Field Support Manual
Monitor 12"/15" (FIMI)

Telecommunication
and Data Systems

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1.1 INTRODUCTION

This manual provides the technical and maintenance information necessary for the effective field servicing of FIMI Monitors. FIMI Monitors are employed in display equipments to visually present alphanumeric and/or graphical information. The visual presentation is achieved with either a 12 inch or 15 inch monochrome CRT displaying light characters on a dark background or vice versa.

Electronic cicuitry resident in the monitor converts serial video data into synchronized characters or symbols for display on the screen of the CRT. Display equipment compatibility is governed by the selection of respective logic cards and cabinet mounting, which is determined at system configuration level.

This manual is only concerned with the basic constituent parts of a FIMI Monitor, which excludes logic cards etc. However, whenever necessary relevant cross-references to associated Field Service Manuals are given. The constituent parts are described in section 1.2 PHYSICAL DESCRIPTION.

1.2 PHYSICAL DESCRIPTION (SEE FIGURE 1.1)

This section describes the general physical features of the FIMI Monitor, which includes details of the unit arrangement appertaining to FIMI Monitor applications as specified in section 1.5.

1.2.1 SUPPORT FRAME AND CRT MOUNTING - 12 INCH

The support frame comprises four preformed metallic plates which provide, when secured together by eight lock screws, the main structural support for the CRT and pcb mounting racks. The CRT is simply screw mounted to the left and right side plates of the support frame, a metallic strap affixed to the outside perimeter of the CRT retains the four mounting lugs used for this purpose.

1.2.1.1 CRT MOUNTING - 15 INCH

The support frame used in the 12 inch version is not employed in the 15 inch version. The CRT is simply screw mounted to the front panel of the VDU housing.

1.2.2 DEFLECTION UNIT

The deflection unit forms part of the CRT assembly, being mounted directly onto the CRT stem and secured in position by a screw clamp.

1.2.3 ELECTRONICS RACK

This rack retains the CRT electronics pcb with additional provision for three logic cards, and is located adjacent to the right side panel. Card retention is achieved with slides clip mounted in the top and bottom panels of the support frame. Each slide has two card locking clips which secure the card in position. Access to the electronics rack is from the rear of the support frame.

1.2.4 POWER CARD RACK

This rack is identical in physical features with that of the electronics rack, except that it is formed by a single slide position. This rack retains a power supply card for use in certain monitor configurations.

1.2.5 VIDEO AMPLIFIER

This board contains the circuitry for video drive, being directly mounted to the 7-pin connector of the CRT.

1.2.6 ELECTRONICS BOARD

This board is located in position 4 of the electronics rack, in proximity to the CRT; of special note is the external brigthness control potentiometer which, from its mounting on the board, protrudes below the CRT screen.

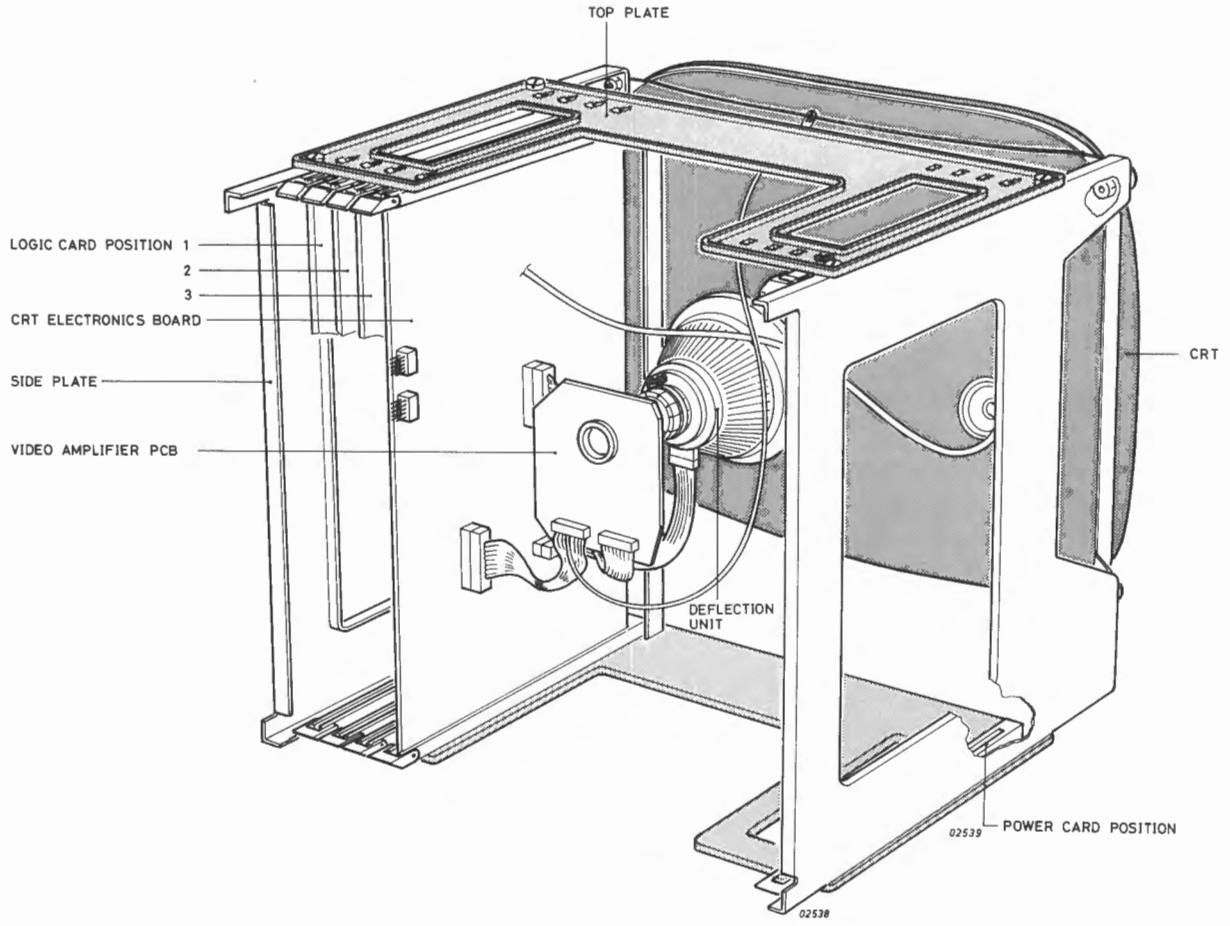


Figure 1.1 MONITOR GENERAL VIEW (12-INCH)

1.3 TECHNICAL DATA

1.3.1 PERFORMANCE DATA

Screen Display Capacity	: 1920 Characters
12 inch screen	: 24 rows
	: 80 characters/row
	: 7 dots/character vertical
	: 9 dots/character block horizontal
	: 15 dots/character block vertical
	: 18,452 MHz dot clock rate
	: 2,047 MHz character rate
	: 230 x 140mm display size
15 inch screen	: 2640 characters
	: 24 rows
	: 110 characters/row
	: 5 dots/character vertical
	: 7 dots/character block horizontal
	: 15 dots/character vertical
	: 19,6608 MHz dot clock rate
	: 2,808 MHz character rate
	: 258 x 190mm display size
Common data	: 15 scan lines/character block
	: 25 rows/frame
	: 390 scan lines/frame
	: 50Hz frame refresh rate
	: 19,5 KHz scan line refresh rate
CRT Display	: White Phosphor (P4 standard) (with options of orange or green phosphor).

1.3.2 POWER REQUIREMENTS

The power supply requirements for the monitor are:

. Voltage	: + 12VDC ± 180mV
. Current Consumption	: 200mA minimum
	: 2A maximum

1.3.3 ENVIRONMENT

Temperature range:
- Operating - + 5°C to + 55°C
- Storage - - 40°C to + 65°C

Dynamic Temperature (△ Temp/△ Time)
- Operating - 10°C/30 mins maximum
- Storage - 30°C/5 mins maximum

Relative Humidity:
- 5% to 98% non-condensing

Air Pressure:
- Operating - 700 to 1100 mbar
- Storage - 450 to 1100 mbar

1.4 INTERFACES

1.4.1 ELECTRICAL

SIGNAL NOMENCLATURE	CONNECTOR	CONTACT NO.
Horizontal Sync	X1	b-1
Vertical Sync	X1	b-2
Video	X1	b-3
Dummy	X1	b-4
Spare	X1	b-5
OV (Signal Ground)	X1	a-1
OV	X1	a-2
OV	X1	a-3
Spare	X1	a-4
Spare	X1	a-5
+ 12V	X2	a1, a2, a3, a4, a5
OV (Signal Ground)	X2	b1, b2, b3, b4, b5
Dynamic Focus	Xe	1
OV (Signal Ground)	Xe	2
Video	Xe	3
Spare	Xe	4
Brightness	Xe	5
Focus	Xp	1
CRT Heater	Xp	2
+ 64V	Xp	3
+ 12V	Xp	4
Vertical Deflection Return	Xt	3
Horizontal Deflection Return	Xt	4
Horizontal Deflection	Xt	5
Vertical Deflection	Xt	6

Table 1.1 ELECTRICAL INTERFACES

1.4.2 DEFINITION OF INTERFACE SIGNALS

HORIZONTAL SYNC

A pulse which is positive going from a low level (less than or equal to 0,5V) with an amplitude of 2,5V to 5V. Pulse width of 4 to 21uS.

VERTICAL SYNC

A pulse which is positive going from a low level (less than or equal to 0,5V) with an amplitude of 2,5 to 5V. Pulse width of 155uS.

VIDEO

Positive going pulse; positive level denotes white image, zero volts (less than or equal to 0,5V) denotes black.

1.4.3 MECHANICAL

Refer to related terminal Field Support Manual for cabinet or display interface details.

1.5 APPLICATION NOTES

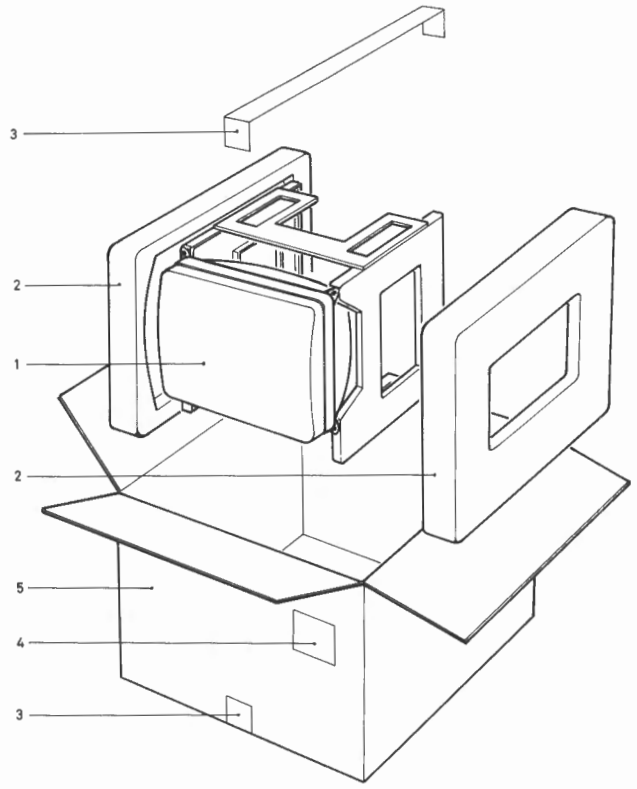
The current applications of the FIMI Monitor are as follows:
. Terminal P8042 (UPL)
. Terminal P8043

1.6 INSTALLATION DATA

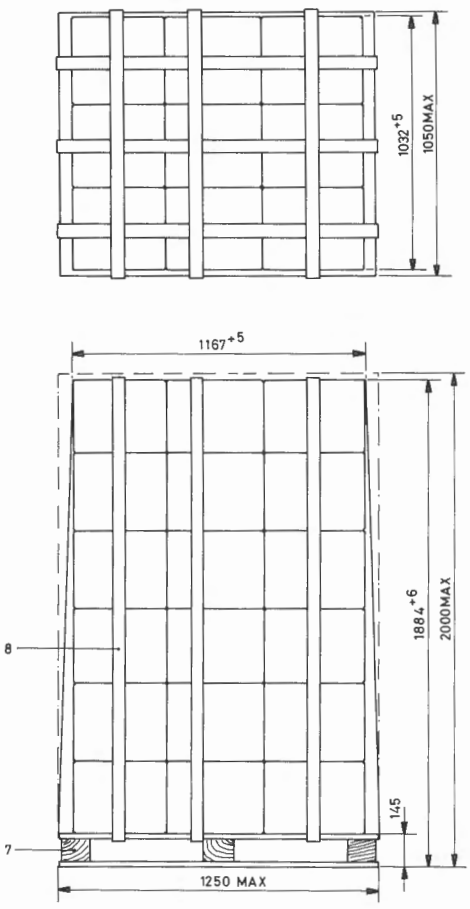
It is an essential requirement that the environmental conditions of the site where the monitor is to be installed, conform to the specification detailed in section 1.3. Refer to respective systems installation data for details of monitor installation.

1.6.1 PACKING AND UNPACKING

For comprehensive details relating to packaging of the monitor refer to fig. 1.2.



1 MONITOR
2 POLYSTRENE PACKING
3 INDUSTRIAL ADHESIVE TAPE
4 LABEL
5 CARDBOARD CONTAINER
6 CARDBOARD CONTAINER
7 SUPPORT BLOCKS
8 SECURING STRIPS



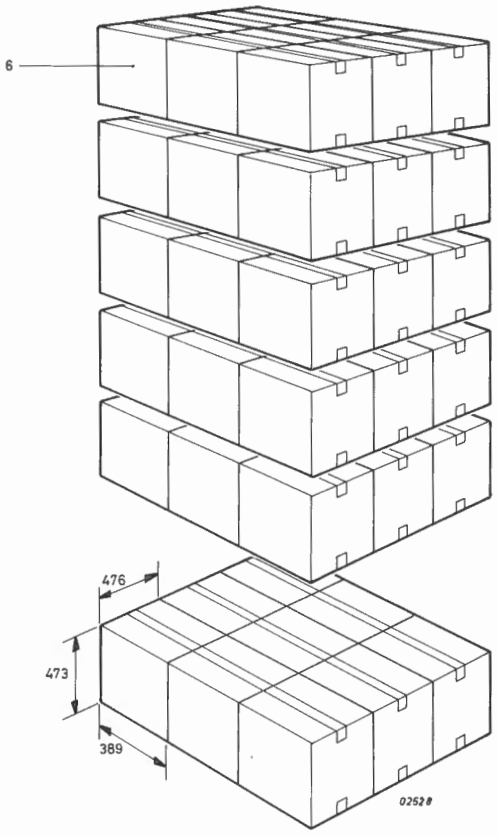


Figure 1.2 PACKING DETAILS

2 FUNCTIONAL DESCRIPTION

LIST OF ILLUSTRATIONS

2.1 PRINCIPLES OF OPERATION

The basic functional block diagram of the FIMI Monitor is shown in figure 2.1. An electron beam generated in the CRT, scans the screen a set number of times forming a raster of horizontal lines. One complete raster scan of the screen constitutes a frame, this is repeated or refreshed every 20mS. The electron beam scanning is controlled by horizontal and vertical deflection yokes, which are driven by current waveforms derived from the respective circuits on the CRT Electronics pcb.

The vertical and horizontal deflection signals are synchronised with timing pulses, VESY and HOSY, to effect the frame refresh and scan line retrace operations at the desired instant in time.

By modulating the beam intensity with the serial video input, character patterns are produced on the CRT screen. Each character is represented by a matrix of illuminated dots, each dot results from an increase in the beam intensity (modulation) over a short period. Prior to modulating the beam, the serial video input is amplified on the Video Amplifier board, the output stage of which controls the current conditions in the CRT cathode.

The total CRT eletronics and video amplifier package requires only the one power supply voltage, this being +12V; this is derived from a power source also mounted in the monitor. (Note that the physical location of the +12V source will vary with monitor application). The various additional supplies required by the CRT viz 14,5KV EHT and several circuits on the CRT electronics pcb, are produced either by series regulation of the +12V supply or from a transformer secondary winding supply.

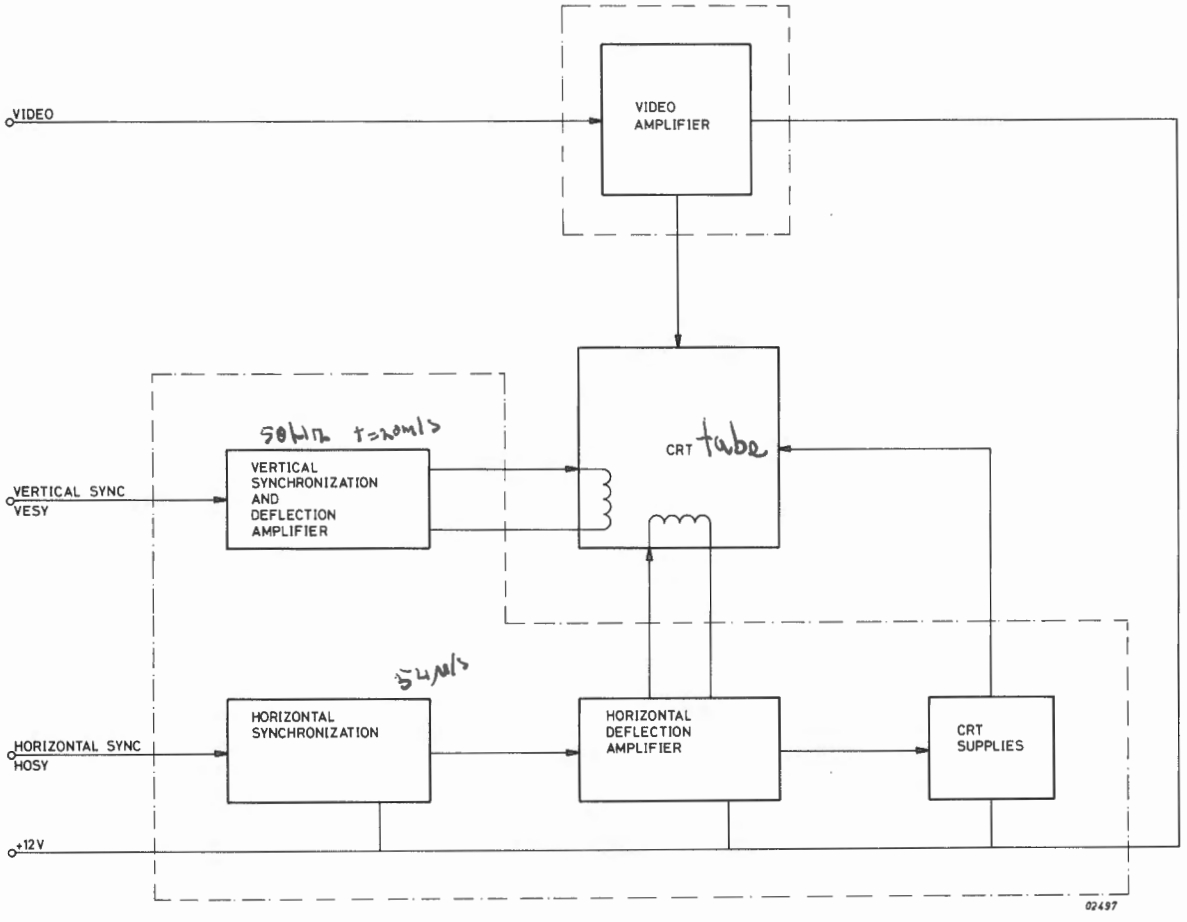


Figure 2.1 BLOCK DIAGRAM FIMI MONITOR

2.2 DESCRIPTION OF CIRCUITS

2.2.1 VERTICAL SYNCHRONIZATION CIRCUIT AND DEFLECTION AMPLIFIER

This circuit comprises a single IC and some associated discrete components, effecting control operations on specific circuits incorporated in the IC itself. The IC, TDA 1170, performs all the necessary functions to provide synchronized vertical deflection signals required by the CRT's vertical yoke winding.

