Description power supply

Introduction:

The power supply of the Anubis S DD is variable frequency and variable duty-cycle Switched Mode Power Supply (SMPS). The control is provided by the TDA4605-3 IC (IC7510).

Basic characteristics of Anubis S DD SMPS:

- Mains isolated flyback converter type
- Input voltage range: 90-276 or 140-276 Vac
- No opto-coupler; variation of the +95 (at the secondary side of 5525 at winding 21-19) is detected by sense winding 3-2 on the primary side
- Slow-start feature of IC.
- Protection circuits
- Frequency and duty-cycle vary with changes on the mains input voltage and the loads at the outputs
  - During **normal** operation the switching frequency is between 25 kHz (low mains voltage/white picture/sound loud) and 90 kHz (high mains voltage/dark picture/sound soft)
  - During **standby** mode the load on the +95 rail is disconnected, SMPS operates in the burst mode.
- The switching period of TS7513 can be divided into three main phases:
  - During T-on (TS7513 switches on), energy is taken from the mains and stored in primary winding 11-9 of transformer 5525; the primary current through winding 11-9 is linearly increasing (slope depends on voltage across C2505). Via Ton regulation the amount of energy stored in the primary winding (and thus the +95) can be controlled.
  - During T-off (TS7513 switches off), energy stored in the primary winding during Ton is transferred, via the secondary windings, to the loads on the secondary side
  - During T-dead no energy is extracted from the mains of supplied to the secondary side; this phase gives "room" for Ton and Toff regulation.

Primary side:

- Degaussing: R3501 is a dual PTC (2 PTC's in one housing). When the set is switched on the PTC's are cold and low ohmic, this would give very high degaussing current. After degaussing the PTC's would be heated up and high ohmic, so in normal operation the degaussing current is very low.
- Mains voltage is filtered by L5500, full wave rectified by diodes 6502-6505 and smoothed by C2505 to Vin (300Vdc for 220 Vac mains).
- Start-up: Via resistor 3508 voltage from the mains is provided to supply pin 7 of IC7510 to start up the power supply.
- Supply for IC7501: During start-up, the voltage across winding 3-2 is built up. When the voltage across winding 3-2 reaches +16, D6511 would start to conduct and take over providing the +16 supply to pin 7 of the IC7510.
- Multi voltage: Only adaptations of some component values are needed to achieve this.

Control circuitry:

+95V feedback for Ton control: Regulation of the SMPS is via pin 1. Winding 3-2 has the same polarity as winding 21-19; thus variations of the +95 can be sensed and fed back to pin 1. The control voltage of winding 3-2 during off period of TS7513 is rectified by D6510, smoothed by 2515 and stepped down at an adjustable ratio by R3514, R3513 and R3511. From the information at pin 1 IC7510 controls each portion of energy transferred to the secondary side such that the output voltages remain nearly independent of load variations.

Secondary side:

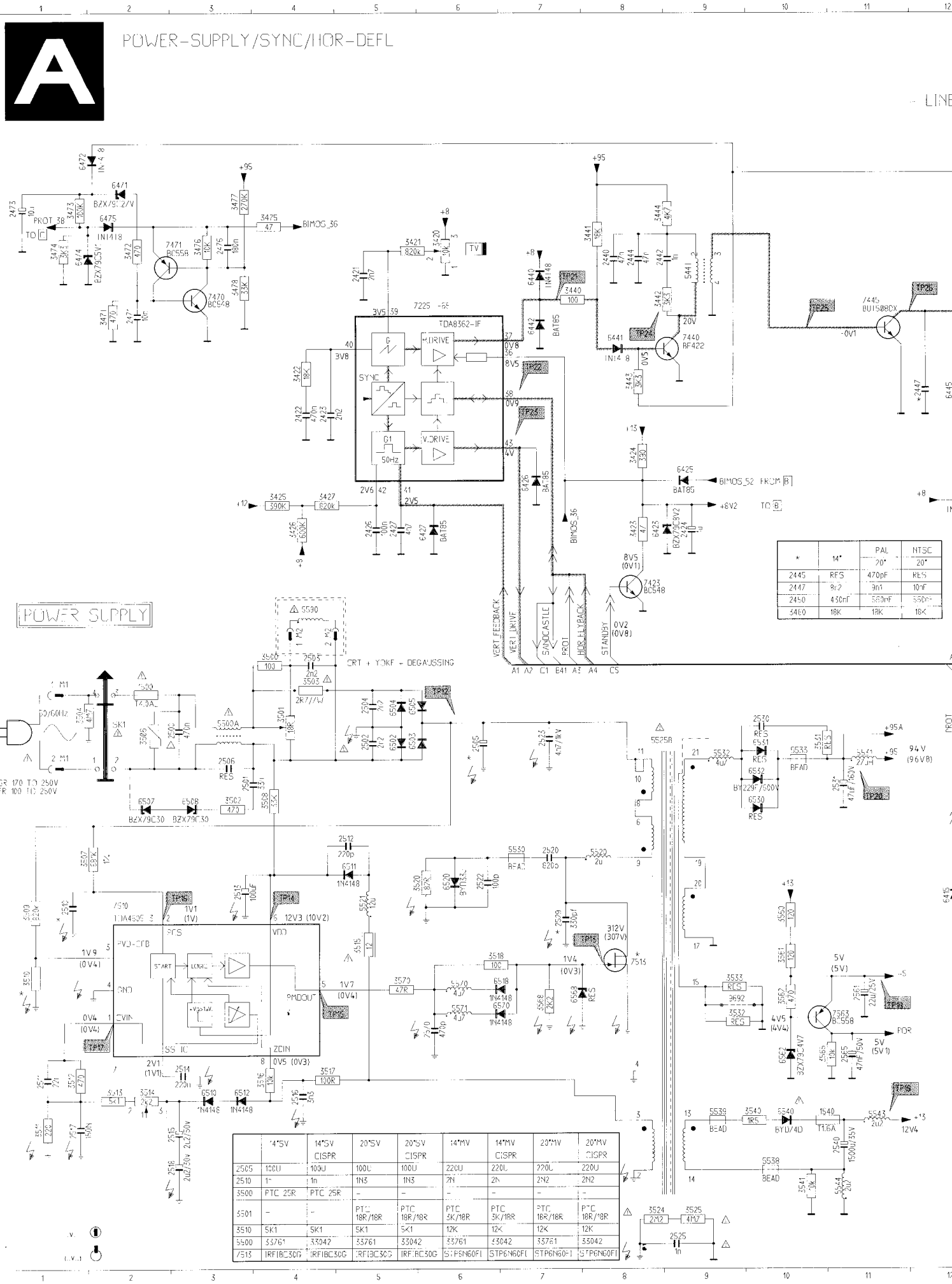
- +95V for the line output stage.
- +13V for sound output amplifier and start up of the line circuitry. The +5 (µC supply) and Power-on reset (POR), for starting up the µC, are derived from the +13V.
- +5V supply for µC: Via D6562 (4V7) and TS7563 emitter of TS7563 ie 5.4V.
- POR: µC enters into operational state when +5 supply voltage has reached 4.5V. POR will initialize the µC at the moment the +5 is 5V5.

Protections:

- Overload protection: The primary current (which is via the transformer related to the secondary current) is simulated at pin 2 IC7510 via R3507 and C2510.
  This simulation is realised as follows; At the end of each energy store into the transformer (end of T-on), C2510 is connected to an internal reference voltage of 1V inside IC7510 at pin 2. This clamping at 1V DC will be remained until the end of the demagnetisation. By then pin 2 will be released by IC7510 and so pin 2 will be charged via the RC-network, giving a sawtooth (so in case the load needs more energy, the energy store into the transformer needs more time, so C2510 will be charged longer, so C2510 will be charged up to a higher peak level). As a result the peak level of the sawtooth at pin 2 is a measure for the load.
  The level of this simulated primary current is measured for overload protection;
  * In case of a small overload pin 2 will exceed 3V DC, the simulated current (and so the output current of the SOPS) will be fixed to 3V DC peak.
  * In case of a high overload or short-circuit, the simulated current will be decreased to 2V6 DC peak. As the energy stored into the transformer can not increase any more, the output current and so the output voltage of the SMPS will drop. In case of a short-circuit, this voltage drop will also result in an undervoltage protection.
- Undervoltage protection:
  * Undervoltage protection of the secondary output voltages is sensed via supply pin 6 of IC7510. If the voltage at pin 6 becomes lower than 7.25V DC the IC switches off.
    At the moment the undervoltage condition is not there any more, the SMPS will start up again via the slow-start principle. In case the undervoltage protection is activated because of a short-circuit, this will result in a clearly audible hick-up mode.
  * Undervoltage protection of the AC mains voltage is sensed via R3509-3510 at pin 3 IC7510. If the voltage at pin 3 becomes lower than 1V DC, the IC switches off completely.
- Overvoltage protection: Overvoltage protection of the secondary output voltages is sensed via supply pin 6 of IC7510. If voltage at pin 6 becomes higher than 16V DC the IC switches off. At the moment the undervoltage condition is not there any more, the SMPS will start up via the slow-start principle.

