511

MICROVITEC PLC

SERVICE MANUAL

SERIES – 3
COLOUR DISPLAY MONITORS

GP0019AA4

INPUT CONNECTIONS AND CUSTOMER CONTROLS

T.T.L. COMPATIBLE/LINEAR INPUT SELECTION

T.T.L. compatible or linear (0 to 4V, 1500 ohm) input level options can be selected by moving 3 links:

TL103 R,G,B located on main PCB:
position 1 corresponds with linear levels
position 2 with T.T.L. levels

NOTE

Contrast control VR111, inoperative when position 1 is selected.

SYNCHRONISATION - INPUT OPTIONS

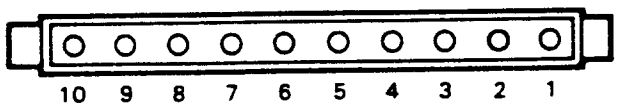
Sync inputs must be T.T.L. compatible, the timing of sync pulses should approximately correspond with those used for broadcast purposes (refer to Fig. 1 for available options.)

INVERSE VIDEO

To facilitate inversion of T.T.L. compatible video input signals by either moving link TL101 on main PCB to position 1, or removing TL101 and feeding a positive T.T.L. level in to pin 9 of PL101.

NOTE

Monitors are normally despatched wired in composite negative (going) syncs mode, with TL102 not fitted, and TL106 selected to position 1.



KEY
1 = +12V
2 = No connection
3 = Sync 3; +field sync
4 = Red video
5 = Sync 2; -field sync
6 = Green video
7 = Sync 1; composite sync or line sync
8 = Blue video
9 = Normal/inverse T.T.L. video
10 = Ground

FIG. 1 SIGNAL INPUT PIN CONNECTIONS

SYNCHRONISATION OPTIONS

SYNC OPTIONS	INPUTS (PL101)	LINK POSITION
MIXED		
-ve going	pin 7	TL102 not fitted TL106 in position 1
+ve going	pin 7	TL102 fitted TL106 in position 1
SEPARATE		
-ve line	pin 7	TL102 not fitted
-ve field	pin 5	TL106 in position 1
+ve line	pin 7	TL102 fitted
+ve field	pin 3	TL106 in position 2
-ve line	pin 7	TL102 not fitted
+ve field	pin 3	TL106 in position 1

INPUT CONNECTIONS AND CUSTOMER CONTROLS

CUSTOMER CONTROLS

NOTE

On 'D' series monitors the controls listed below are located on the front of the monitor, concealed behind a downward hinging door.

ON/OFF Switch

Mounted rear of the monitor, allows mains to be switched on and off without switching the mains supply off.

Contrast/Brilliance Adjustment (VR111)

Mounted rear of main PCB, only active in T.T.L. mode, and allows video gain to be varied from maximum to minimum, at black level.

Brightness Adjustment (VR134 when fitted)

Mounted rear of main PCB, next to VR111. Active in all modes of operation allowing brightness of display to be varied above or below cut off.

Volume/Audio Adjustment (when fitted)

Mounted rear of the monitor, allows user to adjust volume/audio level of the monitor. Clockwise to increase, anti-clockwise to decrease.

Colour Saturation Control (when fitted)

Mounted rear of the monitor, allows user to adjust the colour level of the monitor. Clockwise to increase, anti-clockwise to decrease.

PRESET CONTROLS/ADJUSTMENTS

GENERAL

Preset controls are initially set up at the factory and normally do not require adjustment unless a change is required in the input configuration - for example, typically to install a different graphics adaptor card in the associated host system. Details of the preset controls with their use and adjustment is described following:

PRESET ADJUSTMENTS

TO PROTECT AGAINST ELECTRICAL SHOCK HAZARD AND TO PROTECT THE MONITOR AGAINST SHORT CIRCUIT AND DAMAGE - USE ONLY AN INSULATED NON-METALLIC TRIMMING TOOL TO MAKE ADJUSTMENTS TO THE PRESET CONTROLS.

Care should be taken when adjusting presets. Adjust only one at a time and note carefully the effects of the adjustment before proceeding on the other adjustments. In some cases, it may be advisable to take note of the original setting position of the preset BEFORE adjustment in case the need arises to return to the original setting.

INTERCONNECTION COMPATIBILITY

On installation and prior to preset adjustments, ensure that video and sync connections from the host system are compatible with:

a) The monitor.

b) The interconnecting lead assembly in use.

Having determined these points are correct proceed with the adjustments required according to the details given in the accompanying table and description following.

PRESET CONTROL SETTING

1. To set the preset controls, use a signal generating a display occupying as large a screen area as possible. For example a full page of upper case letter 'H' would be suitable, or alternatively a suitable test card as appropriate.

2. Preset controls in the table following marked with an asterisk * may be adjusted if required.

   However, normally this should not be necessary, as these presets are set accurately at the factory during manufacture.

   NOTE

   A circle is employed in the screen displays illustrated following, only to demonstrate more clearly the geometric effects of wrong settings.

PRESET LOCATIONS

The physical locations of most of the preset controls referred to in the descriptions following are shown in the illustration contained in the Section preceding.

Notable exceptions are preset controls contained on the TUBE BASE PCB assembly.

The positions of these presets are indicated on the individual PCB's by appropriate ident markings.

PRESET CONTROLS/ADJUSTMENTS

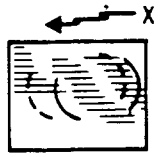
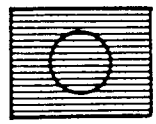
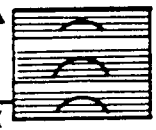
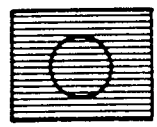
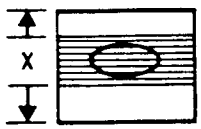
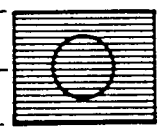
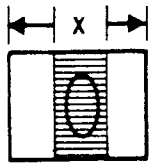
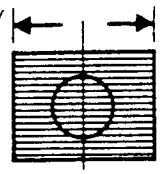
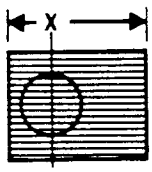
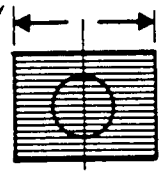
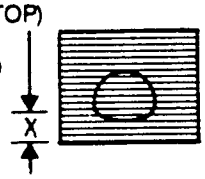
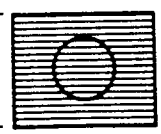
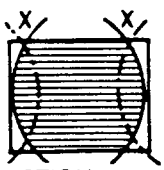
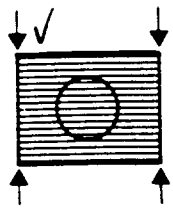
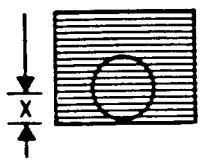
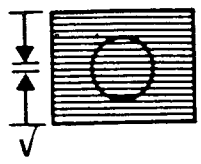
PRESET	WRONG X	RIGHT √
LINE FREQUENCY	PICTURE BREAKS UP ADJUST L.FREQ. 	√  PICTURE LOCKED
FIELD FREQUENCY	PICTURE ROLLS ADJUST F.FREQ. 	√  PICTURE LOCKED
HEIGHT	ADJUST HEIGHT 	√  HEIGHT SET
WIDTH	ADJUST WIDTH 	√  WIDTH SET
LINE PHASE*	PICTURE NOT CENTRAL ADJUST L. PHASE 	√  PICTURE CENTRAL PHASE SET
FIELD LINEARITY* (VERTICAL LINEARITY)	BOTTOM (OR TOP) OF PICTURE COMPRESSED ADJUST F.LIN 	√ =  VERTICAL SCAN LINEAR LIN.SET
EAST/WEST* CORRECTION	PICTURE 'BARREL SHAPED' OR 'PIN-CUSHION' SHAPED — ADJUST E/W CORRECTION 	√ √  VERTICAL EDGES STRAIGHT E/W SET
FIELD SHIFT	PICTURE NOT CENTRAL ADJUST FIELD SHIFT 	 PICTURE CENTRAL FIELD SHIFT SET

TABLE OF PRESET ADJUSTMENTS

PRESET CONTROLS/ADJUSTMENTS

FACTORY PRESET ADJUSTMENTS

NOTE

Certain preset adjustments can be from above or below the main panel. Adjustments are best made on a static display, preferably a Microvitec suitable test card or test pattern.

SET HT - VR1

Adjusted accurately at the factory to give 142V with a dark picture on screen, and should not be readjusted.

WARNING

THIS IS A CRITICAL SAFETY ADJUSTMENT. FAILURE TO COMPLY WITH THE ABOVE WILL INVALIDATE THE WARRANTY.

LINE FREQUENCY VR218

1. Set the free running oscillator frequency to almost frequency of incoming line syncs.
2. Adjust VR218, feed monitor with R.G.B. video and interrupt the mixed sync information to the line oscillator by removing sync information on PL101, (sync 1, 2 or 3 etc).
3. Adjust VR218, until the picture almost stabilizes then re-connect via PL101 as required. Resulting in a stable picture lock.

FIELD FREQUENCY VR307

Control of the free running field oscillator frequency by adjusting VR307, gives a stable picture lock. For effective lock VR307 should be set to 56Hz.

LINE PHASE VR220

VR220, controls positioning of video information relative to raster in line scan direction.

Ensure the following operations have been effected:

1. The line frequency has been set (VR218).
2. The picture width has been set (L202).
3. The monitor is positioned in its place of use.

NOTE

1. VR220 when adjusted will shift the picture, right or left.
2. VR220 only adjusts the picture relative to the raster position. Prior to adjustment, ensure that the sides of the picture are not folding over.

WIDTH L202

CAUTION

CARE SHOULD BE TAKEN WHEN ADJUSTING THIS COMPONENT DUE TO ITS PROXIMITY TO EHT SECTION, IN PARTICULAR, THE TRIPLER AND LINE OUTPUT TRANSFORMER.

Using a non-metallic trimming tool adjust L202, to effect picture width adjustment.

Normally factory set for maximum width.

NOTE

L202 core may not always be fitted.

HEIGHT VR306

VR306, when adjusted will provide for raster under scan and overscan.

PRESET CONTROLS/ADJUSTMENTS

FIELD LINEARITY VR312

Adjust VR312, to give a linear picture in vertical direction.

NOTE

Best results are obtained by using a cross hatch type grid or MICROVITEC test generator.

FIELD SHIFT VR312

VR321, controls positioning of raster in field scan direction.

EAST-WEST CORRECTION VR328

NOTE

Some models will not require this adjustment, because east-west correction is integral on certain types of CRT.

Adjustment of VR328 will achieve straight verticals on left and right hand sides of pictures.

FOCUS

Located on end of tripler module, set brightness control to normal viewing level, then make focus adjustment.

ADJUST COLOUR BACKGROUND CONTROLS (BLACK LEVEL)

NOTE

These controls are factory preset. If adjustment is necessary, an AVO 8 multimeter and/or oscilloscope will be required. However, best results are obtained by using an oscilloscope.

Prepare to adjust colour background controls

1. Set customer contrast (VR111), brightness (VR314) and A1 (VR932) full anti-clockwise.
2. Disconnect R.G.B. sync inputs

Adust red, green and blue

1. Adjust VR906 for red cathode (black level) volts
2. Adjust VR914 for green cathode (black level) volts
3. Adjust VR921 for blue cathode (black level) volts
4. The above voltages are:
   a) 150V-14" monitor (TTL or Linear)
   b) 155V-20" monitor (TTL or Linear)
   c) 140V-12"/14" high res monitor (TTL or Linear)

Adjust A1 voltage

1. Adjust VR932 until a raster is just visible.
2. Raster colour may be neutral. However, it is very likely shaded towards red, green, blue or a combination of any two colours.
3. Establish raster colour shading as follows:
   a) Red and Green - Yellow
   b) Red and Blue - Magenta
   c) Blue and Green - Cyan

4. Reduce black level of remaining one or two guns using VR906, VR914, VR921 or combination until a neutral raster is achieved.

5. Re-adjust VR932 to just extinguish raster.

6. Input - R,G,B and sync signals, then adjust VR111 clockwise.

7. If correct while balance has not been achieved, repeat operations 1 through to 6.

ADJUST COLOUR GAIN CONTROLS

CAUTION

MAKE THE FOLLOWING ADJUSTMENTS USING A DC COUPLED OSCILLOSCOPE ONLY.

Prepare to adjust colour gain controls

1. Disable beam current limit circuit by removing TL901 in series with CRT heaters on tube base panel.

2. Provide a test pattern with peak white and black level information on red, green and blue.

3. Ensure VR111 is fully clockwise to provide maximum drive voltages to video output stages.

4. Above voltages are:
   a) 70V p-p on 14" monitor - TTL mode
   b) 70V p-p on 20" monitor - TTL mode
   c) 60V p-p on 14"/20" monitor - medium and high resolution

Adjust red, green and blue gain controls

1. Adjust VR903, for red peak to peak drive volts at R926.

2. Adjust VR910, for green peak to peak volts at R925.

3. Adjust VR916, for blue peak to peak volts at R924.

SWITCHED MODE POWER SUPPLY

GENERAL

The power supply is a variable frequency, self oscillating, switching flyback converter type providing mains isolation and three voltages, 18 volts, 142 volts and 200 volts. The 18V supply is used to provide a 12V stabilised supply, via IC1.

The Series 3 monitor is fitted with one of three switch mode power supply unit variants, referred to as A, B and C, which are used with either the earlier, mid or latest range of models. The power supply units function in the same way but differ only in changes to component types or values. The main difference between power supply variants A and B is that component TR2 on variant B is a different type to that on variant A. Component changes on power supply variant C are given on the circuit diagram for the power supply unit and are detailed in the parts list.

CIRCUIT DESCRIPTION

Refer to the main circuit diagram for the following circuit description, which is applicable to all three power supply unit variants. **The circuit diagram is typical for a Series 3 monitor, but reference should be made to the Parts List for details of components for individual models.**

CONTROL CIRCUIT

As TR2 turns on, a step voltage whose amplitude depends upon the instantaneous value of the rectified mains is applied across the primary of T2. The current in the winding and TR2's collector increases linearly from zero during which time energy is stored as flux in the transformer. During this period the output diodes D22, 23, 24 are reverse biased and any energy supplied to the load is via C27, 28, 31 and 26 from the previous cycle of operation.

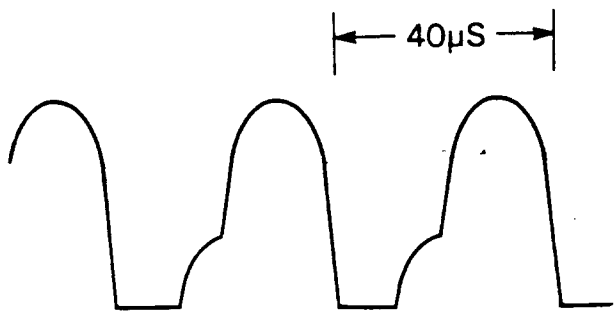
TR1 forms the error amplifier or control function, and is supplied with power from a reference winding on the transformer (nominally +30V). During the on time of TR2, the emitter TR1 is held at a constant potential W.R.T. the reference rail via D18. The base of TR1 is fed directly from the reference rail, via R3, VR4 and R5. Any voltage change on the reference rail, arising from a change of voltage at the mains output, via D23, will vary the TR1 base-emitter voltage and current. As a result, the collector current will vary causing the constant current source, used to charge C16 via R10 to vary in sympathy.

C16 charges up at a rate depending upon the amount of current available via R10, and the voltage across C16 increases exponentially until it reaches the gate-trigger voltage of the 'turn off' device TY1. Then TY1 conducts and 'crow-bars' the base drive to TR2. TR2 ceases conduction and its collector voltage becomes positive very rapidly. The dV/dT at TR2's collector is limited to a safe value by C17, R12 and D17. As this occurs, D22, 23, 24 and 21 become forward biased and stored energy within the transformer is transferred into the output capacitors and their respective loads.

During the 'off' period the base drive winding goes negative thus ensuring TR2 remains off until the next conduction period. D8, D10, D11 limit the negative off drive and so protect TY1.

Eventually, depending upon the load, the energy in the transformer is exhausted and the voltages on D6, 21, 22, 23 and 24 anodes collapse as does the TR2 collector-emitter voltage, during which time the base drive winding tends more positive. TY1 is forced off prior to this stage by negative volts on its anode, allowing TR2 to turn on. Full base drive is then sustained via R16.

HT stabilisation is achieved by controlling the duty cycle of the switching transistor. Increasing load increases the duty cycle and the peak collector current, while increasing supply mains increases the overall operating frequency. HT adjustment is performed via VR4.



TR2 BASE START-UP Fuse F3 out

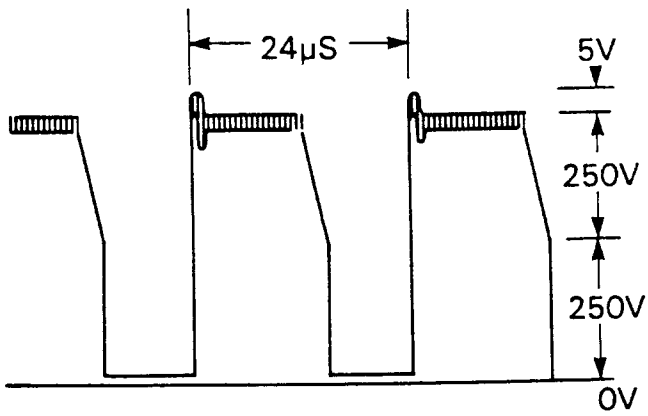
Extra damping in the form of C14, R6 and D7 is provided in order to limit the maximum Vce of TR2 to a safe value, even under fault conditions. D15, 16 provide negative off drive and base current tracking while L2 optimises the storage time of TR2 for minimum switching losses.

The maximum available power is determined by measuring the peak collector current of TR2 and is sensed by R15. If the voltage across R15 at any time exceeds the voltage across TY1 gate-cathode plus three diode drops D12, 13, 14, then TY1 is immediately brought into conduction thus turning TR2 off. This sequence of events happens during the start up sequence at low mains and under fault conditions.

START UP PROCEDURE

Start up power for the SMPSU is derived from a half wave rectified positive going differentiated pulse from the mains supply. The current required at start up is small compared with the base drive current under normal operating conditions because of the self oscillating nature of the design. Once turn on of TR2 has been achieved in this manner (once every 20 ms) the oscillation becomes self-sustaining. R8 continues to supply current even under normal operation but is swamped by the forward base drive via R16.

During the start up period the peak collector current is limited by R15. C21, R18 and 20 provide active feed forward so as to provide ripple rejection over the mains range 190-256V.



TR2 COLLECTOR Fuse F3 in - connector PL201 out (no load)

OVER VOLTAGE PROTECTION

Over voltage protection is controlled by a second feedback loop attached to TY1. This consists of a zener diode reference which senses the reference rail voltage, and hence, proportionally, the HT voltage. If this reference exceeds the zener voltage, D20 conducts, fires TY1 and terminates the drive to TR2, during which time sufficient volts are developed across TY2 gate-cathode to cause it to enter conduction and latch on. Drive to TR2 is now terminated until all the energy from C23 has been removed (10ms). The power supply is held off during this period and remains so until the presence of the next mains start up pulse, after which conduction of TR2 will again occur.

SHORT CIRCUIT PROTECTION

Short circuit or over current on any output rail represents an increase in stored energy required from the transformer T2, and therefore an increase in collector current through TR2, again this is detected by R15 and above a preset load, TY1 is fired and TR2 turned off. The supply now operates in 'Burst Mode'. This means that the power supply is initiated as under normal start up conditions once every mains cycle, but only operates for a few switching cycles during which time the over current protection again comes into operation thus terminating the drive to TR2.

MAINS INPUT CIRCUIT

This consists of a diode bridge preceded by a surge limiting thermistor and mains filter network. Degaussing is automatic at switch on and employs a dual PTC thermistor. The mains filter networks provide suitable suppression of the symmetric and assymetric radiation developed within the SMPSU concept.

NOTES

1. For the 110V power supply unit there will be certain component differences between the 240V power supply unit. These are detailed as follows:

Component	240V P.S.U.	110V P.S.U.
L1	LO001ZA1	LO001KA6
R5	RF104OJ0 10K	RM913GK0 9K1
R8	RF333JJ0 3K3	RF224GJ0 22K
R15	RQ150LJ0(1) 1R5	RO150LJ0(2) 1R5
R16	RW472ZJ5 470R	RW103XJ5 1K9W
R18	Not fitted	RF394GJ0 39K
R20	Not fitted	RF394GJ0 39K
R29	RF185DJ0 180K	RF684DJ0 68K
C10	CM564RK6 56nF	CM105NL6 0.1µF
C11	CA108RM6 100µF	CA228QM7 220µF
C21	Not fitted	CM105RK6 0.1µF
TH1	RT005QN0	RT002QL0
T2	TI0004I06	TL002SU0 (3960)
F1	KA2001BA0 2A	KA3151BA0 3.15A
F2	KA2001BA0 2A	KA3151BA0 3.15A
F3	KA1001BQ0 1A	KA2001BQ0 2A

2. Later version power supplies have the following changes:

240V	110V
R1 — Removed	R1 — Removed
D5 — Wire link	D5 — Wire link
C10 — 22K Res. ½W	C10 — Wire link
R8 — 22K Res. ½W	R8 — 22K Res. ½W