2.2.2. HORIZONTAL SYNCHRONIZATION CIRCUIT

The synchronization of the horizontal deflection waveforms is realized by a dual one-shot monostable circuit, SN74LS123. The TTL logic of this IC utilizes a +5V supply for VCC and permanently high input commands, this +5V is derived from the +12V input supply via an Op amp line regulator. The circuit also comprises discrete components which set the required logic level inputs for the IC, and form RC networks for external control of the time constant functions associated with the monostable's operation.

2.2.3 HORIZONTAL DEFLECTION AMPLIFIER

This circuit generates the horizontal deflection waveforms under control of the synchronizing pulses output from the one-shot monostable (see 2.2.2). The final stage of this circuit serves a dual function, that of switching the primary winding of transformer in the CRT supplies circuit, and to drive the horizontal deflection yoke winding.

2.2.4 VIDEO AMPLIFIFER

The video amplifier exhibits a fast response characteristic, being held in permanent state of readiness by a voltage term derived from the +12V supply. Upon reception of a video data pulse the output stage is switched hard-on and then sharply-off, the resultant pulse is directly coupled to the CRT cathode, hence electron beam modulation is achieved. The video amplifier occupies a single card directly mounted to the CRT tube, this minimizes the path between output and cathode load so reducing effects from spurious radiation and optimizing response time.

2.2.5 CRT SUPPLIES

The CRT supplies circuit produces the 14,5KV EHT, the heater and grid control voltages for the CRT, and the +24VDC supply for the TDA 1170 circuit. The CRT supplies circuit is formed around a switched primary transformer, the switching frequency of which is determined by the horizontal deflection amplifier. The secondary voltages are rectified and smoothed and distributed to their respective points within the monitor. The circuit retains variable control potentiometers for the adjustment of grid conditions within the CRT. Finally, a dynamic focusing facility is provisioned by the circuit, this is directly related to the primary switching waveform.

2.2.6 CATHODE RAY TUBE (CRT)

The CRT is a sealed unit upon which are mounted the horizontal and vertical deflection yokes, and the video amplifier pcb. The CRT has three control grids: BRIGHTNESS, FOCUS and DYNAMIC FOCUS; the anode EHT is fed directly from the CRT supplies circuit to the tube.

3 DETAILED DESCRIPTION

LIST OF ILLUSTRATIONS

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3 DETAILED DESCRIPTION

Refer to the circuit diagram 4.1C throughout the following text.

3.1 VERTICAL SYCHRONIZATION AND DEFLECTION

The vertical sychronization and deflection functions are performed in the one IC designated U1 (a TDA 1170 device) and its associated discrete components.

3.1.1 IC TDA 1170A (REFER TO FIGURE 3.1)

The IC TDA 1170A consists of five circuit areas, these being:

. Oscillator
. Synchronizing Circuit
. Ramp Generator and Buffer
. Power Amplifier
. Flyback Generator

The oscillator is formed by a differential amplifier utilizing positive feedback. The oscillator frequency is determined by the RC network C2, R3 and potentiometer R2 connected between signal ground and pins 9 and 6. The potentiometer R2 allows adjustment of the frequency, this is lower than the VESY frequency at all times.

The synchronizing circuit receives the VESY pulse signals via pin 8, the leading positive edges of the VESY pulses switch the oscillator amplitude level to zero. The combined output from this circuit therefore, assumes a ramped sawtooth having the start of each ramp synchronized with a VESY pulse.

The ramp generator is essentially a current generator which produces a ramped waveform amplitude regulated by an externally mounted potentiometer R5 (HEIGHT). The ramp waveform also appears at pin 1 in a buffered state. Capacitors C4 and C5 in conjunction with resistors R6 and R7, establish the waveform's linearity characteristic. Potentiometer R7 allows adjustment of the curvature of the ramp. The power amplifier operates with current feedback. The output current of the amplifier flows through a resistor of small ohmic value R10. The resultant voltage drop caused by R10 is compared at the junction of R9 and R12, effectively a high impedance summing point, with the voltage level from pin 1. This summing function ultimately controls the amplifier gain.

The power amplifier consists of three stages: a high input impedance pre-amplifier, a driver, and final power stage. The inverting input of the pre-amplifier is connected to pin 10, while the non-inverting input is internally connected to a stabilized 2V supply.

The pre-amplifier output is fed to the driver stage which consists of a single transistor circuit whose base is accessible at pin 11, where an externally mounted resistor and capacitor, R11 and C6, provide frequency compensation. The rising collector current of the driver transistor drives the bases of two Darlington pairs, which form the final output power stage.

The final transistor stage conducts only during the rise time of the ramp, the resultant output from pin 4 is AC coupled C1/1) to the vertical deflection yoke, (1/C11) producing the vertical scan deflection and period.

To obtain a sufficiently short flyback time, a voltage of 48V is applied to the vertical yoke this voltage is produced by the final circuit in TDA1170 - the Flyback Generator. During the vertical scan capacitor C3 is charged, when flyback begins the yoke current flows to the supply, via C3. Transistor circuits are switched to cause the potential at pin 3 to rise to +24V, pin 5 goes to +48V, and this voltage is applied at the yoke winding. The current in the yoke is reduced and then flowing through the supply via C3, it increases until the power amplifier stage operates. At the commencement of scanning, the current starts to drop this causes a corresponding drop in yoke voltage, the circuit then returns to the scanning condition.

The +24V supply for the TDA 1170 is derived from transformer T52 secondary (pin 10); being rectified by V59, smoothed by capacitor C67, and then applied to a low-pass filter formed by line choke L1 and capacitors C8, C10.

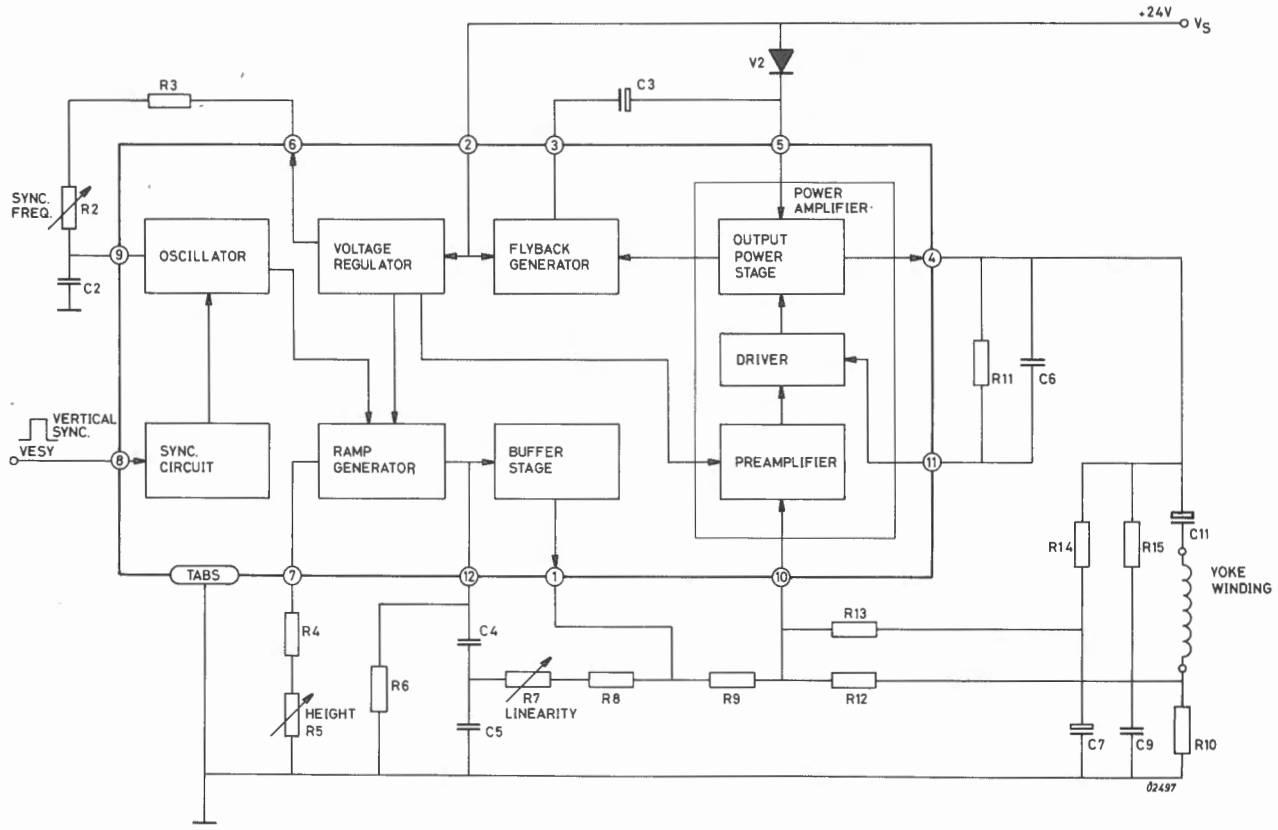


Figure 3.1 BLOCK DIAGRAM OF TDA 1170 CIRCUIT U1

3.2 HORIZONTAL SYNCHRONIZATION AND DEFLECTION

The horizontal synchronization is achieved by a dual retriggerable one-shot monostable in conjunction with several discrete components. The deflection amplifier and transformer switching circuit formed by transistors V51, V53 and V54, drives the horizontal yoke winding whilst also switching CRT power supplies input transformer T52.

3.2.1 HORIZONTAL SYNCHRONIZATION TIMING

Refer to the truth table shown in table 3.1. The monostable U51 (74LS123) produces the horizontal deflection timing, operating as follows:

- Input at pin 1 is set low, a condition established by zener diode V50 with the +12V supply at the correct level.
- Input at pin 2 goes high on the leading positive edge of each HOSY pulse (horizontal sync. pulse of 2,5 to 5V Amplitude and 4 to 21uS width).
- Input at pin 3 is set at a permanent high via the +5V rail (derived from the op amp regulation of the +12V line).
- A short duration pulse appears at pin 13 when a rising edge appears at pin 2. The duration of this pulse and therefore the timing of its falling edge is dependent upon the fast RC time constant established by C53, R54 and R53. Potentiometer R53 allows adjustment for picture centering purposes,
- Pin 13 output is linked directly to pin 9.
- Inputs at pins 10 and 11 are set permanently high via the +5V rail.
- The falling edge of the input pulse presented at pin 9 triggers the second monostable producing an output at pin 5 of a single pulse. The pulse parameters 4,2V amplitude and 18uS width, are determined by the RC network C54 and R56.

Pin 1	Pin 2	Pin 3	Pin 13	Pin 9	Pin 10	Pin 11	Pin 5
H	X	H	L	H	X	H	L
X	L	H	L	X	L	H	L
L	↑	H	P	↓	H	H	P
X	X	L	L	X	X	L	L

↑ = rising edge, ↓ = falling edge, P= pulse X= not significant

Table 3.1 TRUTH TABLE FOR IC U51

3.2.2 +5V LOGIC SUPPLY

The +5V required for TTL logic levels and VCC for the U51, is derived from the +12V supply line. The +12V is dropped across resistors R55 and R52, and the resultant voltage is series regulated by U50 (an op amp regulator) to produce a stabilized +5V.

The +5V supply is also utilized as a pre-heat supply for the CRT heater circuit, the +5V is routed to the CRT via diode V52 acting as a block to the +6V derived from the CRT supplies circuit.

3.2.3 HORIZONTAL DEFLECTION AMPLIFIER

At the initial switch-on of the monitor current flow in the horizontal deflection coil is zero. Transistor V54 is forward biased deriving base volts from transformer T51, which has 9.4V on its primary derived from the +12V supply via R78. During the scan period, therefore, V54 is switched on and this, in conjunction with +12V charging C62 and C65, causes the generation of a current ramp via an LC network comprising the primary of T52, inductors L51 and L52, and capacitors C62, C65. The current ramp increases with linear amplitude (amplitude and linearity are adjustable by means of L51 and L52 respectively) until retrace time.

At the commencement of retrace time a sync pulse from pin 5 of U51 switches V51 on, with V51 on transistor V53 conducts, and in so doing a voltage pulse is developed across V53 collector load, the primary of T51. The voltage bias on V54 base goes sharply negative and V54 switches off. The LC network collaspes rapidly so causing a high level voltage pulse to appear across the deflection coil. The scanning drive current drops and retrace is effected. At the falling edge of the sync pulse V51 and V53 switch off and V54 switches on, this initiates the current ramp generation process and horizontal scan is repeated until the next sync pulse from U51.

The primary switching function of T52 is utilized in the generation of CRT supplies, which will be fully described in section 3.4.

3.3 VIDEO AMPLIFIER

Transistor V101 is switched on being forward biased by a base potential of 6.2V established by zener diode V100, transistor V102 is off. When the incoming video signal is applied to the base of V102 it is switched on, causing V101 to conduct hard-on, collector current is developed through R104 and L100 and this is coupled to the CRT cathode pin 7 via R105, thereby modulating electron beam intensity. On the falling edge of a video pulse, V102 switches off and V101 collector current drops. Diode V103 serves to limit the V101 collector current to 250mA during video pulse amplification to increase the operational life of the CRT cathode.

3.4 CRT SUPPLIES

Various supplies for the CRT and circuits employed in the monitor electronics are developed across the secondary of transformer T52. This transformer has, as its primary input, a 250V AC 19KHz signal developed by the horizontal retrace circuit (see section 3.2).

3.4.1 14.5KV EHT SUPPLY

The 14,5KV anode voltage is developed by means of a screened secondary winding which has a high turns ratio. This voltage is fed directly to the CRT via an EHT lead terminating in a diode (mounted within the CRT) for rectification before appearing at the anode.

3.4.2 CRT CONTROL AND HEATER SUPPLIES

At secondary tap-off points voltages of varying values are rectified and smoothed, each voltage level and its function is now described:

600V

This voltage is rectified by V57 and applied to a CRT control grid via pin 3; also it is fed to potential divider network R75, R76 and R77 where the focus potential is derived. The voltage level set by R76 is boosted by a voltage waveform introduced from the horizontal deflection coil circuit via transformer T53. The focus voltage is dynamic, peaking at a period immediately before and after the horizontal sync pulse.

6V

This voltage is rectified by diode V58 and smoothed by C66, and provides the CRT heater supply.

24V

Rectified by V59 and smoothed by C67 to provide the VCC supply for the IC U1.

64V

Rectified by V60 and smoothed by C68 to provide the collector voltage for the video amplifier, and in conjunction with -150V it establishes the potential for the brightness control grid, this is input to the CRT on pin 2.

-150V

A voltage level rectified by V61 and smoothed by C69, used for brightness control. Set by two potentiometers R72 - an external brightness control, and R73 which is preset.

