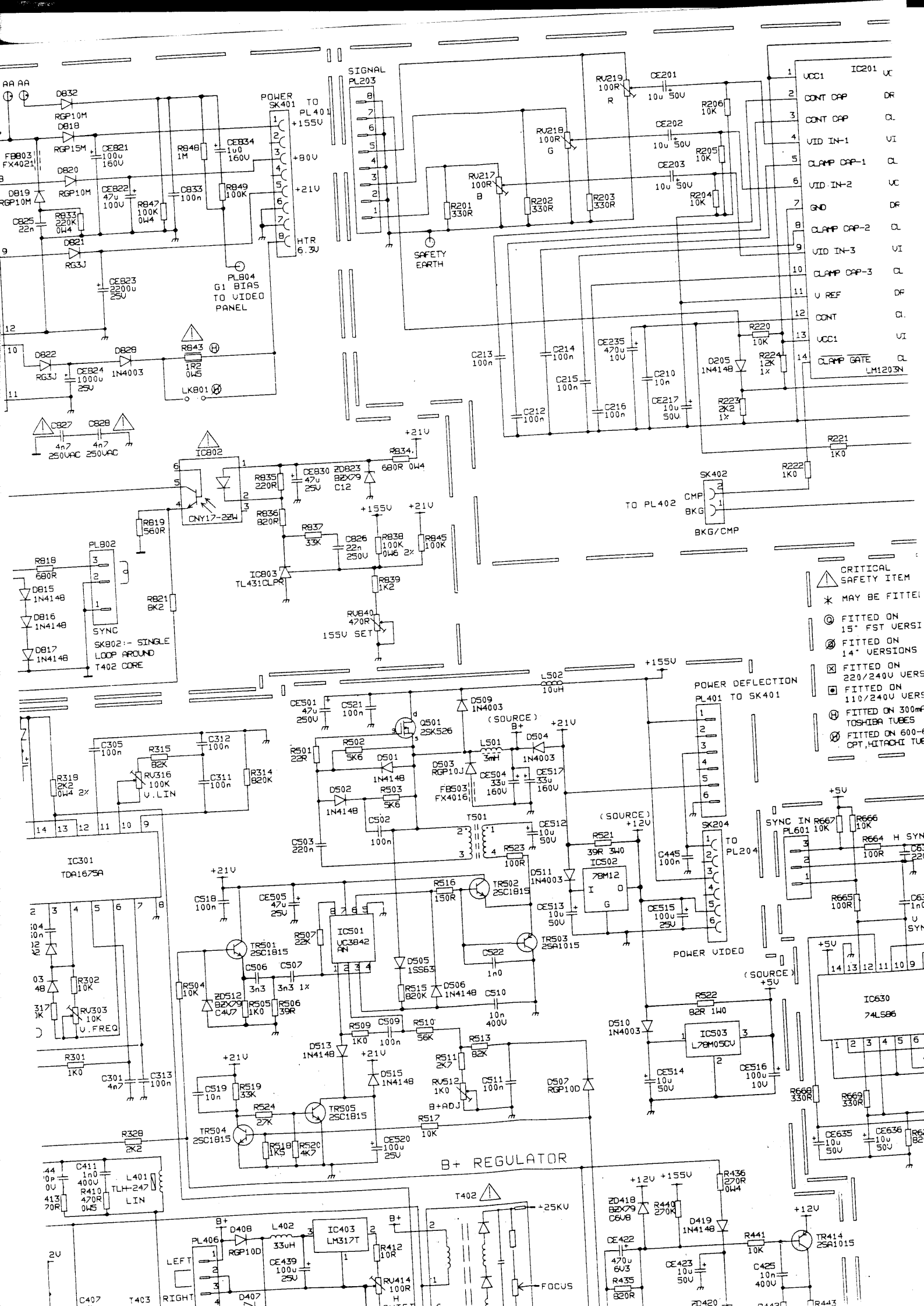
③ ONLY FITTED ON Y SERIES

R707 VALUES FOR TUBE VARIANTS

SERIES	TUBE	SIZE	R707
W	TOSHIBA	15"	6R8 2W
W	HITACHI	15"	0R39 2W
W	CHUNGHWA	14"	2R2 2W
X	CHUNGHWA	14"	4R7 2W
Y	CHUNGHWA	14"	2R2 2W

