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HANTAREX CDU 1431 /HA01 COLOUR VIDEO DISPLAY

Theory of Operation, Schematics and Components

For Service Manuals
MAURITRON SERVICES
8 Cherry Tree Road, Chinnor
Oxfordshire, OX9 4QY.
Tel (01944) 351694
Fax (01844) 352554
email:- mauritron@dial.pipex.com

PREFACE

This mamual is intended for laboratory technicians repairing a CDU1431 HANTAREX colour video display unit, connected to an Olivetti Personal Computer.

SUMMARY

This manual is composed of four chapters: the first chapter contains the theory of operation of the video display unit, the second chapter describes regulations and adjustments, the third chapter contains schematics and the fourth chapter contains the parts list.

REFERENCES:

To install video display unit, refer to the documentation regarding the Personal Computer.

SECTOR RANGE PRODUCT: S5 M380 M290 P500

S4 M240

S3 M250

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A1. SCHEMATICS

A2. COMPONENTS LIST

THEORY OF OPERATION

INTRODUCTION

The CDU 1431 is a self-powered monitor with analog video inputs (with linear voltage steps).

The picture tube used is a 14" colour tube, with deflection angle of 90 degrees and a self-converging deflection mechanism, set and fitted by the manufacturer.

The coding CDU 1431 stands for Color Display Unit, 14" with horizontal scan frequency of 31 KHz.

A specific circuit enables the monitor acknowledge three different levels of vertical resolution, encoded through the polarity of the vertical and horizontal sync signals. The three vertical resolutions are:

350 lines

400 lines

480 lines,

Vertical deflection frequency varies from 50 Hz to 70 Hz, while horizontal frequency is stable at around 31 KHz.

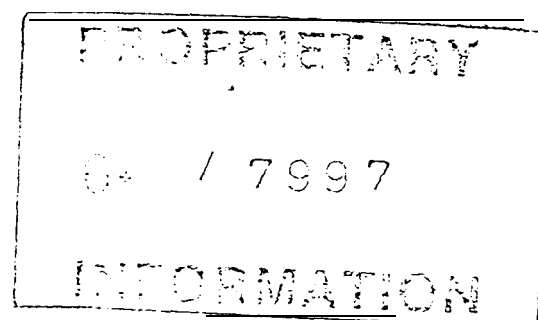
The monitor electronics is on two printed circuit boards:

Switching power supply and deflection circuitry board on bottom of monitor module

Video interface and amplifier board connected directly on to the cathode ray tube" socket, thus reducing stray capacitance to a minimum and optimizing the video band.

The switching power supply offers all the characteristics typical of this type of equipment, such as an excellent yield power/weight-bulk ratio and the ability to adapt to mains voltage fluctuations. To avoid video noise, the power supply is synchronized with the row oscillator.

The monitor can furthermore produce a white pattern signal to illuminate the screen when the signals connector is disconnected (self-test mode).



SAFETY CHECKS

Warning: BEFORE DOING ANY MAINTENANCE WORK ON THIS CHASSIS READ THE "PRECAUTIONS AGAINST X-RAYS", "SAFETY PRECAUTIONS" AND "PRODUCT SAFETY WARNINGS" ON THE FOLLOWING PAGES.

PRECAUTIONS AGAINST X-RAYS

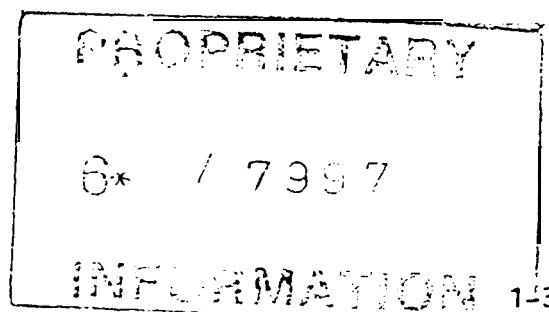
1. Excessively high EHT voltages can produce potentially dangerous X-rays. To avoid this hazard, the high voltage must never exceed the limits specified. The extra high voltage of this video has a nominal value of 25 KV under conditions of minimum luminosity with an a.c. power supply of 100 - 240 V. Under no circumstances must the high voltage exceed 26.5 KV. When performing service on the video,, always check the high voltage using the "HIGH VOLTAGE CHECK" procedure described later. You are advised to use a reliable, precision high voltage voltmeter and to record the high voltage value read in the service register.
2. The monitor has a protection circuit which interrupts generation of the EHV in case it accidentally exceeds the design values set. Should this protection be triggered, the monitor must be switched off and switched on again 30 s later to allow this circuit to reset.
3. The only possible cause of X-rays is the cathode ray tube in the event of a excessive EHV level. To ensure continued protection from X-RAYS, only use the same type of tube as specified in the spare parts list when replacing the original tube.
4. A number of components of this video have special safety and X-RAY protection characteristics. To ensure durability of these characteristics before replacing any parts, always consult the "PRODUCT SAFETY WARNINGS" given below.

THEORY OF OPERATION

SAFETY PRECAUTIONS

In the course of normal video operation, electric potentials of around 25.5 KV are present. It is important to observe the following points to avoid accidents:

1. The service technician must be aware of regulations concerning service work on high voltage equipment; unwary users are strongly advised not to open up the monitor and attempt any service or regulations inside.
2. Before removing the anode protection, fully discharge the anode of the cathode ray tube on the unit chassis to avoid the risk of discharges to ground occurring through the service technician.
3. There are extremely high voltages in the deflection and power circuits of the tube, from a hundred to a thousand volts, so that caution is strongly recommended at all times:
4. If a fuse in the video blows, replace it with the type of fuse specified in the unit spare parts list..
5. When replacing components or boards, wind the wires of all conductors round the terminal posts before applying solder.
6. When replacing a high power resistor (metal oxide film resistors) on a board, set the resistance at a minimum distance of 10 mm from the board.
7. Keep all wires far from high voltage or high temperature components.
8. Never connect this video to a d.c. power supply, or power supply other than 200 V - 240 V 50 Hz for the CDU 1431/220 V, 100 V - 125 V 60 Hz for the CDU 1431/110 V.
9. It is essential that no modifications be made to the original design "without the written consent of the manufacturer; the manufacturer will not be held responsible for any damage deriving from failure to observe the above regulations.



ANTI-IMPLOSION PROTECTION

The tube is equipped with anti-implosion protection; however, the monitor should be handled with great care to avoid scratching the surface or causing excessive shocks.

PRODUCT SAFETY WARNINGS

Many electrical and mechanical components of this apparatus have special safety characteristics, not always visible to the observer, and the protection from X-rays provided by these components is not necessarily provided by spares with higher voltage, power, etc., ratings. Spares with these special safety characteristics are identified in this manual and subsequent updatings by way of the "!" symbol on the electric diagrams and in the spare parts list.

Before proceeding to replace any such components, consult carefully the spare parts list of this manual. Use of spares which do not have the same safety characteristics may cause X-RAYS.

HIGH VOLTAGE CHECK

Warning: This equipment has no HIGH VOLTAGE regulation. Regulate the 83 V power supply correctly to ensure a correct high voltage level.

1. Connect a precision high voltage voltmeter to the second anode of the cathode ray tube.
2. Turn the video on (black pattern signal). Set the BRIGHTNESS and CONTRAST adjustment knobs to minimum.
3. The high voltage must not be above 26.5 kV.
4. Turn the BRIGHTNESS adjustment knobs to the two end positions to ensure that under no conditions does the high voltage exceed the limit.

THEORY OF OPERATION

TECHNICAL SPECIFICATIONS

Cathode Ray Tube:

Type :	M37-108XN1140
Screen dimensions:	14"
Gun :	In-Line
Deflection angle:	90 degrees

Active video area

Horizontal dimension:	240 mm \pm 4 mm
Vertical dimension:	180 mm \pm 4 mm

Power supply

Input voltage:	220 V: 170 — 264 V a. c.
Mains frequency:	50 Hz : 47 — 63 Hz
Degauss :	On powering up

Input signals

Video :	R, G, B (red, green, blue) driving.
---------	-------------------------------------

Input signal:	In linear voltage steps (63 steps of 11 mV)
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Level:	0 - 700 mV
Polarity:	Positive

Horizontal sync:	
Frequency:	31.469 kHz \pm 300 Hz
Polarity:	Negative or positive
Level:	TTL

Vertical sync:	
Frequency:	50 - 70 Hz
Polarity:	Negative or positive
Level:	TTL

Sync coding:	
640 x 350 mode:	Horizontal positive - Vertical negative
640 x 400 mode:	Horizontal negative - Vertical positive
640 x 480 mode:	Horizontal negative - Vertical negative

Controls

Internal controls:	
Monitor printed circuit:	See page 1.7
Video printed circuit:	See page 1.7

External controls:	
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Contrast and brightness

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INPUT SIGNALS CONNECTOR

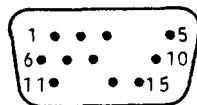
Connection of the colour analog monitor CDU 1431 to the video control board OVC (Olivetti VGA compatible Controller) is by way of a shielded cable, 1.5 metres long with a 15-way, D-shell female end connector, AMP 211359-1 type or similar.

Configuration of the D-shell connector is illustrated in the table below, whereas the figure illustrates position of the pins in the connector.

15-way female, D-shell video connector

- 1 - RED Video input
- 2 - GREEN Video input
- 3 - BLUE Video input
- 4 - Not connected
- 5 - Self-test input (see note)
- 6 - RED Video ground
- 7 - GREEN Video ground
- 8 - BLUE Video ground
- 9 - Not connected
- 10 - Logic ground
- 11 - IDENT output - connected to pin 10
- 12 - IDENT output - not connected
- 13 - Horizontal sync
- 14 - Vertical sync
- 15 - Not connected.

Note: When the signals connector is not connected, the monitor goes into the self-test condition in which the vertical oscillator produces a free-running frequency (about 46 Hz) and the screen is illuminated with the white colour.



FRONTAL VIEW

Fig. 1-1 Pin Layout of 15-way Female D-shell Connector

THEORY OF OPERATION

REGULATIONS ON MONITOR PRINTED CIRCUIT

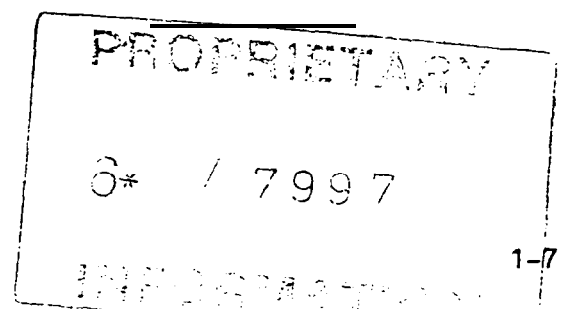
The list below is of all the major regulations available on the monitor main board, the figure illustrating position of the regulation points on the board.

RV1 = Switching power supply output voltage regulation
RV2 = Horizontal position regulation
RV3 = Vertical width regulation in 350 line mode
RV4 = Vertical width regulation in 400 line mode
RV5 = Vertical width regulation in 480 line mode
RV6 = Vertical linearity regulation
RV7 = Horizontal frequency regulation
RV8 = Vertical centering regulation
RV9 = Pincushion distortion regulation
RV10 = Horizontal width regulation
BI = Horizontal linearity regulation

REGULATIONS ON VIDEO PRINTED CIRCUIT

The list below is of all the regulations that can be made on the video amplifier board, the figure illustrating position of the regulation points on the board:

RV102 = RED level regulation.
RV103 = RED cut-off level regulation
RV104 = GREEN level regulation
RV105 = GREEN cut-off level regulation
RV106 = BLUE level regulation
RV107 = BLUE cut-off level regulation



For Service Manuals
MAURITRON SERVICES
 8 Cherry Tree Road, Chinnor
 Oxfordshire, OX9 4QY.
 Tel (01844) 351694
 Fax (01844) 352554
 email:- mauritron@dial.pipex.com

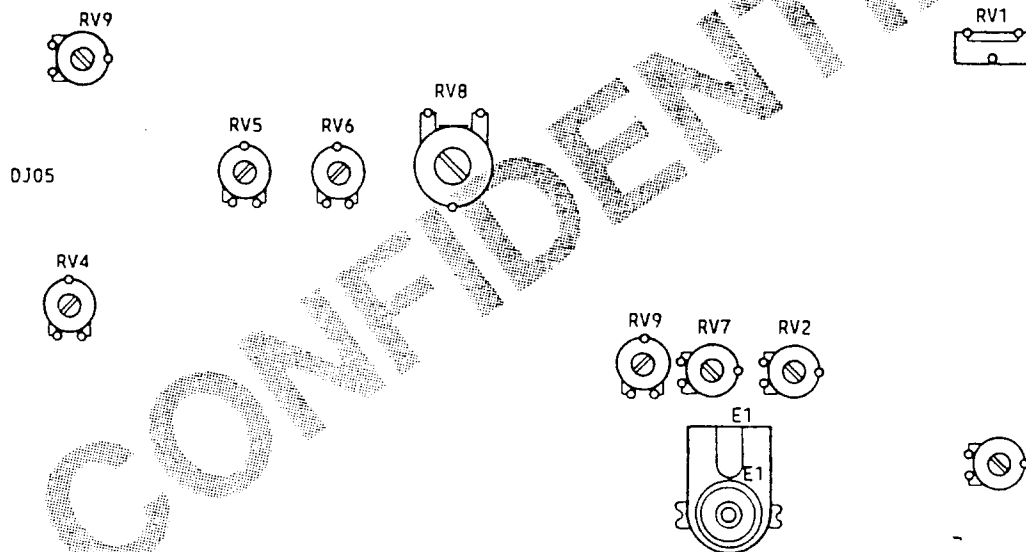


Fig. 1-2 Position of Regulation Points on Main Board

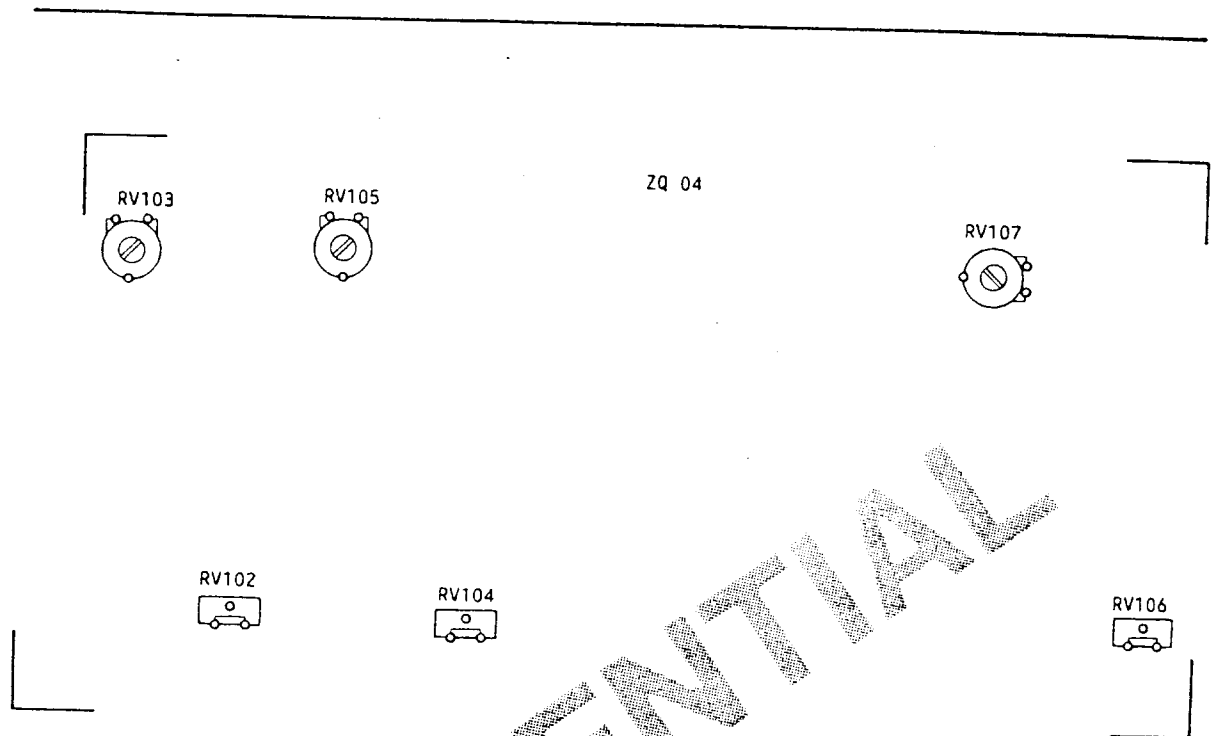


Fig. 1-3 Position of Regulation Points on Video Preamplifier Board

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CDU 1431 BLOCK DIAGRAM

The figure on the following page is a simplified block diagram of the monitor.

The monitor control logic is contained on two boards: the bottom half of the block diagram refers to the power supply and deflections board while the top half is of the video preamplifier and amplifier, and of the cathode ray tube.

Inside each of the blocks representing the different circuit functions, the names of the main components responsible for the function are listed.

The description of operation provided in this manual will refer the following main monitor parts:

- Cathode ray tube
- Power supply circuit
- Vertical standard acknowledge circuit
- Horizontal deflection and EHV generator circuit
- X-ray protection circuit
- East-West correction circuit
- Vertical deflection circuit
- Video amplifier and preamplifier.

The operating description of the CDU 1431 monitor control logic is divided into two main parts:

- Description of main board

Description of video amplifier and preamplifier board.

THEORY OF OPERATION

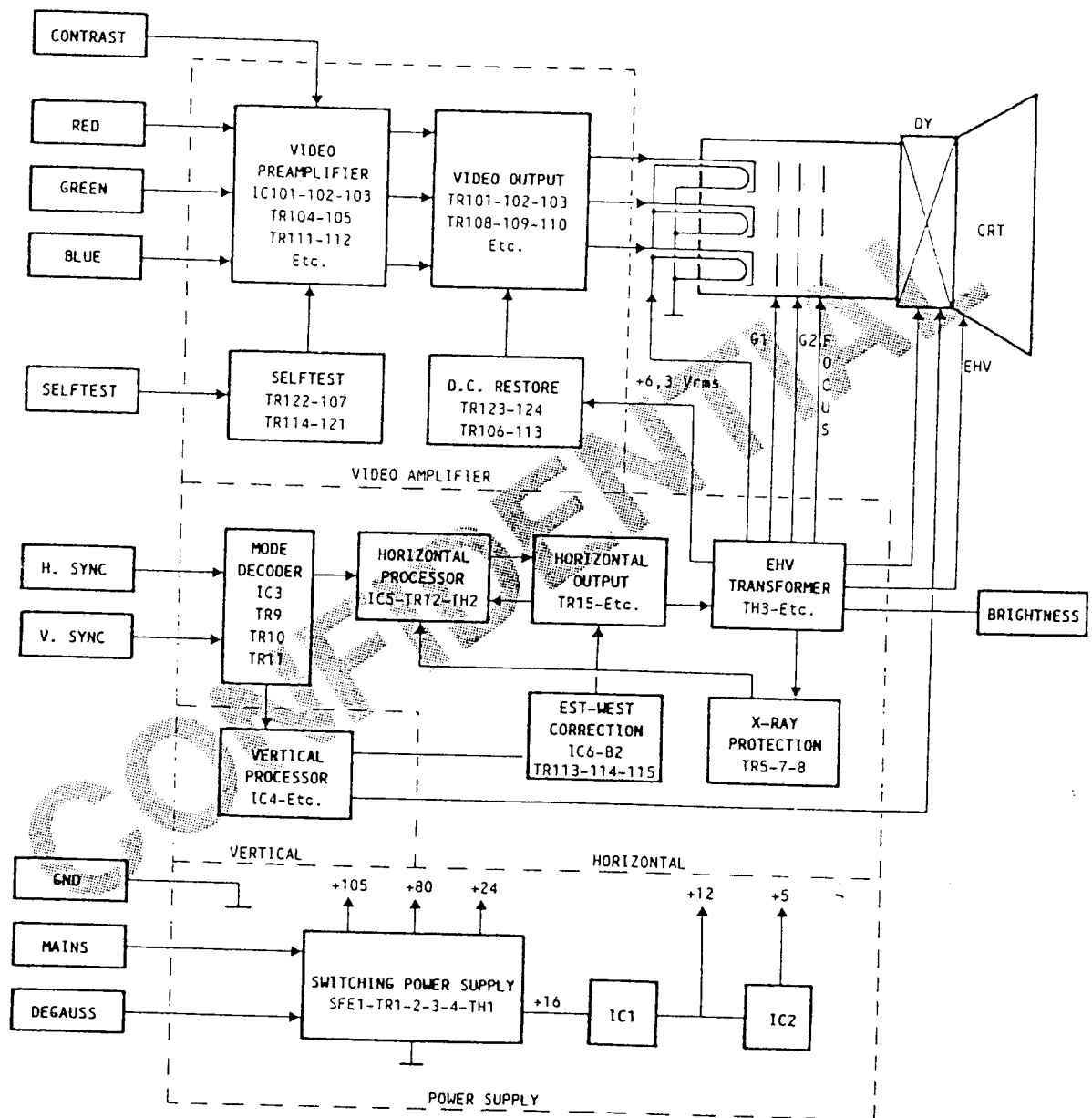


Fig. 1-4 CDU 1431 Monitor Block Diagram

PROPRIETARY INFORMATION

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PROPRIETARY INFORMATION

CIRCUIT DESCRIPTION: MAIN BOARD

The main board comprises the following circuits, identified by referencing the block diagram of figure 1-4:

Switching power supply

Resolution standard decoder circuit

Horizontal deflection generator circuit

Vertical deflection generator circuit

EHV transformer

East-West correction circuit

X-ray protection circuit.