LIST OF ILLUSTRATIONS

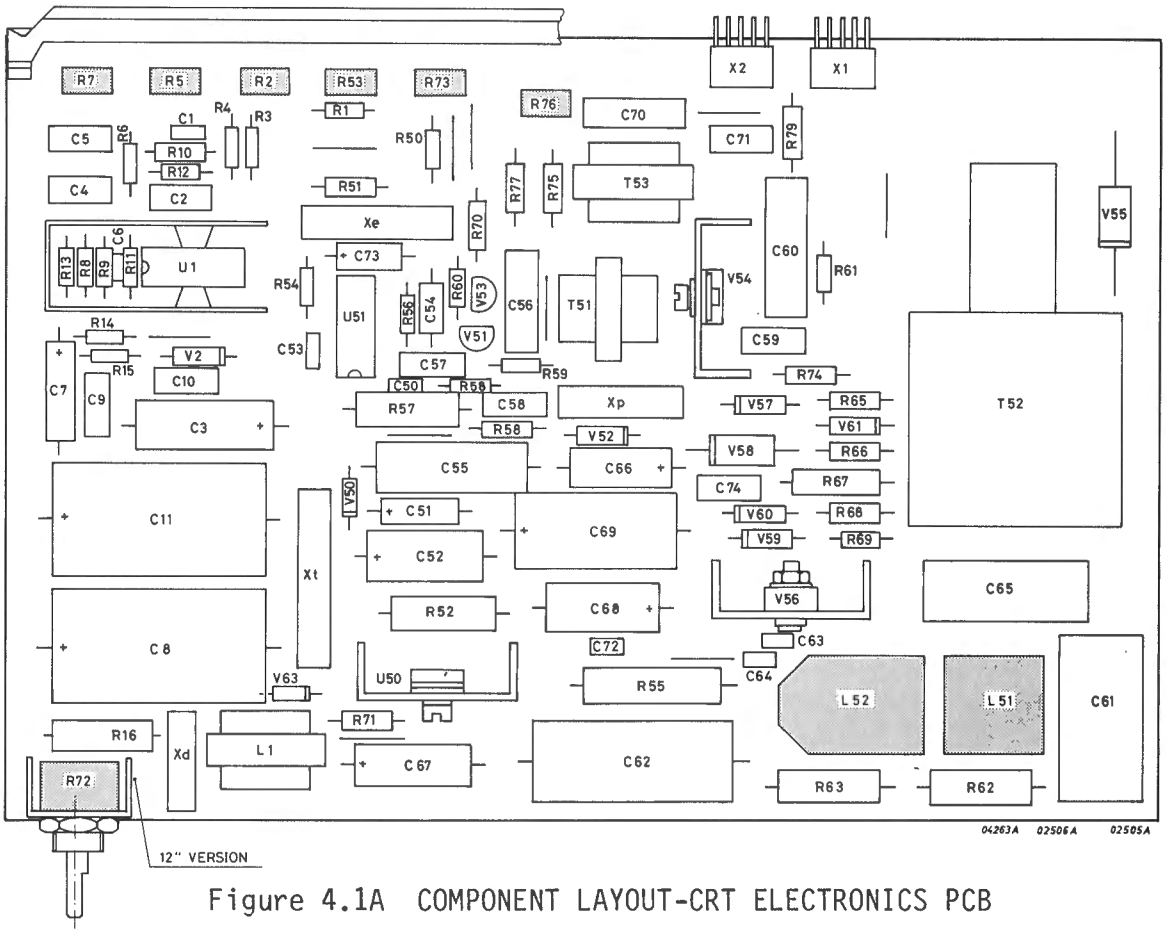


Figure 4.1A COMPONENT LAYOUT-CRT ELECTRONICS PCB

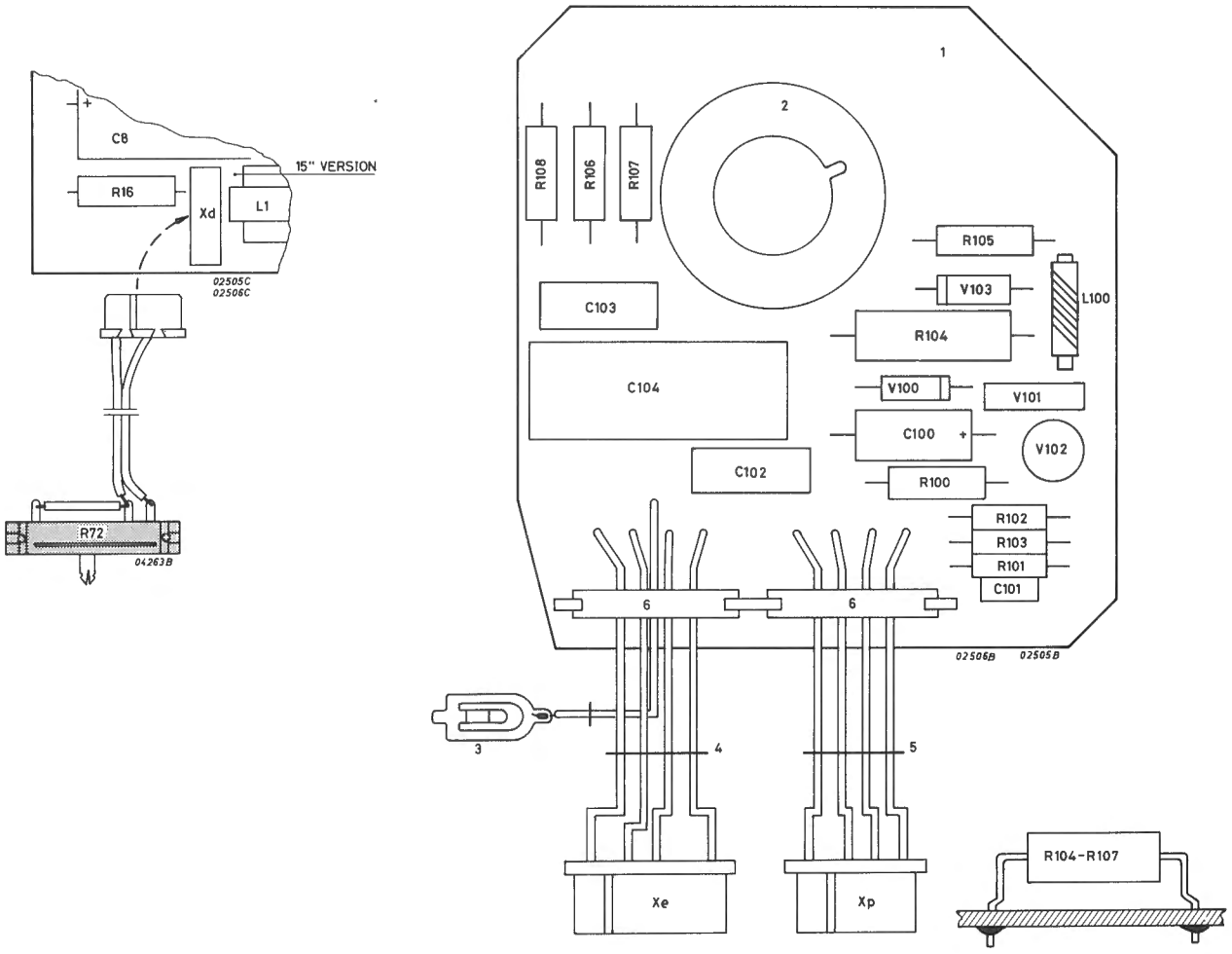
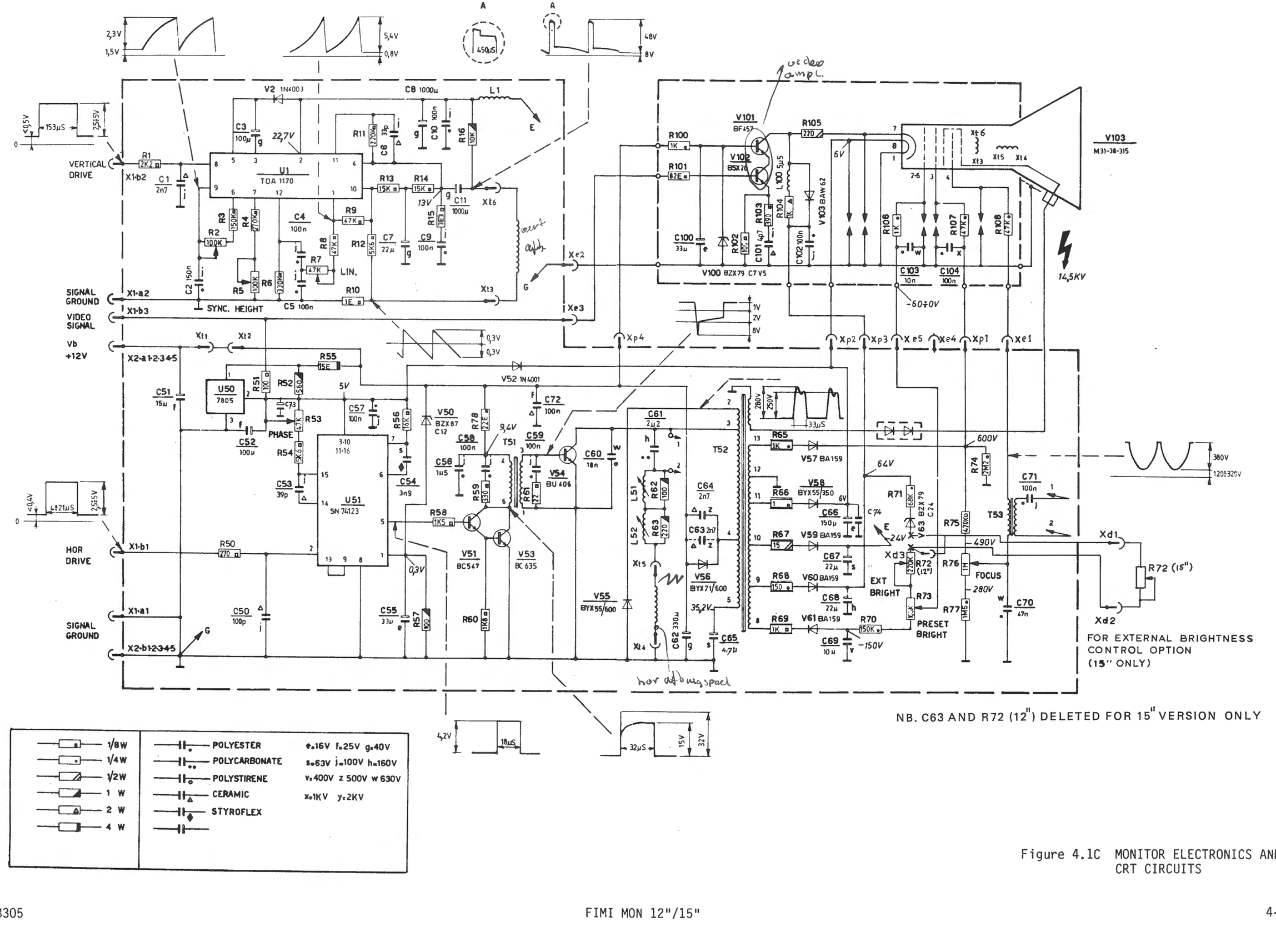


Figure 4.1B COMPONENT LAYOUT-VIDEO AMPLIFIER PCD

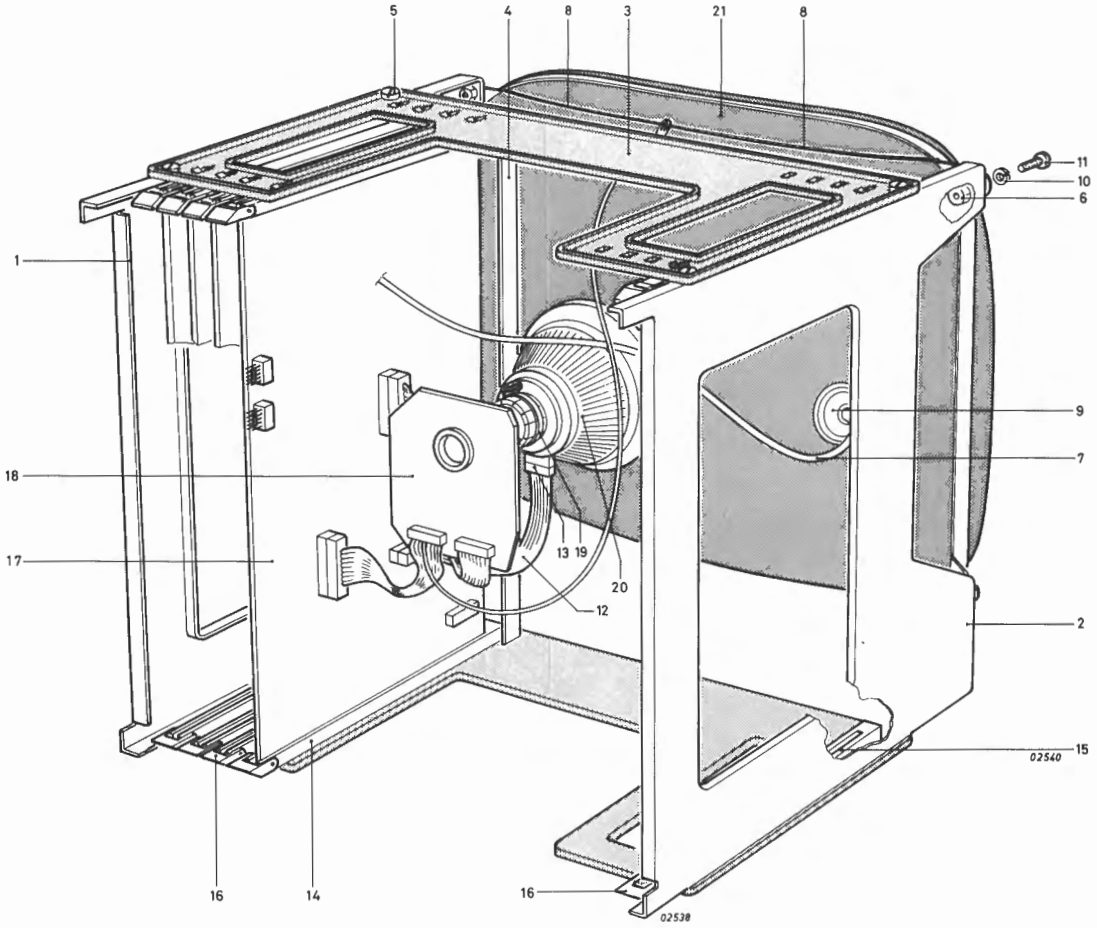


NB. C63 AND R72 (12") DELETED FOR 15" VERSION ONLY

Figure 4.1C MONITOR ELECTRONICS AND CRT CIRCUITS

5 LISTINGS

Not Applicable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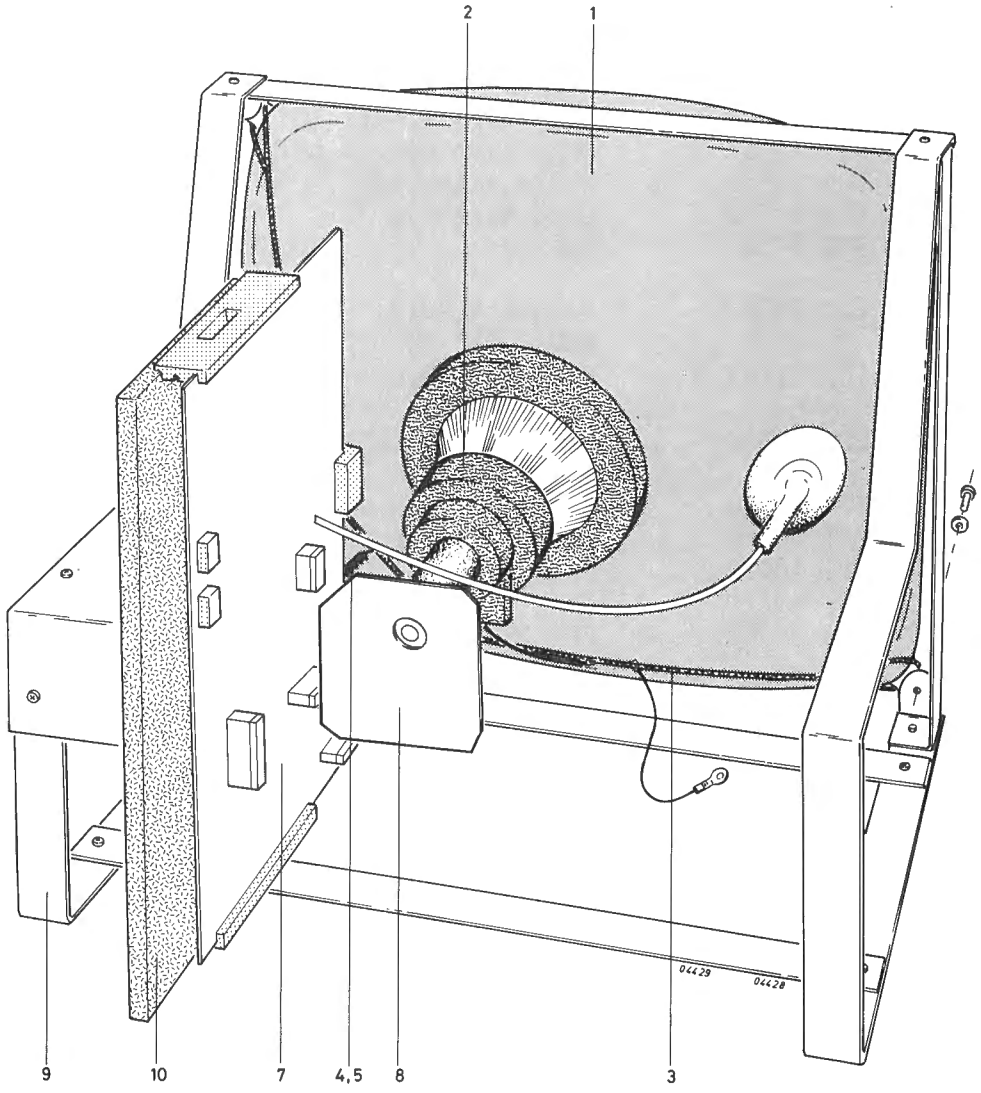
16
02538

Pos.	Code Number	Description
A	5103 107 53010	General Assembly - 12 inch
1B	3119 201 23440	Right side panel
2B	3119 201 23450	Left side panel
3B	3119 201 23460	Bracket plate guide (2 off)
4B	3119 201 23470	Corner
5B	3119 200 40570	Hex Taptite M4x7 (8 off)
6B	2519 619 03001	Expansion nut (4 off)
7B	3119 108 88550	Cable Assembly
8B	3119 108 88560	Cord Assembly
9B	3122 996 47380	Spring
10B	2522 600 17027	Washer 4,2x12 NLN-B 050 (4 off)
11B	2522 163 01043	Pan tap Screw 4,2X16 UAN-B 023 (4 off)
12B	3119 209 33540	Lead Xt assembly
13B	3119 209 30310	Sleeve
14B	5112 211 40180	Card guide (2 off)
15B	5112 211 40170	Card guide (2 off)
16B	5112 211 40220	Card lock (10 off)
17B	3119 208 54940	Printed Board Assembly
18B	3119 208 54950	Video Board Assembly
19B	2413 015 00246	Clamp
20B	3119 208 51090	Deflection Unit
21B	9300 861 30000	CRT M31-325 W
22B	3119 201 23480	Bracket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04429
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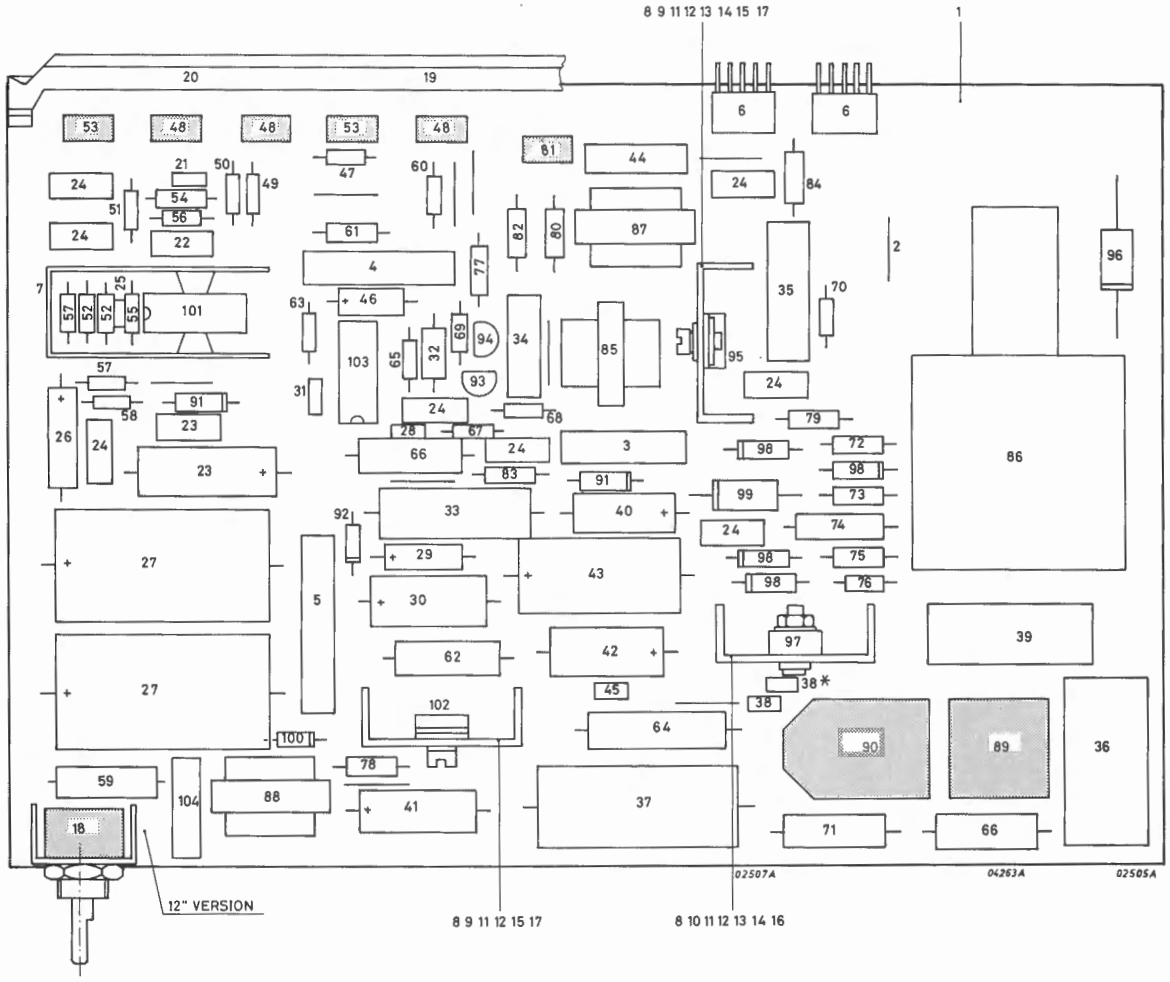
Pos.	Code Number	Description
A	5112 291 59820	Assembly 15 inch - orange (P2712)
	5112 291 77160	Assembly 15 inch - green (P2712)
	5122 011 31160	Assembly 15 inch - white (P2757)
	5122 011 31170	Assembly 15 inch - green (P2757)
1B	9300 954 30682	Table - orange (P2712)
	9300 941 30112	Tube - green (P2712)
	9300 941 10000	Tube - white (P2757)
	9300 941 20000	Tube - green (P2757)
2B	3119 208 05210	Deflection unit
3B	3119 200 50270	Bread lead assembly
4B	3119 108 90850	Card assembly
5B	2122 996 47380	Spring
6B	3119 208 05250	Ground cable assembly
7B	3119 208 55570	PCB CRT01
8B	3119 208 54950	PCB Video
9B		Frame not used
10B		Card holder not used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12" VERSION
8 9 11 12 15 17
8 10 11 12 13 14 16
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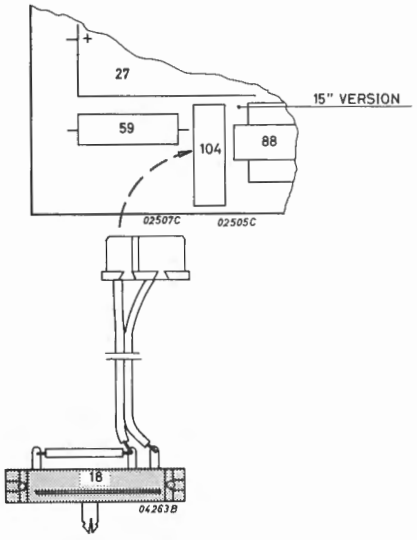
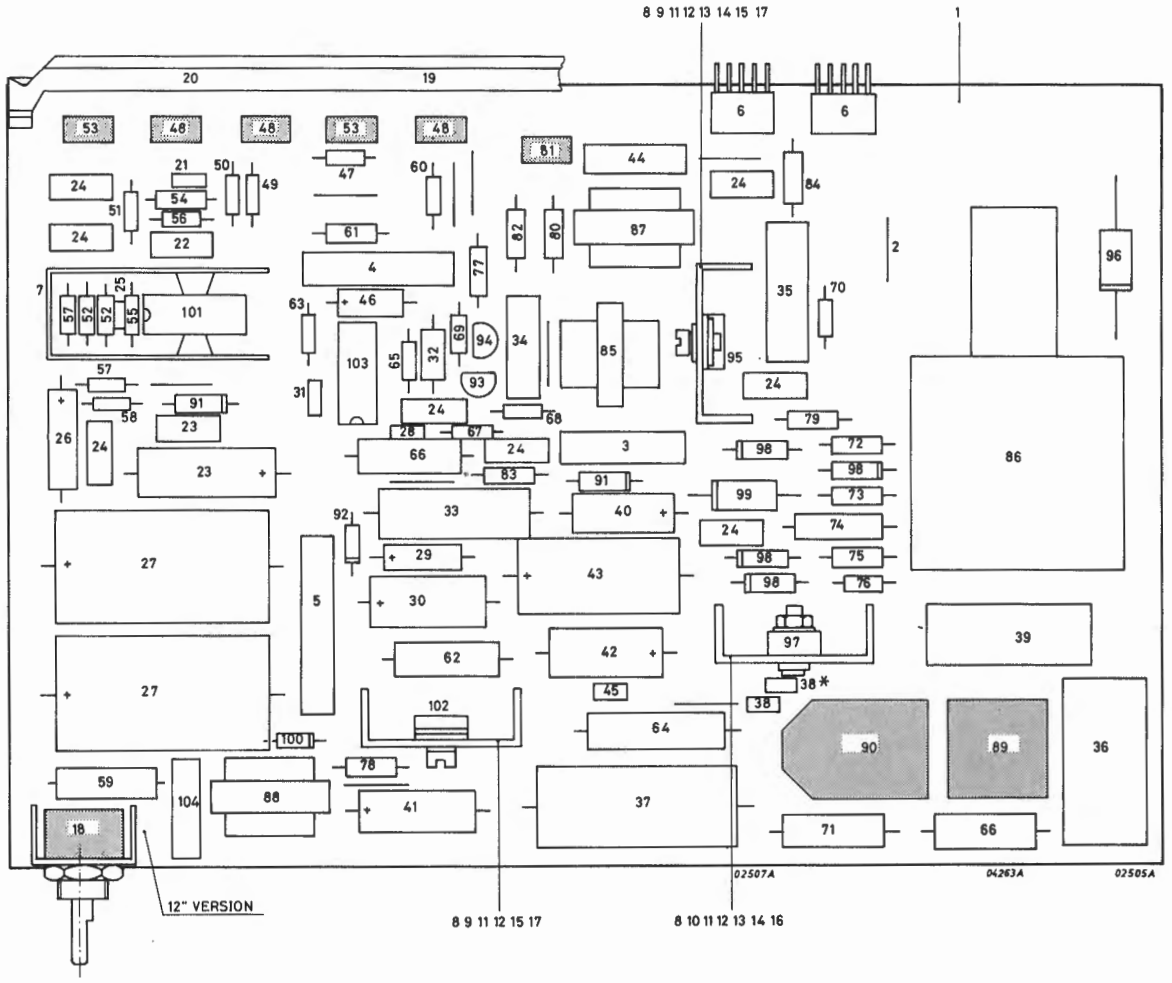
02505A


