SERVICE MANUAL

CHASSIS **CTR-AA**

CONTENTS

1. Technical specifications

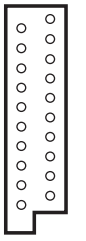
CHASSIS CTR - AA

Mains voltage	: 220 - 240 V ± 10% AC;50 Hz (±5%)
Power cons. at 220V~	: 35 W (14"), 50W (20''/21''), 55 W (21" Real Flat), 3W (Stand-By)
Aerial input inpedance	: 75 - coax
Min. aerial input VHF	: 30µV
Min. aerial input UHF	: 40µV
Max. aerial input VHF/UHF	: 180mV
Pull-in range colour sync.	: ± 300Hz
Pull-in range horizontal sync.	: ± 600 Hz
Pull-in range vertical sync.	: ± 5 Hz
Picture tube range	: 14" / 21'' / 21" RF / 21" PRF
	: Mono: 25 1W (14''), 16 2W (20''/21'')
	: Estereo : 2x16 2x4W (21''), 2x5 W (21" Real Flat)
TV Systems	: PAL BG
	: PAL I
	: PAL / SECAM BG / DK
	: PAL / SECAM BG / L / L'
Indications	: On screen display (OSD) green and menu
	: 1 LED (red in On and blinking red in stand-by
VCR programs	: 99, Ø (new mask software)
Tuning and operating system	: VST
UV1315A / IEC (VST)	: VHFa: 48 - 168 MHz
	: VHFb: 175 - 447 MHz
	: UHF: 455 - 855 MHz
U1343A / IEC (VST)	: UHF: 455 - 855 MHz
Local operating functions	: Vol/Prog, +, -, contrast, colour, brightness and sharpness (and hue on program AV with NTSC signal).

2. Connection facilities

Euroconnector 1

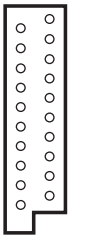
Ext 1



1	-	Audio R	
2	-	Audio R	
3	-	Audio L	
4	-	Audio	
5	-	Blue	
6	-	Audio L	
7	-	Azul	
8	-	CVBS status 1	
9	-	Green	
10	-	-	
11	-	Green	
12	-	-	
13	-	Red	
14	-	-	
15	-	Red	
16	-	RGB status	
17	-	CVBS	
18	-	CVBS	
19	-	CVBS	
20	-	CVBS	
21	-	Earthscreen.	

Euroconnector 2

Ext 2



1	-	Audio R	(0V5 RMS@ 1K)
2	-	Audio R	(0V5 RMS@ 1K)
3	-	Audio L	(0V5 RMS @ 1K).
4	-	Audio	
5	-	-	
6	-	Audio L	(0V2 - 2V RMS @ 10K).
7	-	-	(0V7pp @ 75
8	-	CVBS status 2	(0-2V int., 10-12V ext.).
9	-	-	
10	-	-	
11	-	-	(0-2V int., 10-12V ext.).
12	-	-	
13	-	Chroma	
14	-	-	
15	-	Chroma	(0V7pp @75
16	-	-	(0-V4 int.) (1-3V ext.@ 75
17	-	CVBS	
18	-	CVBS	
19	-	CVBS	(1Vpp @ 75
20	-	CVBS /Y	(1Vpp @ 75
21	-	Earthscreen.	

Head phone:

8 to 600 . Mono : 25mW @ 32
3,5mm ø. Stereo : 2x6mW @ 32

3. Mechanical instructions

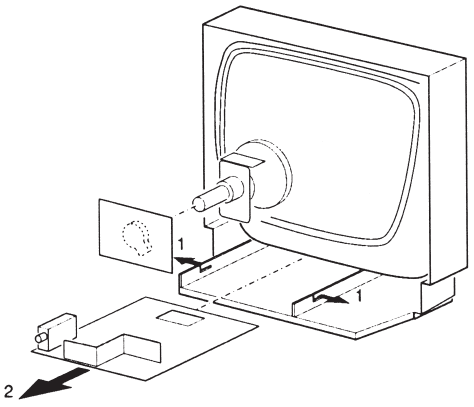
For the main carrier two service positions are possible (3.1).

A: For faulfinding 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 10 cm.

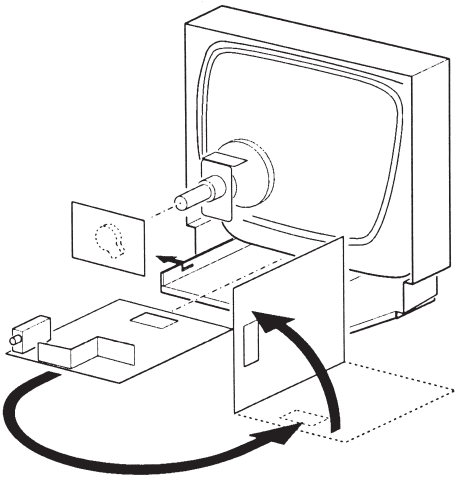
Position B can be reached from position A after disconnecting the degaussing cable.Put the carrier on the line transformer side.

