Roadstar®

SERVICE MANUAL

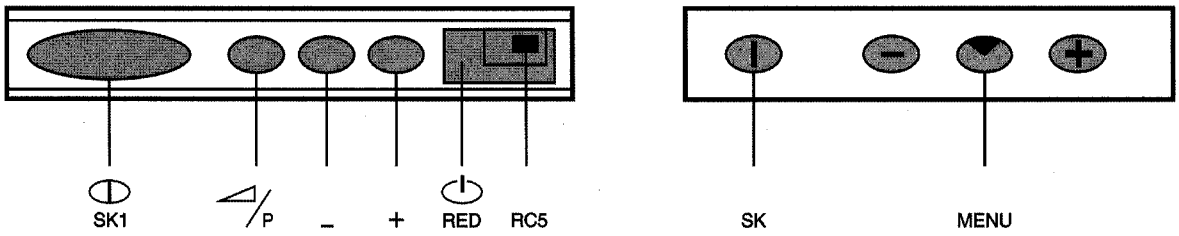
CHASSIS CTS-AA

Service Manual - CTS-AA

1. Technical specifications

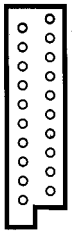
CHASSIS CTS - AA

Mains voltage	: 220 - 240 V 10% AC; 50 Hz (5%)
Power cons. at 220V~	: 35W (14"), 50W(20"/21"), 5W (stand by)
Aerial input impedance	: 75Ω - coax
Min. aerial input VHF	: 30 V
Min. aerial input UHF	: 40 V
Max. aerial input VHF/UHF	: 180mV
Pull-in range colour sync.	: 300Hz
Pull-in range horizontal sync.	: - 600 Hz / + 480 Hz
Pull-in range vertical sync.	: 5 Hz
Picture tube range	: 14" / 20" /21"
	: Mono: 25Ω 1W (14"). 16Ω 2W (20"/21")
TV Systems	: PAL BG : PAL I : PAL BG / SECAM BGDK : PAL BGI / SECAM BGLL'
Indications	: On screen display (OSD) / menu : 1 LED RED. Dark in ON, bright in stand by, blinking with RC.
VCR programs	: 0 to 99
Tuning and operating system	: VST
UV1315A / IEC (VST)	: VHFa: 48 - 168 MHz : VHFb: 175 - 447 MHz : UHF: 455 - 855 MHz
U1343A / IEC (VST)	: UHF: 471 - 855 MHz
Local operating functions	: Vol/Prog, +, -, contrast, colour and brightness.



2. Connection facilities

Euroconector:



1 - Audio	R (0V5 RMS / 1K).	
2 - Audio	R (0V2 - 2V RMS / 10K).	
3 - Audio	L (0V5 RMS / 1K).	
4 - Audio		
5 - Blue		
6 - Audio	L (0V2 - 2V RMS / 10K).	
7 - Blue	(0V7pp/75Ω).	
8 - CVBS status 1	(0-2V int., 10-12V ext.).	
9 - Green		
10 - -		
11 - Green	(0V7pp/75Ω).	
12 - -		
13 - Red		
14 - -		
15 - Red	(0V7pp/75Ω).	
16 - RGB status	(0V to 0V4 int.) (1-3V ext. 75Ω).	

17 - CVBS	
18 - CVBS	
19 - CVBS	(1Vpp 75Ω).
20 - CVBS	(1Vpp/75Ω).
21 - Earthscreen.	

Head phone:

8Ω to 600Ω (32Ω 25mW)

3. Mechanical instructions

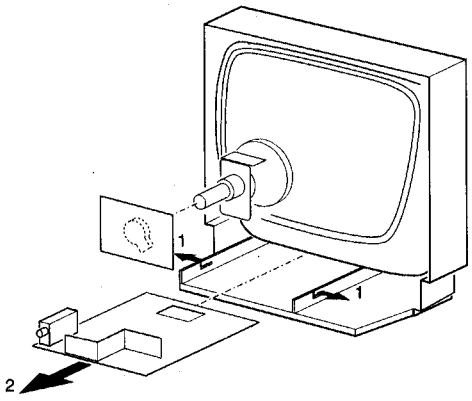
For the main carrier two service positions are possible (3.1).

A: For faultfinding on the component side of the main carrier.
B: For (de) soldering activities on the copper side of the main carrier.

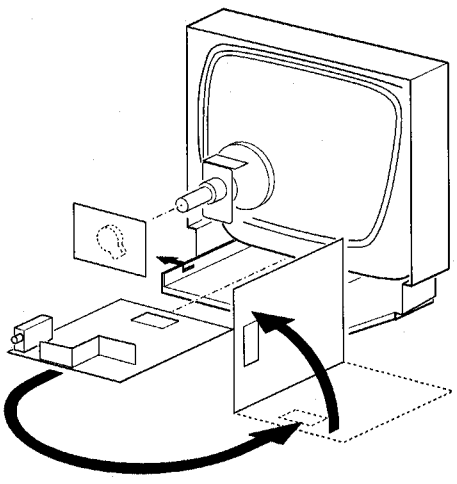
Position A can be reached by first removing the mains cord from it's fixation, then loosen the carrier lips (1) and then pulling the carrier panel (2) for approximately 10cm.

Position B can be reached from position A after disconnecting the degaussing cable. Put the carrier on the line transformer side.

Fig. 3.1

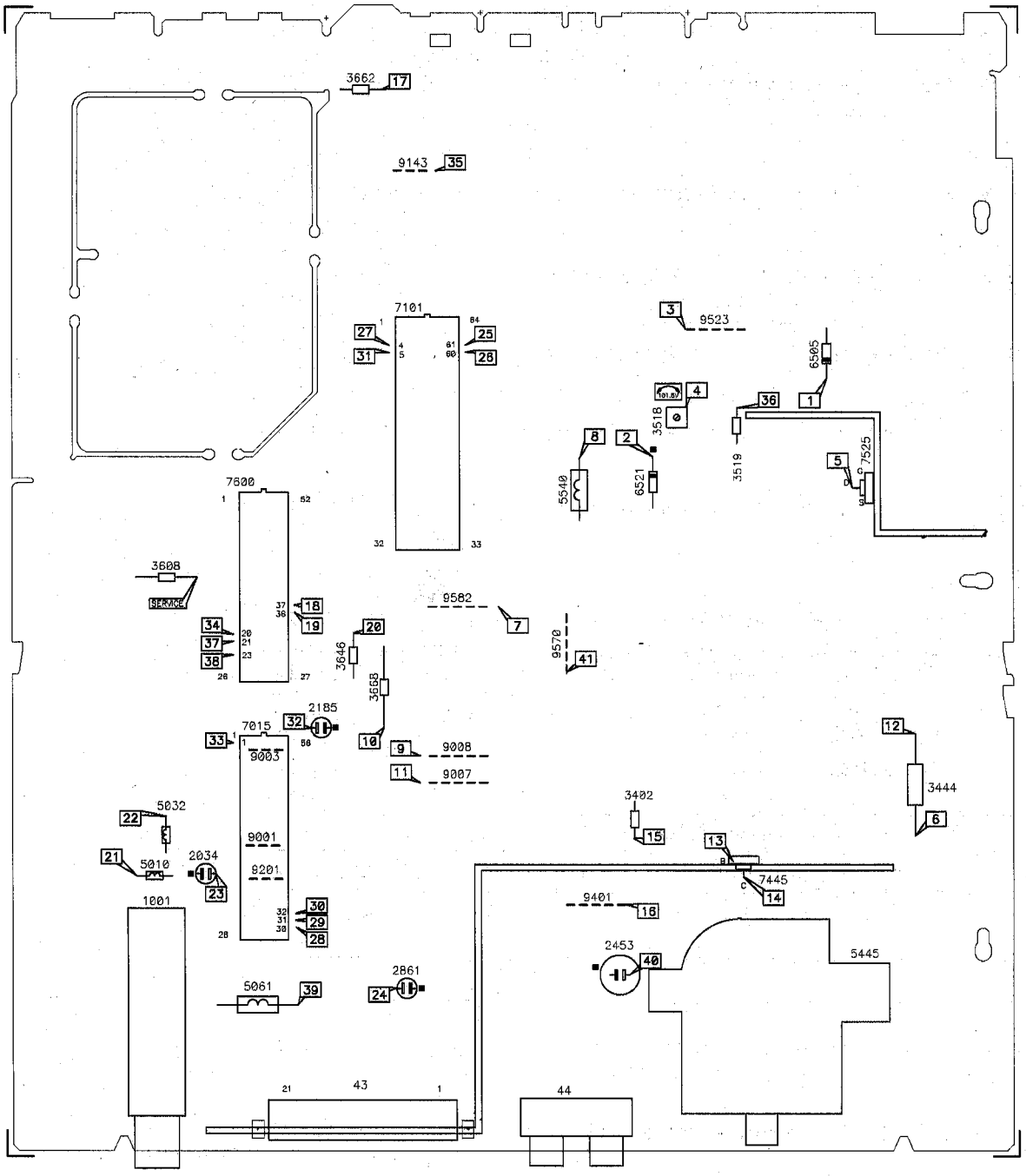


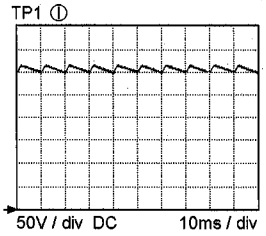
A



B

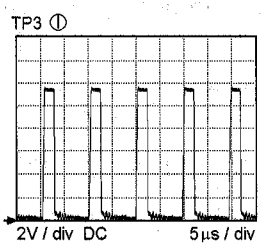
4. Oscillograms

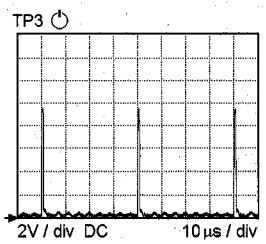


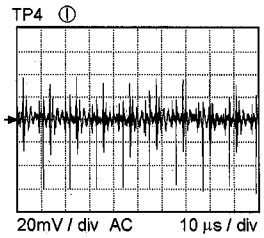


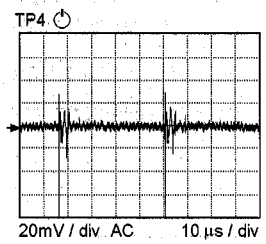
TP2 → 12V6 DC

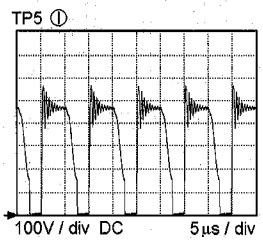
TP2 → 10V6 DC

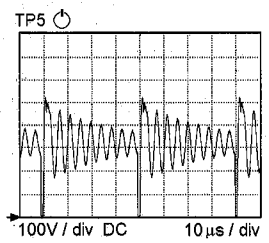








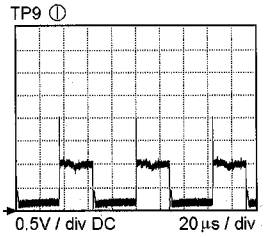




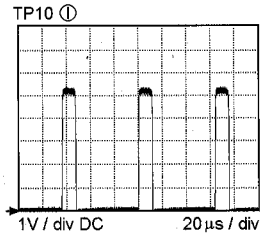
TP6(14") ⏀ → 101V5 DC
TP6(20") ⏀ → 103V5 DC
TP6(21") ⏀ → 105V DC