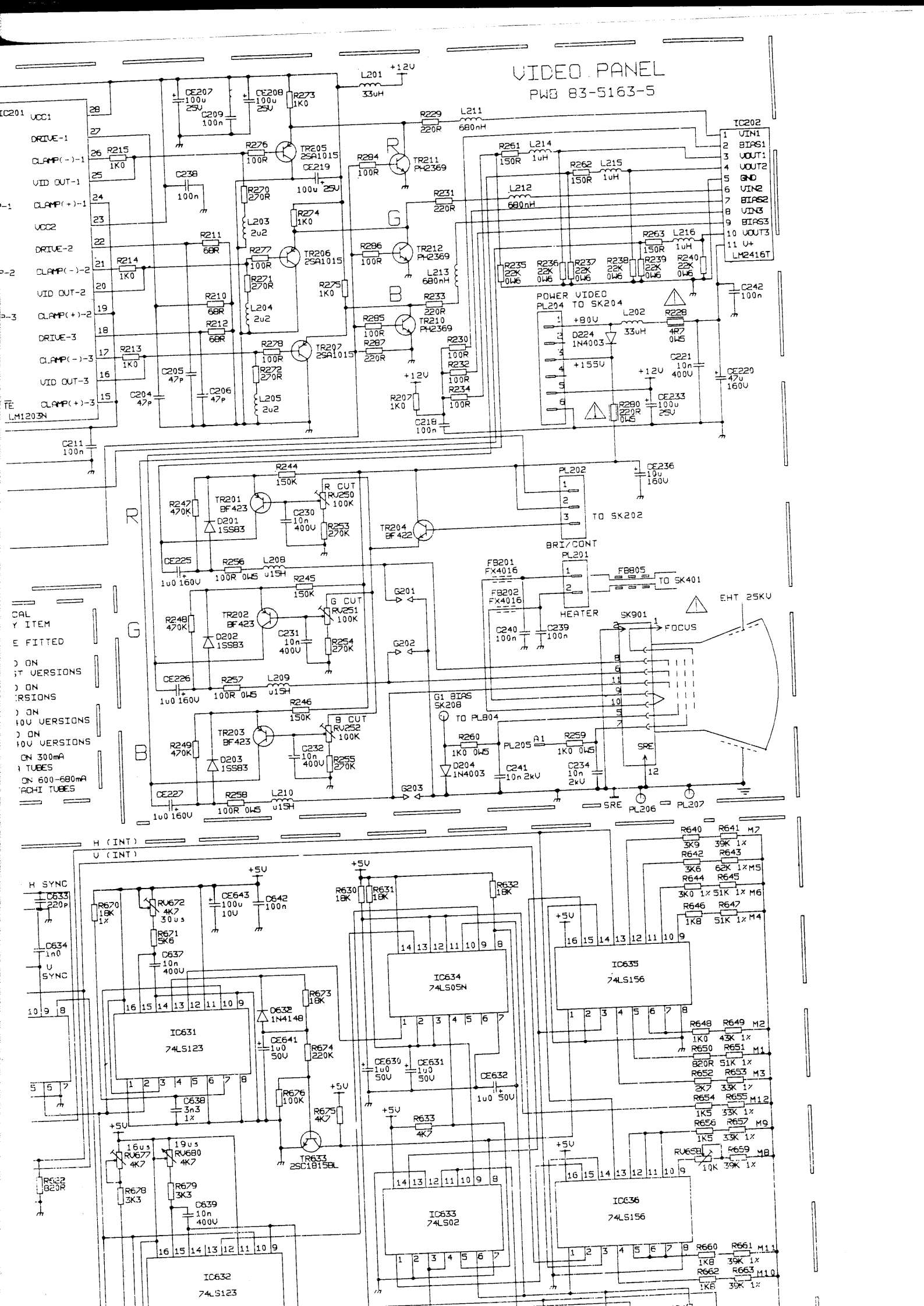
CIRCUIT DIAGRAM
POWER MANAGEMENT CONTROL PANEL
79-1575-6-001 Jan '94