Fig. 3.1



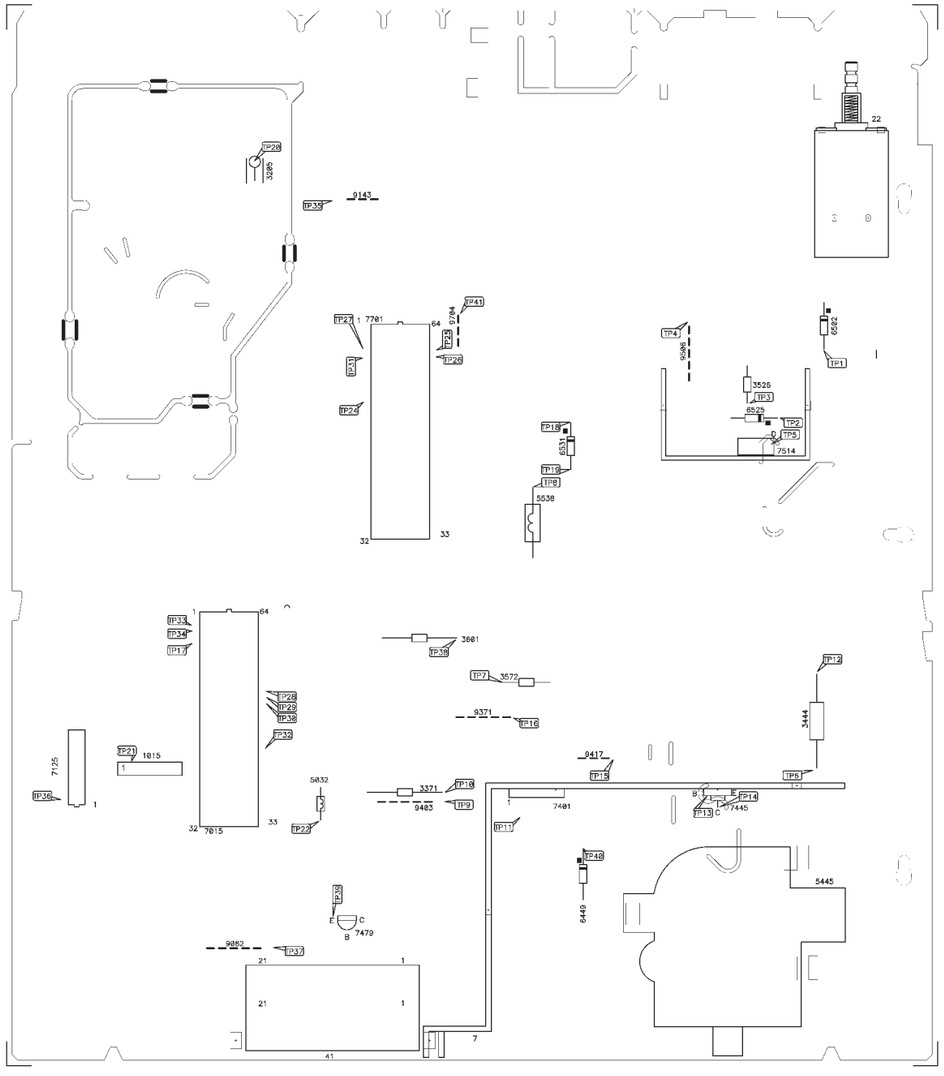
A

Fig. 3.2

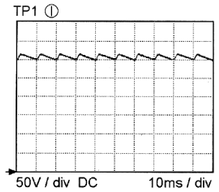


B

4. Oscillograms



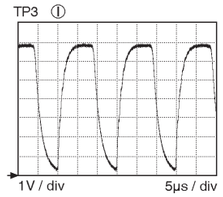
TP1 ⓘ



50V / div DC 10ms / div

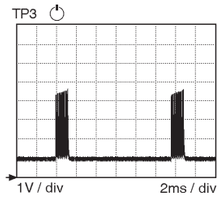
TP2 ⓘ ⟶ 27V4 DC
TP2 ⏱ ⟶ 11V5 DC

TP3 ⓘ



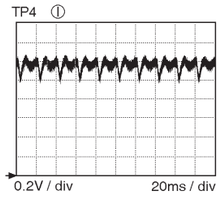
1V / div 5µs / div

TP3 ⏱



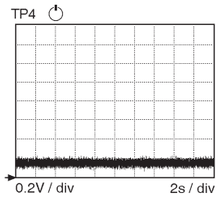
1V / div 2ms / div

TP4 ⓘ



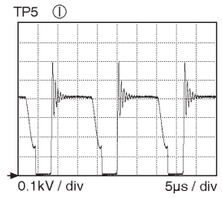
0.2V / div 20ms / div

TP4 ⏱



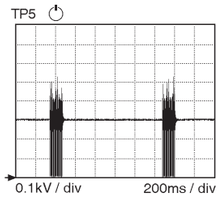
0.2V / div 2s / div

TP5 ⓘ



0.1kV / div 5µs / div

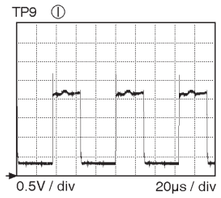
TP5 ⏱



0.1kV / div 200ms / div

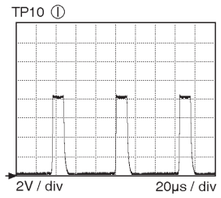
TP6 ⓘ ⟶ 100V7 DC
TP7 ⓘ ⟶ 3V4 DC
TP8 ⓘ ⟶ 13V4 DC

TP9 ⓘ



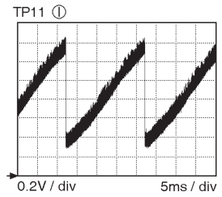
0.5V / div 20µs / div

TP10 ⓘ



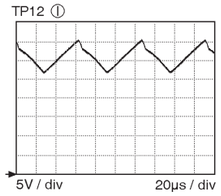
2V / div 20µs / div

TP11 ⓘ



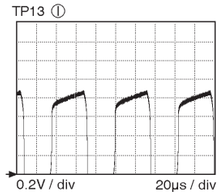
0.2V / div 5ms / div

TP12 ⓘ



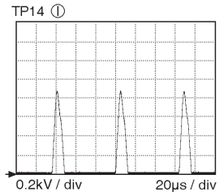
5V / div 20µs / div

TP13 ⓘ



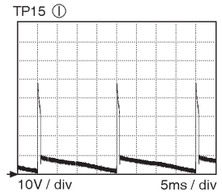
0.2V / div 20µs / div

TP14 ⓘ



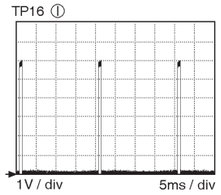
0.2kV / div 20µs / div

TP15 ⓘ



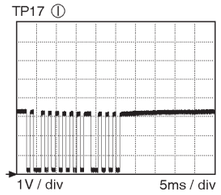
10V / div 5ms / div

TP16 ⓘ



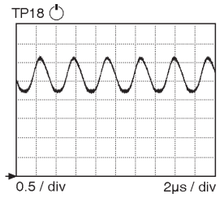
1V / div 5ms / div

TP17 ⓘ



1V / div 5ms / div

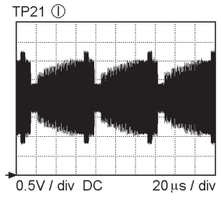
TP18 ⏱



0.5 / div 2µs / div

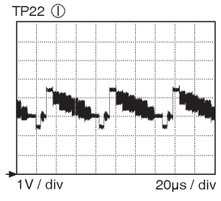
TP18 ⓘ ⟶ 2V4 DC
TP19 ⓘ ⟶ 0V DC
TP20 ⓘ ⟶ 175V DC