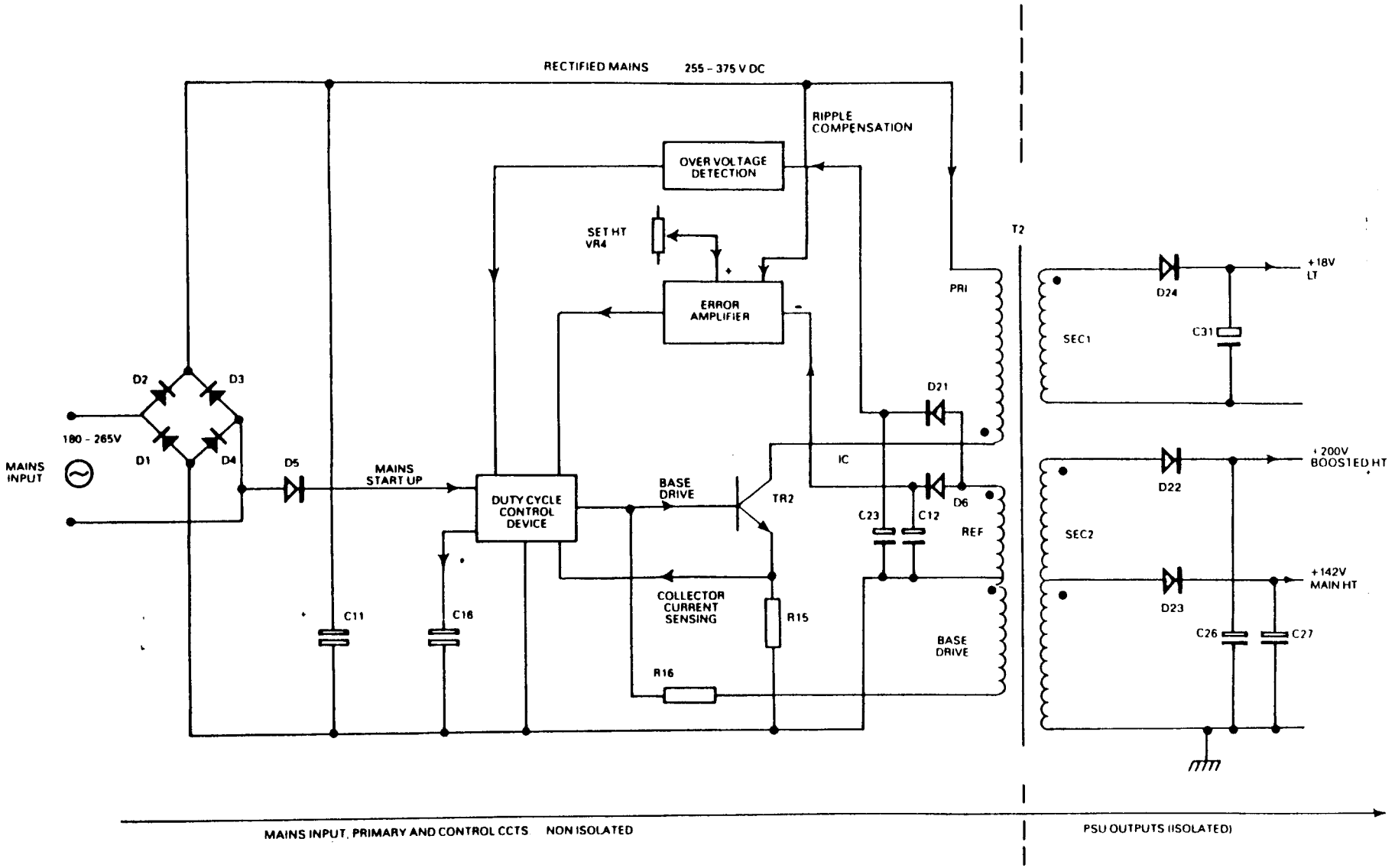


FIG. 1 SWITCHED MODE POWER SUPPLY CONCEPT : SIMPLIFIED CIRCUIT DIAGRAM

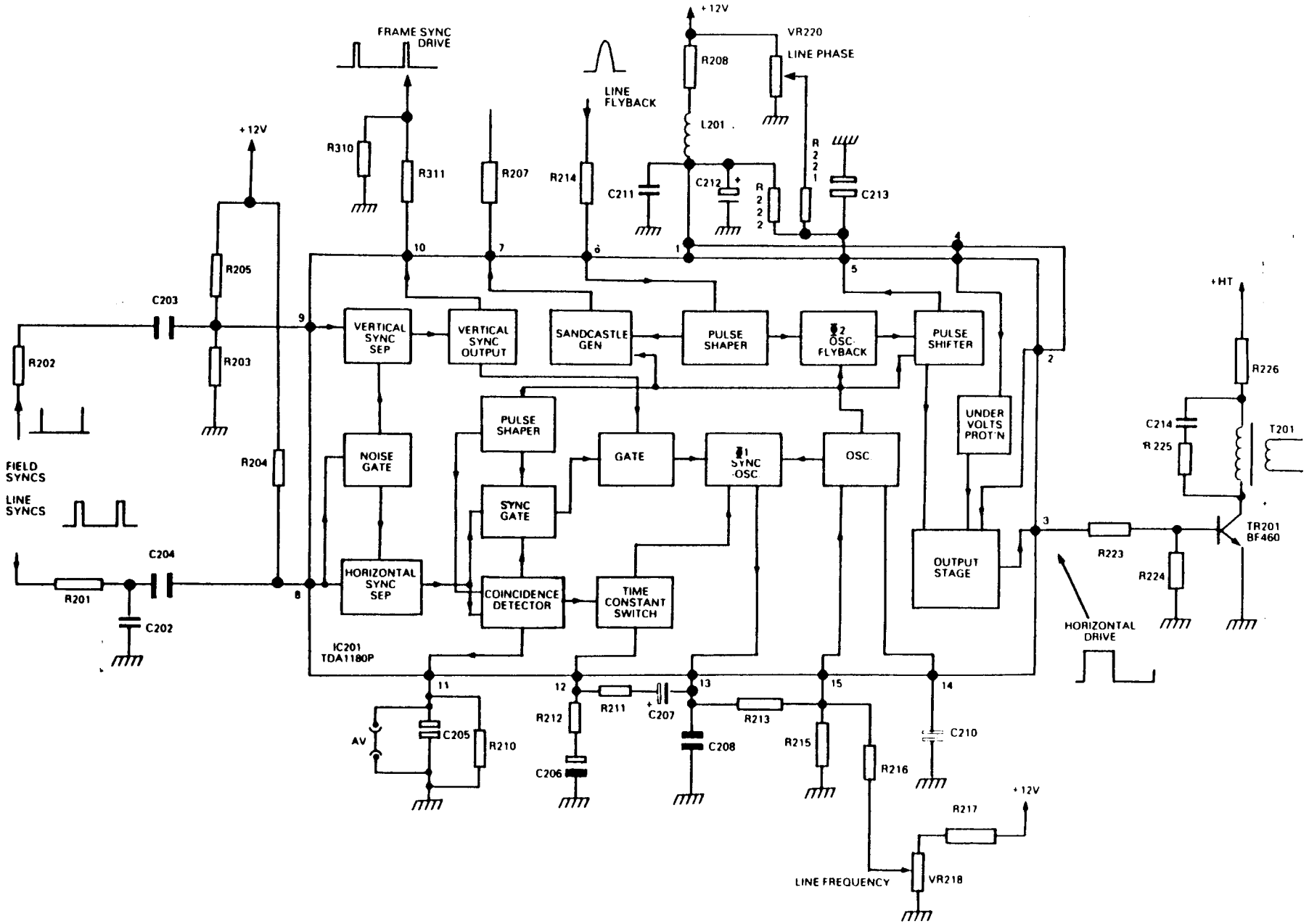


FIG. 1 LINE TIMEBASE : SIMPLIFIED CIRCUIT DIAGRAM - IC201

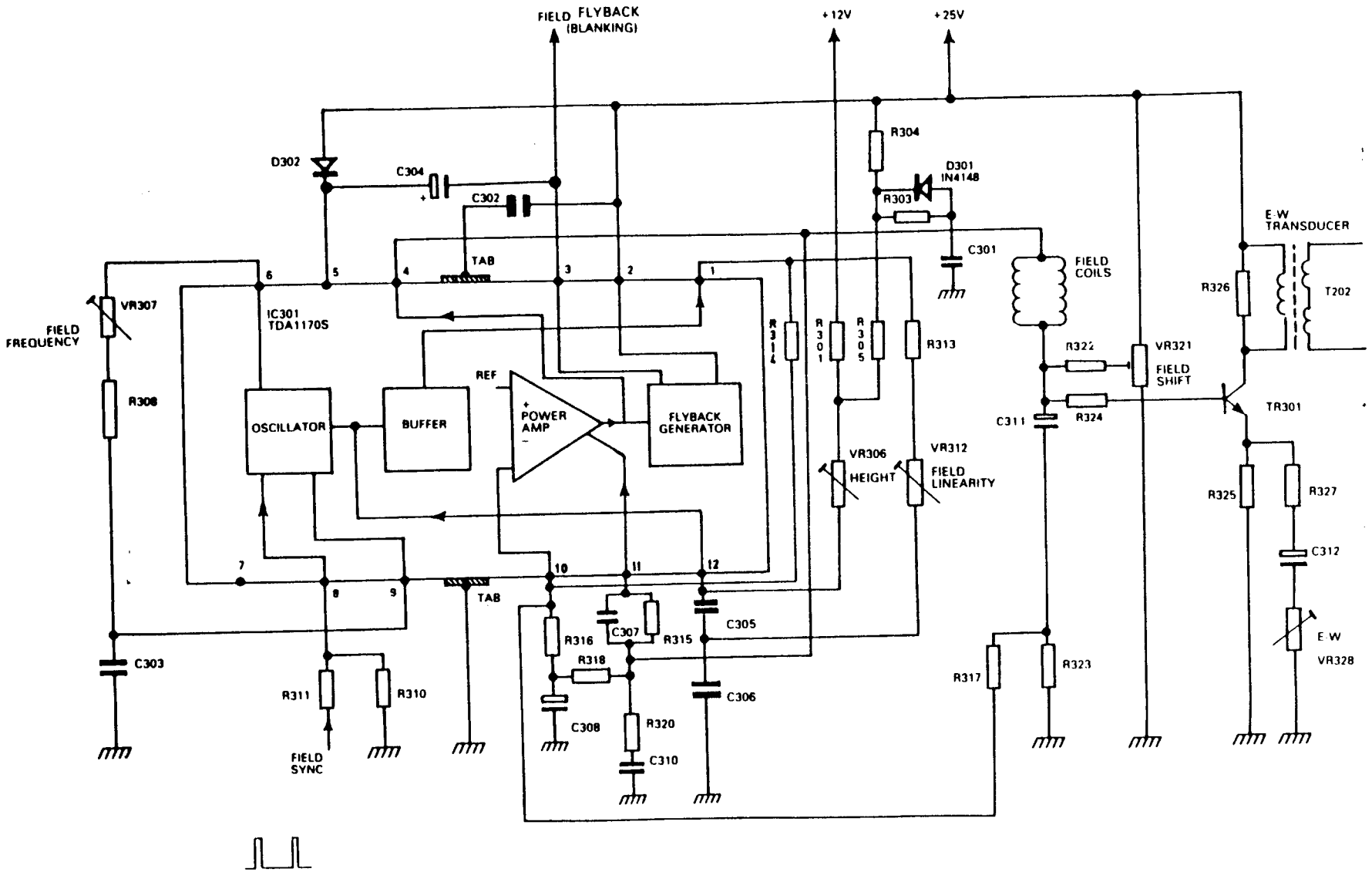
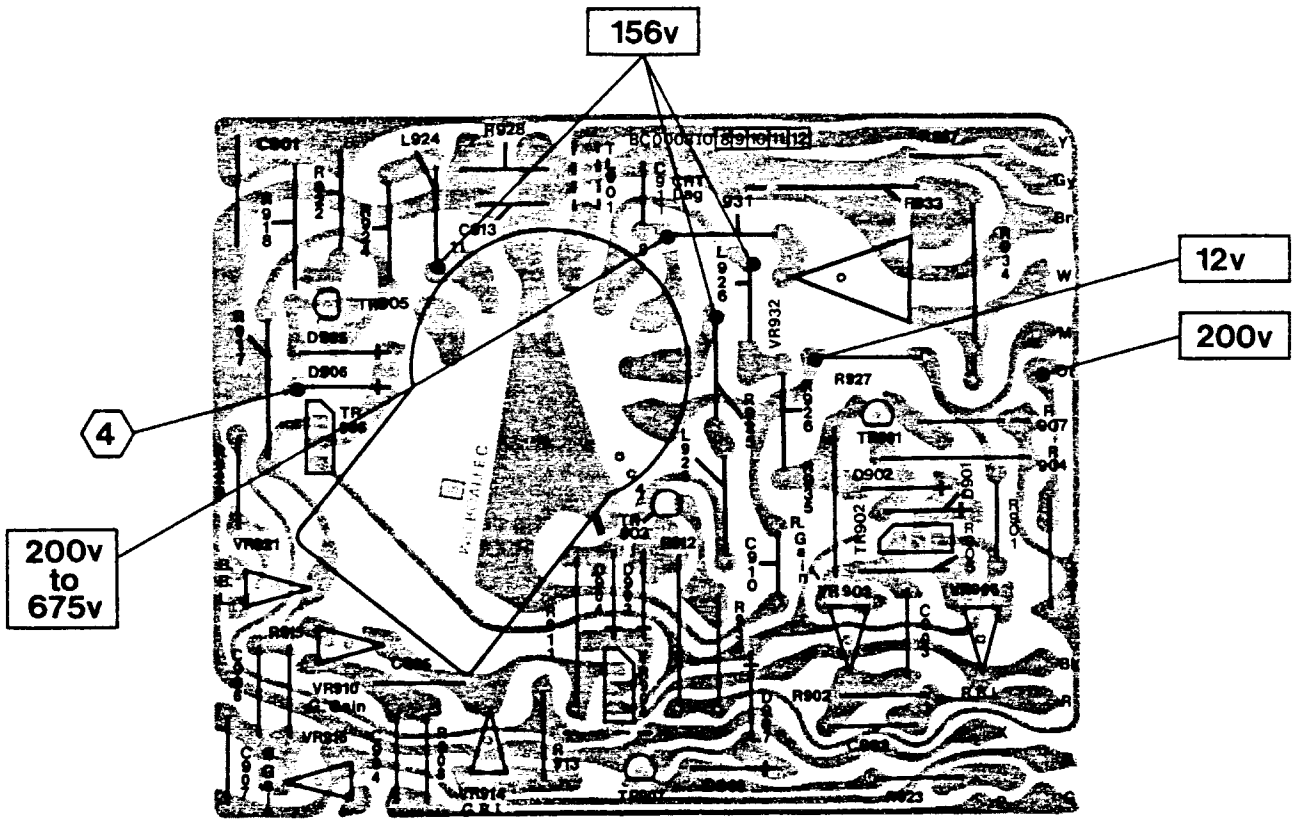