TP7 ⏀ → 3V3 DC
TP8 ⏀ → 11V7 DC

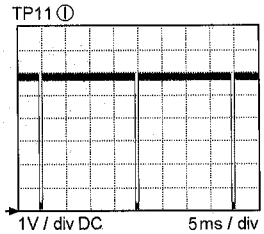
TP9 ⏀



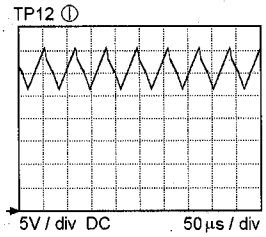
TP10 ⏀



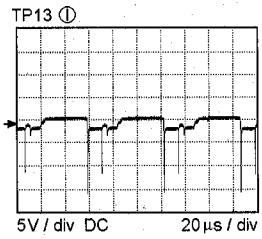
TP11 ⏀



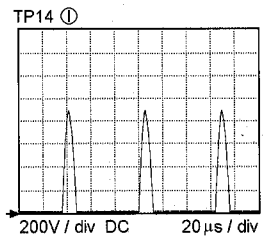
TP12 ⏀



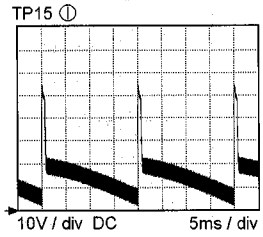
TP13 ⏀



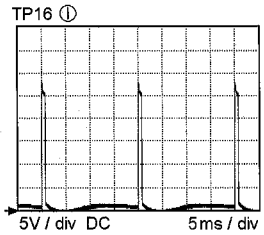
TP14 ⏀



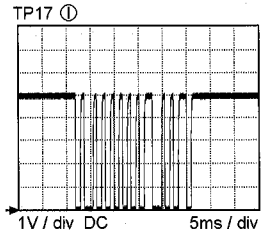
TP15 ⏀



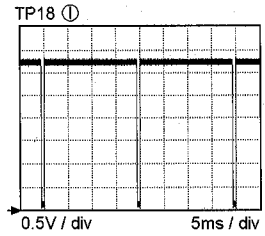
TP16 ⏀



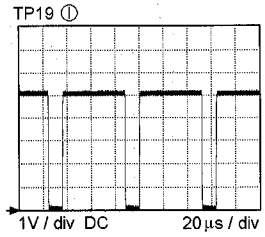
TP17 ⏀



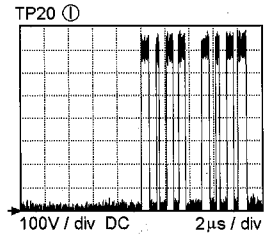
TP18 ⏀



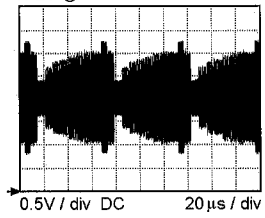
TP19 ⏀



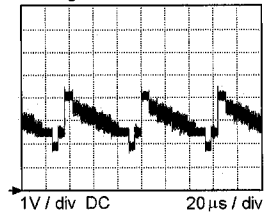
TP20 ⏀



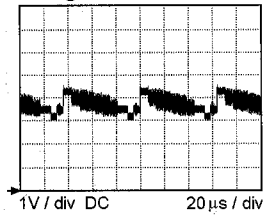
TP21 ⏀



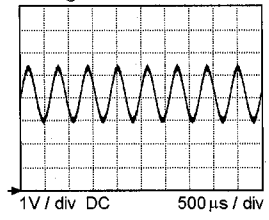
TP22 ⏀



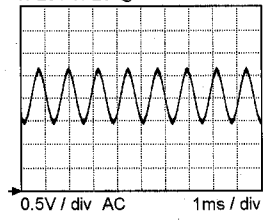
TP23 ⏀



TP24 ⏀



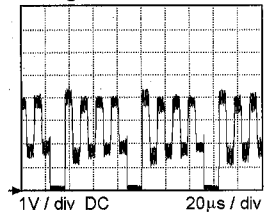
TP25 / TP26 ⏀



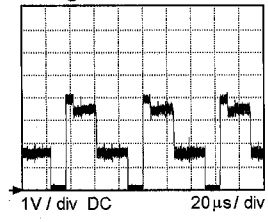
I2C BUS STV224x:
TP34 ⏀ → SCL
TP37 ⏀ → SDA

I2C BUS TDA9875:
TP27 ⏀ → SCL
TP31 ⏀ → SDA

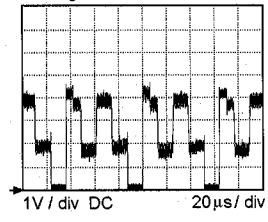
TP28 ⏀



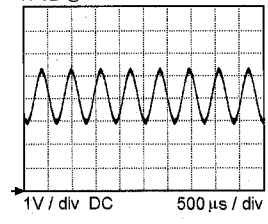
TP29 ⏀



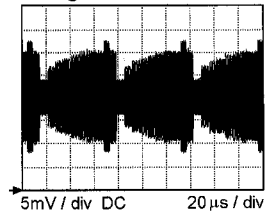
TP30 ⏀



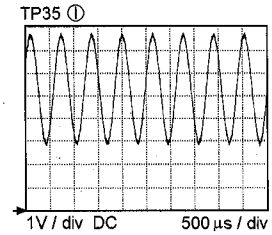
TP32 ⏀



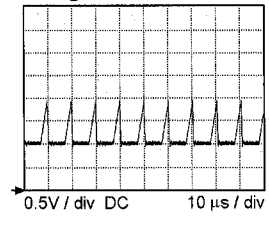
TP33 ⏀



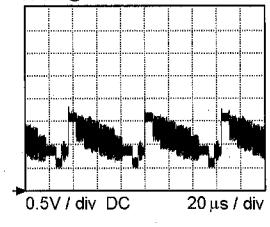
TP35 ⏀



TP36 ⏀

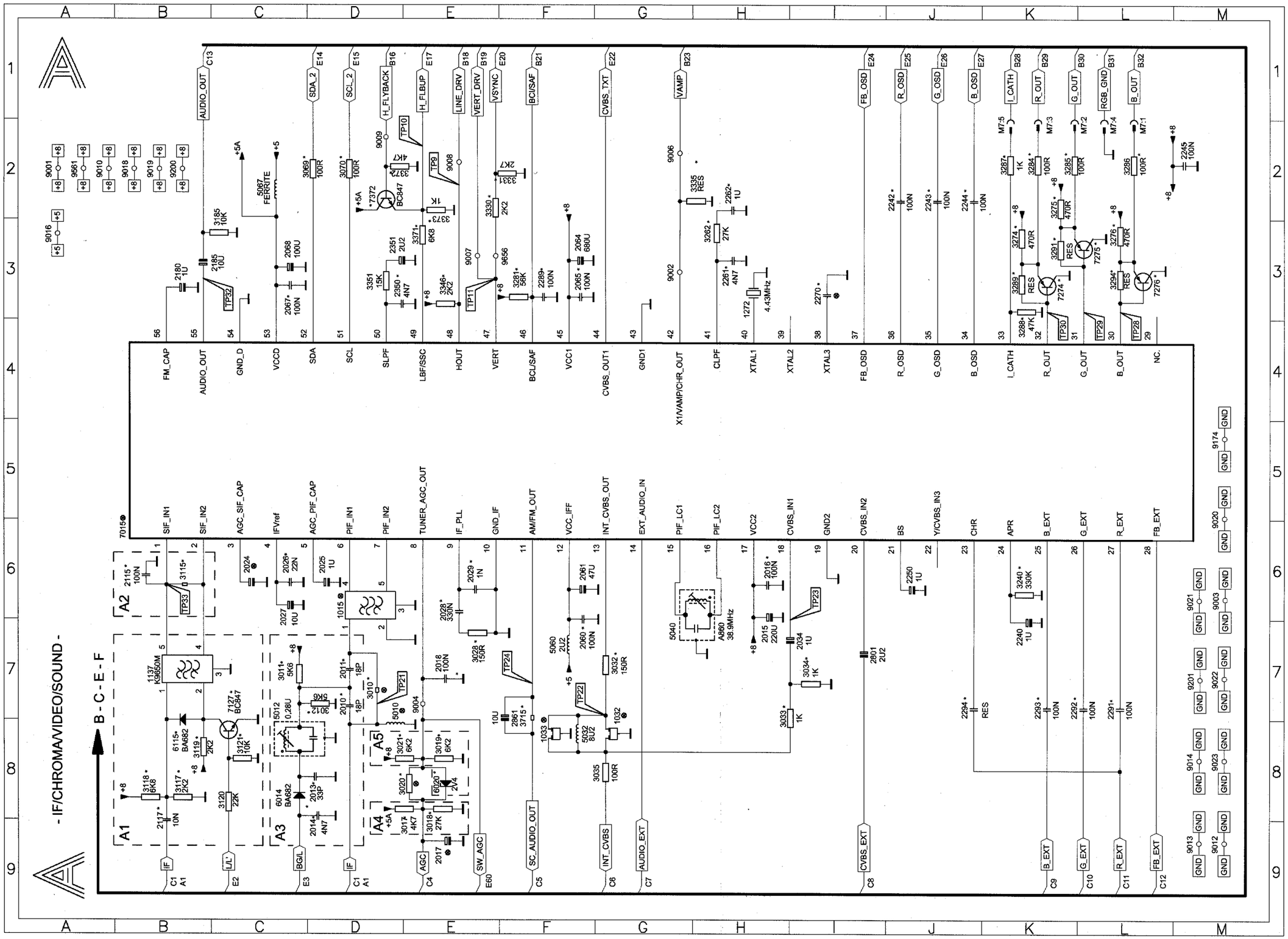


TP38 ⏀



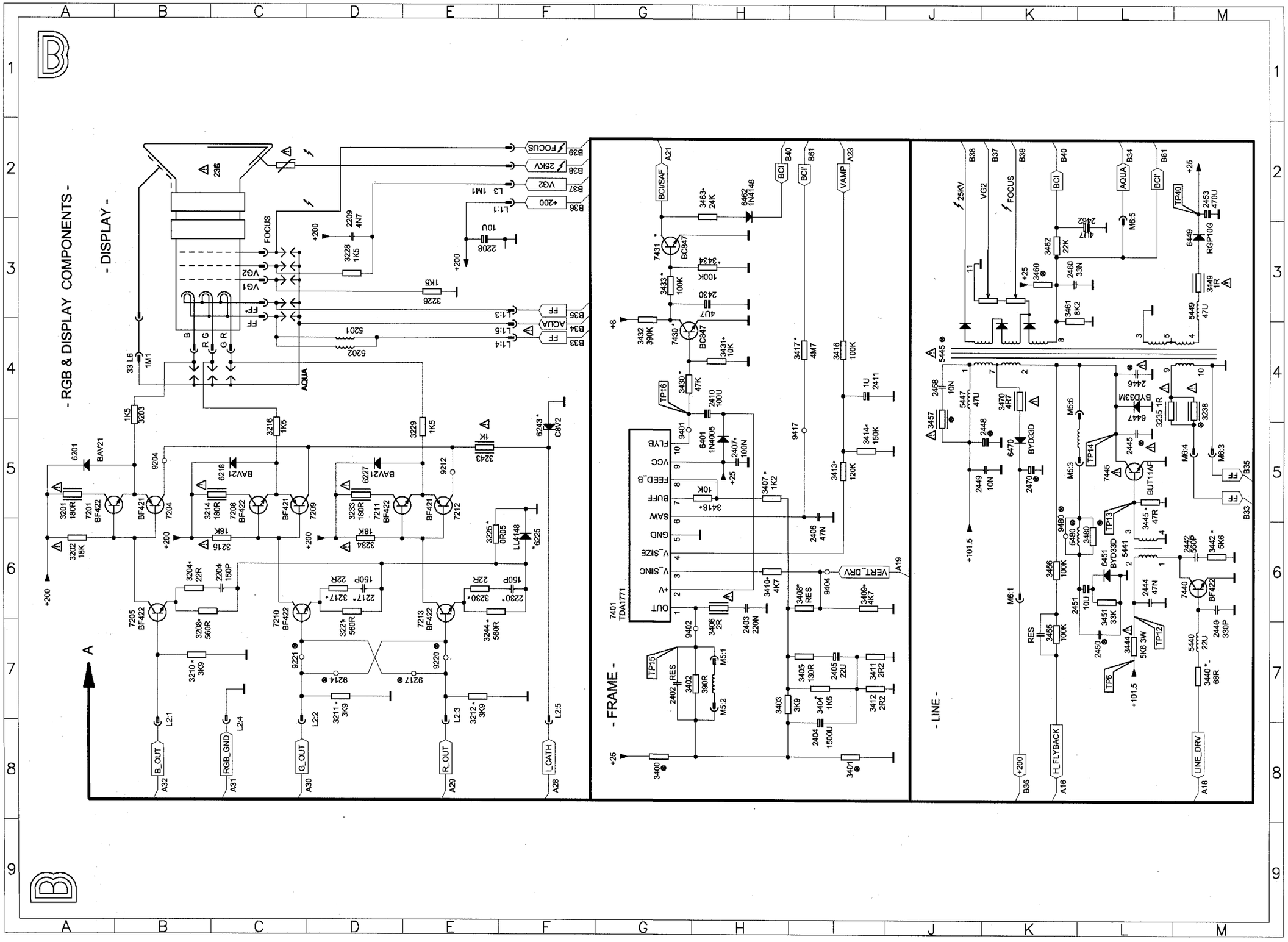
TP39 ⏀ → 5V DC
TP39 ⏻ → 0V DC
TP40 ⏀ → 25V DC
TP40 ⏻ → 0V DC
TP41 ⏀ → 5V6 DC
TP41 ⏻ → 5V6 DC