TP21 ⓘ



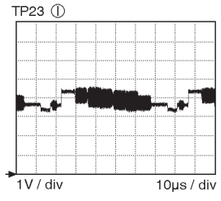
0.5V / div DC 20 µs / div

TP22 ⓘ



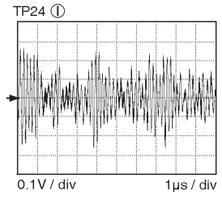
1V / div 20µs / div

TP23 ⓘ



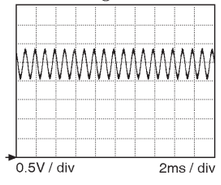
1V / div 10µs / div

TP24 ⓘ



0.1V / div 1µs / div

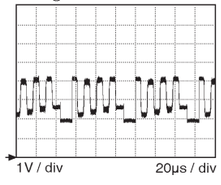
TP25 / TP26 ⓘ



0.5V / div 2ms / div

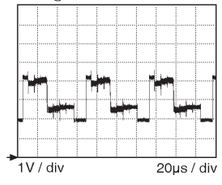
I2C BUS TDA987X :
TP27 ⓘ ⟶ SCL
TP31 ⓘ ⟶ SDA

TP28 ⓘ



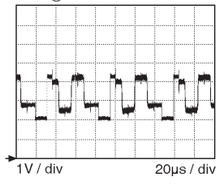
1V / div 20µs / div

TP29 ⓘ



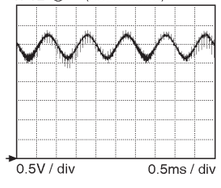
1V / div 20µs / div

TP30 ⓘ



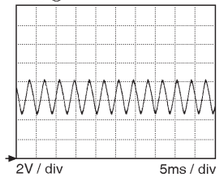
1V / div 20µs / div

TP32 ⓘ (SOLO MONO)