Carri

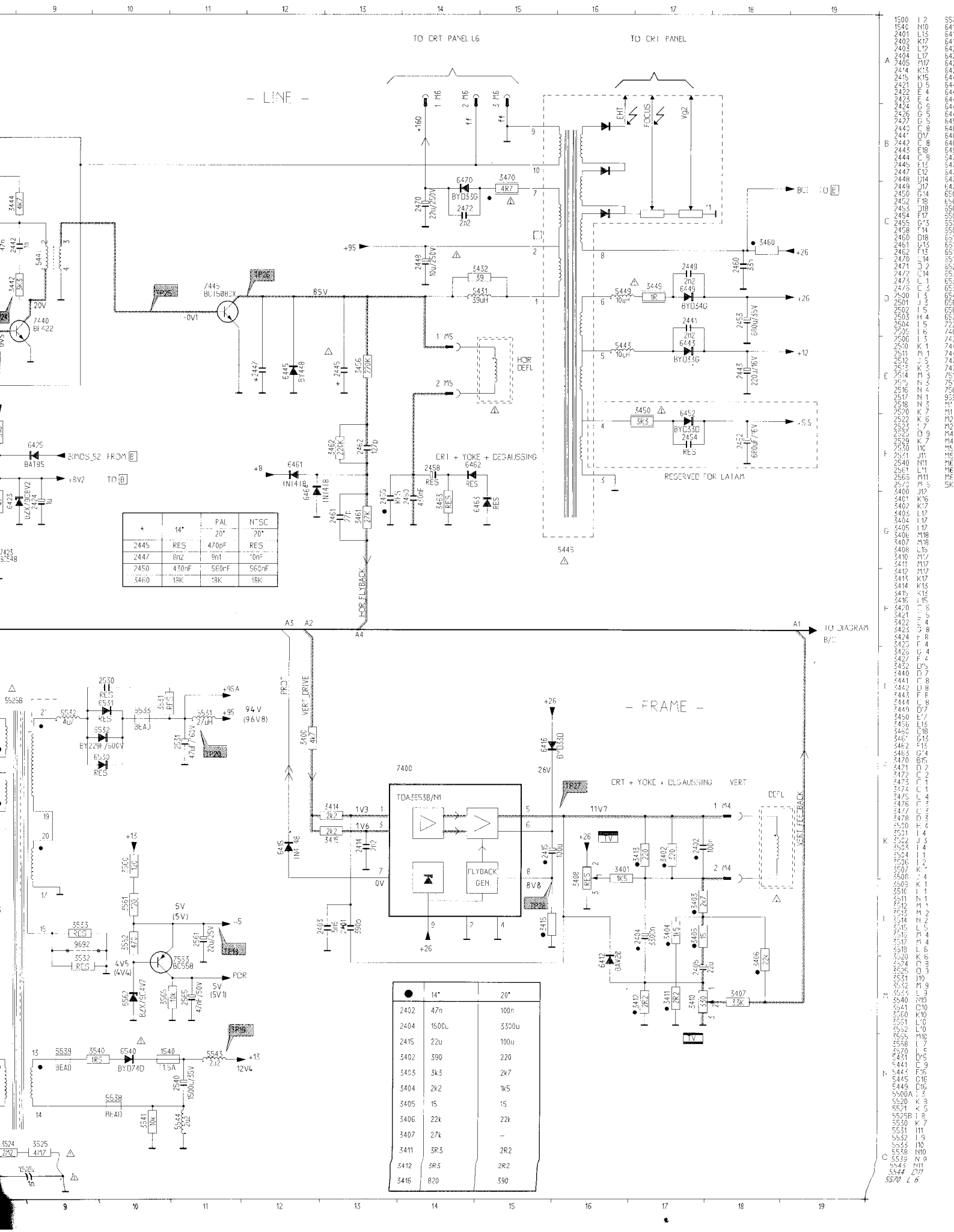
0020	A2	2445	E1	3129	B3	3456	F1				
0025	A4	2447	E1	3130	D5	3460	F2				
1000	F3	2448	E2	3132	A2	3461	F4				
1015	D4	2449	F2	3135	A3	3462	G2				
1105	D5	2450	E1	3136	D5	3463	E1				
1106	D5	2452	E2	3138	F5	3464	E5				
1206	D5	2453	F2	3139	F5	3465	E5				
1207	D5	2454	E2	3140	F5	3466	E4				
1275	E4	2455	E1	3142	D3	3470	F2				
1277	E4	2458	E1	3143	C3	3471	F1				
1278	F4	2460	F2	3144	F5	3472	F1				
1279	E4	2461	F4	3200	C5	3473	D2				
1500	A1	2462	G2	3201	D5	3474	D2				
1540	C3	2470	F1	3202	C5	3475	D2				
1602	A5	2471	F1	3203	C5	3476	D2				
1630	B4	2472	F1	3206	C5	3477	D2				
2002	F4	2473	G1	3207	F5	3478	D2				
2003	D3	2476	E2	3208	D5	3500	B2				
2008	F4	2500	B1	3209	D5	3501	A2				
2010	F4	2501	B2	3210	D4	3502	B2				
2101	D5	2502	C2	3211	C5	3503	B2				
2102	D5	2503	B2	3212	D3	3504	C1				
2104	D4	2504	C2	3213	D4	3506	B1				
2105	C3	2505	C1	3214	D5	3507	C2				
2110	C3	2506	B2	3215	G5	3508	B2				
2111	C3	2510	D1	3216	G5	3509	C2				
2112	D5	2511	D1	3217	G4	3510	D1				
2119	C5	2512	D1	3218	G5	3511	C1				
2120	C3	2513	D1	3236	F5	3512	D1				
2121	B3	2514	D1	3239	C5	3513	D1				
2122	C3	2515	D1	3240	C4	3514	D1				
2123	D5	2516	D1	3245	F4	3515	D1				
2124	B3	2517	D1	3248	E4	3516	D1				
2125	A3	2518	D1	3250	F5	3517	D2				
2127	A3	2520	C1	3251	F5	3518	C1				
2129	A3	2522	C1	3252	F5	3520	C1				
2130	D3	2523	C1	3253	F4	3524	C2				
2131	A3	2525	C2	3254	F4	3525	C2				
2132	C3	2529	C1	3255	F5	3531	D3				
2133	C3	2530	D3	3256	E5	3532	D2				
2138	F5	2531	E2	3257	E5	3533	D2				
2200	C5	2540	C3	3259	D5	3540	D3				
2208	E5	2561	D3	3260	D5	3541	C3				
2212	E5	2565	D3	3261	F3	3560	C3				
2213	D4	2570	D1	3263	D4	3561	D3				
2221	E5	2605	B5	3264	D4	3562	D3				
2222	D4	2607	B5	3265	D3	3565	D3				
2223	F4	2608	A3	3267	B5	3568	C1				
2226	E5	2610	A3	3268	C5	3570	D1				
2228	E5	2615	A3	3270	C5	3598	A1				
2229	E5	2620	B4	3271	C5	3599	A1				
2236	F5	2624	A3	3273	E4	3603	A5				
2245	F5	2625	B5	3275	E4	3604	A5				
2246	F5	2626	A4	3276	E4	3605	A4				
2248	F4	2627	A4	3277	E4	3606	C4				
2249	F4	2628	A4	3278	E4	3607	A5				
2251	F5	2638	B5	3279	E4	3608	A3				
2254	F4	2648	C3	3280	E4	3609	A3				
2256	F4	2656	C3	3281	F4	3611	A3				
2257	F4	2682	C3	3282	F4	3617	A3				
2260	D5	2683	A3	3285	E5	3622	B4				
2261	D4	2685	B3	3295	E4	3625	B5				
2262	F4	2687	B4	3296	D4	3626	A4				
2264	D4	2688	B3	3400	F3	3627	B4				
2265	D4	2692	C3	3401	F3	3634	B5				
2272	E4	2700	B4	3402	F3	3635	A5				
2273	E4	2703	B4	3403	F2	3637	A5				
2275	E4	2711	C5	3404	F2	3638	B5				
2277	E4	2714	B5	3405	F2	3640	A4				
2278	F4	2721	B5	3406	F3	3641	A5				
2279	E4	2722	B5	3407	F3	3646	C4				
2280	E5	2726	B5	3408	E3	3647	B4				
2284	E5	2727	A5	3410	E3	3648	C4				
2285	E5	2728	A5	3411	F2	3649	C3				
2286	E5	3000	E3	3412	F2	3650	D3				
2287	E5	3001	D3	3413	F3	3652	C4				
2288	E5	3002	D3	3414	F2	3653	C4				
2401	G2	3004	E3	3415	F2	3654	C4				
2402	F3	3005	E3	3416	F3	3656	C3				
2403	F2	3006	E3	3420	E4	3661	B4				
2404	E2	3007	E3	3421	E4	3662	A3				
2405	E2	3010	G4	3422	E4	3671	B4				
2414	F2	3106	D5	3423	D4	3685	B4				
2415	F3	3113	D4	3424	D3	3687	B4				
2421	E4	3118	C3	3425	F4	3691	B4				
2422	E4	3119	C3	3426	F4	3692	B4				
2423	E4	3120	B3	3427	F4	3694	B4				
2424	E4	3121	C3	3432	E1	3695	B3				
2426	D4	3122	C3	3440	E3	3697	A4				
2427	D4	3123	B3	3441	D2	3698	A4				
2440	F1	3124	B3	3442	F1	3699	B4				
2441	E2	3125	B3	3443	G1	3700	B4				
2442	F1	3126	B3	3444	F1	3702	C4				
2443	E2	3127	A3	3449	F2	3703	B4				
2444	F1	3128	C3	3450	E2	3704	C4				



*	14"	PAL 20"	NTSC 20"
2445	RES	470pF	RES
2447	8n2	9n1	10nF
2450	430nF	560nF	560nF
3460	18K	18K	18K

	14"SV	14"SV CISPR	20"SV	20"SV CISPR	14"MV	14"MV CISPR	20"MV	20"MV CISPR
2505	100U	100U	100U	100U	220U	220U	220U	220U
2510	1n	1n	1N5	1N5	2N	2N	2N2	2N2
3500	PTC 25R	PTC 25R	-	-	-	-	-	-
3501	-	-	PTC 18R/18R	PTC 18R/18R	PTC 5K/18R	PTC 3K/18R	PTC 18R/18R	PTC 18R/18R
3510	5K1	5K1	5K1	5K1	12K	12K	12K	12K
5500	33761	33042	33761	33042	33761	33042	33761	33042
7513	IRF1BC30G	IRF1BC30G	IRF1BC30G	IRF1BC30G	STP5N60FI	STP6N60FI	STP6N60FI	STP6N60FI

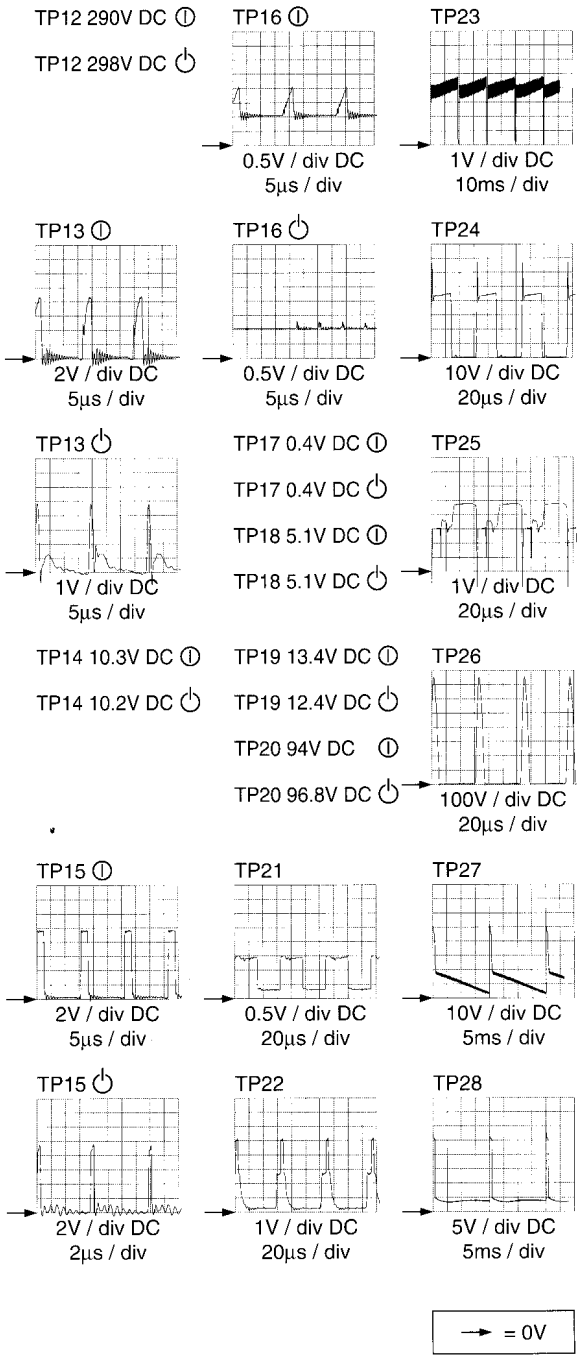
Fuente de alimentación + Sincronización + Deflexión



*	14"	PAL 20"	NTSC 20"
2445	RES	470pF	RES
2447	8n2	9n1	10nF
2450	430nF	560nF	560nF
3460	18K	18K	18K

●	14"	20"
2402	47n	100n
2404	1500L	3300u
2415	22u	100u
3402	390	220
3403	3k3	2k7
3404	2k2	1k5
3405	15	15
3406	22k	22k
3407	27k	–
3411	3R3	2R2
3412	3R3	2R2
3416	820	390

Power supply + Synchronisation + Deflection



Description of IC7225

Description of IC7225-6A-6B-6C-6D-6E-6F (TDA8362)

Intermediate frequency (IF) demodulation (IC7225-6A)

IF-demodulation with reference circuit L5260 at pin 2 and 3 of IC7225-6A. AGC control of tuner via pin 47 IC7225-6A to tuner. Top sync. level is used for AGC inside IC7225-6A. Tuner AGC voltage at pin 49 IC7225-6A. AGC adjustment (tuner take over point) via R3264. C2265 at pin 48 determines time constant of the AGC. Base band CVBS signal at pin 7 IC7225-6A (normal = 2,4 Vpp) and fed to the sound trap filters. AFC at pin 44 is taken from the reference signal at L5260 for IF demodulation while C2213 stabilizes this voltage. TRANS_ID comes from pin 14 of IC7225-6B via TS7270; if no horizontal synchronisation (no signal detected), pin 14 IC7225-6B "low", so TS7270 not conducts; TRANS_ID is "low".