6.- Electric Diagram



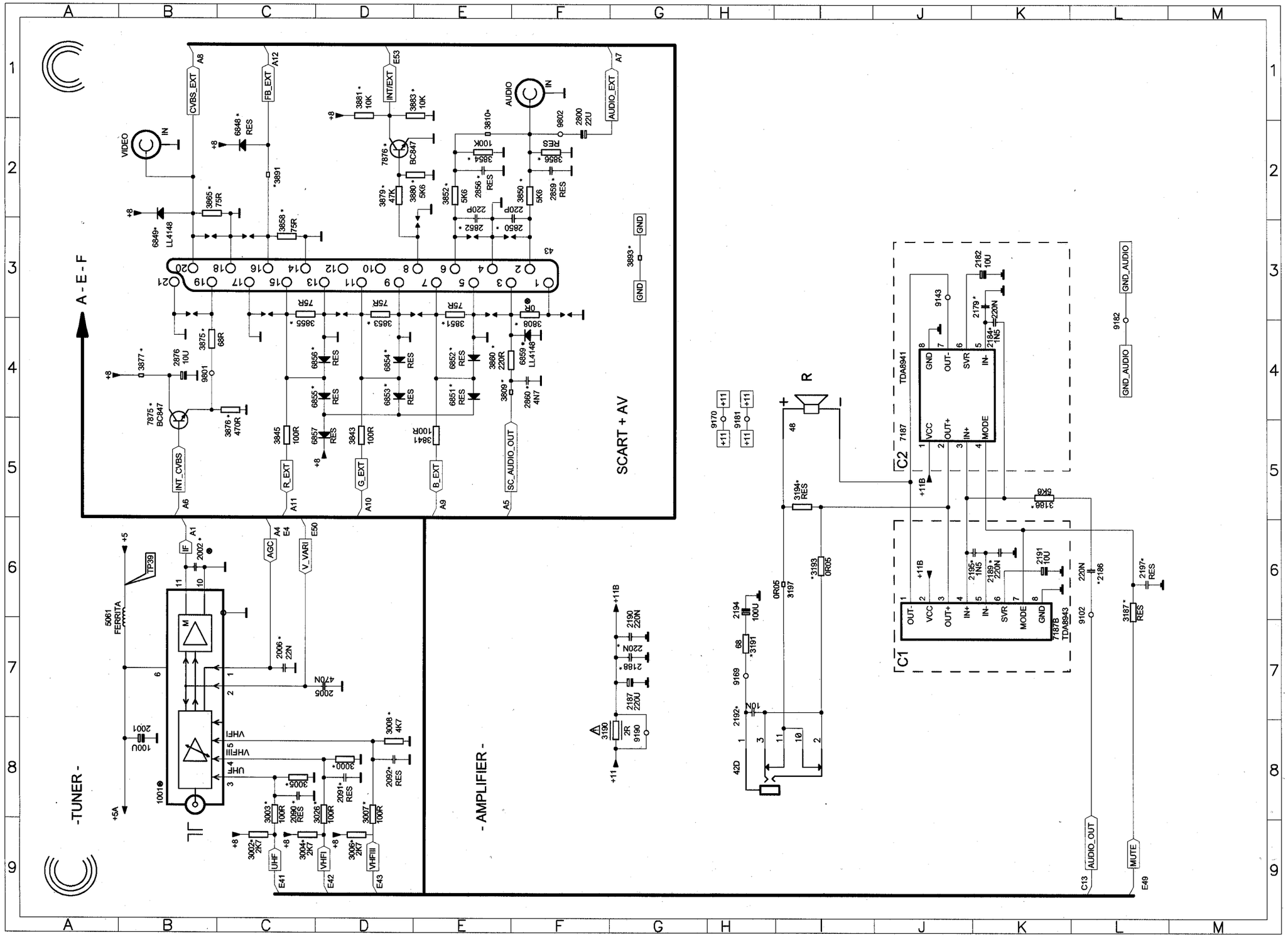
1015	D6	9021	M6
1032	G8	9022	M7
1033	F8	9023	M8
1137	B7	9174	M5
1272	H3	9200	B2
2010	D7	9201	M7
2011	D7	9561	A2
2013	D8	9656	E3
2014	D8		
2015	H6		
2016	H6		
2017	E9		
2018	E7		
2024	C6		
2025	D6		
2026	C6		
2027	C6		
2028	E6		
2029	E6		
2034	I7		
2060	F7		
2061	F6		
2064	F3		
3274	K3		
3275	K2		
3276	L3		
3281	F3		
3284	K2		
3285	K2		
3286	L2		
3287	K2		
3288	K3		
3289	K3		
3291	K3		
3294	L3		
3330	E2		
3331	F2		
3335	H2		
3346	E3		
3351	D3		
3371	E3		
3372	D2		
3373	E2		
3715	F8		
5010	D8		
5012	D8		
5032	F8		
5040	H7		
5060	F7		
5067	C2		
6014	C8		
6020	E8		
6115	B8		
7015	G5		
7127	C8		
7274	K3		
7275	L3		
7276	L3		
7372	D2		
9001	A2		
9002	G3		
9003	M6		
9004	E7		
9006	G2		
9007	E3		
9008	E2		
9009	D2		
9010	A2		
9012	M9		
9013	M9		
9014	M8		
9016	A3		
9018	B2		
9019	B2		
9020	M6		

6.- Electric Diagram



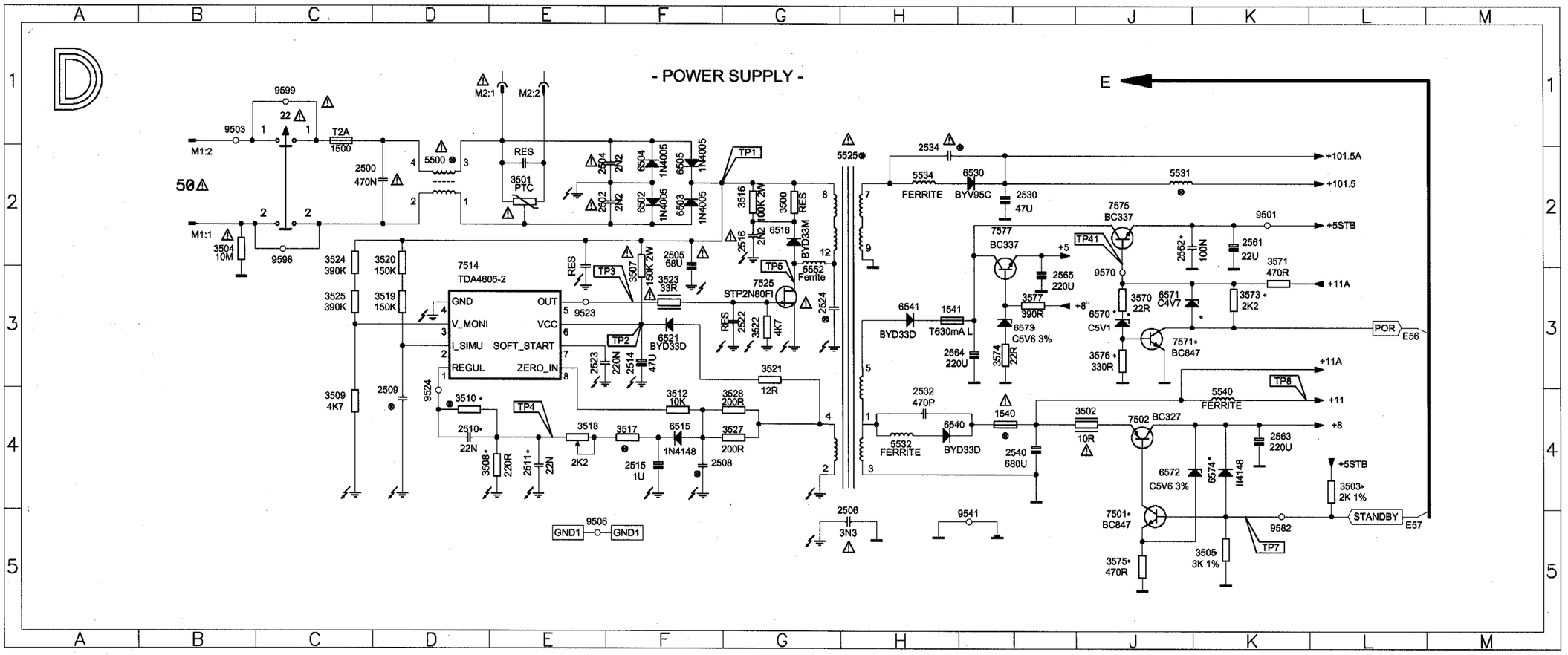
2204	C6	3433	G3
2208	E3	3434	H3
2209	D3	3440	M7
2217	D6	3442	M6
2230	F6	3444	L7
2402	G7	3445	L5
2403	H6	3449	M3
2404	I8	3451	L6
2405	I7	3455	K7
2406	I5	3456	K6
2407	H5	3457	J5
2408	K7	3460	K3
2410	H4	3461	K4
2411	I4	3462	K3
2430	H3	3463	H2
2440	M6	3470	K4
2442	M6	3480	L6
2444	L6	5201	D4
2445	L5	5202	D4
2446	L4	5440	M7
2448	K5	5441	L6
2449	K5	5445	L4
2450	L7	5447	J4
2451	L6	5449	M3
2453	M2	5480	L6
2458	J4	6201	A5
2460	K3	6218	C5
2462	L3	6225	F6
2470	K5	6227	D5
3201	A5	6243	F5
3202	A6	6401	H5
3203	B4	6447	L4
3204	B6	6449	M3
3208	B6	6451	L6
3210	B7	6462	H2
3211	D7	6470	K5
3212	E7	7201	A5
3214	C5	7204	B5
3215	C6	7205	B6
3216	C5	7208	C5
3217	D6	7209	C5
3221	D6	7210	C6
3225	E6	7211	D5
3226	E3	7212	E5
3228	D3	7213	E6
3229	E5	7401	G6
3230	E6	7430	G4
3233	D5	7431	G3
3234	D6	7440	M6
3235	L4	7445	L5
3238	M4	9204	B5
3243	E5	9212	E5
3244	E6	9214	D7
3400	G8	9217	E7
3401	I8	9220	E7
3402	H7	9221	C7
3403	H7	9401	G5
3404	I7	9402	H7
3405	I7	9404	I6
3406	H6	9417	I5
3407	H5	9480	K6
3408	I6		
3409	I6		
3410	H6		
3411	I7		
3412	I7		
3413	I5		
3414	I5		
3416	I4		
3417	I4		
3418	H5		
3430	G4		
3431	H4		
3432	G4		

6.- Electric Diagram



1001	B7	6852	E4
2001	B8	6853	D4
2002	B6	6854	D4
2005	D7	6855	D4
2006	C7	6856	D4
2090	C8	6857	D5
2091	D8	7187	J4
2092	D8	7187	K6
2179	K3	7875	B5
2182	K3	7876	D2
2184	K4	9102	L6
2186	L6	9143	J3
2187	G7	9169	H7
2188	G7	9170	H5
2189	K6	9181	H5
2190	G7	9182	L4
2191	K6	9190	G8
2192	H7	9801	B4
2194	H6	9802	F2
2195	K6		
2197	L6		
2800	F2		
2850	F3		
2852	E3		
2856	E2		
2857	F4		
2859	F2		
2860	F4		
2876	B4		
3000	D8		
3002	C9		
3003	C8		
3004	C9		
3005	C8		
3006	D9		
3007	D8		
3008	D8		
3026	D8		
3186	K5		
3187	L6		
3190	G8		
3191	H7		
3193	I6		
3194	I5		
3197	I6		
3808	F3		
3809	E4		
3810	E2		
3841	E5		
3843	D5		
3845	C5		
3850	F2		
3851	E3		
3852	E2		
3853	D3		
3854	E2		
3855	C3		
3856	F2		
3858	C3		
3860	E4		
3865	B2		
3875	B4		
3876	C4		
3877	B4		
3879	D2		
3880	E2		
3881	D1		
3883	E1		
3891	C2		
3893	G3		
5061	B7		
6848	C2		
6849	B2		
6851	E4		