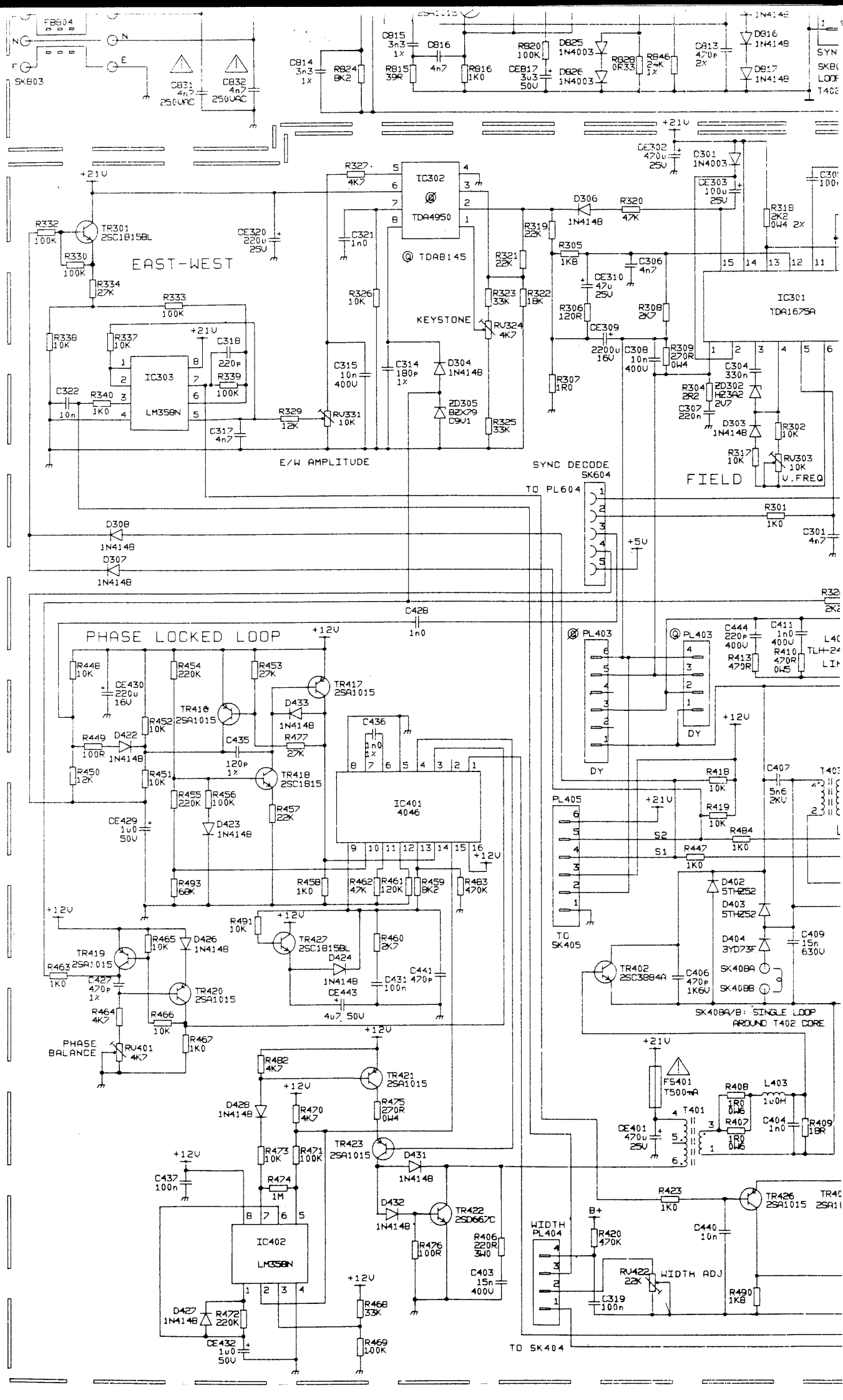

POWER SUPPLY PANEL
PWB 83-5164-3
FLYING LEAD
DEGAUSS
AC FROM SWITCH
AC TO SWITCH
AC IN
SK602
SK603
SK803
SK802
SK604
PL801
PL802
PL403
T801
FL802
TLF011
IC801
UC3842
IC302
TDA4950
TDA8145
IC303
LM358N
IC301
TDA1675A
TR301
2SC1815BL
TR801
2SA1015
TR802
2SA1015
TR803
2SA1015
TR416
2SA1015
TR417
2SA1015
TR418
2SC1815
Q801
2SK1649
OVP
EAST-WEST
E/W AMPLITUDE
KEYSTONE
V.FREQ
FIELD
SYNC DECODE
TO PL604
PHASE LOCKED LOOP
DY
T2A UL/CSA
T2A IEC
+21V
+12V
+5V