Source select, luminance and chrominance separation (IC7225-6B)

Source select via A/V' which is, via TS7240, the inversion of A/V from pin 10 of the µC. For all sets except the full multi sets (PAL/SECAM/NTSC) switching takes place inside IC7225-6B; pin 16 A/V' = 0V gives internal CVBS (pin 13), pin 16 A/V' = 8V gives external CVBS (pin 15). PAL and NTSC switching takes place inside IC7225-6B via pin 16 IC7225-6B and for SECAM switching takes place via TS7216 and TS7217.
Luminance and chrominance separation; Chrominance signal is filtered out (-20dB) by a luminance notch filter which is internally calibrated at the subcarrier frequency (4,43 or 3,58). Pin 14 has a double function: sharpness control (in case hor. sync. is there) by controlling the gain of the internal luminance signal or TRANS_ID (in case IC7225-6E has no hor. sync., by then pin 14 is output pin "low" so TS7270 conducts so TRANS_ID "low").

Chrominance decoding (IC7225-6C)

PAL and NTSC chroma decoding inside IC7225-6C, SECAM chroma decoding inside IC7245. Inside IC7225-6C the PAL/NTSC chroma signal is fed via amplification and a burst demodulator to the R-Y and B-Y demodulator. PAL or NTSC processing is determined automatically by the burst demodulator inside IC7225-6C. The reference crystals for demodulation for IC7225-6C are present at pin 34 and/or pin 35 of IC7225-6C.
PAL/NTSC mode if voltage at pin 27 ≤ 5V5; if IC7225-6C detects PAL the voltage at pin 27 makes no sense, if IC7225-6C detects NTSC the voltage at pin 27 is used for hue control (0-5V) as for NTSC sets jumper 9246 is added.
For Trinorma sets the set selects (auto or forced) one of the 3 different crystals for PAL M, PAL N and NTSC M at pin 34 of IC7225-6C; for trinorma sets pin 26 of IC7225-6D has double function: saturation control (normal input pin) or trinorma system select (output pin) during system searching.
PAL/SECAM mode if voltage at pin 27 of IC7225-6C 5V5; IC7225-6C searches for PAL and IC7245 searches for SECAM. Via a bidirectional communication line between pin 32 of IC7225 and pin 1 of IC7245 both IC7225-6C and IC7245 "knows" whether a PAL/NTSC or a SECAM signal is detected: 4,43 calibration (on AC level) for calibration the PLL and chroma cloche filter of IC7245, and SECAM or PAL/NTSC operation (on DC level) enabling automatic selection of IC7225-6C or IC7245 to supply R-Y and B-Y to the delay line IC7255:

- If IC7225-6C has detected PAL or NTSC Vpin 32 = 1V5 and so the demodulated R-Y and B-Y at output pins 30 and 31 of IC7225-6C to delay line IC7255.
- If IC7225 has not detected PAL or NTSC Vpin 32 = 5V0 and so no demodulated R-Y and B-Y at output pins 30 and 31 of IC7225-6C to delay line IC7255.
- If IC7245 has detected a SECAM signal Vpin 1 IC7245 becomes "low" sinking typical 150 µA from the 5V0 of pin 32 of IC7225-6C. Only if sinking current of pin 32 is typical 150 µA IC7225-6C "knows" IC7245 has detected SECAM. The SECAM demodulated R-Y and B-Y via output pins 9 and 10 of IC7245 are fed to delay line IC7255.

RGB dematrixing (IC7225-6D)

RGB-dematrixing dematrixes the -(R-Y), -(B-Y) and the Y signals to RGB signals; the sandcastle pulse coming from the IC7225-6E synchronises the RGB dematrix and suppresses the RGB signals during line and frame flyback. Control by the microprocessor for contrast, brightness and saturation (0V5 to 4V5). RGB-source select switches between RGB from the RGB-dematrix and RGB from OSD via the BLANKING signal at pin 21 of IC7225-6D.

Horizontal synchronisation (IC7225-6E)

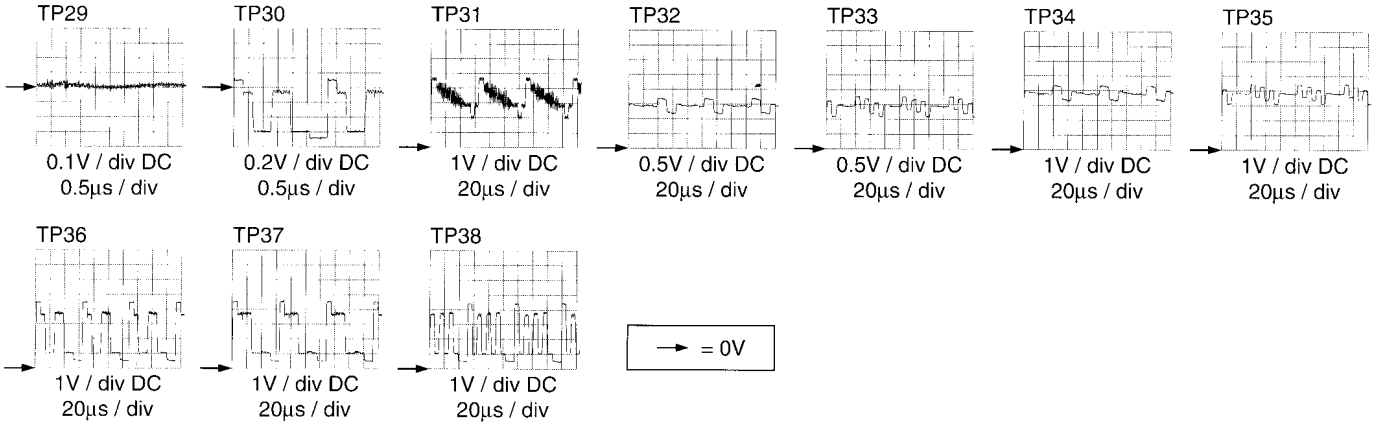
Start up of the hor. oscillator via +13 gives start up current into pin 36; if voltage at pin 36 5V8 the hor. oscillator starts running. At standby (STANDBY "high") TS7423 conducts, pin 36 IC7225-6E is 3V6, thus no oscillation. In normal operation (STANDBY "low") TS7423 not conducts so pin 36 IC7225-6E is 8V (via zener D6423) thus hor. oscillator runs. Hor. sync. separator separates hor. pulses out of CVBS and so synchronises the free-running hor. sawtooth generator. 50/60Hz is determined by chroma decoder part IC7225-6C. Hor. oscillator sawtooth is converted in square wave voltage with variable duty cycle (pin 37). Hor. flyback pulse at pin 38 compares phase of flyback pulse with phase of the hor. oscillator; if phase not correct the duty cycle of hor. oscillator will be adjusted. Time constant of the sync. circuit automatically determined by IC7225-6E. Pin 38 is both sandcastle output and hor. flyback input. Selection automatically determined by the input current (sandcastle a few µA, flyback 100-300 µA determined by R3428). Amplitudes of sandcastle pulse are burst is 5V3, line blanking is 3V, frame blanking is 2V. The protection line BIMOS_52 coming from pin 52 IC7225-6B to pin 36 IC7225-6E prevents IC7225 to get into a "non-operative" mode at ESD flashes.

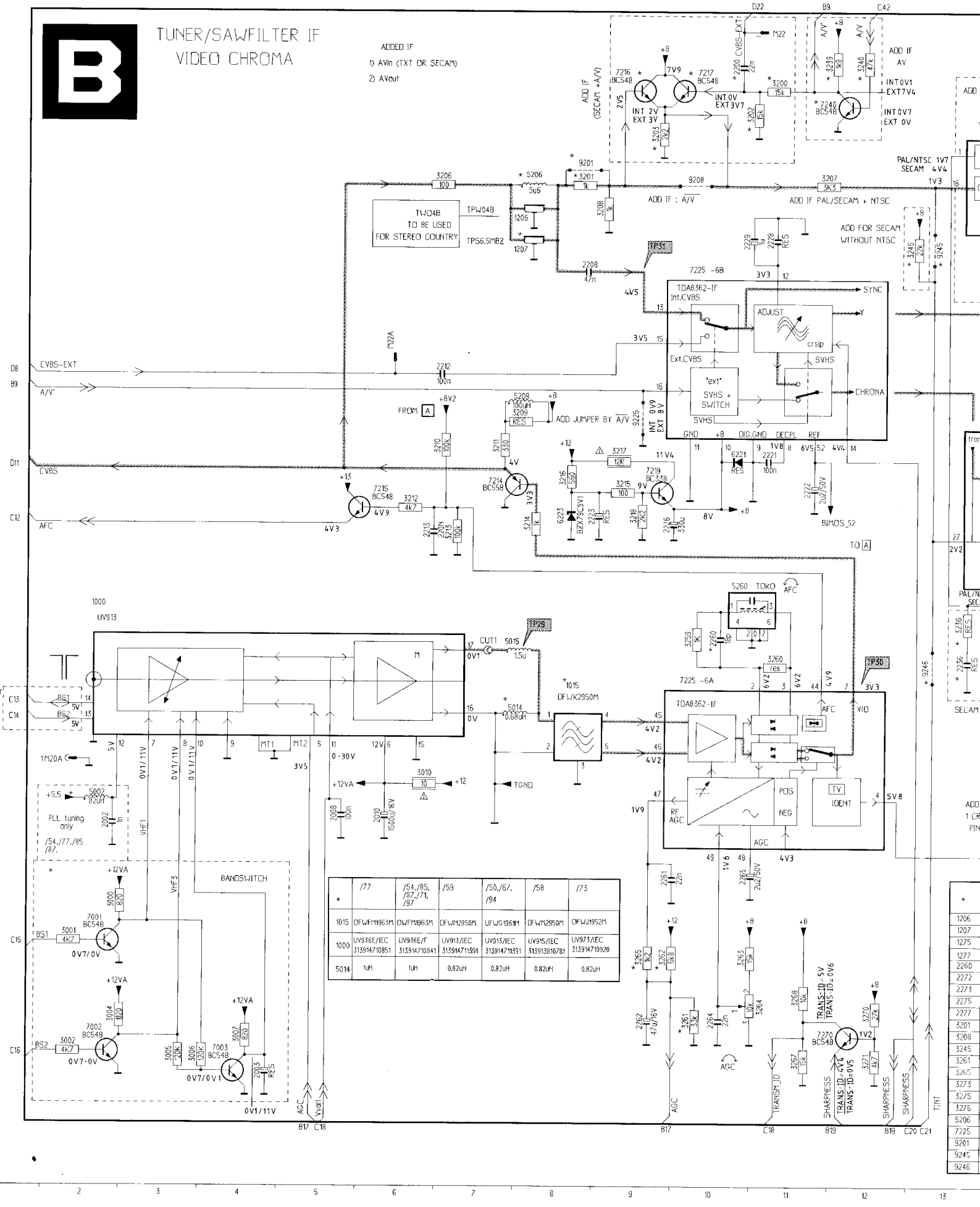
Vertical (vert.) synchronisation (IC7225-6E)

Vert. sync. separator separates frame sync. pulses from CVBS signal and synchronises frame oscillator. IC7225-6E compares phase of flyback pulse with phase of sawtooth at pin 42 (from external RC network); if phase not correct the duty cycle of frame oscillator will be adjusted. If no sync., the frame oscillator keeps running the earlier incoming standard of 50Hz or 60Hz.
Pre-amplifier in IC7225-6E amplifies sawtooth (pin 43 of IC7225-6E).