SWITCHING POWER SUPPLY

The switching power supply used in the CDU 1431 monitor is of the self-oscillating, flyback type. It is synchronized with the row oscillator by way of a winding of TH3 (row transformer), whose outputs are identified with SP3 and SP4 (see figures 1-9), and diode D8 (figure 1-5).

The main input and output characteristics of this power supply are listed in the table below:

	NOMINAL VALUE	RANGE ADMITTED
INPUT VOLTAGE	220 V	170 - 264 V
FREQUENCY	50 Hz	47 - 63 Hz

TH1 OUTPUT	OUTPUT VOLTAGE
8	+ 12 V
9	+ 24 V
11	+ 83 V
12	+ 105 v

THEORY OF OPERATION

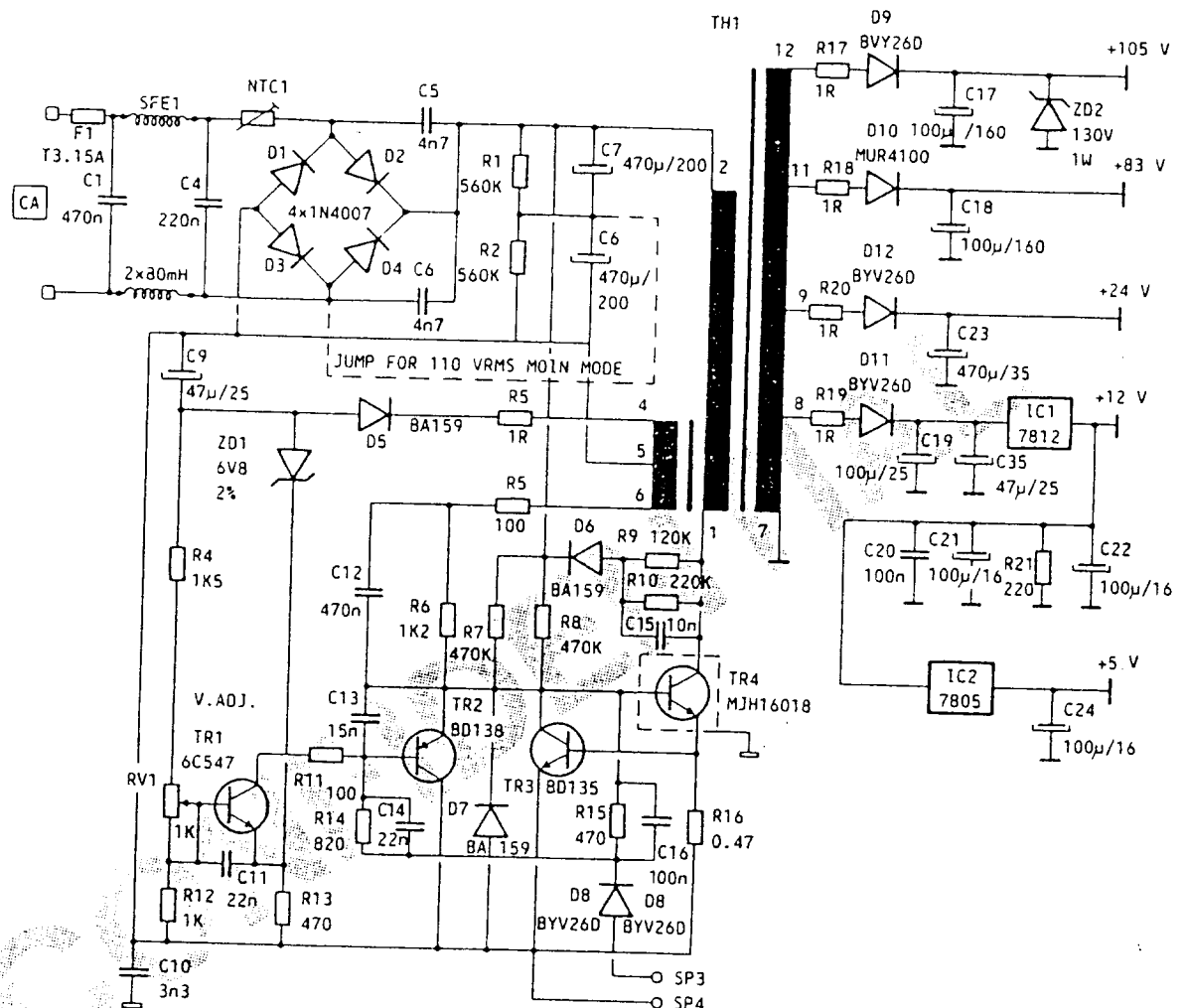


Fig. 1-5 Switching Power Supply

The CDU 1431 self-powered monitor mains input voltage passes through a NTC1 (Negative Temperature Coefficient) resistor to limit the inrush current and is then rectified by a conventional rectifier bridge consisting of four diodes D1, D2, D3 and D4. The resultant waveform is filtered by the network consisting of R1, R2, C7 and C8.

The electronic switch is constituted by transistor TR4, which oscillates (between off and saturation) at a frequency determined by the row oscillator, but with a duty cycle varying depending on the load.

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Resistor R8 supplies TR4 the current needed on starting up.

Switching time (Ton) control is made by way of the currents summed algebraically on the TR4 base. These currents are supplied by:

TR2 which supplies the d.c. polarization level and the feedback impulse current

TR3 which removes current from the base of TR4 when the voltage drop on the terminals of R16 is sufficient to cause TR3 to conduct, thus providing the overload protection.

The feedback impulse current arrives on TR2 from output 6 of TH1 (feedback winding 4/5/6).

The d.c. polarization arrives on the base of TR2 coming from the TR1 collector to which the output voltage regulation potentiometer RV1 is connected.

The network consisting of R3, D5, ZD1 and R13 supplies the low reference voltage on the TR1 emitter. R12 modifies the voltage on the TR1 base in function of the feedback voltage coming from the feedback winding (TH1 4/5). This modifies the base current of TR2, and hence of TR4, thus altering the switching parameters. This circuit produces the negative feedback by way of which the TH1 output voltage is regulated.

The network comprising D6, R9, R10 and C15 protects TR4 from the initial overvoltages on the collector.

The TH1 secondary output voltages are rectified and filtered by the diode/capacitor groups D9/C17, D10/C18, D11/C19/C35 and D12/C23.

The output voltages made available are listed in the table on the previous page. The +12 V voltage is further stabilized by the 7812 component:

The +5 V voltage used by the contrast regulation potentiometer RV101 and by the video signal preamplifiers (IC102) is taken from this +12 V voltage by way of component 7805.

RESOLUTION DECODER CIRCUIT

The CDU 1431 monitor can work with three different vertical resolutions (350, 400 and 480 lines), each with its own vertical deflection frequency and vertical deflection width. The vertical deflection width must be altered so that the screen area illuminated in the three different operating modes is constant.

The video control board supplies the monitor the resolution information through the polarity of the sync signals on pins 13 and 14 of the interface connector (see figure 1-1). The table below shows the four identification possibilities offered by the two sync signals (only three are used):

LINES PER FRAME	HORIZONTAL SYNC	VERTICAL SYNC
350	Positive	Negative
400	Negative	Positive
480	Negative	Negative
	Positive	Positive

The figure on the following page illustrates the decode circuit based on the integrated circuit IC3, which is an EX-OR quad gate,

Through the two sections 12/13/11 and 1/2/3, the sync signals are sent to the two integrated circuits which handle the horizontal and vertical deflection, irrespective of the status of the outputs of sections 9/10/8 and 4/5/6. The vertical sync signal is brought through C41, TR10 and D17 to pin 4 of integrated circuit IC4 (TDA1670A, vertical oscillator), whereas the horizontal sync signal is brought through C32 to pin 9 of integrated circuit IC5 (TDA2593, horizontal oscillator).

Section 9/10/8 is input the horizontal deflection signal and, when the polarity is positive (350 lines mode), the output brings potentiometer RV3 to ground through D14. In this way, input 7 of IC4 (TDA 1670A), which controls vertical deflection width, has the parallel network consisting of RV3, R72 and RV5. Capacitor C36 ensures that the voltage on the terminal of RV3 is independent of the sync pulses, though it retains the polarity value (high time constant of RC group).

PROPRIETARY

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INFORMATION 1-15

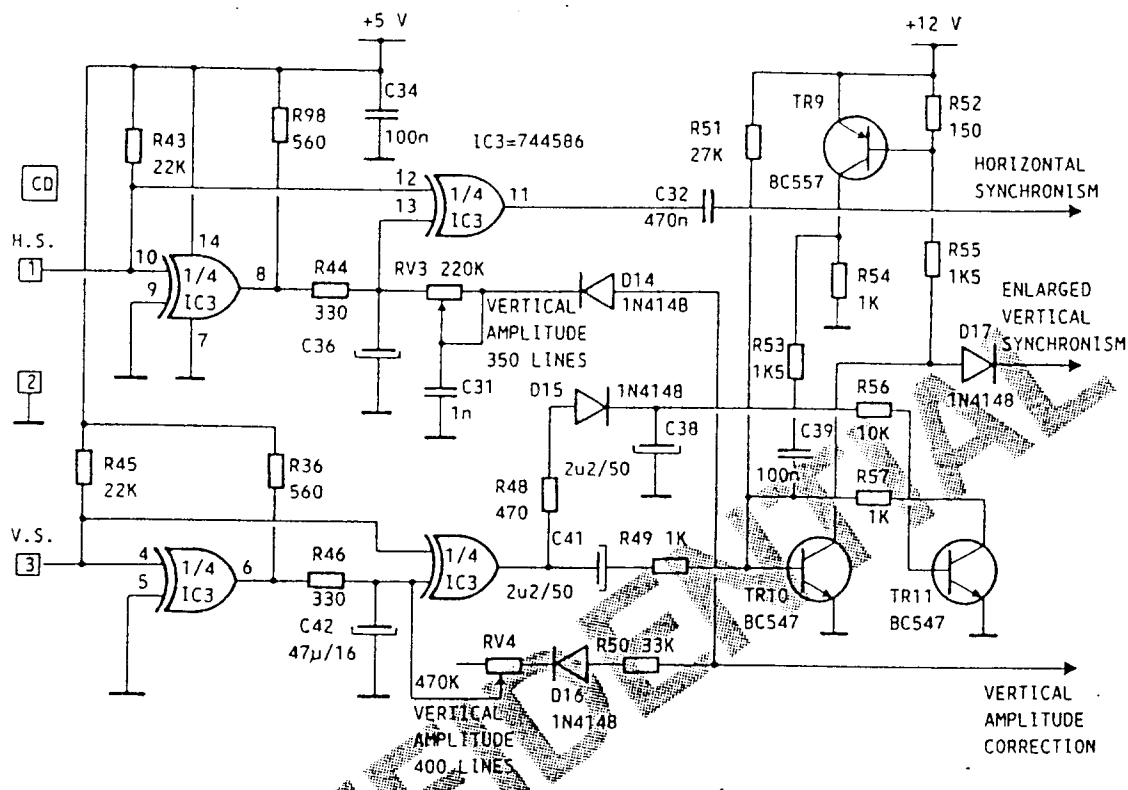


Fig. 1-6 Sync Acknowledge Circuit

Similarly, with section 4/5/6, when the vertical sync signal is of positive polarity, output 6 brings RV4 to ground, through 16, so it is in parallel with R72 and RV5. Capacitor C42 performs the same function for this circuit as C36 above.

RV3 thus regulates vertical width for the 350 line mode and RV4 for the 400 line mode. If both sync signals are negative, the output of both sections is high, D14 and D16 as a result are off, and vertical width can only be adjusted through potentiometer RV5.

The sync signal is brought to IC4 through the network consisting of TR9, TR10, TR11 and associated components which is designed to increase the duration of the vertical switch-off pulse (IC4 pin 13) and to allow the oscillator adopt a free-running oscillation in the absence of the video and sync signal (self-test condition).

VERTICAL DEFLECTION GENERATOR CIRCUIT

The vertical deflection signal generator circuit is based on integrated circuit IC4 TDA1670A (see figure below). The following circuits may be located inside this integrated circuit:

- Voltage regulator
- Oscillator
- Ramp generator
- Power stage with heat protection and vertical yoke drive
- Flyback voltage generator.

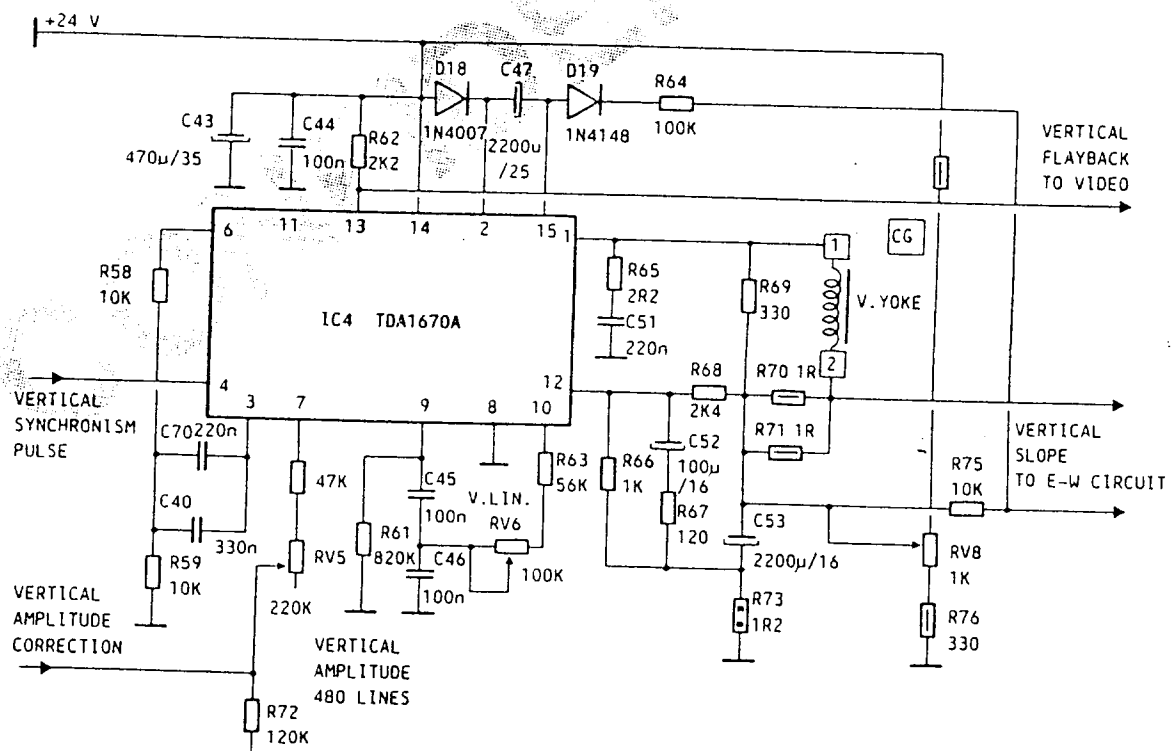


Fig. 1-7 Vertical Deflection Generator Circuit

PROPRIETARY

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INFORMATION

The power supply voltage is brought to TDA1670A pin 2 (24 V through D18) where it is filtered and stabilized by the internal voltage regulator, ready for use by the other circuits, the oscillator circuit in particular. On the output pin 15, a voltage pulse, produced by the internal flyback voltage generator circuit, increases the battery voltage so as to reduce the ramp return time.

The oscillator receives the sync pulse generated by the video control board on pin 4, by way of D17. There is no circuit regulating the free oscillation frequency which the monitor adopts when the signals cable is disconnected. The sync pulse input compensation circuit is connected on pins 3 and 6.

Pin 7 is connected to the operating mode decoder network and controls vertical deflection width.

Pins 9 and 10 are the deflection final drive stage inputs and the components connected control symmetry of the current ramp in the vertical deflection yoke. RV6 is the potentiometer which controls vertical linearity so that the distance between characters on the screen is constant.

The power stage output is present on pin 1, connected in turn to the deflection yoke. The network connected on pin 12 is a power stage negative feedback network, defining position of the work dot in direct current, and RV8 is the potentiometer used to adjust screen picture vertical centering.

The pin 13 output is the vertical flyback signal, used by the screen grid G1 drive circuit for the raster return blanking.

HORIZONTAL RASTER GENERATOR CIRCUIT

The horizontal raster generation circuit is built around integrated circuit IC5 (TDA2593). It controls the horizontal deflection stage comprising TR16 and TH3 by way of the impedance adapter stage TR12-TH2.