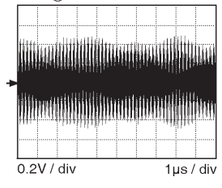
0.5V / div 0.5ms / div

TP35 ⓘ



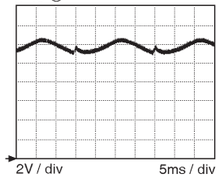
2V / div 5ms / div

TP36 ⓘ



0.2V / div 1µs / div

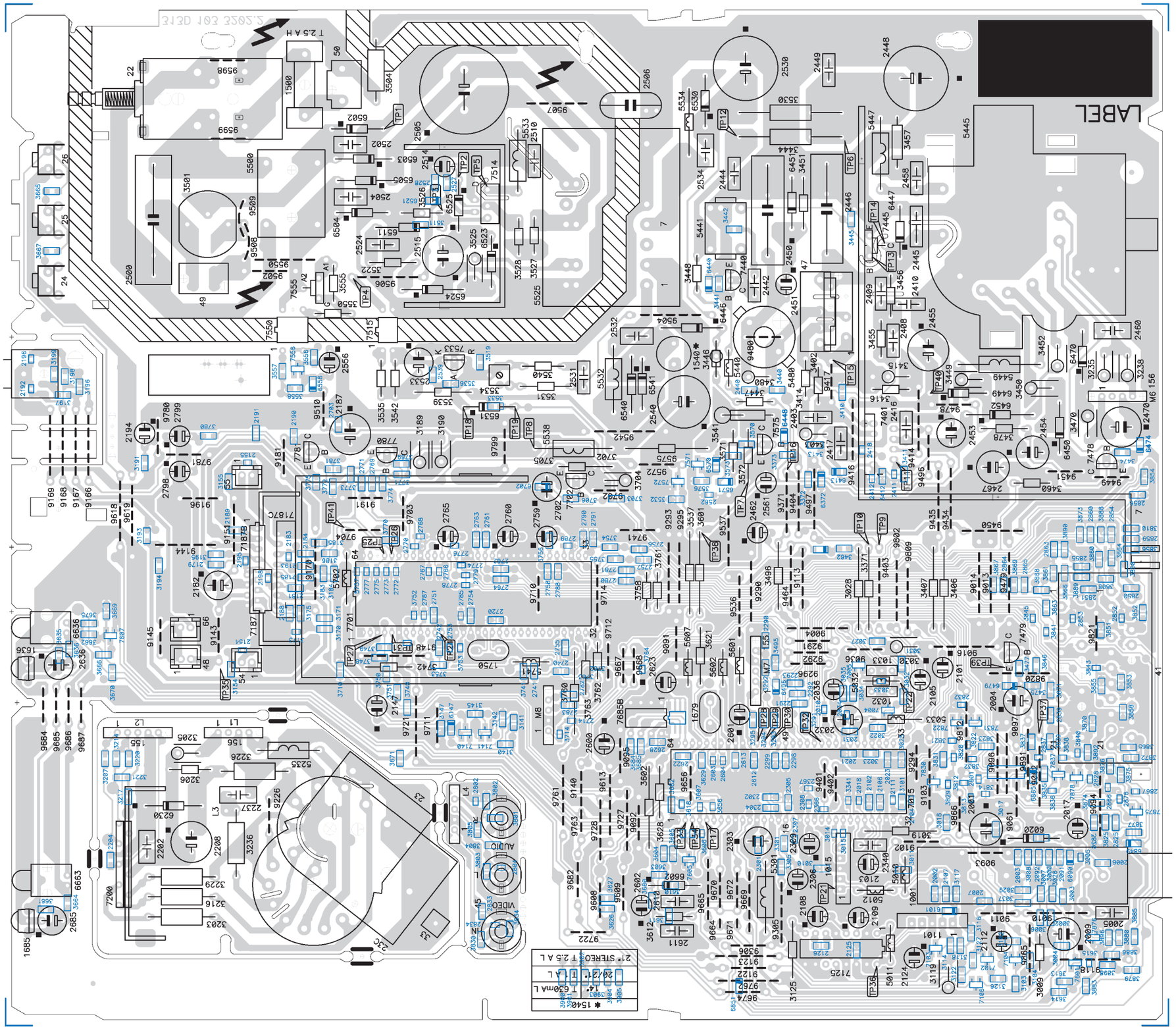
TP40 ⓘ

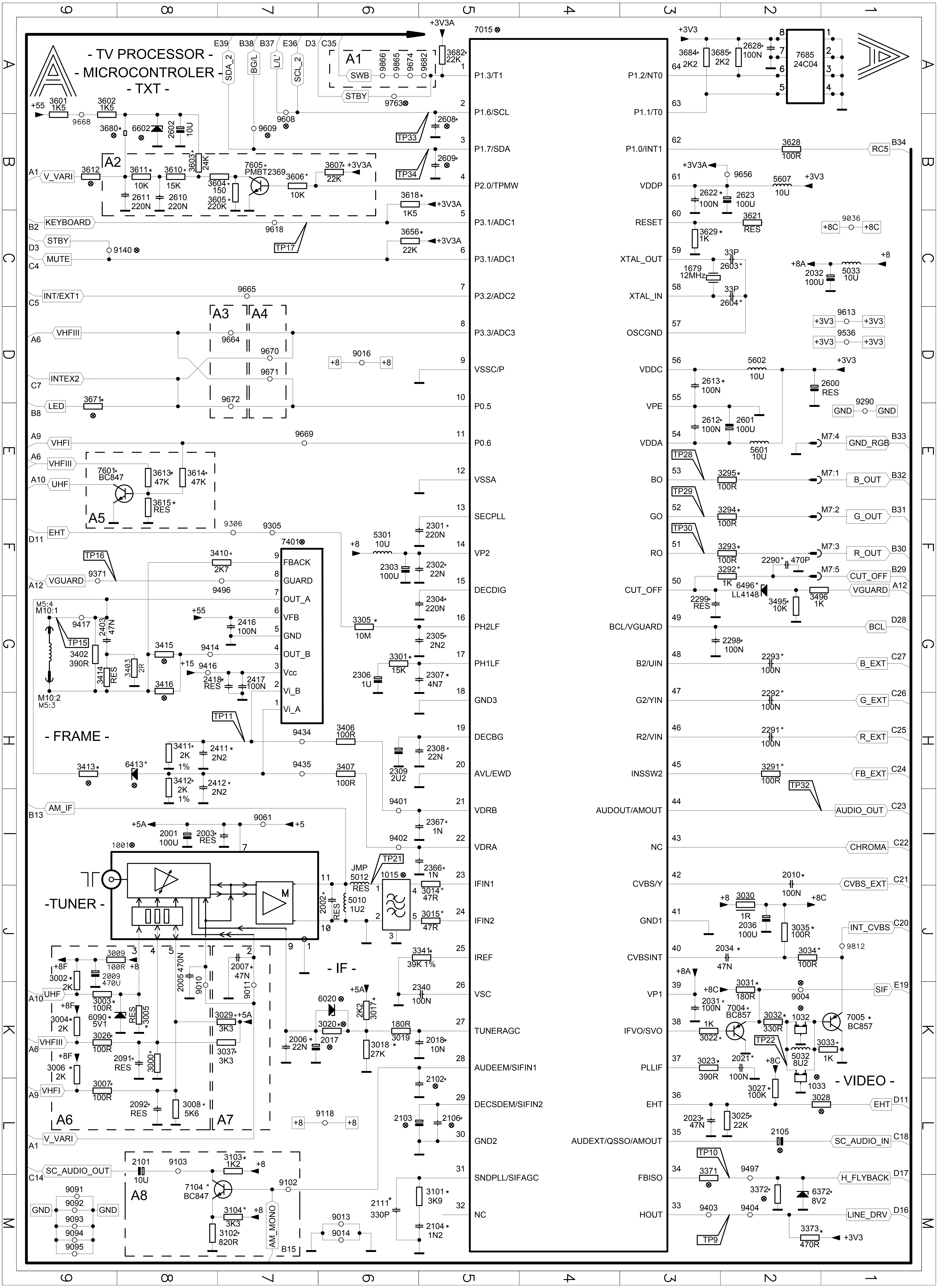


2V / div 5ms / div

TP37 ⓘ ⟶ 8V2 DC
TP38 ⓘ ⟶ 45V DC
TP39 ⓘ ⟶ 5V DC
TP39 ⏱ ⟶ 0V DC
TP40 ⏱ ⟶ 0V DC
TP41 ⓘ ⟶ 5V DC
TP41 ⏱ ⟶ 0V DC

5. PRINT BOARD LAYOUT





- TV PROCESSOR -
- MICROCONTROLER -
- TXT -
- FRAME -
-TUNER -
- IF -
- VIDEO -
7015
7685
24C04
7401
1001
1015
P1.3/T1
P1.6/SCL
P1.7/SDA
P2.0/TPMW
P3.1/ADC1
P3.1/ADC1
P3.2/ADC2
P3.3/ADC3
VSSC/P
P0.5
P0.6
VSSA
SECPLL
VP2
DECDIG
PH2LF
PH1LF
GND3
DECBG
AVL/EWD
VDRB
VDRA
IFIN1
IFIN2
IREF
VSC
TUNERAGC
AUDEEM/SIFIN1
DECSDEM/SIFIN2
GND2
SNDPLL/SIFAGC
NC
P1.2/NT0
P1.1/T0
P1.0/INT1
VDDP
RESET
XTAL_OUT
XTAL_IN
OSCGND
VDDC
VPE
VDDA
BO
GO
RO
CUT_OFF
BCL/VGUARD
B2/UIN
G2/YIN
R2/VIN
INSSW2
AUDOUT/AMOUT
NC
CVBS/Y
GND1
CVBSINT
VP1
IFVO/SVO
PLLIF
EHT
AUDEXT/QSSO/AMOUT
FBISO
HOUT
FBACK
GUARD
OUT_A
VFB
GND
OUT_B
Vcc
Vi_B
Vi_A
V_VARI
KEYBOARD
STBY
MUTE
INT/EXT1
VHFIII
INTEX2
LED
VHFI
UHF
EHT
VGUARD
AM_IF
SC_AUDIO_OUT
GND
AM_MONO
RC5
GND_RGB
B_OUT
G_OUT
R_OUT
CUT_OFF
BCL
B_EXT
G_EXT
R_EXT
FB_EXT
AUDIO_OUT
CHROMA
CVBS_EXT
INT_CVBS
SIF
EHT
SC_AUDIO_IN
H_FLYBACK
LINE_DRV
SDA_2
BG/L
L/L'
SCL_2
SWB
A1
A2
A3
A4
A5
A6
A7
A8
TP9
TP10
TP11
TP15
TP16
TP17
TP21
TP22
TP28
TP29
TP30
TP32
TP33
TP34
+3V3A
+3V3
+55
+5A
+5
+8
+8A
+8C
+8F
+15
M5:4
M10:1
M10:2
M5:3
M7:1
M7:2
M7:3
M7:4
M7:5
7605 PMBT2369
7601 BC847
7104 BC847
7004 BC857
7005 BC857
6496 LL4148
1679 12MHz
JMP 5012

- RGB & DISPLAY COMPONENTS -

- DISPLAY -

A-D

+200
2202 100N
7200