Sound detection (IC7225-6F)

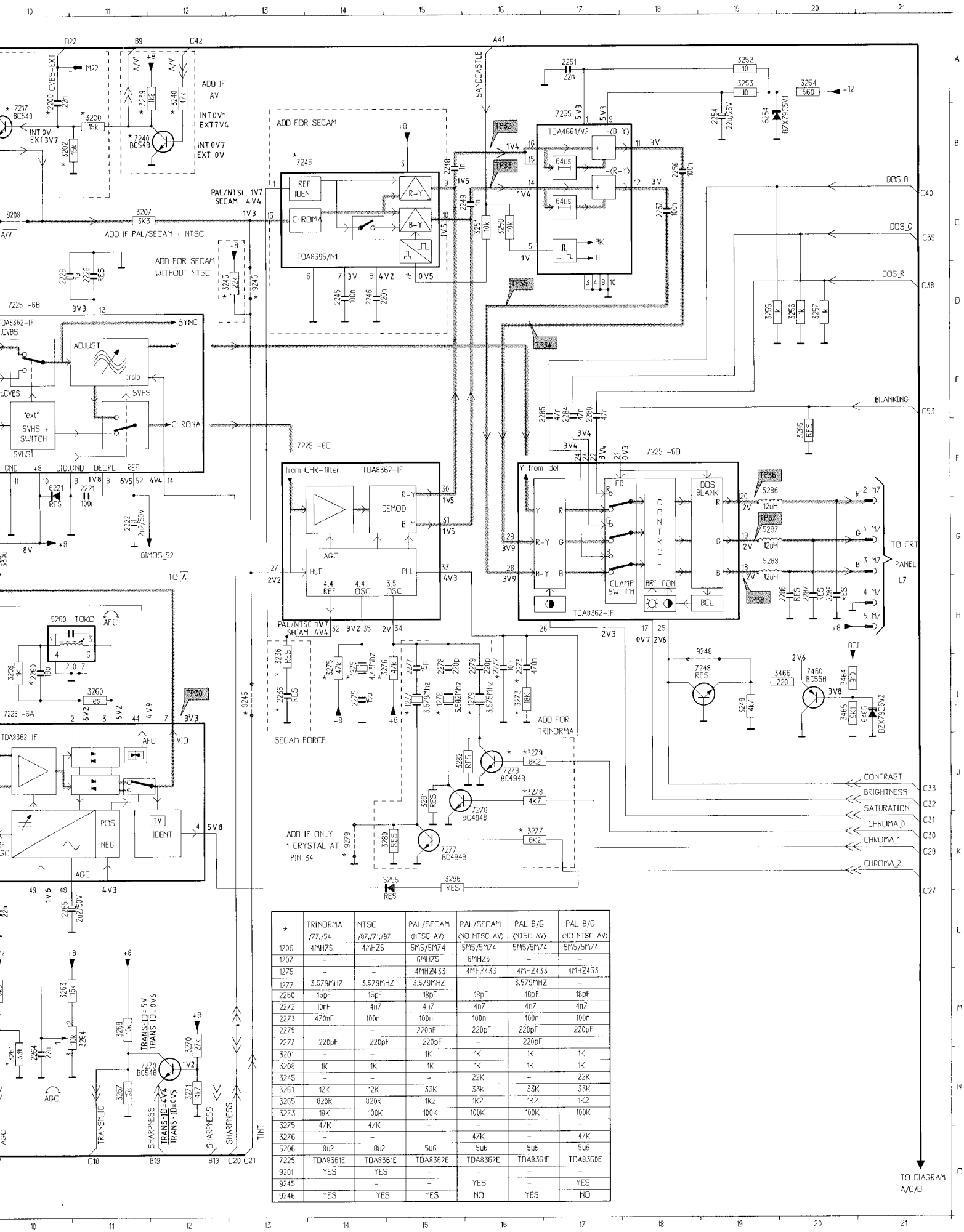
Single FM-mono sound for demodulation takes place in IC7225-6F. No adjustment required as automatic PLL tuning (4,2 to 6,8 MHz). Sound frequency characteristic is defined by deemphasis C2104.



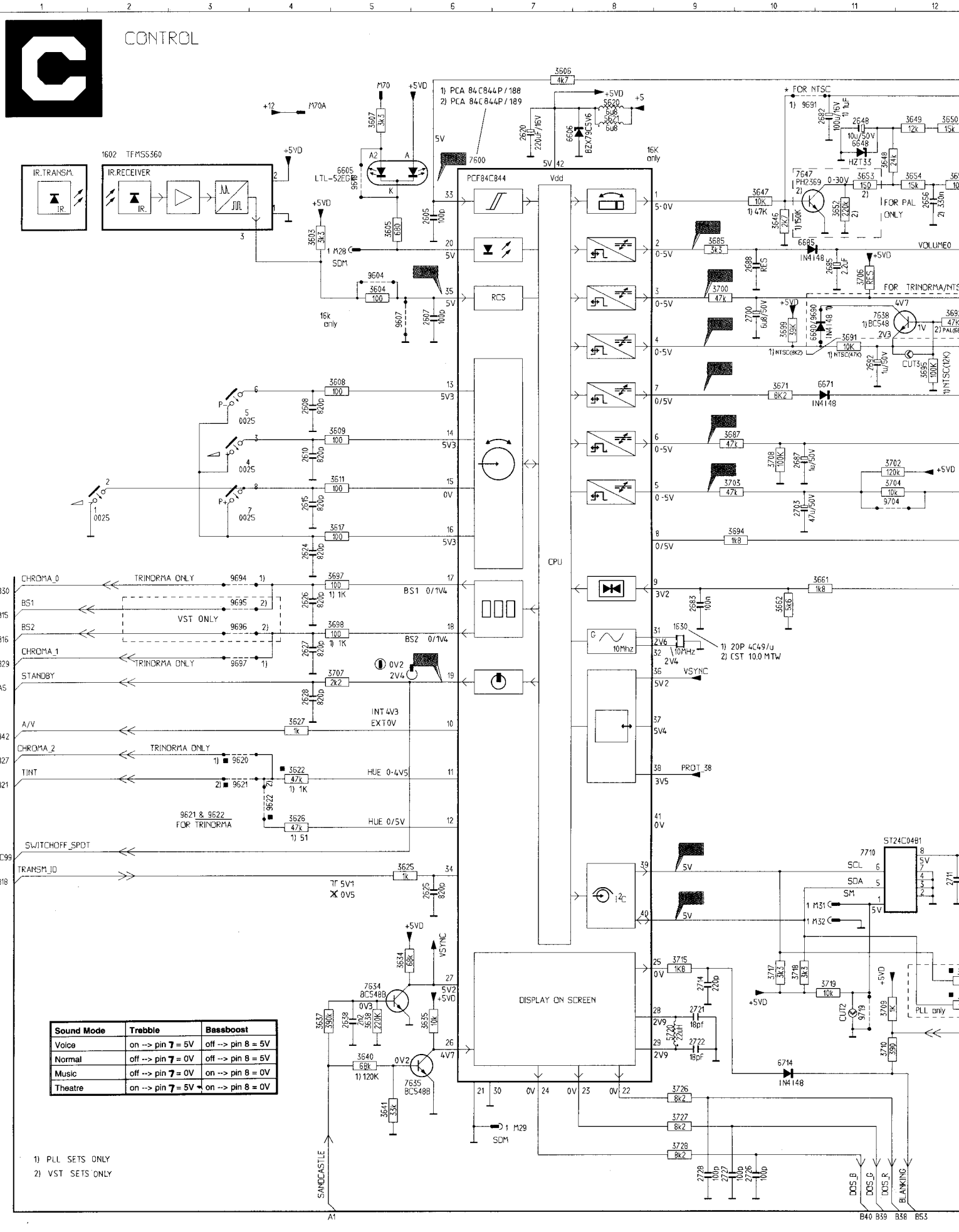


*	/77	/54./85. /87./71. /97	/59	/50./67. /94	/58	/73
1015	DFWFM1963M	DWFM1963M	DFWM2950M	UFWG19611	DFWM2950M	DFWJ1952M
1000	UV936E/IEC 313914710851	UV936E/F 313914710841	UV913/IEC 313914711391	UV913/IEC 313914711391	UV915/IEC 313913810781	UV973/IEC 313914710920
5014	1uH	1uH	0.82uH	0.82uH	0.82uH	0.82uH

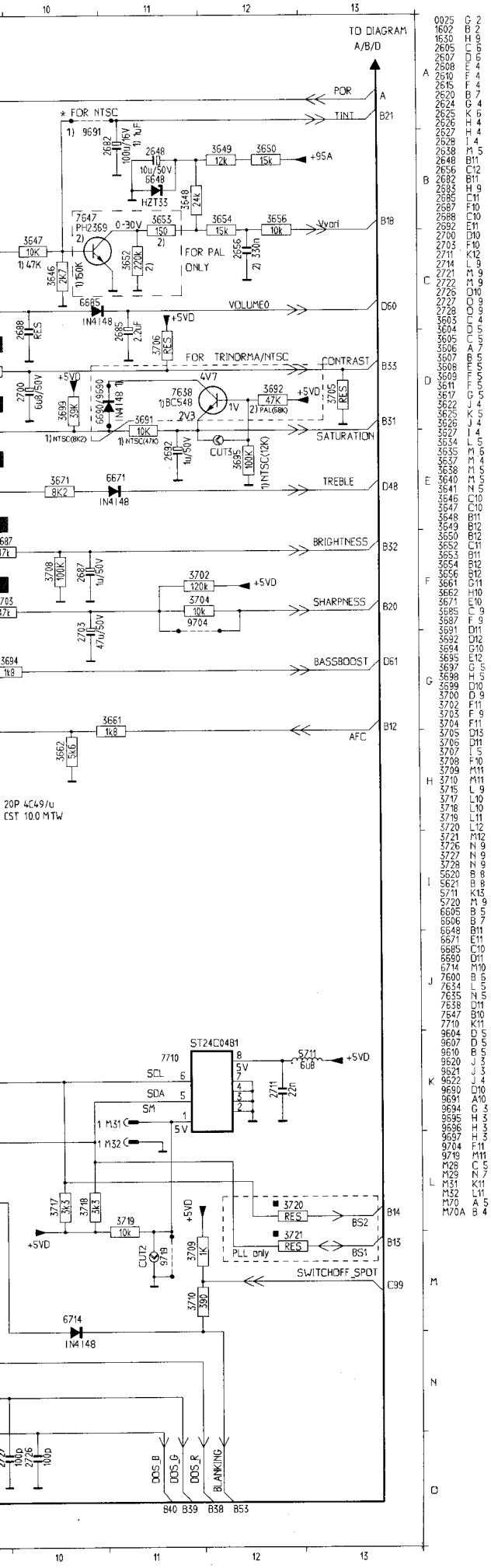
Sintonizador + FI + Procesámiento de video