6.- Electric Diagram



POS	PAL BG	PAL I	PAL SECAM BG	PAL SECAM BG - DK	PAL SECAM BG - L/L' - I
A1	--	--	--	--	YES
A2	YES	YES	YES	YES	--
A3	--	--	--	--	--
A4	YES	YES	YES	YES	--
A5	--	--	--	--	YES
E1	--	--	--	--	YES
1015	G1961M	J1952M	G1961M	K2955M	K3953M
1032	5.5MHz	--	5.5MHz	5.5MHz	5.5MHz
1033	--	6.0MHz	--	6.5MHz	--
2002	--	--	--	--	5P6
2017	47U	47U	47U	47U	100U
2024	--	--	--	--	1U
2270	--	--	100N	100N	100N
3010	0R05	0R05	0R05	0R05	0R05
3020	0R05	0R05	0R05	0R05	3K6
3604	150R	150R	150R	150R	22R
5010	1U2	1U2	1U2	1U2	0U56
7015	STV2246	STV2246	STV2248	STV2248	STV2248

POS	14"	20" / 21"
2445	SEE TABLE 11, PAGE 23	
2446	SEE TABLE 11, PAGE 23	
2448	10U	47U
2450	SEE TABLE 11, PAGE 23	
3238	SEE TABLE 11, PAGE 23	
3400	---	1K2
3401	2K4	1K2
3457	27R	47R
3460	15K	18K
3480	---	1K2
3510	750R	1K2
3517	6K2	5K6
5445	LOT 14 CTS	LOT 20/21 CTS
5480	---	At4042
5500	CU15	CU15D3
5525	SOPS 14 CTS	SOPS 20/21 CTS
5531	9X3.5	SPT0508A
9214	JMP	---
9217	JMP	---
9220	---	JMP
9221	---	JMP
9480	JMP	---

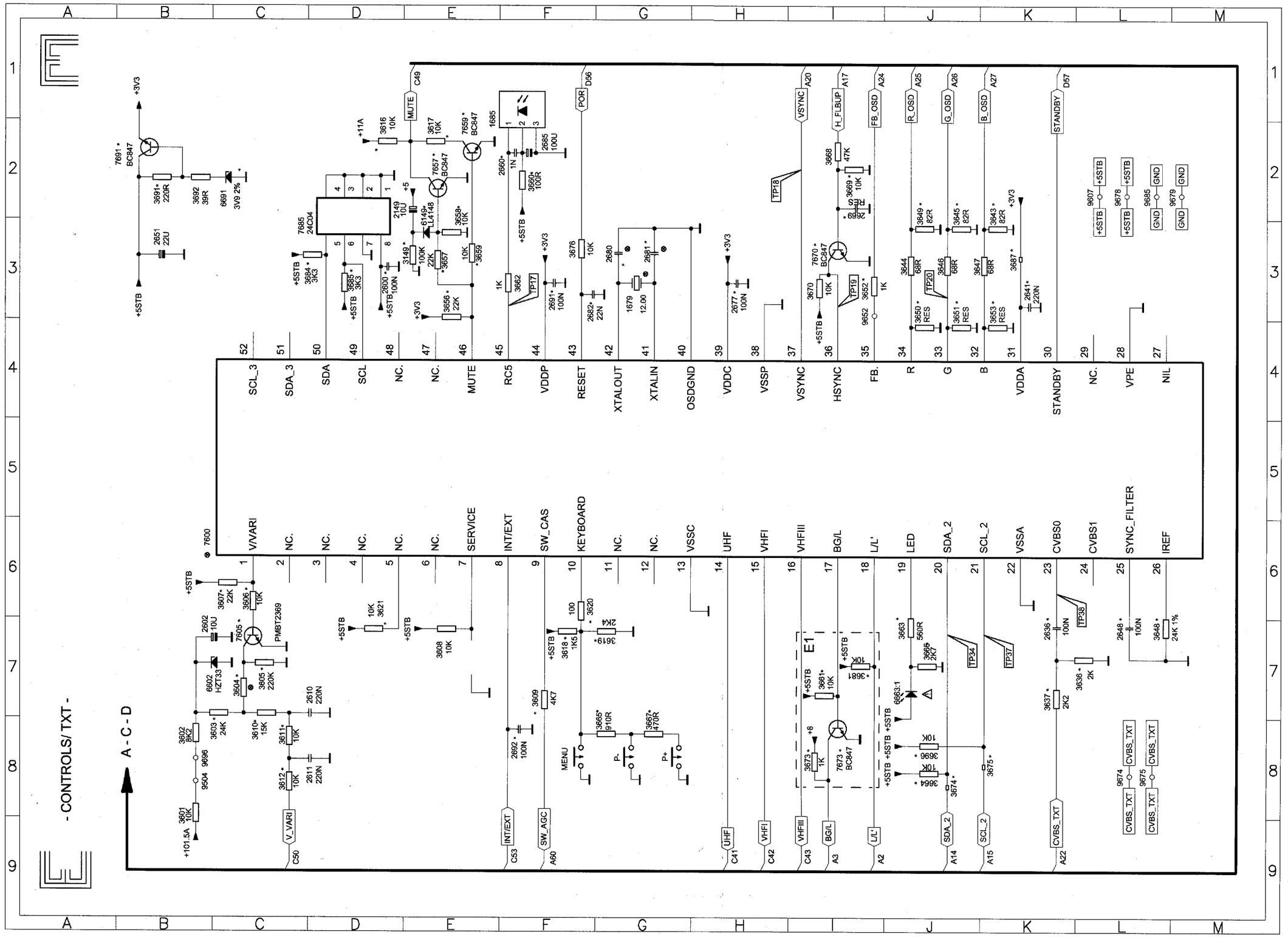
POS	1W	2W
1540	T 1A L	T 1.25A L
C1	---	YES
C2	YES	---

POS	TXT	NO TXT
7600	SAA5531 CTS	SAA5541 CTS

POS	SOLO UHF	HYPER
1001	UV1343A I-2	UV1315A I-2
3000	4K7	---
3005	4K7	10K

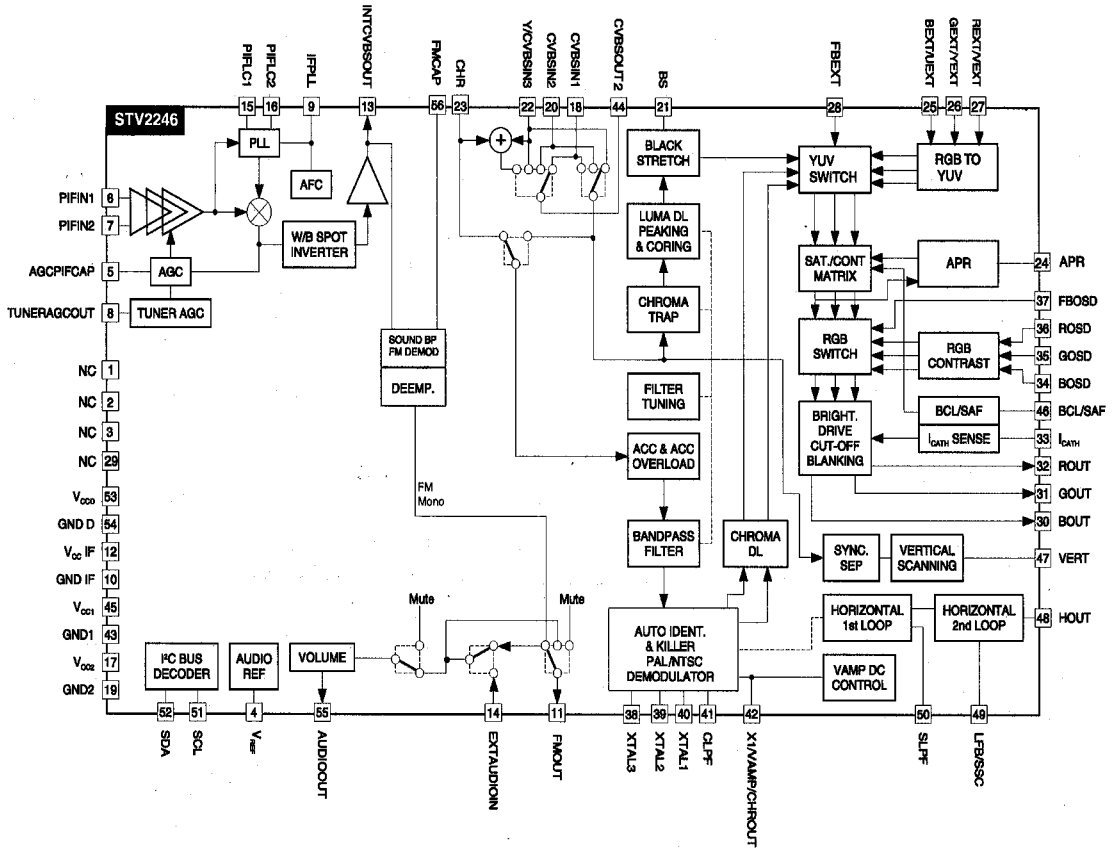
1500 C1
1540 I4
1541 H2
2500 D2
2502 F2
2503 E2
2504 F2
2505 F2
2506 H5
2507 E2
2508 F4
2509 D4
2510 D4
2511 E4
2514 F3
2515 F4
2516 G2
2522 G3
2523 E3
2524 G3
2530 I2
2532 H4
2534 H2
2540 I4
2561 K2
2562 J2
2563 K4
2564 I3
2565 I3
3500 G2
3501 E2
3502 J4
3503 L4
3504 B2
3505 K5
3507 F2
3508 E4
3509 C4
3510 D4
3512 F4
3516 G2
3517 F4
3518 E4
3519 D3
3520 D2
3521 G3
3522 G3
3523 F3
3524 C2
3525 C3
3527 G4
3528 G4
3570 J3
3571 K3
3573 K3
3574 I3
3575 J5
3576 J3
3577 I3
5500 D2
5525 H3
5531 J2
5532 H4
5534 H2
5540 K4
5552 G2
6502 F2
6503 F2
6504 F2
6505 F2
6515 F4
6516 G2
6521 F3
6530 I2
6540 H4
6541 H2
6570 J3
6571 J3
6572 J4
6573 I3
6574 K4
7501 J5
7502 J4
7514 E3
7525 G3
7571 J3
7575 J2
7577 I2
9501 K2
9503 B1
9506 E5
9523 E3
9524 D4
9541 I5
9570 J3
9582 K5
9598 C2
9599 C1

6.- Electric Diagram



1679	G3	3687	K3
1685	F2	3691	B2
2149	E2	3692	B2
2600	D3	3696	J8
2602	C7	6149	E3
2610	D7	6602	C7
2611	D8	6663	J7
2636	K7	6691	C2
2641	K3	7600	H5
2648	L7	7605	C7
2651	B3	7657	E2
2660	F2	7659	E2
2669	I2	7670	I3
2677	H3	7673	I8
2680	G3	7685	D3
2681	G3	7691	B2
2682	F3	9504	B8
2685	F2	9607	L2
2691	F3	9652	I3
2692	F8	9674	L8
3149	E3	9675	L8
3601	B8	9678	L2
3602	B8	9679	M2
3603	C7	9685	L2
3604	C7	9696	B8
3605	C7		
3606	C6		
3607	C6		
3608	E7		
3609	F7		
3610	C7		
3611	C8		
3612	C8		
3616	D2		
3617	E2		
3618	F7		
3619	G7		
3620	F6		
3621	D7		
3636	L7		
3637	K7		
3643	K3		
3644	J3		
3645	J3		
3646	J3		
3647	K3		
3648	L7		
3649	J3		
3650	J4		
3651	J4		
3652	I3		
3653	K4		
3656	E3		
3657	E3		
3658	E3		
3659	E3		
3660	F2		
3661	I7		
3662	F3		
3663	J7		
3664	J8		
3665	G8		
3666	J7		
3667	G8		
3668	I2		
3669	I2		
3670	I3		
3673	I8		
3674	J8		
3675	K8		
3676	F3		
3681	I7		
3684	D3		
3685	D3		