FIG. 1 FIELD TIMEBASE : SIMPLIFIED CIRCUIT DIAGRAM - IC301

CRT TUBE BASE PANEL

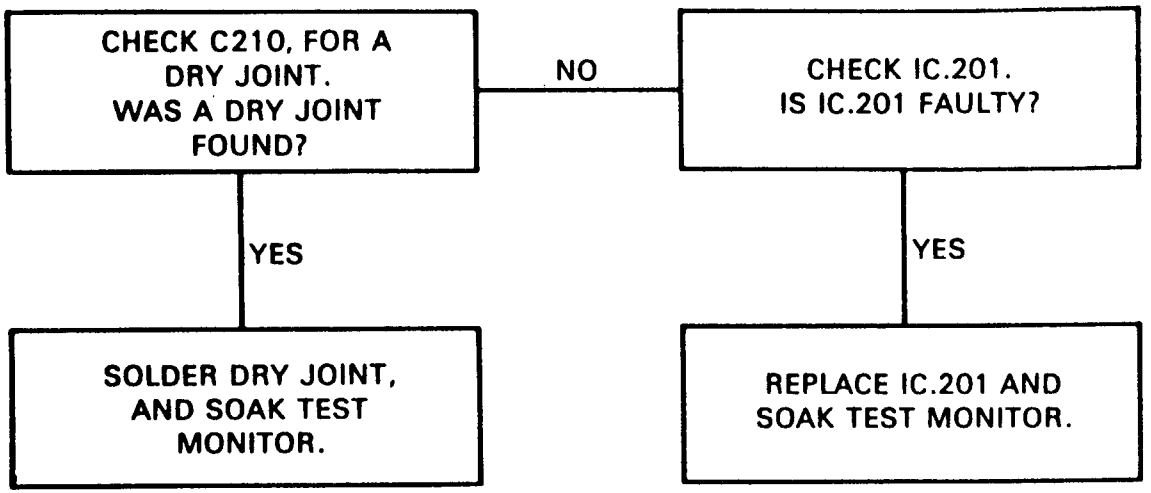


DENOTES TEST WAVEFORM MEASURING POINT

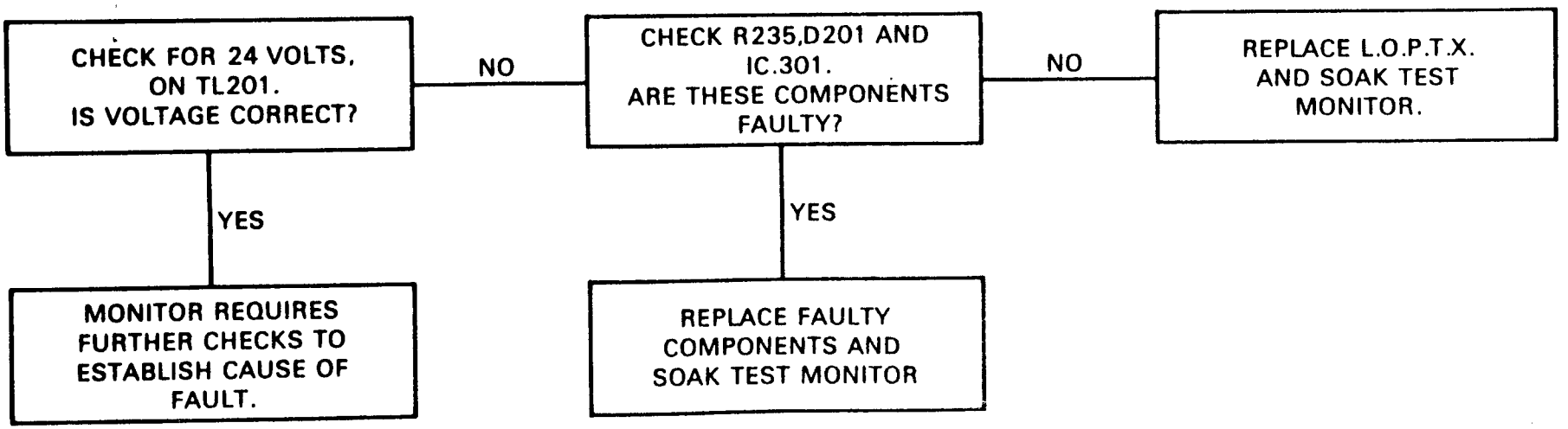
DENOTES TEST VOLTAGE MEASURING POINT

SERIES 3 CRT TUBE BASE PANEL - TRACK (SOLDER) SIDE
VIEWED THROUGH PCB FROM COMPONENT SIDE

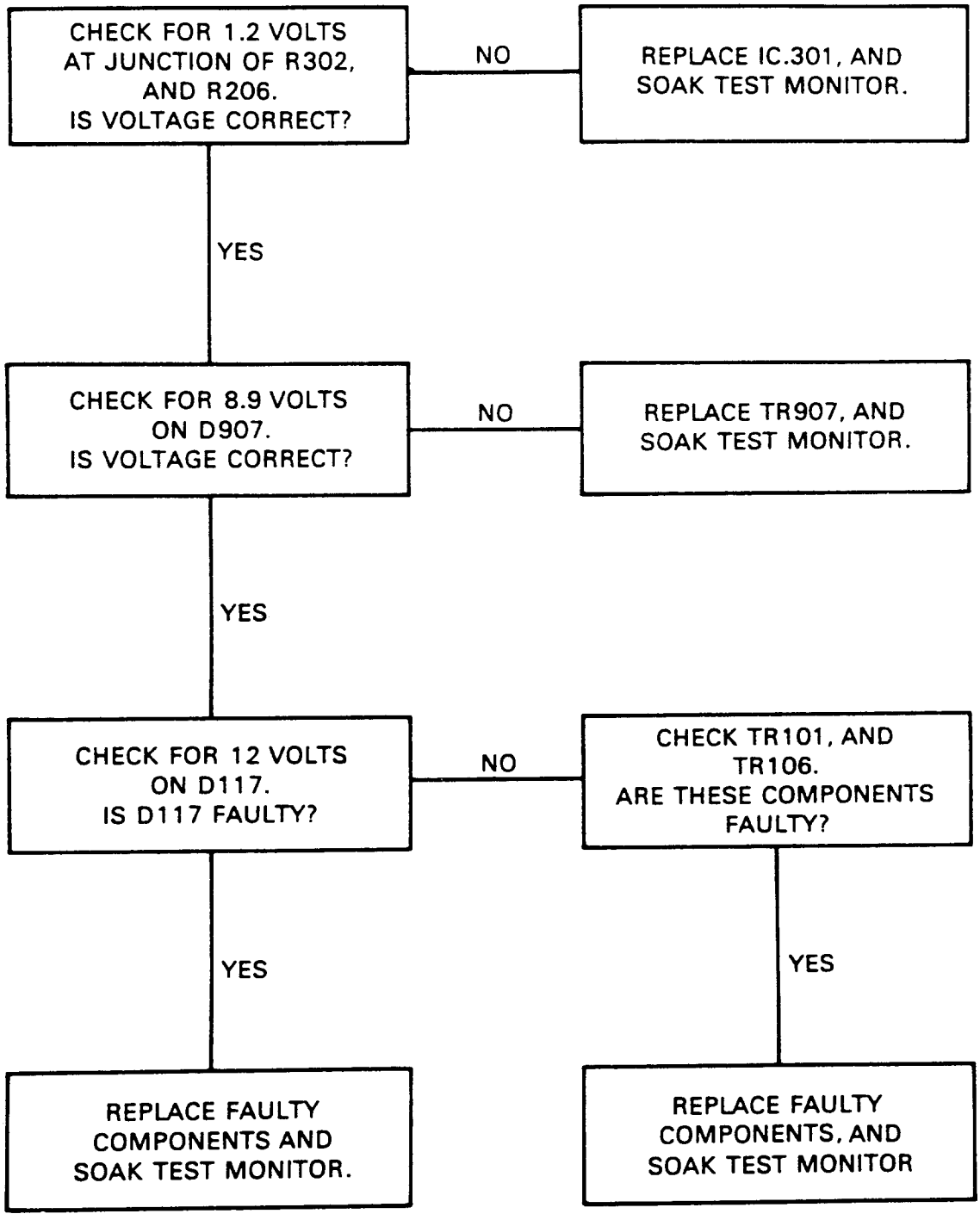
INTERMITTENT –
LINE SYNC



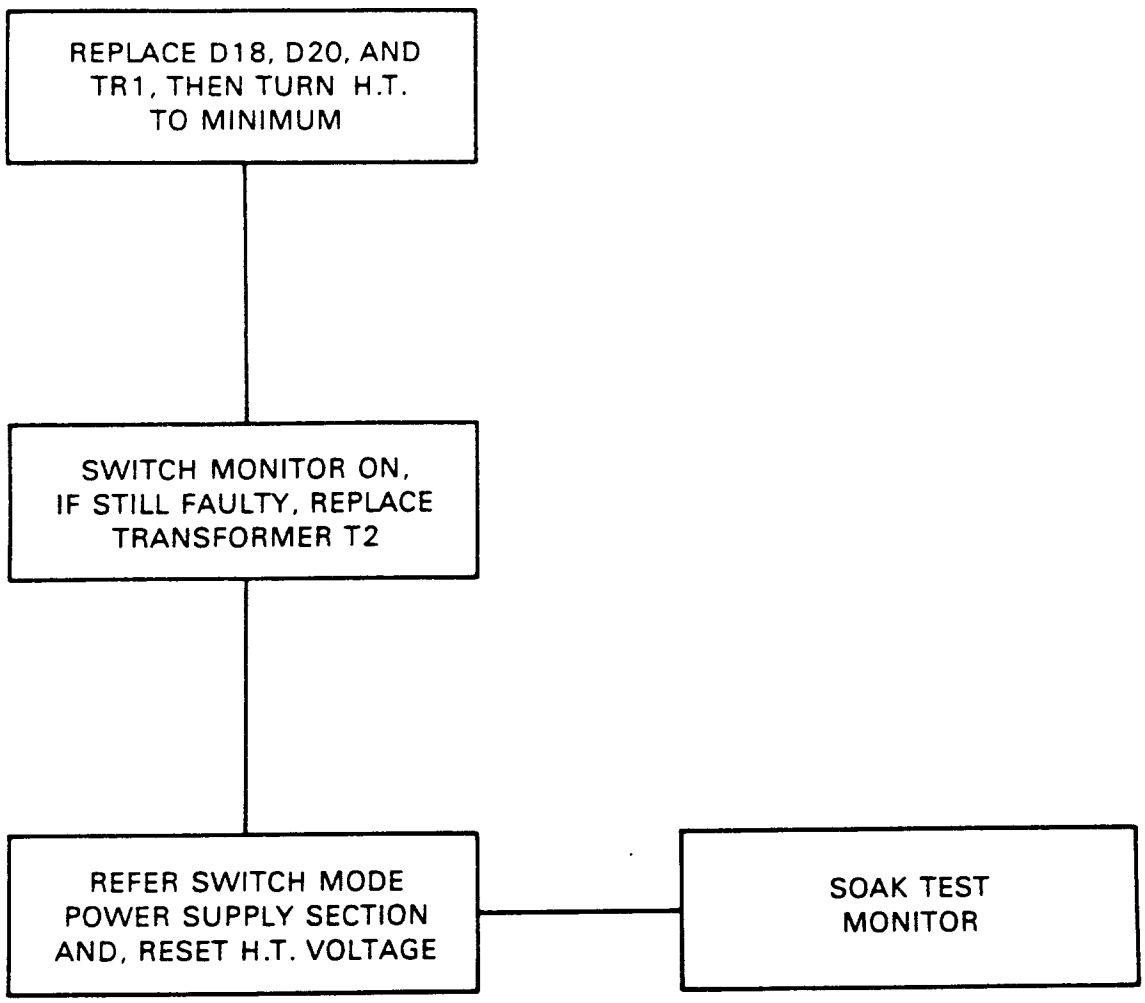
FRAME COLLAPSE



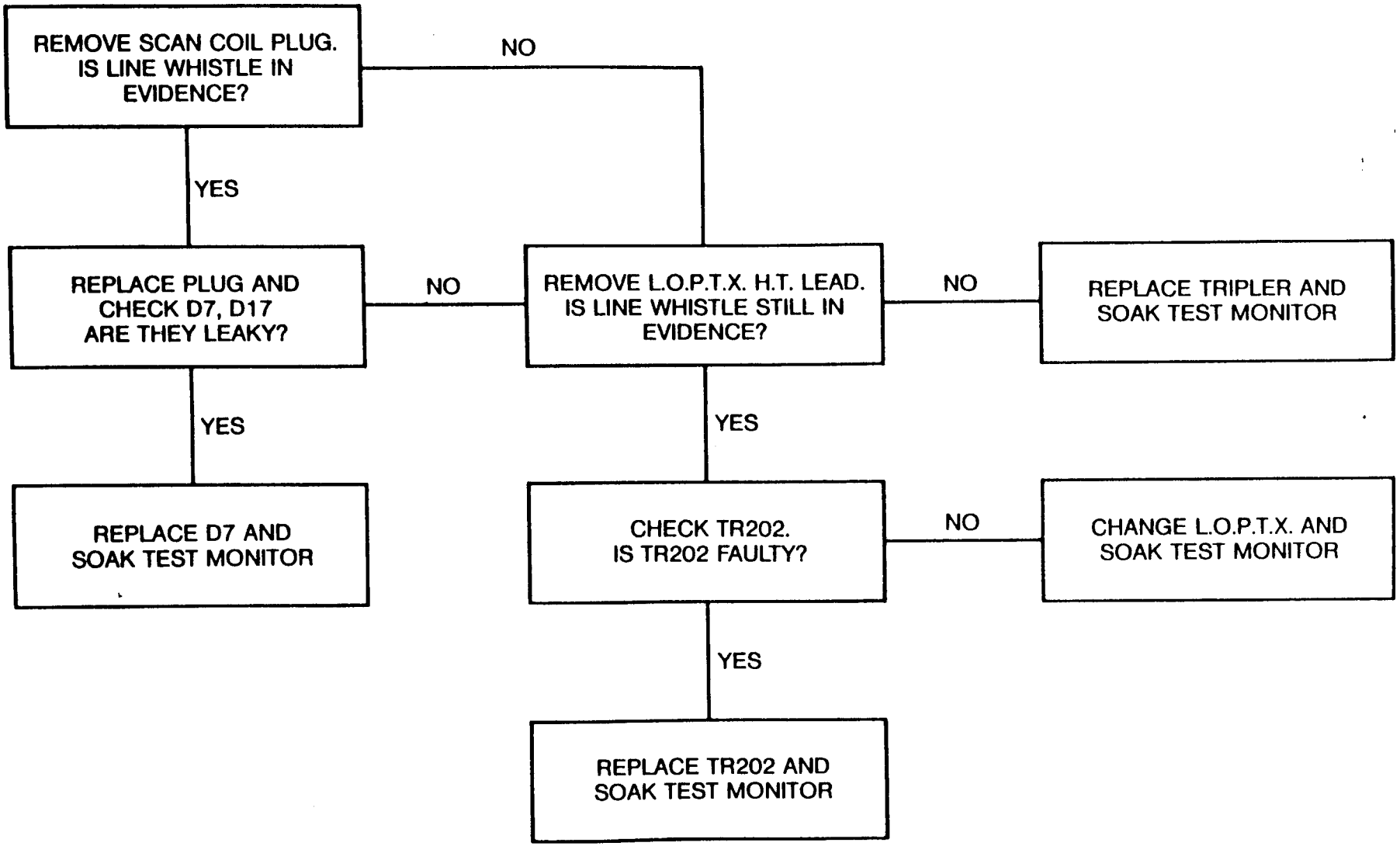
FLYBACK LINES



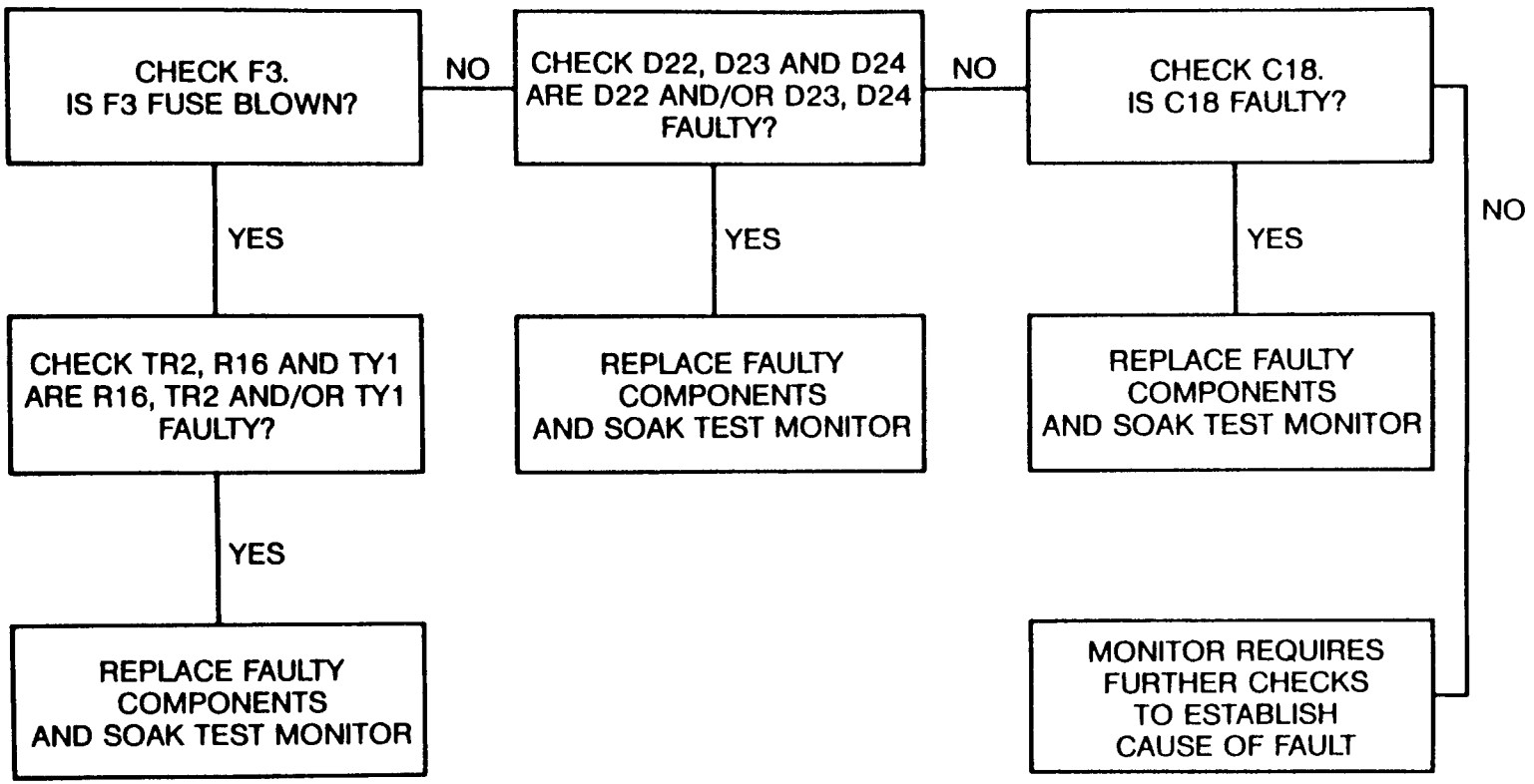
BURST MODE


REPLACE D18, D20, AND TR1, THEN TURN H.T. TO MINIMUM
SWITCH MONITOR ON, IF STILL FAULTY, REPLACE TRANSFORMER T2
REFER SWITCH MODE POWER SUPPLY SECTION AND, RESET H.T. VOLTAGE
SOAK TEST MONITOR

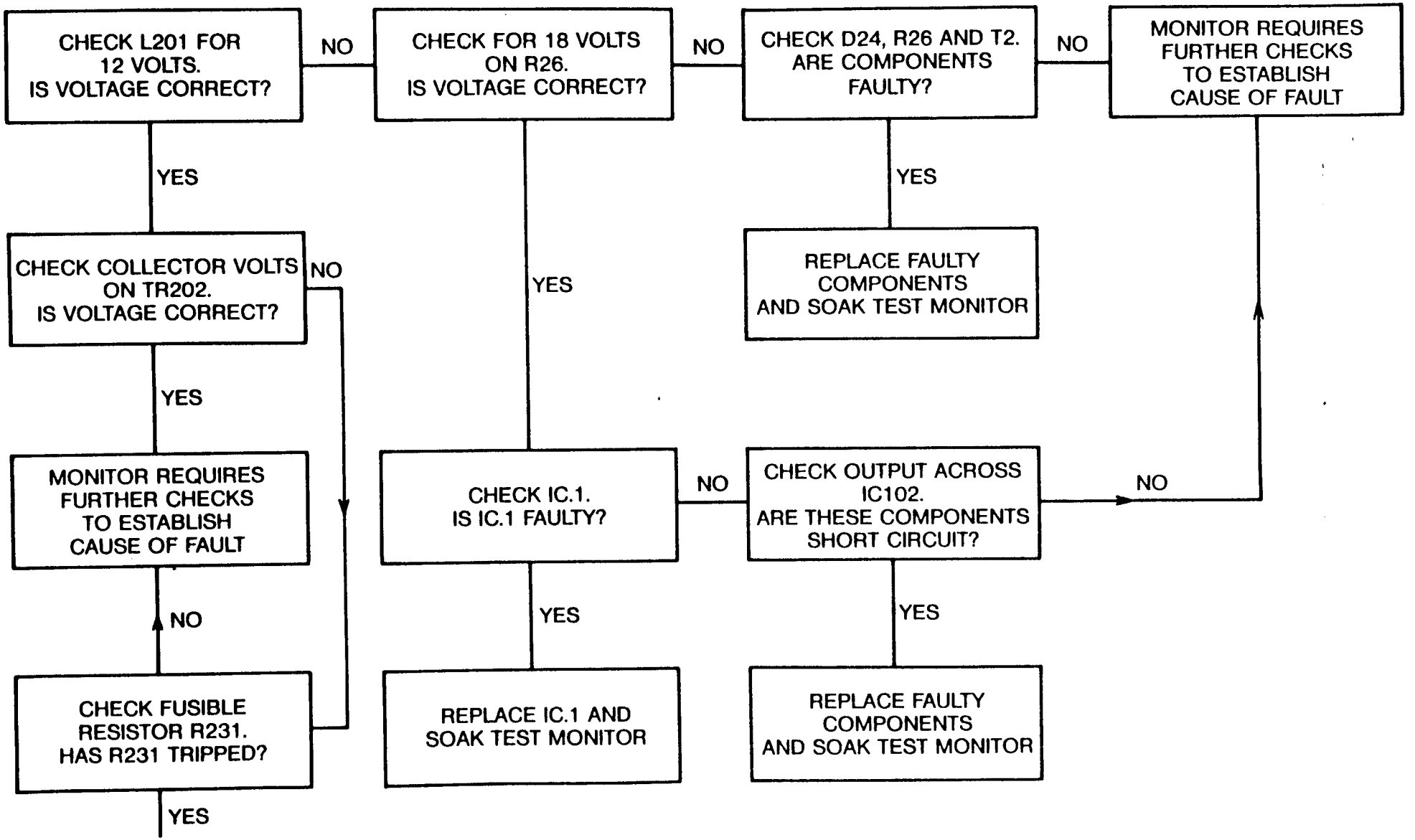
LINE WHISTLE

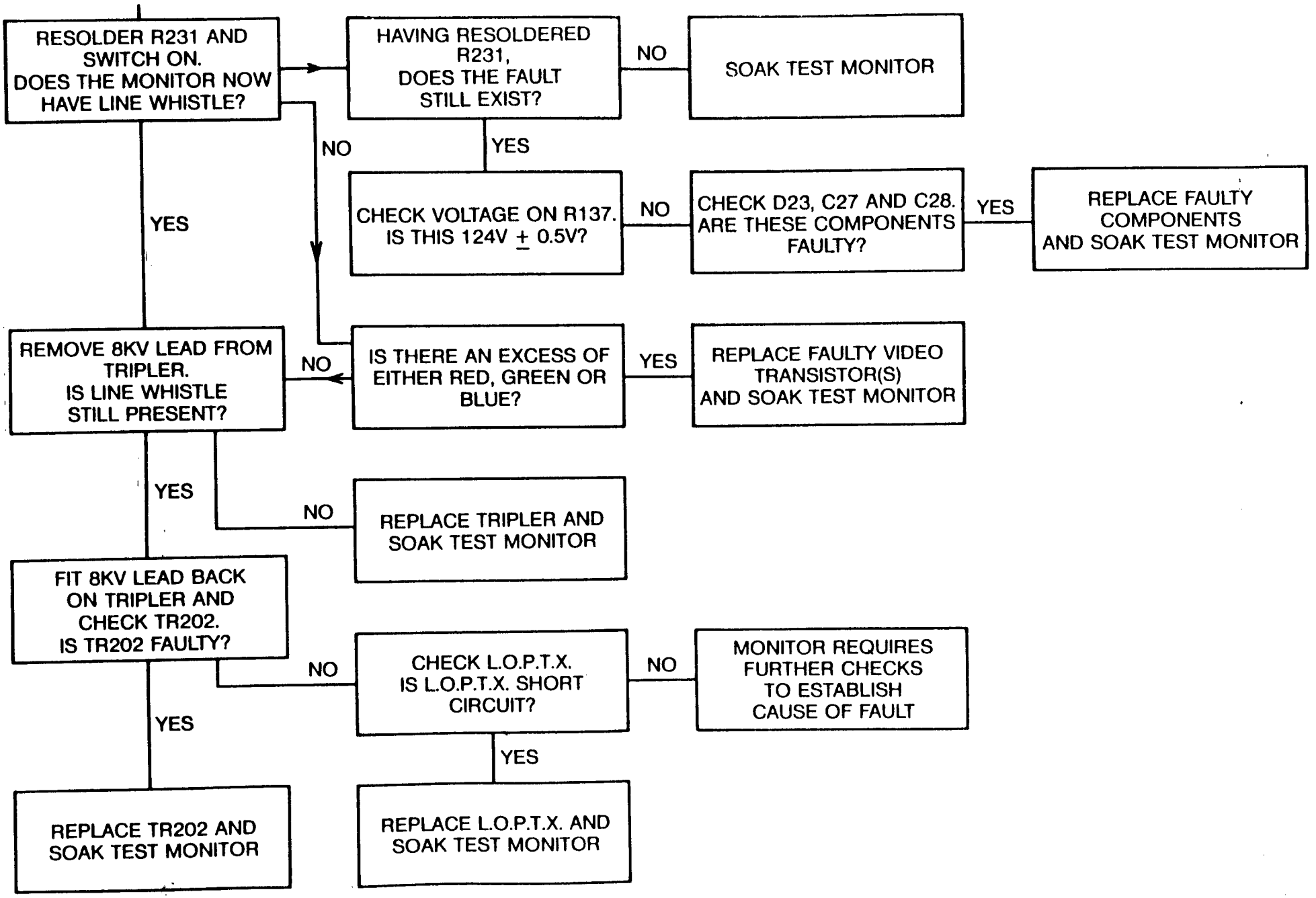


MONITOR DEAD
NEON ILLUMINATED

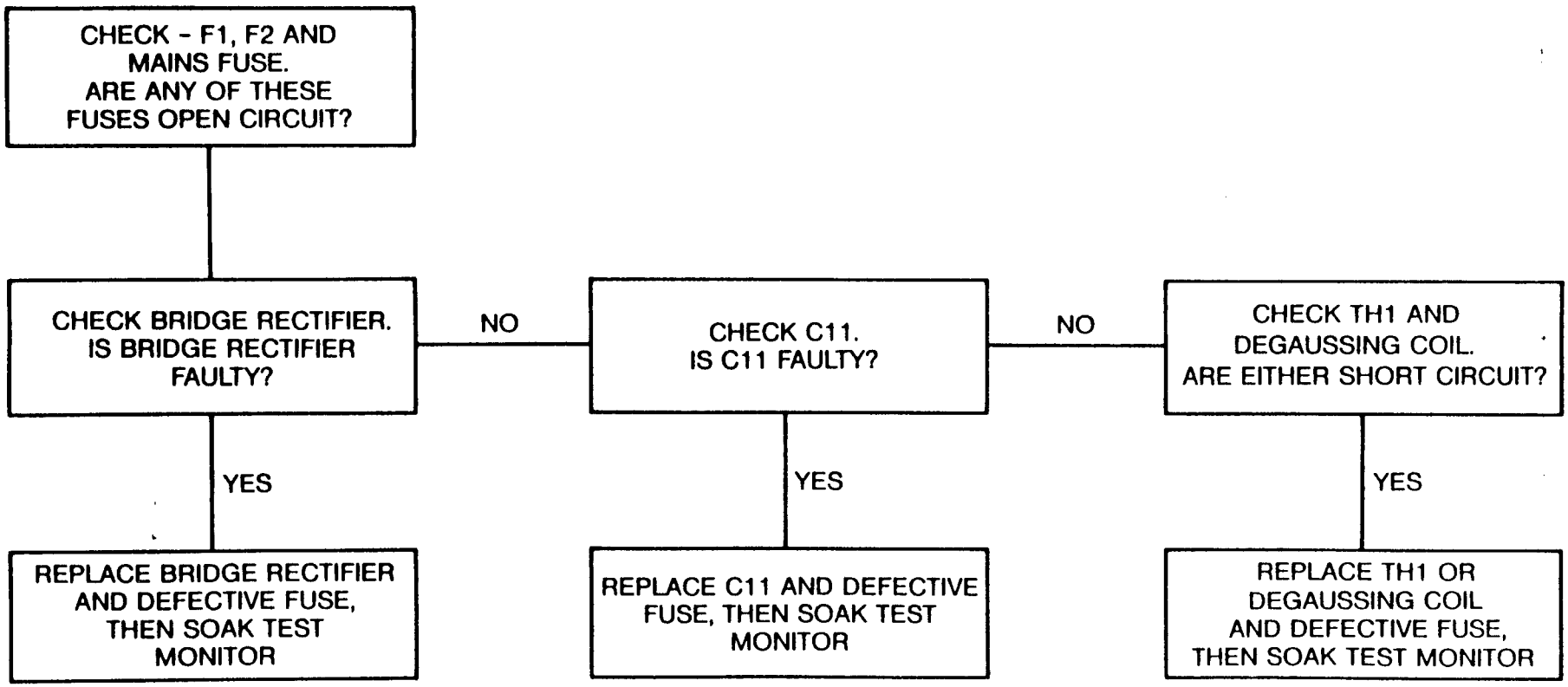


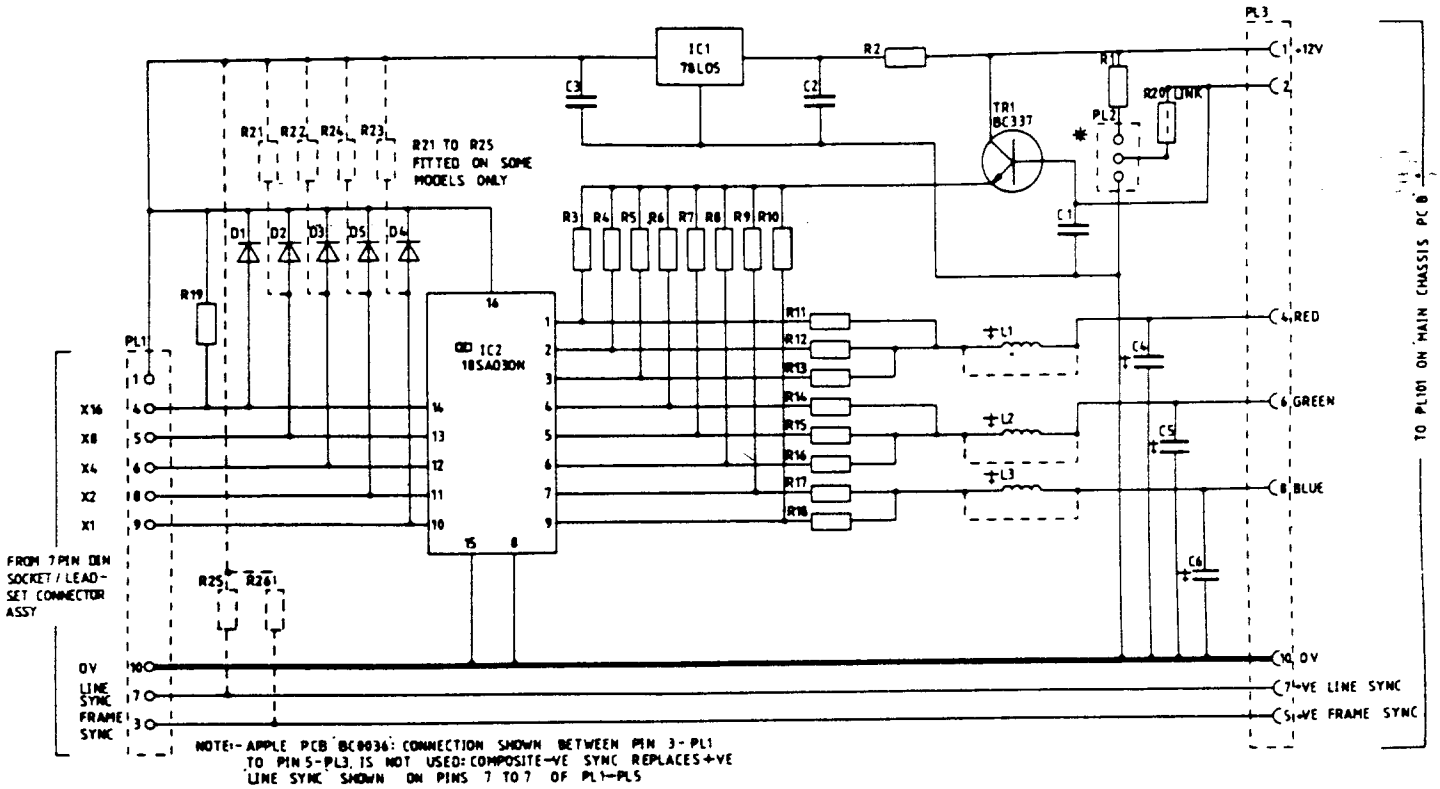
MONITOR HAS NO PICTURE




RESOLDER R231 AND SWITCH ON. DOES THE MONITOR NOW HAVE LINE WHISTLE?
HAVING RESOLDERED R231, DOES THE FAULT STILL EXIST?
NO
SOAK TEST MONITOR
YES
NO
YES
CHECK VOLTAGE ON R137. IS THIS 124V ± 0.5V?
NO
CHECK D23, C27 AND C28. ARE THESE COMPONENTS FAULTY?
YES
REPLACE FAULTY COMPONENTS AND SOAK TEST MONITOR
REMOVE 8KV LEAD FROM TRIPLER. IS LINE WHISTLE STILL PRESENT?
NO
IS THERE AN EXCESS OF EITHER RED, GREEN OR BLUE?
YES
REPLACE FAULTY VIDEO TRANSISTOR(S) AND SOAK TEST MONITOR
YES
NO
REPLACE TRIPLER AND SOAK TEST MONITOR
FIT 8KV LEAD BACK ON TRIPLER AND CHECK TR202. IS TR202 FAULTY?
NO
CHECK L.O.P.T.X. IS L.O.P.T.X. SHORT CIRCUIT?
NO
MONITOR REQUIRES FURTHER CHECKS TO ESTABLISH CAUSE OF FAULT
YES
YES
REPLACE TR202 AND SOAK TEST MONITOR
REPLACE L.O.P.T.X. AND SOAK TEST MONITOR

MONITOR DEAD -
NEON NOT ILLUMINATED

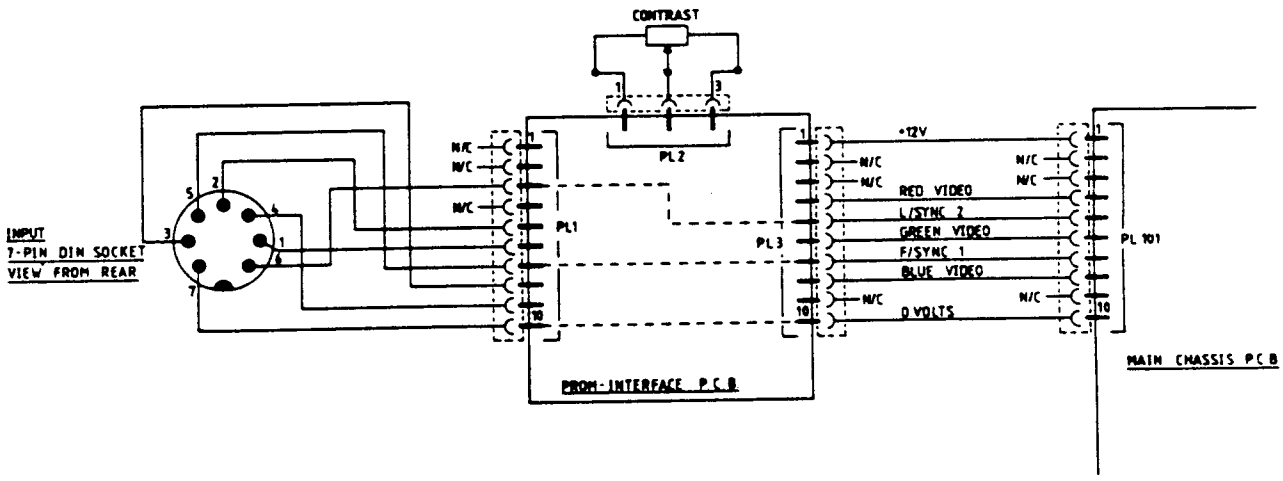


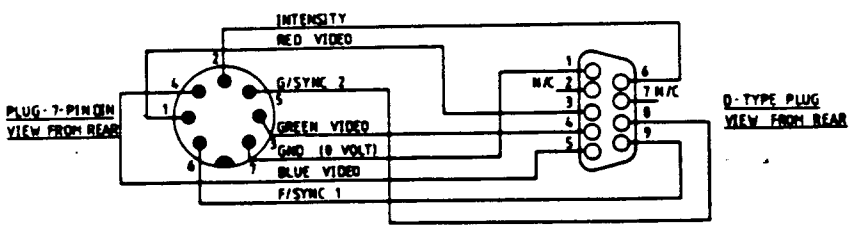


NOTE:- APPLE PCB BC0036: CONNECTION SHOWN BETWEEN PIN 3 - PL1 TO PIN 5 - PL3, IS NOT USED: COMPOSITE -VE SYNC REPLACES +VE LINE SYNC SHOWN ON PINS 7 TO 7 OF PL1 - PL5