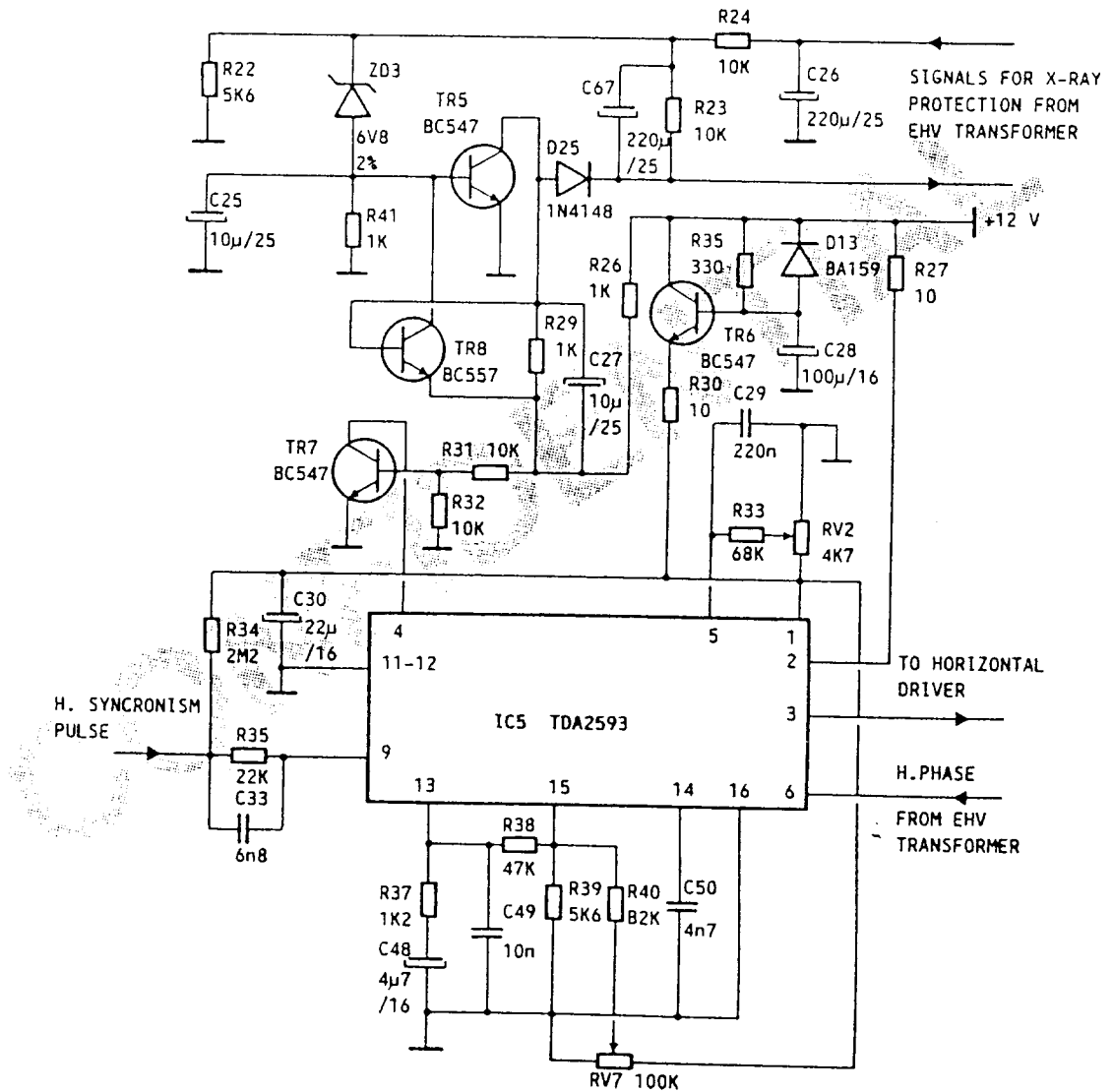


Fig. 1-8 Horizontal Deflection Generation Circuit

PROPRIETARY

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INFORMATION

Integrated circuit IC5 consists of the following circuitry:

Oscillator

Phase control and variation

Horizontal deflection pulse generation.

The sync signal is brought to pin 9 through a passive network consisting of C32, R53 and C33 so that any noise signals are quenched. The signal in question is taken from the video control board by integrated circuit IC3 for operating mode decoding (see page 1-14).

The output controlling the horizontal deflection stage is on pin 3, from where the line pulse is sent to the impedance adapter block comprising TR12 and TH2 and then to the base of TR16, the power stage electronic switch.

Regulation of oscillation frequency is performed by the network connected to pin 15 of TDA2593. Potentiometer RV7 is used to adjust horizontal oscillation frequency.

Automatic phase control is provided by two phase detectors: the one connected to pin 13 compares the sync phase with the oscillator and maintains the ratio constant by way of R38, while the second one receives the flyback pulse phase on pin 6 from the row transformer and compares it internally with the oscillator, establishing the correct deflection pulse phase and correcting any drift caused by heat or component variations.

The network connected on pin 5 allows an offset to be added to the previous comparator circuit so as to be able to move the horizontal raster point of origin on the screen. RV2 is the potentiometer used for this regulation.

Pin 3 is used to block the horizontal oscillator; this input is used by the X-ray protection circuit described in page 1-25.

Power for integrated circuit TDA2593 is supplied on pin 2 connected to the +12 V of the power supply.

HORIZONTAL DEFLECTION AND EHV GENERATION CIRCUIT

The circuit illustrated in the figure below performs two main functions:

Generation of, the current ramp needed for the horizontal deflection yoke

THEORY OF OPERATION

- Generation of the following voltages:
 - . Cathode ray tube power supply voltage (pin 2 of TH3)
 - . Cathode ray tube post-acceleration voltage (pin 8 of TH3).

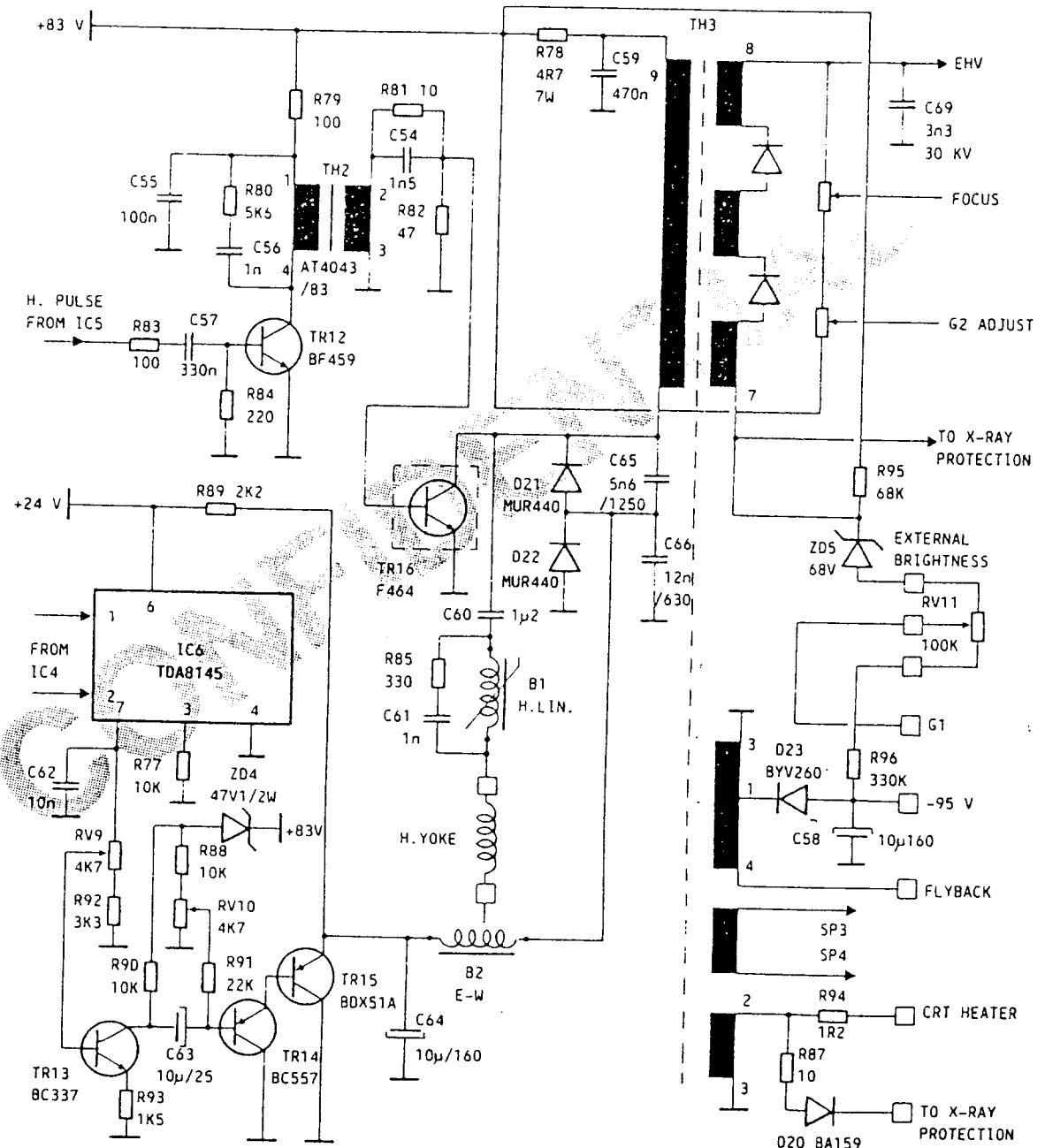


Fig. 1-9 Horizontal Deflection and EHV Generation Circuit

These functions are carried out by electronic switch TR16 and by transformer TH3 and associated circuitry.

As regards the first of the above two functions, the following takes place: transistor TR16 receives the pulse generated by integrated circuit TDA2593, coupled and impedance adapted by TR12 and TH2, and fluctuates between the off (Toff) and saturation (Ton) states. The TR16 collector is charged with the inductance load produced by the horizontal deflection and linearity coils and by the primary of transformer TH3.

When TR16 is saturated (Ton), half of the deflection current is created, from the centre of the screen to the left side. When TR16 goes off (Toff), there is inversion and fast return to the other side of the screen (flyback), followed by generation of the ramp which brings the electron beam from the edge to the centre of the screen.

A second phase produced while TR16 is off is produced, thanks to the magnetic energy stored in the deflection yoke and in the transformer during the Ton time. Capacitors C65 and C66, together with diodes D21 and D22, respectively establish width and speed of the flyback pulse and allow the inversion of the current in the yoke.

The East-West correction described in section 1. is also brought, through the action of coil B2, to capacitors C65 and C66 and diodes D21 and D22.

The power stage power voltage is of 83 V while the overvoltage (flyback) is approximately 1000 V; it is thus advisable to respect the warnings given at the start of this manual.

The current flowing in the deflection yoke first goes through capacitor C60 and then coil B1.

The former performs the S-correction of the deflection current so that the amount of deflection is the same in the centre as at the edges of the screen and so that linearity is maintained all over.

Coil B1, on the other hand, handles horizontal linearity regulation by acting on the ramp geometry.

The voltages referred to in the second of the functions listed at the start of this section are on the secondary of TH3. The high voltage windings serve to bring the flyback voltage up to the 25 KV approx. needed by the cathode ray tube post-accelerator anode. A series of resistor dividers take from this voltage the voltages for grid G2 (accelerator grid) and grid G3 (focus grid).

On the TH3 output pin 7 is the voltage for grid G1 (screen grid) which can be regulated externally by the user with potentiometer RV11 (brightness regulation).

Another voltage taken from pin 7, inversely proportional to the anode current (voltage drops if the anode current is too high), is used by the X-ray protection circuit described in page 1-25.

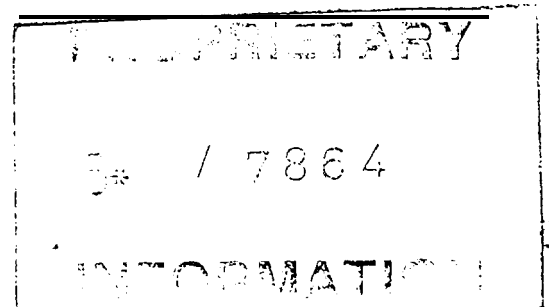
The tube power voltage (filament voltage) used to heat the electron gun cathode and as a reference for the X-ray protection circuit is taken from pin 2 of TH3.

Winding SP3/SP4 provides the switching power supply sync signal.

Pin 4 supplies the horizontal oscillator with the phase comparison flyback pulse, and the grid G1 control circuit with the switch-off pulse for the horizontal raster return.

On pin 1 of TH3, there is a voltage of -95 V used for grid G1 polarization.

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EAST-WEST CORRECTION CIRCUIT

The yoke/picture tube group has an amount of pincushion distortion of the type shown in the figure below.

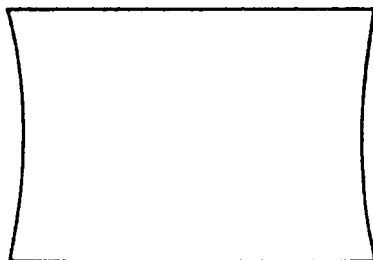


Fig. 1-10 Pincushion Distortion

This distortion has a value of around 8% and is corrected by the circuit based on integrated circuit IC6 (TDA8145) and on the associated transistors TR13, TR14 and TR15.

The IC6 drive signals are found on pins 1 and 2, and come from the vertical deflection generator circuit IC4. On output pin 7, integrated circuit TDA8145 produces a parabolic voltage which drives the three transistors TR13, TR14 and TR15. The TR13 drive voltage is controlled by RV9 which, in this way, performs the pincushion distortion correction function.

The voltage on the TR13 collector is coupled with the final stage through C63. A direct current is summed on the base of TR14 to provide horizontal width regulation, the amount of this current being determined by RV10.

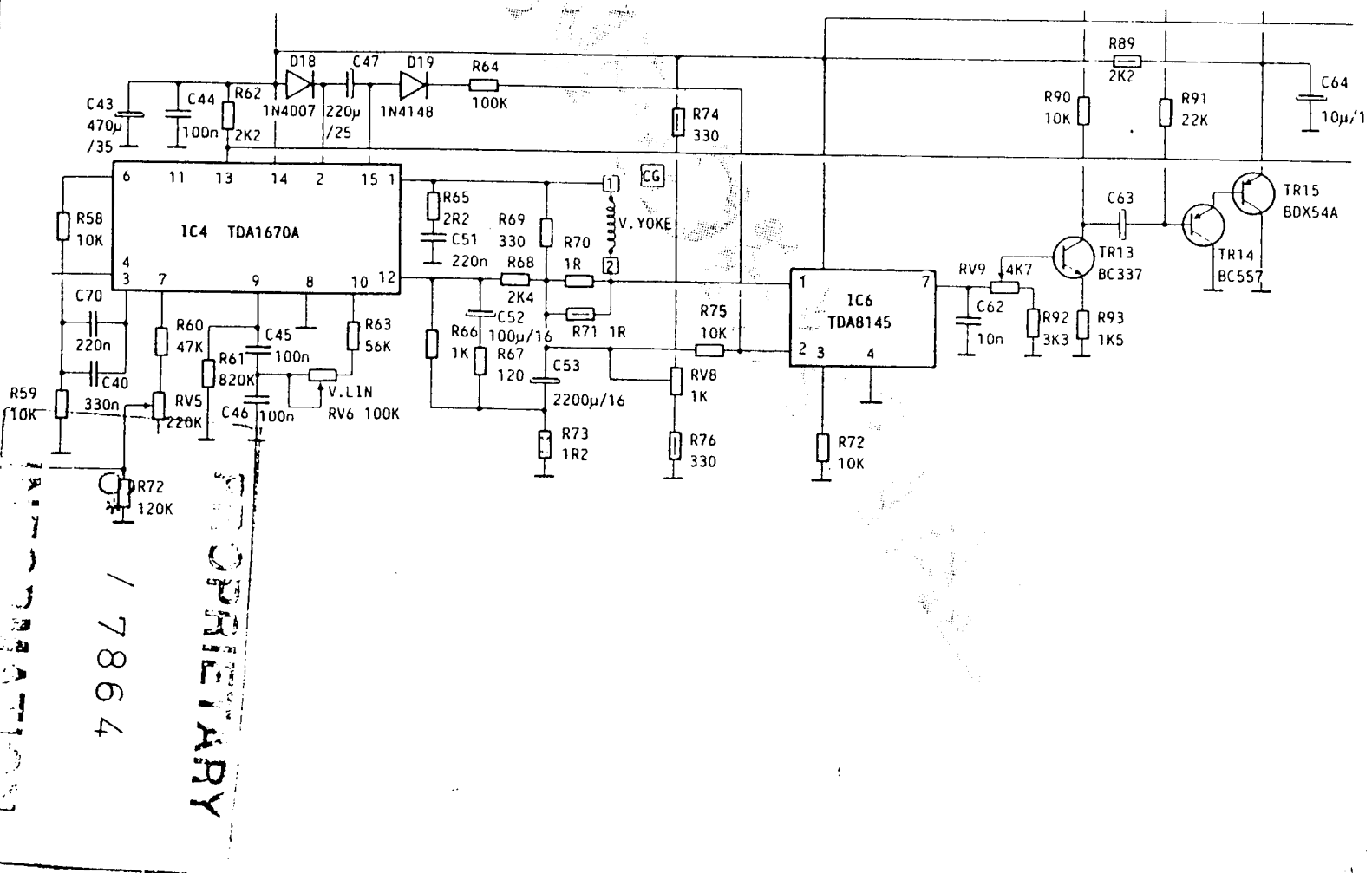


Fig. 1-11 East-West Correction Circuit

X-RAY PROTECTION CIRCUIT

The only element capable of generating X-rays is the cathode ray tube, should the EHV exceed the design levels.

To eliminate this hazard, the main board of the monitor is equipped with a circuit which interrupts horizontal oscillation, thus bringing monitor operation to a halt.

The figure below is of the X-ray protection circuit which is based on transistors TR5, TR7 and TR8.

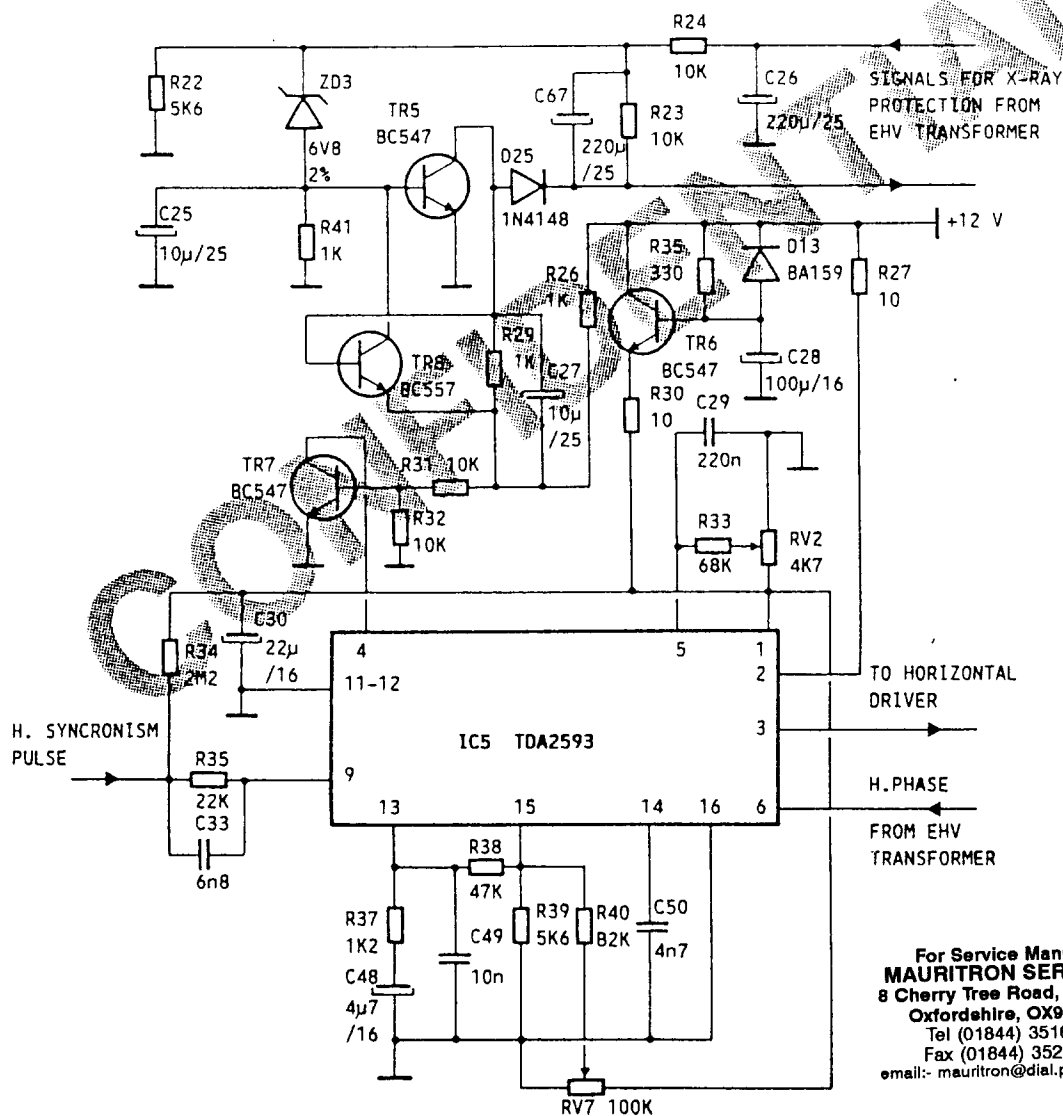


Fig. 1-12 X-ray Protection Circuit

During normal operation, transistor TR7 is off because TR5 is polarized off and integrated circuit IC5 is enabled as pin 4 is short circuited to ground. If the voltage coming from winding 2/3 of TH3 rises and becomes greater than the zener ZD3 voltage, TR5 starts to conduct, takes current from the base of TR7, saturates TR8 (polarized by R29) and thus a positive feedback is created which sends TR5 into saturation until such time as the monitor is switched off.