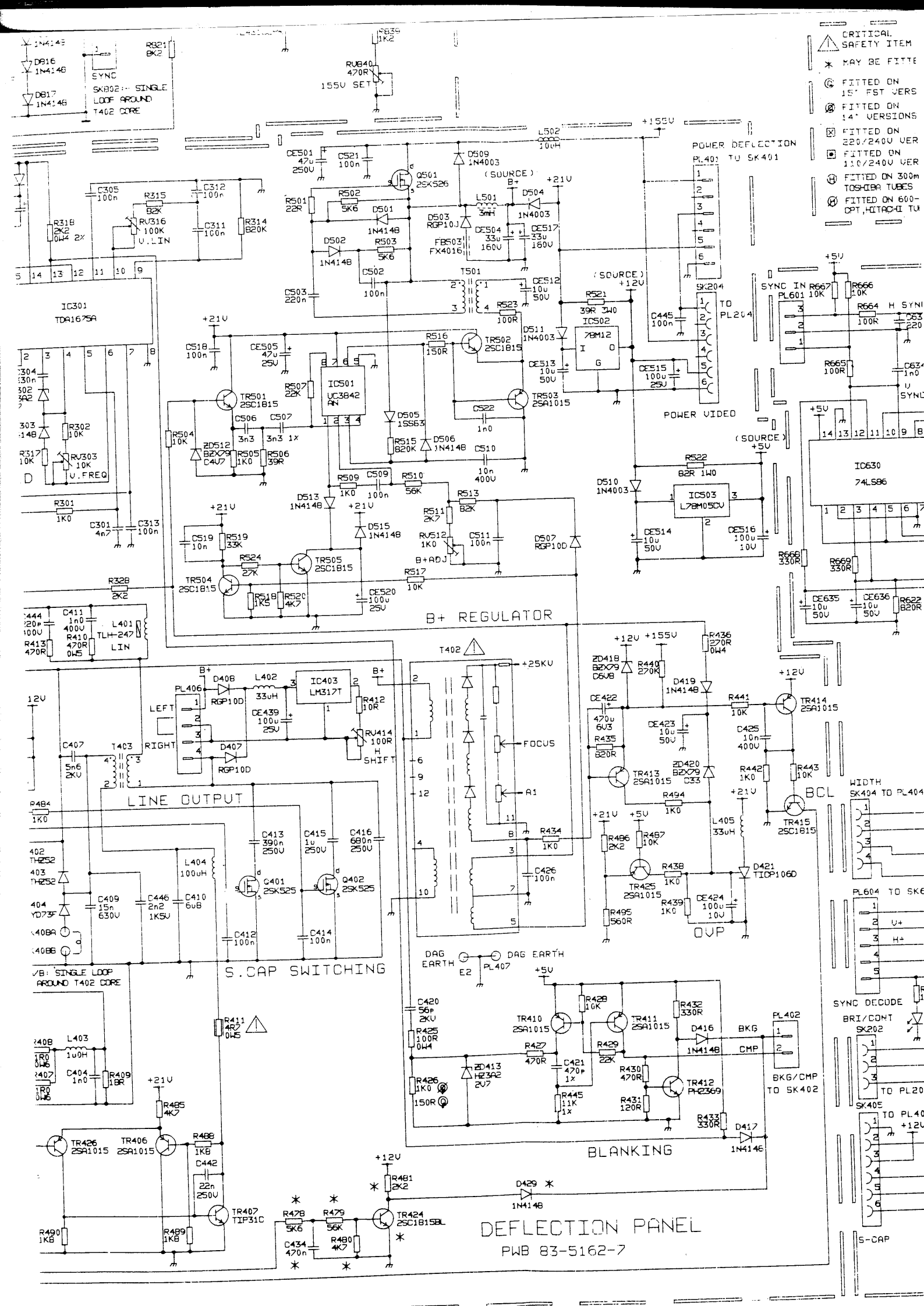

SIGNAL PL203
POWER SK401 TO PL401
+155V
+80V
+21V
HTR 6.3V
SAFETY EARTH
PL804 G1 BIAS TO VIDEO PANEL
IC201 LM1203N
VCC1
CONT CAP
CONT CAP
VID IN-1
CLAMP CAP-1
VID IN-2
GND
CLAMP CAP-2
VID IN-3
CLAMP CAP-3
V REF
CONT
VCC1
CLAMP GATE
SK402
CMP
BKG
TO PL402
BKG/CMP
IC802
CNY17-2&4
IC803 TL431CLPR
PL802
SYNC
SK802:- SINGLE LOOP AROUND T402 CORE
155V SET
CRITICAL SAFETY ITEM
MAY BE FITTED
FITTED ON 15" FST VERSIONS
FITTED ON 14" VERSIONS
FITTED ON 220/240V VERSIONS
FITTED ON 110/240V VERSIONS
FITTED ON 300mA TOSHIBA TUBES
FITTED ON 600-6 CPT,HITACHI TUBES
IC301 TDA1675A
V.LIN
V.FREQ
IC501 UC3842AN
IC502 78M12
IC503 L78M05CV
IC630 74LS86
POWER DEFLECTION
PL401 TO SK401
POWER VIDEO
TO PL204
SYNC IN PL601
B+ REGULATOR
B+ADJ
T402
T403
+25KV
FOCUS
LEFT
RIGHT
LIN
H