6
3
7
1
9
2
8
5
4
TDA6107JF/N3

A32 B_OUT L2:1 3207* 560R
A31 G_OUT L2:2 3214* 3220* 3221*
A30 R_OUT L2:3 3217*
A33 RGB_GND L2:4
A29 CUT_OFF L2:5
2204* 470P

3203 1K5
3216 1K5
3229 1K5

33 L6 1M1
B
RG
GR
23
FF FF* VG1 VG2 FOCUS
9226
AQUA

3226 1K5
3236 1K5
2237 2N2
TP20
+200
5235
3206
2208
3205 51R
6230
L1:3 L1:4 L1:1 L3 1M1

FF D39
FF D40
+200 D41
VG2 D42
25KV D43
FOCUS D44

B1 - AM SOUND -

+8B
3118* 6K8
2107* 10N
A13 AM_IF
3117* 2K2
6101* BA682
3114* 2K2
+3V3
3626* 3K3
A37 L/L'
9122
3122* 22K
7103* BC847
3116* 10K
K9650M 1101
TP36
RES
7125 TDA9830

IF_IN 1 / 16 IF_IN
NC 2 / 15 NC
CAGC 3 / 14 +8V
CREF 4 / 13 GND
NC 5 / 12 MUTE
AM_OUT 6 / 11 +12V
AM_IN 7 / 10 SW
AF_OUT 8 / 9 EXT_IN

2109 4U7
2108 4U7
2126* 220N
2124 4U7
2125* 100N
3119 1R
+8
+3V3
3627* 3K3
9123
BG/L A38

E45 B45 AM_AUDIO_OUT 3125

B2 - AM MONO -

+8
7106* BC847
AM_AUDIO_OUT B45
2U2 2112
AM_MONO A15
3126* 1K
3127* 47K
7102* BC847

B3 14" B4 20"/21"

9686 +3V3 +3V3
9684 GND GND

A34 RC5
3635* 1K
3636* 100R
2636 100U
1636 TSOP1836SS3V
9685
3661* 1K
3664* 100R
2685 100U
1685 TSOP1836SS3V
+3V3
6636 B4_4534
6663 B4_4534
9687

B6

3662*
3666* 270R
3675* 1K3
A8 LED
3670* 0R05
7607* BC847
3669* 1K

B5 -MONO-

MENU 26 KEYBOARD A2
3665* 680R
P- 25
3667* 1K3
P+ 24
9619
9169
HEADPH_GND E49
3191* 68R
2194 100U
42
2192* 10N
2196*
9168 HPH_MONO C48
3197*
3199* 3198*
9166 HPH_L E47
*3196
9167 HPH_R/SPKSW E46 C46

A - E - F

- SCART + AV -

C1
- SECOND SCART-

C2

C3

C4

C5

C6

C7

C8

C9

- AMPLIFIER -

SC2_CVBS C55 3835* 100R 3836* 470R 7837* BC857 3837* 120R +8 2837* 100N 7878* BC847 3838* 1K5 3839* 68R 3840* 1K 2839* RES 3892* 100R SC2_CVBS_IN C54 3870* 75R