15" VERSION
02507C
02505C
04263B

Pos.	Code Number	Description
1B	3119 208 55570	PCB CRT Electronics (15 inch)
	3119 208 54940	PCB CRT Electronics (12 inch)
2C	3122 101 09100	Bridging wire UAT 0238 (9 off)
3C	3122 200 21500	Connector 4SKT grey
4C	3122 128 58740	Connector 5SKT grey
5C	3122 200 21760	Connector 6SKT grey
6C	2422 025 02705	Connector 9 pin (2 off)
7C	3119 201 60750	Heat sink
8C	3119 201 60740	Heat sink (3 off)
9C	2522 001 07098	Screw M3x8 ST/CD (2 off)
10C	2522 002 60413	Screw M3x14 ST/ZN
11C	2522 620 01005	Lock Washer 3 ST (3 off)
12C	2522 600 17017	Washer 3,2x7x0,5 ST (3 off)
13C	3119 200 10120	Insulating bush (2 off)
14C	3119 088 62800	Mica insulator.(2 off)
15C	3322 088 62800	Washer flat
16C	3119 101 63460	Square nut M3-ST (2 off)
17C	2522 401 04008	Nut M3
18C	3119 208 01890	Carbon pot 0,1W 220K and bracket
	3119 208 05220	Brightness adjusting assembly 220K
19C	5112 211 55720	List
20C	5112 211 54020	Sticker
21C	2222 630 06272	Cer cap pl 2C2 100V 2N7 10%
22C	2222 352 28154	Flat f cap 100V 150N 10%
23C	2222 016 37101	El cap 40V 100MU
24C	2222 352 28104	Flat f cap 100V 100N 10%
25C	2222 642 10339	Cer cap pl NPO 100V 33P 2%
26C	2222 016 27229	El cap 40V 22MU
27C	2222 032 17102	El cap 40V 1000MU
28C	2222 642 10101	Cer cap pl NPO 100V 100P 2%
29C	2022 001 00159	El cap solid ta 20V 15MU 20%
30C	2222 016 36101	El cap 25V 100MU
31C	2222 642 10399	Cer cap pl NPO 100V 39P 2%
32C	2222 428 73902	Ps cap tub 63V 3N9 2%
33C	2222 016 25331	El cap 16V 330MU
34C	2222 352 28564	Flat F cap 100V 560N 10%
35C	2222 357 72183	Pol F cap 1000V 18N 5%
36C	2222 363 42225	Pol F cap 210V 2MU2 5%
37C	2222 032 18331	El cap 63V 330MU
38C	2222 655 03272	Cer cap pl 2C2 500V 4N7 10% (38C* Deleted on 15 inch)
39C	2222 032 19221	El cap 100V 220MU
40C	2222 016 35151	El cap 16V 150MU
41C	2222 016 38229	El cap 63V 22MU
42C	2222 016 39229	El cap 100V 22MU
43C	2222 041 33109	El cap 250V 10MU
44C	2222 352 68473	Flat F cap 630V 47N 10%
45C	2022 552 01405	Cer cap pl 2E4 50V 100N 20%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12" VERSION
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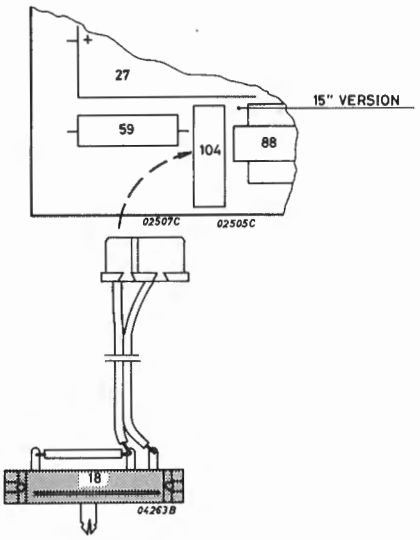
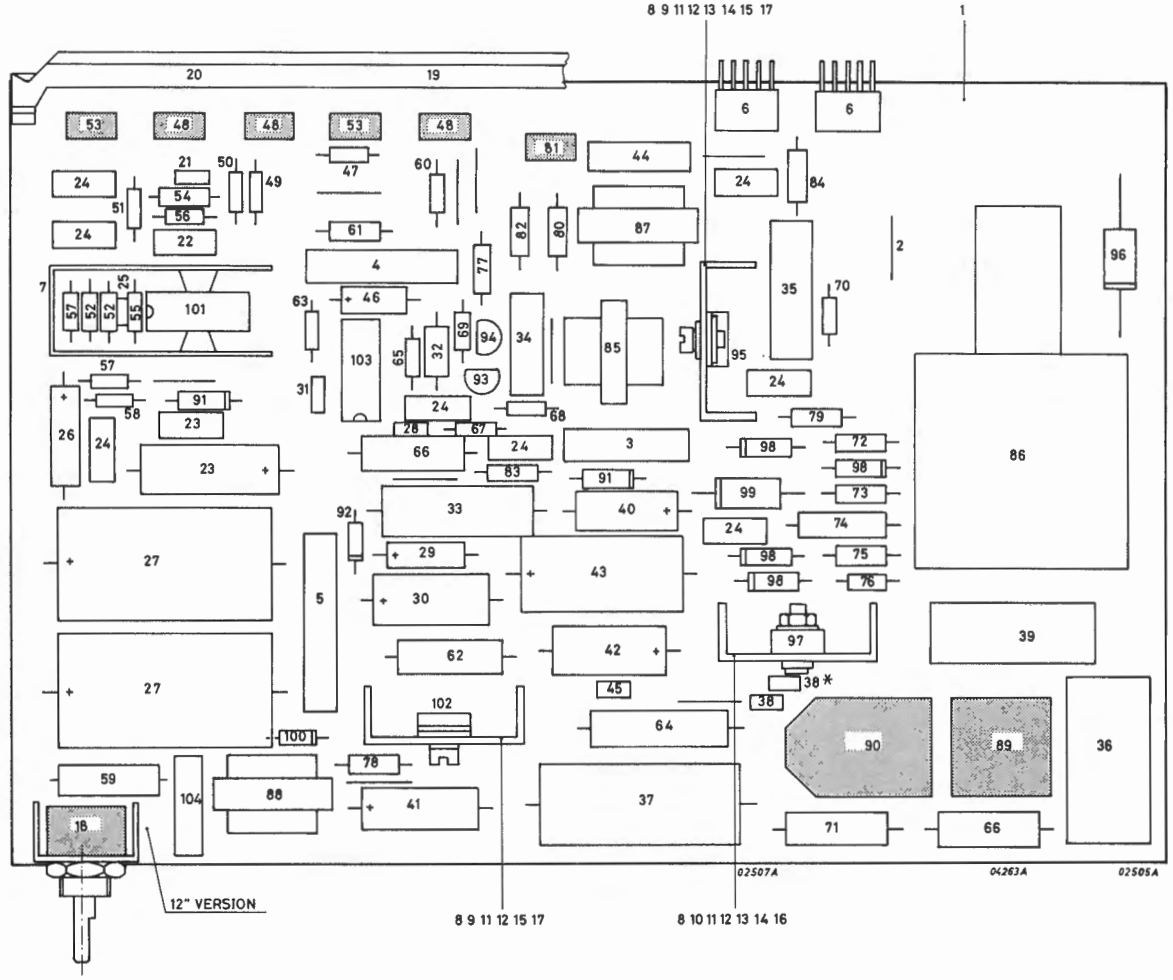

15" VERSION
02507C
02505C
04263B

Pos.	Code Number	Description			
46	2222 015 24479	El cap	10V	47MU	
47	2322 211 23222	Carb. resistor	CR25	2K2	2%
48	2122 362 00433	Trim pot cerm.	0,5W	100K	10%
49	2322 211 23154	Carb. resistor	CR25	150K	5%
50	2322 211 23244	Carb. resistor	CR25	240K	5%
51	2322 211 23334	Carb. resistor	CR25	330K	5%
52	2322 211 23473	Carb. resistor	CR25	47K	5%
53	2122 362 00432	Trim pot cerm.	0,5W	47K	5%
54	2322 312 23108	Carb. resistor	CR37	1E0	5%
55	2322 211 23224	Carb. resistor	CR25	220K	5%
61C	2322 212 23101	Carb. resistor	CR37	100E	5%
62C	2322 214 13561	Carb. resistor	CR68	560E	5%
63C	2322 211 23562	Carb. resistor	CR25	5K6	5%
64C	2306 330 03159	WW resistor	5W	15E	5%
65C	2322 211 23163	Carb. resistor	CR25	16K	5%
66C	2322 214 13101	Carb. resistor	CR68	100E	5%
*67C		Carb. resistor		1K5	5%
68C	2322 211 23331	Carb. resistor	CR25	330E	5%
69C	2322 211 23182	Carb. resistor	CR25	1K8	5%
70C	2322 211 23229	Carb. resistor	CR25	22E	5%
71C	2322 214 13221	Carb. resistor	CR68	220E	5%
72C	2322 212 83102	Carb. resistor safety	SR37	1K0	5%
73C	2322 212 83108	Carb. resistor safety	SR37	1E0	5%
74C	2322 212 83159	Carb. resistor safety	SR37	15E	5%
75C	2322 211 23163	Carb. resistor safety	SR37	150E	5%
76C	2322 205 23102	Metal resistor safety	NFR2	1K05	5%
77C	2322 212 23154	Carb. resistor safety	CR37	150K	5%
78C	2322 212 23683	Carb. resistor	CR37	68K	5%
79C	2322 242 13225	Metal G1 resistor	VR37	2M2	5%
80C	2322 212 23474	Carb. resistor	CR37	470K	5%
81C	2122 362 00434	Trim pot cerm.	0.5W	1M0	10%
82C	2322 242 13155	Metal G1 resistor	VR37	1M5	5%
83C	2322 212 23279	Carb. resistor	CR37	27K	5%
84C	2322 212 23103	Carb. resistor	CR37	10K	5%
85C	3119 208 30770	Driver transformer			
86C	3119 208 30750	Line output transformer			
87C	3119 208 30760	Dynamic focus transformer			
88C	3119 208 22750	Choke coil			
89C	3119 208 21650	Line amplitude coil			
90C	3119 208 21940	Linearity control unit			
91C	9330 619 30000	Diode 1N4003			
92C	9331 592 00000	Zener diode BZX 87C12			
93C	9331 976 10000	Transistor BC547			
94C	9334 219 20000	Transistor BC635			
95C	9332 711 00000	Transistor BU406			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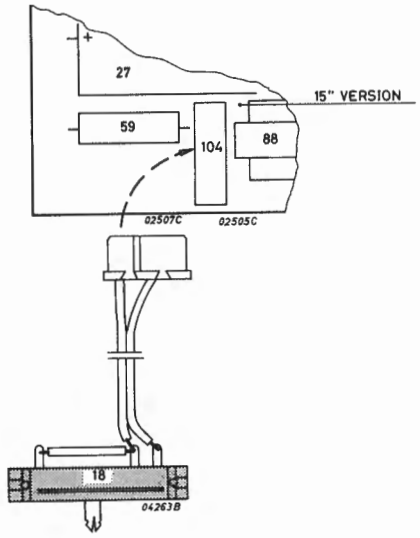
15" VERSION
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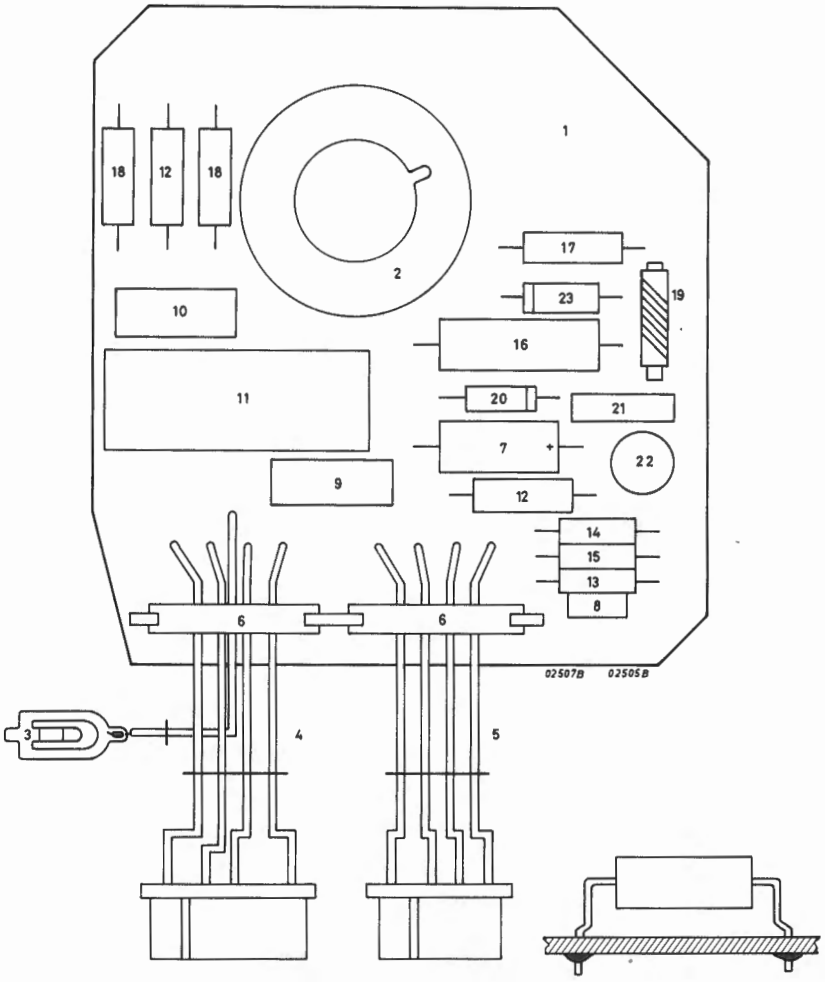
Pos.	Code Number	Description
96C	9331 421 90000	Diode BYX55/600
97C	9331 834 80000	Diode BYX71/600
98C	9332 985 30682	Diode BA 159
99C	9331 355 30000	Diode BYX 55/350
100C	9331 178 80000	Zener diode BZX79 C24
101C	9334 151 00000	Integrated circuit TDA 1170
102C	9332 110 51682	Integrated circuit ´A7805 UC
103C	9331 667 30682	Integrated circuit SN74123N
104C	3122 200 21580	Connector 3SKT grey (15 inch only)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Pos.	Code Number	Description
1B	3119 208 54950	PCB Video Amplifier
2C	2419 501 06004	Valve Holder
3C	3119 209 30100	Lead with clamp assembly
4C	3119 209 30810	Lead Xe assembly
5C	3119 209 30800	Lead Xp assembly
6C	3122 124 02420	Clamp
7C	2222 015 25339	El. Cap 16V 33MU
8C	2222 642 09478	Cer. Cap. P1 NPO 100V 4P7 + 0.25P
9C	2222 352 28104	Flat F cap 100V 100N 10%
10C	2222 352 68103	Flat F cap 630V 10N 10%
11C	2019 309 00054	Met. PF cap 1000V 100N 10%
12C	2322 212 23102	Carb. resistor CR37 1KO 5%
13C	2322 181 73829	Met. resistor SFR25 82R 5%
14C	2322 211 23101	Carb. resistor CR25 100E 5%
15C	2322 211 23391	Carb. resistor CR25 390E 5%
16C	2322 192 31002	Met. F resistor PR52 1KO 5%
17C	2322 212 23221	Carb. resistor CR37 220E 5%
18C	2322 212 23473	Carb. resistor CR37 47K 5%
19C	3122 108 20150	Coil 5MU5 assembly
20C	9331 177 60000	Zener diode BZX79C7V5
21C	9331 844 80000	Transistor BF457
22C	9330 219 20000	Transistor BSX20
23C	9331 012 20000	Diode BAW62