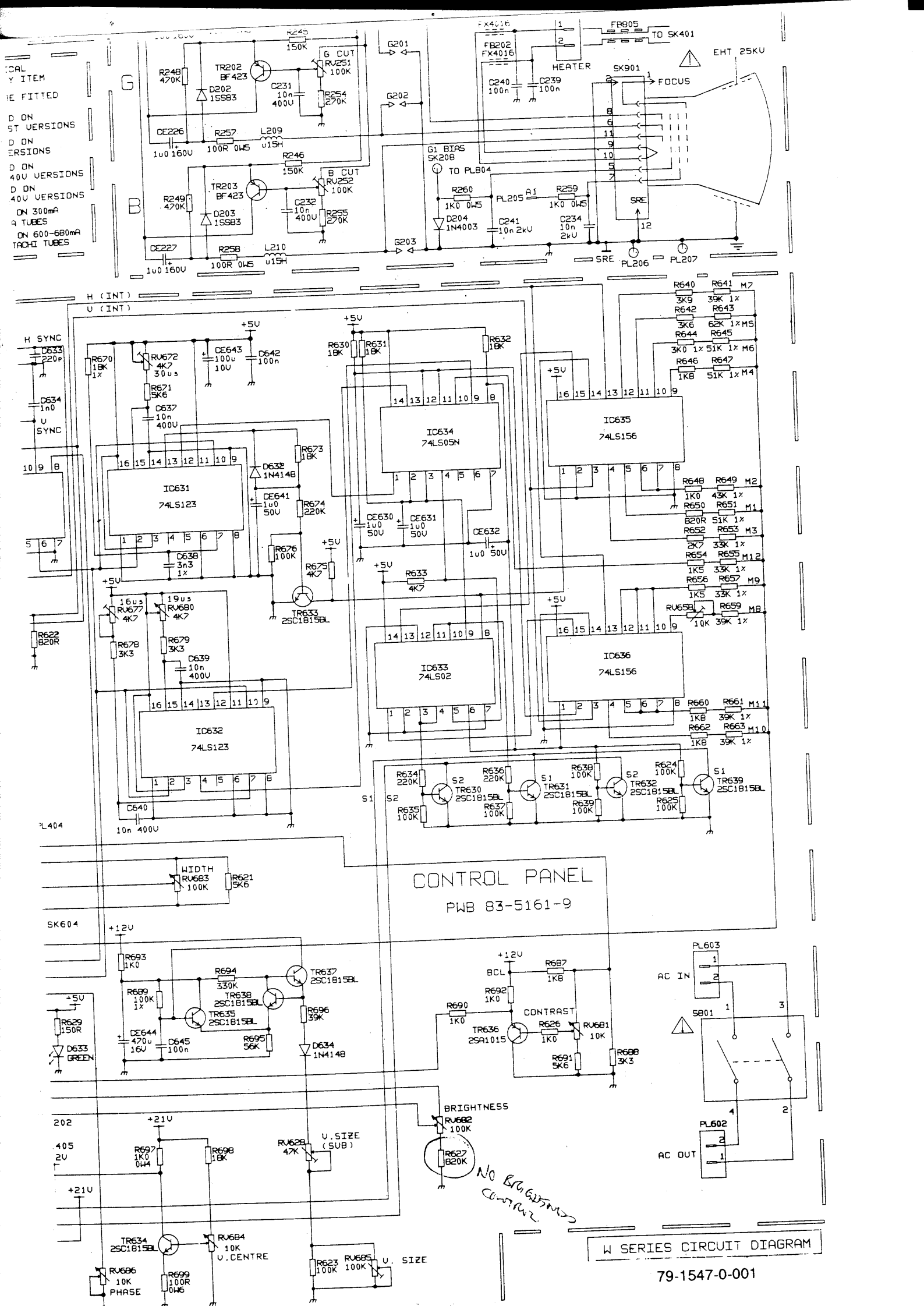
VIDEO PANEL

PWB 83-5163-5




SK803
FB804
CB31 4n7 250VAC
CB32 4n7 250VAC
CB14 3n3 1%
RB24 8K2
CB15 3n3 1%
CB16 4n7
RB15 39R
RB16 1K0
RB20 100K
CEB17 3u3 50V
DB25 1N4003
DB26 1N4003
RB28 0R33
RB46 2K4 1%
CB13 470p 2%
DB16 1N4148
DB17 1N4148
+21V
CE302 470u 25V
D301 1N4003
CE303 100u 25V
R318 2K2 0W4 2%
IC302
TDA4950
TDA8145
R327 4K7
C321 1n0
R326 10K
CE320 220u 25V
R319 22K
R321 22K
R323 33K
R322 18K
D306 1N4148
R320 47K
R305 1K8
C306 4n7
CE310 47u 25V
R306 120R
R308 2K7
CE309 2200u 16V
C308 10n 400V
R309 0R20 0W4
IC301
TDA1675A
R332 100K
TR301 2SC1815BL
R330 100K
R334 27K
R333 100K
EAST-WEST
KEYSTONE
RV324 4K7
R338 10K
R337 10K
IC303
LM358N
C318 220p
R339 100K
C322 10n
R340 1K0
C315 10n 400V
C314 180p 1%
D304 1N4148
ZD305 BZX79 C9V1
R325 33K
R329 12K
RV331 10K
C317 4n7
E/W AMPLITUDE
R307 1R0
C304 330n
R304 2R2
ZD302 HZ3A2 2V7
C307 220n
D303 1N4148
R302 10K
R317 10K
RV303 10K V.FREQ
FIELD
SYNC DECODE
SK604
TO PL604
R301 1K0
C301 4n7
D308 1N4148
D307 1N4148
+5V
C428 1n0
PHASE LOCKED LOOP
+12V
R448 10K
CE430 220u 16V
R454 220K
R453 27K
TR417 2SA1015
TR416 2SA1015
D433 1N4148
R452 10K
R449 100R
D422 1N4148
C435 120p 1%
R427 27K
R450 12K
R451 10K
TR418 2SC1815
R455 220K
R456 100K
R457 22K
D423 1N4148
CE429 1u0 50V
C436 1n0 1%
IC401 4046
R493 68K
R458 1K0
R462 47K
R461 120K
R459 8K2
R483 470K
R491 10K
TR427 2SC1815BL
R460 2K7
D424 1N4148
C441 470p
C431 100n
CE443 4u7 50V
TR419 2SA1015
R463 1K0
C427 470p 1%
TR420 2SA1015
R465 10K
D426 1N4148
R464 4K7
R466 10K
R467 1K0
PHASE BALANCE
RV401 4K7
R482 4K7
TR421 2SA1015
D428 1N4148
R470 4K7
R475 270R 0W4
TR423 2SA1015
D431 1N4148
R473 10K
R471 100K
R474 1M
C437 100n
IC402
LM358N
D427 1N4148
R472 220K
CE432 1u0 50V
R468 33K
R469 100K
D432 1N4148
TR422 2SD667C
R476 100R
R406 220R 3W0
C403 15n 400V