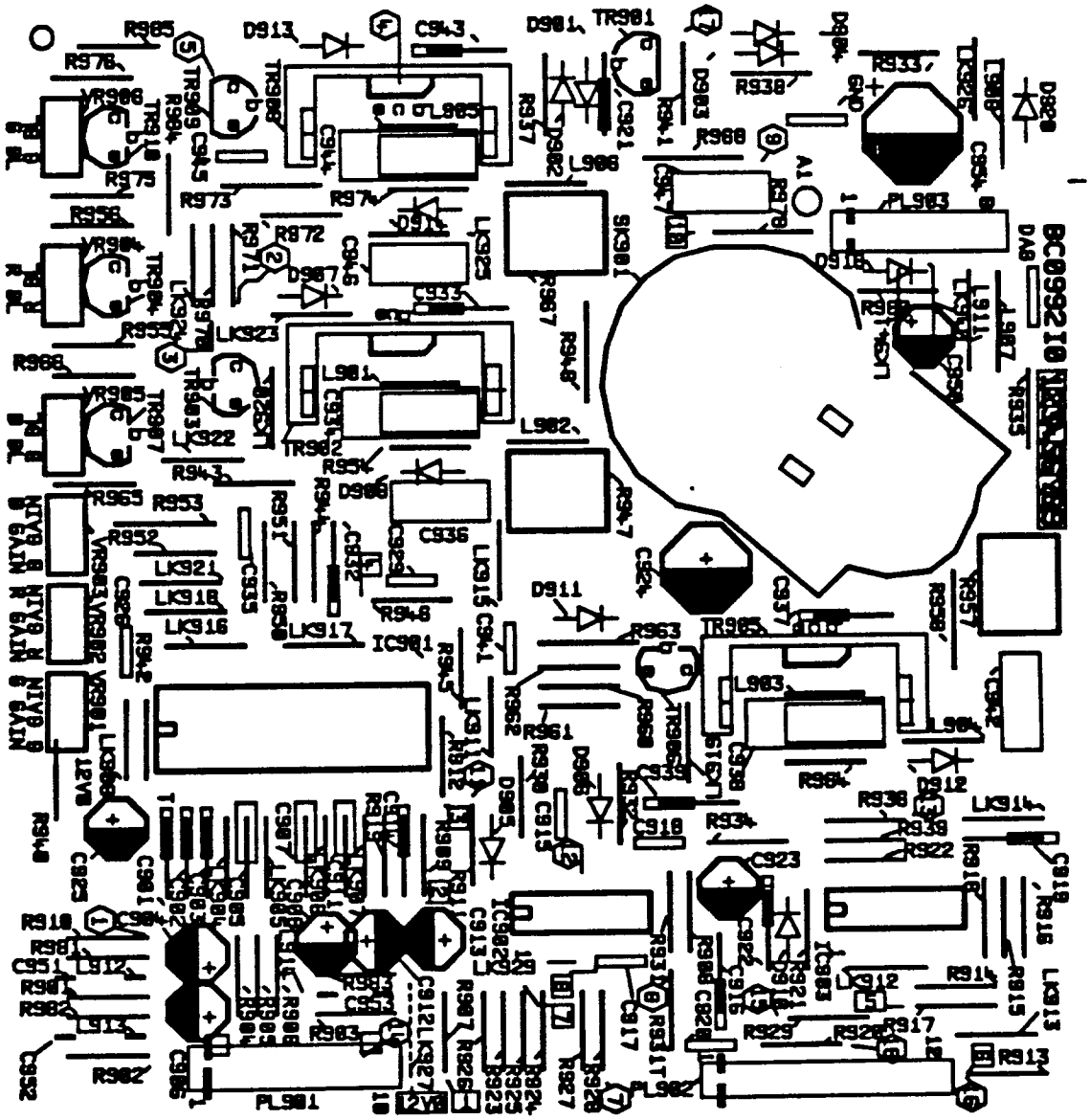
SYMBOL	REMARKS
⊡	IC2 IS PROGRAMMED INDIVIDUALLY FOR SPECIFIC MONITOR MODEL Nº
*	PL2 CONNECTS TO CUSTOMER CONTRAST CONTROL POT ASSY
⏚	FITTED ON RFI SUPPRESSED VERSIONS ONLY

CIRCUIT DIAGRAM PROM INTERFACE PANEL

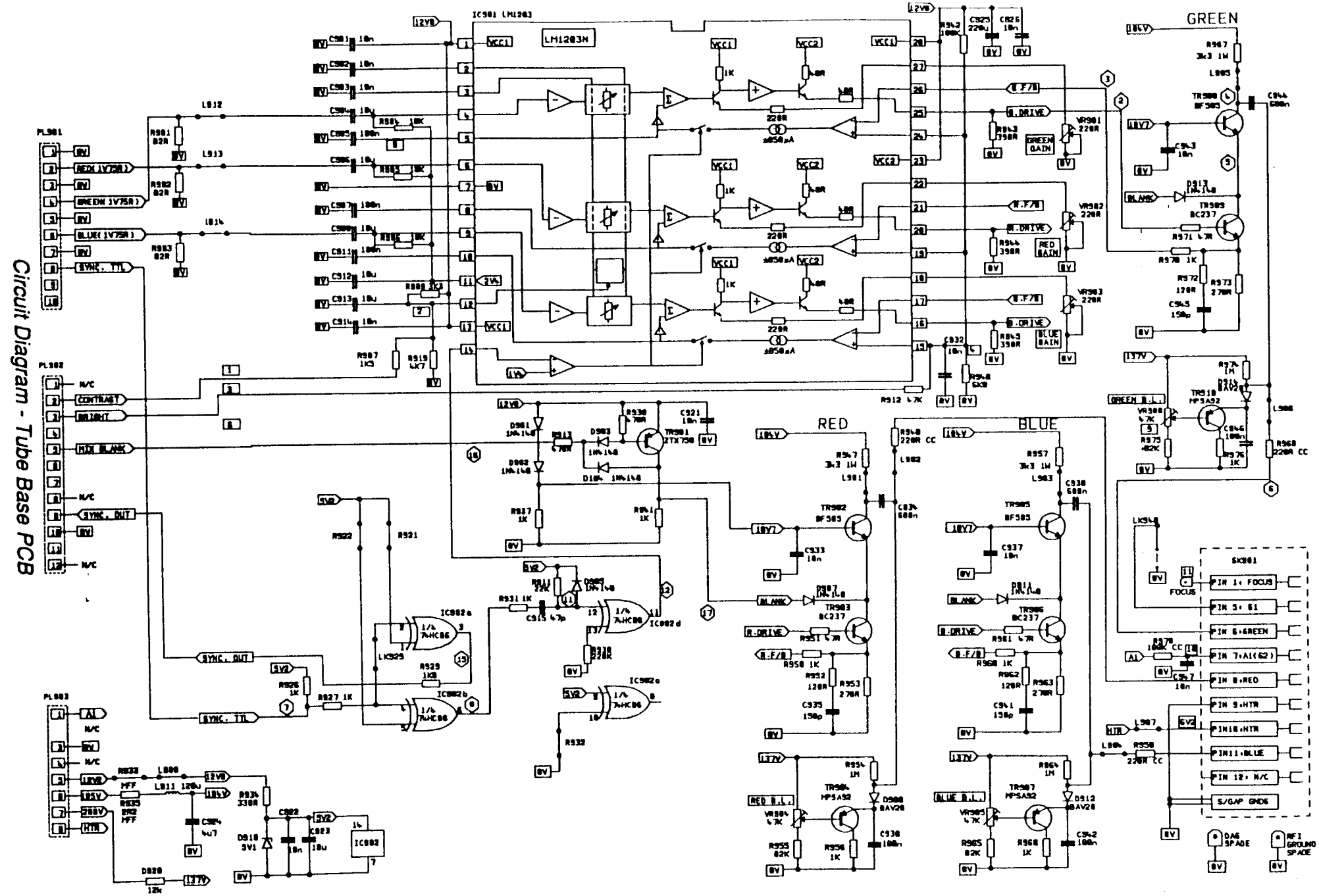


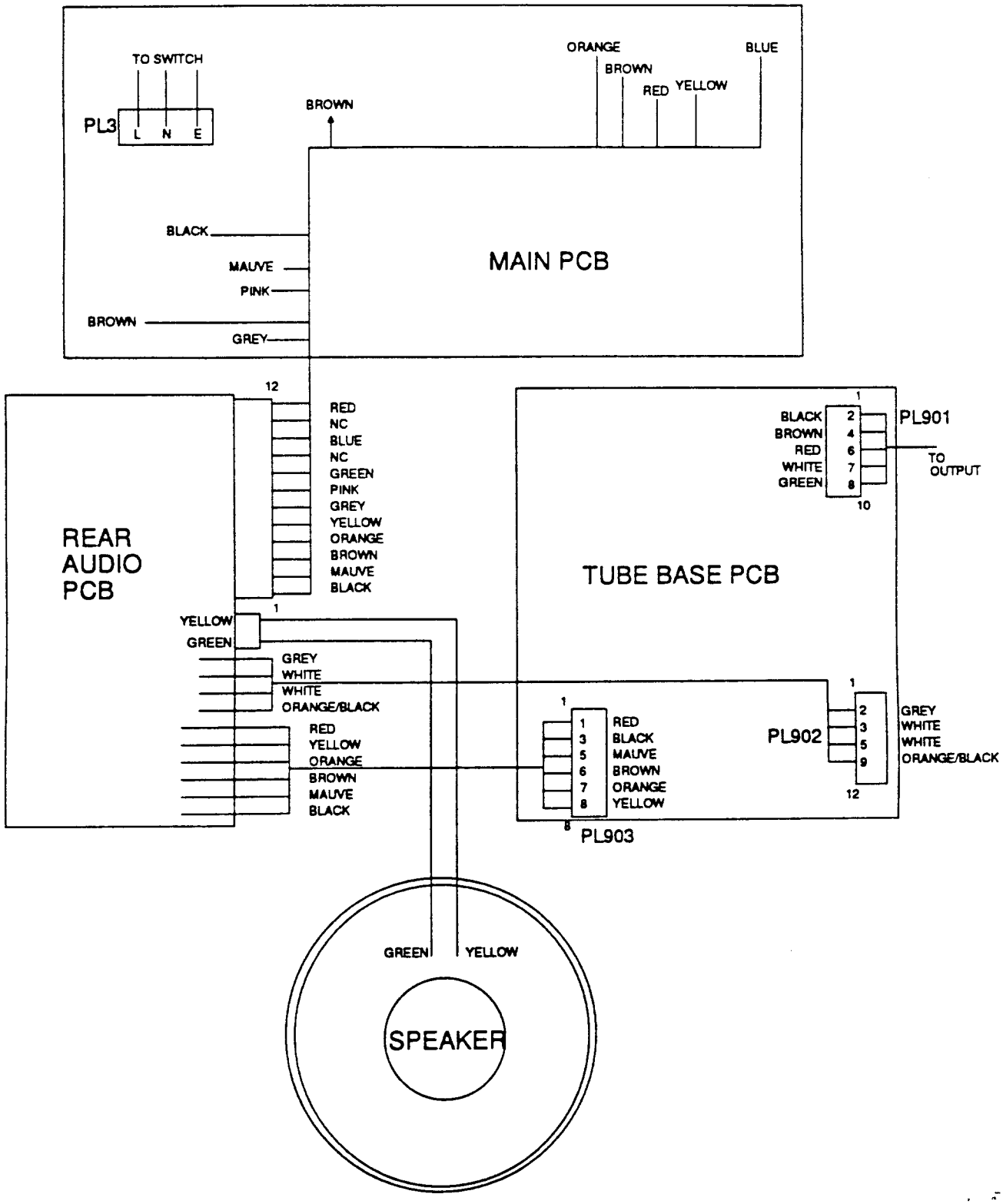


PROM INTERFACE - INTERCONNECTION DIAGRAM - FOR SERIES 3 MONITORS
DRG Nº G00737

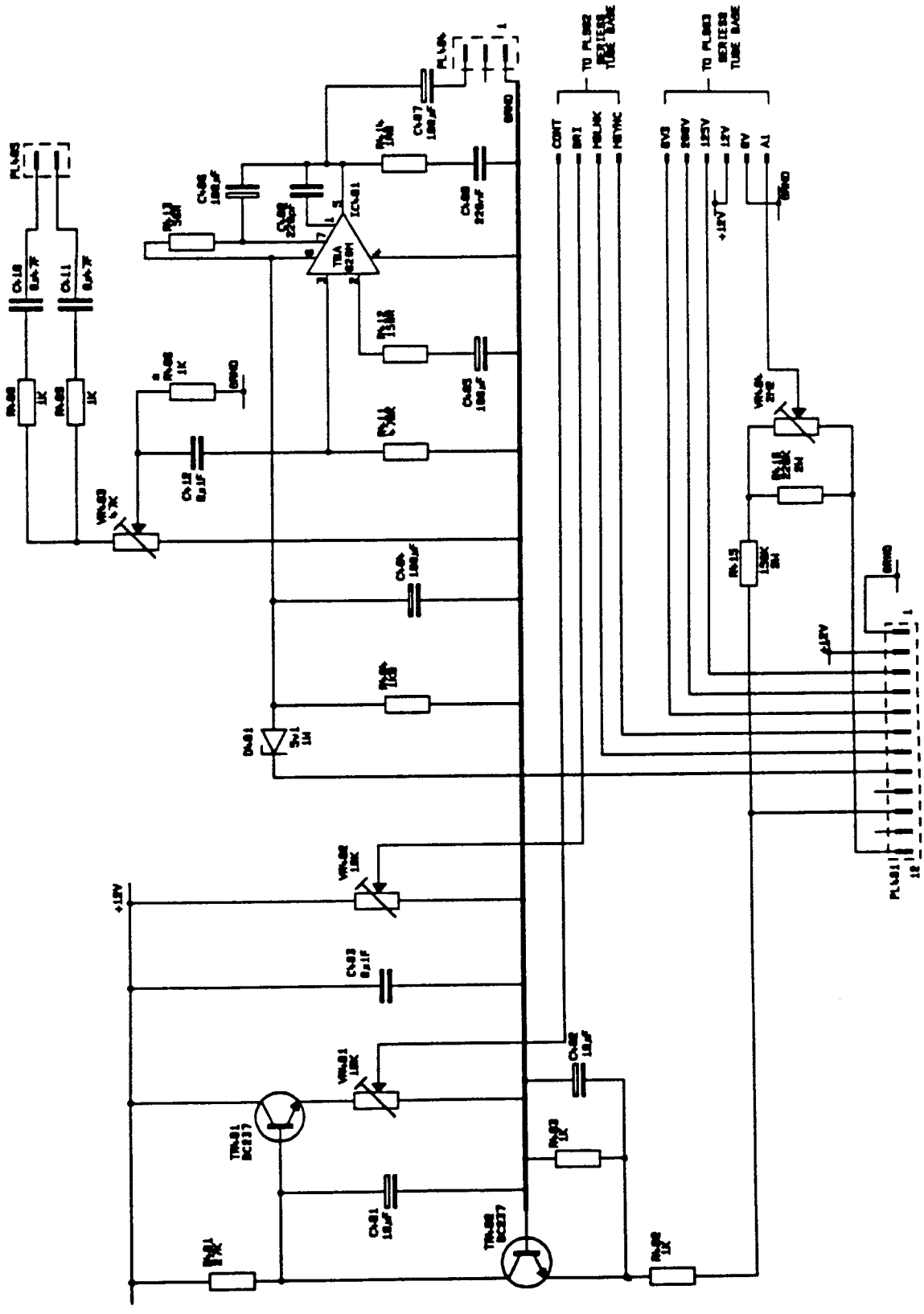


PCB Layout - Tube Base PCB


IC901 LM1203
LM1203N
PL901
PL902
PL903
GREEN
RED
BLUE
GREEN GAIN
RED GAIN
BLUE GAIN
GREEN B.L.
RED B.L.
BLUE B.L.
SK301
PIN 1: FOCUS
PIN 5: B1
PIN 6: GREEN
PIN 7: A1(62)
PIN 8: RED
PIN 9: HTR
PIN10: HTR
PIN11: BLUE
PIN 12: N/C
S/GAP GNDS
FOCUS
DAC SPADE
RFI GROUND SPADE
HOR BLANK
SYNC. OUT
SYNC. TTL
CONTRAST
BRIGHT
BLANK
R-DRIVE
G-DRIVE
B-DRIVE
R-F/B
G-F/B
B-F/B
12V0
18V7
13V7
8V
5V2
18V
HTR



Interconnection Diagram 14M325MA2



Circuit Diagram - Audio PCB - 14M325MA2

SERIES 3 SUPPLEMENT - ALL MODELS WITH SUFFIX 'C'

SUPPLEMENT TO THE SERVICE MANUAL FOR MODELS WITH SUFFIX 'C'

MODELS AFFECTED :

14M325MA2C	1431MS4C	1451MS4C
1439A2SC	1459A2SC	1431A2SC
1450MS4C	1451APMS4C.	

INTRODUCTION

All models with the suffix 'C' have a new Drive/Deflection PCB. The 14M325MA2C, 1431MS4C and 1451MS4C have a new cabinet back, with revised control positions. The 1431MS4C and 1451MS4C now have captive leads with DIN plugs instead of rear panel-mounting DIN sockets. The 14M325MA2C has a smaller Rear Audio Input PCB.

SAFETY NOTE

THE EHT CIRCUIT TO THE FINAL CRT ANODE DOES NOT HAVE A BLEED RESISTOR IN 'C' MODELS.THE FINAL ANODE WILL STILL BE CHARGED TO UP TO 25KV EVEN WHEN THE MONITOR IS SWITCHED OFF. BEFORE ATTEMPTING TO REMOVE THE FINAL ANODE BUTTON CONNECTOR, DISCHARGE THE FINAL ANODE WITH A SUITABLE EHT PROBE.

DRIVE/DEFLECTION PCB

SEE SAFETY NOTE, ABOVE, BEFORE SERVICING THIS AREA OF CIRCUITRY.

Power Supply, Video Inputs, Line Timebase and Field Timebase areas are substantially unchanged.

The most significant areas of change to the Drive/Deflection PCB are the Line Output, Line Drive and the addition of an Audio Amplifier.

LINE OUTPUT

The Line Output stage has the old Line Output Transformer and Tripler combination replaced by a Diode Split Transformer (DST), T203. Focus and A1 potentials are now derived within the DST and can be adjusted by the controls on the DST marked " FOCUS " and " SCREEN ", voltages emerge on leads which connect directly to the Tube Base. The area of circuitry on the Tube Base which was used to derive the A1 potential has now been removed. The DST is driven from a line flyback pulse on pin 2 of the DST. L202, L203 and T203 primary , are tuned during the flyback period by C222. Flyback time depends on the model. The Line output transistor, TR202, is driven directly from the secondary winding of T201, 'ON' current is controlled by R227, turn off by D202/R232.

Line linearity correction is provided by L203 and width control by L202 these are damped by C216, R228. 'S' correction is provided by C218.

Current for the line output is from the B+ (voltage varies from 123 to 130V, depending on model) via a resistor, R231, to reduce breathing effects, into pin 3. Pins 4 and 5 generate the Frame Output volts, approx. 25V. Pins 6 and 10 generate the Heater volts for the CRT, the voltage applied is reduced by R237 to approx. 6.0V RMS.

EHT current is taken from pin 7 of the DST, this is smoothed by C107 and limited by R141 before being applied to the Beam Current Limit circuitry at the junction of D117/D118. When this current becomes excessive the Beam Current Limit circuitry reduces the drives via the contrast control.

LINE DRIVE

The Line Drive circuit (TR201 and T201) is driven from horizontal drive pulses on pin 3 of IC201, these are AC coupled to TR201 and used to control the driver transformer (T201). T201 gives the impedance conversion necessary to provide 600mA forward base current for saturation of the output transistor, TR202. Ringing is damped by R225/R230 and C214 at TR201 turn off, thus limiting its Vce to a safe value. The Driver stage is now powered from the +18V rail via R226.

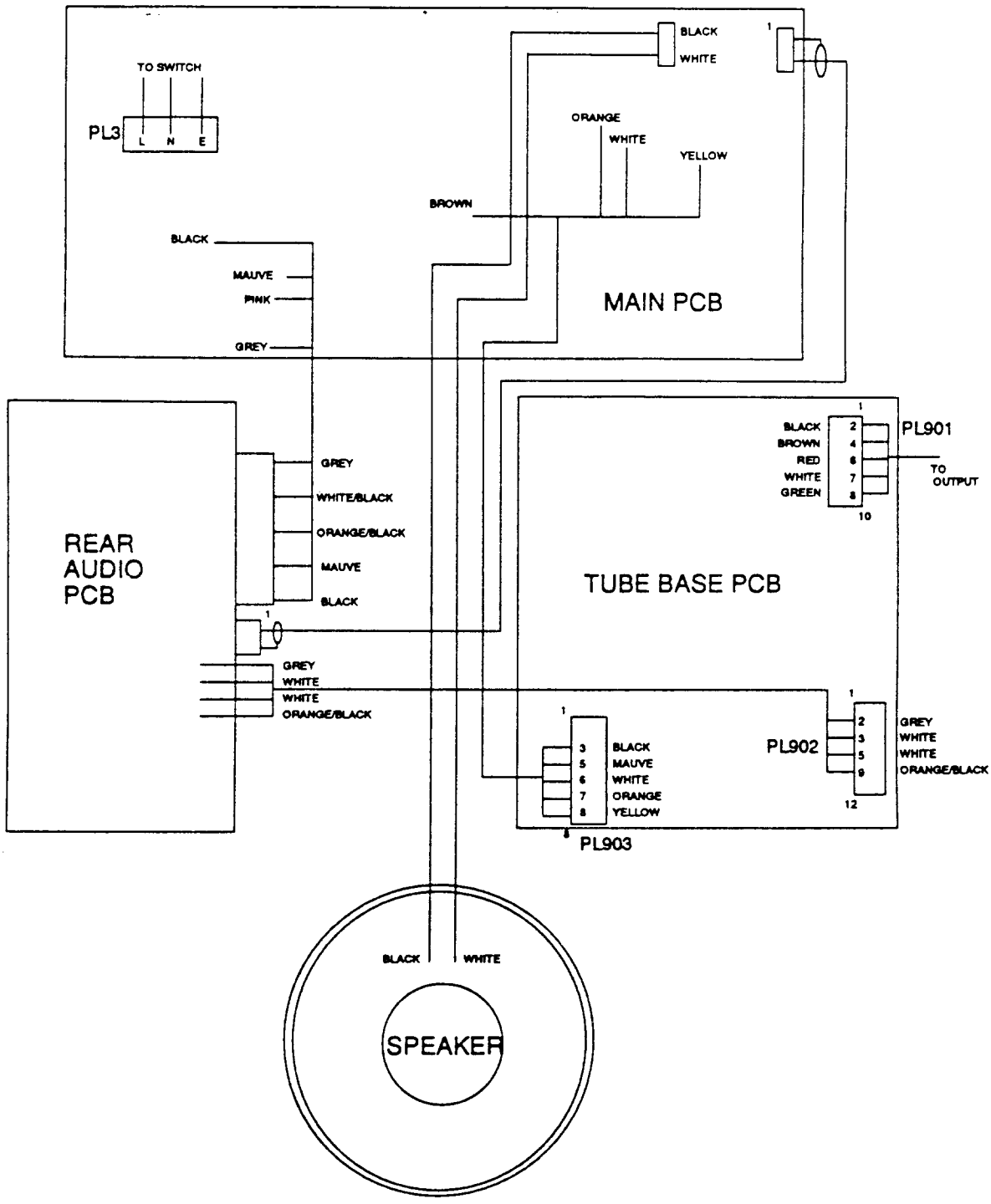
AUDIO AMPLIFIER

An audio amplifier has now been included on the Drive/Deflection PCB for use in the 14M325MA2C, where there is now no amplifier on the Rear Audio Input Board. The audio amplifier circuit is based on the TDA820M 1.2 Watt 8 pin DIP audio amplifier IC. The IC is supplied from the 18 volt power supply rail via a 5.1V dropper zener diode (D501) and fusible resistor (R506) so that the actual supply to the IC is 13V. Stereo audio is now resistively summed on the Rear Audio Input Board and passed on to the audio amplifier on the Drive /Deflection PCB via a screened lead connecting to PL501. Impedences are kept low to allow termination by R502/C508 which reduce pick-up. Signal input to the IC is on pin 3, resistor R503 sets the feed back level and hence the closed loop gain of the amplifier. C505 sets the upper frequency stability, preventing the amplifier from oscillating. Audio output is coupled via C507 to PL502, the loudspeaker connection.

