GRUNDIG E2000 Series

Recommended Safety Parts

Item	Part No.	Description				
C 100	435515	220n	250Vac	20%		
C 114	433001	MKP	2n2	250	Vac	20%
C 124	435017	MKP	470n	400V	10%	
IC 104	412092	IC	TCDT1101GA			
L 100	440516	RFI choke				
R 115	428000	MG	10M	1/2W	5%	
R145	426017	MFF	1R	1/2W	10%	
R 200	426020	MFF	3R3	1/2W	5%	
R 205	421004	SMD	0805	10K	5%	
R 300	426011	MFF	1K	1/2W	5%	
R 302	426001	MFF	0R22	1/4W	5%	
R 311	426002	MFF	1R	1/4W	5%	
R 314	426013	MFF	6R8	1/4W	5%	
R 315	426005	MFF	10R	1/4W	5%	
R 330	426015	MFF	68R	1/2W	5%	
R 332	426012	MFF	27R	1/4W	5%	
R 832	426002	MFF	1R	1/4W	5%	
R 904	426018	MFF	47R	1/4W	5%	
T 100	274012	SMT	47	10469220		
F 100	460004	FUSE 3,15 AT				

Safety Specifications

This television set complies with class II safety specification, indicated by the symbol ***.
After carrying out maintenance work on class II sets, it is advisable to measure the insulation resistance and leakage current on sets in working order, in accordance with the EN 60-065 standard (NF C 92-130).

Measurement of insulation resistance according to the EN 60-065 standard:
Connect an insulation resistance measuring instrument (U test = 500V-) simultaneously to the two poles of the mains plug and all the accessible metal parts of the television set (aerial, base etc.)

It is operating correctly if
• Insul. R. ≥ 2 Mohm for U test 500 V-.
• Duration of measurement ≥ 1 second.

Note: Class II sets may be designed with insulation below 2 Mohm (discharging resistor).

Connections
Measurement of leakage current according to the EN 60-065 standard:
Connect a milliammeter (U test =220 V-) simultaneously to both poles of the mains plug and all the accessible metal parts of the set (aerial, bases, etc.)

It is operating correctly if:
• leakage current ≤ 1 mA for U test = 220 V-.
• Duration of measurement ≥1 second

Connections
Measurement of insulation resistance (M Ohm)
Measurement of leakage current (mA)

Set Functions

POWER SUPPLY
The supply system is a traditional one with insulated and autonomous switching. After rectification and filtering, the supply is applied to the T100 transformer. The TR101 transistor is controlled by the IC101 integrated circuit. The starting voltage of IC101 is taken from the mains supply by R114, D130, D131 and C124.

Regulation of the supply
Regulation is obtained by comparison between a resultant of the voltage + 150V (D115), a voltage fixed by the B+ microprocessor (pin 9 IC501) and a reference voltage internal to CbS. An error current is generated then transmitted via IC104 to IC101 (pin 15), which adapts the width of the drive pulse of TR101. Protection against overcurrent is provided by comparing a reference voltage internal to IC101 with a voltage derived from R113, R116, R117.

Standby mode
The “Standby’ voltage derived from IC501, switches T102, T100 and activates the D125 thyristor. A voltage derived from T100 (pin 9) is applied via D124, D125 to IC100, which delivers a +5V_SBY voltage. In standby mode the value of the other voltages is reduced by approximately 10 %. T103 switches IC101 in standby operating mode.

Supplies

Outputs	Uses
+ 16.5 V	Audio supply.
+ 150 V (+B)	Line stage, tuning voltage
+ 12.1 V	Line stage
+ 8 V	Video and stereo processor switching
+ 5 V	FI, tuner, videoprocessor, audio processor and microprocessor.
+ 5 V_SBY	Standby supply for IR receiver, LED and microprocessor.

Supply safety
If there is a short circuit on one of the supplies : +16.5 V, +12.1 V, +5 V, the uP safeguards the set.
Note : uP pin 20 voltage: in normal operation: ~ 1 V=, in fault or standby mode : ~ 5 V=

All the secondary supplies are insulated so that the main heat sinks and external connections are at earth potential for the safety of the user.

CAREFUL THE HEAT SINK OF TR 101 IS LIVE.
R115 and C114 are insulating components designed to balance the earth potentials of the frame (insulated and non-insulated side) and eliminate HF parasites.

CAUTION: If these parts are changed, it is essential that they be replaced by manufacturer’s parts.

THE MICROCONTROLLER
The SDA 5250 microcontroller (IC501) fulfils the following functions:
- Control of frequency synthesis for the tuner
- Teletext, on-screen graphic display generator
- It has a series-in for the infrared remote control, and a I2c port for communications with other integrated circuits
- It manages the switching of the different modes and options.

The conditions required for correct uP operation are as follows:

• Supply voltage of 4,8 V on pin 13.
• Clock frequency of 18 MHz on pins 14 an 15.
• Reset pulse on pin 16.
• Bidirectional I2c bus: SCL clock line (pin 56), data line (pin 57).

IC501 pins
Pin 1 NC.
Pin 2 Switching (A) of IC701 (MICOP02).
Pin 3 Switching 4/3 - 16/9 of vertical stage (IC200) (ODD/EVEN)
Pin 4 Not in use
Pin 5 Presence of headphones
Pin 6 Switching of FI inputs of IC602 (SYSTEM)
Pin 7 Adjustment of vertical framing (U_SHIFT)
Pin 8 Threshold of AGC voltage (AGC_DRIVE)
Pin 9 Threshold voltage for regulation of supply (B+)
Pin 10 Switching of the Bd I L’ standard (SYS)
Pin 11 BG/LL’ switching (CVBS_MOD)
Pin 12 Earth
Pin 13 VDD(4-4.8V)
Pin 14 18 Mhz oscillator
Pin 15 18 Mhz oscillator
Pin 16 uP reset
Pin 17 Address and data lines of IC500
Pin 18 Address and data lines of IC500
Pin 19 Address and data lines of IC500
Pin 20 Supply safety
Pin 21 Address and data lines of IC500 to 44
Pin 45 On-screen graphic incrustation to 48
Pin 49 NC.
Pin 50 Earth
Pin 51 VDD (+5 V SBY) uP supply in standby mode
Pin 52 Teletext oscillator to 53
Pin 54 Horizontal and vertical synchro inputs to 55 (HSYNC) (VSYNC)
Pin 56 SCL (clock) of 12c bus
Pin 57 SDA (data) of 12c bus
Pin 58 Standby switching (STY)
Pin 59 Control line of IC701 (VID_SW)
Pin 60 Control line of IC701 (SCART2_EN)
Pin 61 Not in use
Pin 62 Not in use
Pin 63 UHF switching (see note)
Pin 64 Pin 8 socket AV2 voltage detection (SC2_PIN8)
Pin 65 Pin 8 socket AV1 voltage detection (SC1_PIN8)
Pin 66 AGC time constant
Pin 67 AFC voltage input
Pin 68 Earth
Pin 69 PLL filter for TXT and VPS
Pin 70 PLL filter for TXT
Pin 71 PLL filter for VPS
Pin 72 Teletext supply
Pin 73 PLL reference
Pin 74 Video input for teletext (AV-CVBS)
Pin 75 Matrix for the V+, V-, P+ and P- buttons on the front panel of the set
Pin 76 Audio mute (SPEAK_MUTE)
Pin 77 Matrix for the V+, V-, P+ and P- to 78buttons on the front panel of the set
Pin 79 Series-in receiving orders from the remote control
Pin 80 Matrix for the V+, V-, P+ and P- buttons on the front panel of the set

FI VIDEO DEMODULATION

FI demodulation is provided by the integrated circuit IC602 TDA 4470M (BG/LL’ standards) or TDA 4472M
(BG standard).
The AGC voltage for the tuner is supplied to pin 11 of IC602.
The threshold of the AGC voltage, fixed by the uP (IC501) arrives on pin 10 of the IC602.
The FI signal from the tuner, after going through the FOS (SAW601), arrives on pins 6 and 7 of IC602.
The BG/LL’ switching is done by pin 13.
The video output on pin 12 is injected into pin 2 of IC800 after switching in IC701.