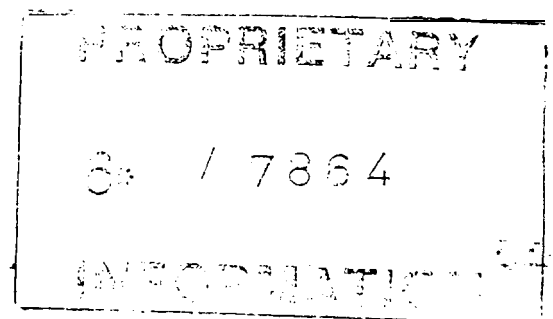
When the above sequence of events occurs, pin 4 of IC5 is removed from ground and the oscillator is blocked.

If the protection is triggered again after the monitor is switched off and on, the cause of the malfunction must be discovered.

The X-ray protection circuit is also triggered in the same way if the 025 cathode voltage drops below the value of 10 V.

The 025 cathode voltage comes from winding 7 of transformer TH3 and is inversely proportional to the anode current or beam current.

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CIRCUIT DIAGRAMS: VIDEO AMPLIFIER BOARD

The board mounting the video final stages and relative preamplifiers is connected directly to the cathode ray tube, in this way reducing stray capacitance to a minimum and granting an improved video band.

This close connection between video amplifier board and tube also increases the efficiency of the circuits providing protection from the high potential discharges between the tube internal electrodes (flashover phenomenon).

Such discharges would cause the electronic components irremediable damage were they not quenched and absorbed by the dischargers of the tube socket. Any return current present is limited by resistors R106, R128, R148, R102.

In the block diagram of figure 1-, this board is shown at the top beside the tube.

For a description of the video preamplifier and amplifier circuitry, see the figure on the following page, which illustrates the BLUE circuits. The circuitry for GREEN and RED is identical, except for the compensation value on the emitters of TR103, TR110 and TR117.

The video preamplifier stage comprises TR118, IC103 and TR119.

The video signal coming from the video controller board inside the Personal Computer is input to integrated circuit IC103 (video preamplifier CA3046) on pin 3 by way of transistor TR118. The preamplified video signal is available on pin 5 of IC103 and is then amplified to a level of approx. 30 Vpp by the video final through the action of a cascade-type circuit consisting of transistors TR115, TR116 and TR117. The video signal output by IC103 is a.c. coupled by way of c131.

The preamplifier stage gain may be adjusted in one of two ways:

- By potentiometer RV101, accessible externally (contrast regulation) and common to all three preamplifier stages

- By the three potentiometers RV102, RV104 and RV106 for colour level regulation,

THEORY OF OPERATION

Transistor TR122, common to all three channels, generates the self-test signal by fetching the flyback pulse when the signals cable is disconnected. If the signals cable is connected, pin CM/1 is connected to ground and the circuit is inhibited. In the self-test condition, the signal in question is coupled to the preamplifiers TR121, TR114 and TR107 and the screen is lit white.

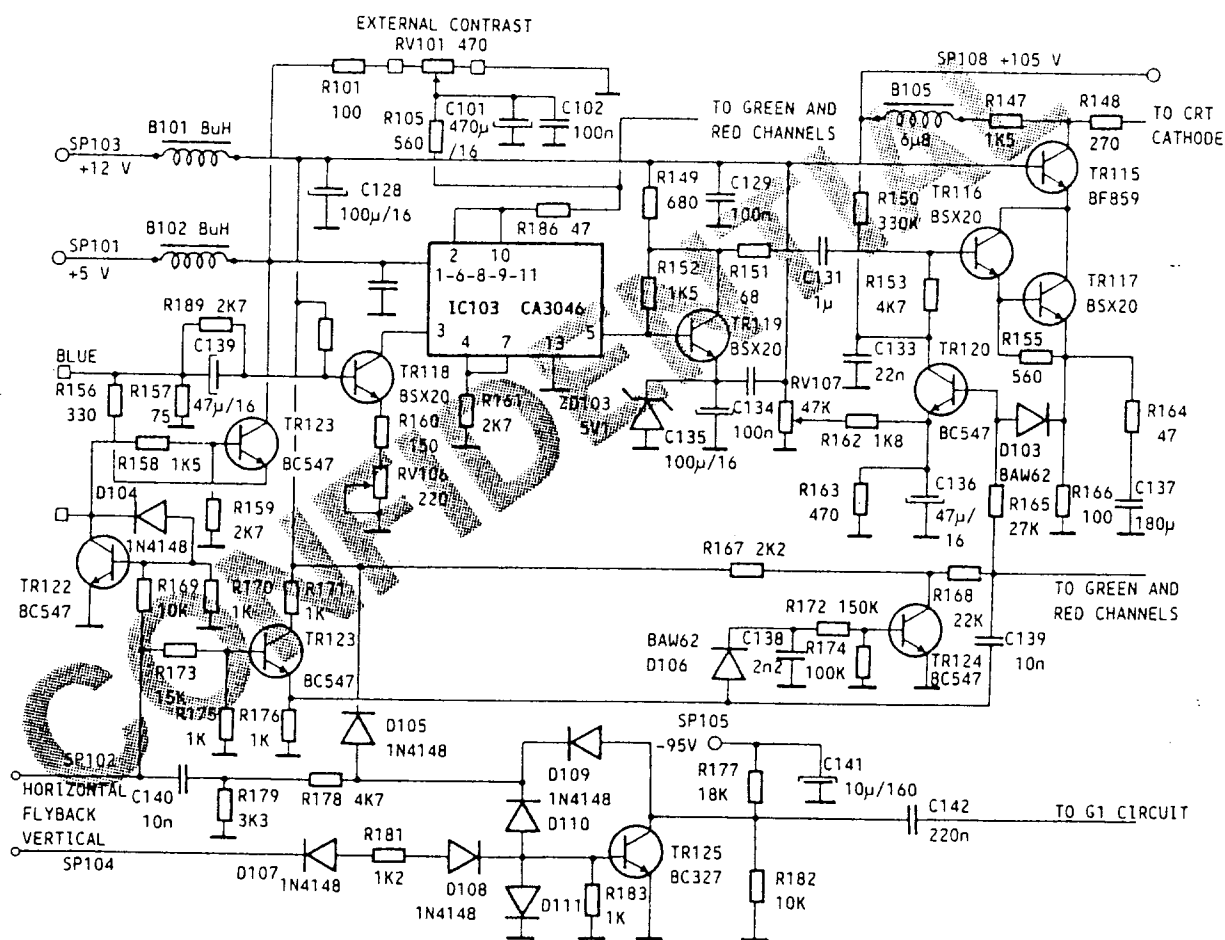


Fig. 1-13 Video Preamplifier and Amplifier Circuit

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The video amplifier circuit is described below:

The transistor TR115 load is constituted by R147 and B105. The role of B105 is to compensate for stray capacitance at the high frequencies and to maintain amplification at a constant value.

The amount of amplifier stage gain is determined by the relationship between R147 and R166.

A d.c. component is summed to the base of TR116 by way of TR120, R162 and RV107. This d.c. component regulates the cut-off value and RV107 is the potentiometer used for the regulation.

TR120 also restores the black level at each row return (d.c. restorer) by way of a flyback pulse coming from row transformer pin 4, and which is brought to its base by TR123 and C139.

Transistor TR124 is common to all three video amplifier stages. It is designed to switch off the final transistors TR115, TR108 and TR101 should there be a horizontal deflection stage malfunction.

Transistor TR125 is driven by the horizontal and vertical retrace signals and generates a series of switch-off pulses which are brought to screen grid G1 by C142.

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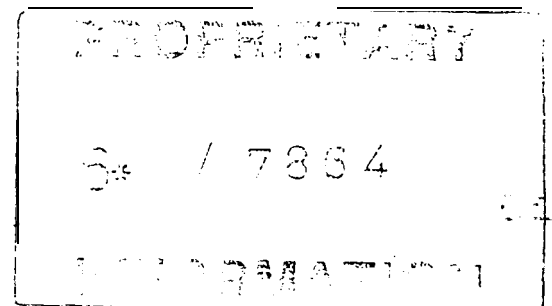
GENERAL

The need to regulate the monitor arises generally after replacement or repairs of electrical parts: To do so, you are advised to follow the procedures described below, bearing in mind a number of general rules:

- Any setting work can only be performed at least 5 minutes after the monitor has been switched on so that there is a stable heat coefficient.
- When a short circuit occurs, you should check the insulation of all conductors and components and replace any parts found to have suffered excessive heating.
- When servicing the monitor, always remember that there are high voltages in the power and deflection circuitry; be extremely cautious in handling the unit and using measurement apparatus.
- Never work on the circuits when the unit is connected to the mains.
- Before touching any circuits, switch the monitor off, take out the mains cable and wait a few seconds for the internal bleeder of the EHV transformer to discharge the tube anode.
- Any damaged components, especially those to do with safety, must be replaced only with the original spares (see the notices in the early part of this manual).

POSITION OF REGULATION POINTS

The functions of all the regulations on the two boards are given in page 1-7, while position of the regulation points on the boards is shown in 1-2 and 1-3.



REGULATIONS AND SETTINGS

MONITOR SETTING

The setting procedures granting correct monitor operation are described in this section. These procedures are given in a certain order which you are advised to maintain for optimum results.

Transformer TH3 Power Supply **Voltage Regulation**

1. Set all controls to an intermediate position.
2. Turn the monitor on after connecting it to the computer: the signal provided should be the first test grid.
3. Set potentiometer RV1 to give a value of 83 V on diode D10.

Vertical Hold Regulation

1. Display the first test grid.
2. Short circuit pin 9 of integrated circuit TDA2593 to ground.
3. Regulate potentiometer RV7 (horizontal frequency) to obtain as stable a picture as possible.

Horizontal Width Regulation

1. Display the first test grid.
2. Regulate horizontal width roughly using potentiometer RV5.
3. Correct horizontal linearity using coil B1.
4. Set horizontal width using potentiometer RV10 for a value of 240 mm.

Pincushion Distortion Regulation

1. Display the first test grid.
2. Correct the pincushion distortion with potentiometer RV9 (East-West correction).

Horizontal Shift Regulation

1. Display the first test grid.
2. With potentiometer RV2, adjust horizontal phase so as to centre the picture horizontally with respect to the raster.

Vertical Linearity Regulation

1. Display the first test grid.
2. Correct vertical linearity with potentiometer RV6.

Vertical Width Regulation

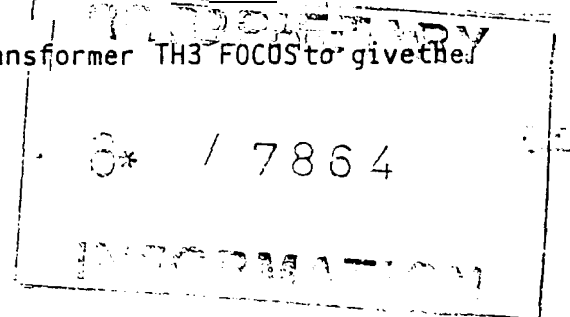
1. Set your Personal Computer to display the second test grid (480 line grid) and adjust vertical width using potentiometer RV5. Set a value of 180 mm.
2. Set your Personal Computer to display the third test grid (350 line grid) and adjust vertical width using potentiometer RV3. Set a value of 180 mm.
3. Set your Personal Computer to display the third test grid (400 line: grid) and adjust vertical width using potentiometer RV2. Set a value of 180 mm.

Vertical Centering Regulation

1. Display a test grid on the screen.
2. Adjust potentiometer RV8 to centre picture vertically.

Focus Regulation

1. Display a highlight character pattern on the screen.
2. Adjust the potentiometer on the row transformer TH3 FOCUS to give the best possible focus.



VIDEO SETTING

1. Set your Personal Computer to display a video level 0 page.
2. Adjust RV103, RV105 and RV107 (cut-off) so as to produce a voltage of 80 Vdc on the respective cathodes.
3. Adjust the potentiometer on the row transformer TH3 (SCREEN = G2 voltage regulation) and set at minimum by turning anti-clockwise to produce a dark screen.
4. Switch off the vertical deflection circuit by short circuiting R61 (820 K).
5. Turn the potentiometer mentioned in step 3 until a horizontal line in any one of three colours is produced; now turn the cut-off potentiometers (RV 103 RED, RV105 GREEN and RV107 BLUE) of the two colours not on display until a white line is produced.
6. Remove the short circuit on R61.
7. Set the external brightness potentiometer for maximum brightness by turning anti-clockwise.
8. Turn the potentiometer mentioned in step 3 (G2 regulation) to give a raster brightness of between 6 and 10 nits.
9. Set your Personal Computer to give a 467 mV level white page.
10. Set the external brightness potentiometer to the centre position (click point).
11. Set the external contrast control for maximum brightness (turn anti-clockwise).
12. Adjust gain of the three colours (RV102 RED, RV104 GREEN and RV106 BLUE) to give a brightness of 92 nits with the correct white chromatic coordinates in the centre of the screen: $X = 0.315 \pm 0.020$
 $Y = 0.325 \pm 0.020$.

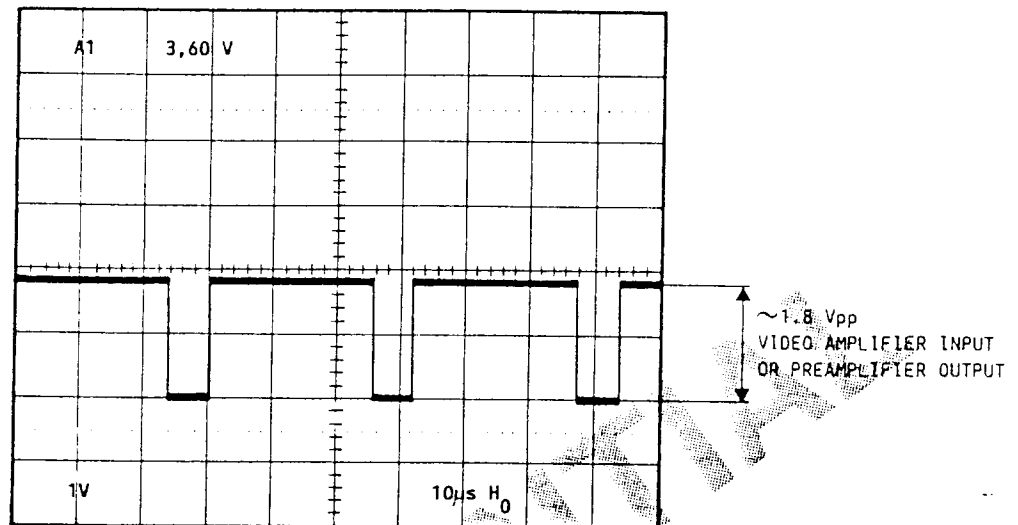
TIMING DIAGRAMS

Fig. 2-1 Pin 5 of CA3046

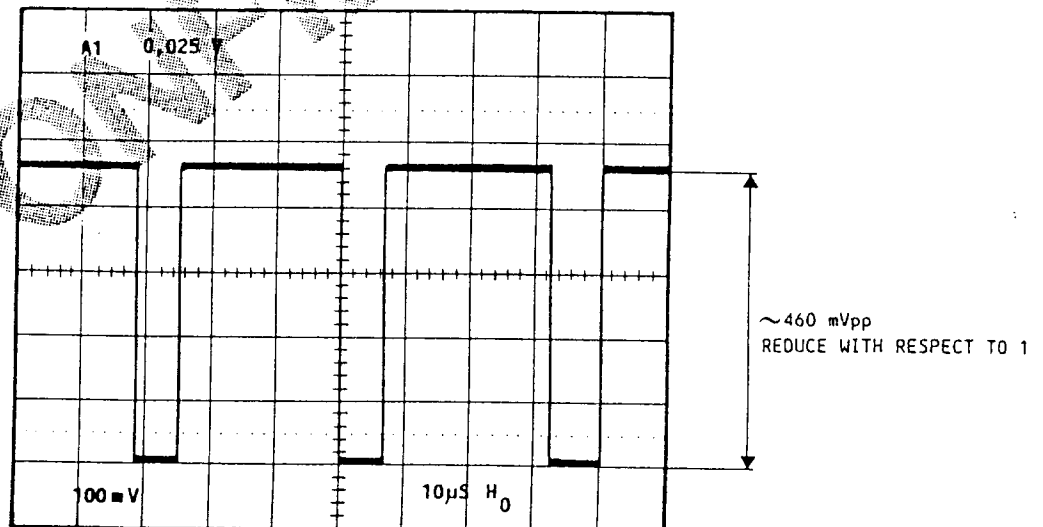
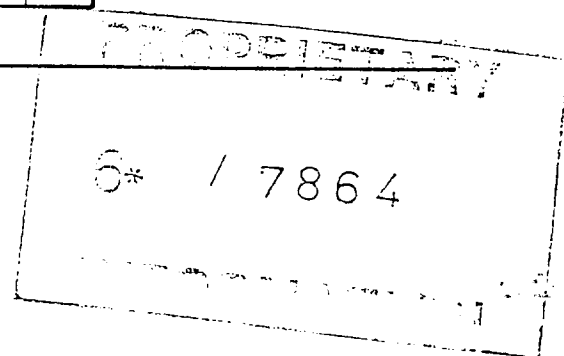