IDENTIFICATION CODE NUMBER	SERVICE CODE NUMBER	DESCRIPTION
2019 309 00054	5322 121 44371	CAP.100N 1000V 10%
2022 001 00142	5322 124 14053	ELCO C33MU/15V
2022 001 00159	5322 124 10017	CAP.15MU 20V 20%
2108 260 00087	5322 130 41042	RES.
2108 260 00153	5322 113 44198	RES 680E +-5% 7W
2108 260 00591	5322 113 41043	RES.
2222 015 24479	4822 124 20678	CAP.47MU 10V
2222 016 35151	4822 124 20586	CAP.150MU 16V
2222 016 36101	4822 124 20701	CAP.100MU 25V
2222 016 37101	4822 124 20715	CAP.100MU 40V
2222 016 38229	4822 124 20711	CAP.22MU 63V
2222 032 17102	4822 124 20795	CAP.1000MU 40V
2222 032 18331	4822 124 20802	CAP.330MU 63V
2222 032 19221	4822 124 20811	CAP.220MU 100V
2222 052 53471	5322 124 40451	CAP. 470UF 250V
2222 108 34681	5322 124 24229	CAP.680UF 10V
2222 108 35102	5322 124 24275	CAP.1000UF 16V
2222 108 37159	5322 124 21235	CAP.15UF 40V
2222 108 37229	5322 124 24274	CAP.22NF 40V
2222 122 53339	4822 124 10196	CAP.33UF 6,3V
2222 122 54159	5322 124 14036	ELCO 15MU/16
2222 122 56688	5322 124 14081	CAP. 6.8UF 25V
2222 344 21104	5322 121 40323	CAP. 0.1UF 100V
2222 344 21105	5322 121 40197	CAP.1UF 100V
2222 344 21154	4822 121 40231	CAP 150 NF 100V
2222 344 21155	5322 121 40227	CAP.1,5UF 100V
2222 344 21474	5322 121 40175	MKC KO 470N +-10% 10
2222 344 45473	5322 121 44138	CAP 47N +-10% 250V
2222 344 51103	5322 121 44201	CAP. 10UF 250V
2222 344 51223	5322 121 40308	CAP.0,022UF 250V MPR
2222 344 61104	4822 121 40145	CAP 100N +-10% 630V
2222 352 28104	4822 121 41161	CAP.100NF 10% 250V
2222 352 28154	4822 121 40423	CAP.150NF 10% 100V
2222 352 28473	4822 121 40239	CAP.47NF 10% 400V
2222 352 68103	5322 121 44344	CAP.
2222 357 72183	5322 121 44281	CAP.18N 1000V 5%
2222 425 41802	5322 121 54087	CAP.1,8NF 1% 125V
2222 426 23902	4822 121 50597	CAP.3K9PK 250V
2222 427 31202	5322 121 54135	CAP 1N2 +-5% 500V
2222 428 73902	5322 121 54127	CAP.3N9 63V 2%
2222 630 01102	4822 122 30027	CAP.1000PF 1000V 10%
2222 630 01182	4822 122 30048	CAP.1,8NF
2222 630 01471	4822 122 30034	CAP.470PF 10% CERP
2222 630 01472	4822 122 30128	CAP.4,7NF 100V CER
2222 630 01681	4822 122 30053	CAP.680PF CERPLAT
2222 630 06272	4822 122 31174	CAP.2.7NF 10% 500V
2222 631 34101	4822 122 31504	CAP.100PF KERKO
2222 631 46121	5322 122 34156	CAP.120PF 100V
2222 642 09478	4822 122 31045	CAP.4P7 100V
2222 642 10101	4822 122 31081	CAP.100P 100V 2%
2222 642 10339	4822 122 31067	CAP.33P 100V 2%
2222 642 10399	4822 122 31069	CAP.39P 100V 2%
2222 655 03272	4822 122 31174	CAP.2N7 500V 10%
2322 151 51001	5322 116 54469	RES.100E MR25
2322 151 51002	4822 116 51235	RES.1K MR25
2322 151 51003	4822 116 51253	RES.10K MR25
2322 151 51008	4822 116 51179	RES. 1E0 0,4W
2322 151 51009	5322 116 50452	RES. 10E 1% 0,4W
2322 151 51781	5322 116 54492	RES.178E 1% 0,4W
2322 151 53161	5322 116 54511	RES.316E MR25

IDENTIFICATION CODE NUMBER	SERVICE CODE NUMBER	DESCRIPTION
2322 151 54641	5322 116 50536	RES.464E MR25
2322 151 54642	5322 116 50484	RES 4K64 0,25W 1%
2322 151 55621	5322 116 54009	RES.562E 1% 0,4W
2322 151 55629	5322 116 54446	RES.56,2E 1% 0,4W
2322 152 51001	5322 116 54852	RES 100 1%
2322 152 51005	4822 116 51279	WIDERST 1M-1%0,5W
2322 152 51009	5322 116 54214	RES.100E MR30
2322 153 51004	5322 116 55609	RES 100K
2322 192 31002	5322 116 54403	RES.1K0 0,67W 5%
2322 205 23102	4822 111 30561	RES.1K0 0,4W 5%
2322 211 23152	4822 110 73112	RES.1K5 0,33W 5%
2322 211 23153	4822 110 73138	RES.M.FILM
2322 211 23154	4822 110 73165	RES. M.FILM 150K
2322 211 23163	4822 110 70139	RES.16K 0,33W 5%
2322 211 23182	4822 110 73114	RES.1K8 0,33W 5%
2322 211 23222	4822 110 73116	RES.2K2 0,33W 5%
2322 211 23224	4822 110 73169	RES.M.FILM
2322 211 23229	4822 110 73043	RES.22E 0,33W 5%
2322 211 23271	4822 110 73092	RES.M.FILM
2322 211 23331	4822 110 73094	RES.330E 0,33W 5%
2322 211 23334	4822 110 73174	RES.M.FILM
2322 211 23338	4822 110 73041	RES.M.FILM
2322 211 23391	4822 110 73096	RES.390E 0,33W 5%
2322 211 23473	4822 110 73152	RES.47K 0,33W 5%
2322 211 23562	4822 110 73127	RES.5K6 0,33W 5%
2322 211 23829	4822 110 73078	RES.82E 0,33W 5%
2322 212 23101	4822 110 53081	RES.100E 0,5W 5%
2322 212 23102	4822 110 53107	RES.1K 5% 0,5W
2322 212 23221	4822 110 53089	RES.220E 0,5W 5%
2322 212 23473	4822 110 53152	RES.47K 0,5W 5%
2322 212 83102	4822 111 30108	RES.1K0 0,5W 5%
2322 212 83108	4822 111 30339	RES.1E 5% 0,5W
2322 212 83151	4822 111 30156	RES.150E 0,5W 5%
2322 212 83159	4822 111 30027	RES.15E 5% 0,5W
2322 214 13101	4822 110 23081	RES.100E 5% 1,15W
2322 214 13103	4822 110 23134	RES.10K 1,15W 5%
2322 214 13221	4822 110 23089	RES,220E 5% 1,15W
2322 214 13561	4822 110 23101	RES.560E 1,15W 5%
2322 241 13105	5322 116 64132	RES 1M
2322 242 13155	4822 110 42192	RES.1M5 0,5W 5%
2322 242 13225	4822 110 42196	RES.2M2 0,5W 5%
2322 329 04391	4822 112 21096	RES 390R MM 5W
2322 329 04392	5322 113 44314	RES 3K9
2322 329 05272	4822 112 21118	RES.2,7K-5%
2322 329 05561	4822 112 21101	RES.560E AC05
2322 482 20102	5322 100 10112	POTMETER 1K
2322 482 20222	5322 101 14008	POTENTIO METER 2K2
2322 482 20471	5322 101 14047	POT. M. 470 OHM 20%
2322 482 20472	5322 100 10114	TRIMPOTM.5K
2322 482 20473	5322 101 14048	POTMETER 47K
2412 125 00039	5322 277 14232	SWITCH
2413 124 01076	5322 271 30284	SWITCH
2422 086 00181	5322 253 54033	FUSE REF 313002
2432 088 00051	5322 256 30195	FUSE HOLDER
2432 088 00052	5322 256 54013	FUSE ADAPTER EUR
3119 208 21650	5322 154 14113	COIL
3119 208 51090	5322 150 10137	DEFLECTION UNIT
3119 208 54940	5322 216 21037	PCB MAIN
3119 208 54950	5322 216 21038	PCB VIDEO
3122 108 20150	4822 158 10107	COIL SMU5

IDENTIFICATION CODE NUMBER	SERVICE CODE NUMBER	DESCRIPTION
3522 059 99311	5322 254 64001	FUSE 1A 250V T
3522 059 99341	4822 253 30025	FUSE 2A
4022 369 67971	5322 142 44023	TRAFO RM5
4022 369 69131	5322 148 60105	MAIN TRAFO
4022 369 69141	5322 158 20411	COIL 12V 680UH
4022 369 69151	5322 158 20412	COIL 5V 62UH
4022 369 69161	5322 158 20413	COIL 12V 4.1MH
4022 369 69171	5322 158 20414	COIL 24V 8,35MH
5122 000 05290	4822 130 30594	DIODE BAV10
5122 000 06530	4822 130 34173	ZENER DIODE BZX79
5122 000 06540	4822 130 34278	DIODE BZX79-B6V8
5122 000 06620	4822 130 34441	DIODE BZX79C22
5122 000 06700	5322 130 41805	TRANS.
5122 000 06740	5322 130 40324	TRANS.BCY70
5122 000 06840	5322 130 44576	TRANS.BCY59
5122 000 08750	5322 209 84307	IC MC1488L
5122 000 08760	5322 209 84308	IC MC1489L
5122 000 09150	4822 209 80782	IC 74LS74
5122 000 09170	5322 209 85647	IC N74LS138B
5122 000 09350	4822 209 80783	IC 74LS04
5122 000 09650	5322 209 84724	IC SN74864N
5122 000 09660	5322 209 84995	IC SN74LS08N-00
5122 000 09680	5322 209 85667	IC SN74LS253N
5122 000 09820	5322 209 84475	IC N74804A
5122 000 09860	5322 209 14298	IC 4702B
5122 000 09900	5322 209 86018	IC D8251
5122 000 09960	5322 209 85677	IC N74838A
5122 000 10080	5322 209 84167	IC SN74S00N-00
5122 000 10090	5322 209 84915	IC N74811N
5122 000 10110	5322 209 84183	IC SN74874N-00
5122 000 10130	5322 209 86062	IC SN74LS373J
5122 000 10200	4822 209 80631	LM339AN
5122 000 10210	5322 209 85662	IC TDA1060
5122 000 10350	5322 209 85311	IC N74LS32A
5122 000 10480	5322 209 85005	IC N74LS161N
5122 000 10600	5322 209 85862	IC SN74LS240N
5122 000 10660	5322 209 85792	IC N74LS273N
5122 000 10750	5322 209 85869	IC SN74LS374AN
5122 000 10760	4822 209 80447	IC N74LS393N
5122 000 10880	5322 209 85698	IC SN748161N
5122 000 11090	5322 209 85889	IC UA723AN
5122 000 11190	5322 209 86017	IC N74LS244N
5122 000 11230	5322 209 86035	IC 8085
5122 000 11330	5322 242 74381	CRYSTAL 19.6608MHZ
5122 000 11340	5322 242 74378	X-TAL 18,4MHZ
5122 000 11490	5322 111 94227	RES. 78R 1K
5122 000 11690	5322 130 34688	IC HP5082-4650
5122 000 11820	5322 122 34153	CAP.100NF 50V
5122 000 11830	5322 209 86065	IC CNY21
5122 000 11840	5322 111 90133	RES.78R180
5122 000 11940	5322 209 54482	IC 2114-2
5122 000 13060	5322 209 81174	IC 74F194
5122 000 13090	5322 130 41806	TRANS.IRF 531
5122 000 13130	5322 209 10233	IC 6116.15
5122 000 13140	5322 113 90096	RES.0,1E AC
5122 000 13410	5322 121 41418	FILTER
5122 011 30810	5322 113 41003	ERC2032A
5122 011 30890	5322 111 90085	RES.PACK10-07-001-00
5122 011 30910	5322 111 90087	RES.PACK11-06-001-00
5122 011 30920	5322 111 90088	RES.PACK13-11-002-00

IDENTIFICATION CODE NUMBER	SERVICE CODE NUMBER	DESCRIPTION
5122 011 30950	5322 116 90097	RES.PACK
5122 011 30960	5322 116 90098	RES.PACK
5122 011 30970	5322 116 90099	RES.PACK
5122 011 30980	5322 116 90101	RES.PACK
5122 011 30990	5322 116 90102	RES.PACK
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5122 011 31000	5322 116 90103	RES.PACK
5122 194 33110	5322 321 20481	CABLE
5122 194 41650	5322 216 21099	PCB CAB1
5122 194 42110	5322 216 21211	PCB CRK LLI
5122 194 45210	5322 216 21099	PCB CAB2
5122 194 44840	5322 216 21205	PCB CR0
9300 861 30000	5322 131 20068	PICTURE TUBE M31-325
9330 219 20112	5322 130 40417	TRANS BSX20
9330 441 00112	5322 130 40324	TRANSISTOR BCY70
9330 619 30112	5322 130 30208	DIODE 1N4003
9331 012 20112	4822 130 30613	DIODE BAW62
-		
9331 176 80112	5322 130 34834	DIODE BZX79 C3V6
9331 177 50112	4822 130 34278	DIODE BZX79-B6V8
9331 177 60112	4822 130 30861	DIODE ZENERBZX79C7V5
9331 177 90112	4822 130 34297	Z-DIODE BZX79/C10
9331 178 50112	4822 130 31024	DIODE BZX79 B18
-		
9331 178 60112	4822 130 34499	DIODE BZX79-B20
9331 178 80112	4822 130 34398	DIODE BZX79-B24
9331 178 90112	4822 130 34379	DIODE BZX79-C27
9331 355 30112	4822 130 34275	DIODE BYX55/350
9331 421 90112	4822 130 30817	DIODE BYX55/600
-		
9331 491 80112	4822 130 40854	TRANS.BC327
9331 492 00112	4822 130 40855	TRANSISTOR BC337
9331 592 00112	5322 130 34068	DIODE ZENER BZX87C12
9331 667 30112	5322 209 84194	IC SN74123N
9331 834 80112	4822 130 34522	DIODE BYX71/600
-		
9331 844 80112	4822 130 41049	TRANS.BF457
9331 892 00112	4822 130 34189	DIODE BAV20
9331 970 60112	5322 130 34294	DIODE BZV11
9331 976 10112	4822 130 44257	TRANSISTOR BC 547
9332 066 00112	4822 130 40968	TRANSISTOR BS838
-		
9332 110 51112	5322 209 84841	IC UA7805UC
9332 219 20112	5322 130 44349	TRANS BC635
9332 711 00112	5322 130 44581	TRANS.BU 406
9332 715 30112	5322 130 44729	TRANS.BUX81
9332 715 60112	5322 130 44718	TRANS.BUX86
-		
9332 985 30112	4822 130 31051	LED BY208-1000
9333 912 90112	5322 130 34711	DIODE BYW29-150V
9334 151 00112	5322 209 85428	IC TDA1170
9334 752 20112	5322 130 31686	DIODE BY257
9335 001 00112	4822 130 31348	DIODE BYV96D
-		
9335 001 50112	4822 130 41602	DIODE BYW95C

IDENTIFICATION CODE NUMBER	SERVICE CODE NUMBER	DESCRIPTION
2022 001 00142	5322 124 14053	CAP C33MU/15V
2022 001 00159	5322 124 10017	CAP. 15MU 20V 20%
2108 260 00087	5322 130 41042	RES.
2108 260 00153	5322 113 44198	RES 680E +-5% 7W
2108 260 00591	5322 113 41043	RES.
2222 052 53471	5322 124 40451	CAP. 470UF 250V
2222 108 34681	5322 124 24229	CAP.680UF 10V
2222 108 35102	5322 124 24275	CAP.1000UF 16V
2222 108 37159	5322 124 21235	CAP.15UF 40V
2222 108 37229	5322 124 24274	CAP.22NF 40V
2222 122 53339	4822 124 10196	CAP.33UF 6,3V
2222 122 54159	5322 124 14036	ELCO 15MU/16
2222 122 56688	5322 124 14081	CAP. 6.8UF 25V
2222 344 21104	5322 121 40323	CAP. 0.1UF 100V
2222 344 21105	5322 121 40197	CAP.1UF 100V
2222 344 21154	4822 121 40231	CAP 150 NF 100V
2222 344 21155	5322 121 40227	CAP.1,5UF 100V
2222 344 21474	5322 121 40175	MKC KD 470N +-10% 10
2222 344 45473	5322 121 44138	CAP 47N +-10% 250V
2222 344 51103	5322 121 44201	CAP. 10UF 250V
2222 344 51223	5322 121 40308	CAP.0,022U+ 250V MPR
2222 344 61104	4822 121 40145	CAP 100N +-10% 630V
2222 424 41003	5322 121 54154	CAP.10NF 63V
2222 425 41802	5322 121 54087	CAP.1,8NF 1% 125V
2222 426 23902	4822 121 50597	CAP.3K9PK 250V
2222 427 31202	5322 121 54135	CAP 1N2 +-5% 500V
2222 455 62203	4822 121 50609	CAP 22NF
2222 455 63303	5322 121 54111	CAP 33NF
2222 455 64703	5322 121 50882	CAP 47NF
2222 630 01102	4822 122 30027	CAP.1000PF 1000V 10%
2222 630 01182	4822 122 30048	CAP.1,8NF
2222 630 01392	4822 122 30098	CAP.3900PF
2222 630 01471	4822 122 30034	CAP.470PF 10% CERP
2222 630 01472	4822 122 30128	CAP.4,7NF 100V CER
2222 630 01681	4822 122 30053	CAP.680PF CERPLAT
2222 631 10279	4822 122 30045	CAP. 27PF 100V
2222 631 10479	4822 122 31072	CAP. 47PF 100V
2222 631 34101	4822 122 31504	CAP.100PF KERKO
2222 631 46121	5322 122 34156	CAP.120PF 100V
2222 631 52151	4822 122 31285	CAP.150PF 100V CER
2222 631 58181	4822 122 31172	CAP. 180PF/100V
2222 631 70331	5322 122 34148	CAP 330PF 100V
2222 631 70391	4822 122 30091	CAP. 390PF/63V
2322 151 51001	5322 116 54469	RES.100E MK25
2322 151 51002	4822 116 51235	RES. 1K0 1% 0.4W
2322 151 51003	4822 116 51253	RES. 10K 1% 0.4W
2322 151 51005	5322 116 55535	RES. 1M0 1% 0.4W
2322 151 51008	4822 116 51179	RES. 1E0 0,4W
2322 151 51009	5322 116 50452	RES. 10E 1%0,4W
2322 151 51213	5322 116 50572	RES. 12K1 1% 0.4W
2322 151 51471	5322 116 50766	RES.147E 1% 0.4W
2322 151 51473	5322 116 54632	RES. 14K7 1% 0.4W
2322 151 51781	5322 116 54492	RES.178E 1% 0,4W
2322 151 51782	5322 116 50515	RES. 1K78 1% 0.4W
2322 151 51784	5322 116 54721	RES.178K 1% 0.4W
2322 151 52151	5322 116 55274	RES.215E 1% 0.4W
2322 151 52152	5322 116 50767	RES. 2K15 1% 0.4W
2322 151 52612	5322 116 50671	RES. 2K61 1% 0.4W
2322 151 52613	5322 116 54651	RES. 26K1 1% 0.4W
2322 151 52614	5322 116 54736	RES.261K 1% 0.4W