THE VIDEO PROCESSOR MC 44002/07

Note : the MC 44007 integrated circuit is intended for operation on the PAL standard only.

IC800 is a video processor with the basic functions for a colour television (processing of chrominance, video and time bases). All the controls are done via the I2c bus. Access and setting controls are explained in the chapter on SERVICE MODE.
Video input is done on pin 2 for the signal coming from the FI stage and on pin 4 for external signals coming from the S-Video and Video IN sockets.
After separating the chrominance and luminance signals, R-Y and B-Y (pins 36 and 37) are applied to the IC801 digital delay line, then to the IC 802 CTI circuit (improvement of colour transitions) before being once again injected into IC 800 (pins 26 and 27).
After mixing with the luminance, then matrixing, the RGB signals (pins 17, 18, 19) are taken to the cathode-ray tube via TR801, TR802 and TR803.
IC also includes the time base circuits, and delivers raster and line synchronization pulses (pins 7 and 12). A system of limiting the output of the cathode-ray tube (beam brake) allows one to ensure that the video output is still suited to the characteristics of the latter (pins 9 and 10).
IC800 has a system of automatic correction of the grey scale level (pin 20).

AUDIO PART
The E2000 frame is equipped, depending on the type of television set, with a progressive audio system:
- NICAM digital stereo sets (sets of the type : CE 70x5), are equipped with the basic audio system.
- 3D NICAM digital stereo sets (sets of the type: CE 70x6), are equipped with the basic audio system plus a Dolby 3D module.

DOLBY SURROUND PRO-LOGIC sets (sets of the type : CE 70x7), are equipped with the audio system
plus the DOLBY SURROUND PRO-LOGIC module.

FI AUDIO DEMODULATION
FI demodulation is provided by the integrated circuit IC602 TDA 4470M (BG/LL’ standards) or TDA 4472M (BG standard).
The FI signal from the tuner goes through the FOS (SAW600), and arrives on pins 1 and 2 of IC602. The audio intercarrier output is done on pin 24 and transmitted to IC1 (pin 58) for NICAM, FM, 2 tone, double language sounds.
Demodulated AM sound comes out at pin 25 and is transmitted to IC1 (pin 55).
For sound on band I in L’ standard, the FI signal arrives at pins 27 and 28 of IC602 via the FOS (5AW602). The intercarrier output is at pin 24.
The switching of audio inputs is done by pin 3 : If the voltage of pin 3 is between 0 V and 0.8 V inclusive, pins 1 and 2 are selected if the voltage is between 2 V and 5 V inclusive, pins 27 and 28 are active.

AUDIO PROCESSOR MSP 3400C
The MSP 3410D (ICI) is a multisystem audio processor, capable of decoding NICAM, FM, stereo, double language or mono signals. The MSP3400C has the same features, but without the NICAM decoding. The audio intercarrier is applied to pin 58 for NICAM, FM sound demodulated AM (LL’) sound is applied to pin 55.
The MSP 3410D has an integrated AGC block which allows it to treat signals situated in the 0.14 V to 3 V range peak-to-peak. The amplified signal is then transmitted to an A/D converter to be processed.

The audio processor is able to choose between several audio inputs:
- FM, NICAM, 2 tone intercarrier AM intercarrier (France)
- Video input SCART socket 1 (stereo)
- Video input SCART socket 2 (stereo)
- Cinch sockets (stereo)

The audio processor also has two ND converters allowing the connection of:
- Loudspeakers
- Headphones or cinch outputs.

After processing (bass, treble, balance), the BF signal (pins 28 and 29) is transmitted for amplification to IC250. Headphone outputs are on pins 25, 26.

Note : The headphone socket and the audio OUT sockets (situated at the back of the television set) are paired. If no headphones are connected, the BF output level is fixed on these sockets and allows the television set to be connected to a hi-fi system, for example. If the user plugs in some headphones, the BF level is variable using the V+ or V- buttons, and the television speakers are cut off.

3D MODULE and *DOLBY SURROUND PROLOGIC
The 3D and DOLBY SURROUND PROLOGIC modules are identically equipped. A software configuration, accessible only in the factory, allows operation in 3D.

***DOLBY SURROUND PRO LOGIC 3D AUDIO PROCESSOR - DPL3619A**
The stereo signals containing the coded DOLBY SURROUND PRO LOGIC information are processed by the IC950 linked with ICI by means of the PS bus. The BF outputs of the central and rear paths are supplied by IC950 to pins 21 and 25.

BF AMPLIFIERS
The final amplification of the left and right paths is provided by the integrated circuit TDA 7297 (IC250).
BF inputs by pin 4 for the right-hand path and pin 12 for the left-hand path, amplified outputs on pins 1 and 2 for the right-hand channel, on pins 14 and 15 for the left-hand channel (symmetrical outputs).
Output impedance : 8 Ohm)

The final amplification of the centre and rear paths, for DOLBY SURROUND PRO LOGIC provided by the integrated circuit TDA 7297 (IC550).
BF inputs by pin 4 for the centre path and pin 12 for the rear path, amplified outputs on pins 1 centre path, on pins 14 and 15 for the rear path (symmetrical outputs).
Output impedance of the centre path : 8 Ohm
Output impedance of the rear path :16 (Ohm or 2 8 Ohm loudspeakers mounted in a series circuit.

TELETEXT
The teletext decoder circuit is integrated in IC501 (microcontroller). The decoder has a capacity of 8 pages of teletext and will automatically detect the FLOF and TOP modes.

REMOTE CONTROL KEYS
1) Placing on standby and restarting the television set
2) Numerical buttons: direct selection of programme numbers and pages in teletext mode.
3) Selection (+ or -) of programmes:
Selection of lines in the different menus.
Selection (+ or -) of page numbers in teletext mode. Rapid scrolling of programmes, menu lines and teletext pages when the button is held down.
4) Setting (+ or -) of sound volume. Modification of settings in the different menus.
5) Access to the different menus by pressing repeatedly.
6) Access to the channel tuning menu.
7) Store button in channel setting mode, sort menu.
8) Button to stop scrolling of multiple pages on one sub-page in telextext mode
9) Button for cutting out and restarting the sound.
10) On-screen display button:
- for programme number.
- for masked information in teletext mode.
11) Allows the summary page to be displayed in telextext mode.
12) Direct access button to picture menu orto submenu in teletext mode.
13) Direct access button to audio menu orto submenu in teletext mode.
14) Direct access button to function menu orto submenu in teletext mode.
15) Direct access button to sort menu orto submenu in teletext mode.
16) Mono/stereo or language I/II selection.
17) Teletext mode button; press again to incrust the text in the picture, and again to return to normal teletext mode.
18) Button allowing a return to TV mode from the different menus or from teletext mode.
19) Button allowing the doubling of the size of the teletext characters by pressing once to display the top half of the page and again for the bottom half and again to return to normal display.
20) Numerical button 0 and selection of positions of AV programme by pressing repeatedly.