STV2246:



STV2248:

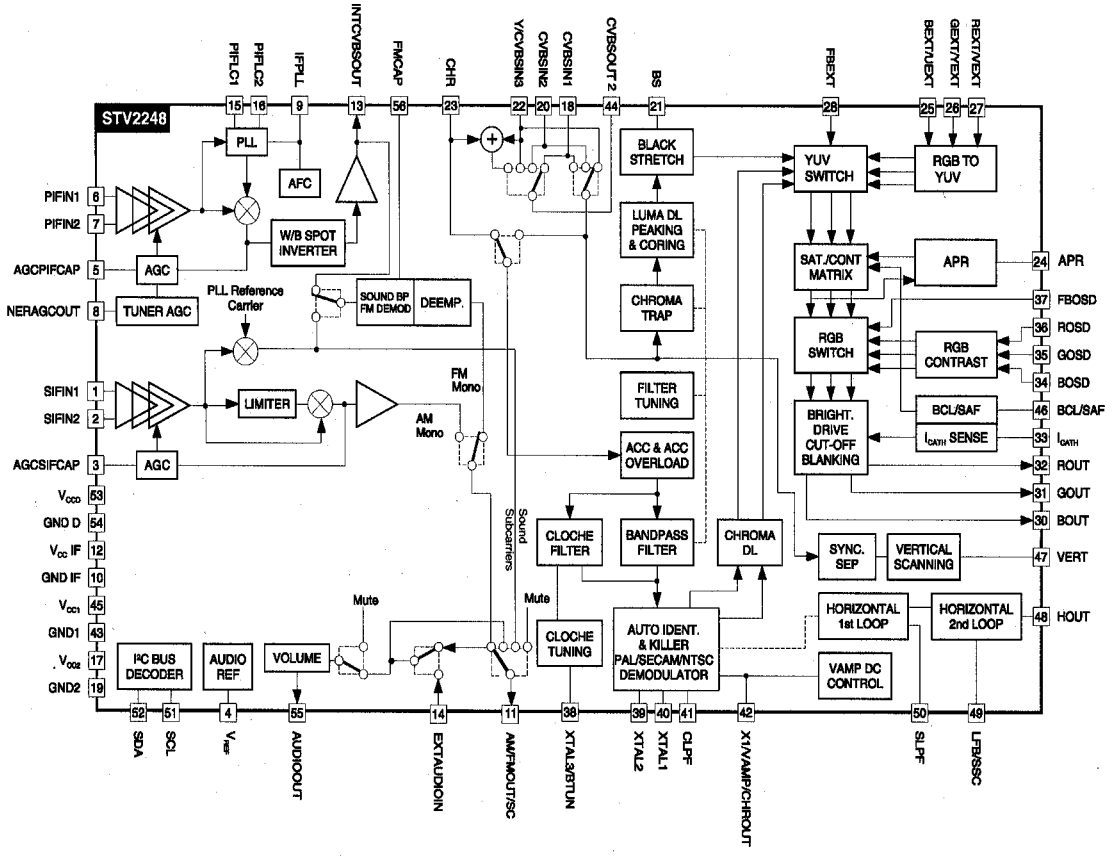


Figure 7.1 TV Processor block diagram

7.- CIRCUIT DESCRIPTION

7.1 SMALL SIGNAL PROCESSING (Diagram A)

The small signal is processed by IC 7015 (STV2246 for Pal sets, STV2248 for Pal/Secam sets), including IF detection, video processing, chroma decoder, RGB , sync processor and sound decoder. The ICs STV2246 and STV2248 are fully controlled by I2C bus and their block diagram can see in fig. 7.1.

7.1.1 IF detection

IF detection can be intercarrier (no multistandard sets), that means sound and picture are detected in the same circuit (PIF), or QSS (Quasi Split Sound, used in multistandard sets) where sound is detected in a separated circuit (SIF).

- PIF input (pins 6, 7): The IF signal coming from pin 11 of the tuner (diagram C) is filtered by the IF SAW filter (1015) and applied to PIF input of IC7015 (pins 6 and 7). The IF bandpass characteristic is determined by the SAW (Surface Acoustic Wave) filter.
- PIF oscillator (pins 9, 15, 16): The PIF PLL (phase locked loop) is based on a LC resonator (L5040). Carrier frequency should be adjusted by I2C bus at 38.9 MHz (see chap. 8.3). A filter for the PLL is present at pin 9 (2028, 2029, 3028). AFC is internally controlled for the µC (7600 diagram E) by I2C. Identification signal is also internal.
- AGC (pins 5, 8): The IF AGC time constant is fixed by the capacitor 2025 (pin 5). The AGC delayed voltage (pin 8) is applied to pin 1 of the tuner and adjusted by I2C (see chap. 8.4).
- Video output (pin 13) : This baseband CVBS signal with 2Vpp of nominal amplitude, contains the FM intercarrier sound signal. Sound is filtered out by a ceramic trap (1032 or 1033) which frequency can be different depending on the system: 5.5 MHz for BG, 6.0 MHz for I or 6,5 MHz for DK.

Multistandard sets
- The IC STV2248 is used in multistandard sets.
- Only picture IF is processed in PIF circuit (pins 6,7), and carrier frequency has a second adjustment (by I2C) at 33.9MHz for L' standard (see chap. 8.3). The IC changes automatically between negative (BGIDK) and positive (LL') modulation.
- Sound IF is processed in SIF circuit (QSS system)
- SIF input (pins 1, 2): Sound is filtered from IF signal in a SAW filter K9650 (1137). The IF input is present at pin 1 of 1137 and pin 2 is used as a switching input:
  - If Vpin2 = 0V a 40.40MHz sound carrier is filtered (for L´ system, L/L´ signal is high, T7127 conducts).
  - If Vpin2 = Vpin1 a 33.40MHz sound carrier is filtered (for L,I,BG systems, L/L´ signal is low, T7127 is cut, D6115 conducts).
- SIF AGC (pin 3): The sound IF AGC time constant is fixed by the capacitor C2024.

7.1.2 Sound processor

- FM demodulation: For intercarrier sets (no multistandard) FM sound is filtered internally from CVBS (pin 13) and demodulated. De-emphasis is also made internally. If the set is Pal/Secam BG or DK, STV2248 is used instead of STV2246. SIF input and AM demodulator are avoided and pins 1, 2 are AC grounded by C2115.
- Scart audio out (pin 11): The signal at this pin is drived to the euroconnector sound outputs (see Diagram C).
- External audio in (pin 14): External audio proceeding of pins 2,6 of euroconnector is applied to this pin. Selection between internal or external is done by an internal switching controlled by I2C (see INT/EXT, chapter 7.6).
- Audio out (pin 55): After a volume control (by I2C), this output is drived to the input IN+ of the final sound amplifier IC7187 (Diagram C).

Multistandard sets:
FM demodulation: This function is done in the same internal circuit of STV2248 that no multi sets, but the input proceeds of SIF circuit, instead of CVBS signal.
AM demodulation: In Multistandard sets, also AM demodulation for LL' systems is necessary. AM sound is extracted directly from the SIF inputs by an internal circuit.
AM/FM switch : This internal switch is commanded by the µC depending on the system selected on the tuning menu.

7.1.3 Video processing

- Video switches (pins 18, 20, 44): The internal CVBS signal is now fed to pin 18 IC7015. External CVBS proceeding from pin 20 of Euroconnector is present on pin 20 of 7015. The IC switches between internal and external by I2C bus (see INT/EXT, chapter 7.6). At pin 44 there is an output of CVBS used for the TXT decoder.

- Luminance processor: CVBS coming from video switches is internally applied to luminance processor, which is composed of chrominance trap filter, luminance delay line and peaking circuits. Sharpness control modifies peaking by I2C.
- Black stretch circuit (pin 21): This feature of the picture is fixed (not adjustable). Black stretch capacitor 2250 is connected to pin 21.

7.1.4 Chroma Decoding

- ACC and chroma filter: Video signal coming from video switches, goes through an internal variable-gain amplifier to the chroma band pass filter. Gain of amplifier is determined by burst amplitude (ACC). If the amplitude of chroma signal is higher than standard, an additional overload circuit decreases it (ACCO).
- XTAL (pin 40): The VCO uses one 4,43MHz crystal connected to pin40.

PAL sets:
STV2246 is used. Bandpass filter and demodulator are fully integrated.
Demodulator consist of synchronous detectors.
PLL is locked during the burst gate time window.
- CLPF (pin 41): The voltage on this chroma PLL filter controls the VCO in order to have the right frequency and phase according burst signal.

PAL/ SECAM sets:
STV2248 is used. Pal or Secam signals are recognized automatically by the IC.
Pal decoding is the same as in STV2246.
Secam demodulation is based on a PLL with automatic calibration loop.
- Secam bell filter (pin 38): Central frequency of bell filter (4.286 MHz) is fine tuning during frame blanking, using the XTAL frequency (4.433 MHz) as a reference. Tuning control voltage is stored in C2270.

- Chroma DL: The outputs of the demodulator are applied to an internal chroma delay line. Line number n is delayed 64useg and added to n+1 obtaining U and V signals (R-Y and B-Y).

7.1.5 RGB processor

- External RGB inputs (pins 25, 26, 27): RGB inputs coming from scart (see diagram C), are AC coupled (C2291/92/93) and converted internally in YUV signals (RGB TO YUV). Then are switched with internal YUV (YUV SWITCH) by fast blanking.
- Fast blanking external (pin 28): When fast blanking is high external RGB is displayed, only if TV is in external AV (program 0). Fast blanking can switch signals for full screen (by a DC voltage) or for a part of the screen (by a pulse voltage).
- Matrix: After switching, YUV signals are converted to RGB in the internal MATRIX circuit. Saturation control is received from the µC by I2C bus.
- APR (pin 24): The APR circuit (Automatic RGB Peak Regulation) compensates the spread of contrast between sources. If one of RGB signals exceeds the APR threshold, 2440 is charged and the gain is decreased. APR threshold can be adjusted in Service menu.
- RGB OSD (pins 36, 35, 34): RGB inputs for OSD and TXT coming from µC (7600 diagram E), are AC coupled (C2242/43/44) and applied to a RGB SWITCH controlled for the µC by fast blanking input (pin 37).
Video controls: Contrast, brightness and saturation are adjusted by I2C for the µC.
- BCL input (pin 46): Beam current is limited by circuit BCL/SAF. When beam current is high, voltage of C2460 is lower (Diagram B), D6462 conducts and Vpin46 is lower. When Vpin46 < 5.75V first contrast and then brightness are reduced.
- Safety input (pin 46): BCL/SAF circuit has also a safety function. If frame deflection is broken down, T7431 conducts (Diagram B), Vpin46 = 0V and line deflexion (pin 48) is disabled .
- RGB output circuit (pins 32, 31, 30): RGB outputs are drived to RGB amplifier (Diagram B).
- Digital cut-off loop (pin 33): Cut-off loop permits to control automatically the cut-off point of the 3 RGB cathodes by DC level. At the end of the frame blanking 3 consecutive cut-off lines, B, G and R are created. Cut-off current flows across T7204, T7209 and T7212 (Diagram B) respectively and it is measured on pin 33. When VG2 voltage is adjusted, DC level of RGB outputs is adapted to keep cut-of current.
- Warm-up detection circuit (pin 33): At the start up picture is blanked and 3 white lines are drived, instead of cut-off lines. As soon as the start beam current is detected on pin 33, RGB circuit starts in normal operation. If RGB circuit is damaged or grid 2 is low, the RGB circuit could not start (black picture) due to current is not detected.

7.1.6 Horizontal synchro

- Start up (pins 45, 53): The horizontal oscillator starts running when supply voltage of pin 45 reaches 6V and supply voltage of pin 53 reaches 4V. During start up circuit provides a softer operating horizontal output with a 75% of duty cycle.