IDENTIFICATION CODE NUMBER	SERVICE CODE NUMBER	DESCRIPTION
2322 151 53161	5322 116 54511	RES.316E MR25
2322 151 53162	5322 116 50579	RES. 3K16 1% 0.4W
2322 151 53163	5322 116 54657	RES. 31K6 1% 0.4W
2322 151 53832	5322 116 54589	RES.3,83K 1/8W 1%
2322 151 53833	5322 116 55369	RES.38,3K 1% 0,125W
2322 151 54641	5322 116 50536	RES.464E MR25
2322 151 54642	5322 116 50484	RES 4K64 0,25W 1%
2322 151 54643	5322 116 50557	RES 46K4 0,125W 1%
2322 151 54644	5322 116 55207	RES.464 K 0,125W 1%
2322 151 55621	5322 116 54009	RES.562E 1% 0,4W
2322 151 55622	5322 116 54011	RES. 5K62 0,4W/1%
2322 151 55623	4822 116 51264	RES. 56,2K +-1% 0
2322 151 55629	5322 116 54446	RES.56,2E 1% 0,4W
2322 151 56812	5322 116 54012	RES.6K81 0,4W 1%
2322 152 51001	5322 116 54852	RES 100 1%
2322 152 51005	4822 116 51279	RES. 1M-1%0,5W
2322 152 51009	5322 116 54214	RES.100E MM30
2322 153 51004	5322 116 55609	RES 100K
2322 241 13105	5322 116 64132	RES 1M
2322 329 04391	4822 112 21096	RES 390R WW 5W
2322 329 04392	5322 113 44314	RES 3K9
2322 329 05272	4822 112 21118	RES.2,7K-5%
2322 329 05561	4822 112 21101	RES.560E AL05
2322 482 20102	5322 100 10112	POTMETER 1K
2322 482 20222	5322 101 14008	POTENTIO METER 2K2
2322 482 20471	5322 101 14047	POT. M. 470 OHM 20%
2322 482 20472	5322 100 10114	TROMPOTM.5K
2322 482 20473	5322 101 14048	POTMETER 47K
2412 125 00039	5322 277 14232	SWITCH
2422 086 00181	5322 253 54033	FUSE REF 313002
2422 132 01734	5322 280 24071	REEDRELAIS
3119 208 30750	5322 140 10205	TRAFO LINE OUTPUT
3119 208 51090	5322 150 10137	DEFLECTION UNIT
3119 208 54950	5322 216 21038	PCB VIDEO
3119 208 55570	5322 216 21235	PCB MAIN
3522 059 99310	5322 254 64001	FUSE 1A 250V T
4022 369 67971	5322 142 44023	TRAFO RM5
4022 369 69131	5322 148 60105	MAIN TRAFO
4022 369 69141	5322 158 20411	COIL 12V 680UH
4022 369 69151	5322 158 20412	COIL 5V 62UH
4022 369 69161	5322 158 20413	COIL 12V 4.1MH
4022 369 69171	5322 158 20414	COIL 24V 8,35MH
5112 211 40221	5322 526 54247	LATCH
5122 000 05290	4822 130 30594	DIODE BAV10
5122 000 05640	4822 130 30613	DIODE BAW62
5122 000 06530	4822 130 34173	ZENER DIODE BZX79
5122 000 06540	4822 130 34278	DIODE BZX79-B6V8
5122 000 06620	4822 130 34441	DIODE BZX79C22
5122 000 06700	5322 130 41805	TRANS.
5122 000 06740	5322 130 40324	TRANS.BCY70
5122 000 06840	5322 130 44576	TRANS.BCY59
5122 000 08750	5322 209 84307	IC MC1488L
5122 000 08760	5322 209 84308	IC MC1489A
5122 000 09120	5322 209 84823	IC N74LS00A
5122 000 09130	5322 209 85604	IC N74LS11A
5122 000 09140	5322 209 85569	IC SN74LS20N
5122 000 09150	4822 209 80782	IC 74LS74
5122 000 09170	5322 209 85647	IC N74LS138B
5122 000 09180	5322 209 86452	IC 74LS151
5122 000 09200	5322 209 85489	IC N74LS157B
2712 028 00175	5322 462 10216	ADJUSTABLE FOOT
2712 028 00176	5322 462 10217	FOOT

IDENTIFICATION CODE NUMBER	SERVICE CODE NUMBER	DESCRIPTION
5122 000 09220	5322 209 85405	IC N74LS193N
5122 000 09230	5322 209 85652	IC N74LS194AB
5122 000 09310	5322 209 86189	IC 82S09
5122 000 09350	4822 209 80783	IC 74LS04
5122 000 09360	5322 209 84996	IC N74LS10A
-		
5122 000 09430	5322 209 14866	IC D8251A
5122 000 09580	5322 209 85201	IC 74LS132N
5122 000 09650	5322 209 84724	IC SN74S64N
5122 000 09660	5322 209 84995	IC SN74LS08N
5122 000 09670	5322 209 85605	IC N74LS38A
-		
5122 000 09680	5322 209 85667	IC SN74LS253N
5122 000 09700	5322 209 84237	IC SN74S112N
5122 000 09710	5322 209 84999	IC SN74LS175N
5122 000 09820	5322 209 84475	IC N74S04A
5122 000 09860	5322 209 14298	IC 4702B
-		
5122 000 09900	5322 209 86018	IC D8251
5122 000 09910	5322 209 85877	IC D8224
5122 000 09960	5322 209 85677	IC N74S38A
5122 000 10030	5322 209 85312	IC N74LS02A
5122 000 10080	5322 209 84167	IC SN74S00N-00
-		
5122 000 10090	5322 209 84915	IC N74S11N
5122 000 10100	5322 209 85195	IC SN74S20N
5122 000 10110	5322 209 84183	IC SN74S74N-00
5122 000 10130	5322 209 86062	IC SN74LS373J
5122 000 10200	4822 209 80631	LM339AN
5122 000 10220	5322 209 86176	IC UA7912
5122 000 10210	5322 209 85662	IC TDA1060
5122 000 10340	5322 209 84985	IC SN74LS30N
5122 000 10350	5322 209 85311	IC N74LS32A
5122 000 10410	5322 209 84997	IC SN74LS86N
5122 000 10480	5322 209 85005	IC N74LS161N
-		
5122 000 10600	5322 209 85862	IC SN74LS240N
5122 000 10630	5322 209 86334	IC 74LS257
5122 000 10660	5322 209 85792	IC N74LS273N
5122 000 10750	5322 209 85869	IC SN74LS374AN
5122 000 10760	4822 209 80447	IC N74LS393N
-		
5122 000 10800	5322 209 86191	IC 74S08
5122 000 10840	5322 209 85666	IC SN74S51N
5122 000 10880	5322 209 85698	IC SN74S161N
5122 000 10900	5322 209 85451	IC N74S175B
5122 000 10910	5322 209 85813	IC N74S257F
-		
5122 000 11040	5322 209 86193	IC AM2917A
5122 000 11080	5322 209 85512	IC MC1458V
5122 000 11090	5322 209 85889	IC UA723AN
5122 000 11190	5322 209 86017	IC N74LS244N
5122 000 11230	5322 209 86035	IC 8085
-		
5122 000 11330	5322 242 74381	CRYSTAL 19.6608MHZ
5122 000 11340	5322 242 74378	X-TAL 18,4MHZ
5122 000 11490	5322 111 94227	RES. 7SR 1k
5122 000 11660	5322 111 94232	RES.9SR1K
5122 000 11690	5322 130 34688	DIODE HP5082-4650
-		
5122 000 11820	5322 122 34153	CAP.100NF 50V
5122 000 11830	5322 209 86065	IC CNY21
5122 000 11840	5322 111 90133	RES.7SR180
5122 000 11940	5322 209 54482	IC 2114-2
5122 000 12930	5322 209 81241	IC HN4864-3
-		
5122 000 13060	5322 209 81174	IC 74F194
5122 000 13090	5322 130 41806	TRANS.IRF 531
5122 000 13130	5322 209 10233	IC 6116.15
5122 000 13140	5322 113 90096	RES.0,1E AC
5122 000 13180	5322 111 90243	RNW 9SR10K
-		

IDENTIFICATION CODE NUMBER	SERVICE CODE NUMBER	DESCRIPTION
5122 000 13420	4822 130 30953	LED HLMP 1401
5122 000 13430	5322 130 31903	LED HLMP-1301 RED
5122 011 29600	5322 242 74355	X TAL 9M216
5122 011 30810	5322 113 41003	ERC2032A
5122 011 30890	5322 111 90085	RES.PACK10-07-001-00
5122 011 30910	5322 111 90087	RES.PACK11-06-001-00
5122 011 30950	5322 116 90097	RES.PACK
5122 011 30960	5322 116 90098	RES.PACK
5122 011 30970	5322 116 90099	RES.PACK
5122 011 30980	5322 116 90101	RES.PACK
5122 011 31110	5322 116 90105	RNW 09-06-001-10
5122 011 31120	5322 111 90177	RNW 13-11-003-00
5122 011 31130	5322 116 90106	RNW 18-15-001-10
5122 110 94780	5322 414 30005	KNOB
5122 194 41750	5322 216 21101	PCB CRK1
5122 194 41930	5322 216 21224	PCB CNB 1
5122 194 42110	5322 216 21211	PCB CRK LLI
5122 194 44840	5322 216 21205	PCB CRO 1
5122 194 45210	5322 216 21099	PCB CAB2
9300 941 10112	5322 131 20094	TUBE 15" M38-334WC/P
5122 194 46400	5322 218 80025	MAINSFILTER 3A
9330 219 20112	5322 130 40417	TRANS BSX20
9330 441 00112	5322 130 40324	TRANSISTOR BCY70
9330 619 30112	5322 130 30208	DIODE BZZ16
9331 012 20112	4822 130 30613	DIODE BAW62
9331 176 80112	5322 130 34834	DIODE BZX79 C3V6
9331 177 60112	4822 130 30861	DIODE ZPD7,5
9331 177 90112	4822 130 34297	Z-DIODE BZX79/C10
9331 178 50112	4822 130 31024	DIODE BZX79 B18
9331 178 60112	4822 130 34499	DIODE BZX79-B20
9331 178 80112	4822 130 34398	DIODE BZX79-C24
9331 178 90112	4822 130 34379	DIODE BZX79-C27
9331 355 30112	4822 130 34275	DIODE BYX71/350R
9331 421 90112	4822 130 30817	DIODE BYX55/600
9331 491 80112	4822 130 40854	TRANS.BC327
9331 492 00112	4822 130 40855	TRANSISTOR BC337
9331 592 00112	5322 130 34068	DIODE BZX87C12
9331 668 50112	4822 130 34382	DIODE BZX79-B8V2
9331 834 80112	4822 130 34522	DIODE BYX71/600
9331 844 80112	4822 130 41049	TRANS BF457
9331 892 00112	4822 130 34189	DIODE BAV20
9331 970 60112	5322 130 34294	DIODE BZV11
9331 976 10112	4822 130 44257	TRANS BC547
9332 066 00112	4822 130 40968	TRANSISTOR BSS38
9332 110 51112	5322 209 84841	IC UA7805UC
9332 219 20112	5322 130 44349	TRANS BC635
9332 711 00112	5322 130 44581	TRANSISTOR BU 406
9332 715 30112	5322 130 44729	TRANS.BUX87
9332 715 60112	5322 130 44718	TRANS.BUX86
9332 746 80112	5322 209 85266	IC 74LS123
9332 985 30112	4822 130 31051	DIODE BA159
9333 912 90112	5322 130 34711	DIODE BYW29-150V
9334 151 00112	5322 209 85428	IC TDA1170
9334 752 20112	5322 130 31686	DIODE BY257
9335 001 00112	4822 130 31348	DIODE BYV96D
9335 001 50112	4822 130 41602	DIODE BYW95C

7 MAINTENANCE

LIST OF ILLUSTRATIONS

LIST OF TABLES

7.1 TROUBLE SHOOTING

This section provides a general troubleshooting guide enabling the technician to isolate fault conditions down to specific functional areas within the monitor.

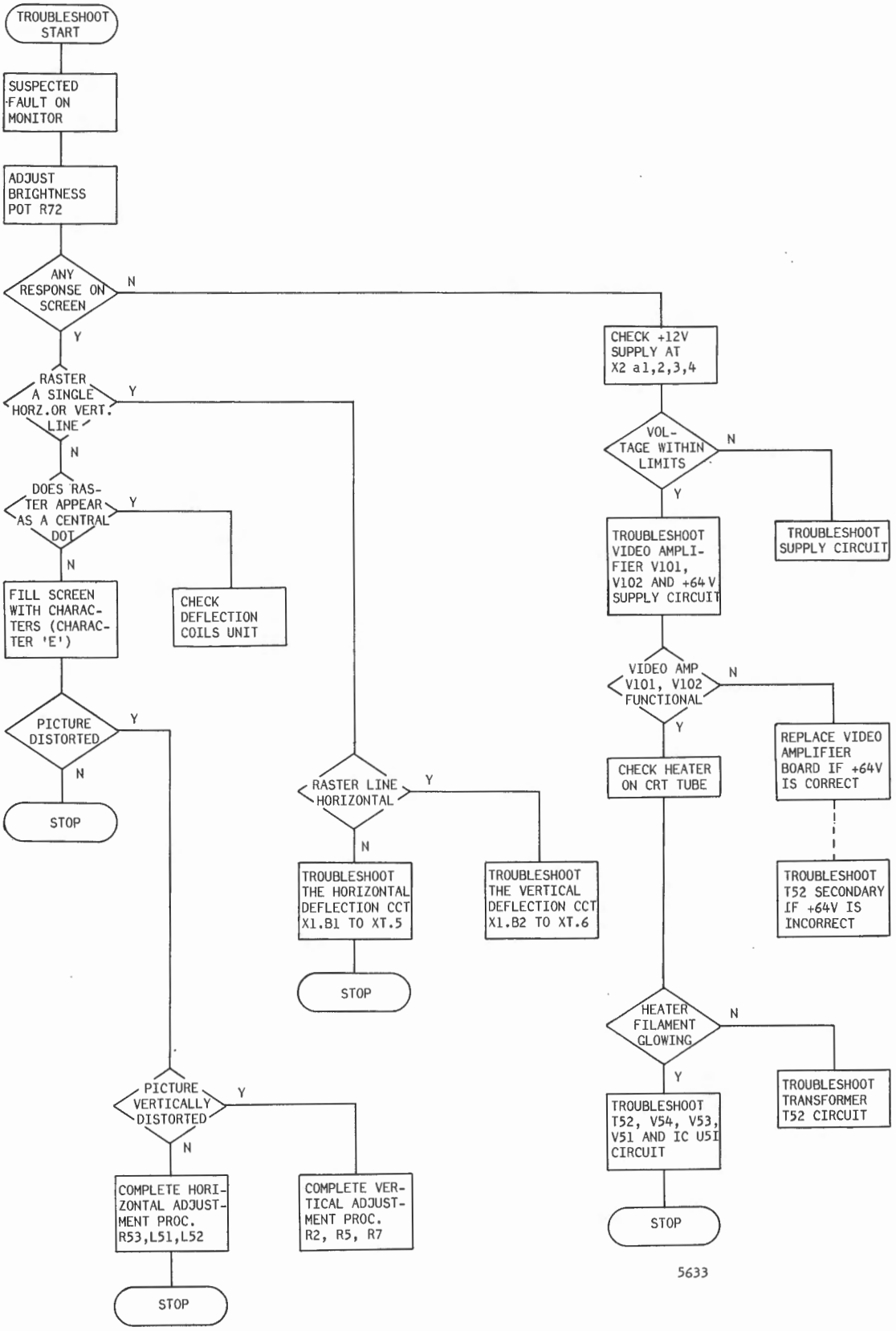


Figure 7.1 TROUBLESHOOTING FLOWCHART

7.2 MAINTENANCE

7.2.1 SAFETY PRECAUTIONS

WARNING:

- Never remove the CRT Electronics Board, the video amplifier or CRT from the support frame without first disconnecting the +12V supply source.
- Prior to handling the monitor assembly discharge the CRT by shorting the anode connection to chassis ground. This is done by unclipping the 14,5KV EHT lead, and shorting the anode to chassis ground via an external wire link.
- Extreme care should be taken when handling the CRT, to do otherwise may cause the CRT to implode. Never subject the CRT to any undue pressure, and do not damage the CRT screen by scratching.
- The wearing of safety goggles and gloves is advised when handling the CRT.

7.2.2. TOOLS

For normal preventive maintenance no special tools are required, a standard tool set will suffice. However, when adjusting monitor display quality a trimming tool is required, the part number for which is given below:

TRIMMING TOOL 53322 395 54054

7.2.3 MATERIALS

Materials required to carry out preventive maintenance are detailed below:

WIPERS - SCOTT TYPE
CLEANING FLUID - 150 PROPYL ALCOHOL

7.2.4 CLEANING

Wipe or brush clean all exposed surfaces; for stubborn accumulations of dirt on the CRT screen, a wiper dampened with cleaning fluid should be used.

Over longer periods the monitors assembly should be cleaned with a vacuum cleaner and dust brush.

7.2.5 ADJUSTMENTS

Adjustments on the monitor are required to obtain the optimum visual presentation on the CRT screen. Adjustments are to be carried out when discrete components, board assemblies or CRT have been replaced. In the event of CRT replacement a picture alignment procedure will also be carried out, this procedure is detailed separately in chapter 8.

Access to each adjustment point is achieved without having to first remove board assemblies from the support frame. All adjustment points are located on the CRT Electronics pcb (see figure 7.2).

Adjustment points and their functions (Refer to figures 7.2 and 4.1C)

. Table 7.1 lists the components that are adjustable and their respective functions.

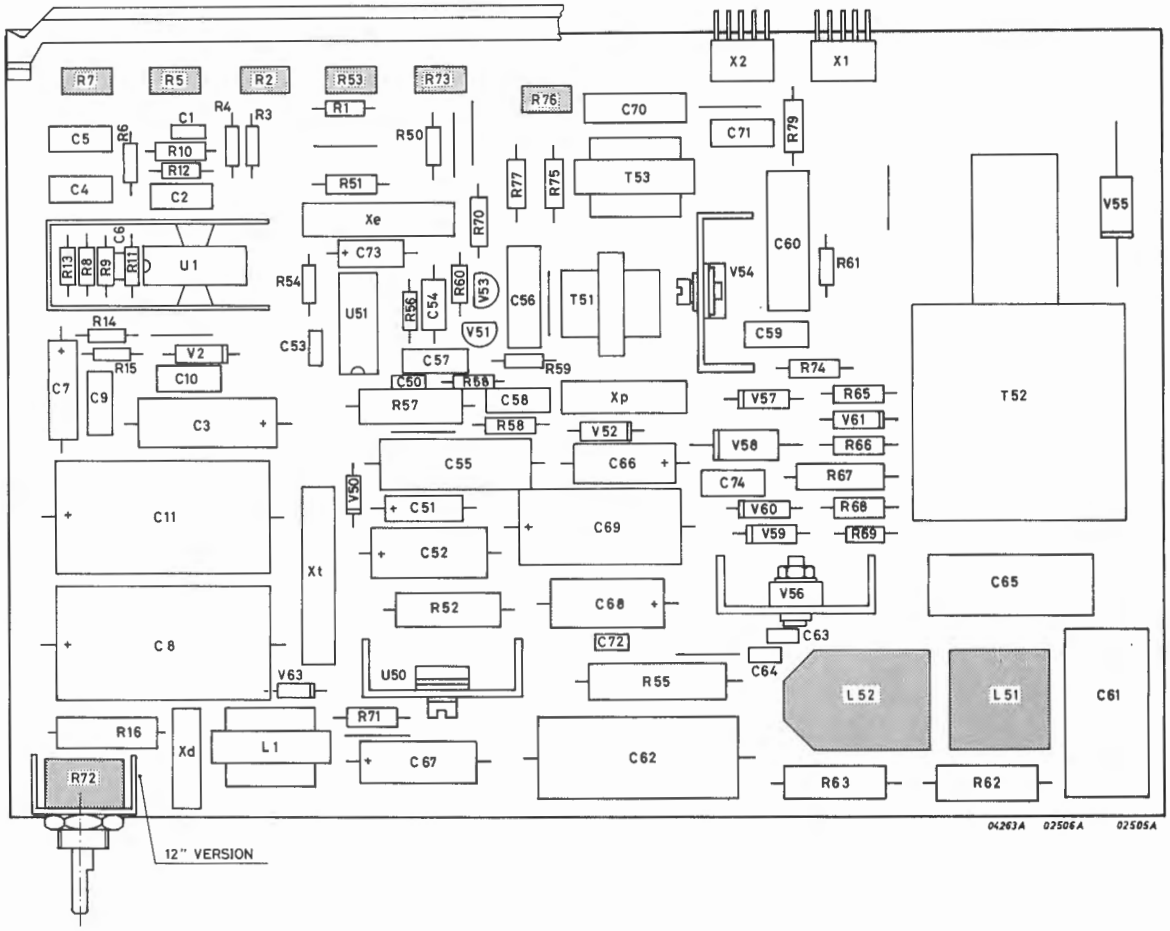
COMPONENT	LAYOUT NO.	FUNCTION
Pot. R2	48	Vertical synchronization
Pot. R5	48	Vertical height
Pot. R7	53	Vertical linearity
Pot. R53	53	Horizontal synchronization
Pot. R72	18	Variable brightness control
Pot. R73	48	Preset brightness
Pot. R76	81	Focus
Var. Ind L51	89	Horizontal amplitude
Var. Ind L52	90	Horizontal linearity

Table 7.1 ADJUSTMENT POINTS-FUNCTIONS

Adjustment Procedure (Refer to figures 7.2 and 7.3)

. With the monitor connected in either a system or test configuration (for the latter see chapter 8), switch on the respective supplies and allow a three minute warm-up period.
. Fill the screen with 'test display' characters (the character 'E' is suggested for this purpose).
. Set the EXTERNAL BRIGHTNESS potentiometer R72, located at the bottom front right side of the monitor, to a mid-range position. By adjusting the PRESET BRIGHTNESS potentiometer R73 obtain optimum character contrast without noticeable character blooming with raster lines extinguished.
. Adjust the FOCUS potentiometer R76 for optimum overall focus of the picture within the area between centre and upper left of the display.
. Adjust the HORIZONTAL AMPLITUDE variable inductor L51 using the short head of the trimming tool. The width of the picture response is shown in figure 7.2. The initial positioning of the picture is achieved with the HORIZONTAL SYNCHRONIZATION potentiometer R53.
. Set the VERTICAL HEIGHT potentiometer R5 for a picture height as shown in figure 7.3. If necessary adjust VERTICAL SYNCHRONIZATION potentiometer R2.
. Adjust the VERTICAL LINEARITY potentiometer R7 for optimum linearity of the picture.
. Adjust the HORIZONTAL LINEARITY variable inductor L52 using the short head of the trimming tool for optimum horizontal linearity.