Channel Setting

Automatic search
• Press the TUNE button (6) for 3 seconds, the SETTING menu is displayed.
• Press the GREEN button (13), the AUTO menu appears and the search starts.

When the automatic search is finished, the SORT menu appears (see instructions).

Manual search
You may use this method if you know the channels in your area.
• Press the TUNE button (6) for 3 seconds, the SETTING menu will appear.
• Press the YELLOW button (14), the MANUAL menu appears.

Example of display:

	Manual
Programme	01
Channel	C 60
Standard	LL’ (Light displayed only on sets with several reception standards)
Band	UHF
Fine Tuning	00
Tuning	-----I-----

RED: -
GREEN: RF/Cable
YELLOW: Exit
BLUE: Store

• To move between different menus, use the P+, P- buttons (3) to select the option (the option

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Channel Setting Cont'd

selected is highlighted). Use the V+, V- buttons (4) to modify settings (eg. programme number, channel number, etc.)

- Select the line Programme, type the programme number using the numbered buttons (2) or the P+, Pbuttons (3).
- To modify the standard, if necessary, for sets with this function. Select the line STANDARD, use the buttons V+, V- (4) to change the reception standard : LL' for French channels, BG, I/I' for other European channels.
- Select the line Channel, if the channel you are looking for is brodcast in the Cable Networks standard, press the GREEN button (13), the display will change from C-- to S-- (the same button allows you to come back to the C-- display): C for hertz reception, S for satellite reception.
- Type the channel number using the numbered buttons (2), as a two digit number (eg. C2- first), then the second digit (eg. C25). For channels between 0 and 9 type 0 instead of the first digit (eg. S05).
- If you do not know the channels in your area, it is possible to do an automatic search as follows:

Hold down the V+ button (4), the channel search is carried out step by step in ascending order or in descending order with the V- button (4). The search stops as soon as a transmitter is found. If the channel is not what you want, start the search again as before.

Note: the UHF, VHF1 and VHF3 bands are automatically explored (depending on the country).

- Store by pressing the BLUE button (15). The <<blue>> block (dialogue line) will display OK for about one second (to signal storing) before displaying STORE again. Proceed in the same way for all the channels.

Fine tuning

The channel is automatically tuned to its optimum setting, although certain local conditions of reception may make however a deviation necessary. The channel must then be fine tuned. The fine tuning is made by successive jumps (±63 steps) of 62.5 Khz each.

- Select the line FINE TUNING using the P+ or P- buttons (3).
- Change the setting using the buttons V- (4) (negative fine tuning) or V+ (4) (positive fine tuning).
- Store as before.

Service Mode

The service mode is specially designed for the maintenance of the television set. It allows the main geometry, white balance, AGC, G2 and frame configuration adjustments, etc. to be carned out.
To activate service mode, hold down the buttons P+ and P- [3] (on the front of the set), then switch on the television set by pressing the on/ off button [1], until the picture appears. The service menu appears on the screen.
In order to select the different functions and to modify the settings, the use of the remote control is essential.

The function **Vert lin** is automatically selected.

- To choose a function in service mode, press the P+ or P- buttons (3).
- To modify the setting, press the V+ or V- buttons (4).
- To store the settings and quit service mode, press UPDATE button (7).
- To quit service mode without storing, press the TV button (18).
- To go from one page of the service menu to another, press the MENU button (5).

Particularity: the selection of the G2 function has the effect of masking page 1 of the service mode, with only G2 remaining on the screen. The contrast value (maximum) and brightness (minimum) are adjusted automatically. Pressing on the P+ or P- buttons (3), to choose another function, will display page 1 again.

Explanations of Functions

Note: before changing IC502, note the values and selections defined in service mode (pages 1 and 2) in order to be able to program them back in as soon as the IC502 replacement has been carried out.

R, G, B settings: depending on the type of cathode-ray tube the values defined are as follows:

	Panasonic 66 EAK 071X11	Philips 66 ECF 50X05
R	53 Steps	50 Steps
G	38 Steps	39 Steps
B	38 Steps	33 Steps

Page 1

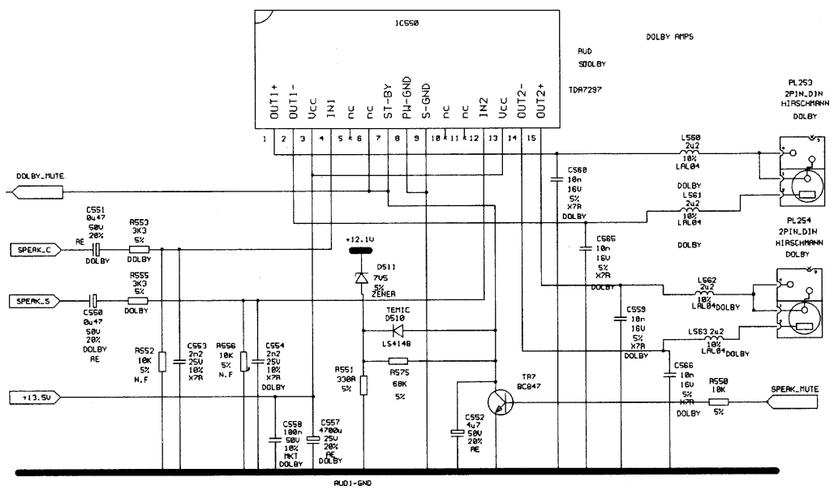
Functions E2000 version x.xx	Adjustment / Selections	Remarks Number of software version.
G2	G2 voltage	Voltage too high : green square displayed. Voltage too low : red square displayed. Voltage correct : no display; Adjust the G2 potentiometer (on T300). Grid test card.
Vert lin	Vertical linearity	Grid test card.
Height	Vertical amplitude	Grid test card.
H Phase	Horizontal framing	Grid test card.
R	White balance	Adjust for minimum colouration of white bar. Bar card with standardized colours
G	White balance	Adjust for minimum colouration of white bar. Bar card with standardized colours
B	White balance	Adjust for minimum colouration of white bar. Bar card with standardized colours
AGC	AGC threshold	Select a UHF channel in the middle of the band (eg C40) 60dBµV signal Measurement on pin 1 of tuner. Set to 3.5 V ± 0.2 V
L' adjust	Video demodulator	**BG/L/I standard** : connect a test card generator (colour bar **38.9 Mhz**) to pins **6-7** of IC602. Set **L602** in order to obtain on pin **22** of IC602 : **2.5 V**. **L' (Bd I) standard** : proceed in exactly the same way, adjust the generator to **33.9 Mhz**. The adjustments are made using the remote control and the cursor which moves about on the screen.
B+	Value of the B+ voltage (150 V)	Set to **150 V ± 0.5 V**. Point of measurement : cathode of **D115**.
Width	Picture width	Grid test card.
EW Parab	East/West correction	Correction of geometry (barrel, cushion). Grid test card.
Tilt	East/West correction	Correction of geometry (keystone). Grid test card.
Corner	East/West correction	Correction of geometry in corners. Grid test card.
Vert breadth	Vertical compensation	Avoids vertical distortion. Set to 16 steps.
Vert shift	Vertical framing	Grid test card.
Text Con	Teletext	Adjustment of contrast in teletext mode.
Text Bri	Teletext	Adjustment of brightness in teletext mode.