Note: The set do not start up if protection voltages are activated (Vpin 49 > 2.5V or Vpin46 < 1V)
- Hor. sync. separator: Fully integrated sync. separator with a low pass filter, slicing level at 50% of the synchronized pulse amplitude.
- Horizontal 1st loop circuit (pin 50): The first phase locked loop (PLL1) locks the internal line frequency reference on the CVBS input signal. It is composed of an internal VCO (12MHz) that requires the chroma reference frequency (4.43MHz at pin 40), a divider by 768, a line decoder and a phase comparator. Scanning PLL1 filter (SLPF) needs external components on pin 50. PLL1 time constant is automatically controlled by software for broadcasting signals. For video signals (AV and program 99) constant is always fast to prevent top bending on the screen.
- LBF (pin 49): Line Fly Back input, is obtained by the network R3456/55 (Diagram B), T7372 and R3371. Output of T7372 is used also as HSYNC of the µC (pin 36 IC7600 diagram D). When the DC voltage of pin 49 is higher than 2.5V, HOUT (pin 48) is inhibited (protection).
- SSC output (pin 49): Super Sand Castle output is used only internally. Levels of sandcastle pulse are 5V for burst detection, 3V for line blanking and 2V for frame blanking.
- Horizontal 2nd loop circuit: The flyback position respect line blanking on TRC cathode is controlled in this circuit. Phase can be adjusted by I2C.
- HOUT (pin 48): Horizontal output is an open collector which one drives the horizontal driver stage (T7440 diagram B).

7.1.7 Vertical synchro

- Vert. sync. separator: It is an internal integrator to separate frame sync. pulses from CVBS.
- Vertical oscillator: Vertical frequency is obtained internally from line frequency by a line counter. Mode used is automatic 50/60Hz identification with 50Hz priority.
- Vert. output stage (pin 43): This pulse output is used to drive the sawtooth generator in the vertical amplifier (pin 3 IC7400 diagram B) and also as VSYNC of the µC (pin 37 IC7600 diagram D). The VERT pulse period is 314 lines in 50Hz free running mode (264 in 60Hz) and 312.5 lines in 50Hz synchronized mode (262.5 in 60Hz). Frame blanking is from line 2 to 12.5.
- Vert. amplitude (pin 42): This DC output is applied by a divider resistor (R3416, R3414 diagram B) to pin 4 of IC7400 to control vertical amplitude. It can be adjusted by I2C from 1.5V (max. vert. amplitude) to 6V (min. vert. amplitude).

7.2 RGB AMPLIFIERS (diagram B)

- RGB inputs : The inputs of RGB amplifiers come from pins 32, 31 and 30 of IC7015 (Diagram A). White D is adjusted in IC7015 changing the AC level of the inputs by I2C bus and cut-off changing the DC level.
- RGB amplifiers (7205, 7210, 7213): RGB circuit consist of 3 inverter amplifiers (7205, 7210, 7213) including active load (7201, 7208, 7211). To improve high frequency amplification there are small capacitors (2204, 2217 and 2230), and to adapt DC level for inputs there is a diode (6225).
- Cut off control (7204, 7209, 7212): Cathode current produced at cut-off pulses, is applied to cut-off control circuit, pin 33 of IC7015 (see 5.1.5), across transistors (7204, 7209, 7212). Diode 6243 is added to prevent high voltage in IC7015.
- Flash-over protections: Clamping diodes to +200V (6201, 6218, 6227) and 1K5 series resistors (3203, 3216, 3326, 3228, 3229) are added for protect the circuit from TRC flash-over.

7.3 DEFLECTION (Diagram B)

7.3.1 Frame deflection

This function is performed by the integrated circuit TDA1771 (7401).
- Frame supply (pins 2, 9, 10): Pin 9 is used to supply the IC except output stage which one is supplied by pin 2. At pin 2 there is a higher voltage during flyback time. This is produced adding the flyback signal present at pin 10 to a +25V supply by D6401 and C2410.
- Vertical driver (pin 3): A vertical pulse is drived by pin 47 of IC7015. This pulse is used to synchronize vertical oscillator.
- Vertical oscillator (pin 6): Saw tooth is performed in the capacitor 2406. R3417 makes a feed back to stabilize vertical amplitude from beam current.
- Vertical amplitude (pin 4): A DC voltage originated at pin 42 of IC7015 and adjusted I2C bus is applied to pin 4 to modify vertical amplitude.
- Vertical output (pin 1): Vertical output is applied to deflection coil. DC current is suppressed by C2404. A voltage proportional to current deflection is present in R3411/12 and a feedback of it is sent to pin 8 across C2405, R3405 and R3407. A DC feedback is obtained by resistor divider R3403 and R3404. Linearity is corrected by the network C2405 and R3405.
- CRT protection (7430, 7431): When frame deflection is broken down, transistor 7430 is cut, and 7431 conducts so that the signal BCI/SAF=0V and the line is switched off protecting the tube (see pin 46 of IC7015).

7.3.2 Line deflection

The final line transistor is driven by the transformer 5441, whose primary winding is driven by the transistor T7440 connected to the line drive output of IC7015 (pin 48).
The horizontal deflection stage is carried out in a conventional way, with the deflection transistor (T7445) and line transformer (5445).
Beam current info (BCI) is present at C2460.
There are the following supply voltages obtained from line transformer (5545):
+25V : To supply frame deflection..
FF : The heather voltage is reduced by R3235/38 and 5201/02 (Diagram B) to obtain 6.3Veff at the CRT.

7.4 SOUND AMPLIFIER (Diagram C)

Sound amplifier is a Bridge Tied Load (BTL) amplifier short circuit protection, mute and stand by mode.
IC used can be TDA8941 for 14" and 17" models or TDA8943 for 20" and 21" models. TDA8944 is reserved for stereo models (not explained in this manual).
- Supply (Vcc, SVR): Main supply (Vcc) is taken from +11V of Power Supply (C2540 diagram D). The IC creates internally a half supply, present in SVR pin and decoupled by 10uF capacitor.
- Sound input (IN+): This amplifier has a differential input (IN+,IN-). Audio input is connected to IN+ decoupled by 220nF capacitor (C2186) and IN- is decoupled to ground by other 220nF capacitor. To avoid oscillations there is a 1n5 capacitor connected between both inputs.
- Mode input: This input is commanded by the µC and has three modes depending of the voltage level:
  - Standby mode (Vmode=Vcc): Consumption is very low (used during stand by)
  - Mute mode (2.5V<Vmode<Vcc): No sound output (used when the set is switched on/off, there is no signal, etc.)
  - Operating mode: (Vmode<0.5V): Sound output present (normal operation).
- Sound output (OUT+/OUT-): Amplified sound is drived to the loudspeakers. Headphones output has been connected in such a way that when headphones are connected, loudspeakers are switched off.

7.5 POWER SUPPLY (Diagram D)

Mains isolated switched mode power supply (SMPS), controlled by IC7514 (TDA4605) in variable frequency mode.
- Switching behaviour: The switching period is divided in on-time, when energy is extracted from the mains into the primary winding (8-12 of 5525), off-time, when energy in the transformer is supplied to the loads via secondary windings of 5525 and dead-time when no energy is extracted or supplied.
- Standby mode: Output voltages are present when the set is on stand by, due to standby is done cutting line deflection. On-time is lower and power consumption is very low.

7.5.1 Primary side

- Degaussing: R3501 is a dual PTC (2 PTC's in one housing). After switch on set, PTC is cold so low-ohmic and so degaussing current is very high. After degaussing, PTC is heated so high-ohmic, so in normal operation degaussing current is very low.
- Rectifier: Mains voltage is filtered by L5500, full wave rectified by diodes D6502-D6505 and smoothed by C2505 (300V DC for 220V AC mains).

7.5.2 Control circuit (IC7514)

- Start up and supply (pin 6): When the set is switched on, a current via R3507 is applied to pin 6. When C2514 is charged to 15V, the power supply starts and a current from pin 5 to T7525 is drived. T7525 and starts conduction and a voltage across transformer windings is built up. The voltage across winding 4-2 is rectified by diode D6521 and used to supply the IC on pin 6.
- Soft start (pin 7): The capacitor C2523 causes a slow increase of the duration of the output pulse during start up.
- IC output (pin 5): This output drives T7525. R3523 is a fuse resistor to protect IC from short circuits in T7525. D6516 limits the maximum voltage in T7525.
- Start conduction of T7525 (pin 8): A voltage proceeding from winding 4-2 is applied to this pin. The zero crossing detector recognizes the complete discharge of the energy stored in the transformer core, in addition to a dead time depending on C2508. This circuit guarantee that T7525 starts conduction at minimum Vds voltage (see fig 7.5).
- Primary current info (pin 2): Current primary winding is simulated by a pin 2 voltage.
- Output voltage info (pin 1): The voltage across winding 4-2 is rectified by diode D6515, divided by R3517, R3518 and R3508 and applied to pin 1. Internal control voltage (Vcont) inversely proportional to Vpin1 is generated.

- Output regulation (pins 1, 2, 8): IC7514 stabilizes output voltage by controlling T-on and so the frequency and the duty cycle.

Start pulse to T7525 is determined by pin 8 circuit (see fig 7.5).

Then a sawtooth voltage V2 is generated at pin 2. Stop pulse to T7525 is produced when V2 reaches Vcont.

Output control is done by the following way:

If output is higher, V1 is higher, Vcont is lower, T-on and output will be reduced.

If output is lower, output will be increased.

Output voltage of supply can be adjusted by R3518.

Mains voltage variation is stabilized in the following way:

If mains voltage is higher, slope in the sawtooth voltage V2 is higher, stop point is reached before and T-on is reduced.

If mains voltage is lower, T-on is increased.

7.5.3 Protections

- Overload protection (pin 2): This is produced if T-on is increased till V2 voltage reaches the foldback point (see fig 7.5). The IC will switch into overload mode (off and on continuously).
- Output voltage protections (pin 6): Limiting values of V6 voltage (7.25V and 16V) provide under and overvoltage protections for the circuit.
- Mains overvoltage (pin 3): The voltage at pin 3 IC7515 is a measure for the mains voltage and so the DC voltage across C2505. As soon as the voltage V3 reaches 6.6V, the supply will stop running.

7.5.4 Secondary side

- Line supply: Line supply present at capacitor C2530 should be adjusted to the correct value (depending on the TRC) by means of P3518. This supply is also used to obtain +33V varicap voltage by D6602 (see diagram E).
- Sound supply (+11V): This supply is used for sound output amplifier and to feed following stabilizers.
- +8V stabilizer: A reference voltage obtained by a resistor divider R3503 and R3505 is amplified in T7501 and T7502 transistors till diode D6572 conducts stabilizing +8V output. When the set switch to stand by, standby voltage is 0V, then T7501 is cut, and +8V is reduced to 0V.
- +5V stabilizer: +5V for small signal is made by and D6573 T7577 circuit. R3577 is connected to +8V to switch off +5V when the set is in stand by mode.
- +5V stand by: +5STB is regulated by T7575 and D6570. A positive power on reset signal (POR) is obtained in the collector of T7571, which one is cut during start up till R3576 has 0.6V.

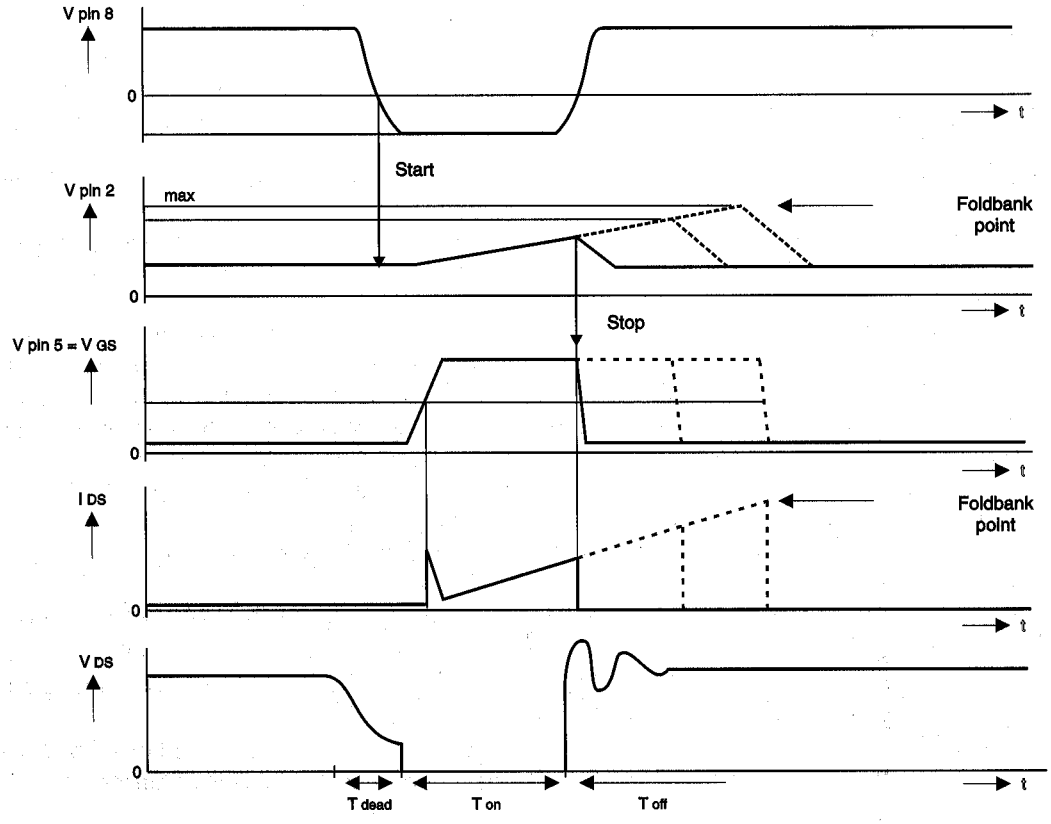


Figure 7.5 Power supply signals

7.6 MICROCONTROLLER/TEXT (Diagram E)

The CTS-AA chassis is designed to accept 2 different microcontrollers: SAA5531 for TXT models and SAA5541 for no TXT.
Both microcontrollers are mounted in the same position (7600), and the associated circuitry is the same. The ROM of the ICs contain an specific program that assures all the functions of the appliance, including 2 menus, one to control the set (see Instructions Manual) and another for Service Mode (see Service Instruct. chapter 8.1).
The µC for TXT sets contains a teletext decoder, including the following functions: TXT on/off, reveal, freeze, temporary cancellation, clock, subcode, zoom, index, flof, page +/-, X/26 and 8/30 packet decoding (station identification and start-up page).