The dimensions of a correctly adjusted picture display are shown in figure 7.3.



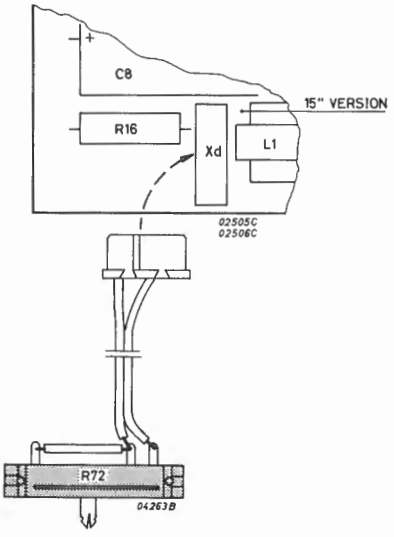


Figure 7.2 ADJUSTMENT POINTS FIMI MONITOR

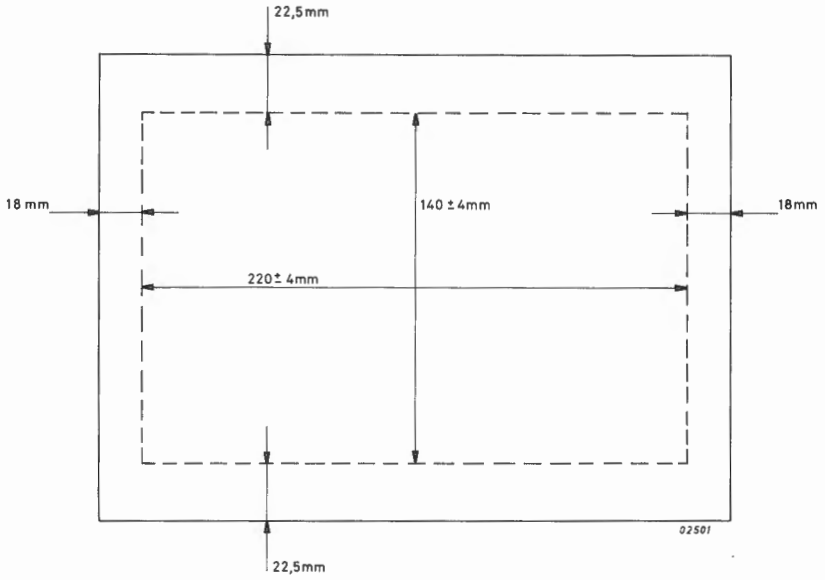


Figure 7.3A 12 INCH ACTIVE VIDEO DISPLAY SIZE

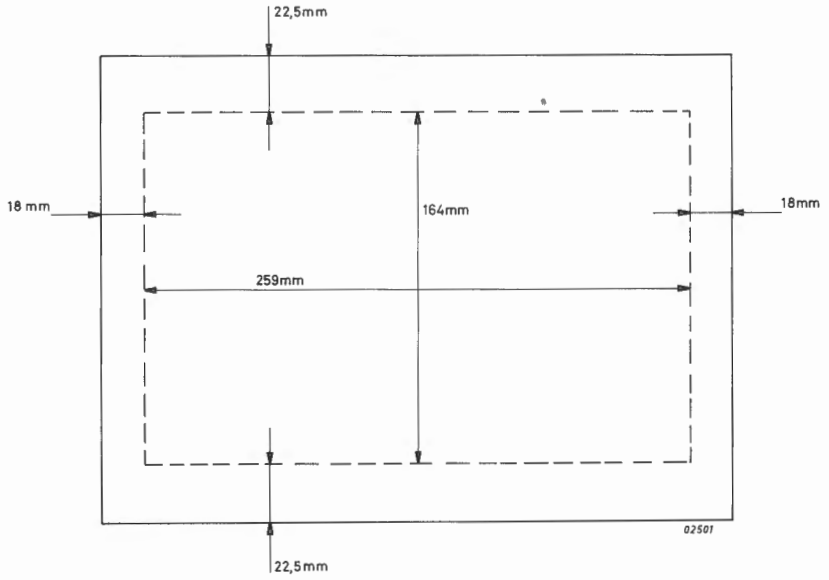


Figure 7.3B 15 INCH ACTIVE VIDEO DISPLAY SIZE

LIST OF ILLUSTRATIONS

8.1 DISMANTLING AND REASSEMLBY PROCEDURES

Prior to carrying out a dismantling or reassembly procedure, the warnings detailed in section 7.2.1 SAFETY PRECAUTIONS should be observed and complied with.

8.1.1 VIDEO AMPLIFIER PCB (3119 208 54950)

Dismantling Procedure (see figure 8.1)

. The video amplifier board (1) is mounted at the rear of the CRT (2) via connector (3).
. Disconnect the 4-pin plug Xp (4) from the socket connector located on the CRT Electronics Board (5).
. Similarly disconnect the 5-pin plug Xe (6) and the 6-pin plug Xt.
. Disengage the video-ground cable assembly (7) from the braided strap (8) on the CRT Unit (2).
. Gently disengage the video amplifier board (1) from the 8-pin CRT connection (3) and manoeuvre the board clear of the support frame (10).
. Removal of discrete components from the board shall be done in accordance with existing workshop procedures.

Reassembly Procedure

. Follow in reverse sequence the dismantling procedure.

8.1.2 CRT ELECTRONICS PCB (3119 208 54940)

Dismantling Procedure (see figure 8.1)

. The CRT Electronics board (5) is mounted within the four-position card rack (11) in the right-hand slot (slot 4) as viewed from the rear.
. With the video Amplifier Board (1) removed, (see sub-section 8.1.1) disconnect the EHT lead (12) from the CRT unit (2).
. Release the two board locking clips (14) located at the top and bottom of the board, gently slide the board out from the rack (11).
  Note: Connectors X1 (15) and X2 (16) will have been previously disconnected.
. Removal of discrete components from the board shall be done in accordance with existing workshop procedures.

Reassembly Procedure

. Follow in reverse sequence the dismantling procedure.

8.1.3 CATHODE RAY TUBE - 12 INCH VERSION

Dismantling Procedure (see figure 8.1)

. With the two electronics boards (1) and (5) removed (see sub-sections 8.1.1 and (8.1.2), the CRT (2) can be dismantled..
. Locate the four pan-head screws (17) securing the CRT unit (2) to the support frame (10).
. Unscrew and remove two diagonally opposed pan-head screws (17) and washers (24).

. Support the CRT unit (2) firmly, and remove the two remaining pan-head screws and washers (24).
. Carefully manoeuvre the CRT unit clear from the support frame (10).
. Place the CRT on a clean flat work surface, and remove the deflection coil assembly (18), slackening the clamp (20) by means of screw (19). Slide the deflection coil assembly (18) together with cable assembly (13) away from the CRT unit (2).

Reassembly Procedure

. Follow the dismantling procedure in reverse sequence.

8.1.4 SUPPORT FRAME - 12 INCH VERSION

Dismantling Procedure (see figure 8.1)

. Remove the 4-position and 1-position card racks (11) and (21) from the support frame (10), by compressing the respective recess clips located in the top and bottom bracket plates.
. Dismantle the support frame (10), by unscrewing the eight taptite screws (22).
. Disengage the corner assembly (25) from the top and bottom bracket plates.
. If necessary replace the expansion nuts (23) located in the left and right side plates.

Reassembly Procedure

. Follow dismantling procedure in reverse sequence.

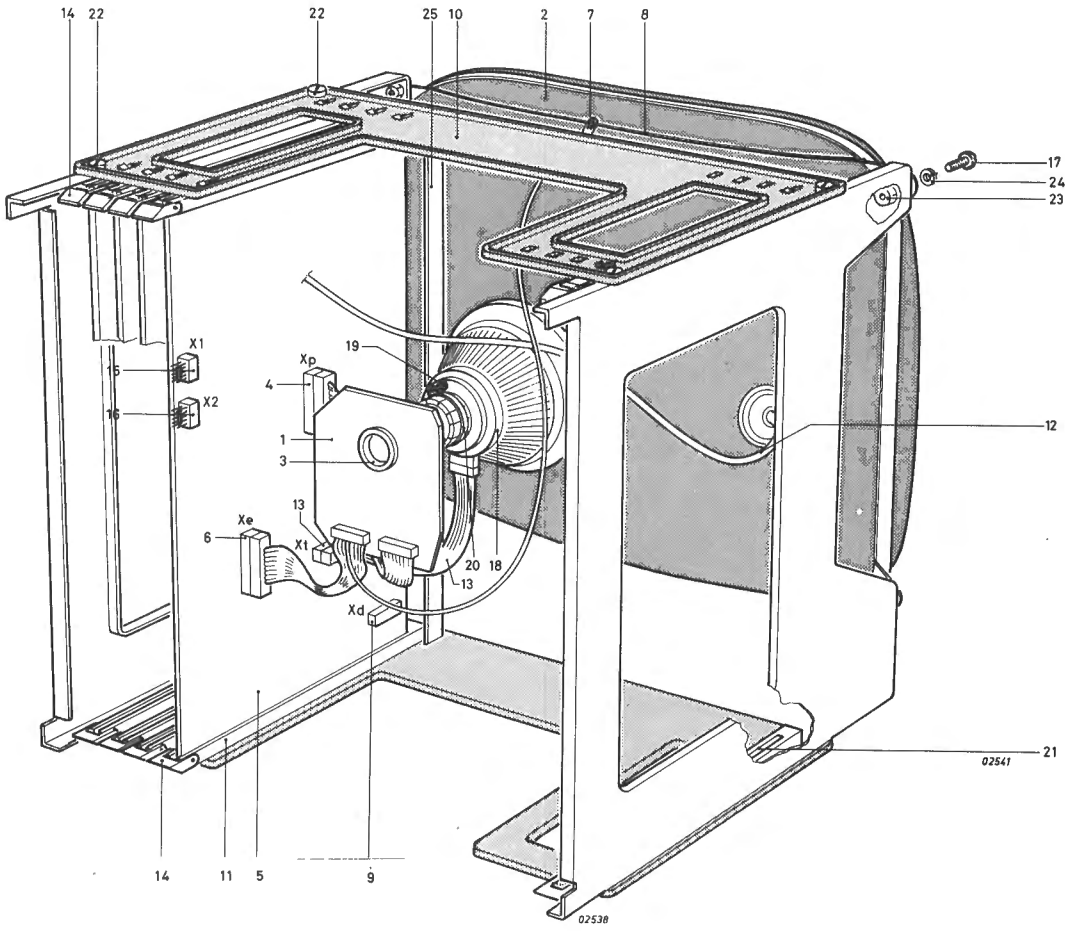


Figure 8.1 MONITOR - EXPLODED VIEW - 12 INCH

8.2 ADJUSTMENTS

The following section details the adjustments, test procedures and special tools that are necessary after repair or overhaul at workshop level.

8.2.1 SPECIAL TOOLS

The following special tools are required to implement effective adjustment and testing of the monitor's main assemblies at this level:

. CHARACTER GENERATOR - MOTOROLA DG100-HA
. DEFLECTION UNIT WITH INTERCONNECTING PLUG - DT1038/40
. TEST MASKS - see figure 8.10.

Throughout the adjustment procedures standard test equipment items are utilized, these are now listed:

. MULTIMETERS - PM2421 AND PM2517X
. FREQUENCY COUNTER - HP5245L
. PULSE GENERATOR - EH137
. DUAL TRACE OSCILLOSCOPE - PM3260 (rise time 3ns)
. POWER SUPPLY - DELTA TYPE D050-10
. PROBE - PM8932 (2pF 100X)

Note that individual standard items can be substituted by equipment with similar performance specifications.

8.2.2 ADJUSTMENT PROCEDURES

Vertical Deflection Circuit (figure 8.2)
a. Set switch positions on the character generator DG100-HA as follows:

DOTS/CHA	9	LINES/CHA	15
CHA	80	ROWS	24
HSYNC DELAY	01	VSYNC DELAY	01
HSYNC	09	VSYNC	04
HSCAN DELAY	08	VSCAN DELAY	16
FREQ BAND 4		60 CYCLES/TEST	60 CYCLES
TUNE DIAL	18,5 MHz	DUTY CYCLE	100%
VIDEO POSITIVE		POWER OFF	
INTERFACE OUT			

b. Connect +24VDC to the junction of C67 and L1, connect - VE rail to X1 - a2. Connect Xt6 and Xt3 to the vertical deflection yoke of the deflection unit DT1038/40. Connect character generator output VS to X1-b2, ground to X1-a2.
c. Connect oscilloscope probe (X1) to C11 positive plate, select following switch positions on oscilloscope.

Horizontal : 5mS/div.
Mertical : 10V/div.
Coupling : DC

d. Switch on supply and character generator, wait 30S warm-up period. Observe waveform on oscilloscope (see figure 8.2A).

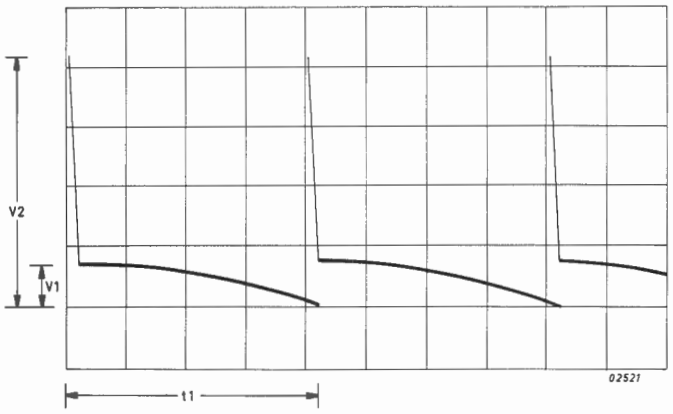


Figure 8.2A VERTICAL DEFLECTION WAVEFORM

e. Adjust SYNC. POT R2 for t_1 = 21mS. Check that V1 = 8V and V2 45V-48V.
f. Reset horizontal setting to 0,2mS on the oscilloscope and observe waveform, see figure 8.2B, for t_2 = 450 - 500nS.

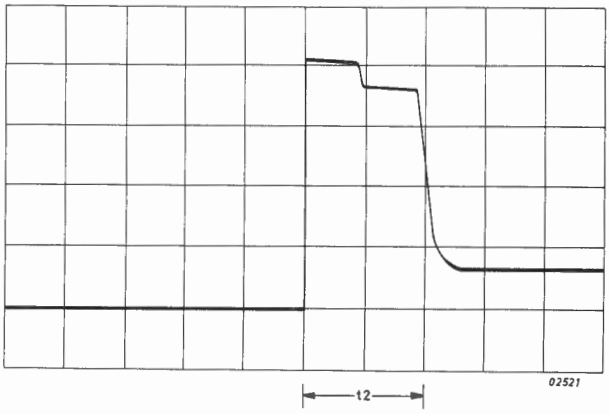


Figure 8.2B VERTICAL REFRESH PULSE WIDTH

g. Switch off supply and character generator on completion of adjustment, disconnect +24VDC supply from PCB.

Horizontal Deflection Circuit (figure 8.3)

a. Connect +5VDC to the junction of R51 and R53 wiper, connect -VE rail to X1-a1. Connect character generator output HS to X1-b1 and ground to X1-a1.
b. Connect oscilloscope probe (X1) to junction of U51 pin 5 output and R58, set set the following switch positions:

Horizontal : 10uS/div
Vertical : 1V/div
Coupling : DC

c. Switch on supply and character generator wait 30S warm-up period. Observe waveform on oscilloscope (see figure 8.3).

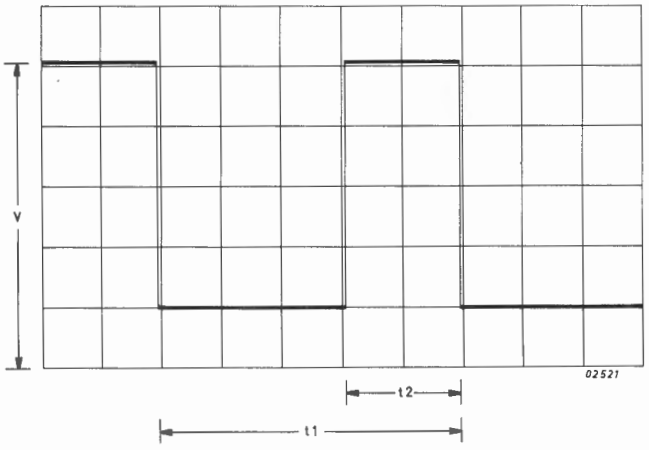


Figure 8.3 HORIZONTAL SYNC. TIMING

d. Adjust PHASE POT R53 for t1 = 50uS. Check that t2 = 18uS and V = 4,2V.
e. Switch off supply and character generator on completion of adjustment, disconnect the +5VDC test supply from the PCB.