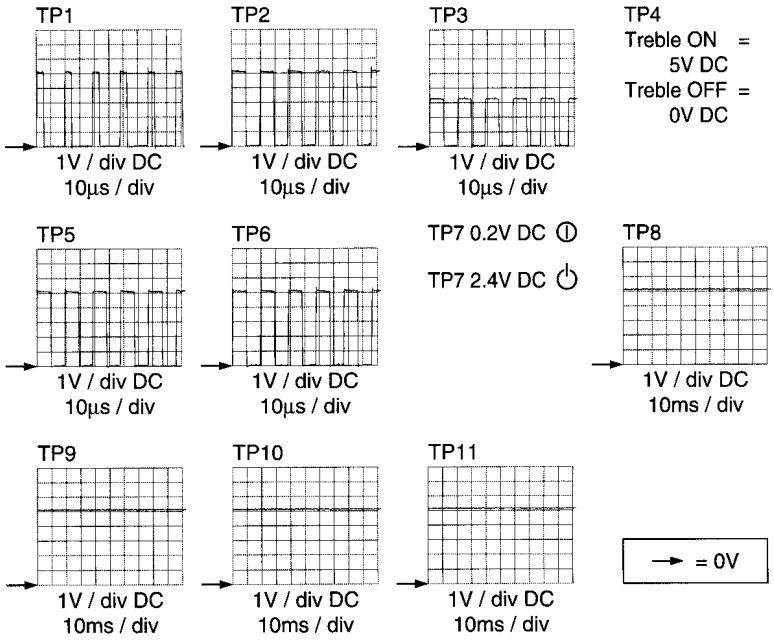


*	TRINORMA /77./54	NTSC /87./71./97	PAL/SECAM (NTSC AV)	PAL/SECAM (NO NTSC AV)	PAL B/G (NTSC AV)	PAL B/G (NO NTSC AV)
1206	4MHZ5	4MHZ5	5M5/5M74	5M5/5M74	5M5/5M74	5M5/5M74
1207	–	–	6MHZ5	6MHZ5	–	–
1275	–	–	4MHZ433	4MHZ433	4MHZ433	4MHZ433
1277	3,579MHZ	3,579MHZ	3,579MHZ		3,579MHZ	–
2260	15pF	15pF	18pF	18pF	18pF	18pF
2272	10nF	4n7	4n7	4n7	4n7	4n7
2273	470nF	100n	100n	100n	100n	100n
2275	–	–	220pF	220pF	220pF	220pF
2277	220pF	220pF	220pF	–	220pF	–
3201	–	–	1K	1K	1K	1K
3208	1K	1K	1K	1K	1K	1K
3245	–	–	–	22K	–	22K
3261	12K	12K	33K	33K	33K	33K
3265	820R	820R	1K2	1K2	1K2	1K2
3273	18K	100K	100K	100K	100K	100K
3275	47K	47K	–	–	–	–
3276	–	–	–	47K	–	47K
5206	8u2	8u2	5u6	5u6	5u6	5u6
7225	TDA8361E	TDA8361E	TDA8362E	TDA8362E	TDA8361E	TDA8361E
9201	YES	YES	–	–	–	–
9245	–	–	–	YES	–	YES
9246	YES	YES	YES	NO	YES	NO


CONTROL
IR.TRANSM.
IR.
IR.RECEIVER
1602 TFMS5360
LTL-52EGB
PCF84C844
CPU
DISPLAY ON SCREEN
1) PCA 84C844P/188
2) PCA 84C844P/189
SDM
RCS
VOLUME
FOR PAL ONLY
FOR TRINORMA/NTS
* FOR NTSC
16K only
CHROMA_0
BS1
BS2
CHROMA_1
STANDBY
A/V
CHROMA_2
TINT
SWITCHOFF_SPOT
TRANSM_ID
TRINORMA ONLY
VST ONLY
9621 & 9622 FOR TRINORMA
BS1 0/1V4
BS2 0/1V4
INT 4V3 EXT0V
HUE 0-4V5
HUE 0/5V
VSYNC
PROT_38
SCL
SDA
SM
ST24C04B1
SANDCASTLE
DDS_B
DDS_G
DDS_R
BLANKING
PLL only
Sound Mode | Trebble | Bassboost
Voice | on --> pin 7 = 5V | off --> pin 8 = 5V
Normal | off --> pin 7 = 0V | off --> pin 8 = 5V
Music | off --> pin 7 = 0V | on --> pin 8 = 0V
Theatre | on --> pin 7 = 5V | on --> pin 8 = 0V
1) PLL SETS ONLY
2) VST SETS ONLY

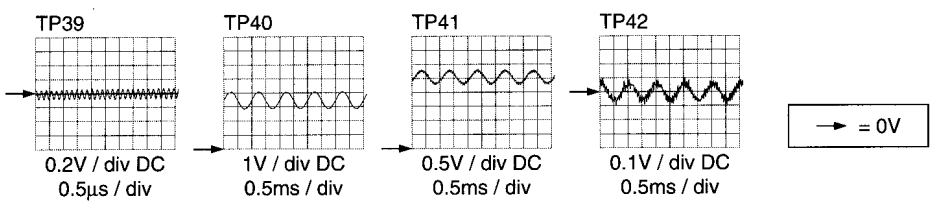
Controls / Controles



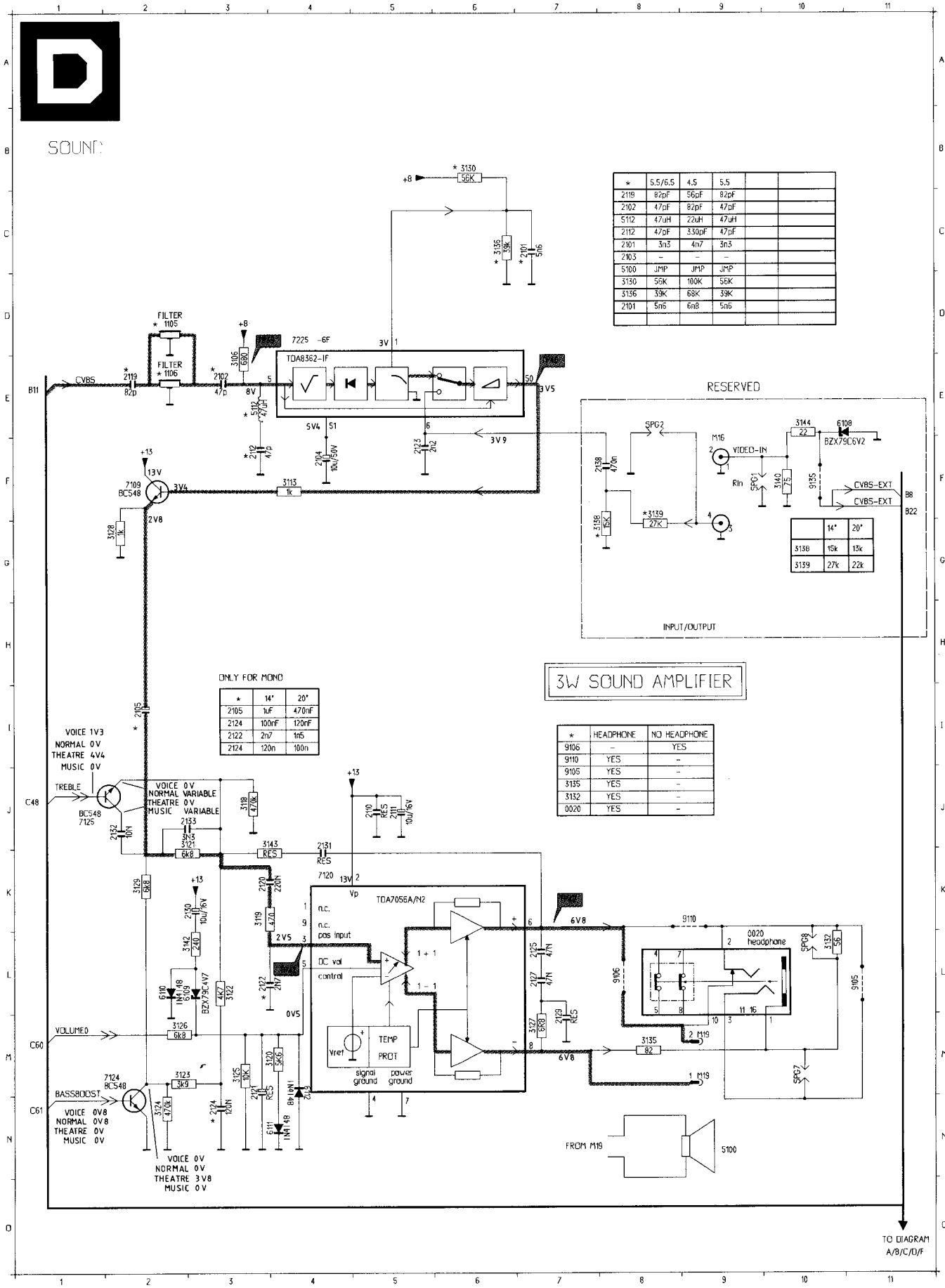


List of abbreviations (incl. all signal names)

+95	+95 Supply voltage from the power supply to the line output stage
A/V'	Switching signal; "high" for external CVBS, "low" for internal CVBS
A/V	Switching signal; "low" for external CVBS, "high" for internal CVBS
AFC	Automatic Frequency Control
AGC	Automatic Gain Control
BASSBOOST	Switching signal; "low" for bassboost "on", "high" for bassboost "off"
BCI	Beam Current Info; If beam current increases the BCI signal decreases
BIMOS_36	Protection signal from protection circuitry around TS7470-7471 to pin 36 IC7225 In case of an open circuit of the flyback capacitor (flyback pulse increase) or +95V drop (e.g. short-circuit of primary side LOT) the thyristor TS7470-7471 is fired making BIMOS_36 continuous "low". As a result pin 36 IC7225-6E is made "low" so the horizontal driver and so the line output stage is switched "off"
BIMOS_52	Signal coming from pin 52 IC7225-6B to pin 36 IC7225-6E preventing IC7225 being "hanged" at ESD flashes
BLANKING	Fast blanking signal from µC to video controller IC7225-6D for blanking the RGB
BRIGHTNESS	Control signal (from µC, but on DC level via RC network) for brightness control of the video controller IC7225-6D (0-5V)
BS1	For VST sets bandswitching signal, for PLL sets SDA from I^2C
BS2	For VST sets bandswitching signal, for PLL sets SCL from I^2C
CHROMA_0	Switching signal from µC to chroma decoder IC7225-6C; if CHROMA_0 = 5V the 3.575 MHz crystal for PAL M is selected
CHROMA_1	Switching signal from µC to chroma decoder IC7225-6C; if CHROMA_1 = 5V the 3.582 MHz crystal for PAL N is selected
CHROMA_2	Switching signal from µC to chroma decoder IC7225-6C; if CHROMA_2 = 5V the 3.579 MHz crystal for NTSC M is selected
CONTRAST	Control signal (from µC, but on DC level via RC network) for contrast control of the video controller IC7225-6D and the teletext decoder (0-5V)
CRT	Picture tube
CVBS	Colour Video Blanking Sound
CVBS_EXT	CVBS signal from AV-IN cinch to pin 15 IC7225-6B
EEPROM	Electrical Erasable Programmable Read Only Memory
EHT	Extra High Tension (25 kV)
HOR	Horizontal
HOR_FLYBACK	Horizontal flyback pulse (15625 / 15750 Hz) used for locking the horizontal oscillator in IC7225-6E
HUE	Tint adjustment for NTSC system
I^2C	Digital control bus of the microcomputer
IF	Intermediate Frequency
NIL	Non Interlace
NTSC	National Television System Committee
OSD (DOS)	On Screen Display (in diagrams Display On Screen)
PLL	Phase Locked Loop
POR	Power On Reset
PROT	Protection signal from frame IC7400; in case the vertical flyback generator in IC7400 is not activated, the voltage on pin 8 IC7400 becomes 2V. By then the protection circuit in IC7400 will make pin 7 "high" overriding the HOR FLYBACK and SANDCASTLE. The constant "high" sandcastle is fed to the chrominance decoders (IC7225-6D and IC7250) and so the picture will become "black"
PROT_38	Protection signal from protection circuitry around TS7470-7471 to pin 38 of the µC; in case of an protection the µC switches the TV in stand-by and the LED blinks. In case the BIMOS_36 has switched "off" the line output stage or in case of a short-circuit on the secondary side of the LOT, the LOT voltages drop. This drop is measured via R3473-3474 and so PROT_38 becomes "low"; the µC will switch into protection mode
RC5	Remote Control 5 system
RGB	Red Green Blue
SANDCASTLE	Sandcastle signal from IC7225-6E to delay line IC7255 and SECAM chroma decoder IC7245
SATURATION	Control signal (from µC, but on DC level via RC network) for saturation control of the video controller IC7225-6D (0-5V); In trinorma sets this signal is also used as TRANS_ID ("low" in case the correct system is not found)
SCL	Clock of the I^2C-bus
SDA	Data of the I^2C-bus
SDM	Service default mode
SM	Service mode
STANDBY	Switching signal from µC; "high" for standby, "low" for normal operation
SWITCHOFF_SPOT	Switching signal equal to standby switching signal directly activating blanking at switching set to standby
TINT	Pulse width modulated control signal for hue control
TRANS_ID	Status signal; "high" for hor. sync. present so video identification
TREBLE	Switching signal; "high" for treble "on", "low" for treble "off"
V-in	The DC voltage across C2505 present at pin 11 of the primary side of the transformer
V-SYNC	Vertical sync signal from pin 27 µC to pin 36 µC
V-VARI	Tuning voltage (0-30V for VST, 30V for PLL)
VERT_DRIVE	Vertical drive signal from IC7225-6E to frame amplifier IC7400
VERT_FEEDBACK	50/60 Hz vertical flyback pulse used for locking the vertical oscillator in IC7225-6E
Vg2	Voltage on Grid 2 of the picture tube
VST	Voltage Synthesized Tuning
Y	Luminance part of the video signal