Fig. 2-2 Connectors CH, CI, CL



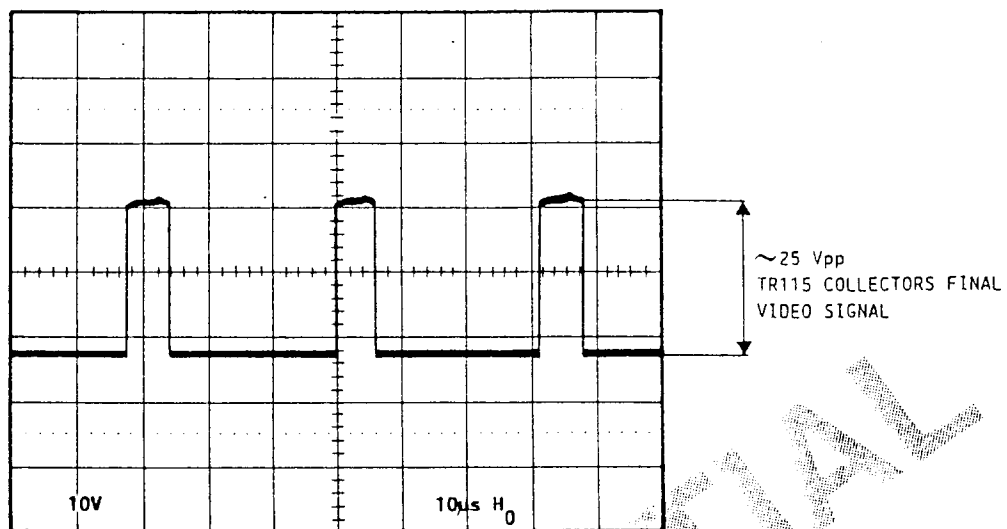


Fig. 2-3 TR115 Collector

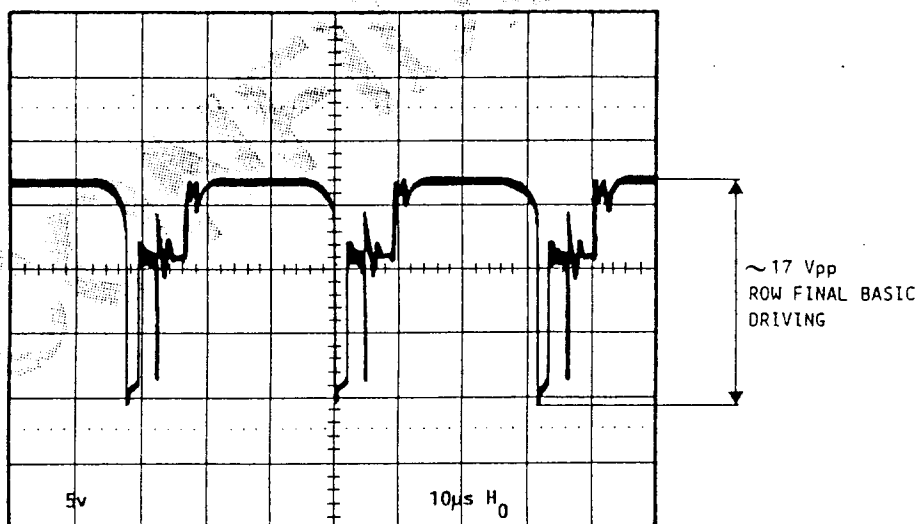


Fig. 2-4 TR16 Base

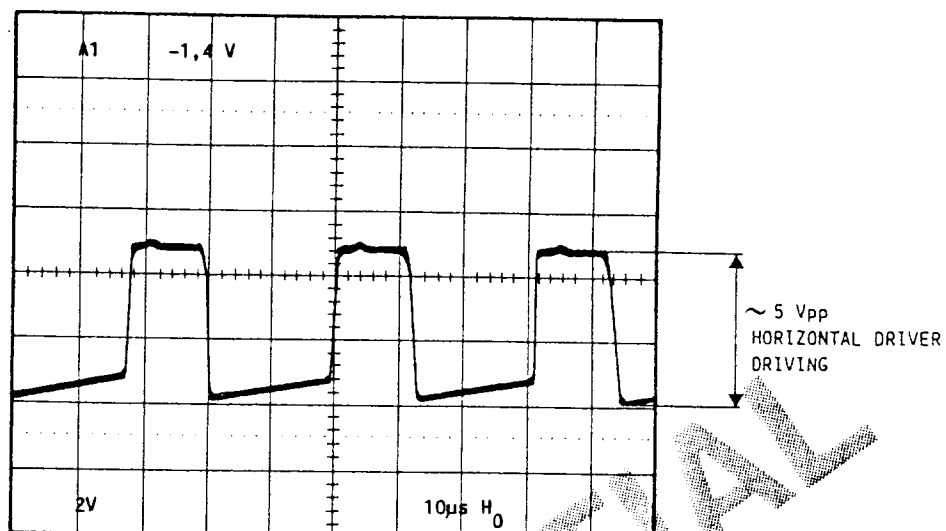


Fig. 2-5 TR12 Base

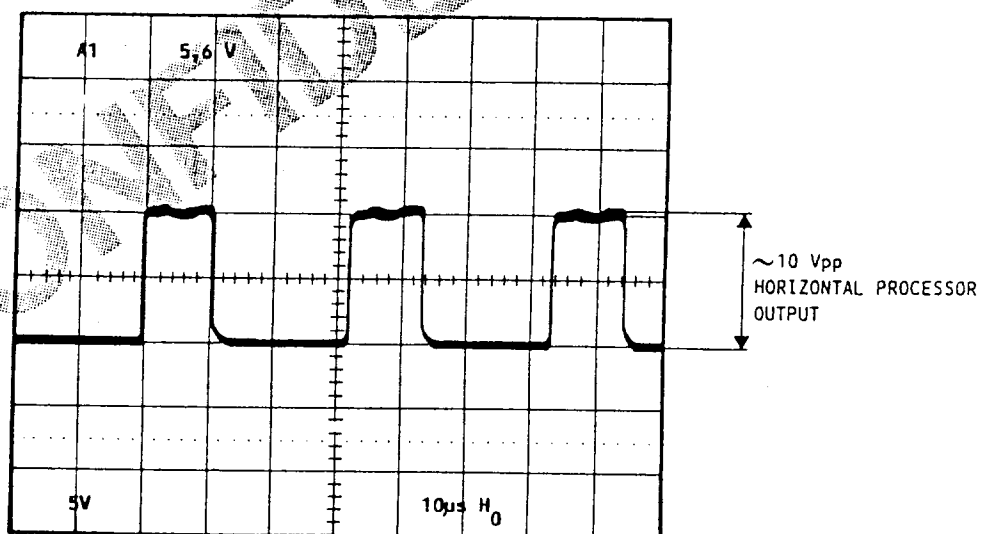
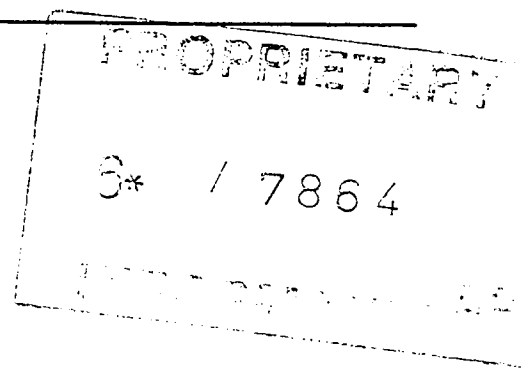


Fig. 2-6 Pin 3 of TDA2593



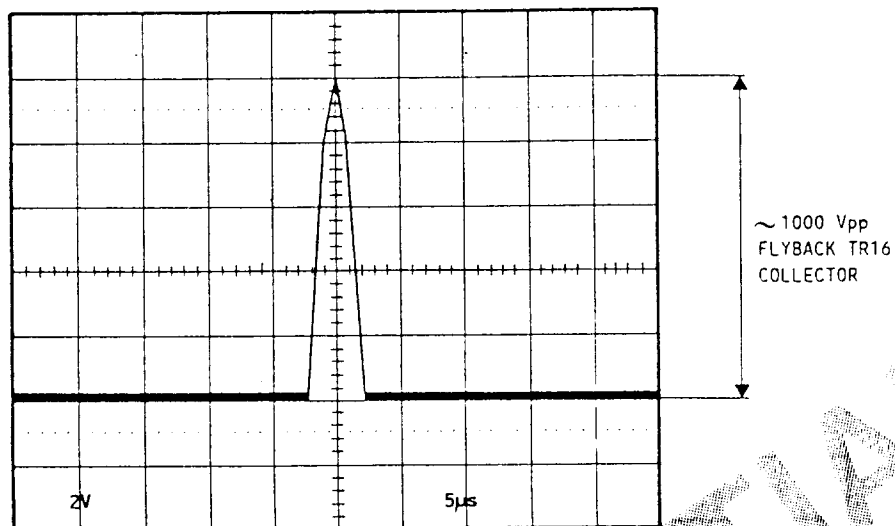


Fig. 2-7 TR16 Collector

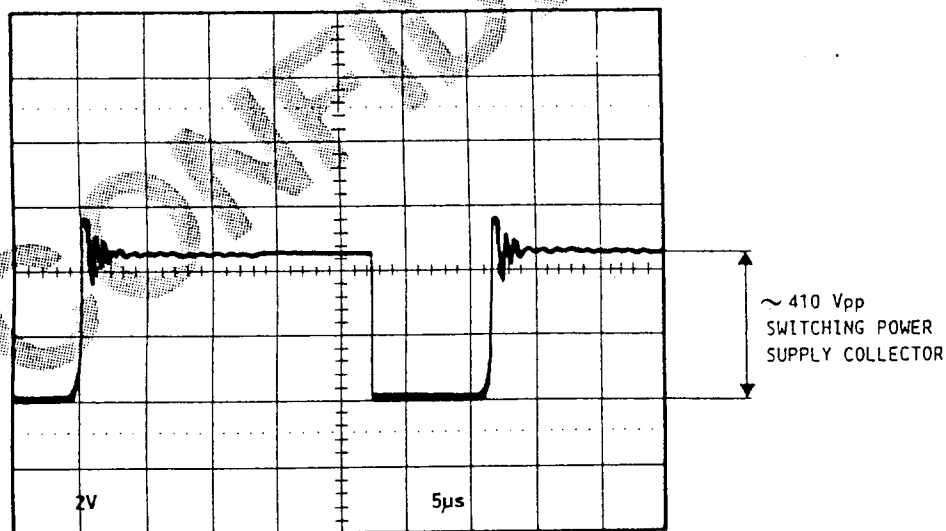


Fig. 2-8 TR4 Collector

For Service Manuals
MAURITRON SERVICES
 8 Cherry Tree Road, Chinnor
 Oxfordshire, OX9 4QY.
 Tel (01844) 351694
 Fax (01844) 352554
 email:- mauritron@dial.pipex.com

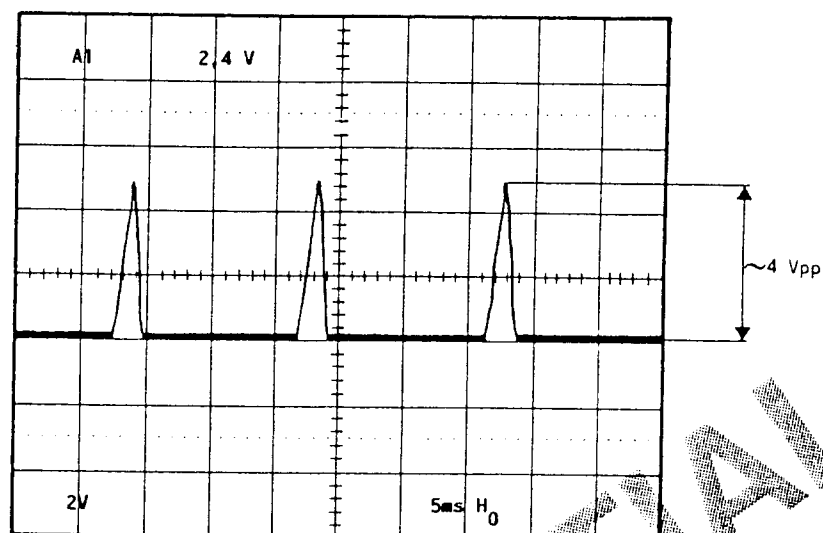


Fig. 2-13 Pin 4 of IC3

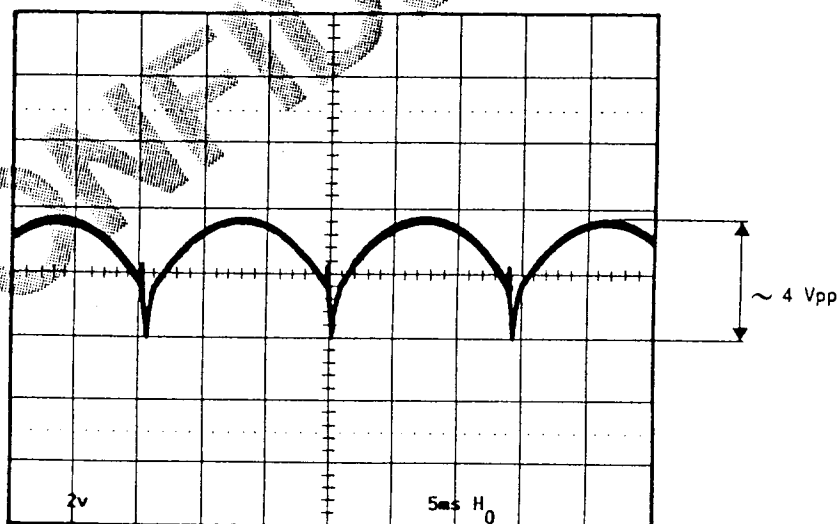
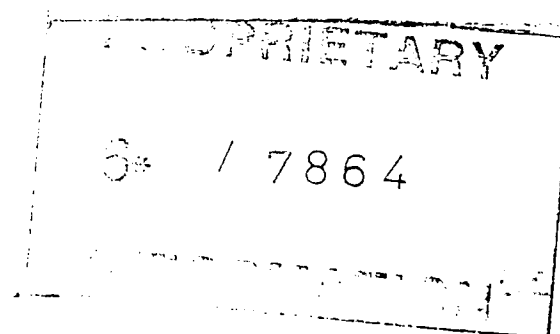


Fig. 2-14 Pin 4 of IC3



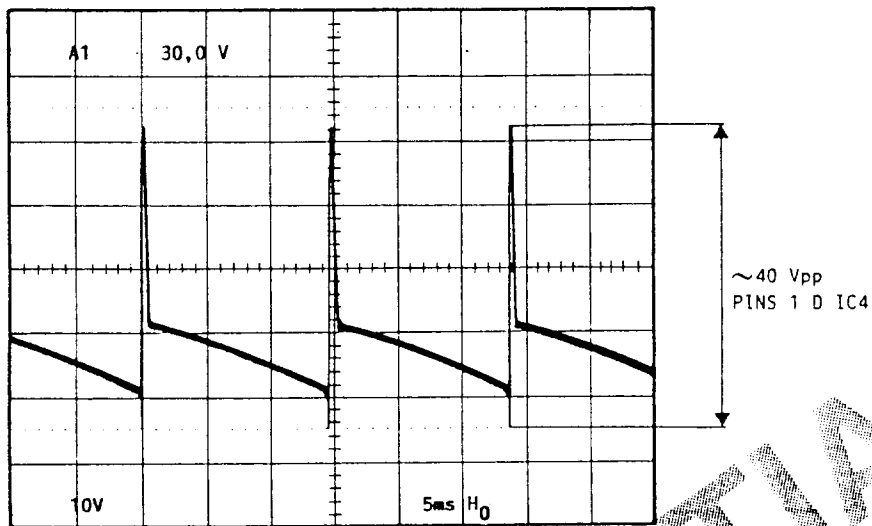


Fig. 2-15 Pin 6 of TDA8145

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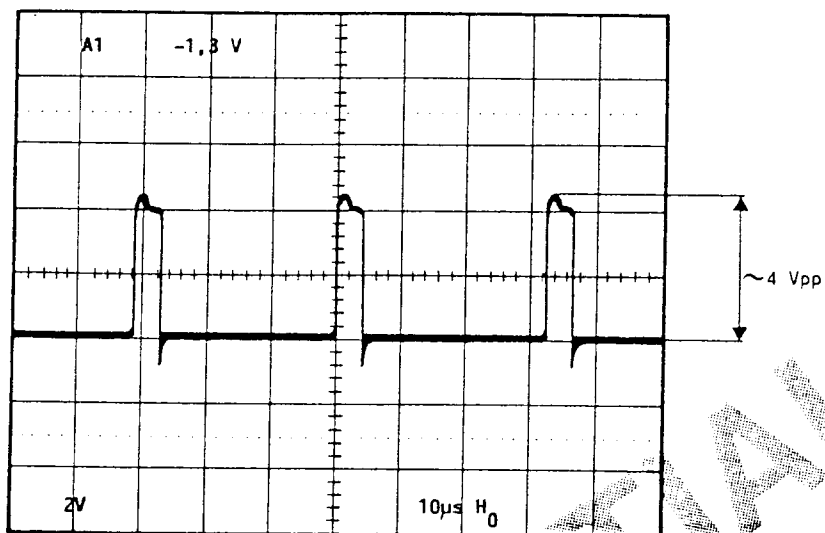


Fig. 2-9 Pin 9 of TDA2593

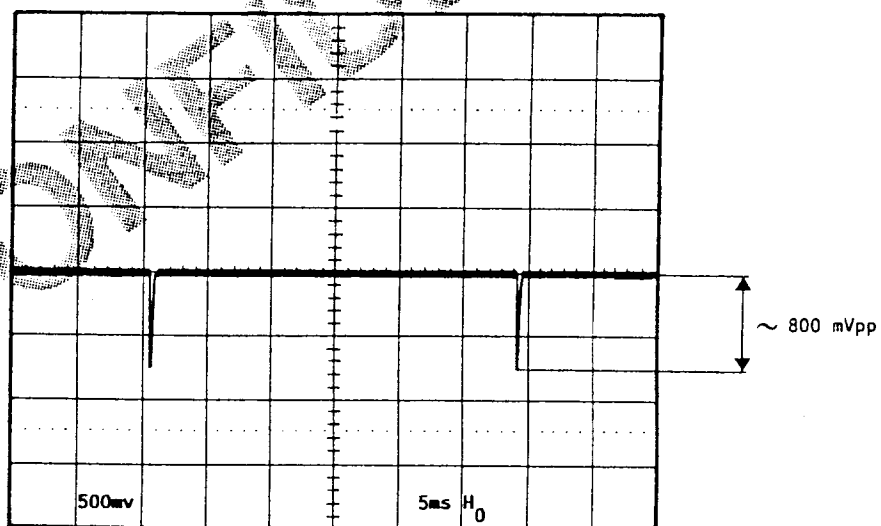
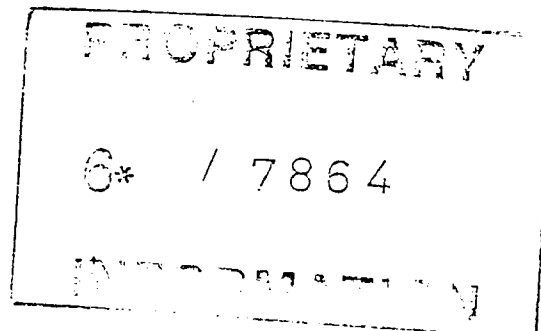