Page 2 (Press the MENU button once).

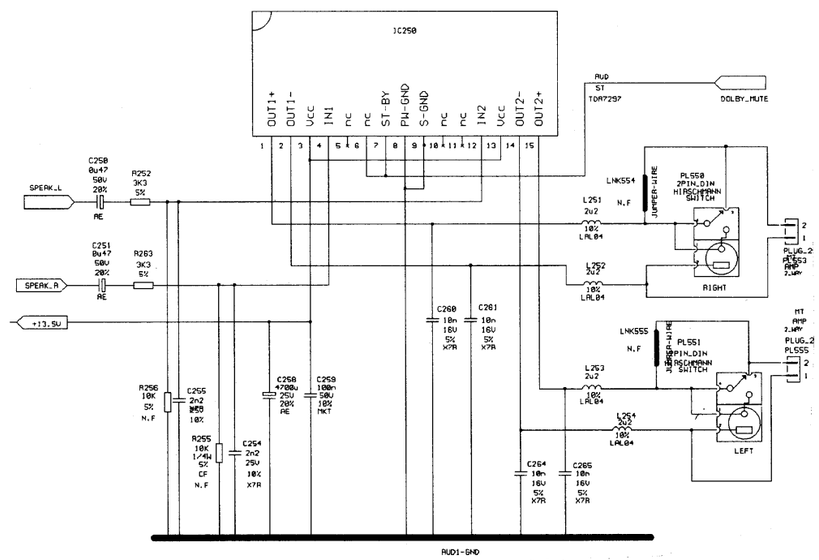
Functions	Adjustment / Selections	Remarks
System	Selection of standards	**BG/LL'** : sets CE 7025/26/27. **BG/DK** : sets CE 7055/56/57. **I** : sets CE 7005 /06 /07. **I/I'** : for sets intended for Eire. **BG** : sets CE 7015/16/17. **BG/I** : reserved for later use.
Audio	Selection of Audio mode	**DOLBY** : for CE 70x7 sets. **MONO** : switches the set onto monophonic mode. **STEREO** : switches the set into stereophonic mode for CE 70x5 sets. **3D** : for CE 70x6 sets.
Tuner	Selection of type of tuner	When changing the tuner, select the corresponding type of tuner.
CPT	Selection of type of frame	**110°** : for sets equipped with a 110° tube. (■) **90°** : for sets equipped with a 90° tube.
CTI	Colour transition improvement circuit	**Fitted** : operation active. (■) **Not fitted** : operation inactive.
AV3	Selection of S-Video and Video In sockets	**Fitted** : operation active. (■) **Not fitted** : operation inactive.
Hotel	Selection of hotel mode	**On** : hotel mode active. **Off** : hotel mode inactive. (■)
MAX	Limiting of sound volume	Setting of maximum sound volume in hotel mode.
PAL Delay	Setting of luminance chrominance delay in PAL system	Adjustment from : 00 to 05 (■) = 00
SECAM Delay	Setting of luminance chrominance delay in SECAM system	Adjustment from : 00 to 05 (■) = 05
Peaking	Adjustment of picture peaking	Adjustment from : 00 to 07 (■) = 06
RESET press HOLD	NVM programming	If the IC502 is replaced by a non-programmed IC (blank), press the HOLD button on the remote control to program in IC502 data allowing the TV to start. **See note**.

(■) Settings defined in the factory.