TUBE BASE (models other than 14M325MA2C)

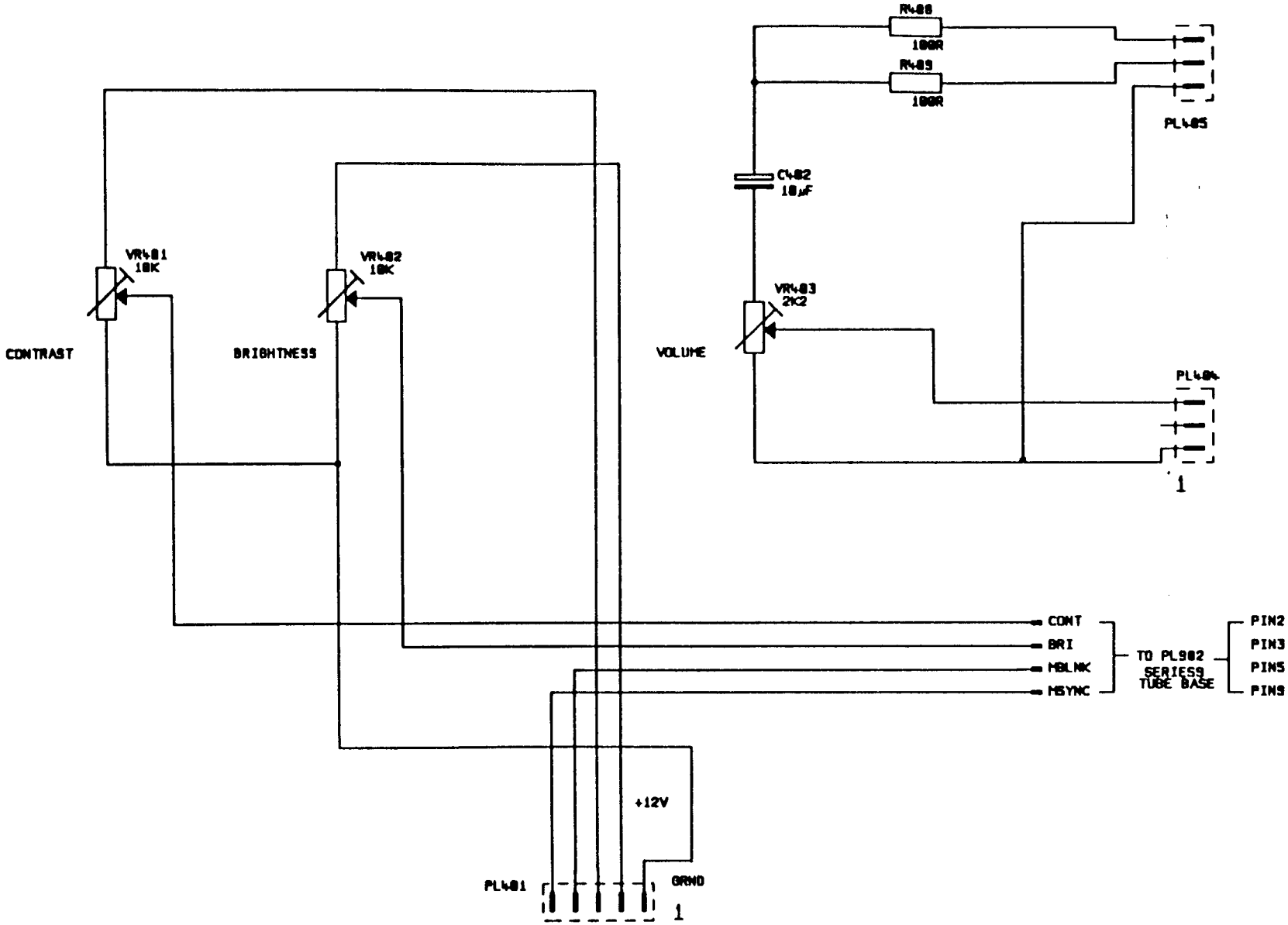
The A1 circuitry has now been removed from the tube base and the A1 voltage from the DST connects to the A1 CRT electrode via R931. Beam Current Limit is no longer routed via the Tube Base so the former 'floating' earth of the spark gaps is now connected to 0V.

ADDITIONAL DIAGRAMS

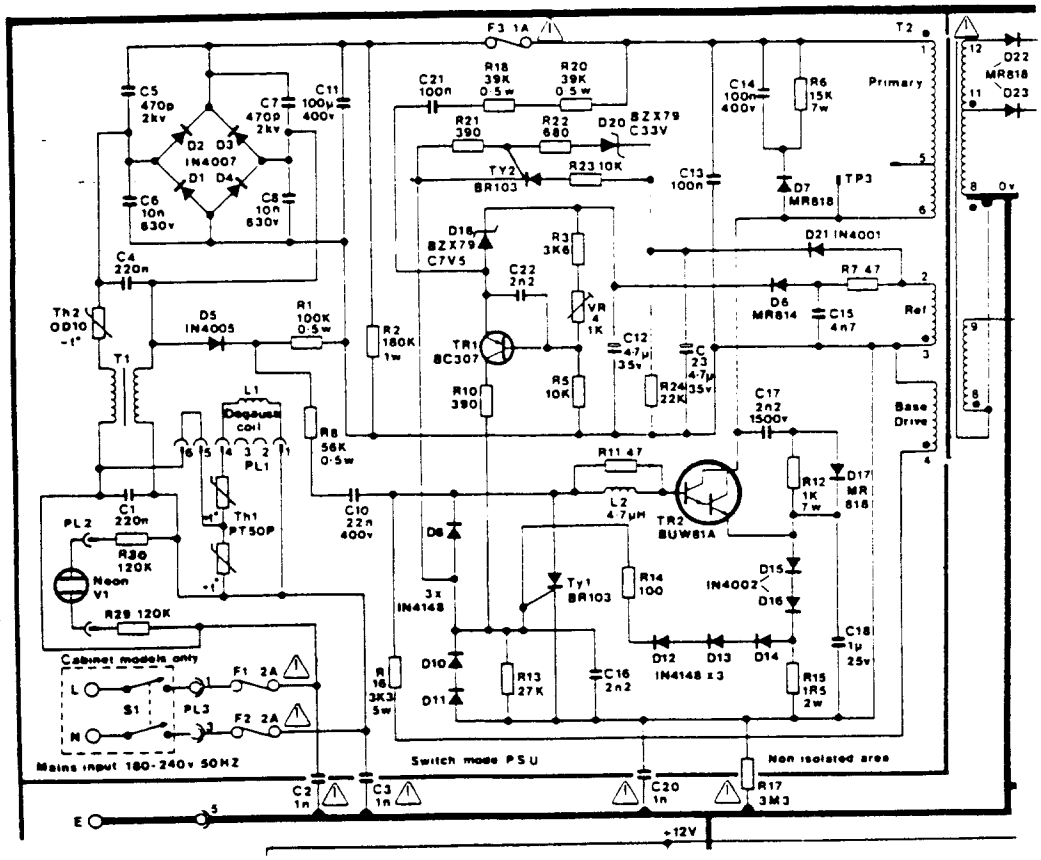


Interconnection Diagram - 14M325MA2C

Rear Input Panel Circuit Diagram - G02261 - 14M325MA2C



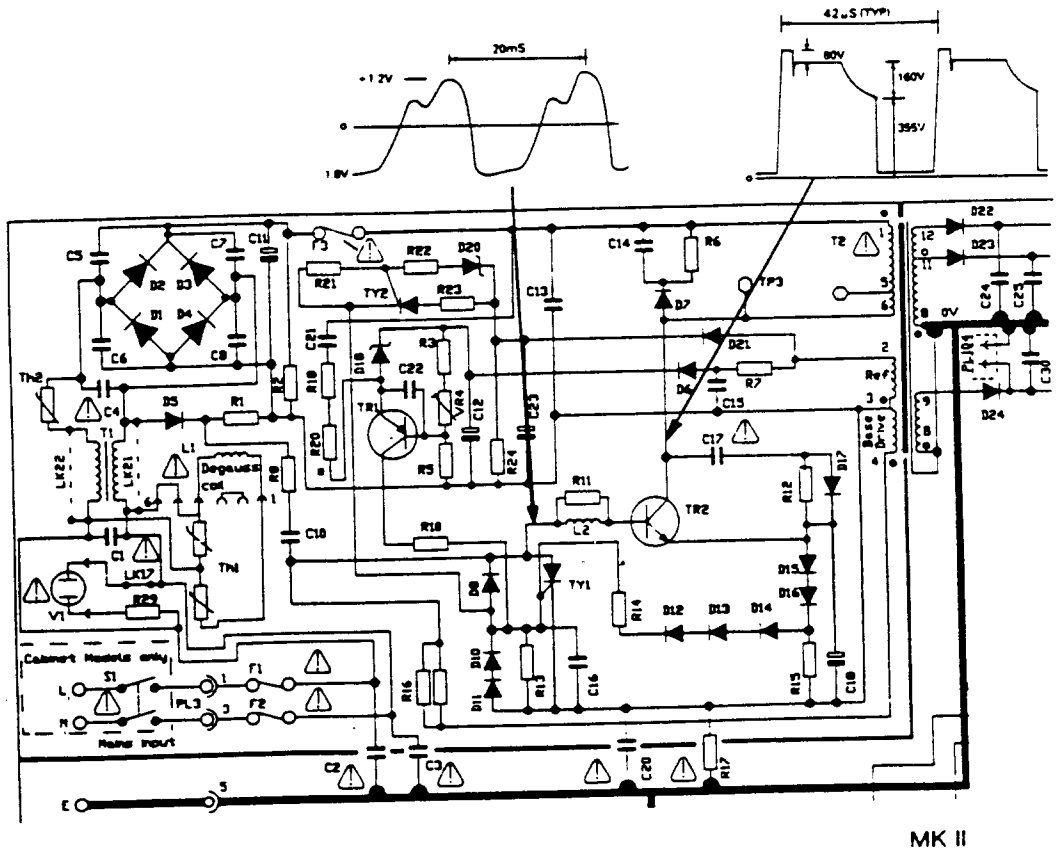
EARLIER POWER SUPPLIES



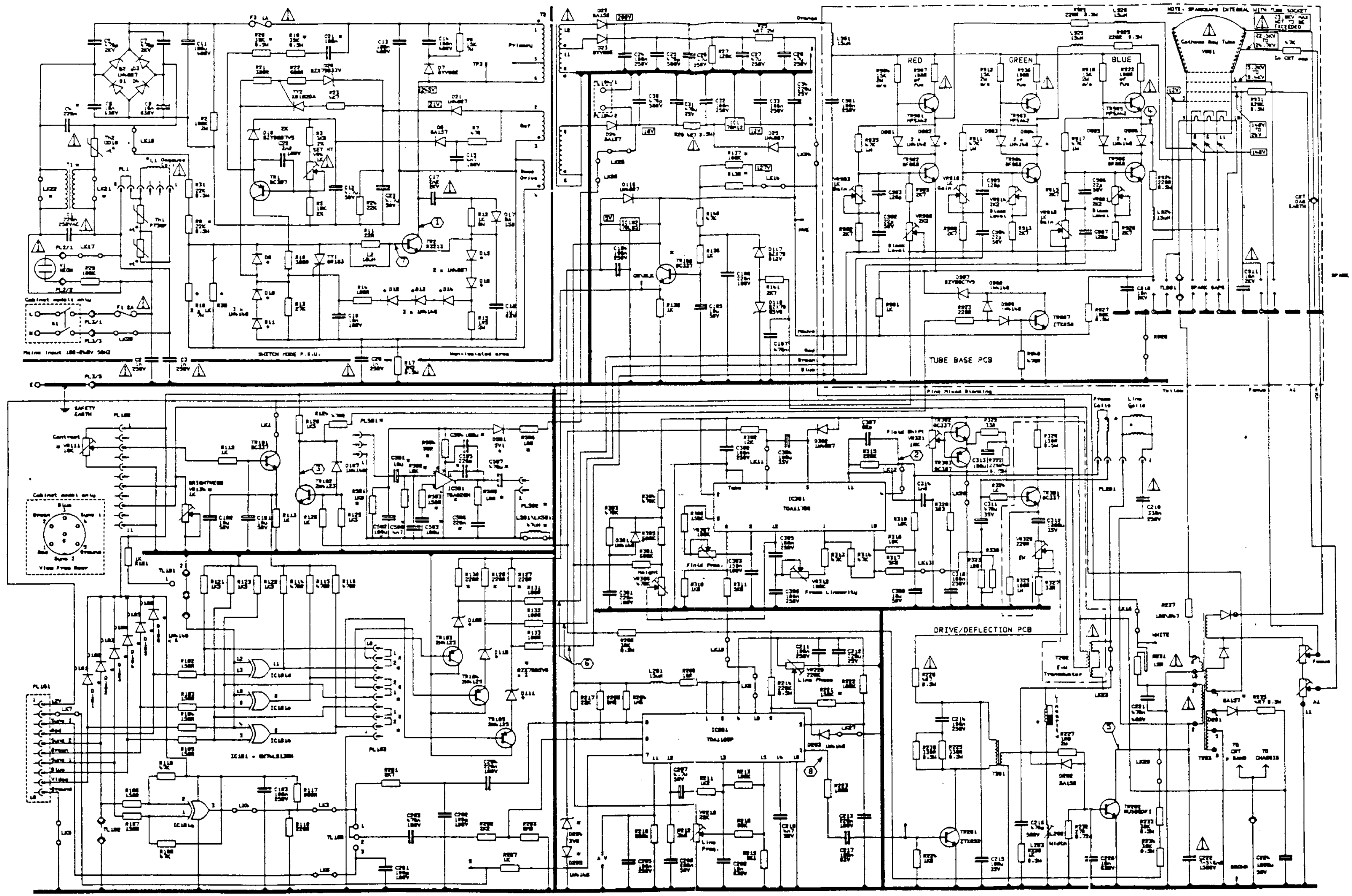
MK I

*NOTE
THE LATEST SERIES 3
POWER SUPPLY DIFFERS
FROM THE PREVIOUS BY
THE FOLLOWING:

R1 REMOVED
D5 REMOVED AND LINK FITTED
C10 } NOW 22K ½W
R8 } M/FILM RESISTOR

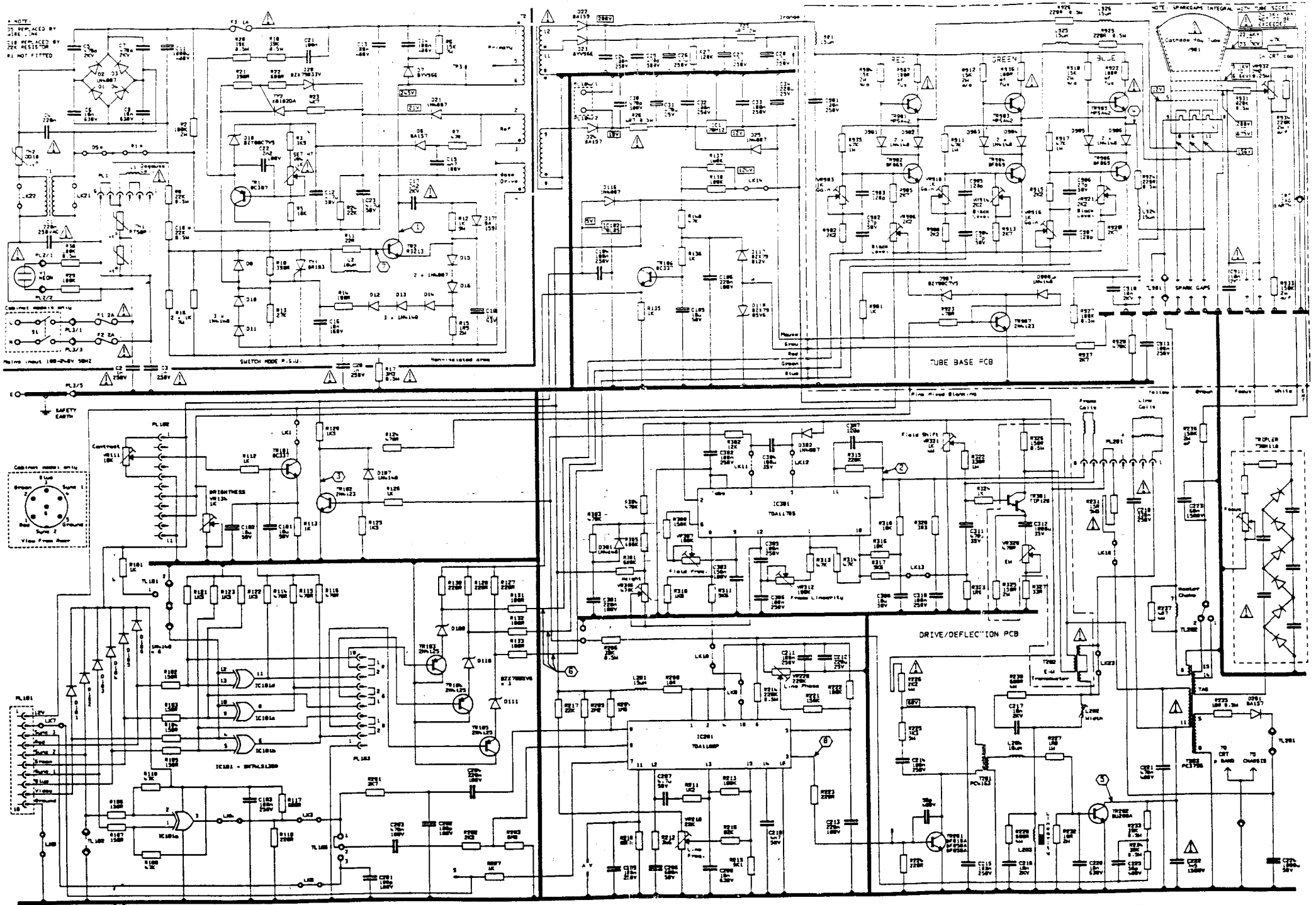


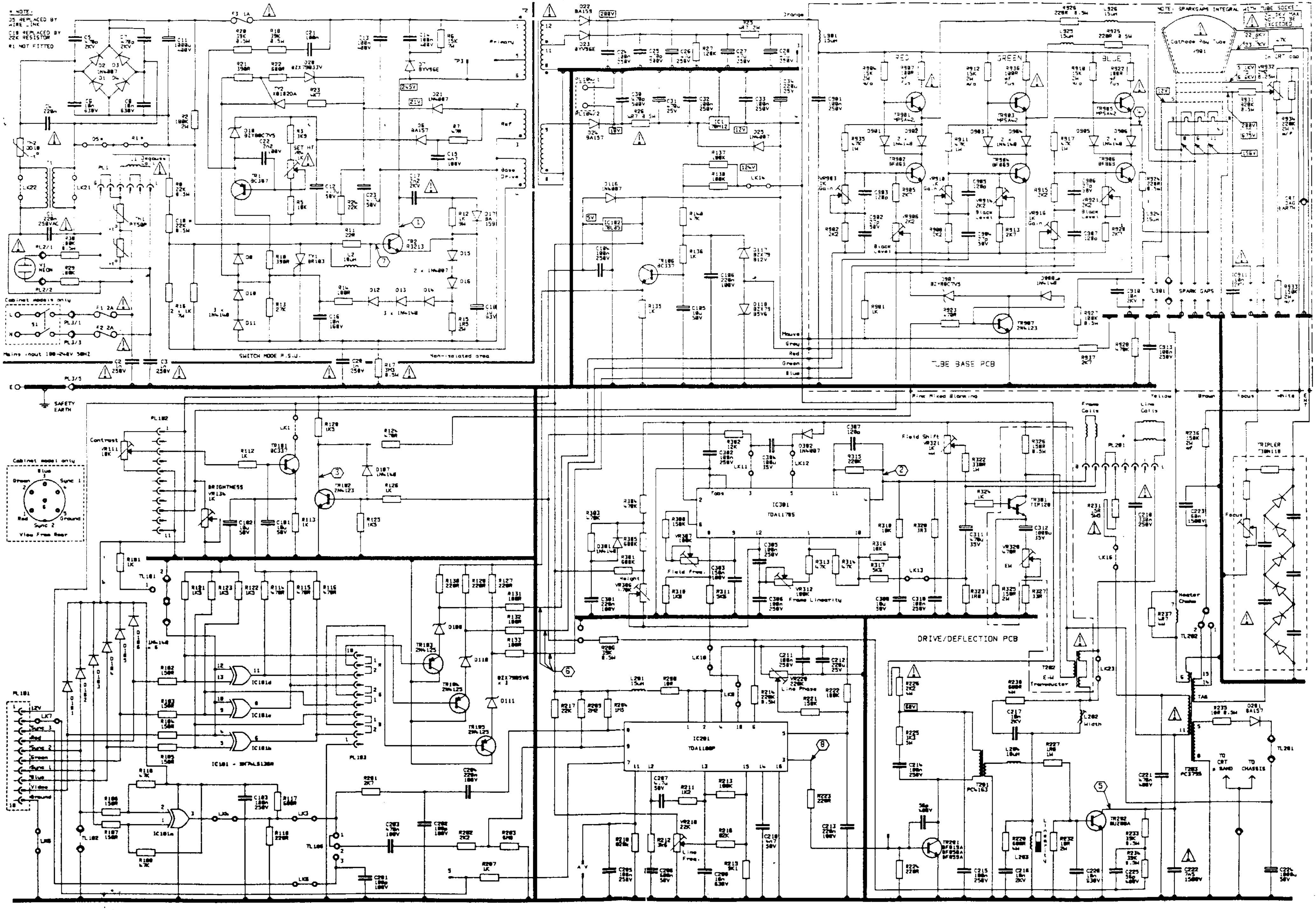
MK II

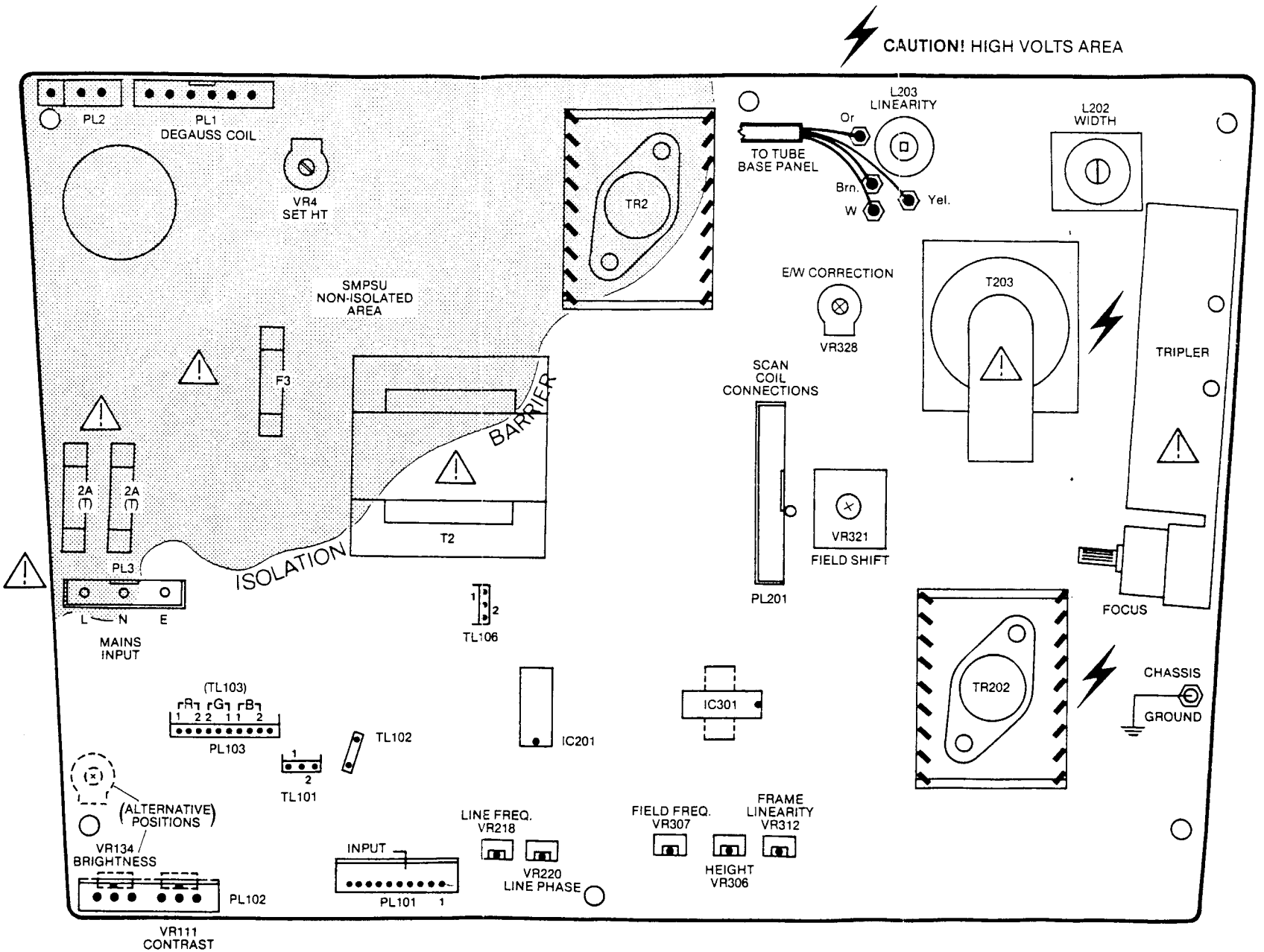


* May not be fitted or may be a different value on some models.