CHROMA A22 3846* 100R 3871* 75R

6851* LL4148 INTEX2 A7 3885* 24k2% 3883* RES

SC2_AUDIO_OUT_L E50 3890* 220K 2863* 330P 3861* 150R

SC2_AUDIO_OUT_R E51 3889* 220K 2855* 330P 3866* 150R

3863* 8K2 SC2_AUDIO_IN_L E58 2853* RES 2864* 330P 3867* 10K

2851* RES 3868* 8K2 SC2_AUDIO_IN_R E57 2865* 330P 3869* 10K

41:B

SC1_CVBS_IN C52 2825* 2867* 18P 6849* LL4148 +8 9891 3872* 100R

CVBS_EXT A21 9296 3865* 75R

AV_CVBS_IN C53

FB_EXT A24 3858* 75R

INT/EXT1 A5 3898* 3879* 3896* 10K

SC1_AUDIO_IN_L E59 3852* 3854* 2856* 2852* 3810*

SC1_AUDIO_IN_R E60 3850* 2850* 3856* 2859* 9802

SC_AUDIO_IN A18

GND 9820 GND

GND 9821 GND

41:A

+8 3877* 120R 7875* BC847 3874* 2876* 100N 3814* 100R INT_CVBS A20 3875* 68R 2866* 18P 3876* 470R

3845* 100R R_EXT A25 75R 3855*

3843* 100R G_EXT A26 75R 3853*

3841* 100R B_EXT A27 75R 3851*

3860* 150R 9809 3808* 2860* 3873* 220K

3864* 150R 2854* 330P 3888* 220K

+8 3825* 47K 2801* 100N 2004 RES 7801 TDA4053B 3823* 10K 7831* BC847 9291 SWA E56 2832* 100N

Vdd 16 9 3 4 5 13 14 1 11 2 6 7 8 10 15 12 /E Vee Vss

C52 SC1_CVBS_IN 3826* 22K

A20 INT_CVBS 3812* 1K 3813* 1K 9292

C53 AV_CVBS_IN

6865* LL4148 +8

C54 SC2_CVBS_IN 2828* 100N

C52 SC1_CVBS_IN

SC2_CVBS C55

CVBS_EXT A21

10K 3832* +8 3831* RES 7830 BC847 3829* 10K

3822* 10K +8 7822* BC847 3820* 22K SWB A35 3821* 10K

C2 +8 3886* 10K 7876* BC847 3880* 5K6

L4:1 L4:2 L4:3 L4:4 M8:1 M8:2 M8:3 M8:4

VIDEO 45:1 3834* 75R 3804* 10K 3803* 8K2 2804* 330P AUDIO L 45:2 3805* 3802* 10K 3801* 8K2 2802 330P AUDIO R 45:3 2833* 100N 3830* 100R 2834* 18P

3714* 2714* AV_CVBS_IN C53 AV_AUDIO_IN_L E62 AV_AUDIO_IN_R E63 SC1_AUDIO_OUT_R E64 SC1_AUDIO_OUT_L E65/A14 SC_AUDIO_OUT

C9 VIDEO 3830* 100R 2834* 18P 3834* 75R 3804* 10K AUDIO 3803* 8K2 2804* 330P

GND 9096 GND GND 9097 GND GND 9293 GND GND 9295 GND GND 9294 GND

HPH_R/SPKSW E46 B46 HPH_MONO B47 9145 66 48 9143 TP35 OUT-_MONO C72 OUT+_MONO C71 3194* RES 3193*

7187 TDA8941P +13B 1 VCC GND 8 2188* 2 OUT+ OUT- 7 3 IN+ SVR 6 4 MODE IN- 5

9170 +13B +13B 9181 +13B +13B 9062 +8 +8

INA+ C66 2182 10U IN- C69 MODE C70

C7 2147 10U 6147* LL4148 +5B 3147* 100K 3140* 22K 3142* 10K 7140* BC847 3171* 10K 3145* 10K 7141* BC847 MUTE A4 3141* 22K

3190 3189 1R +13A +13B 2187 2189*

A23 AUDIO_OUT 9113 3184* 3183* MAIN_R E67

C4 2181* 220N 2198* 1N5 INA+ C66

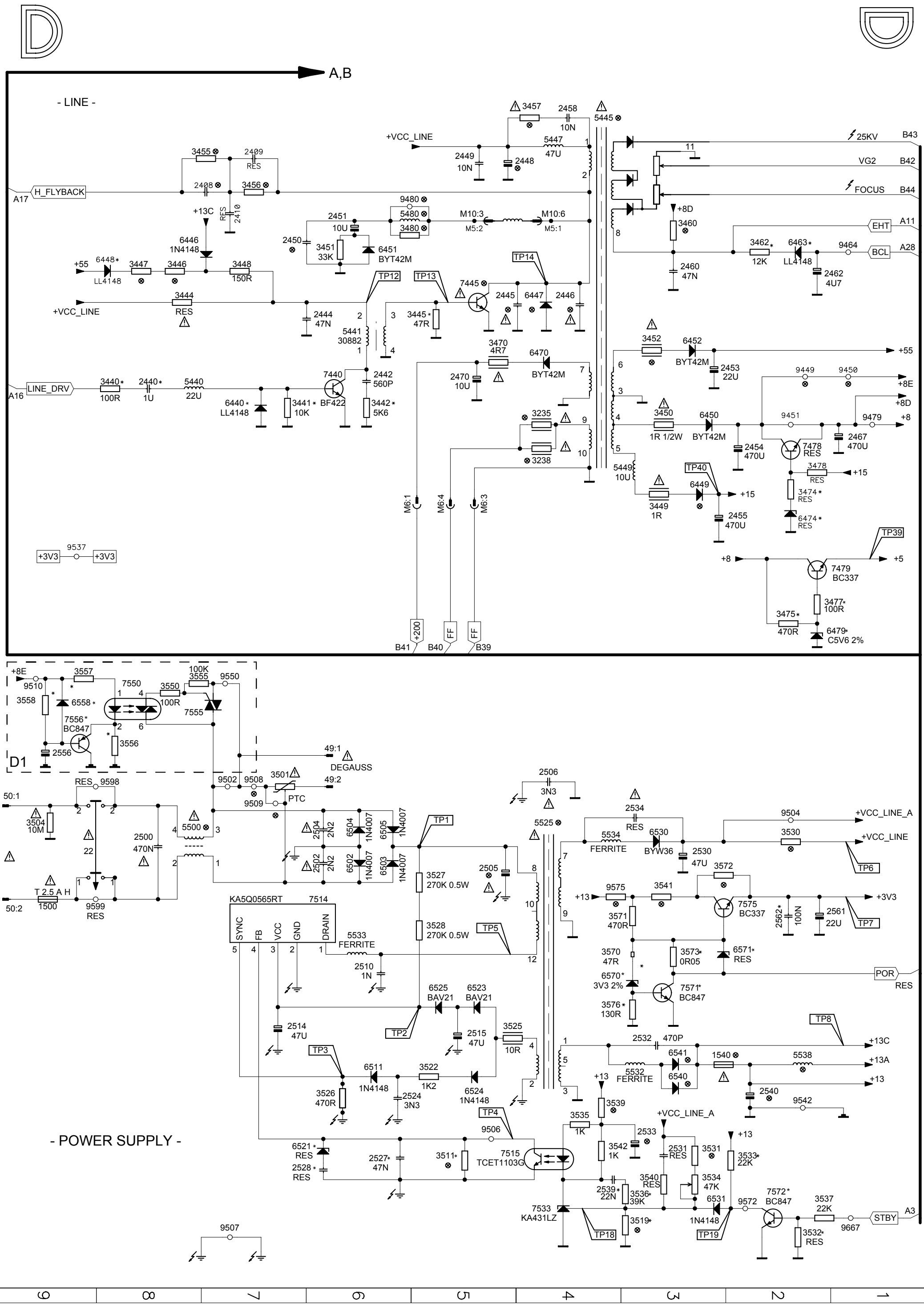
C5 2185* 220N 2195* 1N5 2179* 220N IN- C69 INB+ C68 3195* RES