Following there is an explanation of the different functions of the microcontroller indicating pins number assigned:
- Tuning (pins 1, 9): The unit has a VST (Voltage Synthesized Tuning) system. This system works by tuning to a station on the tuner through a linear variation of the tuning voltage (V-VARI) from 0V to 33V applied on pin 2 of the tuner. It is generated on pin 1 of the µC and converted to an adequate level for the tuner using T7605.
While searching, µC are always reading AFC (Automatic Frequency Control) and video identification signals from IC7015 by I2C bus. When video signal is identified, µc stops searching and do a fine tuning to reach a right AFC value.
- Factory facility (pin5): This pin used only in the factory should be connected to +5V by R3621.
- Service (pin 7): This pin is used to put the set in Service Mode (see chapter 8.1).
- INT/EXT input (pin 8): The set can switch to external (AV on the screen) by remote control (selecting program 0) or by rise edge at pin 8 of euroconnector (see diagram C). The µC switches video and audio (see 5.1.2) to external via I2C bus. In both cases the user can switch to internal changing the channel.
- Control key (pin 10): Pin 10 is activated by a DC voltage. When control keys are not activated, a voltage of 3V3 is produced by divider R3618 and R3619. If a control key is activated, a resistor (R3665, R3667) are connected in parallel with R3619, decreasing the voltage of pin 10. There are 3 voltage levels depending on value of parallel resistor: 1.85V (910R + 470R), 1V (470R) or 0V (ground circuit).
- Band switching (pin 14, 15, 16): There are 3 outputs for band switching pin 15 for VHFI, pin 16 for VHFIII and pin 14 for UHF. The µc controls the channel band in the tuner by a voltage of +5V at the correspondent output.
- L/L´ out-put (pin 18): This signal are only used on multistandard units for switching the system in sound filter (see 5.1.5). L/L' output is high for L' system.
- LED (pin 19): The LED (D6663) lights up with a low current when the television set is ON and with a high current when the set is on Standby. While the set is receiving a remote control signal, the led is blinking.
- Signal I2C bus (pins 20,21): This is a communication bus between the µc and the signal IC (7015).
Picture and sound controls: User controls (brightness, contrast, colour, sharpness and volume) are processed by the µc and sent to IC7015 by I2C bus. The µc also sends a sound mute when the signal received is interrupted (including channel search) and a video mute during a change of program.
- Video input (pin 23): CVBS TXT input are only used on TXT sets. The teletext information is extracted from the video signal inserted on pins 23.
- Standby (pin 30): When this output is low, the set is switched to stand by. Signal voltages of power supply (+5V, +8V diagram D) are reduced and the line oscillator stops, so there is no signal in pin 48 of IC7015 (diagram A).
- Power supply (pins 31, 39, 44): The IC has several +3V3 power supplies, analog (pin 31), core (pin 39), and POR periphery (pin 44). All supplies are present during stand by.
- OSD outputs(pins 32, 33, 34, 35): The RGB and fast blanking outputs used for On-Screen Display (OSD) and also for TXT are applied to RGB inputs of IC7015 (pins 34, 35, 36, 37 diagram A).
- OSD synchronization (pins 36, 37): In order to synchronize the OSD and the TXT information with the picture signal, the VERT FLYBACK signal (pin 37) and HOR FLYBACK signal (pin 36) are added in inverted form to the integrated circuit. Due to this if the video signal is lost, the TXT keeps synchronism.
- Oscillator (pins 41, 42): A 12-MHz oscillator is determined by a 12-MHz crystal (1679) between pins 41 and 42.
- P.O.R. (pin 43): Power on reset (POR) is activated when the set is switched on. If the µC shows abnormal behaviour it is advisable to reset it switching off/on the set. Reset can be produced also connecting pin 43 to +5V for an instant.
- RC5 (pin 45): The commands transmitted by the remote control handset are received by infrared receiver (1685) and passed to the microcontroller for decoding.
- Mute output (pin 46): This pin is a 3 state output used to control the sound amplifier (see chapter 7.4):
  -Stand by mode (Vpin46=0V): T7657 and T7659 are cut, mute signal is 11V
  -Mute mode (pin46=open): T7659 conducts (by resistor divider), T7657 are cut, mute is 5,5V.
  -Operating mode (Vpin46=3V3): Both transistors conduct, mute signal is 0V.
- EEPROM (pins 49 and 50): The microcontroller is connected to non-volatile memory IC7685 (EEPROM) via bus I2C. The following information are stored in the memory:
  - Channel data including tuning voltage and band of all the channels.
  - Personal preferences (PP), menu mix and child lock on user menu.
  - All settings included on Service Menu.

8.- ELECTRICAL ADJUSTMENTS

8.1 Service mode

The signal processor IC7015 (STV2246 or STV2248) is fully controlled by I2C for the µC IC7600, so that the most of adjustments of the set can be made by service menu.

- Enter in Service mode: There are 2 ways to enter in Service mode
  - By a short circuit between pin 7 of microcontroller (IC7600) and ground while the set is starting up. In this case all controls (volume, contrast, brightness and saturation) are pre-adjusted to the mid position.
  - When the set is in program 75, by pressing at the same time OSD key (+) on RC and MENU key on local key board during 4 seconds.

Service mode is indicated by a S symbol on the down left corner of the screen.

- Display Service Menu : When the set is in service mode it is possible to display Service Menu by OSD key (+) on RC. Using P+, P- keys of remote control the different items can be displayed (see table 8.1):

Item Numb.	Item Description	Pre Setting	To Adjust
1	AFC Coarse	05	See 8.3 AFC
2	AFC Fine	36	
3	AFC Coarse LP	07	
4	AFC Fine LP	44	
5	CVBS AMP	10	Fixed
6	AGC Start	33	See 8.4 AGC
7	AGC Gain	00	Fixed
8	Manual C-O	00	See 8.5 White
9	R Cut-Off	20	
10	G Cut-Off	1F	
11	Brightness	16	Controls
12	Contrast	07	
13	R Gain	3B	See 8.5 White
14	G Gain	2E	
15	B Gain	33	
16	Bell Filter	00	Fixed
17	APR Thresh	0B	Fixed
18	HOR Shift	29	See 8.6 Geometry
19	VER AMP	11	
20	TXT Shift	01	
21	Sys Options	02	See 8.7 Options
22	Menu Options	00	
23	AFC Adjust	00	See 8.3 AFC
24	AFC LP Adj.	00	

Table 8.1. Service menu. Settings are hexadecimal values

- Pre setting values: When E2PROM is replaced, pre-setting values indicated on table 8.1 are stored by the µC. (see 8.7 E2PROM).

- Adjust by Service Mode: When a item is selected, using V+, V- keys of remote control it can be adjusted. Items 5, 16 and 17 have fixed values = pre setting values, rest of items see 8.2 to 8.7.

- Remove service menu: There are 2 ways to remove service menu
  - Saving the new settings: Using OSD (+), MENU or INSTALL keys on RC.
  - Keeping the old settings: Switching the TV to stand by. Service mode continues active.

- Remove Service Mode: Switching off the TV (be careful to disconnect pin 7 of microcontroller of ground)

8.2 Power supply and focusing:

- Power supply voltage:
  - Adjust brightness and contrast controls at minimum.
  - Connect a DC voltmeter across C2530 (Diagram D).
  - Adjust R3518 for a required voltage depending on the model and the TRC used (see table 11, page 23).

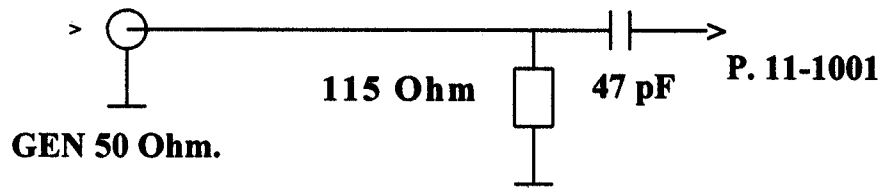
- Focusing:
  - Adjust with the potentiometer placed on the line output transformer.

8.3 AFC

IF Carrier frequency can be adjusted in automatic or manual way. It is recommended the automatic way.
There is an adjusting symbol for AFC on the top of the service menu consisting of a double arrow (><). If only one arrow appears (<) or (>) AFC should be readjusted to reach double arrow (><).

8.3.1 Automatic AFC adjustment

- Insert a 38.9MHz 106dB/µV signal in pin11 of the tuner (1001 diagram C) across the following network:



Note: For Pal I sets, frequency is 38.9MHz only if saw filter (1015 diagram A) used is J1952.
If saw filter is J1951 frequency of the inserted signal should be 39.5MHz.

- Select AFC Adjust (item 23 of Service menu) and press V+ on RC.
- Press OSD key to save adjustment.
- Enter in Service menu again and check that adjusting symbol is correct (><). If not, readjust AFC Fine (item 2 of Service menu) till symbol is (><).

Multistandard sets
A second adjustment for L' system is necessary when the set is multistandard, to do it TV should be tuned in the first half of BI (L' channel).
- Repeat the same automatic AFC adjustment procedure, inserting a signal of 33.9MHz instead of 38.9MHz and using AFC LP Adj. (item 24 of Service menu) and AFC Fine LP (item 4 of Service menu).

8.3.2 Manual AFC adjustment:

- Insert the frequency signal defined in 8.3.1
- Adjust the value of AFC coarse (item 1 of Service menu) to 00 and the item value of AFC fine (item of Service menu) to 40.
- Increase the AFC coarse value just till adjusting symbol is (><) or (<) and adjust AFC Fine to fine a value just in the middle of the range fulfilling the correct symbol (><).

Multistandard sets
TV should be tuned in the first half of BI (L' channel)
- Repeat the AFC Manual AFC adjustment procedure inserting a signal of 33.9MHz instead of 38.9MHz and using AFC coarse LP (item 3 of Service menu) and AFC fine LP (item 4 of Service menu).

8.4 AGC Adjustment

- Connect a pattern generator to the aerial input with RF signal amplitude = 1mV.
- Adjust the value of AGC start (item 6 of Service menu) so that voltage at pin 1 of the Tuner (1001) is 3.7V.

8.5 White D

8.5.1 Manual cut-off:

Item 8 of adjusting values should be 00 (see table 8.1), that means set is in automatic cut-off. However it is possible that RGB do not start (black picture), due to grid 2 is not adjusted. In this case we recommend to change to Manual cut-off (Item 8 = 01), pre-adjust grid 2 to have a good picture and change to automatic cut-off (Item 8 = 0) before continue adjusting (see warm-up detection circuit in 7.1.5)

8.5.2 Grid 2:
- Connect a white pattern generator.
- Adjust contrast at 07 and brightness at 22.
- Adjust VG2 potentiometer (in line transformer) till voltage in collector of transistor 7213 is 142V in 20"/21" or 134V in 14" (measured with a DC voltmeter).