WIDTH PL404
B+
R420 470K
RV422 22K WIDTH ADJ
C319 100n
R423 1K0
TR426 2SA1015
C440 10n
R490 1K8
TO SK404
PL403
DY
C444 220p 400V
C411 1n0 400V
R410 470R 0W5
R413 470R
PL405
TO SK405
R418 10K
R419 10K
C407 5n6 2KV
S2
S1
R484 1K0
R447 1K0
D402 STH252
D403 STH252
D404 BYD73F
C409 15n 630V
SK408A
SK408B
TR402 2SC3884A
C406 470p 1K6V
SK408A/B: SINGLE LOOP AROUND T402 CORE
FS401 T500mA
T401
CE401 470u 25V
R408 1R0 0W6
R407 1R0 0W6
L403 100H
C404 1n0
R409 18R


B+ REGULATOR
LINE OUTPUT
S.CAP SWITCHING
BLANKING
DEFLECTION PANEL
PWB 83-5162-7
POWER DEFLECTION
POWER VIDEO
IC301
TDA1675A
IC501
UC3842AN
IC503
L78M05CV
IC630
74LS86
IC403
LM317T
IC502
78M12
T402
T403
T501
L401
TLH-247
LIN
L402
33uH
L403
1u0H
L404
100uH
L405
33uH
L501
3mH
L502
100H
D408
RGP10D
D407
RGP10D
D503
RGP10J
D507
RGP10D
D421
TIOP106D
D501
1N4148
D502
1N4148
D504
1N4003
D509
1N4003
D510
1N4003
D511
1N4003
D513
1N4148
D515
1N4148
D416
1N4148
D417
1N4146
D429
1N4148
Q401
2SK525
Q402
2SK525
Q501
2SK526
TR501
2SC1815
TR502
2SC1815
TR503
2SA1015
TR504
2SC1815
TR505
2SC1815
TR406
2SA1015
TR407
TIP31C
TR410
2SA1015
TR411
2SA1015
TR412
PH2369
TR413
2SA1015
TR414
2SA1015
TR415
2SC1815
TR424
2SC1815BL
TR425
2SA1015
TR426
2SA1015
ZD512
BZX79 C4V7
ZD413
HZ3A2 2V7
ZD418
BZX79 D6V8
ZD420
BZX79 C33
FB503
FX4016
RV316
100K V.LIN
RV303
10K V.FREQ
RV414
100R H SHIFT
RV512
1K0 B+ADJ
RV840
470R 155V SET
PL401 TO SK401
PL406
PL407
PL601
SK204
TO PL204
SK802: SINGLE LOOP AROUND T402 CORE
SYNC
+155V
+25KV
+21V
+12V
+5V
FOCUS
A1
A2
LEFT
RIGHT
BCL
OVP
B+
DAG EARTH
E2
SYNC IN
H SYNC
V SYNC
WIDTH
SYNC DECODE
BRI/CONT
BKG/CMP
TO SK402
TO PL20
TO PL40
S-CAP
CRITICAL SAFETY ITEM
MAY BE FITTE
FITTED ON 15" FST VERS
FITTED ON 14" VERSIONS
FITTED ON 220/240V VER
FITTED ON 110/240V VER
FITTED ON 300m TOSHIBA TUBES
FITTED ON 600- OPT,HITACHI TU