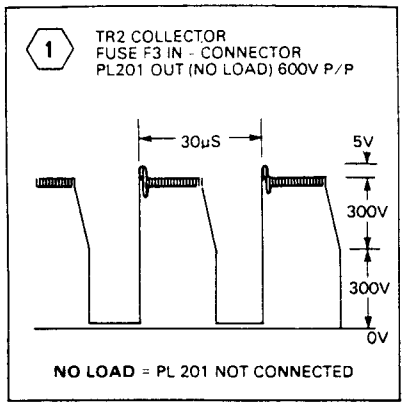
Drive Deflection Circuit Diagram Series 3 C Models - GO0397

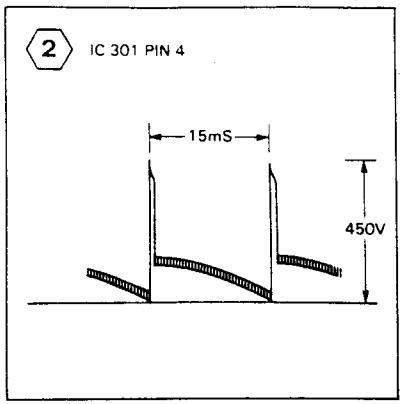

SWITCH MODE P.S.U.
TUBE BASE PCB
DRIVE/DEFLECTION PCB
SAFETY EARTH
RED
GREEN
BLUE
BRIGHTNESS
IC101 = SN74LS139D
IC201
TDA1180P
IC301
TDA1170S

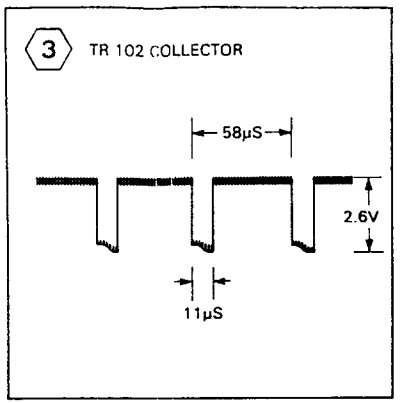

SWITCH MODE P.S.U.
Non-isolated area
Mains input 100-240V 50HZ
Cabinet models only
SAFETY EARTH
Contrast
BRIGHTNESS
View From Rear
IC101 - SN74LS136N
IC301
TDA1170S
IC201
TDA1180P
Field Shift
Height
Field Freq.
Frame Linearity
Line Phase
Line Freq.
Width
E-W Transducer
Frame Coils
Line Coils
DRIVE/DEFLECTION PCB
TUBE BASE PCB
RED
GREEN
BLUE
Cathode Ray Tube
SPARK GAPS
TRIPLER
Focus
Heater Choke

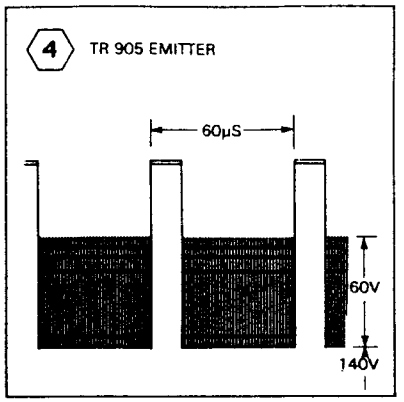


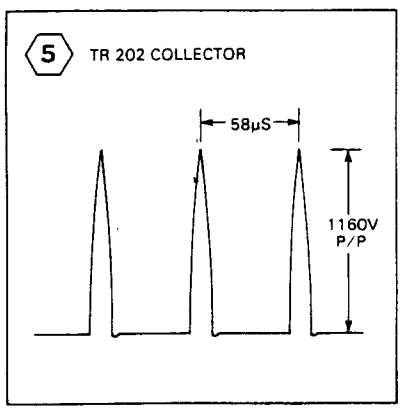
SERIES-3 MAIN CHASSIS - (COMPONENT SIDE SHOWING PRESETS/CONNECTORS AND WIRE LINK LOCATIONS ETC)

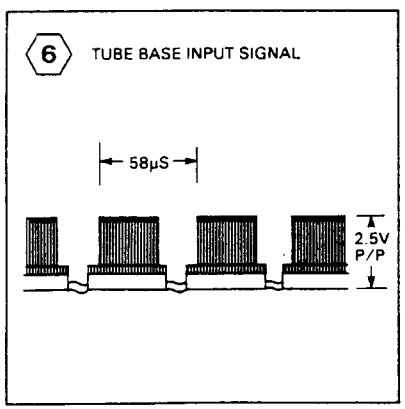


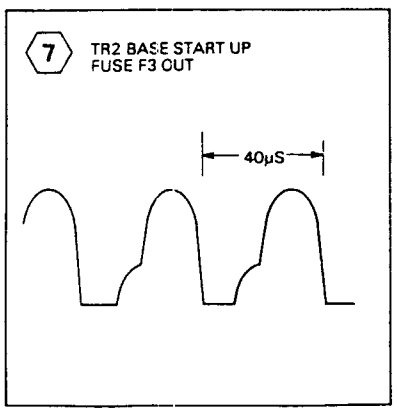


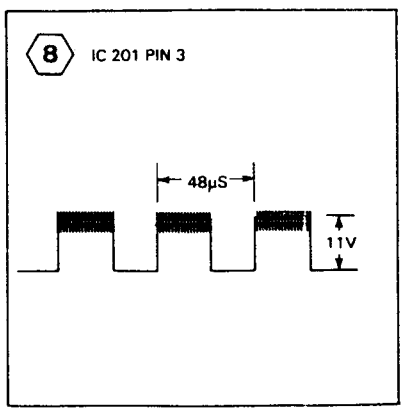












SAFETY AND ISOLATION!

The power supply is always live regardless of the mains supply polarity. Therefore for servicing, the monitor should be supplied through a mains Isolation Transformer of at least 300VA rating.
(See 'SAFETY NOTES' in SERVICE MANUAL).

SAFETY CRITICAL COMPONENTS

Components marked ⚠ on the circuit diagram and parts list are safety approved types and should only be replaced with components supplied or approved by our Service Department. It is recommended that other replaced parts should be of the type originally fitted, particularly resistors stood off the printed circuit boards.
FAILURE TO OBSERVE THE ABOVE MAY RENDER THE CHASSIS AND EXTERNAL ACCESSIBLE PARTS LIVE, OR CAUSE OTHER HAZARDS!

WAVEFORM MEASUREMENT POINTS

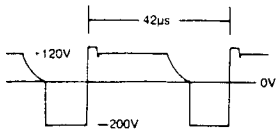
Waveform points are denoted thus (3)

1) The numerical reference point on the circuit diagram relates to the corresponding numbered display on the accompanying table.
2) Waveform measurements were made using an oscilloscope of 20MHz minimum bandwidth and a ÷10 or ÷100 passive probe.

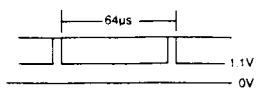
TYPICAL VOLTAGES - MEASUREMENT POINTS [3.0V]

1) Voltages denoted thus [3.0V] on the circuit diagram, are typical voltages only, and were measured using ahigh input impedance D.V.M.
2) Alternatively, Analogue meters of 20 KΩ/Volt minimum can be used.

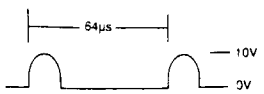
9 TEST POINT – D23 ANODE
Isolated secondary voltage drive winding (D23 anode). X100 probe.



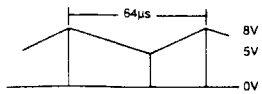
10 TEST POINT – IC201 PINS 8 AND 9
Mixed sync pulses at line rate. X10 probe.



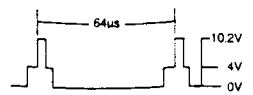
11 TEST POINT – IC201 PIN 6
Line flyback ref. pulse. X10 probe.



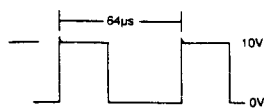
12 TEST POINT – IC201 PIN 14
Line oscillator. X10 probe.



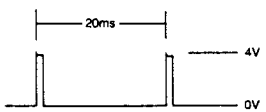
13 TEST POINT – IC201 PIN 7
Sandcastle pulse. X10 probe.



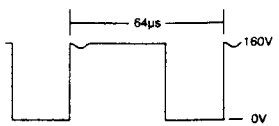
14 TEST POINT – IC201 PIN 3
Line drive information. X10 probe.



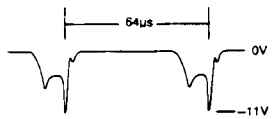
15 TEST POINT – IC201 PIN 10
Field sync. output. X10 probe.



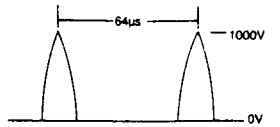
16 TEST POINT – TR201
TR201 Collector line driver primary waveform. X100 probe.



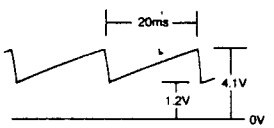
17 TEST POINT – TR202 BASE
Line output transistor base drive voltage. X10 probe.



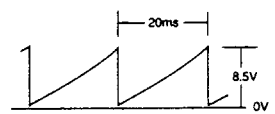
18 TEST POINT – TR202 COLLECTOR
Line output transformer collector -emitter voltage. X100 probe.



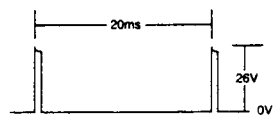
19 TEST POINT – IC301 PIN 9
Field oscillator waveform. X10 probe.



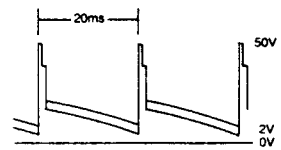
20 TEST POINT – IC301 PIN 12
Ramp generator. X10 probe.



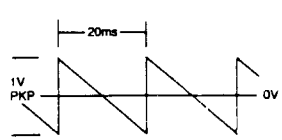
21 TEST POINT – IC301 PIN 3
Field flyback generator. X10 probe.



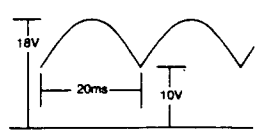
22 TEST POINT – IC301 PIN 4
Field output waveform. X10 probe.



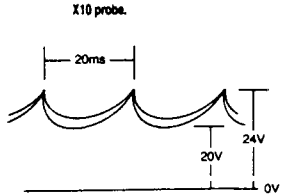
23 TEST POINT – CHECK ON R323
Field coils (Sawtooth current). X10 probe.



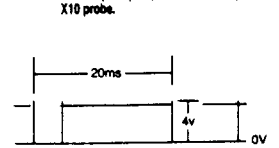
24 TEST POINT – TR301 BASE
Field parabola waveform. X10 probe.



25 TEST POINT – TR301 COLLECTOR
E-W Transducer drive waveform. X10 probe.



26 TEST POINTS – PL101 PINS 4, 6, 8
Video inputs (Red, Green and Blue). X10 probe.



SAFETY AND ISOLATION!

The power supply is always live regardless of the mains supply polarity. Therefore for servicing, the monitor should be supplied through a mains isolation Transformer of at least 300VA rating. (See 'SAFETY NOTES' in SERVICE MANUAL).

SAFETY CRITICAL COMPONENTS

Components marked ⚠ on the circuit diagram and parts list are safety approved types and should only be replaced with components supplied or approved by our Service Department. It is recommended that other replaced parts should be of the type originally fitted, particularly resistors stood off the printed circuit boards.
FAILURE TO OBSERVE THE ABOVE MAY RENDER THE CHASSIS AND EXTERNAL ACCESSIBLE PARTS LIVE, OR CAUSE OTHER HAZARDS!

WAVEFORM MEASUREMENT POINTS

Waveform points are denoted thus (3)

1) The numerical reference point on the circuit diagram relates to the corresponding numbered display on the accompanying table.
2) Waveform measurements were made using an oscilloscope of 20MHz minimum bandwidth and a +10 or +100 passive probe.

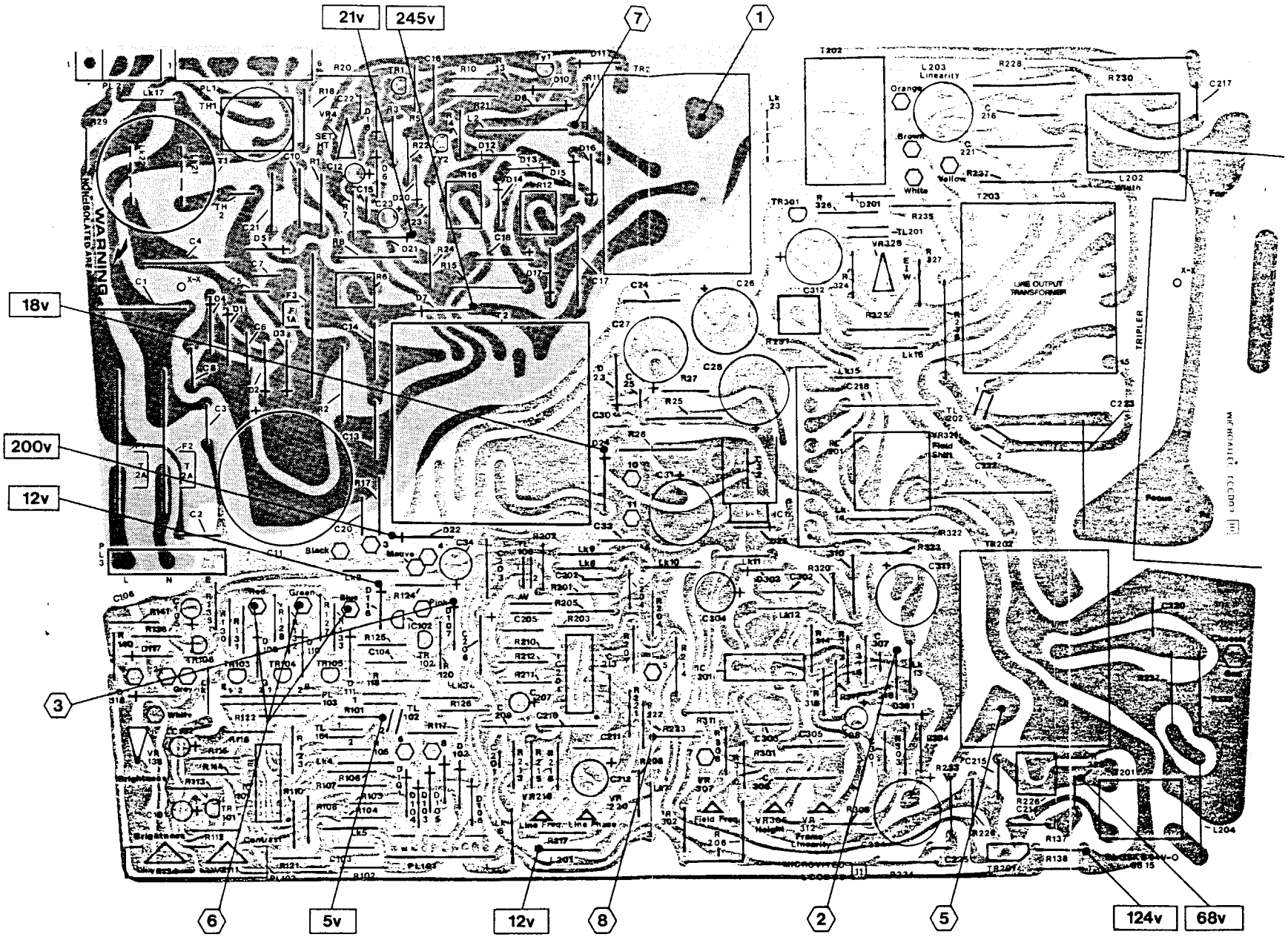
TYPICAL VOLTAGES – MEASUREMENT POINTS

1) Voltages denoted thus 3.0V on the circuit diagram, are typical voltages only, and were measured using a high input impedance D.V.M.
2) Alternatively, Analogue meters of 20 Kn/Volt minimum can be used.

NOTE

Waveform points denoted thus (3)
are NOT shown on the circuit diagram. Component pin numbers are given as test points on the associated waveforms.

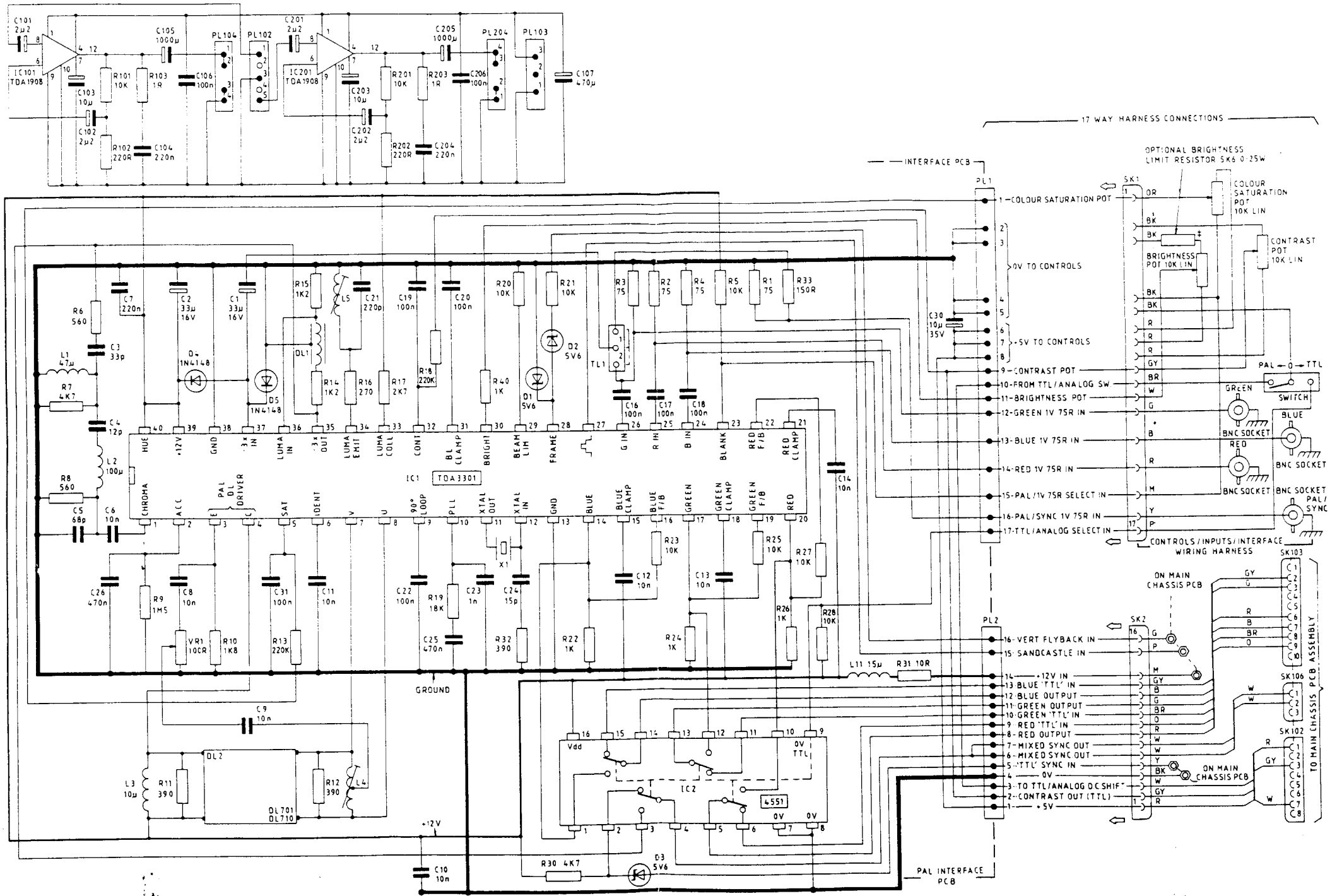
SERIES 3 WAVEFORMS (CONTINUED)



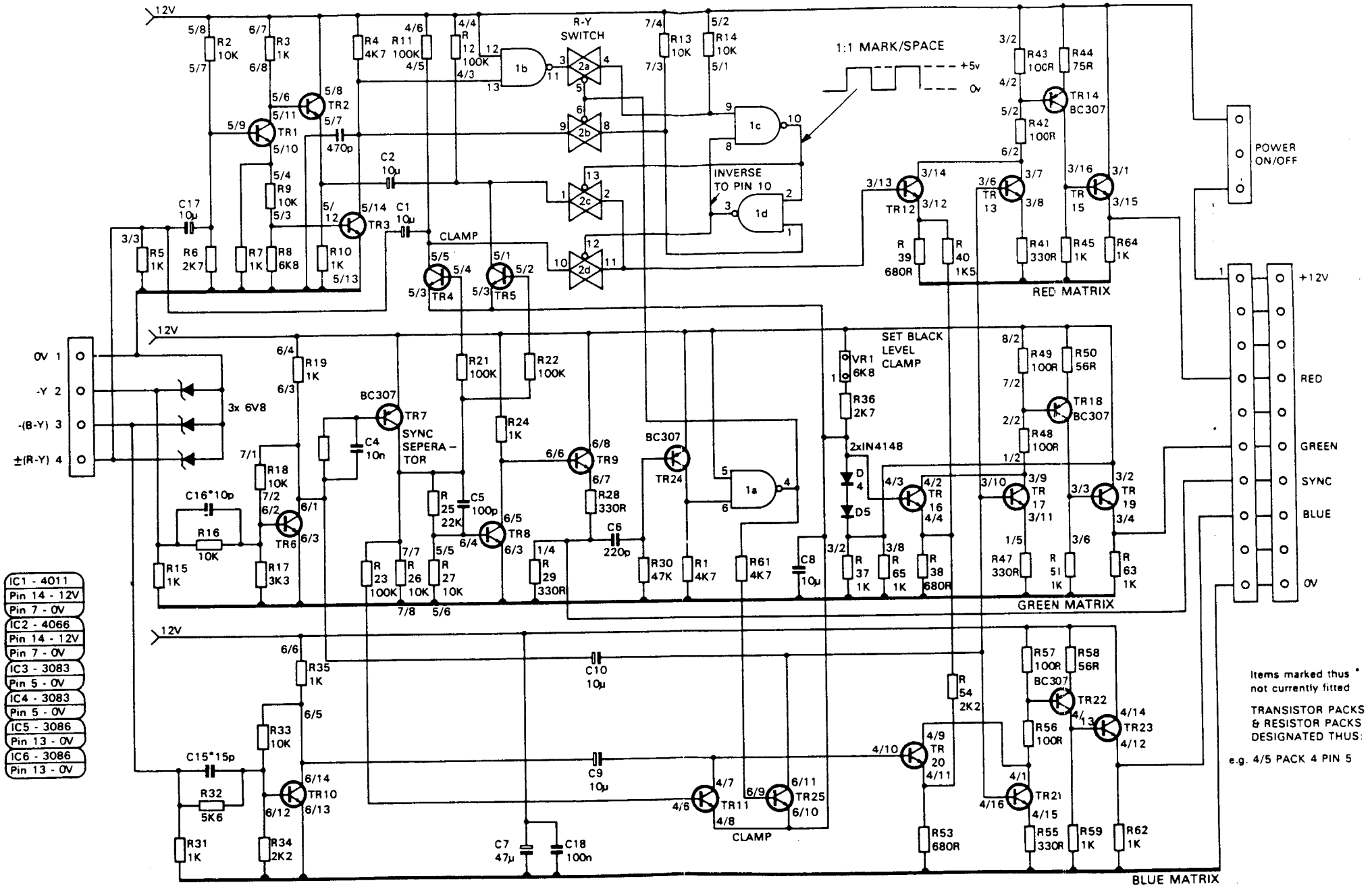
DENOTES TEST WAVEFORM MEASURING POINT

DENOTES TEST VOLTAGE MEASURING POINT

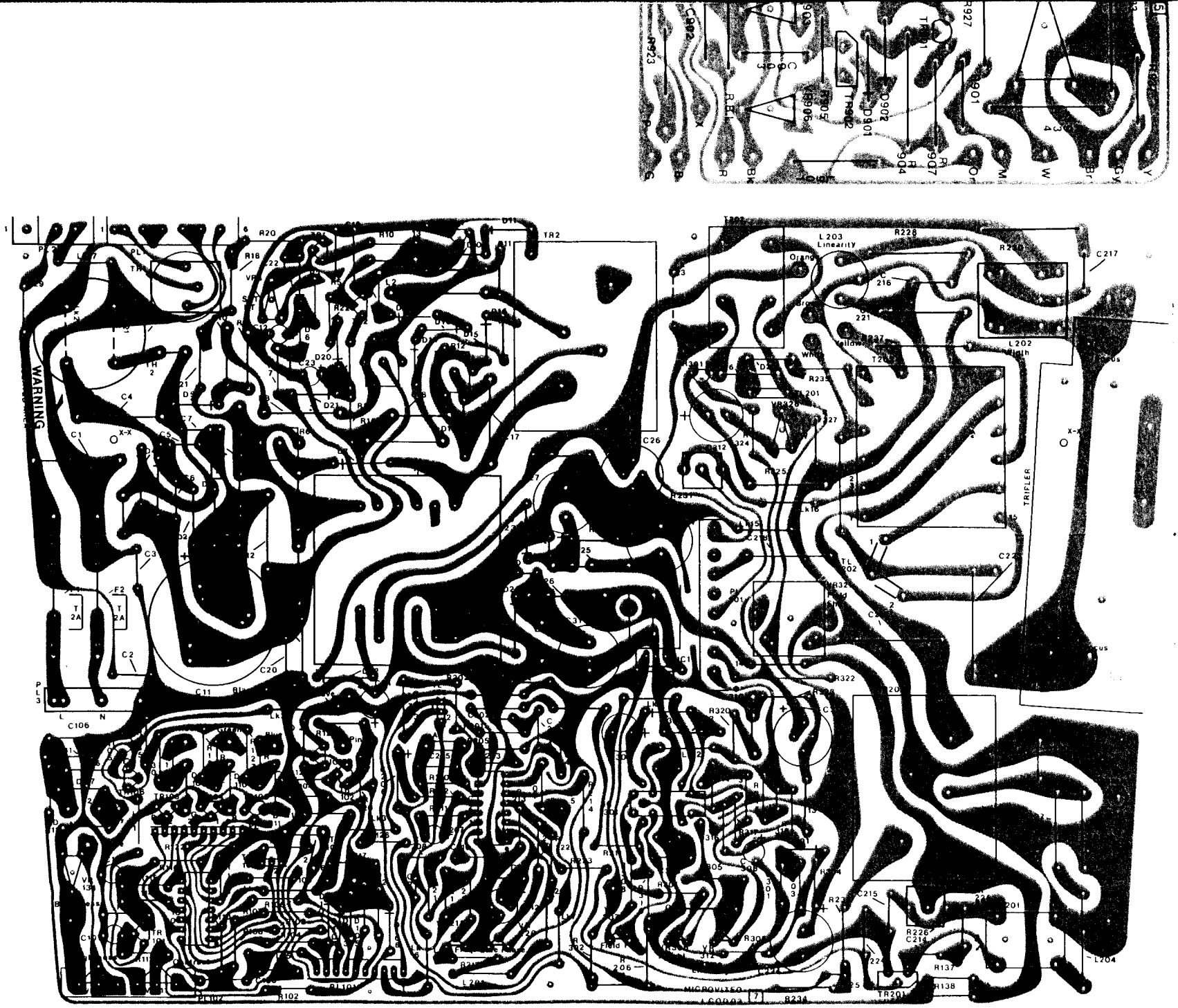
SERIES 3 DRIVE/DEFLECTION PCB - TRACK (SOLDER) SIDE VIEWED THROUGH PCB FROM COMPONENT SIDE