Sound (single/dual) / Procesámiento de sonido (solo/dual)



*	5.5/6.5	4.5	5.5		
2119	82pF	56pF	82pF		
2102	47pF	82pF	47pF		
5112	47uH	22uH	47uH		
2112	47pF	330pF	47pF		
2101	3n3	4n7	3n3		
2103	–	–	–		
5100	JMP	JMP	JMP		
3130	56K	100K	56K		
3136	39K	68K	39K		
2101	5n6	6n8	5n6		

	14"	20"
3138	15k	15k
3139	27k	22k

*	14"	20"
2105	1uF	470nF
2124	100nF	120nF
2122	2n7	1n5
2124	120n	100n

*	HEADPHONE	NO HEADPHONE
9106	–	YES
9110	YES	–
9105	YES	–
3135	YES	–
3132	YES	–
0020	YES	–

of
36

shes

-6D (0-5V)

AL M is selected
AL N is selected
TSC M is selected
25-6D and the

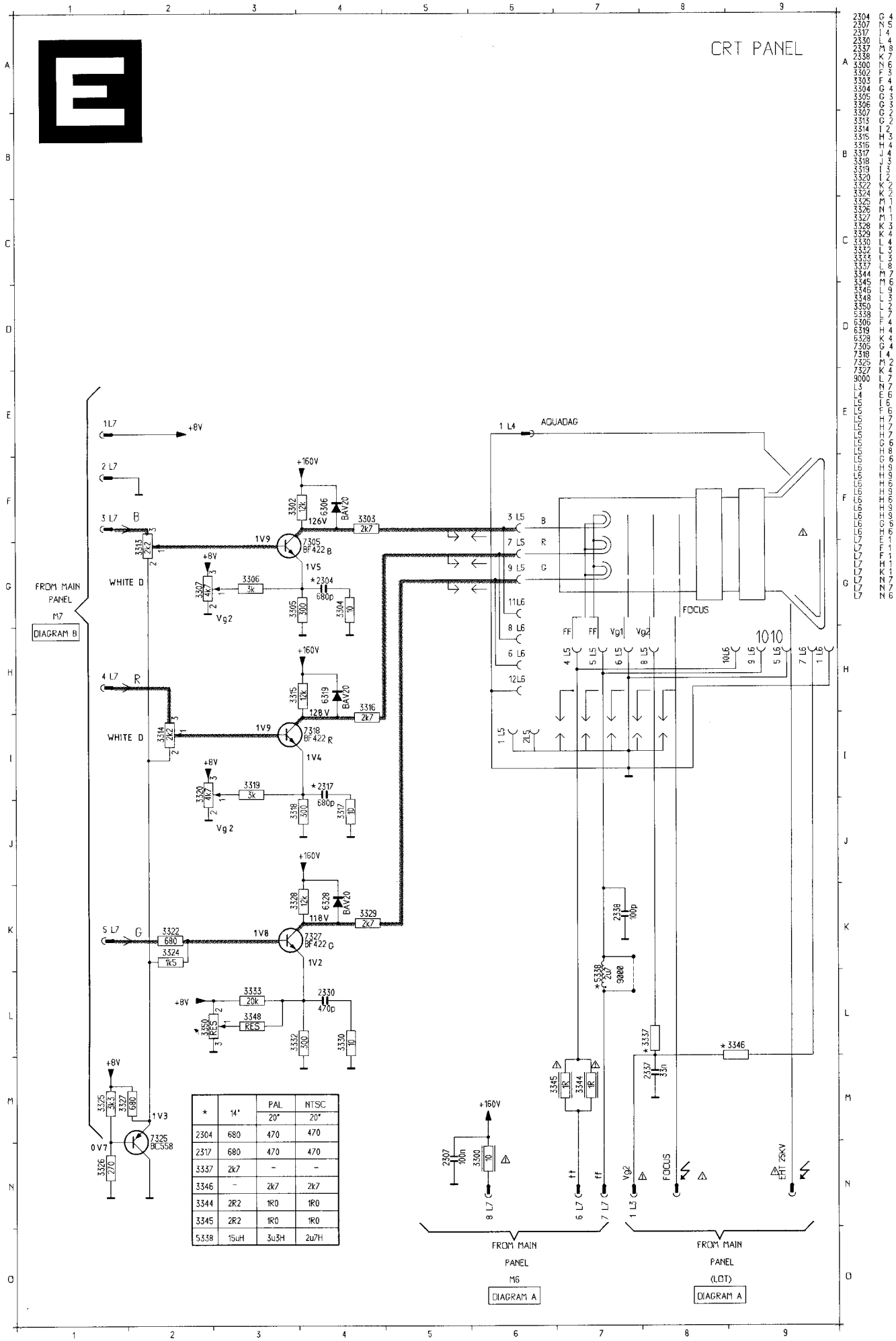
e voltage on pin 8
LYBACK and
250) and so the

on the µC

ary side of the
e µC will switch

7225-6D (0-5V);

CRT panel / Panel del TRC



*	14"	PAL 20"	NTSC 20"
2304	680	470	470
2317	680	470	470
3337	2k7	-	-
3346	-	2k7	2k7
3344	2R2	1R0	1R0
3345	2R2	1R0	1R0
5338	15uH	3u3H	2u7H

7. Electrical adjustments

1. Settings on the carrier panel (Fig. 7.1)

1.1 +95V power supply voltage
Connect a multimeter (DC) across C2531. Set brightness at mid position and contrast at maximum. Apply a pattern generator with a colour bar. Adjust potentiometer **R3514** to +95V ± 0.5V DC.

1.2 Horizontal centring
Is adjusted with potentiometer **R3420**.

1.3 Vertical centring
Can be adjusted with **R3408**.

1.4 Picture height
Is adjusted with potentiometer **R3410**.

1.5 Focusing
Is adjusted with the focusing potentiometer in the line output transformer 5445 (if necessary set brightness at minimum and contrast at maximum for focus adjustment).

1.6 RF AGC adjustment
Connect a pattern generator (e.g. PM5518) to the aerial input with RF signal amplitude = 1 mV. Connect a multimeter (DC) at pin 5 of tuner. Adjust **R3264** so that voltage at pin 5 of tuner is 7.5 ± 0.5V DC.

1.7 Picture demodulator adjustment
Connect a pattern generator (e.g. PM5518) with a cross hatch. Connect an oscilloscope (1µs/DIV) to pin 7 of IC7225-6A and adjust **L5260** so that the overshoot response is minimum, see Fig. 7.2.
Select a colour bar signal and verify if the picture is alright.

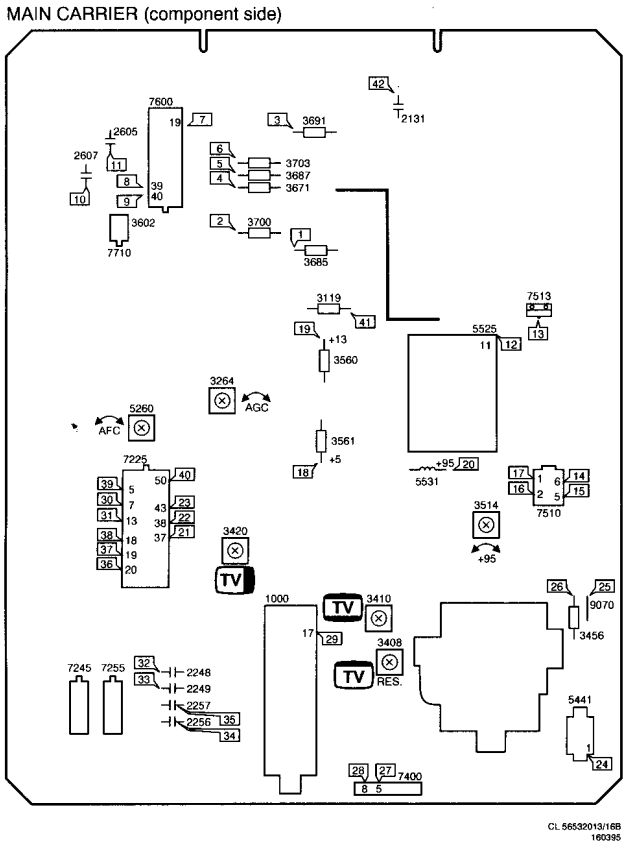


Fig. 7.1

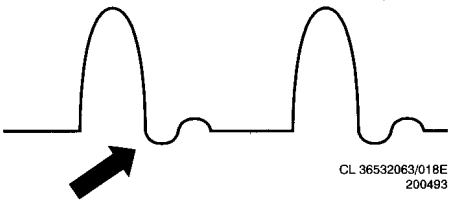


Fig. 7.2

2. Settings on the CRT panel (Fig. 7.3)

2.1 Vg2 cut off adjustment
Connect a pattern generator (eg PM5518) and set it to white raster pattern. Set contrast and the Vg2 potentiometer (in line output transformer) minimum. Adjust with brightness control the top video level at pin 5L7 to the same voltage level of the emitter of transistor 7325.

Pre-adjust the black level preset potmeters **R3320** and **R3307** fully counterclockwise. Adjust Vg2 potmeter of LOT 5445 until green just becomes visible. Adjust the other two guns with their potmeters: **R3307** for blue and **R3320** for red. All three colour shall give the same reading for a white picture.

2.2 White-D adjustment
Use the same signal as prescribed in 2.1. Adjust contrast to such a level that red is good visible. Adjust potentiometers **R3313** (B) and **R3314** (G) to have a correct White-D picture.

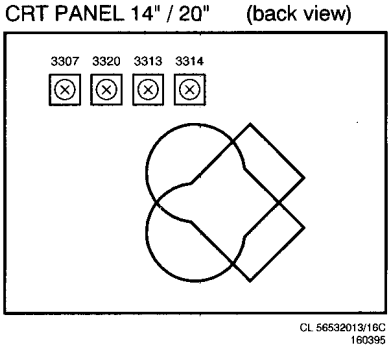


Fig. 7.3

3. Adjusting the picture tube

Note: The colour purity and convergence adjustments described hereafter need only be carried out if a completely new adjustment is called for or if a new picture tube has been fitted.
Otherwise, for instance after replacing the deflection unit, it will not be necessary to remove the rubber wedges (G in Fig. 4). corrections by means of the multi-pole unit will then suffice.