Dolby Amp RC Diagram



Amp RL Diagram



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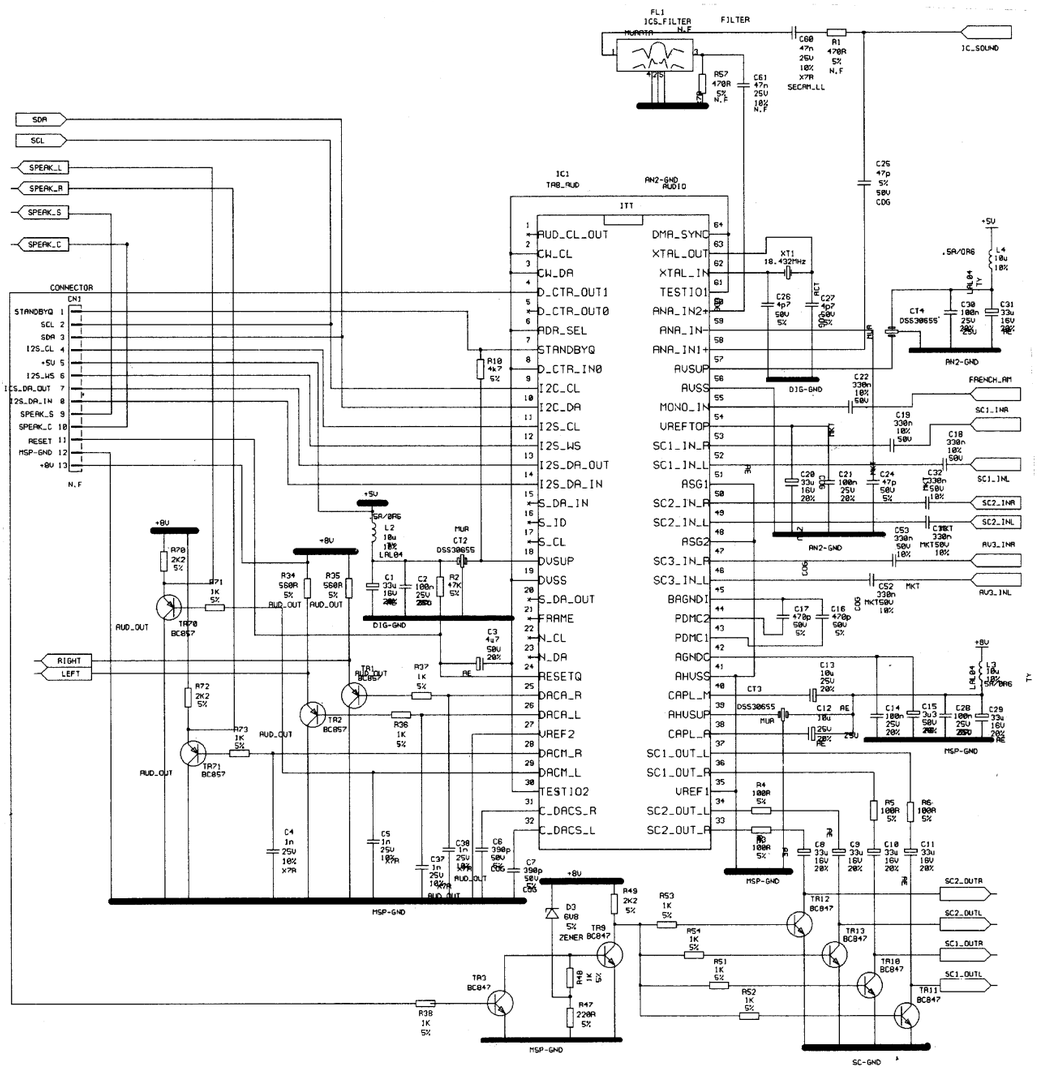
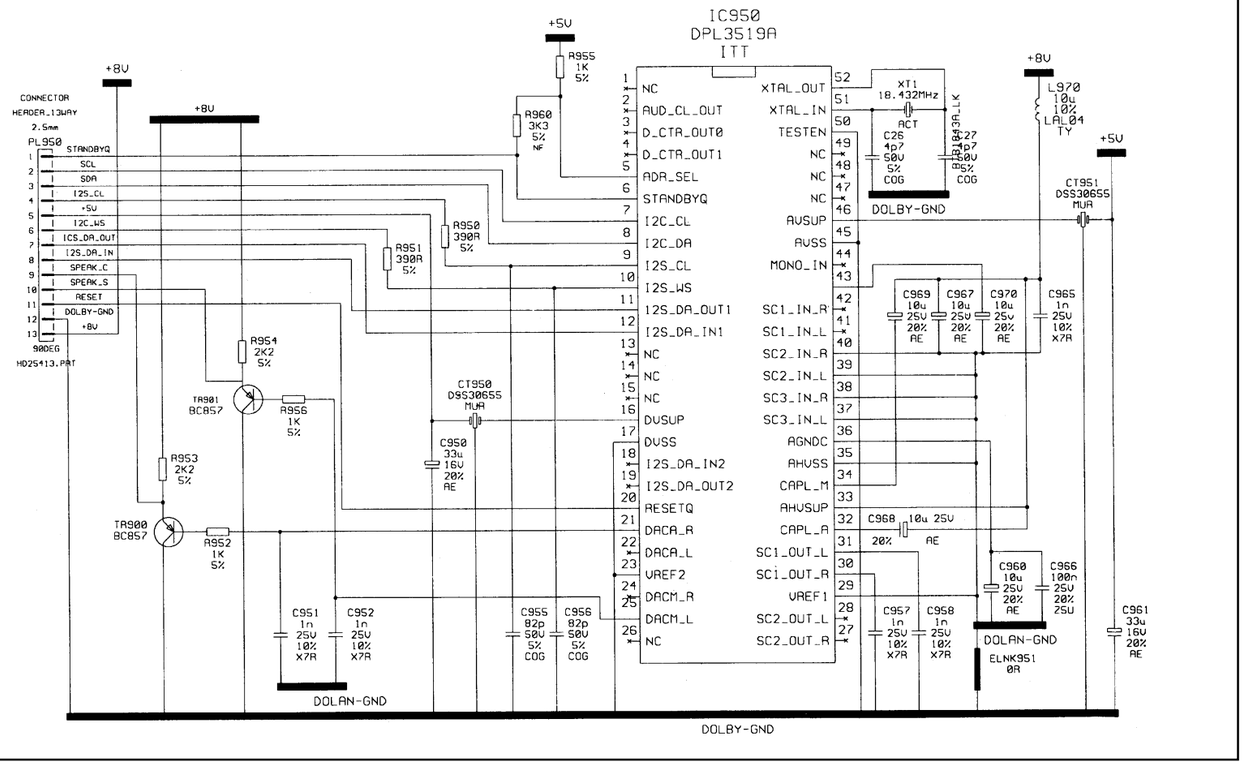
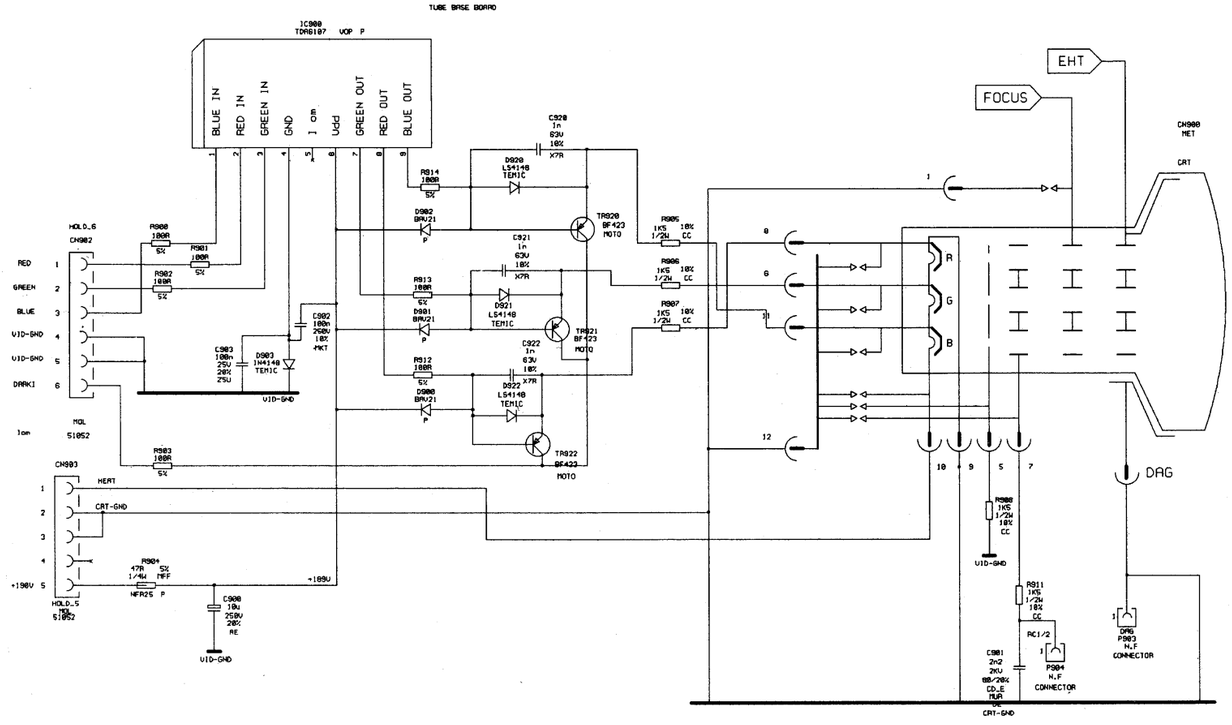
Audio Diagram