TRIPLE STANDARD - PAL INTERFACE CIRCUIT DIAGRAM

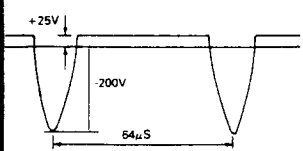


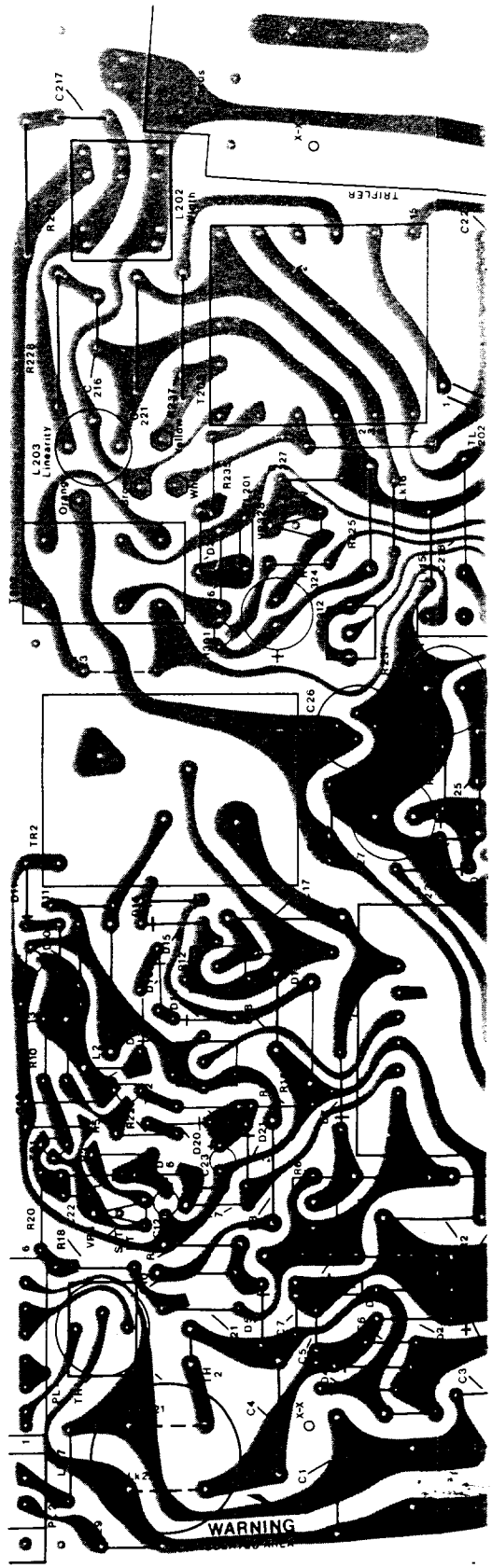
SINCLAIR ZX SPECTRUM INTERFACE



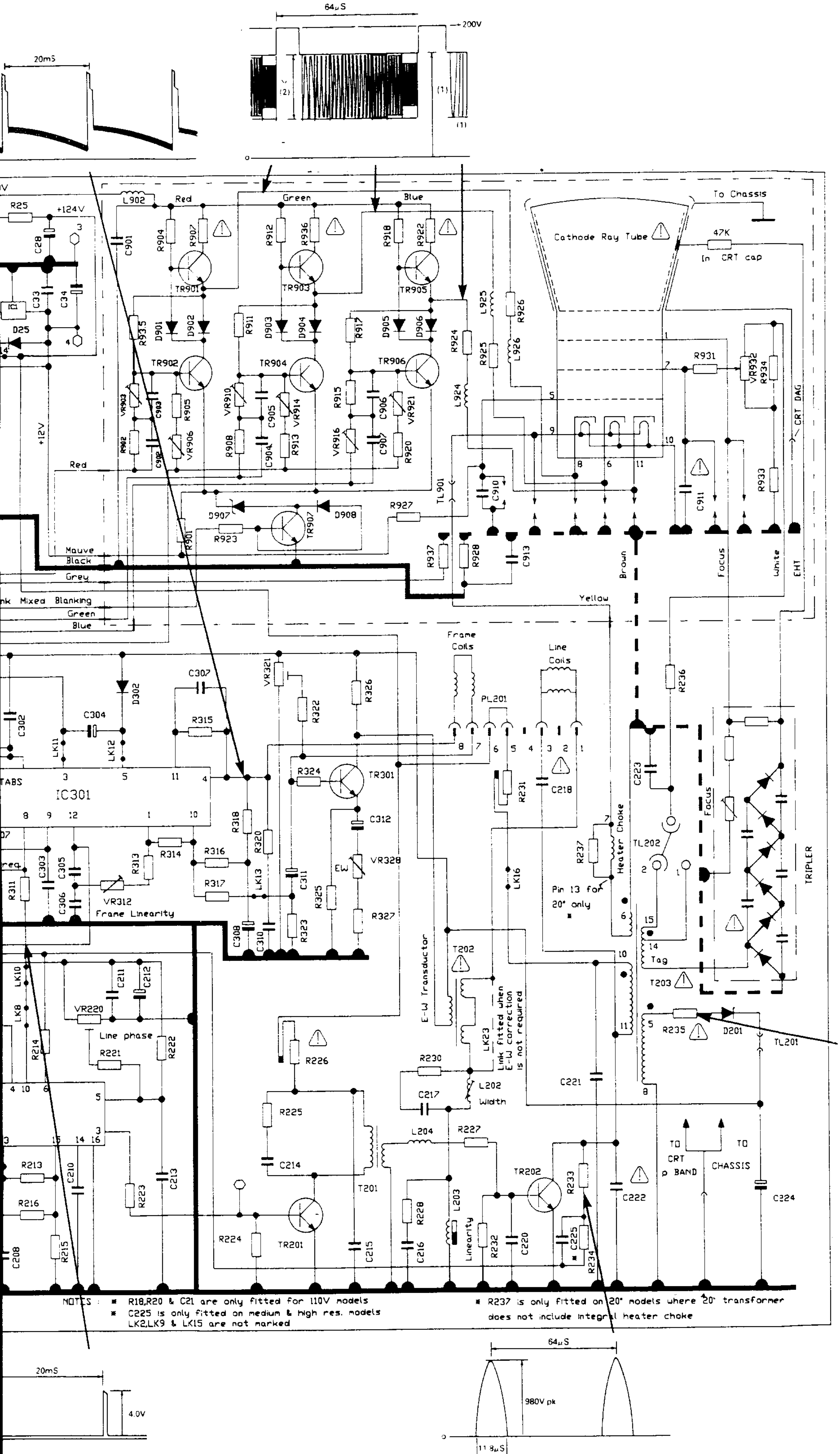
MAIN PCB LAYOUT

STANDARD/MEDIUM RESOLUTION TUBE BASE



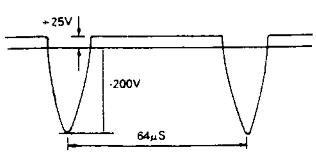


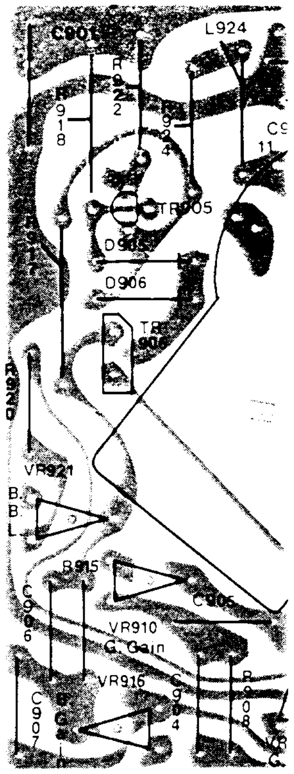
STANDARD/M

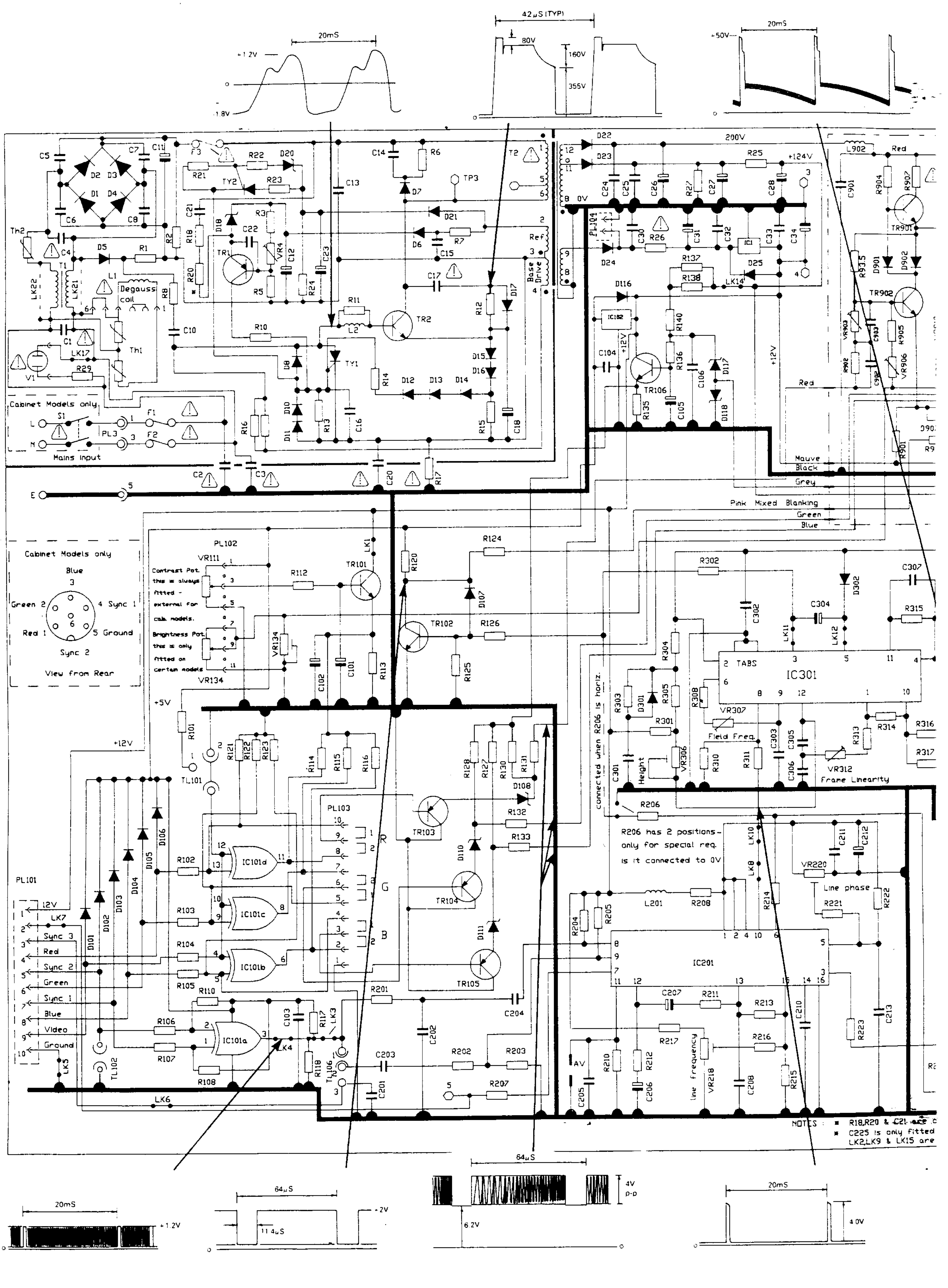


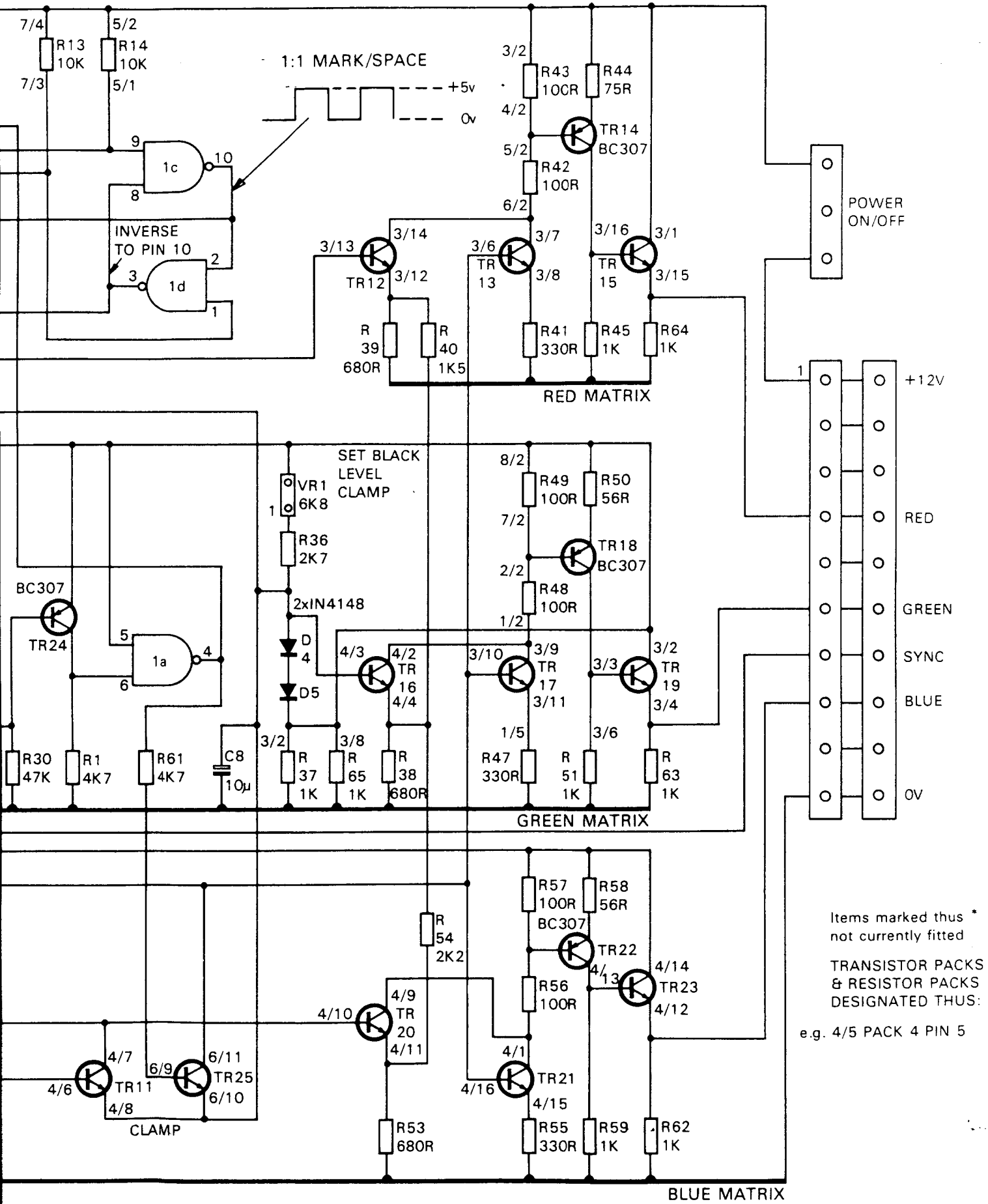
NOTES : * R18,R20 & C21 are only fitted for 110V models
* C225 is only fitted on medium & high res. models
LK2,LK9 & LK15 are not marked

* R237 is only fitted on 20" models where 20" transformer does not include integral heater choke






20mS
+1.2V
-1.8V
42µS (TYP)
80V
160V
355V
+50V
200V
+124V
Red
Degauss coil
Cabinet Models only
Mains input
Base Drive
Ref
PL102
Contrast Pot. this is always fitted - external for cab. models.
Brightness Pot. this is only fitted on certain models
Cabinet Models only
Blue
Green
Sync 1
Red
Ground
Sync 2
View from Rear
Mauve
Black
Grey
Pink Mixed Blanking
Green
Blue
IC301
TABS
Field Freq.
Height
Frame Linearity
connected when R206 is horiz.
R206 has 2 positions - only for special req. is it connected to 0V
Line phase
IC201
line frequency
PL103
PL101
12V
Sync 3
Red
Sync 2
Green
Sync 1
Blue
Video
Ground
IC101a
IC101b
IC101c
IC101d
64µS
11.4µS
+2V
4V p-p
6.2V
4.0V
NOTES
R18,R20 & C21 are
C225 is only fitted
LK2,LK9 & LK15 are

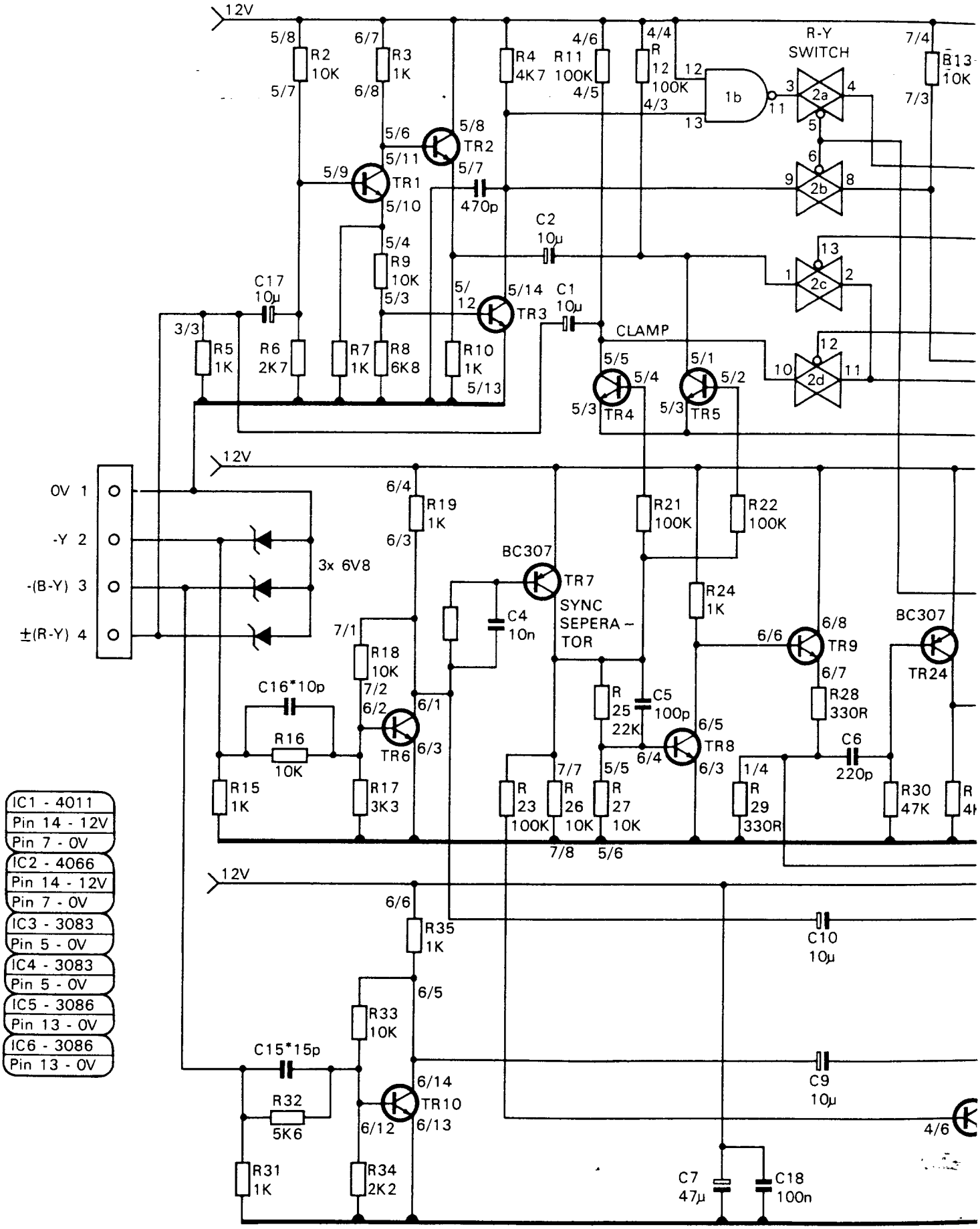


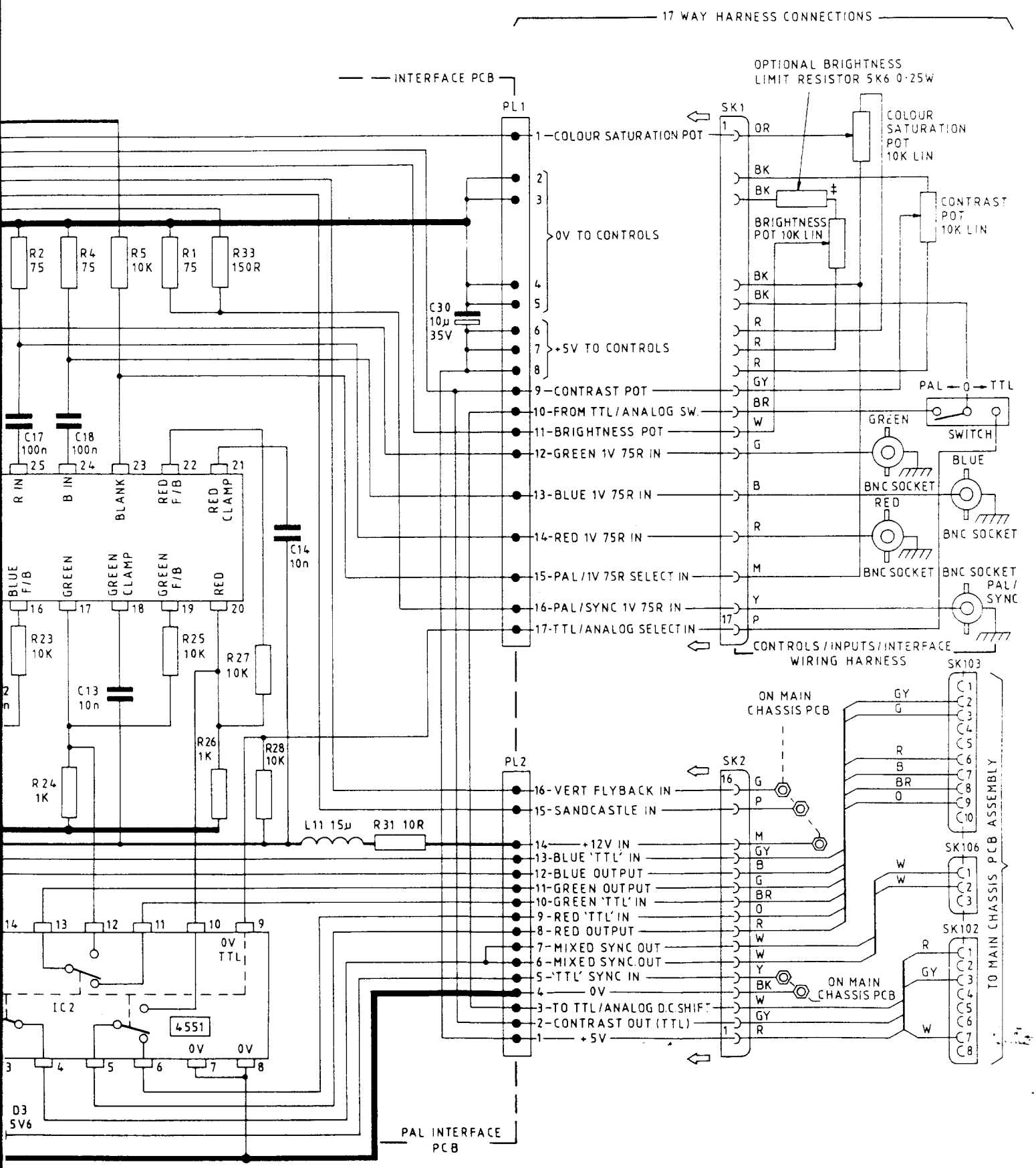
Items marked thus * not currently fitted

TRANSISTOR PACKS & RESISTOR PACKS DESIGNATED THUS:

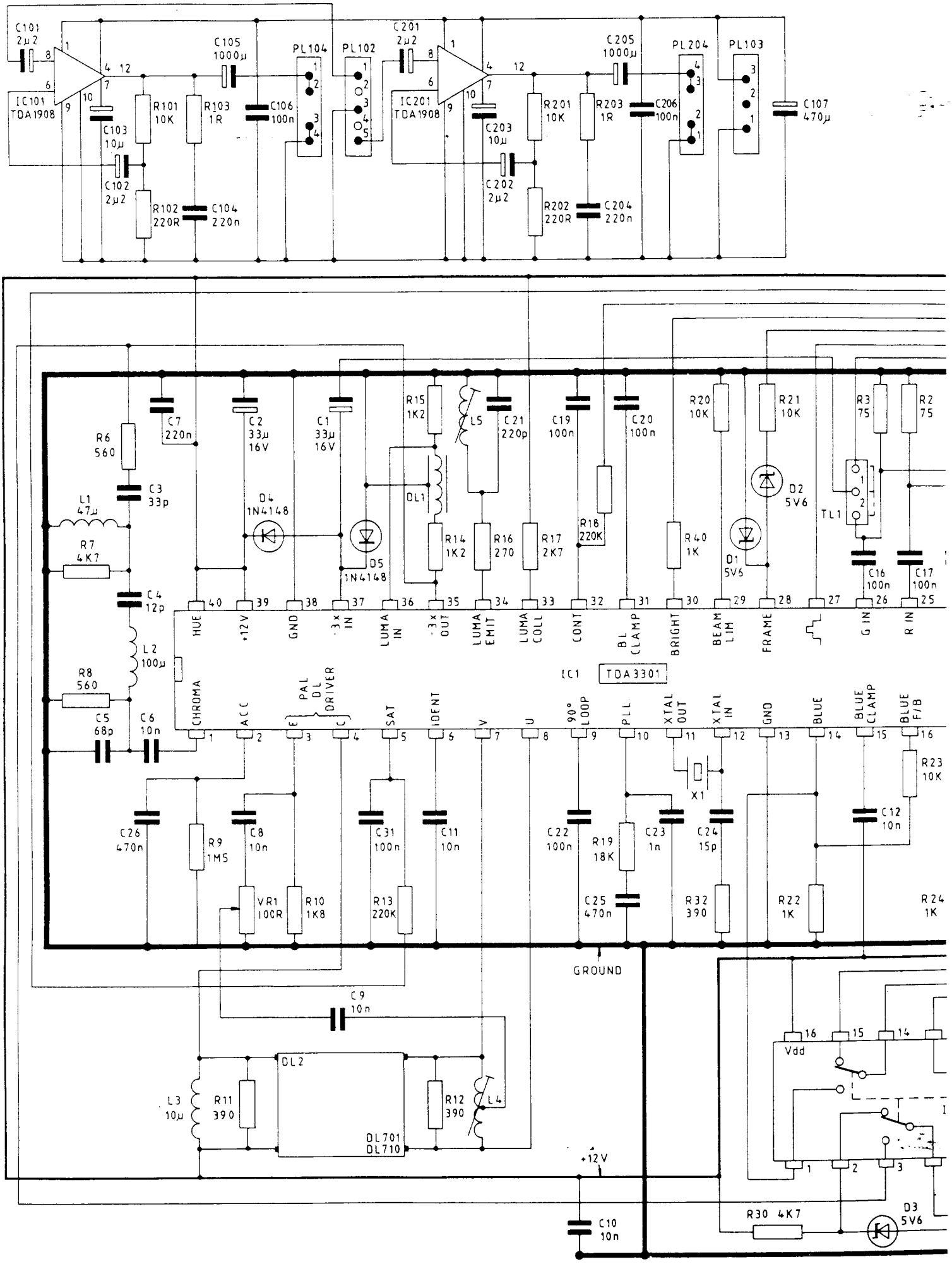
e.g. 4/5 PACK 4 PIN 5

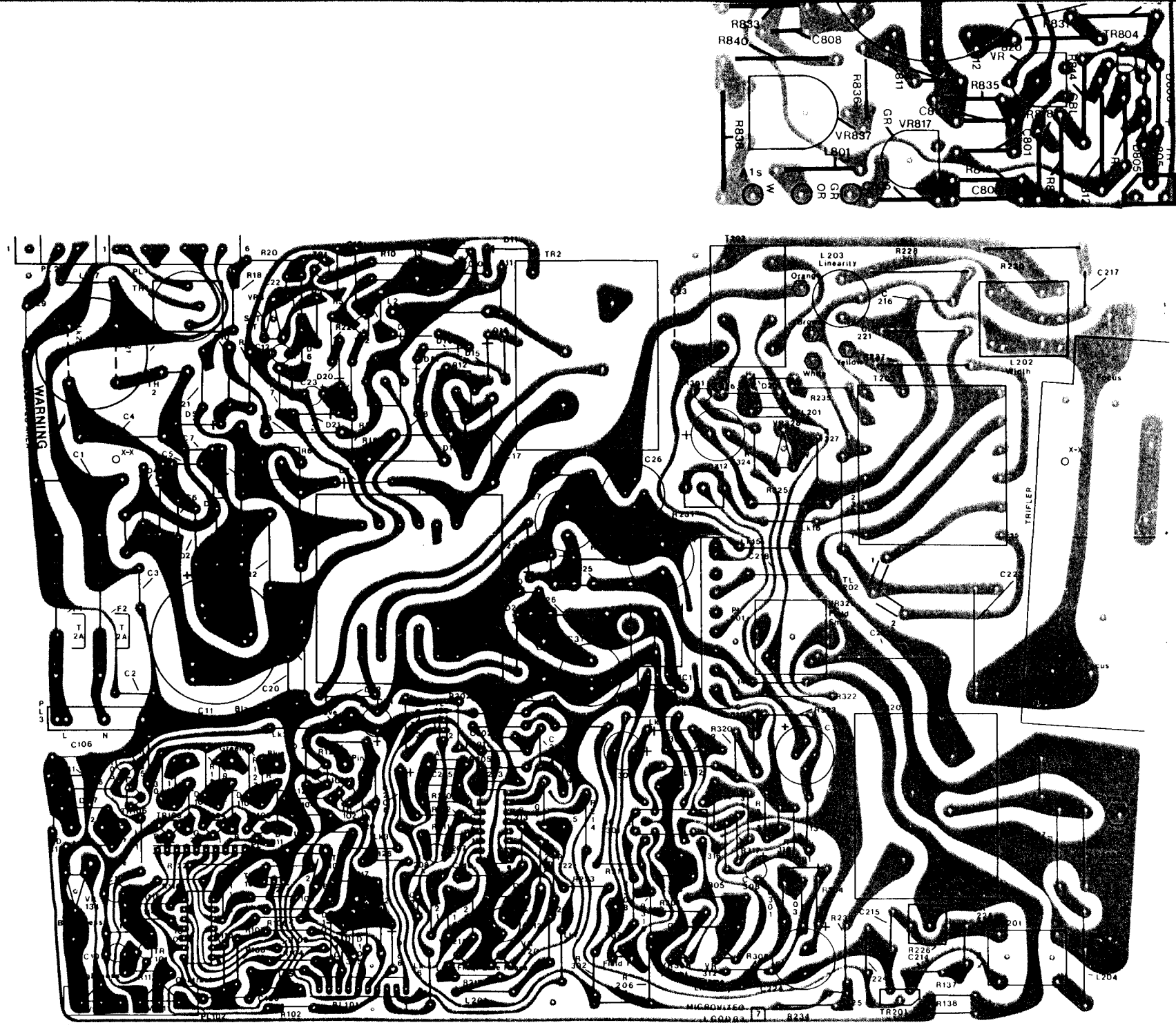
SINCLAIR ZX SPECTRUM INTERFACE


12V
R2 10K
R3 1K
R4 4K7
R11 100K
R
100K
1b
R-Y SWITCH
2a
2b
2c
2d
R13 10K
TR1
TR2
TR3
TR4
TR5
470p
C2 10µ
C17 10µ
C1 10µ
R5 1K
R6 2K7
R7 1K
R8 6K8
R9 10K
R10 1K
CLAMP
0V 1
-Y 2
-(B-Y) 3
±(R-Y) 4
3x 6V8
R19 1K
R21 100K
R22 100K
BC307
TR7
SYNC SEPERA – TOR
C4 10n
R24 1K
TR9
BC307
TR24
R28 330R
C6 220p
R18 10K
C16*10p
R16 10K
TR6
R15 1K
R17 3K3
R
25 22K
C5 100p
TR8
R
23 100K
R
26 10K
R
27 10K
R
29 330R
R30 47K
C10 10µ
R35 1K
R33 10K
C15*15p
R32 5K6
TR10
R31 1K
R34 2K2
C9 10µ
C7 47µ
C18 100n
IC1 - 4011
Pin 14 - 12V
Pin 7 - 0V
IC2 - 4066
Pin 14 - 12V
Pin 7 - 0V
IC3 - 3083
Pin 5 - 0V
IC4 - 3083
Pin 5 - 0V
IC5 - 3086
Pin 13 - 0V
IC6 - 3086
Pin 13 - 0V



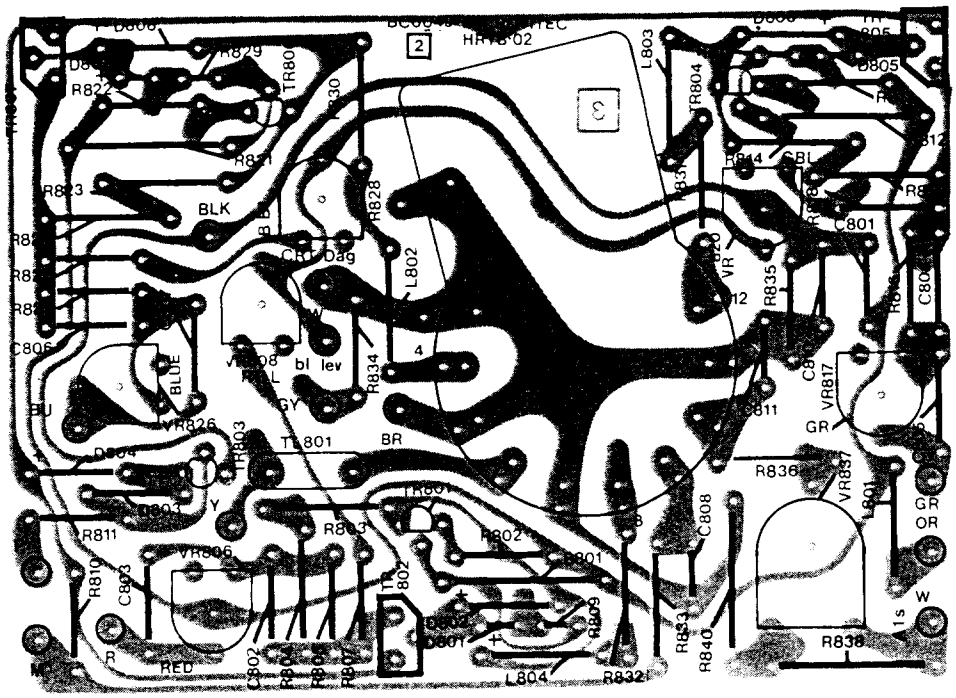
TRIPLE STANDARD - PAL INTERFACE CIRCUIT DIAGRAM

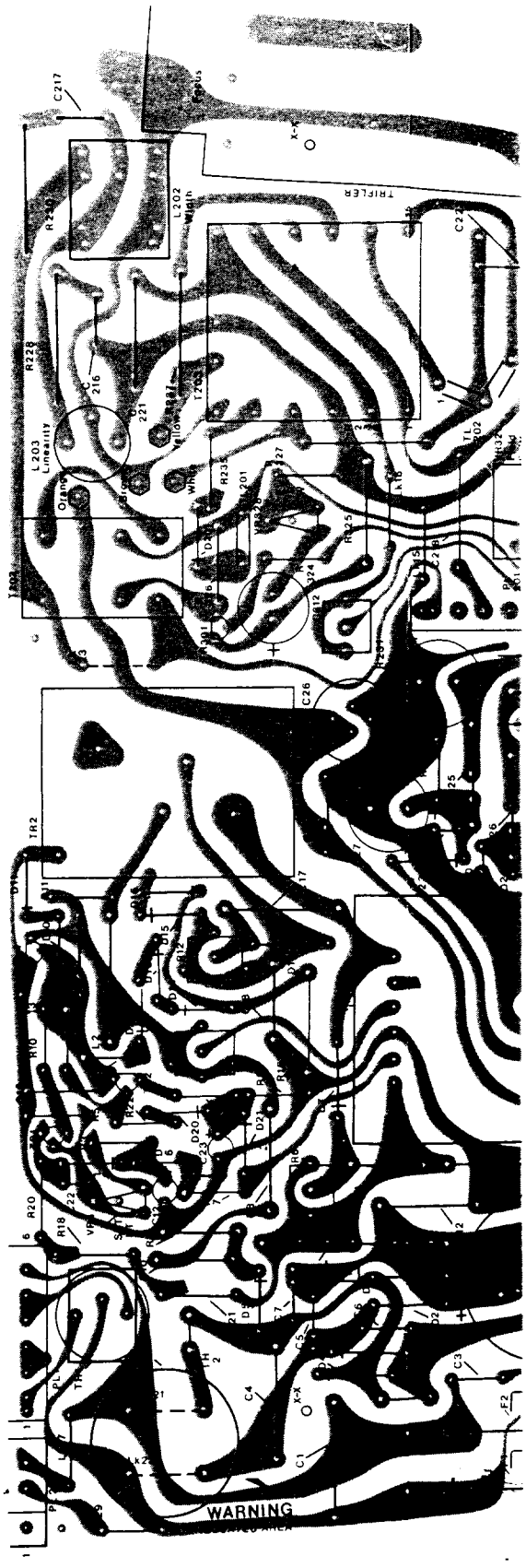

C101 2µ2
IC101 TDA1908
C103 10µ
C102 2µ2
R101 10K
R102 220R
R103 1R
C104 220n
C105 1000µ
C106 100n
PL104
PL102
C201 2µ2
IC201 TDA1908
C203 10µ
C202 2µ2
R201 10K
R202 220R
C205 1000µ
C206 100n
R203 1R
C204 220n
PL204
PL103
C107 470µ
C7 220n
C2 33µ 16V
C1 33µ 16V
R15 1K2
L5
C21 220p
C19 100n
C20 100n
R20 10K
R21 10K
R3 75
R2 75
R6 560
C3 33p
L1 47µ
D4 1N4148
DL1
D5 1N4148
R14 1K2
R16 270
R17 2K7
R18 220K
R40 1K
D1 5V6
D2 5V6
TL1
C16 100n
C17 100n
R7 4K7
C4 12p
L2 100µ
R8 560
C5 68p
C6 10n
HUE
+12V
GND
-3x IN
LUMA IN
-3x OUT
LUMA EMIT
LUMA COLL
CONT
BL CLAMP
BRIGHT
BEAM LIM
FRAME
G IN
R IN
IC1 TDA3301
CHROMA
ACC
PAL DL DRIVER
SAT
IDENT
V
U
90° LOOP
PLL
XTAL OUT
XTAL IN
GND
BLUE
BLUE CLAMP
BLUE F/B
X1
R23 10K
C12 10n
C26 470n
R9 1M5
C8 10n
C31 100n
C11 10n
C22 100n
R19 18K
C23 1n
C24 15p
C25 470n
R32 390
R22 1K
R24 1K
VR1 100R
R10 1K8
R13 220K
GROUND
C9 10n
DL2
L3 10µ
R11 390
R12 390
L4
DL701 DL710
+12V
C10 10n
Vdd
R30 4K7
D3 5V6

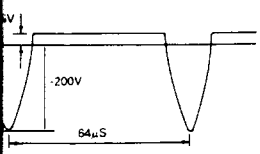


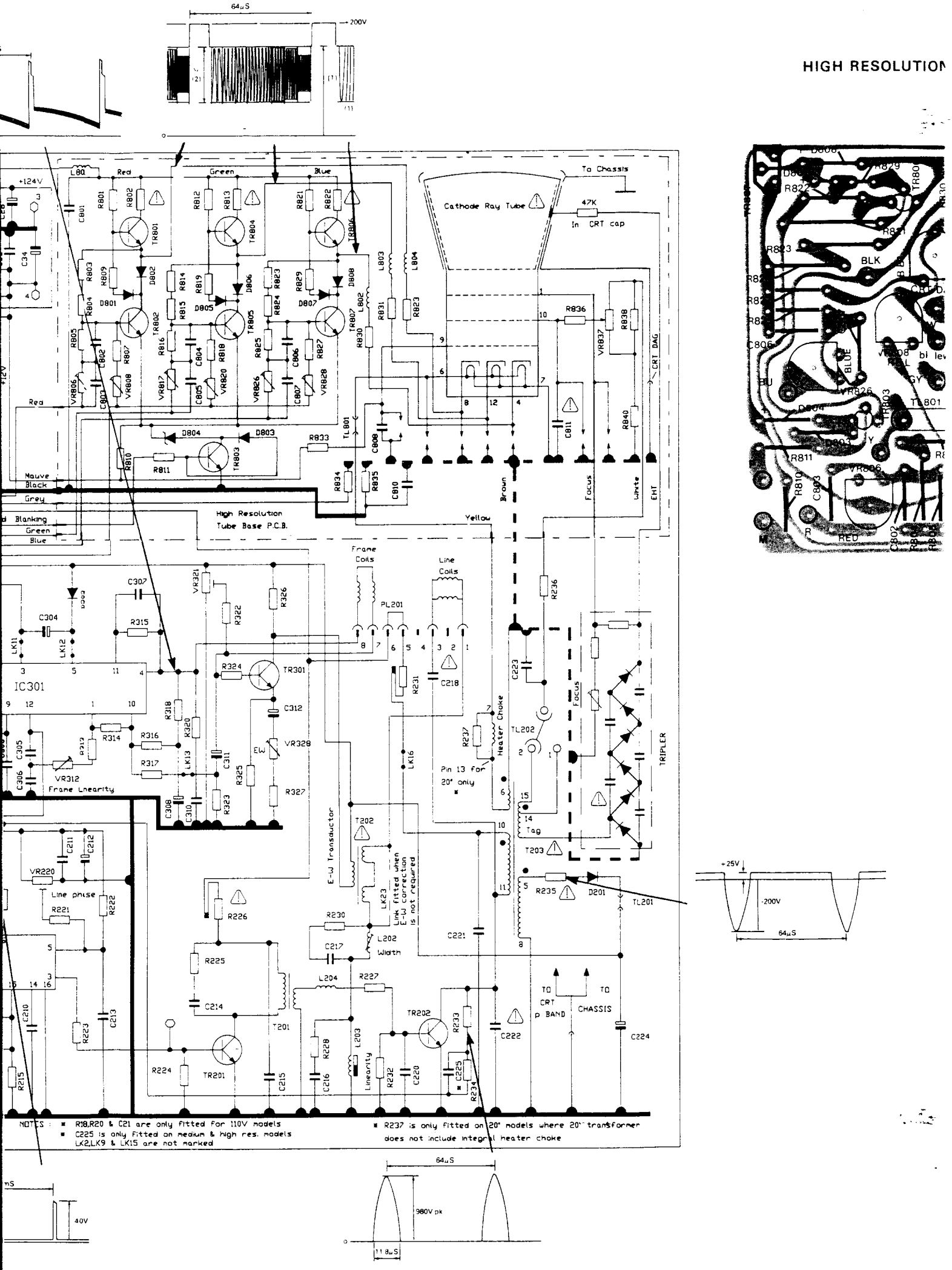
MAIN PCB LAYOUT

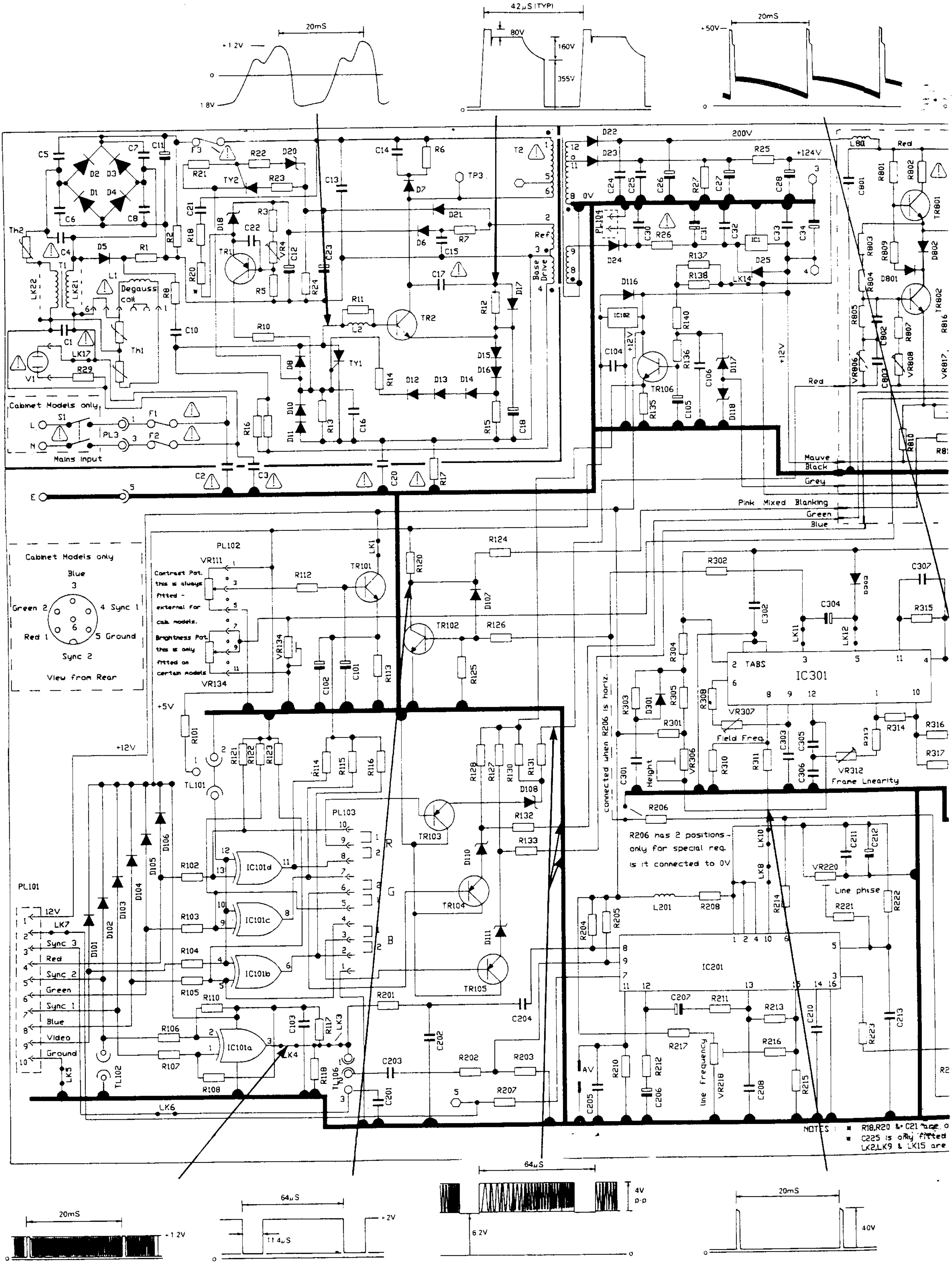
HIGH RESOLUTION TUBE BASE








64µS
200V
+124V
+12V
L801
Red
Green
Blue
To Chassis
Cathode Ray Tube
47K
In CRT cap
CRT DAG
Red
Mauve
Black
Grey
Blanking
Green
Blue
High Resolution
Tube Base P.C.B.
Yellow
Brown
Focus
White
EHT
Frame
Coils
Line
Coils
PL201
IC301
Frame Linearity
Heater Choke
Pin 13 for
20" only
TRIPLER
E-W Transductor
LK23 fitted when
E-W correction
is not required
Line phase
Width
Tag
TO
CRT
p BAND
TO
CHASSIS
+25V
-200V
64µS
40V
64µS
980V pk
11.8µS
NOTES :
R18,R20 & C21 are only fitted for 110V models
C225 is only fitted on medium & high res. models
LK2,LK9 & LK15 are not marked
R237 is only fitted on 20" models where 20" transformer
does not include integral heater choke



20mS
+1 2V
1 8V
42µS (TYP)
80V
160V
355V
20mS
+50V
Cabinet Models only
L
N
S1
PL3
F1
F2
Mains input
Degauss coil
Th1
Th2
V1
LK17
LK21
LK22
T1
L1
E
T2
Ref
Base Drive
TR1
TR2
TY1
TY2
TP3
200V
+124V
0V
PL104
IC1
IC102
TR106
+12V
Red
Mauve
Black
Grey
Pink Mixed Blanking
Green
Blue
TR801
TR802
Cabinet Models only
Blue
Green 2
4 Sync 1
Red 1
5 Ground
Sync 2
View from Rear
PL102
VR111
Contrast Pot. this is always fitted - external for cab. models.
Brightness Pot. this is only fitted on certain models
VR134
TR101
TR102
TR103
TR104
TR105
+5V
TL101
+12V
PL103
R
G
B
IC101d
IC101c
IC101b
IC101a
PL101
12V
LK7
Sync 3
Red
Sync 2
Green
Sync 1
Blue
Video
Ground
LK5
LK6
TL102
LK3
LK4
TL106
IC301
TABS
VR307
Field Freq.
Height
VR306
VR312
Frame Linearity
connected when R206 is horiz.
R206 has 2 positions - only for special req. is it connected to 0V
VR220
Line phase
L201
IC201
line frequency
VR218
4V
NOTES :
R18,R20 & C21
C225 is only fitted
LK2,LK9 & LK15 are
64µS
4V p-p
6.2V
20mS
40V
20mS
+1 2V
64µS
+2V
11 4µS