3.1 Colour purity (see Fig. 4)

1. Switch off the set.
2. Loosen fixing screw "F" of the deflection unit a few turns.
3. Move the deflection unit and remove the three rubber wedges "G".
4. Slide the deflection unit forward as far as possible against the glass of the picture tube cone and tighten fixing screw "F" in such a manner that the deflection unit can be moved with some friction.
5. Place the multi-pole unit in the position shown (see Fig. 4), turn screw "A" and turn securing ring "B" counter clockwise.
6. Let the apparatus face East or West and switch on the set.
   Supply a cross-hatch pattern and set brightness control to maximum. Allow for a warming-up time of 10 minutes.
7. Adjust the static convergence, using tabs "C" and "D" (if necessary, see procedure as described in paragraph 3.2).
8. Switch off the blue and the green gun by disconnecting the resistors 3303 and 3316.
9. By turning the colour purity rings with tabs "E", the vertical red bar is adjusted nearest to the centre of the screen, while the central horizontal line should be as straight as possible (see Fig. 4a).
10. Supply a white pattern signal and check that the red bar is in the centre of the screen. If not, switch on the cross-hatch pattern again and move the red bar in the right direction, taking care that the picture does not move too much in vertical direction.
11. Supply the white pattern signal and move the deflection unit until the whole picture surface is uniformly red.
12. Switch on the blue and the green guns by reconnecting R3303 and R3316. No colour patches should occur in the white picture now obtained. If necessary a minor correction can be made by slightly turning the colour purity rings "E" and/or slightly moving the deflection unit.
13. Tighten screw "F" tightly.
14. Proceed to the static and dynamic convergence adjustments.

3.2 Static convergence (see Fig. 4)

1. Supply a cross-hatch pattern and allow for a warming-up time of 10 minutes.
2. Switch off the green gun by disconnecting resistor 3316 and turn locking ring "B" anticlockwise.
3. By turning the four-pole rings with tabs "C", the red and blue cross-hatch patterns in the centre of the screen are placed on top of each other (see Fig. 4b).
4. Switch on the green gun by reconnecting R3316.
5. By turning the six-pole rings with tabs "D" the red and green cross-hatch patterns in the centre of the screen are placed on top of each other (see Fig. 4c).
6. Tighten ring "B" again.

3.3 Dynamic convergence (see Fig. 5)

Remark:
The dynamic convergence is achieved by vertical and horizontal tilting of the deflection unit. To secure the rig position of the deflection unit, three rubber wedges are fitted between the glass of the picture tube and the deflection unit, as shown in Fig. 5d.

1. First check the colour purity
2. Switch off the green gun by disconnecting resistor
3. Supply a cross-hatch pattern.
4. Eliminate the crossing of the central horizontal blue and red line and the crossing of the central vertical blue and red line, by vertical tilting of the deflection unit (see Fig. 4d).
   If the position of the deflection unit is correct, then place rubber wedge 1 with paper strip not removed the top (Fig. 5a) and wedge 2 with paper strip remo at the bottom (see Fig. 5b). Firmly press the adhes sides of this bottom wedge against the glass of the picture tube.
5. By horizontal tilting of the deflection unit, now both horizontal blue and red lines in the upper and lowe halves of the picture and the vertical blue and red l on the left and right hand side of the picture are pla on top of the other (see Fig. 4e).
   If the position of the deflection unit is correct, then place wedges 3 and 4 with paper strips removed, a shown in Fig. 5c. Firmly press the adhesive sides o these wedges against the glass of the picture tube.
6. Remove wedge 1, to obtain the condition shown in Fig. 5d.
7. Switch on the green gun again by reconnecting R3

Fig. 4

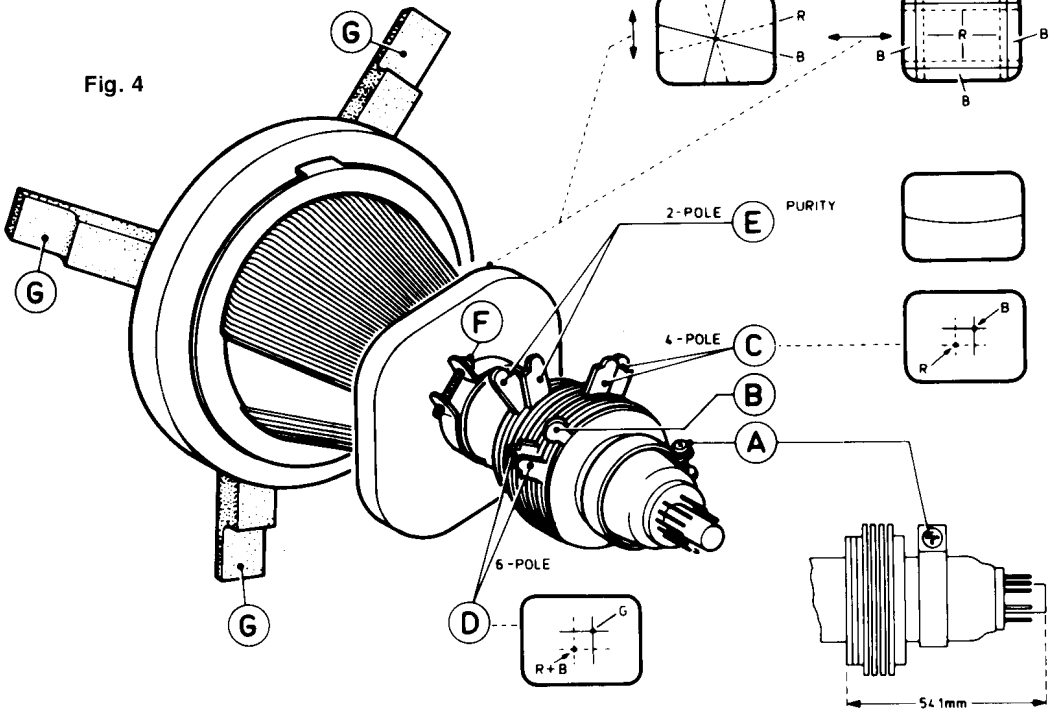


Fig. 4c

Fig. 4d

Fig. 4e

Fig. 4a

Fig. 4b

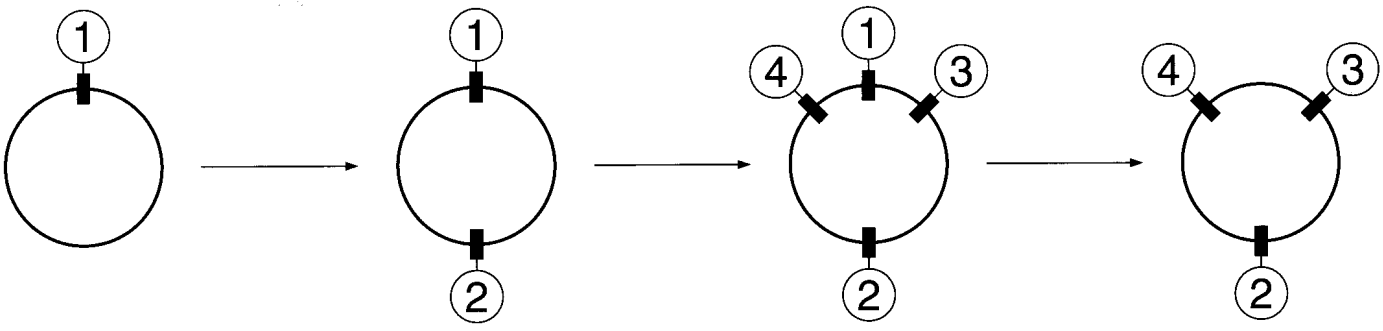


Fig. 5a

Fig. 5b

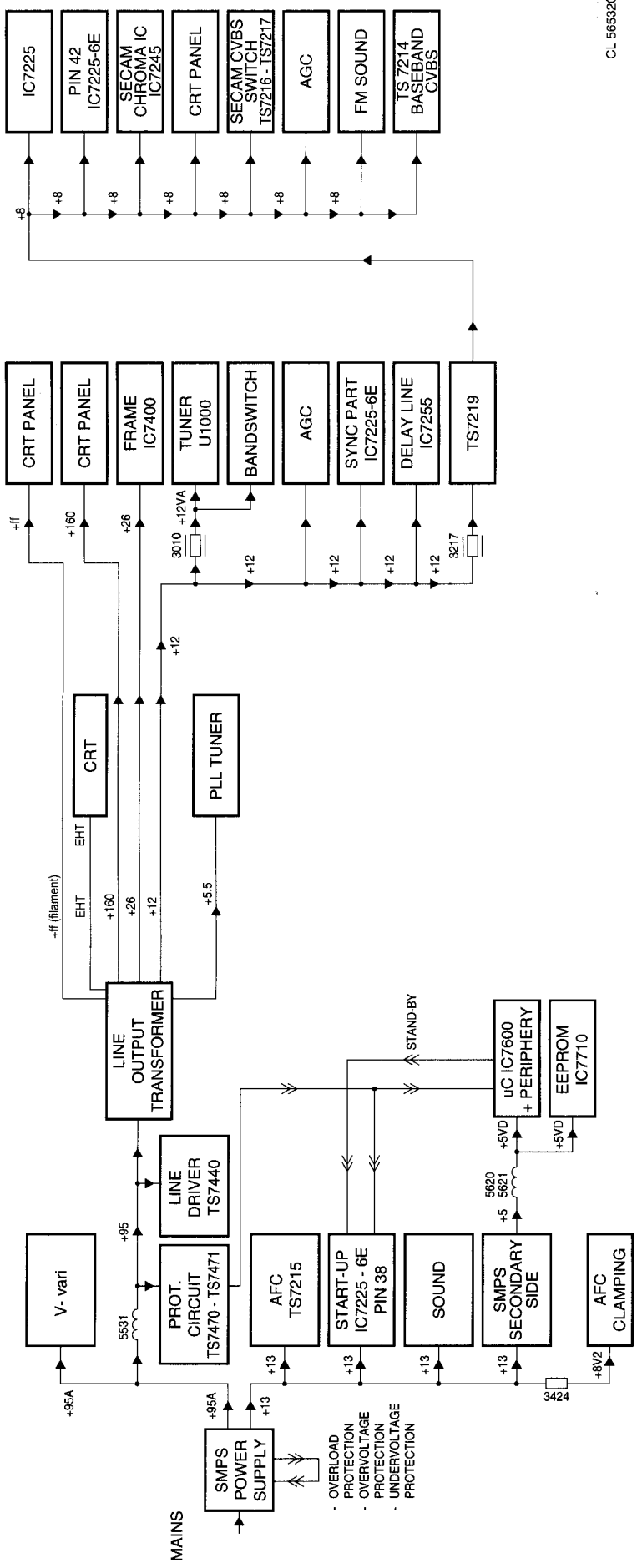
Fig. 5c

Fig. 5d

CL 46532035/013
070494

8. Repair facilities

Power supply block diagram



Repair tips

1. Error messages

Via I^2C the µC can detect malfunction of all I^2C controlled IC's. Maximal 3 error codes can be displayed indicating maximal 3 different errors detected at switch on (see Table 8.1). These error codes will be displayed via OSD, only in normal operation mode after every switch on of the set. Error codes detected in the past can only be displayed in the Service Mode (see section 3.2.3).

Error Code	Error description	Possible defective component
1	PLL tuner error	Tuner U1000 (if PLL tuner)
2	EEPROM checksum error	Set not correct configured (see 3.2.2)
3	Not used	--
4	Not used	--
5	Internal RAM error	IC 7600
6	EEPROM	IC 7710
7	Not used	--
8	Not used	--

Table 8.1

2. Service Default Mode (SDM)

2.1 Entry of the Service Default Mode

Shortcircuit the 2 Service Default Mode pins on the main carrier (M28 and M29 (ground) near µC IC7600 indicated with "SDM" in the service printing) for a short moment while switching on the set. An "S" on the screen will indicate that the Service Default Mode is activated.