Fig. 2-10 Pin 10 of IC3



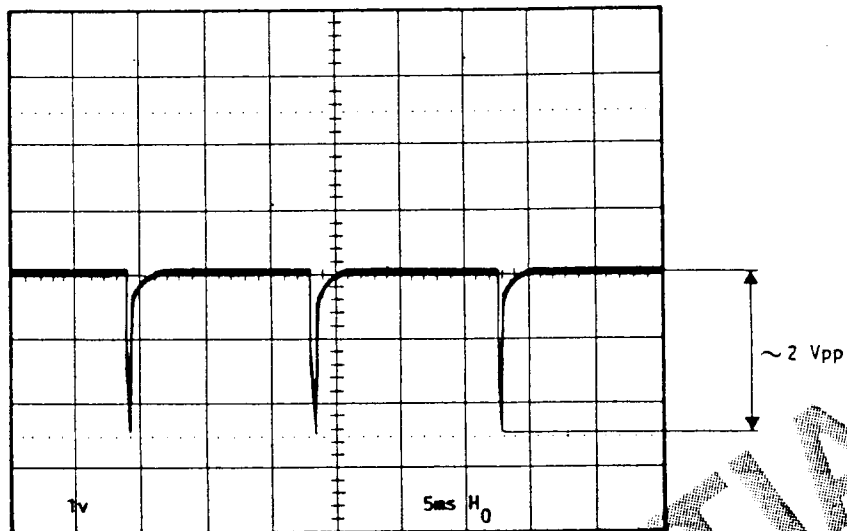


Fig. 2-11 Pin 4 of TDA1670A

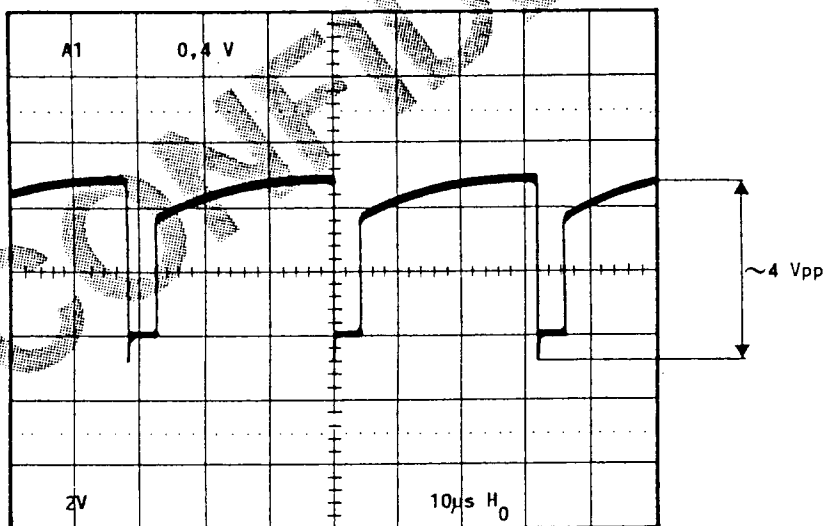
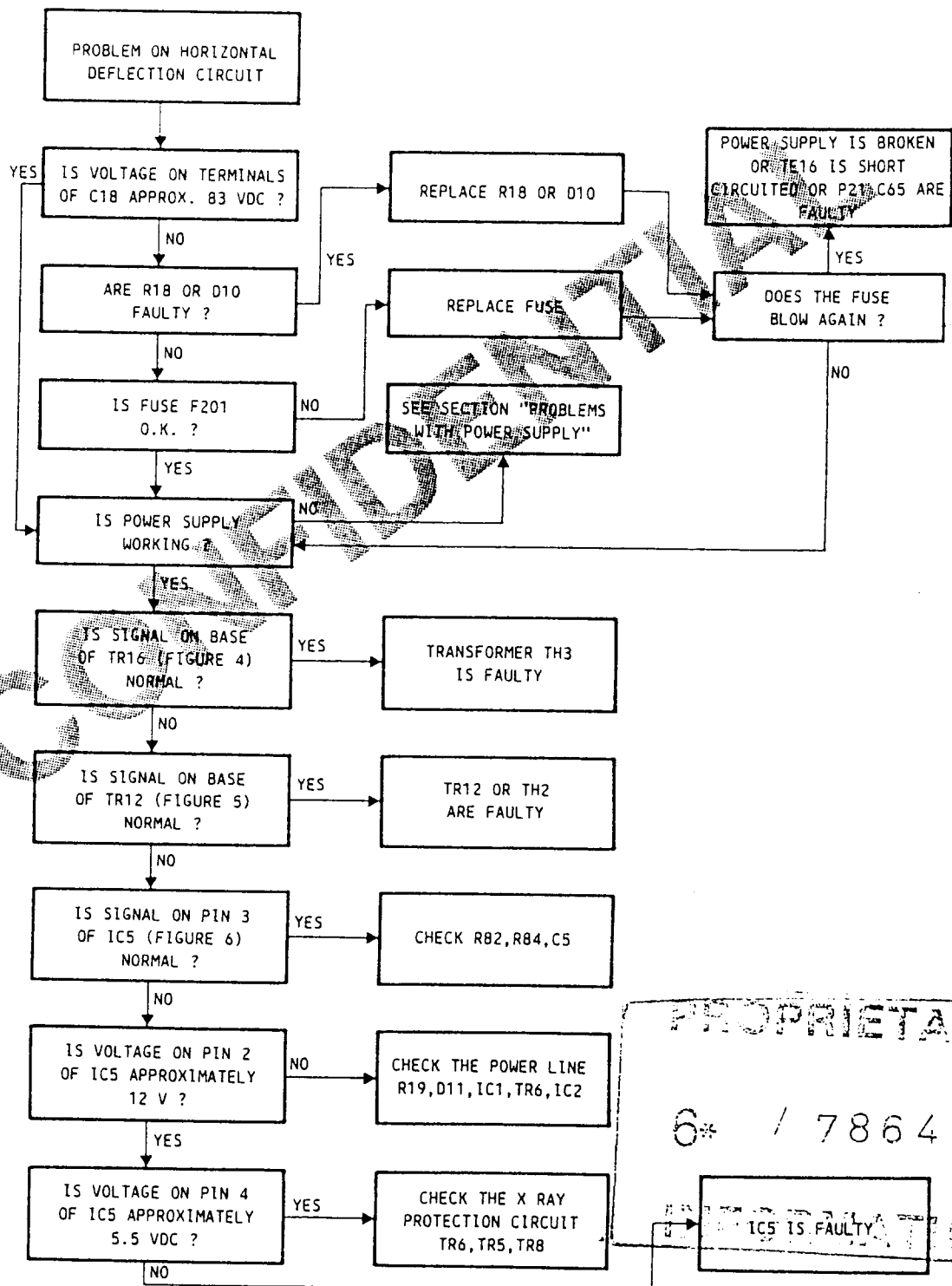


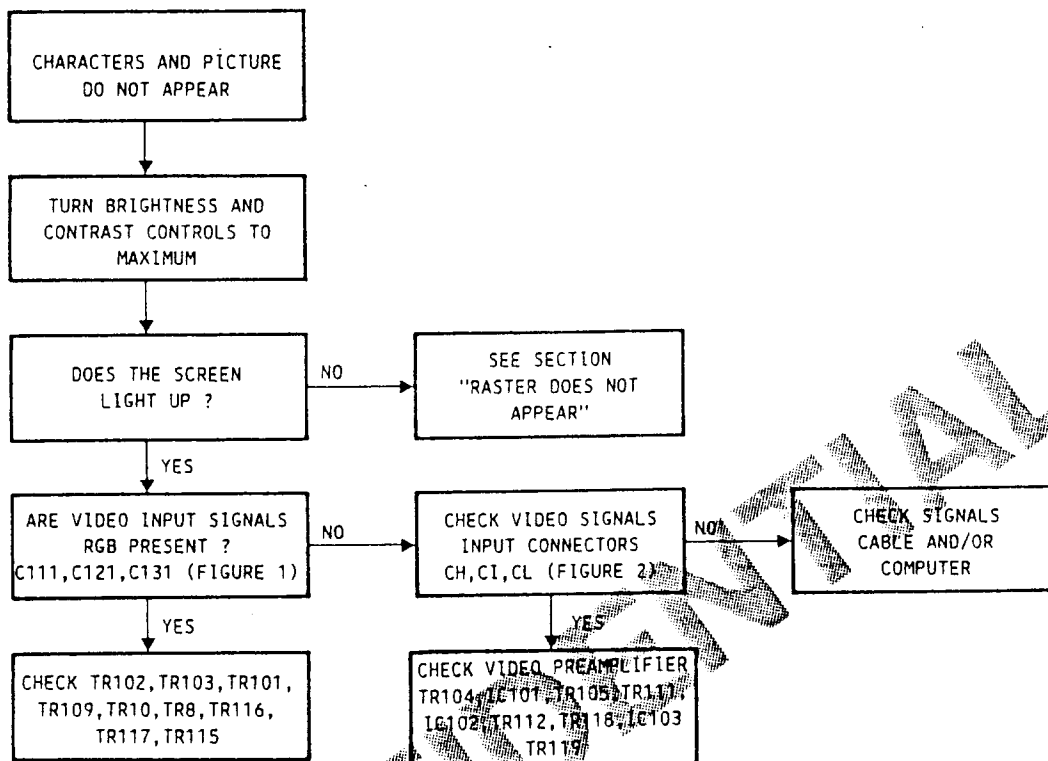
Fig. 2-12 Pin 3 of IC3

TROUBLE SHOOTING GUIDE

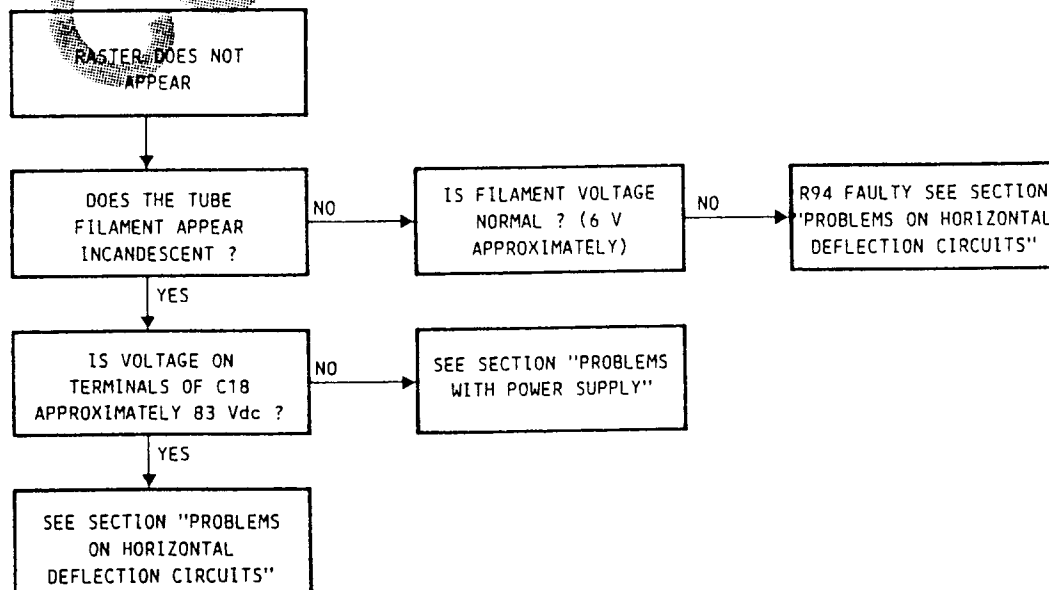
The trouble shooting charts that follow together with the waveforms on the previous pages (section TIMING DIAGRAMS) are designed to facilitate the task of the service technician in locating and identifying the most frequent problem areas.

Horizontal Deflection Circuit Problems

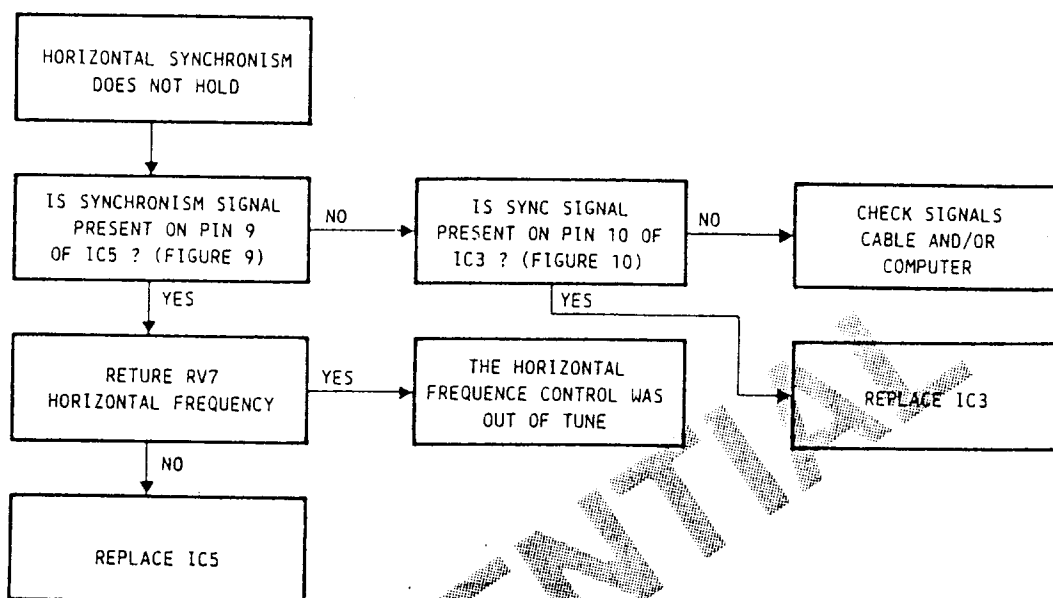
Characters and Picture Missing



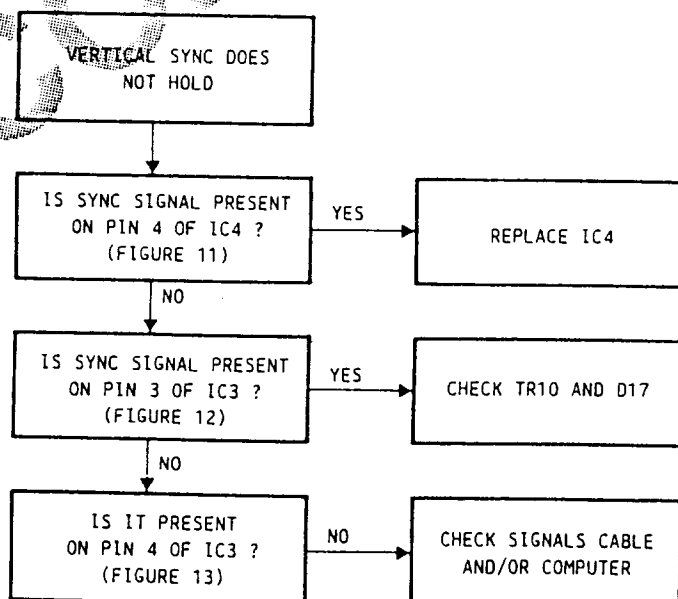
Raster Missing



Horizontal Sync Problems



Vertical Sync Problems

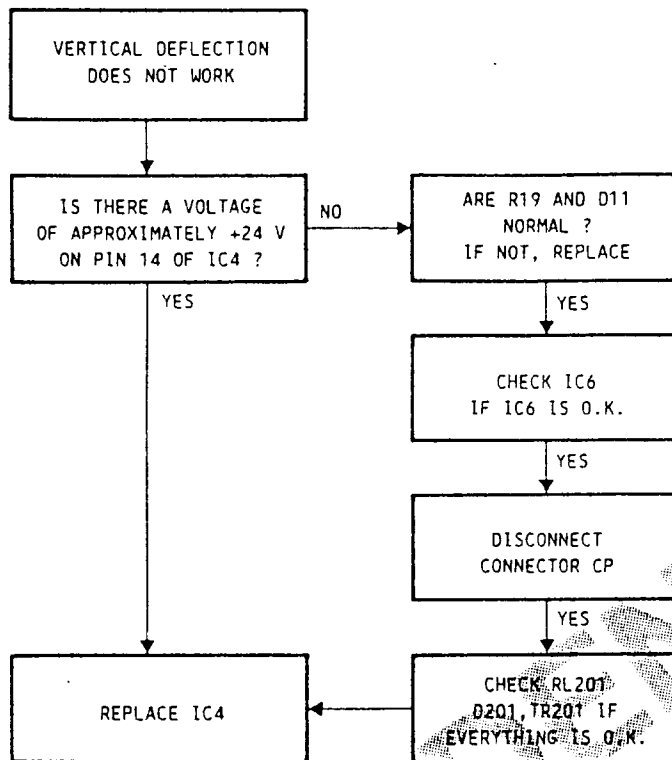


PROPRIETARY

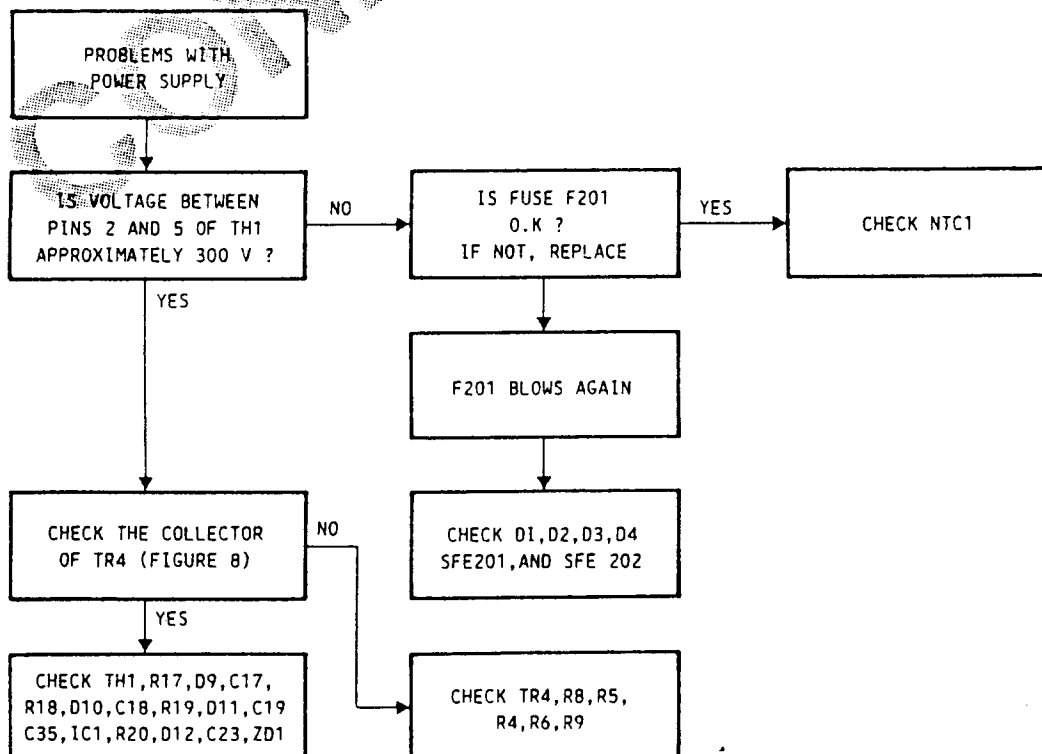
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INFORMATION

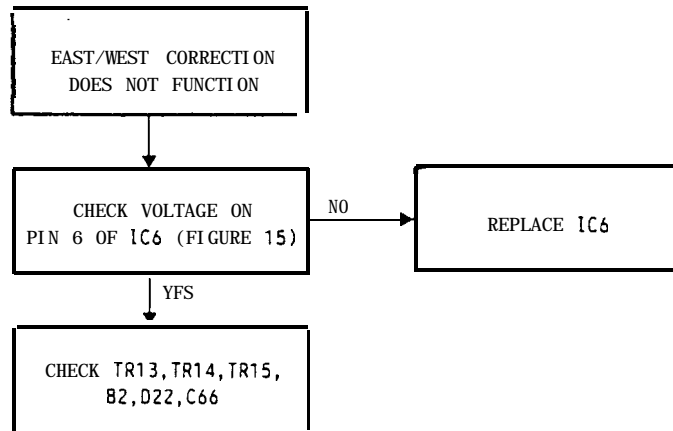
Vertical Deflection not Working



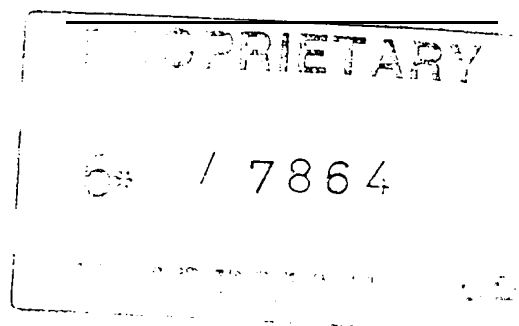
Power Supply Problems



East-West Correction



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MECHANICAL DISASSEMBLY

For disassembly of mechanical parts, see the figure on the following page.