Dolby Diagram



CRT Diagram



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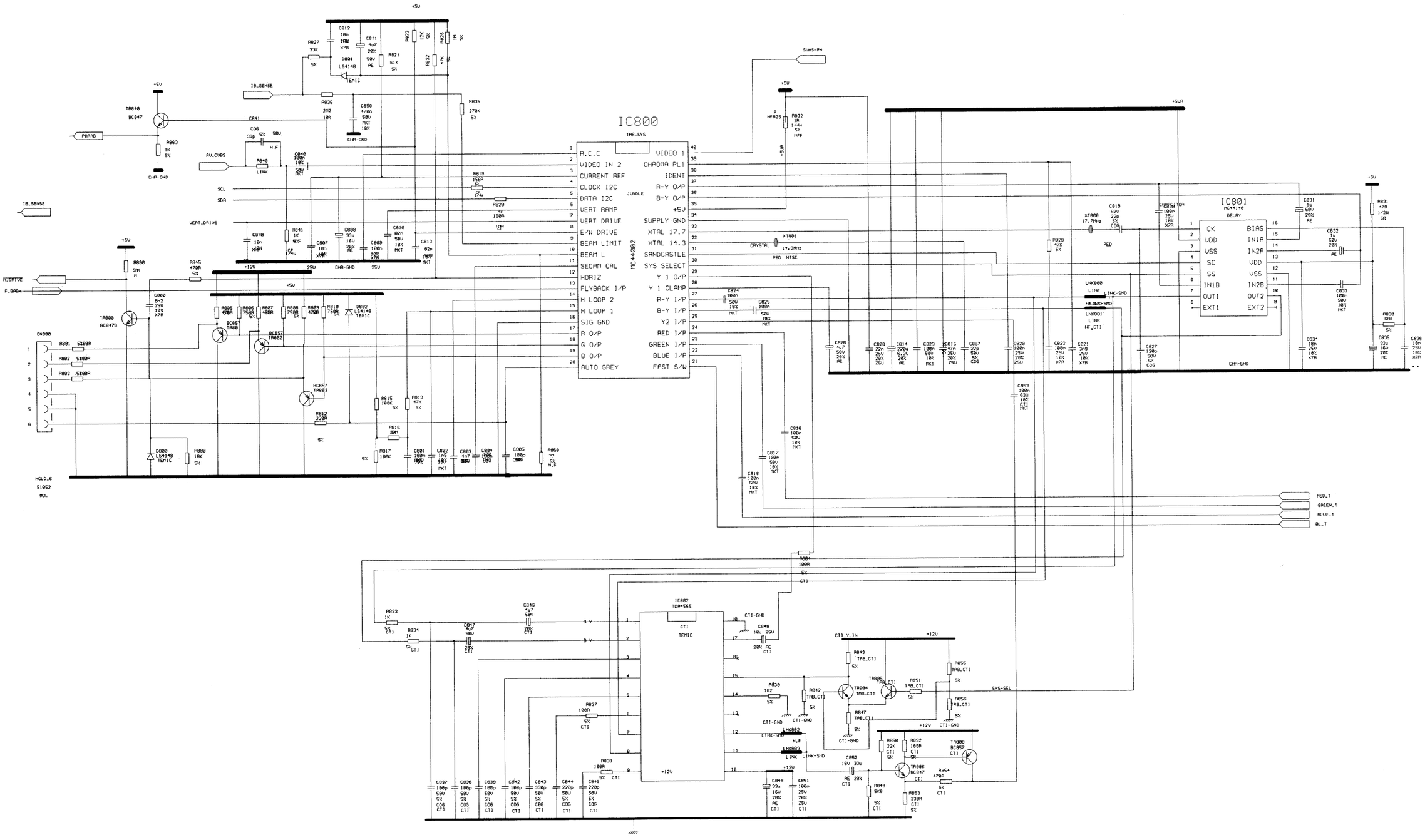
Video Diagram



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