C6 GND 9191 GND 7187 7187B TDA8943SF OUT2+ NC 54 2154* 100N +13B 3154 82R 17 9 VCC2 2190* 220N 16 GND2 GND 15 8 OUT2- 14 NC MODE 3175* RES *RES 13 7 IN2+ 3170* 12 SVR SVR 11 6 MODE 10 IN2- IN- 2193* 220N 2183* 1N5 9 5 IN1- 8 NC IN+ 3186* 2184* 220N 7 4 IN1+ 6 NC OUT+ 3185* RES 5 3 OUT1+ 55 2155* 100N +13B 4 VCC1 VCC 3155* 82R 3 2 GND1 2 OUT1- OUT- 1 1

INA+ C66 MODE C70 IN- C69 INB+ C68 MAIN_L C73 OUT+_MONO C71 9144 OUT-_MONO C72 9151

2191*

GND_AUDIO 9196 GND_AUDIO


A,B
- LINE -
A17 H_FLYBACK
3455
2409 RES
2408
3456
2410 RES
+13C
6446 1N4148
+55
6448*
LL4148
3447
3446
3448 150R
+VCC_LINE
3444 RES
2444 47N
A16 LINE_DRV
3440* 100R
2440* 1U
5440 22U
6440* LL4148
3441* 10K
7440 BF422
2442 560P
3442* 5K6
3457
2458 10N
5445
+VCC_LINE
2449 10N
2448
5447 47U
9480
5480
3480
2451 10U
2450
3451 33K
6451 BYT42M
M10:3
M5:2
M10:6
M5:1
TP14
TP12
TP13
7445
2445
6447
2446
2444 47N
5441 30882
3445* 47R
3470 4R7
6470 BYT42M
2470 10U
3235
3238
M6:1
M6:4
M6:3
B41 +200
B40 FF
B39 FF
+3V3 9537 +3V3
25KV B43
VG2 B42
FOCUS B44
+8D
3460
EHT A11
BCL A28
3462* 12K
6463* LL4148
9464
2462 4U7
2460 47N
3452
6452 BYT42M
+55
2453 22U
9449
9450
+8E
+8D
3450 1R 1/2W
6450 BYT42M
9451
9479
+8
2454 470U
7478 RES
2467 470U
3478 RES
+15
3474* RES
6474* RES
5449 10U
3449 1R
TP40
6449
+15
2455 470U
TP39
+8
+5
7479 BC337
3477* 100R
3475* 470R
6479* C5V6 2%
+8E 9510
3557
100K 3555
9550
3558
6558*
7550
3550 100R
7555
7556* BC847
2556
3556
D1
49:1 DEGAUSS
49:2
RES 9598
9502
9508
3501 PTC
9509
50:1
3504 10M
T 2.5 A H 1500
50:2
9599 RES
2500 470N
5500
2504 2N2
2502 2N2
6504 1N4007
6505 1N4007
6502 1N4007
6503 1N4007
TP1
3527 270K 0.5W
3528 270K 0.5W
TP5
2505
KA5Q0565RT 7514
SYNC FB VCC GND DRAIN
5533 FERRITE
2510 1N
TP2
6525 BAV21
6523 BAV21
2514 47U
2515 47U
3525 10R
TP3
6511 1N4148
3522 1K2
6524 1N4148
3526 470R
2524 3N3
TP4
9506
6521* RES
2528* RES
2527* 47N
3511*
7515 TCET1103G
2506 3N3
2534 RES
5525
5534 FERRITE
6530 BYW36
2530 47U
9504
+VCC_LINE_A
3530
+VCC_LINE
TP6
3572
9575
3541
+13
3571 470R
7575 BC337
2562* 100N
2561 22U
+3V3
TP7
3570 47R
3573* 0R05
6571* RES
6570* 3V3 2%
7571* BC847
POR
RES
3576* 130R
TP8
2532 470P
6541
6540
1540
5538
+13C
+13A
+13
5532 FERRITE
2540
9542
+13
3539
3535 1K
+VCC_LINE_A
2533
3542 1K
2531 RES
3531
3533* 22K
+13
3540 RES
3534 47K
2539* 22N
3536* 39K
7572* BC847
3537 22K
9572
6531
1N4148
7533 KA431LZ
3519*
TP18
TP19
9667
STBY A3
3532* RES
9507
- POWER SUPPLY -

- STEREO -

A - C

7701 ⊗

1 PCLK
2 NICAM
3 ADDR1
4 SCL
5 SDA
6 Vssa1
7 Vdec1
8 Iref
9 P1
10 SIF2
11 Vref1
12 SIF1
13 ADDR2
14 Vssd1
15 Vddd1
16 CRESET
17 Vssd4
18 XTALI
19 XTALO
20 P2
21 SYSCLK
22 SCK
23 WS
24 SDO2
25 SDO1
26 SDI2
27 SDI1
28 TEST1
29 MONOIN
30 TEST2
31 EXTIR
32 EXTIL