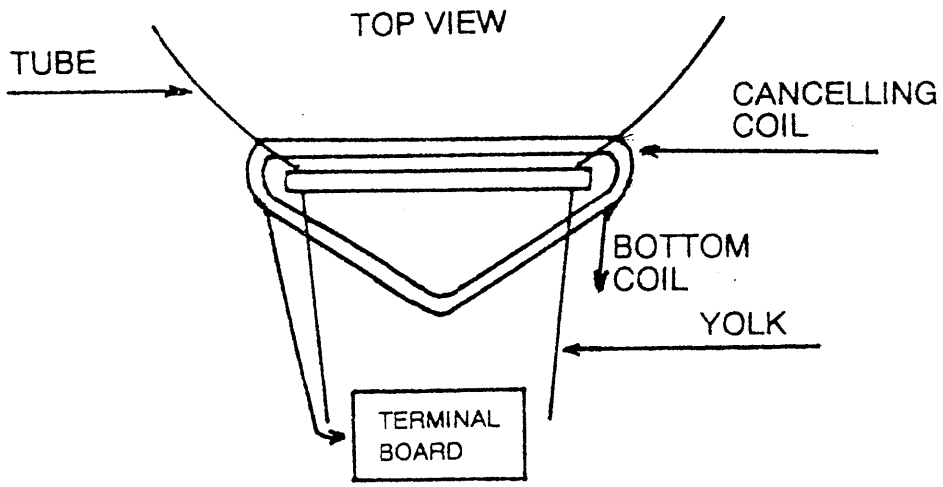

CONTROL PANEL
PWB 83-5161-9
W SERIES CIRCUIT DIAGRAM
79-1547-0-001
EHT 25KV
FOCUS
SK401
HEATER
SK901
G1 BIAS
SK208
TO PL804
SRE
PL206
PL207
G CUT
B CUT
H (INT)
V (INT)
H SYNC
V SYNC
IC631
74LS123
IC632
74LS123
IC633
74LS02
IC634
74LS05N
IC635
74LS156
IC636
74LS156
WIDTH
CONTRAST
BRIGHTNESS
V.SIZE (SUB)
V.CENTRE
V. SIZE
PHASE
AC IN
AC OUT
SB01
PL603
PL602
No Brightness Control

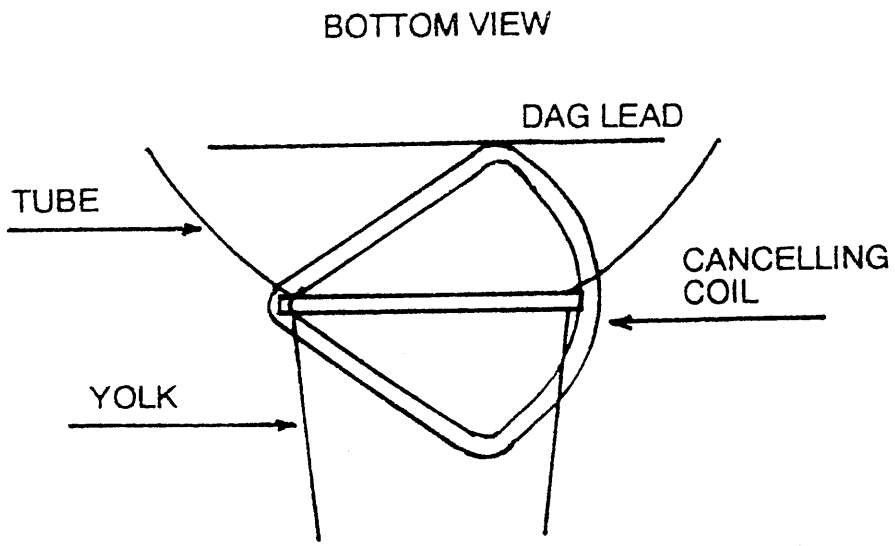
SERVICE MANUAL AMENDMENT RECORD	Series: W	Date of Issue:
Document number: 79-1612-4-004	Models:PMS models	18/01/95
This information refers to: Service Manual No. 79-1499-7-001 Circuit Diagram No. 79-1547-0-001		