To access the electronic boards, carry out the following procedure:

Remove the plastic cover (5) by removing the screws visible on the rear of the display and lifting the cover up

Remove the metal cover after removing the screws 19

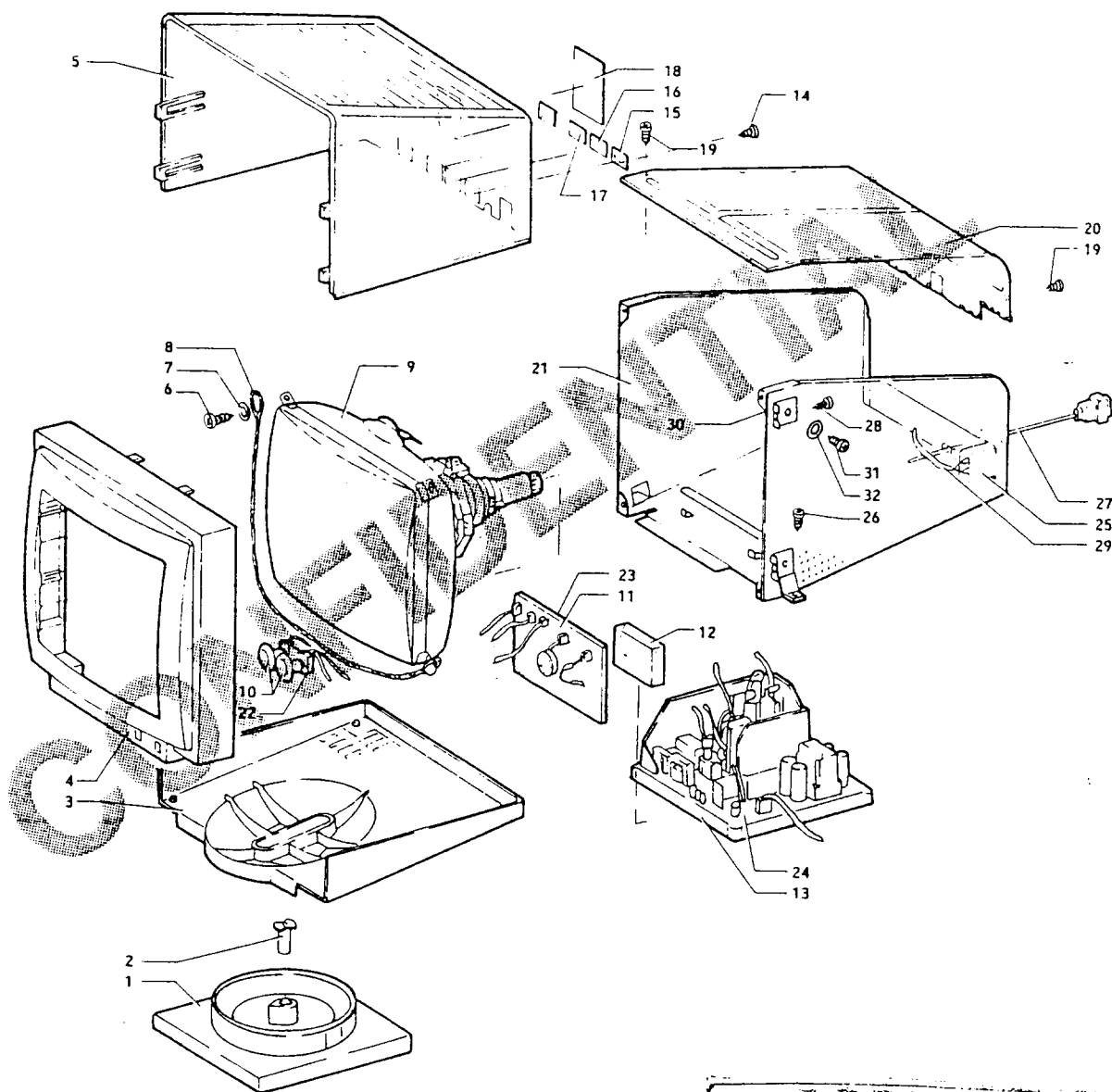
Video Board

Disconnect all connections and lift the video board gently off the CRT socket

Main Board

- All the circuits, power supply included, are on the board located on the bottom of the display unit
- Remove the 4 screws (31) and lift out the main board.

To set the circuits back in place, reverse the above procedure.



PROPRIETARY

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Fig. 2-16 Mechanical Disassembly Diagram

REF.	DESCRIPTION	CODE	QUANTITY
1	Base	50424150	1
2	Support pin	50424170	1
3	Support plate	50424280	1
4	Outer frame	50424260	1
5	Cover	50424250	1
6	Self-thread screw 4.8 x 16	40048017	4
7	Toothed washer 6.5 x 22 x 2.4	42000700	4
8	CRT ground cable	61006310	1
9	Philips 14" CRT	20830550	1
10	Knob	50424180	2
11	Video printed circuit	62009410	1
12	Video circ. stop	53879070	1
13	Mounting frame	50116111	1
14	Self-thread screw 2.2 x 6.5	40022065	6
15	Serial ns label	53879780	1
16	VDE label	53875281	1
17	GS label	53875430	1
18	Mask	50424160	1
19	Self-thread screw 3.5 x 9.5	40035095	9
20	Chassis cover	50116601	1
21	Chassis	50116591	1
22	Potentiometers support	50117400	1
23	Video circ. shield	50117490	1
24	Basic circuit	62009400	1
25	Mains group	34020680	1
26	Screw M4 x 7	40114016	4
27	Signals cable	61006240	1
28	Screw M4 x 9	40114029	4
29	Mains group cable	61006270	1
30	Front bracket	50116662	4
31	Self-thread screw 3.5 x 9.5	40935095	4
32	Toothed washer 4.2 x 9 x 0.8	42000660	4

IMPORTANTE

QUESTA LISTA COMPONENTI E' REDATTA DA D.R.S.
(DIREZIONE RICAMBI E SCORTE)

PER EVENTUALI INFORMAZIONI RIVOLGERSI A: O.R.S.
Telex: 210030 - Fax: 39 (0) 125 521122

IMPORTANT

THIS COMPONENTS LIST IS EDITED BY D. R. S.
(DIREZIONE RICAMBI E SCORTE)

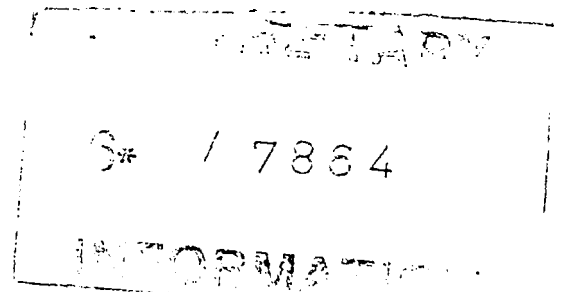
FOR ANY ADDITIONAL INFORMATION REQUIRED, PLEASE CONTACT:
D. R. S. Telex: 210030 - Fax : 39 (0) 125 521122

NOTA

B = COMPONENTI CUSTOM

NOTE

B = CUSTOM COMPONENTS



LISTA COMPONENTI ELETTRONICI
ELECTRONIC COMPONENTS LIST

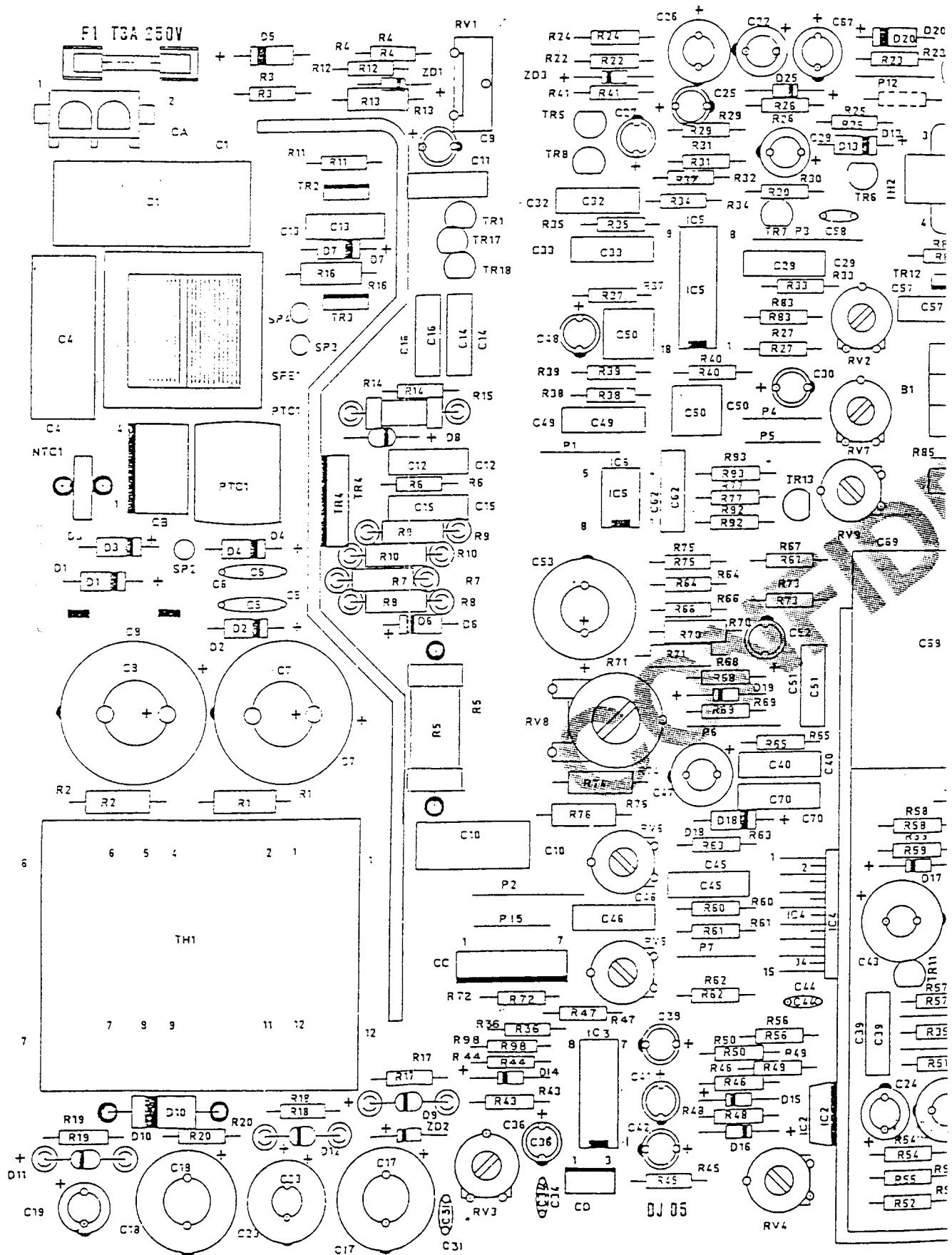
CODE	DESCRIPTION	QTY	NOTES
140836 Y	TRANSISTOR BF 459	1	
142699 D	TRANSISTOR BSX 20	12	
142739 C	DIODE ZENER ZPD 5.1 1/2W	3	
143106 U	TRANSISTOR BC 557 B	3	
143108 E	TRANSISTOR BC 547 8	15	
143109 F	TRANSISTOR BD 135	1	
143421 P	CHOKER COIL 8 MH UTF16	2	B
143704 B	COGEMA COIL 6.8 MH	3	B
143820 T	CAPACITOR 1 nF 1000V 10% POLIES.	1	
I44469 G	I. C. TDA 2593	1	
144822 J	I. C. TDA 1670A	1	
I44825 M	DIODE ZENER ZPD 6.8V 1/2W 2%	2	
144831 K	TRANSISTOR MJH 16018	1	
144835 P	NTC PHILIPS 2322.644.9000s	1	B
145057 x	DIODE BYV 26 D	5	
145059 H	DIODE ZENER ZPY 68 1 .3W	1	I
145222 Z	I. C. CS 3046	3	
145404 z	TRANSISTOR BF. 859	3	
145621 Z	CAPACITOR 5.6 nF 1750V 5% POLIES.	1	I
145641 D	CAPACITOR 6.8nF 2kV 20% CERAMIC	1	I
145707 G	TRANSFORMER EHT 1172.00180	1	B
145708 R	I. C. TDA 8145	1	
I45765 H	POTENTIOMETER 100 kOhm UTH2560	1	B
145766 A	TERM.M.FACO TE115 2.8x0.8	1	B
145767 B	POTENTIOMETER 470 Ohm UTH2561	1	B
145768 L	CAPACITOR 12 nF 630V 10% POLIES.	1	
145769 M	TRANSFORMER SWITCH 2082.358B/C	1	B
145770 J	TRANSFORMER DRIVER AT4043/83	1	B
145771 F	TRANSISTOR F464	1	
145772 G	DIODE MUR4100	2	
I45773 H	DIODE MUR440	1	
145774 A	DIODE ZENER ZPY 47V 1.3W	1	
145775 8	DIODE ZENER ZY130	1	
I45776 C	PTC PHILIPS 2322.662.96011	1	B
145778 N	LINEARITY COIL UTF87	1	B
145779 P	PICT. TUBE+DEFLEC. YOKE H.R.PHILIPS M37-108X-N/1140	1	B
4800150 M	DIODE BAW 62	4	
4800152 S	DIODE 1N4148	13	I
4800240 N	DIODE 1N4007	5	
4800788 8	DIODE BA159	5	
4846802 E	TRANSISTOR BDX 54 A	1	
4848527 T	TRANSISTOR BC 327	1	
4848543 U	TRANSISTOR BD 138	1	

CODE	DESCRIPTION	QTY	NOTES
4849515 N	TRANSISTOR BC 337	1	I
4855804 L	I. C. MA 7805	1	
4855811 C	I. C. MA 7812	1	
4866285 U	I. C. SN 74LS86N	1	
4905472 E	RESISTOR 2.2 MOhm 1/4W 5% CARBON	1	
4906354 X	RESISTOR 82 kOhm 1/4W 5% CARBON	1	
4911151 E	RESISTOR 120 Ohm 1/4W 5% CARBON	1	
4912043 G	RESISTOR 10 Ohm 1/4W 5% CARBON	3	
4922690 G	RESISTOR 47 Ohm 1/4W 5% CARBON	7	
4922858 Q	RESISTOR 68 Ohm 1/4W 5% CARBON	1	
4923073 G	RESISTOR 100 Ohm 1/4W 5% CARBON	6	
4923231 P	RESISTOR 150 Ohm 1/4W 5% CARBON	4	
4923390 W	RESISTOR 220 Ohm 1/4W 5% CARBON	1	
4923538 T	RESISTOR 330 Ohm 1/4W 5% CARBON	7	
4923710 W	RESISTOR 470 Ohm 1/4W 5% CARBON	4	
4923790 E	RESISTOR 560 Ohm 1/4W 5% CARBON	6	
4924070 L	RESISTOR 1 kOhm 1/4W 5% CARBON	12	
4924150 B	RESISTOR 2 kOhm 1/4W 5% CARBON	3	
4924230 B	RESISTOR 1.5 kOhm 1/4W 5% CARBON	9	
4924392 Y	RESISTOR 2.2 kOhm 1/4W 5% CARBON	2	
4924439 J	RESISTOR 2.4 kOhm 1/4W 5% CARBON	1	
4924550 K	RESISTOR 3.3 kOhm 1/4W 5% CARBON	2	
4924773 Q	RESISTOR 5.6 kOhm 1/4W 5% CARBON	1	
4925058 M	RESISTOR 10 kOhm 1/4W 5% CARBON	12	
4925370 D	RESISTOR 22 kOhm 1/4W 5% CARBON	1	
4925450 M	RESISTOR 27 kOhm 1/4W 5% CARBON	4	
4925530 M	RESISTOR 33 kOhm 1/4W 5% CARBON	4	
4925690 V	RESISTOR 47 kOhm 1/4W 5% CARBON	2	
4925770 M	RESISTOR 56 kOhm 1/4W 5% CARBON	1	
4925858 D	RESISTOR 68 kOhm 1/4W 5% CARBON	1	
4926058 Z	RESISTOR 100 kOhm 1/4W 5% CARBON	5	
4926131 J	RESISTOR 120 kOhm 1/4W 5% CARBON	1	
4926690 H	RESISTOR 470 kOhm 1/4W 5% CARBON	1	
4926930 J	RESISTOR 820 kOhm 1/4W 5% CARBON	1	
4931040 M-J	RESISTOR 1 Ohm 1/4W 5% CARBON	1	
4943295 Y	RESISTOR 820 Ohm 1/4W 5% CARBON	1	
5074947 U	CAPACITOR 4.7 nF 500V -20+80% CERAMIC	2	

PROPRIETARY

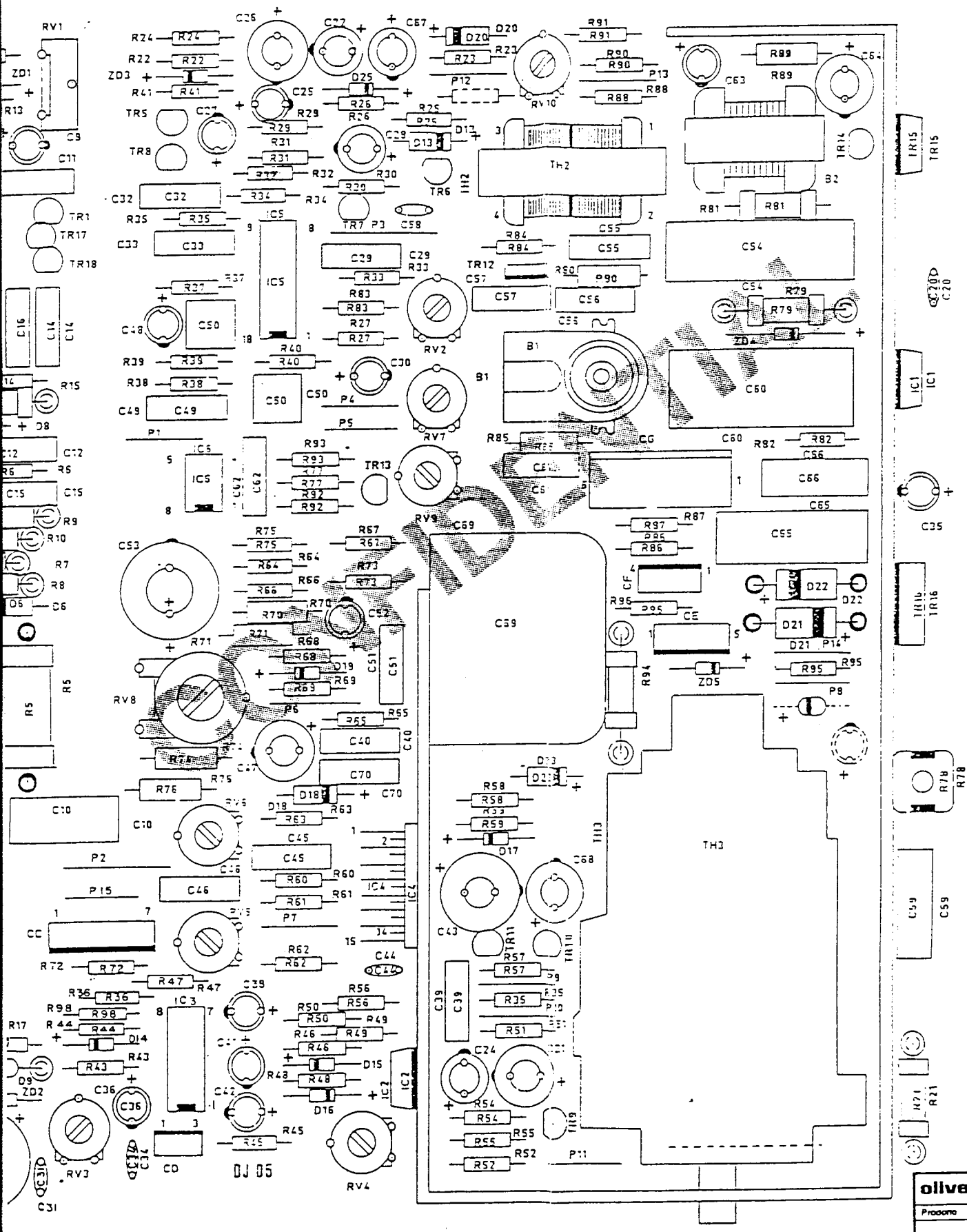
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INFORMATION