8.5.3 White checking:

- Connect pattern generator containing grey scale
- Adjust the set to normal operation and reduce the saturation control to minimum.
- Allow the set to warm up about 10 minutes and check visually if the grey scale has correct colour.
- If not, enter to Service menu and adjust G and B gain (items 14 and 15) until a desired grey is obtained. In the case that adjusting is difficult, start again with the setting values of table 8.1 (items 9, 10, 13, 14, 15).

8.6 Geometry

- Connect a circle pattern generator with the controls at nominal conditions and enter to service menu.

- Horizontal shift:
  Adjust to have picture centred in horizontal position by service menu item 18.

- Vertical amplitude:
  Adjust picture height to cover the screen by service menu item 19.

- Vertical centring:
  Occasionally it is possible to correct the vertical centring cutting resistors R3400 or R3401

- TXT Shift:
  Horizontal shift of OSD or TXT can be adjusted by item 20 of service menu.

8.7 Options:

The type of chassis is defined by items 21 and 22 of service menu. The following alternatives are available:

SYSTEM OPTIONS (Item 21)	VALUE
PAL B / G	00
PAL - I	01
PAL - SECAM B / G	02
PAL - SECAM B / G - DK	03
PAL - SECAM B / G - L - LP	04
PAL - SECAM B / G - I - L - LP	05
PAL - SECAM B / G - I - DK - L - LP	06

MENU OPTIONS (Item 22)	VALUE
13 Languages menu	00
English bars menu	01
Global menu (without languages).	03
Only UHF 13 languages menu	04
Only UHF English bars menu	05
Only UHF global menu (without languages)	07

Important note: All the chassis have identification sheet when the chassis type is indicated: «Cod. service: SXXMXX», where SXX means the option of system and MXX means the option of menu

Example: S03M00 means system = 03 (Pal-Secam B/G-DK) and menu = 00 (13 Languages menu)

When the chassis or the EEPROM (IC7685) have to be replaced, be careful to keep the same type of chassis, setting correctly the chassis options.

8.8 Error messages

The microcomputer also detects errors in circuits connected to the I^2C (Inter IC) bus. These error messages are communicated via OSD (On Screen Display) :

Error message	Error description	Component
F2	Eprom communication error	IC7685
F3	µC internal error	IC7600
F4	SDA2/ SCL2 bus communication	IC7015, tracks PCB
F6	Eprom data error	IC7685

9. Safety instructions, maintenance instructions, warning and notes

Safety Instructions for Repairs

1. Safety regulations require that during a repair:
   - The set should be connected to the mains via an isolating transformer.
   - Safety components, indicated by the symbol ⚠ should be replaced by components identical to the original ones
   - When replacing the CRT, safety goggles must be worn.

2. Safety regulations require also that after a repair:
   - The set should be returned in its original condition.
   - The cabinet should be checked for defects to avoid touching, by the customer, of inner parts.
   - The insulation of the mains lead should be checked for external damage.
   - The mains lead strain relief should be checked on its function
   - The cableform and EHT cable are routed correctly and fixed with the mounted cable clamps in order to avoid touching of the CRT, hot components or heat sinks
   - The electrical resistance between mains plug and the secondary side is checked. This check can be done as follows:
     - Unplug the mains cord and connect a wire tween the two pins of the mains plug.
     - Switch on the TV with the main switch.
     - Measure the resistance value between the pins of the mains plug and the metal shielding of the tuner or the aerial connection on the set. The reading should be between 4.5 M and 12 M.
     - Switch off the TV and remove the wire between the two pins of the mains plug.
     - Thermally loaded solder joints should be oldered.
   - This includes components like LOT, the line utput transistor, fly-back capacitor.

Maintenance Instructions

It is recommended to have a maintenance inspection carried out periodically by a qualified service employee.
The interval depends on the usage conditions.
- When the set is used in a living room the recommended interval is 3 to 5 years. When the set is used in the kitchen or garage this interval is 1 year.
- During the maintenance inspection the above mentioned "safety instructions for repair" should be caried out. The power supply and deflection circuitry on the chassis, the CRT panel and the neck of the CRT should be cleaned.

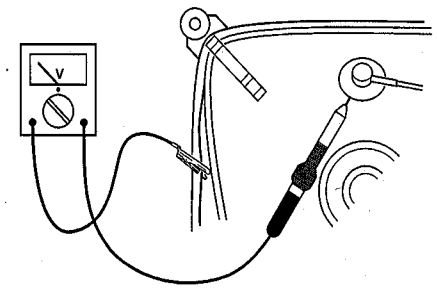


FIG. 9

Warnings

1. In order to prevent damage to IC's and transistors any flash-over of the EHT should be avoided. To prevent damage to the picture tube the method, indicated in Fig. 9, has to be applied to discharge the picture tube.
   Make use of an EHT probe and a universal meter is 0V (after approx 30s).

2. ESD.
   All IC's and many other semi-conductors are sensitive to electrostatic discharges (ESD). Careless handing during repair can reduce life drastically. When repairing, make sure that you are connected with the same potential as the mass of the set via wrist wrap with resistance. Keep components and tools on the same potential.

3. Proceed with care when testing the EHT section and the picture tube.

4. Never replace any modules or any other parts while the set is switched on.

5. Use plastic instead of metal alignment tools. This will prevent any short circuits and the danger of a circuit becoming unstable.

6. Upon a repair of a transistor or an IC assembly (e.g. a transistor or IC with heatsink and spring) remounting should be carried out in the following order:
   1. Mount transistor or IC on heatsink with spring.
   2. Resolder the joints.

Notes

1. After replacing the microcomputer first solder the shielding before testing the set. This is needed as the shielding is used for earth connection. If this is not done the set can switch into protection mode (see description of the SMPS).

2. Do not use heatsink as earth reference.

3. The direct voltages and waveforms should be measured relative to the nearest earthing point on the printed circuit board.

4. Voltages and oscillograms in the power supply section have been measured for both normal operation (⏻) and in the stand-by mode (⏻). As an input signal a colour bar pattern has been used.

5. The picTure tube PWB has printed spark gaps. Each spark gap is connected between and electrode of the picture tube and the Aguadog coating.

10. List of abbreviations

µC	Microcomputer
µP INT/EXT	Switching signal from µC to TS7876 and TS7877 (diagram C) making together with pin 8 of SCART connector the INT/EXT switching signal; "low" for internal, "high" for external
AF	Alternating Current
AFC	Automatic Frecuency Control
AGC	Automatic Gain Control
AM	Amplitude modulation
APR	Automatic Peak Regulation
AQUA	Aquadag on the CRT panel for spark gaps and used for making BCI signal
AV	Audio and Video cinches on the rear side of the set
BCI	Beam Current Info; if beam current increases the BCI signal decrases. BCI is used for contrast reduction if beam current is too high
BCI'	Derived from BCI; if beam current increases (more white), EHT decreases so picture will become too big. BCI and so BCI' decreases for increasing beam current (diagram C) and the picture will be corrected.
BG/I	Switching signal from µC; "low" for I or DK reception (6.0 or 6.5 MHZ FM sound), "high" for BG reception (5.5 MHZ FM sound)
BG/I/DK/LL'	Sond system BG/I/DK/LL' indicate frecuency distance between sound and picture carriers (5.5 MHz for I, 6.5 MHz for DK and LL')
BG/L	Switching signal from µC; "low" for BGIDK reception (negative modulation, FM sound), "high" for LL' reception (positive modulation, AM sound)
BRI	Brightness control signal (same as BRIGHTNESS)
BRIGHTNESS	Control signal (from µC, but on DC level via RC network) for brightness control of the video controller IC7015/6D
BSW1	Bandswitcing signal from µC to 2 to 3 decorer IC 7002
BSW2	Bandswitching signal from µC to 2 to 3 decorer IC7002
CONTRAST	Control signal (from µC, but on DC level via RC network) for brightness control of the video controller IC7015/6D
CRT	Picture tube
CVS	Colour Video Blanking Synchronisation from pin 7 IF detector IC7015/6A
DC	Direct current
EEPROM	Electrical Eresable Programmable Read Only Memory
EHT	Extra High Tension (25 KV)
FET	Field Effect Transistor
FF	Filatement (heather voltage)
FM	Frecuency MOdulation
HOR FLYBACK	Horizontal flyback pulse (15625 Hz) used for locking the horizontal oscillator in IC7015/6E and for locking the OSD generator in the µC
HOR	Horizontal drive signal from IC7015/6E to line output stage
HUE	Tint ajustment for NTSC system
I²C	Digital Control bus of the microcomputer
IDENT	Status signal; "low" for horizontal synchronisation, "high" in case horizantal synchronisation is detected
IF	Intermediate Frecuency
iNT/EXT	Switching signal derived from µP INT/EXT and pin 8 of SCART to pin 16 IC7015/6B and IC7140 (diagram D); "low" for internal, "high" for external
L/L'	Switching signal from µC; "low" for BGIDKL (picture at 38.9 MHz) reception, "high" for L' reception (picture at 33.4 MHz)
LED	Light Emitting Diode
LOT	Line Output Transformer
MUTE PROG 0	Only for sets whithout SCART + AV ; "low" for program 0 muting the sound, "high" for program 1-39
NIL	Non InterLace
NTSC	National Television System Committee
OSD	On Screen Display
OSD FAST BLANKING	Fast blanking info from OSD generator in µC to video controller IC7015/6D for blanking the RGB info to enable OSD-G insertion
OSD-G	Green info from OSD generator in µC to video controller IC7015 for inserting green OSD info on screen.
PAL	Phase Alternating Lines
PLL	Phase Locked Loop
POR	Power On Reset (ensures the C starts up it's software only if the power supply of the C itself is high enough)
POS/NEG	Switching signal from IC7140 via BG/L; "high" for positive modulation (LL'), highihmic for negative modulation (BGIDK).
PP	Personal Preference
PROT	Prottection signal from frame IC7400; in case vertical flyback generator in IC7400 is not activted, the voltage at pin 8 IC7400 becomes 2V. Protection circuit in IC7400 will make pin 7 "high" overrulling the HOR FLYBACK and SANDCASTLE. The constant "high" sandcastle is supplied to the luminance circuit and so the picture will be blanked.
PTC	Positive Temperature Coefficient Resistor
RC5	Remote Control 5 system
RGB	Red Green Blue
ROM	Random Access Memory
SATURATION	Control signal (from µC, but on DC level via RC network) for saturation control of the video controller IC7015/6D
SAW	Surface Acoustic Wave; very precise bandpass filter.
SC	Sandcastle signal from IC7015/6F to delay line IC7271 and SECAM chroma decoder IC7250
SCART CVBS IN	CVBS signal from pin 2 SCART to external input pin 15 IC7015/6B
SCART CVBS OUT	CVBS signal from IF detector IC 7015/6A to pin 19 SCART
SCART AUDIO IN	Audio signal from SCART + AV cinches to source select IC7140
SCART AUDIO OUT	Audio signal from IC 7140 to pin 1 and 3 SCART + AV
SCART	Euroconnector
SCL	Clock line of the I C-bus
SDA	Data line of the I C-bus
SDM	Service Default Mode; predefined mode for faultfinding (see chapter 8)
SECAM	SEquential Couleur A Memoire
SMPS	Switched Mode Power Suplly
STANDBY	Switching signal; "low" for standby (only line is shut), "high" for normal operation
SYNC	Synchronisation
TP-1	Tets point 1
UHF	Ultra High Frecuency band from tuning range
V-IN	The DC voltage across C2505 present at pin 11 of the primary side of the transformer
V-VARI	Tuning voltage (0-30V)
VERT FEEDBLACK	50Hz vertical flyback pulse used for locking the vertical oscillator in IC7015/6E
VERT FLYBACK	50Hz vertical flyback pulse from frame IC7400 lo lock the OSD generator in µC
VERT DRIVE	Vertical drive signal from IC7415/6E to frame amplifier IC7400
Vg2	Voltage on Grid 2 of the picture tube
VHF	Very High Frecuency band from tuning range
VOLUME	Control signal (from µC, but on DC level via RC network) for volume control of sound processing in IC7015/6F
VST	Voltage Synthesized Tuning
Y	Luminance part of video signal