Seq No	Details of changes	Reason	Ref. No. (ECN)
01	Power Management Control Panel 83-5573-8 issue 2 incorporated. See attached circuit diagram 79-1575-6-002 Appendix 1	Improved protection against static discharge to signal lead. Power Management System models only (PMS).	88/0934
02	Component differences R705,47K,5%,0.25W, 11-2798-5 R706,15K,5%,0.125W,11-5249-1 R710,12K,5%,0.125W,11-5285-8 R711,12K,5%,0.125W,11-5285-8 R712,47K,5%,0.125W,11-5233-5 ZD702,12V,5%,345mW,19-5070-3 ZD703,12V,5%,345mW,19-5070-3		
03	Delete page 38 of W Series Service Manual 79-1499-7-001 Power Management Control Cct. Diagram 79-1575-6-001 Replace with Power Management Control Circuit Diagram 79-1575-6-002. See Appendix 1		

Apendix A

Amended Fitting of Magnetic Field Cancelling Coils





SERVICE MANUAL AMENDMENT RECORD	Series: W	Date of Issue:
Document number: 79-1612-4-006	Models: All VLMF	06/07/95
This information refers to: Service Manual No. 79-1499-7-001 Circuit Diagram No. 79-1547-0-001		

Seq No	Details of changes	Reason & Category	Ref. No. (ECN)
01	A change in the method for fitting magnetic field cancelling coils as illustrated in appendix A.	To further improve magnetic field cancellation. Category C	88/1008

Category A. Essential for all.
Category B. Recommended if problems are experienced.
Category C. Discretionary.

SERVICE MANUAL AMENDMENT RECORD	Series: W	Date of Issue:
Document number 79-1612-4-001	Models: 5401/5501	23/05/94
This information refers to: Service Manual No. 79-1499-7-001 Circuit Diagram No. 79-1547-0-001		

Seq No	Details of changes	Reason	Ref. No. (ECN)
01 02 03 04 05	R697 changed to 180R, 5%, 2W M. Oxide 11-5696-9/P01-37 R698 changed to 3K3, 5%, 0.125W Std. Film 11-5229-7-26 R699 changed to 68R, 5%, 1W M. Oxide 11-5697-7/P18-31 RV684 changed to 2K, 20% 12-4587-2 TR634 changed to 2SD667AC 19-8533-7	To increase Vertical Shift range.	88/0807
06	IC701 changed to 74HC123, part number 19-8763-1	Avoid monitor being switched 'on' when connected to PC which has sync signals at 1v D.C. when first switched 'off'.	88/0817
07	R223 changed to 1K5, 1%, 0.125W 11-5700-0	To improve bias conditions for IC202 and remove 'smear' on Windows type displays.	88/0820

SERVICE MANUAL AMENDMENT RECORD Document number 79-1612-4-002	Series: W Models: 5401/5501	Date of Issue: 27/06/94

This information refers to: Service Manual No. 79-1499-7-001
Circuit Diagram No. 79-1547-0-001

Seq No	Details of changes	Reason	Ref. No. (ECN)
08 09	C212 & C213 changed to 22n, 63v -20+80% Cer. Plt 14-6911-8 Add C243 22n, -20+80%, 63v, C.P 14-6911-8 to back of Video PWB between pins 2 & 3 of IC201. C243 must be connected directly to IC201 pins with minimum sized legs	To correct instability in IC201 when Texas part is used.	88/0841
10 11 12	R483 changed to 1M0, 5%, 0.125W 11-5216-5-26 Add R496, 470K, 5%, 0.125W, 11-5355-2-26 Add R497, 15K, 5%, 0.125W 11-5249-1-26 Note 1: Fit R496 between pins 9 & 10 of IC401, solder side of Deflection PWB 83-5162-7-003 Note 2: Fit R497 between pin 4, SK604 and +12v supply, solder side of Deflection PWB 83-5162-7-003	To improve Phase balance adjustment	88/0846
13	Delete assembly 03-0752-4/M - (18-1040-5 M34AFA60X33 CDT) (83-5323-9-002 coil) (29-5975-5 sleeving) (57-2900-9 cable tie) (60-6656-9 adhesive) Add 18-1067-7 14" CDT M34AFA60X48	Alternative CDT has integral VLMF coil for improved performance.	88/0870

Deflection Panel (Track side)