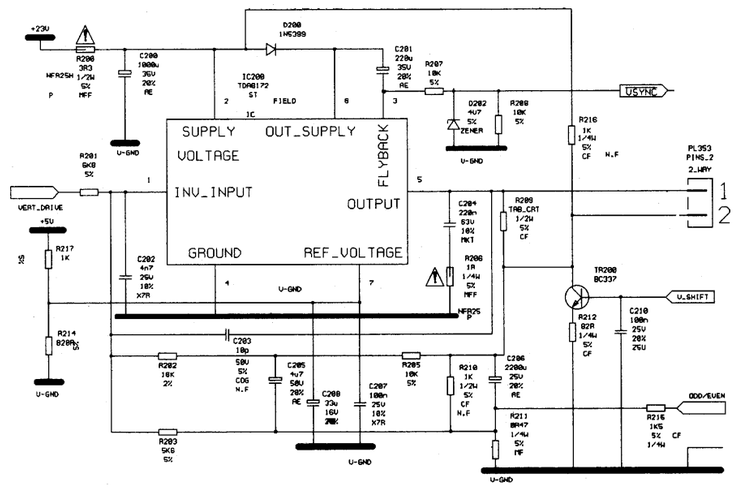
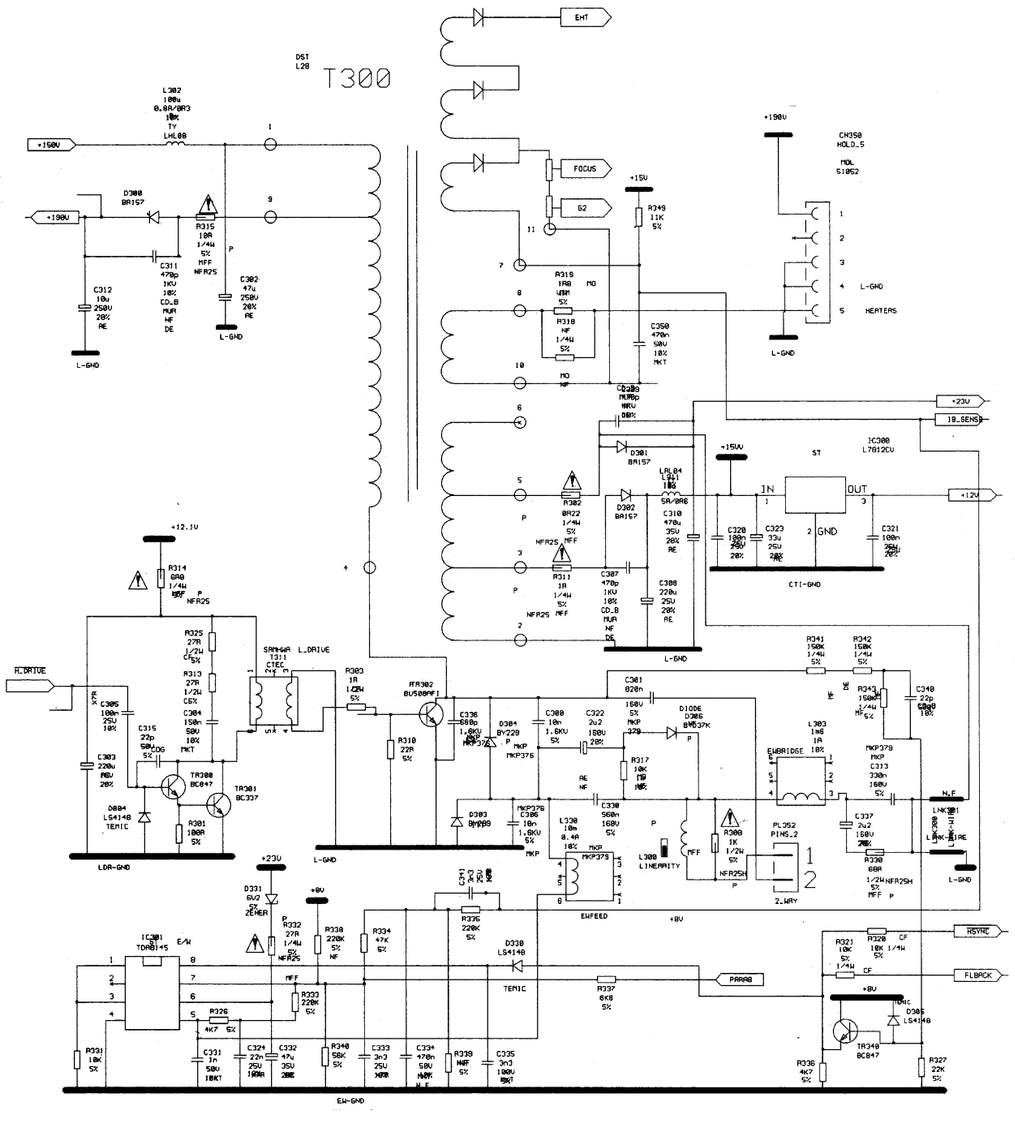
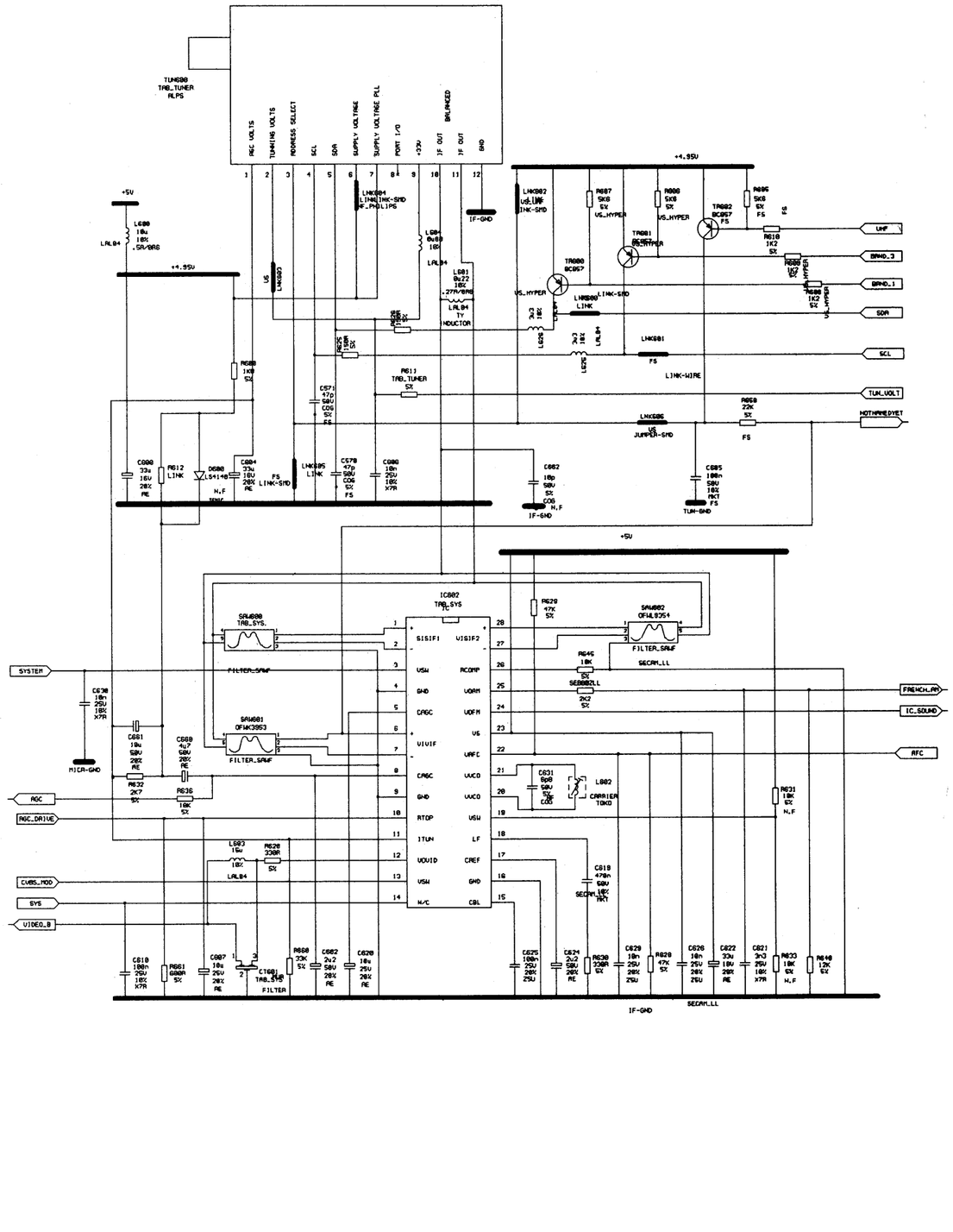
Deflection (Horizontal & Vertical) Diagram