2.2 Functions of the Service Default Mode

In the Service Default Mode the set is in a pre-defined condition: All controls are set at 50% except the volume which is set at 25%. Sets with a VST tuner are tuned at program number 1 and sets with a PLL tuner are tuned at 475.25 MHz. All DC voltages & oscillograms indicated in the Service Manual are measured in this Service Default Mode.

2.3 Exit of the Service Default Mode

The Service Default Mode is exited via the standby command (the SDM pins should not be shortcircuited any more by then).

3. Service Mode (SM)

3.1 Entry of the Service Mode

Shortcircuit the 2 Service Mode pins on the main carrier (M31 and M32 (ground) near EEPROM IC7710 indicated with "SM" in the service printing) for a short moment while switching on the set (the built in EEPROM-protection in the EEPROM will automatically be deactivated at entering the service mode, and activated again at exiting the service mode via standby; as this procedure is realised via the content of address 255, the data at this address 255 may **not** be adapted).

3.2 Functions of the Service Mode

Functions of the Service Mode are; display the software number and version, set all software controlled options, display error codes detected in the past and erase the error code detected in the past.

3.2.1 Display the software number and version

In the Service Mode the following menu will appear:

ANUBIS-S AFH V1.3
ADR XXX DATA XXX

SAF indicates software number AF (AF is dedicated for the Anubis S DD), H indicates Hotel Mode option is present in this software and V1.3 indicates 1st masking with 3rd version.

3.2.2 Set all software controlled options

The addresses where the option settings are stored are the addresses 239 (240 for PLL) up to and including 253. The default data (stored by the factory) differs from type-stroke version to type-stroke version. This default data is given at a sticker inside the set.

For manipulation of the data at the option addresses 239 (240 for PLL) up to and including 253 table 8.3 (for VST sets) or table 8.4 (for PLL sets) can be used.

Changing the options settings according to the hardware environment (the configuration of that typical set), can be done in the Service Mode via the keys:

1. **"CONTROL -/+"** By pressing the "control -/+" keys the value behind ADR or DATA can be highlighted sequently
2a. **"PROG -/+"** By pressing the "prog -/+" keys the highlighted value can be increased or decreased
2b. **"0-9"** By pressing the "0-9" keys the highlighted value can directly be keyed in
3. **"STORE"** After every ADR and/or DATA change a "store" command has to be given to store these changes !

For option addresses 245 and 246 first determine what is valid for your particular set. After determination of all options (so 8 option choices each for address 245 and 246) the 8 corresponding values can be added for that particular address. This sum is the data to be keyed in, so e.g. for all options at address 245 the following data can be calculated:

Clock timer disabled	→	0
AV uses mono only	→	64
AV selectable	→	32
Enable the SMART sound/picture feature	→	16
Hue control possible	→	8
Enable the 13pp option	→	4
Remote STORE key allowed	→	0
Use normal bandswitch signals	→	0

The data at address 245 by then is:		124

The changed settings are only activated when the set is switched off and on again with the mains switch and if the checksum at address 254 is correctly updated; If the checksum is not OK, the set will use default settings.

The checksum at address 254 can be obtained by adding all data at the addresses 239 up to and including 253 and then subtract 256 until the data has a value under 256: for example, if EEPROM contains the following data, the checksum will be:

Address	*Data*
239	0
240	0
241	0
242	0
243	0
244	0
245	84
246	112
247	32
248	42
249	73
250	0
251	129
252	0
253	224

	696

696 - 256 - 256 = 184

Checksum address	*Data*
254	184

The other addresses of the EEPROM (so all addresses except 240 to 254 and 220) contain program information and preference-, factory- and current settings.

3.2.3 Display error codes detected in the past

The data at address 220 indicates all error codes detected in the past. The data at address 220 is a byte whereby the 8 bits refer to 8 possible error codes (for the error codes, see table 8.1) detected in the past; see conversion table 8.2.

Data at address 220	**Error codes: 8 7 6 5 4 3 2 1**	**Error codes detected in the past**
000	0 0 0 0 0 0 0 0	No error codes detected
001	0 0 0 0 0 0 0 1	1
002	0 0 0 0 0 0 1 0	2
003	0 0 0 0 0 0 1 1	1 & 2
004	0 0 0 0 0 1 0 0	3
005	0 0 0 0 0 1 0 1	1 & 3
006	0 0 0 0 0 1 1 0	2 & 3
007	0 0 0 0 0 1 1 1	1 & 2 & 3
etc.		
etc.		
255	1 1 1 1 1 1 1 1	1 & 2 & 3 & 4 & 5 & 6 & 7 & 8

Table 8.2

3.2.4 Erase the error code detected in the past

If the data at address is overwritten with 000 the error code history has been erased.

3.3 Exit of the Service Mode

For all software numbers the Service Mode is exited via the standby command.

4. Replacing an EEPROM

After replacing the EEPROM by an empty one, the addresses 224 up to and included address 254 can filled in accordance with the configuration of that typ set (if this is not done the software will use default settings).
The option setting for the addresses 239 up to and included 254 (checksum) can be different for every type/stroke-version and so are given by an option sticker at the backcover inside the set (and can also calculated via table 8.3 or 8.4).
The option setting for the addresses 224 up to and included 238 (smart control settings) can be set by table 8.5.

5. Hotel mode

The hotel mode can only be activated if:

1. the software for hotel mode is available (so an "H" version)
2. the hotel mode option (at address 246) is enable

In VST version (software number AF) two hotel mod are possible (Hotel Mode 1 and Hotel Mode 2). In P version (software number 3F) only one Hotel Mode (Hotel Mode 1) can be used:

Hotel mode 1:

* Hotel mode 1 is activated by simultaneously pre the "VOLUME-" and "PROGRAM+" on the local keyboard while program 38 is selected. Both ke must be hold down for at least 3 seconds.
* Features of hotel mode 1:
  - Install menu (also automatic search) not pos
  - Storing PP not possible.
  - Using the "PROGRAM +/-" keys from standb switch the TV on to program 1 instead of to last selected program.
  - Maximum volume value is limited to the valu present at the moment the hotel mode was activated.
* Hotel mode 1 is deactivated by simultaneously pressing the "PROGRAM+" and "VOLUME-" ke the local keyboard for at least 3 seconds while program 40 is selected.

Hotel mode 2:

* Hotel mode 2 is activated by simultaneously pre the "VOLUME-" and "PROGRAM+" on the local keyboard while program 37 is selected. Both ke must be hold down for at least 3 seconds.
* Features of hotel mode 2 :
  Same features as Hotel mode 1 except for the program numbers which can be selected. If one these program numbers is selected the screen remains blanked, and so the set can be used as radio (the transmitter should produce a valid horizontal IDENT). The program numbers which be blanked out (RADIO mode) can be programm via address 241 and 242 (see table 8.3).
  While these blanked program numbers are tune small program number will be displayed perma
* Hotel mode 2 is deactivated by simultaneously pressing the "PROGRAM+" and "VOLUME-" ke the local keyboard for at least 3 seconds while program 40 is selected.

Option setting table for software number AF (for VST Anubis-S DD)

Address	Option A	Value	Option B	Value
241	No hotel sets			0
	At this place you can program the first program number from which the RADIO mode will start (so from the program number onwards which is programmed at this address (address 241), the picture will be blanked out. This blank-out of the picture is called the RADIO mode). This RADIO mode will work from the program number programmed at this address (address 241) up to and included the program number programmed at address 242. This feature will only function in case the hotel mode function is enabled at address 246 and if Hotel Mode 2 is selected.			
242	No hotel sets			0
	At this place you can program the first program number from which the RADIO mode will start (so from the program number onwards which is programmed at this address (address 241), the picture will be blanked out. This blank-out of the picture is called the RADIO mode). This RADIO mode will work from the program number programmed at this address (address 241) up to and included the program number programmed at address 242. This feature will only function in case the hotel mode function is enabled at address 246 and if Hotel Mode 2 is selected.			
245	Clock timer disabled	0	Clock timer enabled	128
	AV stereo playback enabled	0	AV uses mono only	64
	No AV selectable	0	AV selectable	32
	Disable the SMART sound/picture feature	0	Enable the SMART sound/picture feature	16
	No hue control possible	0	Hue control possible	8
	Disable the 13pp options (PP-function per channel for the customer is disabled)	0	Enable the 13pp options (PP-function per channel for the customer is enabled)	4
	Remote STORE key allowed	0	No remote STORE key allowed	2
	Swap bandswitch signals for VHF1 & VHF3 bands (needed for UV973)	0	Use normal bandswitch signals	1
246	No hotel mode possible	0	Hotel mode can be enabled	128
	No UHF tuning possible	0	UHF band allowed	64
	No VHF3 tuning possible	0	VHF3 band allowed	32
	No VHF1 tuning possible	0	VHF1 band allowed	16
	Not used			0
	Not used			0
	Not used			0
	Not used			0
247	All VST sets			32
248	All VST sets			42
249	All VST sets			73
250	All VST sets			0
251	All VST sets			129
252	All VST sets			0
253	All VST sets			224
254	Checksum Add data on address 239 up to and included 253 and then (if necessary) substract 256 until the data has a value under 256.			

Table 8.3

	Value
	0
e	
m	
at	
e 2	
	0
e	
m	
at	
e 2	
	128
	64
	32
	16
	8
	4
	2
	1
	128
	64
	32
	16
	0
	0
	0
	0
	32
	42
	73
	0
	129
	0
	224
s a	

Option setting table for software number 3F (for PLL Anubis-S DD)

Address	Option A	Value	Option B	Value
245	Not used			0
	Not used			0
	No AV selectable	0	AV selectable	32
	Not used			0
	No hue control possible	0	Hue control possible	8
	Not used			0
	Always allow RC5 STORE key	0	Allow RC5 STORE key only in SDM (Service Default Mode) and SM (Service Mode)	2
	Not used			0
246	No hotel mode possible	0	Hotel mode can be enabled	128
	Not used			0
	Fixed colour system	0	Trinorma colour system	32
	Not used			0
	Not used			0
	Not used			0
	Not used			0
	Autoskip will perform with optimal speed	0	Autoskip will work slower	1
247	All PLL sets			4
248	All PLL sets			13
249	All PLL sets			9
250	All PLL sets			5
251	All PLL sets			5
252	All PLL sets			80
253	All PLL sets			5
254	Checksum Add data on address 239 up to and included 253 and then (if necessary) substract 256 until the data has a value under 256.			

Table 8.4

Default settings needed for filling empty EEPROM (for other addresses see table 8.3 or 8.4)

Address	VST sets	Function		Address	PLL sets	Function
224	63	RICH - contrast		224	0	not used
225	18	RICH - brightness		225	63	RICH - contrast
226	30	RICH - colour		226	18	RICH - brightness
227	32	RICH - hue		227	24	RICH - colour
228	53	RICH - sharpness		228	32	RICH - hue
229	48	NATURAL - contrast		229	53	RICH - sharpness
230	25	NATURAL - brightness		230	48	NATURAL - contrast
231	26	NATURAL - colour		231	23	NATURAL - brightness
232	32	NATURAL - hue		232	21	NATURAL - colour
233	38	NATURAL - sharpness		233	32	NATURAL - hue
234	28	SOFT - contrast		234	38	NATURAL - sharpness
235	25	SOFT - brightness		235	28	SOFT - contrast
236	23	SOFT - colour		236	25	SOFT - brightness
237	32	SOFT - hue		237	20	SOFT - colour
238	18	SOFT - sharpness		238	32	SOFT - hue
239	0	not used		239	18	SOFT - sharpness
240	0	not used		240	0	not used
241	see table 8.3			241	0	not used
242	see table 8.3			242	0	not used
243	0	not used		243	0	not used
255	224	Enable protected EEPROM after the Service Menu is left		255	224	Enable protected EEPROM afte the Service Menu is left

Table 8.5