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VIMO PIASTRA ATTUAZIONI

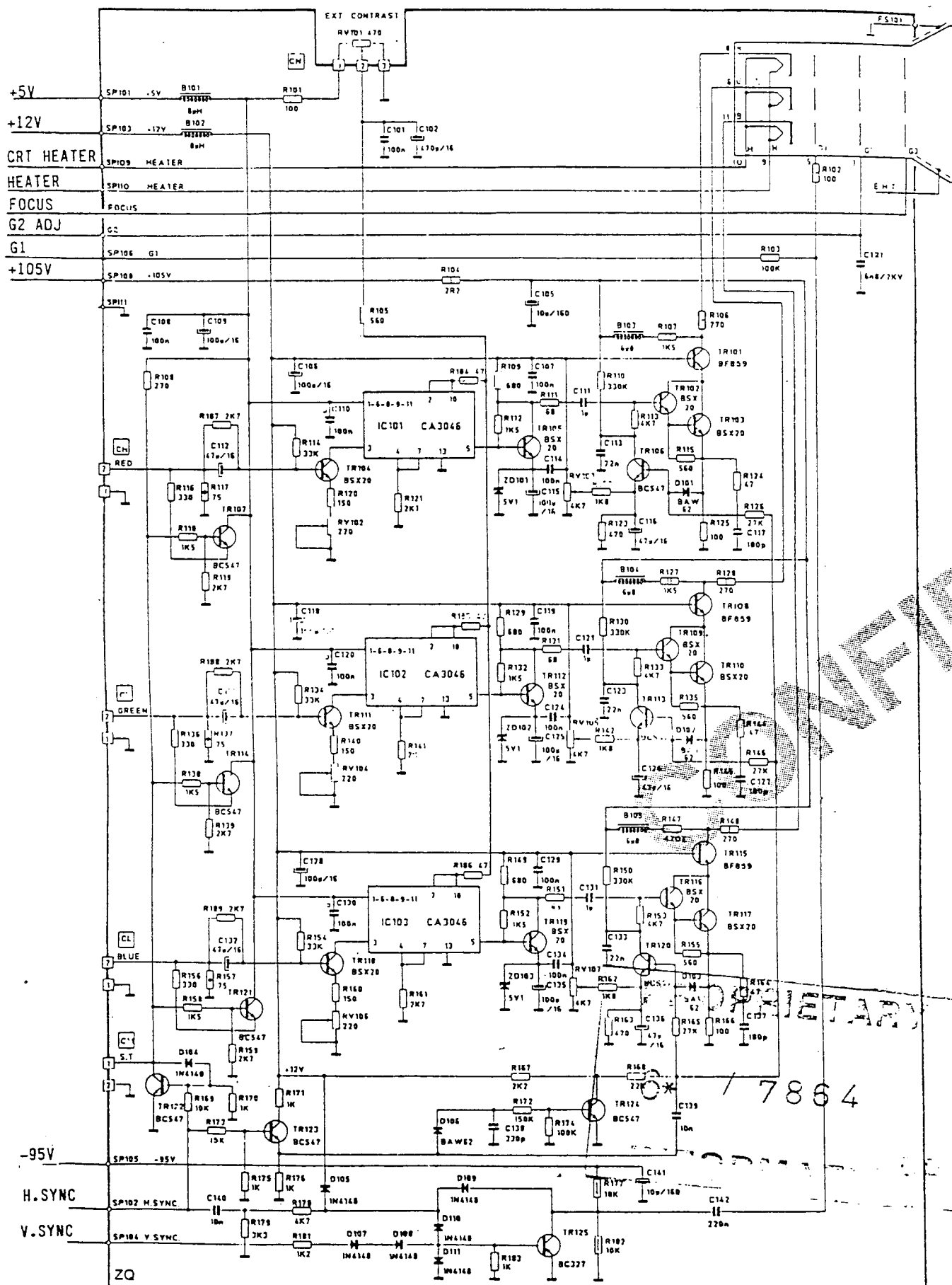


olivetti	
Prodotto	Descrizione

PROPRIETARY INFORMATION: the information herein is intended for use by authorized employees only and is not to be disclosed to others, except by written permission of Olivetti.

olivetti	Descrizione	Mov.	Data	Mov.	Data	Rit.
			MASSICIA-12-89			
Prodotto						Codice e Sull
						1119368 A H

PIASTRA FINALE VIDEO



olivetti	Descrizione	Mov	Data	Mov	Data	Rel
	Prodotto					Codice - Suff
			16/06/88			1111111111111111

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PROPRIETARY INFORMATION: If
employees only and is not to be dis

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	May	Date	May	Date	Ref
	MAY	76-298			
					Cadence
					Suff
					1414936B AA

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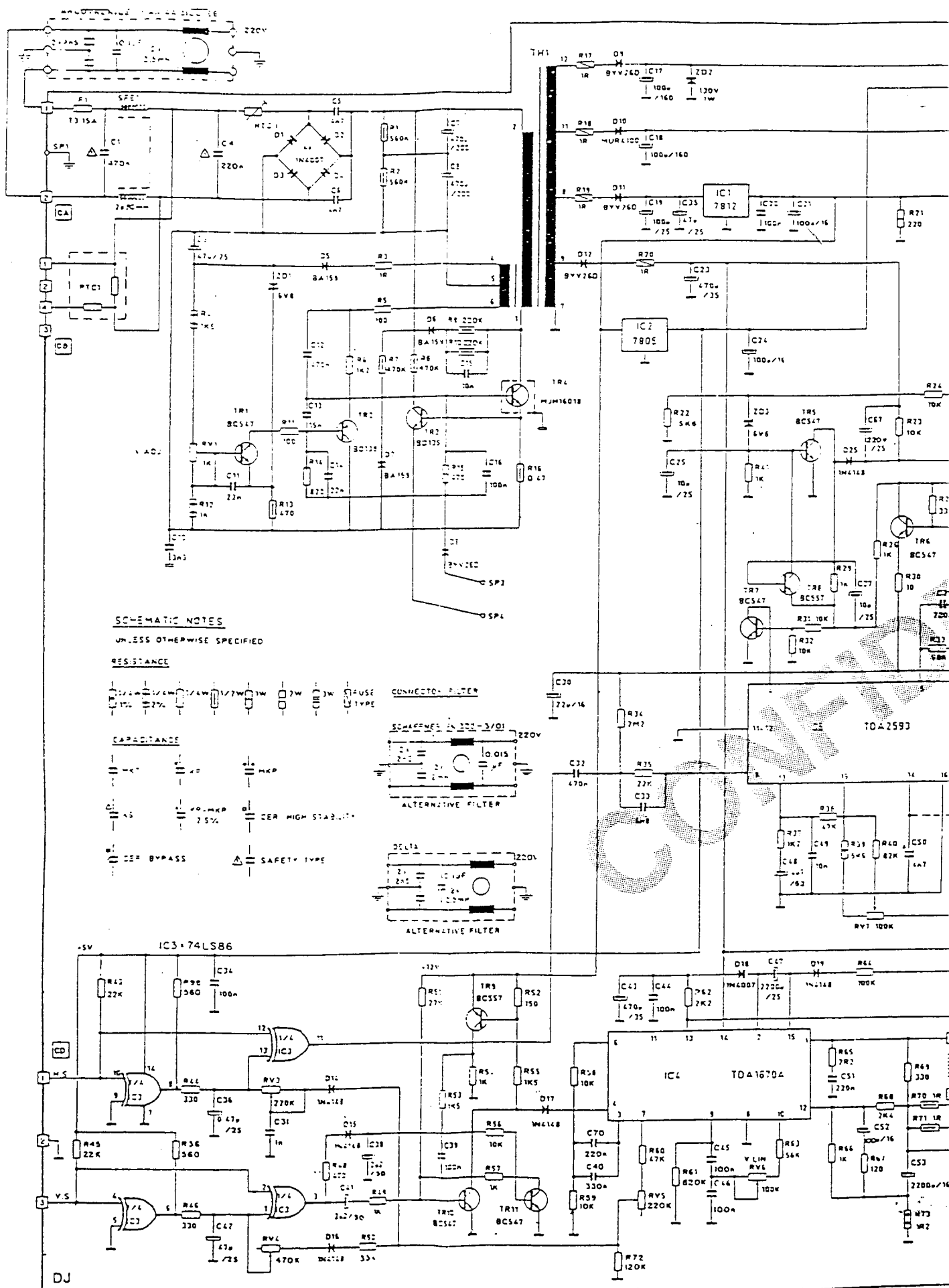
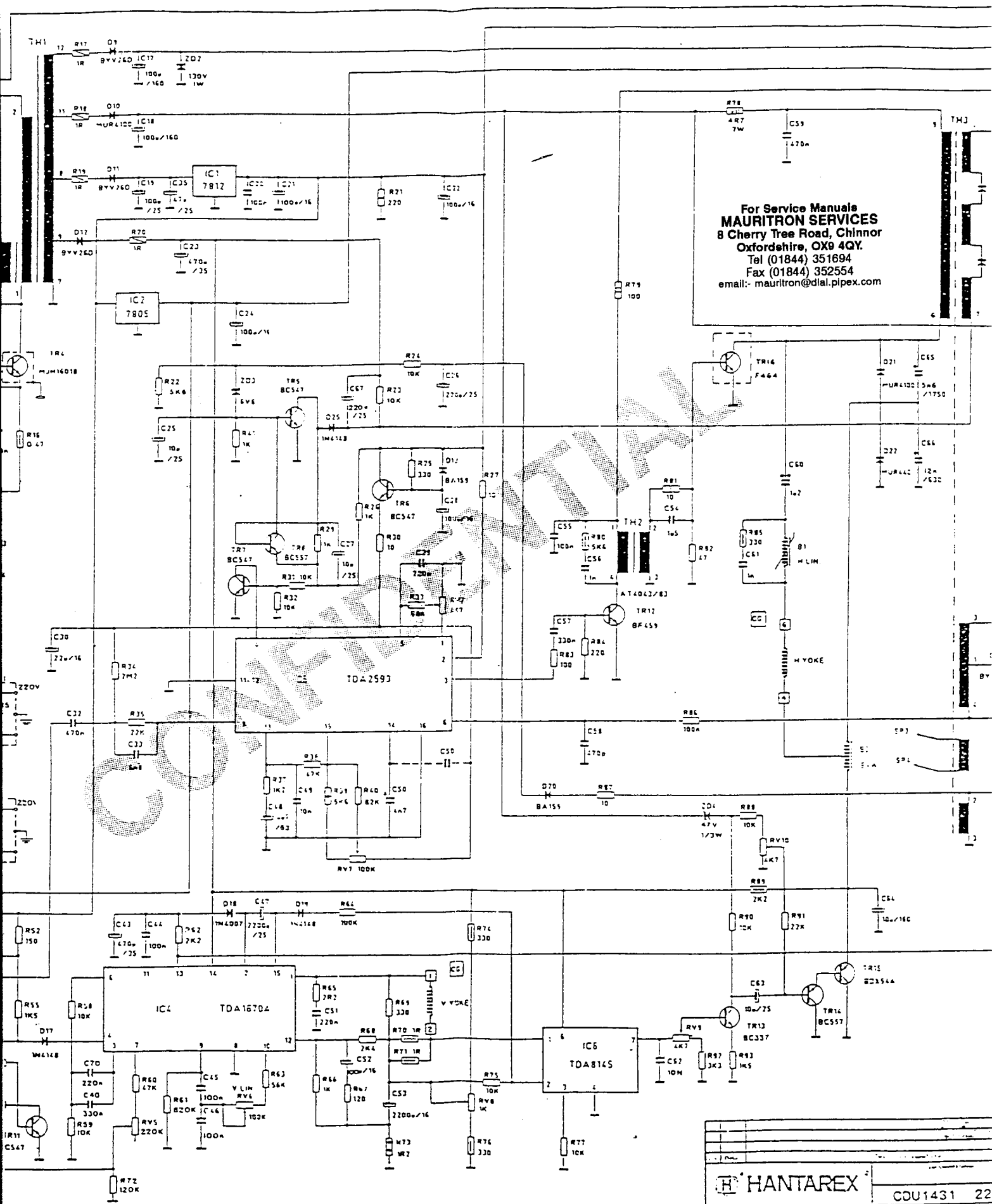
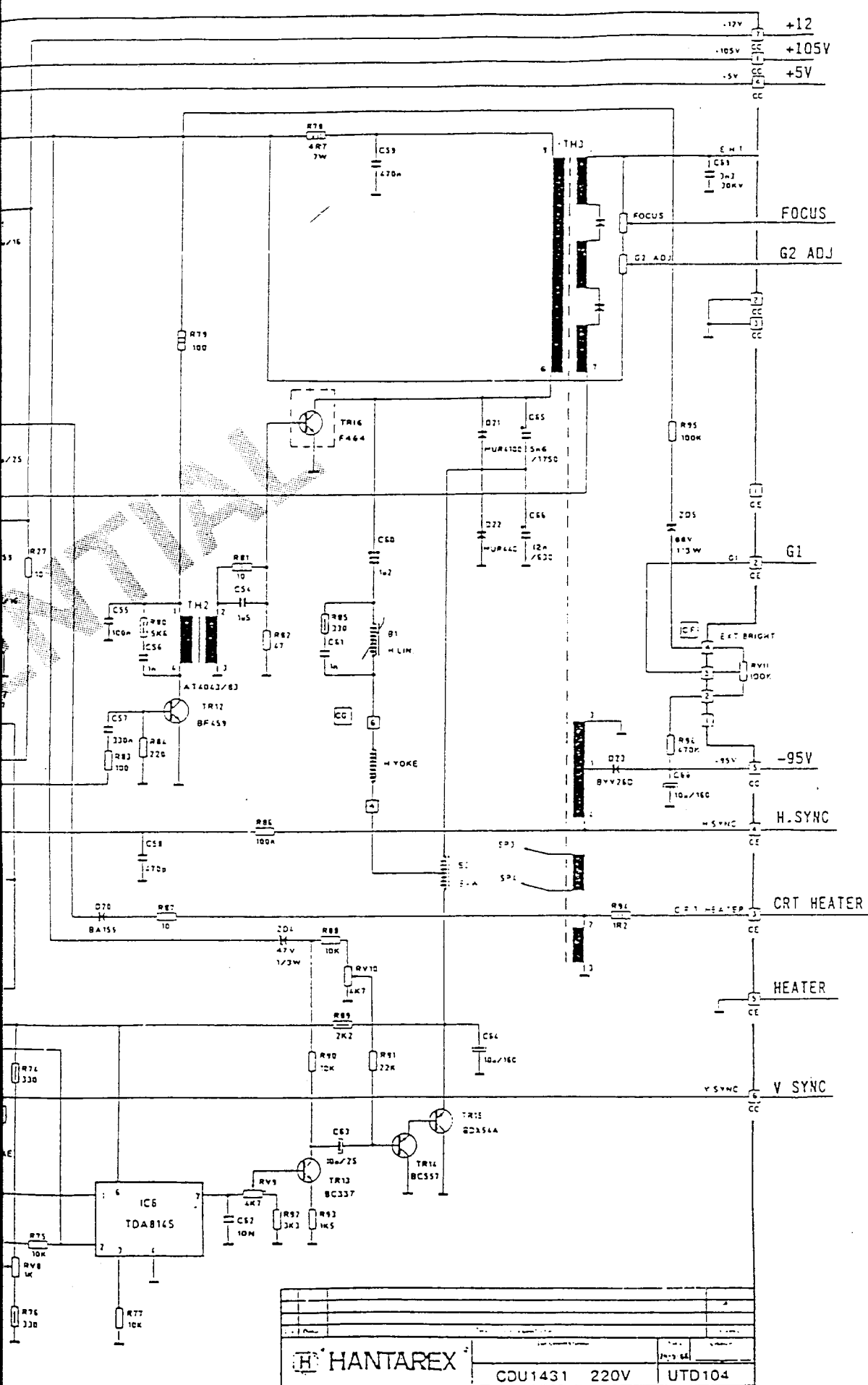
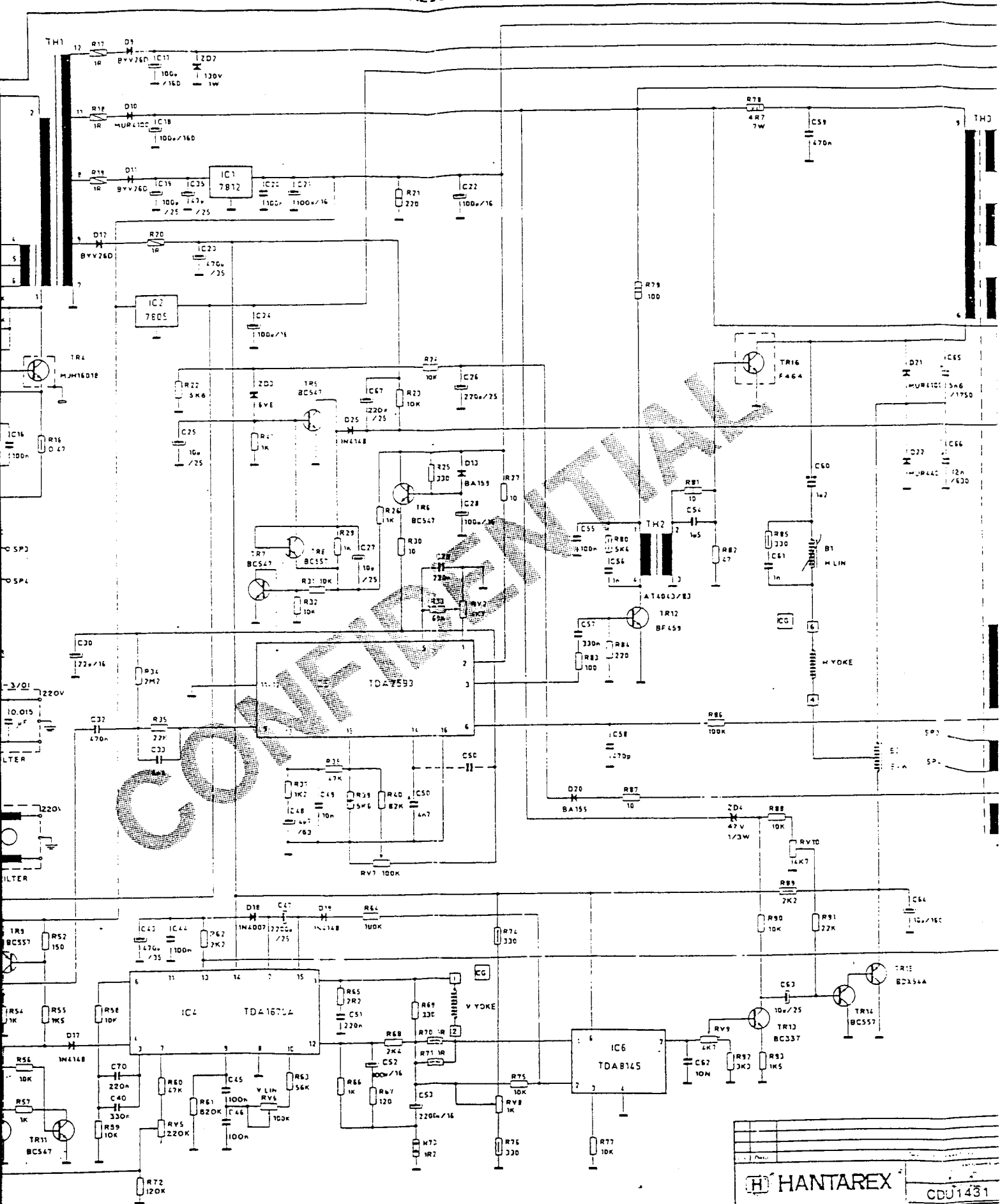


Fig. 2-17 General Circuit Diagram





PIASTRA ATTUAZIONI



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Prodono	Olivetti	