8.2.3 OVERALL TEST PROCEDURE

The test environment shall conform to the following parameters:

. Ambient temperature = 10°C - 35°C
. Relative humidity = 80% maximum

a. Connect the monitor-under-test and test equipment as per the test configuration coniguration shown in figure 8.9.
b. Position the front panel switches of the character generator DG100-HA in accordance with sub-section 8.2.2 (a). Adjust the power supply for an output of +12VDC with a maximum current of 2A.
c. Switch the power supply on and note the stand-by mode current consumption: typically 0.2A. Switch the POWER switch on the character generator to the on position, ensure current consumption does not exceed 2A (typical value = 1,7A).
d. Switch the 60 CYCLES/TEST switch on the character generator to the TEST position, and adjust the 'bar' on the monitor screen for a stable condition by means of the tune dial knob on the character generator. Return the 60 CYCLES/TEST switch back to the 60 CYCLES position.
e. With the frequency counter connected to X1-b1 check that the horizontal hold is maintained across the frequency band of 19,500KHz ±600Hz. Connect the frequency counter to X1-b2 and repeat test for vertical hold: 50Hz ±1Hz. Disconnect frequency counter.
f. Connect an oscilloscope probe (X1) to the collector of transistor. V53 and with the oscilloscope set at:

   Horizontal: 10uS/div
   Vertical : 10V/div
   Coupling : DC

   observe the waveform shown in figure 8.4

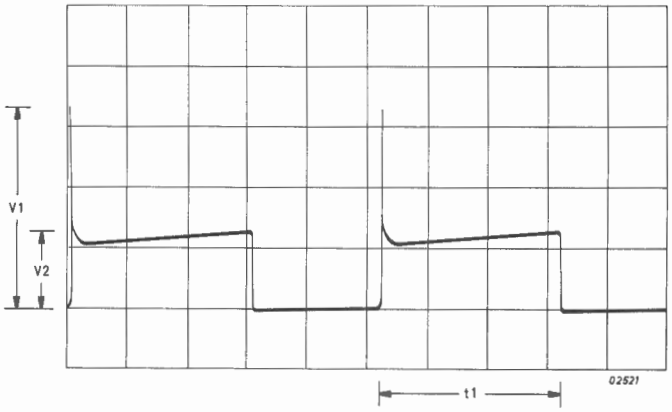


Figure 8.4 TRANSISTOR V53 COLLECTOR CONDITIONS

f. Check that V1 = 32V - 35V, V2 = 15V and t1 = 32uS.
g. Connect the probe to transformer T51 pin 3 and with the oscilloscope set at:

Horizontal : 20uS/div
Vertical : 2V/div
Coupling : DC

observe the waveform on transistor V54 base (see figure 8.5)

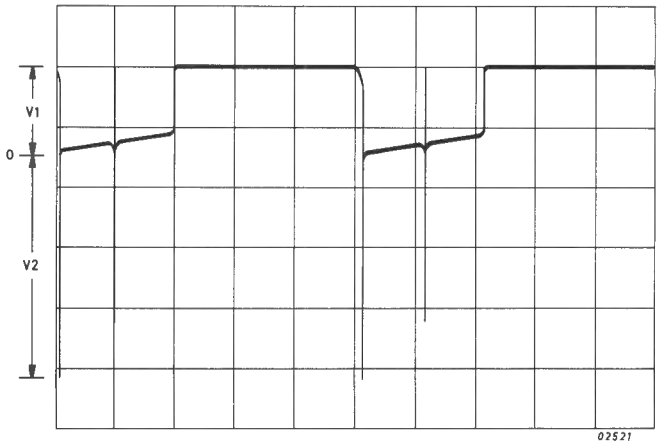


Figure 8.5 TRANSISTOR V54 BASE CONDITIONS

Check that V1 = 3V and V2 = 8V.

h. Connect a X10 probe to diode V55 anode and with the oscilloscope set at:

Horizontal : 20uS/div
Vertical : 2V/div
Coupling : DC

observe the waveform, shown in figure 8.6, the horizontal retrace sync pulse.

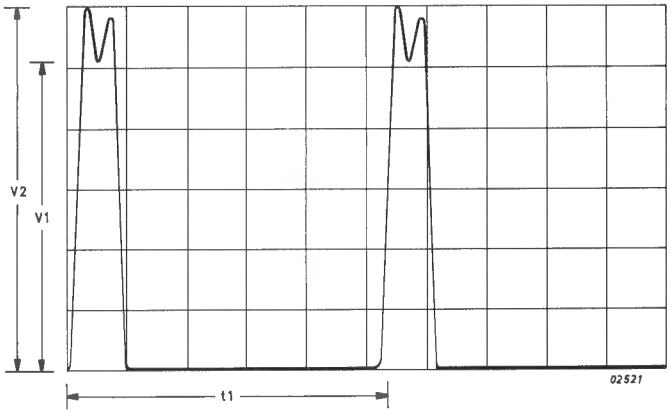


Figure 8.6 HORIZONTAL RETRACE

Note that t1 = 53uS, V1 = 250V and V2 = 280 - 300V

i. Reconnect the X10 probe to transformer T53 pin 4, set the oscilloscope as follows:
Horizontal : 10uS/div
Vertical : 5V/div
Coupling : DC

observe the waveform as shown in figure 8.7, which forms the dynamic focus

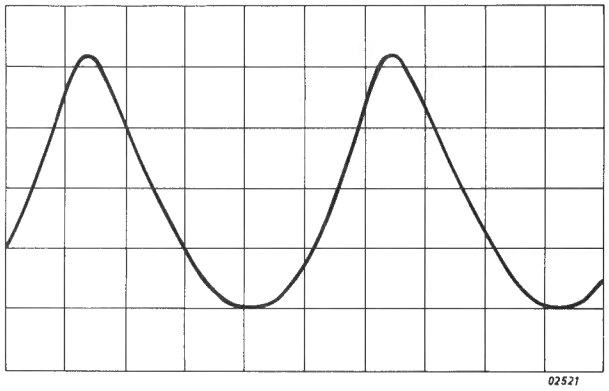


Figure 8.7 DYNAMIC FOCUS WAVEFORM

j. Disconnect the oscilloscope and using the PM2517X multimeter perform the following voltage checks on the video amplifier board (refer to figure 4.1B). All measurements are with negative terminal to pin 1.

Pin 2 = -60 to 0V DC
Pin 3 = 600V DC
Pin 4 = 230V DC
Pin 8 = 6V
R104 = 64V DC

k. Switch off the power supply, disconnect the character generator and connect the pulse generator EH137 output to X1-b3 (signal ground to X1-a3). Set the pulse generator for the following output characteristics:

Pulse width = 27nS
Pulse amplitude = 2-3V
Pulse period = 54nS
Rise time = 4nS
Fall time = 4nS

l. Using a type PM8932 (2pF 100X) probe monitor the video rise and fall times at the output stage of the video amplifier transistor V101 (see figure 8.8).

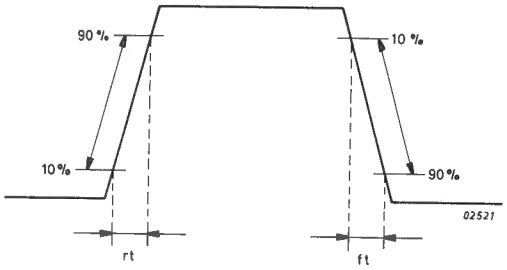


Figure 8.8 VIDEO RISE AND FALL TIMES

Note that RT = 20nS and FT = 20nS

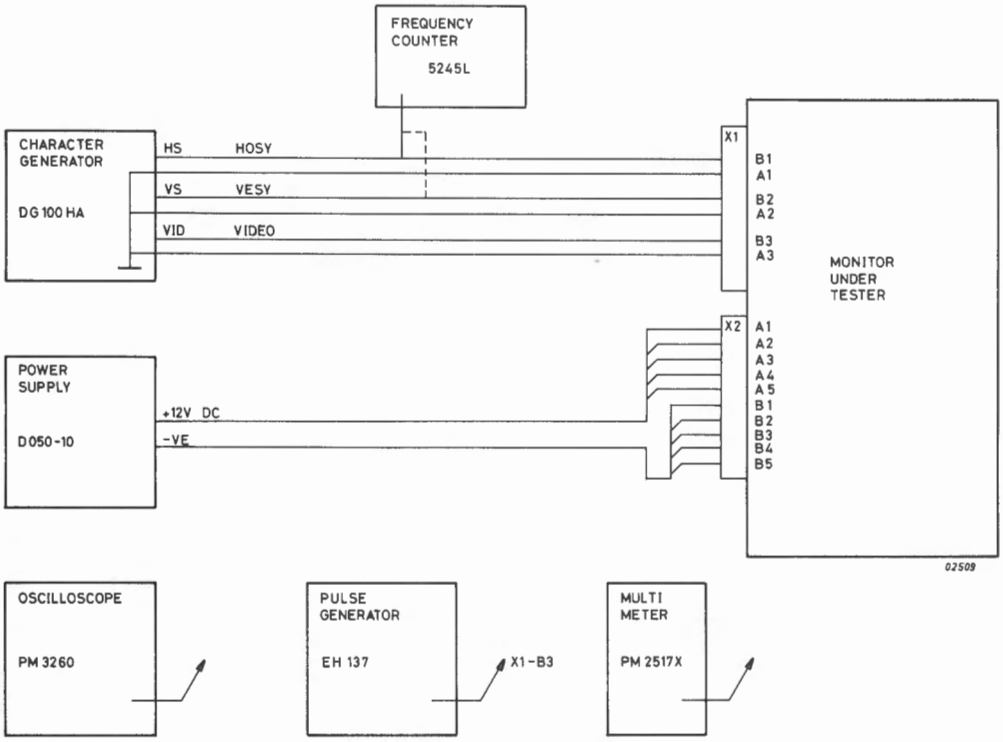


Figure 8.9 TEST CONFIGURATION

m. Switch of the supply and pulse generation and reconnect the character generator; switch on supply and complete procedure d.

n. Frame Alignment
Select MASK 2 and check the following:

. Horizontal alignment using mask 2/2
. Vertical alignment using mask 2/5

Refer to figure 8.10. Any unacceptable alignments must be readjusted by manoeuvring the correction magnets located on the deflection coils unit.

o. Frame Height and Width Alignment
Position the frame in the centre of the screen by adjusting potentiometer R53. If necessary adjust frame width by means of L51, and frame height by R6 (see figure 8.11).
If the correct frame height and width cannot be obtained check the +12VDC supply using multimeter PM2421: +12VDC ± 180mV.

p. Vertical Linearity Adjustment (see figure 8.12).
Select MASK1/3 and place at the top left hand corner of the screen area (a), count the number of complete scan lines and the dots of any part of a character remaining inside the mask aperture. Repeat the same procedure at the bottom left hand corner area (b) and also in the left hand centre area (c). If a = b = c, linearity is correct if not adjust R7. Note that the difference in values between a, b and c should not be more than 10%.

q. Horizontal Linearity Adjustment (see figure 8.13)
Using MASK 1/2 position at the top left hand side of the screen area (a), and count the number of complete characters visible within the mask aperture. Repeat the procedure at the top right hand corner area (b) and also at the top centre area (c). If a = b = c linearity is correct, if not adjust variable inductance L52.

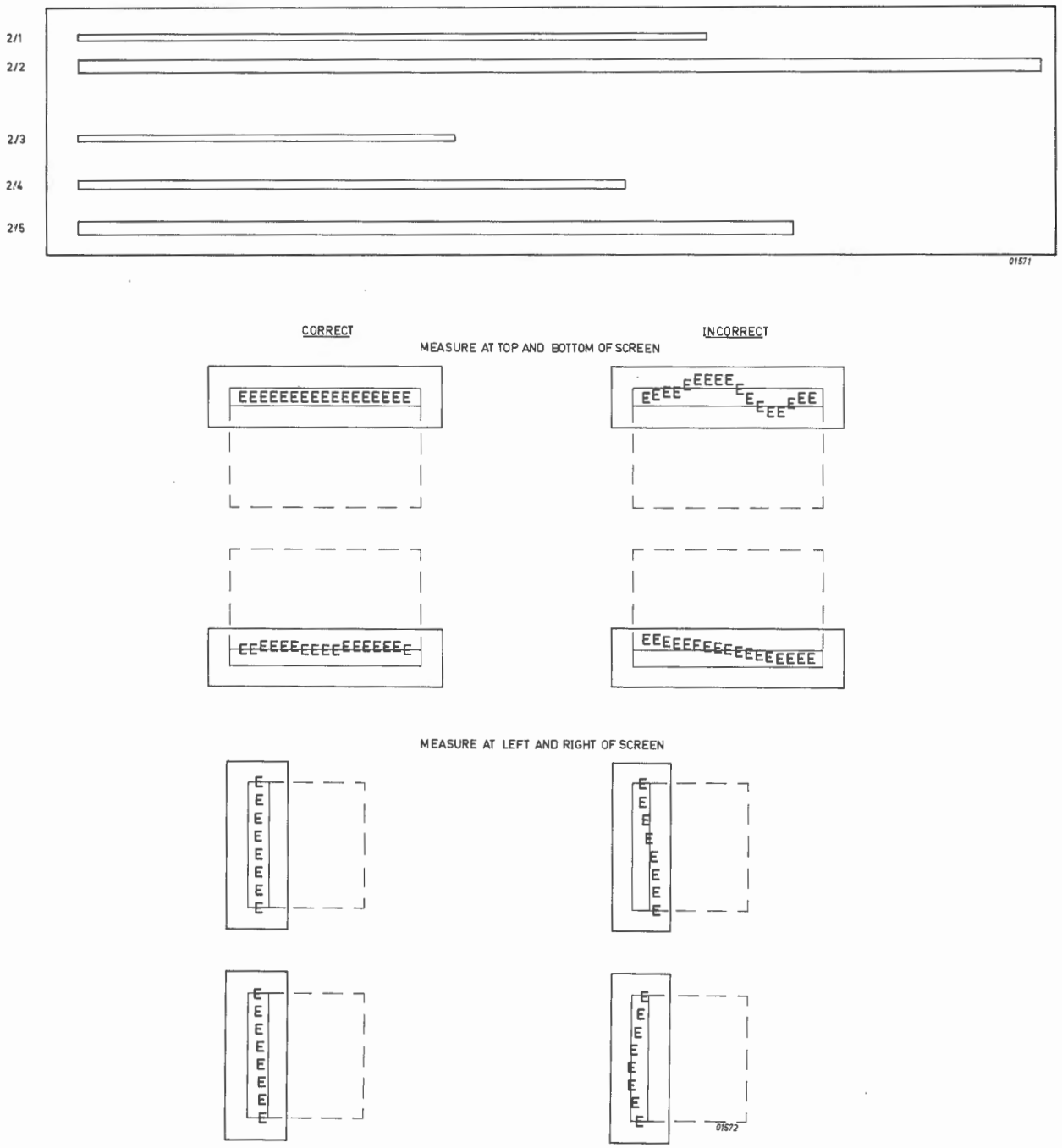


Figure 8.10 MASK 2 AND FRAME ALIGNMENT

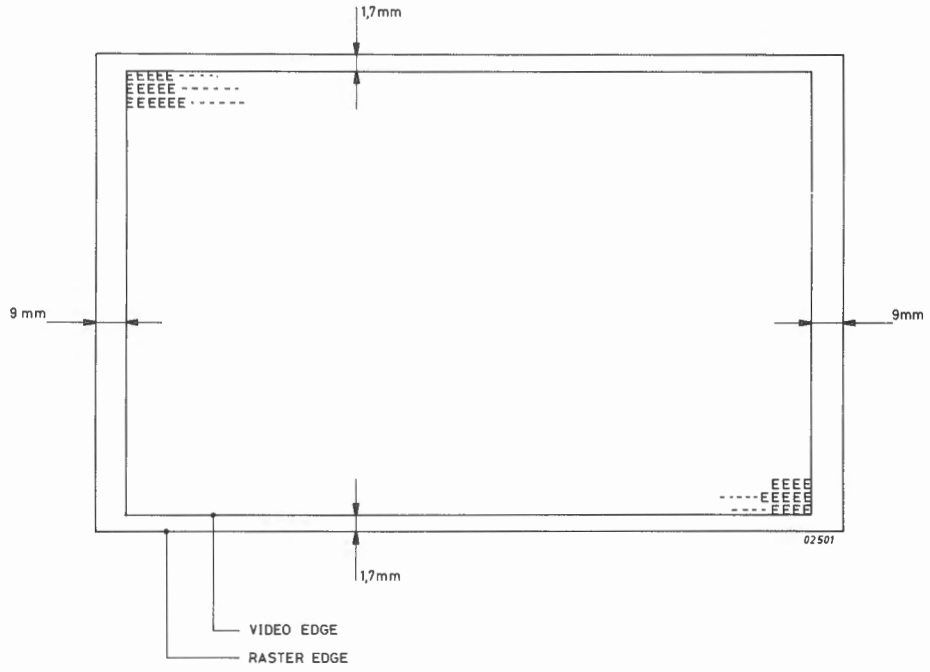
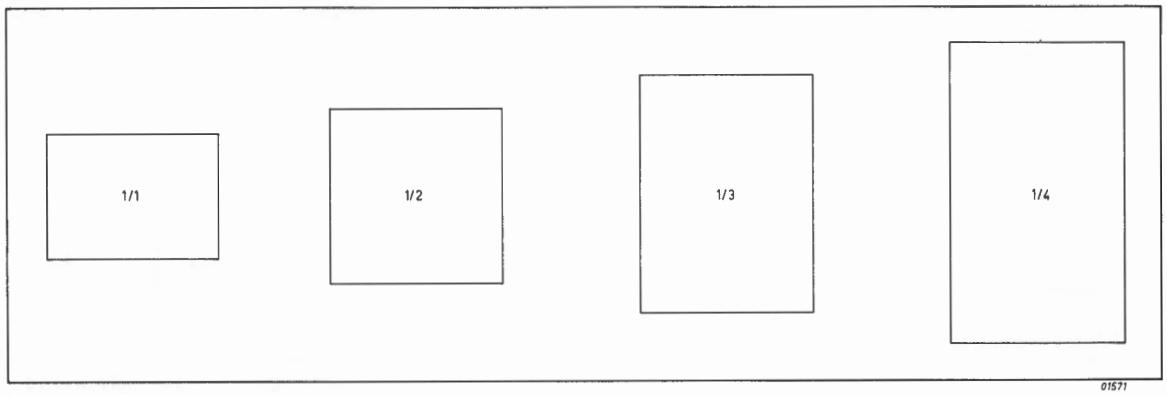


Figure 8.11 FRAME HEIGHT AND WIDTH



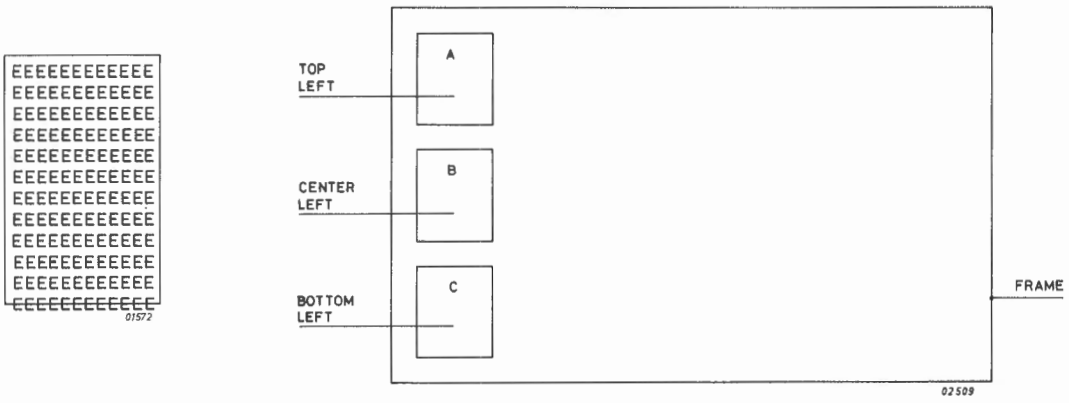


Figure 8.12 MASK 1/3 AND VERTICAL LINEARITY

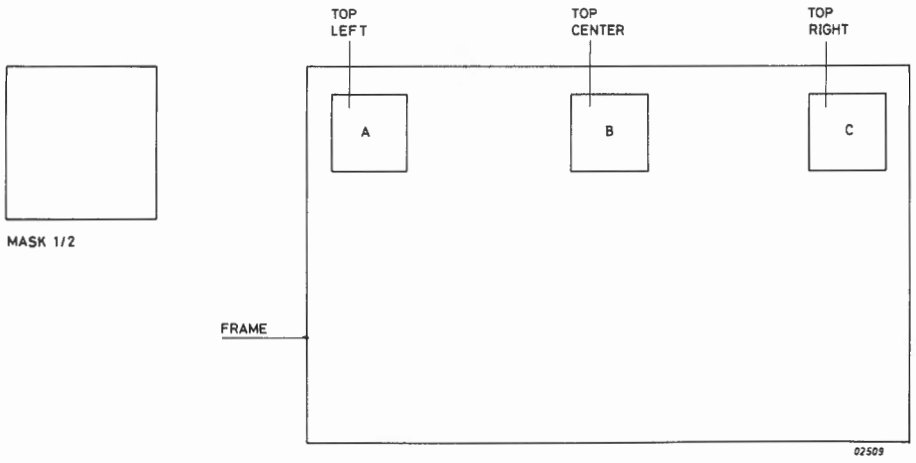


Figure 8.13 MASK 1/2 AND HORIZONTAL LINEARITY

r. Focusing
Focusing adjustment is achieved with potentiometer R76 and shall give a dot resolution defined as follows:

. The frame area within a circle with a diameter measuring 90% of the picture width, shall give a visible dark area between each dot.
. Outside of the circular area dots must be recognizable. Note this function is not adjustable being controlled by the dynamic focus waveform.