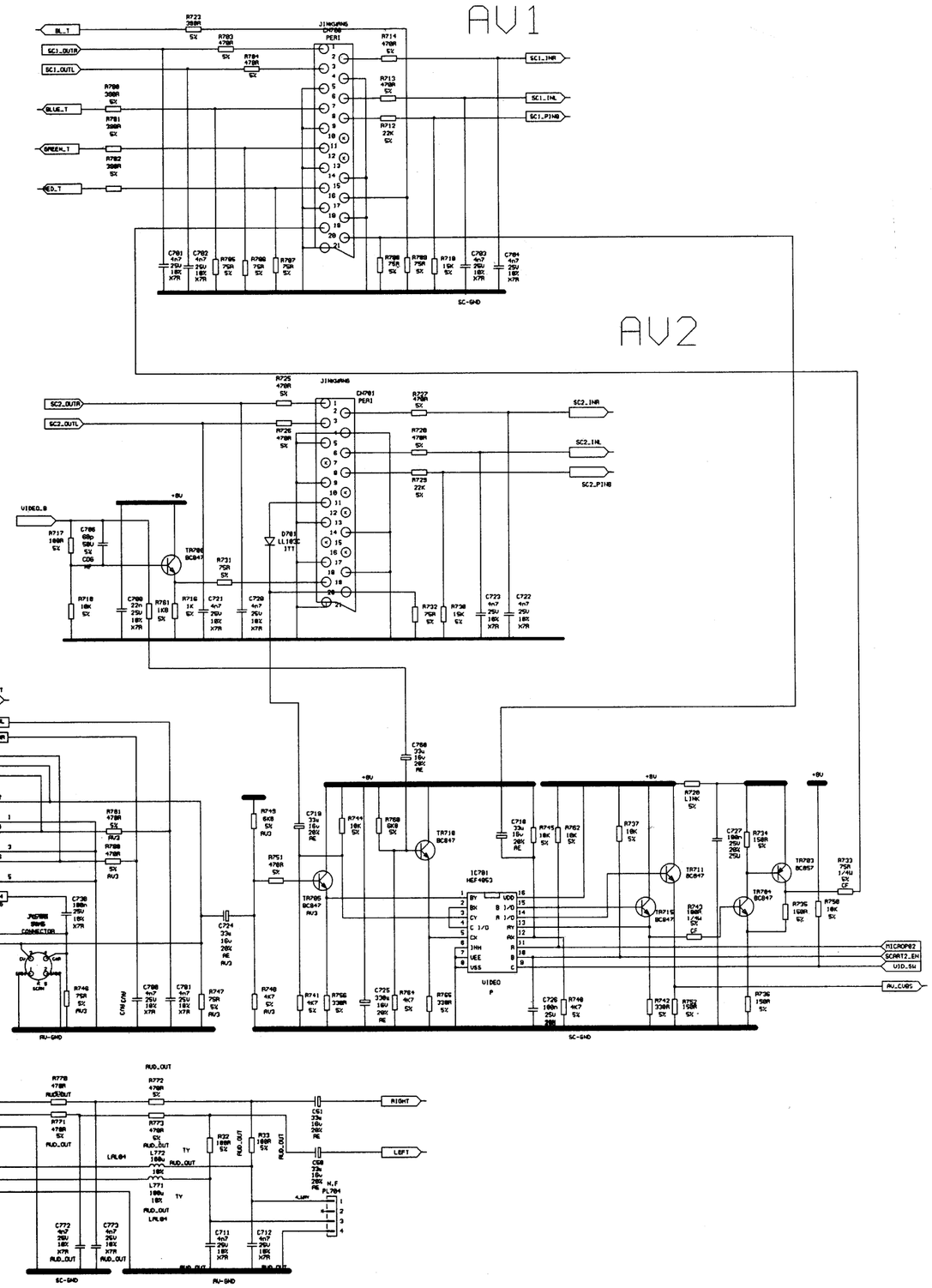




IF Diagram



AV Diagram


AV1
AV2
SC-GND
AV-GND
+8V
MOTHERBOARD
MICROP02
SCART2_EM
VID.SW
AV.CVBS
RIGHT
LEFT

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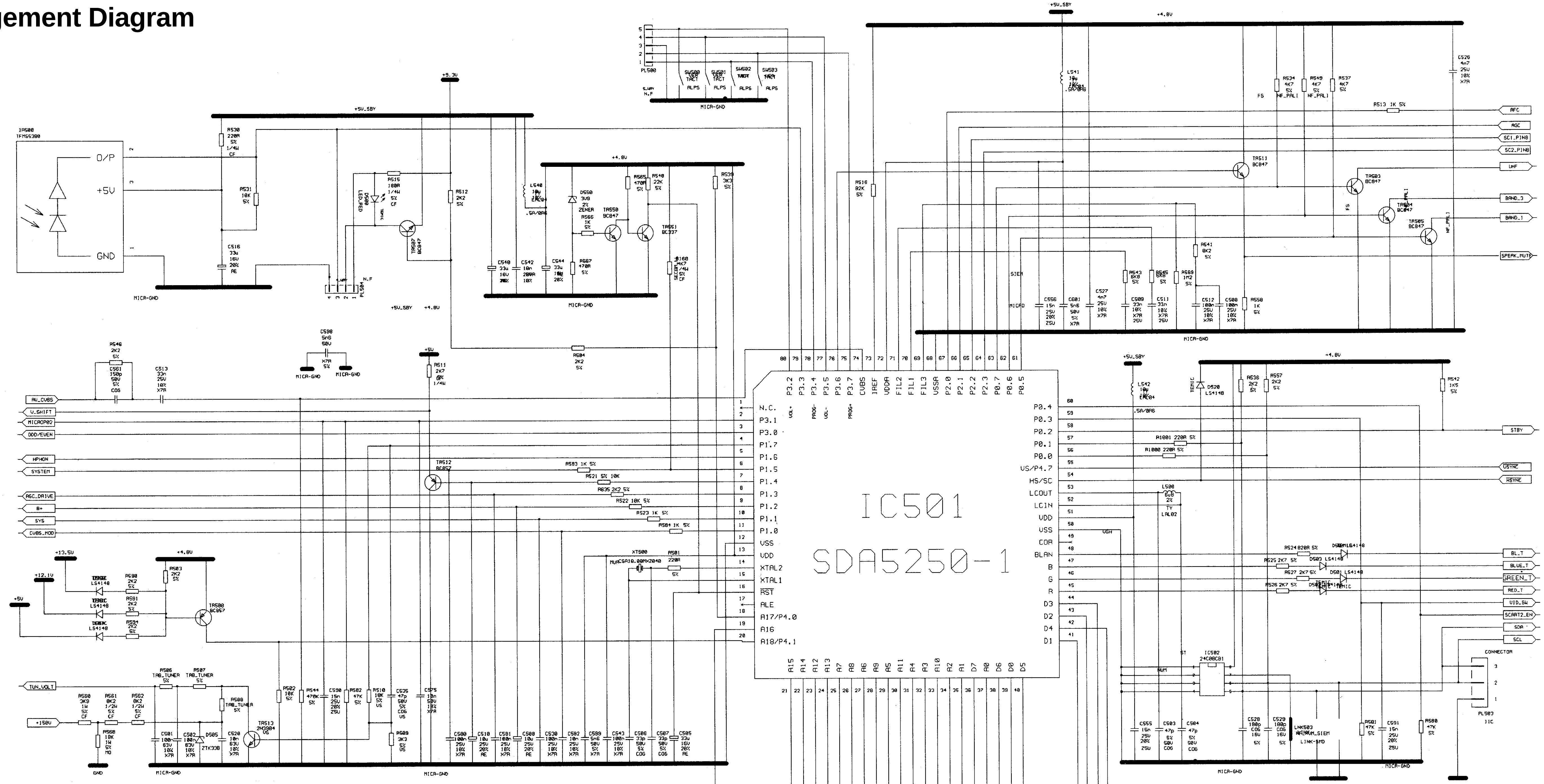
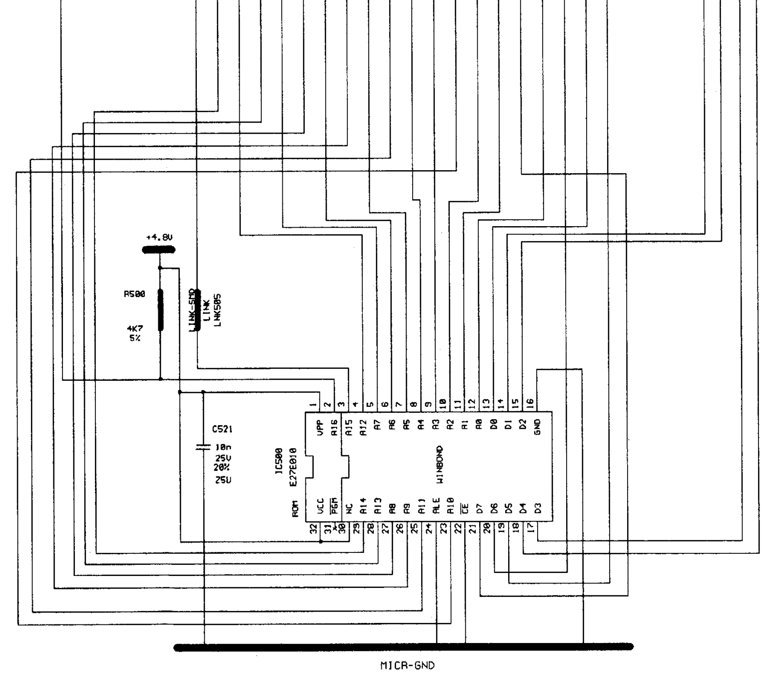
Management Diagram





TAB_SYS	PALBG	PALI	SECAM_LL	EIRE
CT601	TPS5.5MB	TPS6.0MB	TPS5.5MB	TPS6.0MB
IC800	MC44007	MC44007	MC44002	MC44007
SAW600	OFWK9354	OFWK9353	OFWK9354	OFWK9353
IC602	TDA4472	TDA4472	TDA4470M	TDA4472

TAB_CTJ	PALBG	PALI	SECAM_LL	EIRE
TR804	NF	NF	BC847	NF
TR805	NF	NF	BC847	NF
R842	3K3	3K3	NF	3K3
R847	NF	NF	4K7	NF
R851	NF	NF	4K7	NF
R855	NF	NF	47K	NF
R856	NF	NF	10K	NF
R843	NF	NF	47K	NF

TAB_TUN	FS_UHF	FS_HYPER	VS_UHF	VS_HYPER
TUN600 ALPS		TELE9X117A	TEL81	TELE4
R506	LINK	LINK	22K	22K
R507	LINK	LINK	22K	22K
R508	LINK	LINK	22K	22K
R611	LINK	LINK	47K	47K

TAB_TUN	FS_UHF	FS_HYPER	VS_UHF	VS_HYPER
TUN600 THOMSON		CTTS020		
LNK603	NF	NF	NF	NF
L601		0.39u		

TAB_AUD	ZWEITON	NICAM		
IC1	MSP3400C	MSP3410D		

TAB_CRT	A66EAK71-X11	A66ECF50-X05		
R209	220R	150R		

Power Supply Diagram