64 Vddd2
63 LOR
62 LOL
61 MOL
60 MOR
59 Vdda
58 AUXOL
57 AUXOR
56 Vssa3
55 PCAPL
54 PCAPR
53 Vref3
52 SCOL2
51 SCOR2
50 Vssa4
49 Vssd2
48 SCOL1
47 SCOR1
46 Vref2
45 i.c.
44 i.c.
43 Vssa2
42 i.c.
41 i.c.
40 Vref(n)
39 Vref(p)
38 Vdec2
37 SCIL2
36 SCIR2
35 Vssd3
34 SCIR1
33 SCIL1

A36 SCL_2 9728 3750* 100R 3748* 3K3 +5B
A39 SDA_2 9727 3751* 100R 3749* 3K3 +5B
TP27
TP31

E1 - MULTI -
+5B 3742 RES
9722 9721
A33 L/L'
2787 RES*

2750* 470N
3752* 10K

GND 9712 GND
GND 9741 GND
GND 9799 GND_AUDIO

A19 SIF 2740* 27P 2742* 120P
5741 22U
3741* 6K8
2741* 180P
TP24
2751* 100N

9148 +5B 3753* 1R 5753* FERRITE
2753* 470N
2785 *RES
2754* 1U

1750 24.576MHz
+3V3 3764* ⊗
C56 SWA
2720* RES

E2 - MULTI -
B45 AM_AUDIO_OUT 9762 9761 3760 2K2 2755* 470N
3710* 9710 GND GND
C63 AV_AUDIO_IN_R 2782* 3763
C62 AV_AUDIO_IN_L 2783* 3762
E74 MONO_AV 9714

5757* FERRITE +5B
2777* 470N

TP25 TP26
MOL 2775* 10N
MOR 2773* 10N
MAIN_L C73
MAIN_R C67

Vdda 3770* 2R2 +5C
2772* 470N
+13B +8E
3771* 3K3
7781 BC547
2771* 4U7
AUXOL 2770* 10N
3772* 33K
0R05 3780* 2799 100U
HPH_L B47
3775* 330R 1/4W

AUXOR 2769* 4U7
2768* 10N
+13B +8E
3769* 3K3
3774* 33K
7780 BC547
0R05 3781* 2798 100U
HPH_R/SPKSW B46
3773* 330R 1/4W

Vssa3
PCAPL 2767* 10N
PCAPR 2766* 10N
9780 HEADPH_GND B49
9781 RES
Vref3 2765 47U

E3 - 2ND SCART-
SCOL2 2778* 2U2 2776* 470P SC2_AUDIO_OUT_L C50
SCOR2 2779* 2U2 2774* 470P SC2_AUDIO_OUT_R C51

Vssa4
Vssd2
SCOL1 2764* 2U2 2763* 470P SC1_AUDIO_OUT_L C65
SCOR1 2762* 2U2 2761* 470P SC1_AUDIO_OUT_R C64
Vref2 2760 47U

i.c.
+8E 3702 RES
2703* RES
9702 3705 100R 1/2W
TP41
9704 5702 JMP +5B
3704 RES
7702 BC337
9703 +5C
2702 47U
3706 100R *
3703* 330R
6702* C5V6 2%

i.c.
i.c.
Vref(n) 2759 47U
Vref(p) 3756* 270R
Vdec2 2758* 470N

E4 - 2ND SCART-
SCIL2 2780* 330N 3761 15K SC2_AUDIO_IN_L C58
2788 RES*
SCIR2 2781* 330N 3758 15K SC2_AUDIO_IN_R C57
2789 RES*

Vssd3
MONO_AV E74
SCIR1 2790 RES* 3755* 15K 2757* SC1_AUDIO_IN_R C60
SCIL1 2791 RES* 3754* 15K 2756* 330N SC1_AUDIO_IN_L C59

6. Electric Diagram (Divertisy tables)

⊗	14"	21" / 21" PRF	21" RF *
B3	YES	---	---
B4	---	YES	YES
2208	1U 200V	10U 250V	10U 250V
2408	---	---	47N 250V
2445	SEE CRT TABLE		
2446	SEE CRT TABLE		
2448	10U 200V	47U 200V	47U 200V
2450	SEE CRT TABLE		
2505	56U 400V	56U 400V	68U 385V
3028	220K	220K	270K
3206	---	1M	1M
3214	560R	---	---
3217	560R	---	---
3220	---	560R	560R
3221	---	560R	560R
3235	1R 0.33W	2R 0.5W	2R 0.5W
3238	SEE CRT TABLE		
3371	27K	27K	22K
3372	22K	22K	---
3413	270K	360K	360K
3415	SEE CRT TABLE		
3416	4R7 0.5W	3R6 0.5W	3R6 0.5W
3446	560R 1/2W	560R 1/2W	820R 1/2W
3447	560R 1/2W	560R 1/2W	820R 1/2W
3452	33R 0.33W	1R 0.5W	1R 0.5W
3455	100K	100K	---
3456	100K	100K	430K
3457	47R 1W	10R 1W	10R 1W
3460	7K5 0.5W	6K2 0.5W	6K2 0.5W
3480	---	1K2 1W	1K2 1W
3519	5K1	4K7	5K1
3530	FERRITE	4R7 3W	4R7 3W
3531	180K	180K	220K
3541	22R 0.5W	47R 1W	47R 1W
5445	LOT 14"	LOT 20/21"	LOT 21" RF
5480	---	DC-12	84UH
5500	35001	37551	37551
6230	JMP	BAV21	BAV21
6413	11V	13V	13V
6447	RGP15M	BY448	BY448
7401	TDA8357J/N2	TDA8359J/N2	TDA8359J/N2
7445	BUT11AF	BUT11APX-1200	BUT11APX-1200
9480	JMP	---	---
9575	22R 0.5W	47R 0.5W	47R 0.5W

* 21"RF AND 21"PRF CORRESPOND TO AESTHETICS 21" WITH FLAT PICTURE TUBE. TO IDENTIFY THE CATEGORY OF A TV SET, YOU HAVE TO CONSULT THE CRT TYPE IN THE CRT TABLE (10.2 PAGE 28).

	MONO		STEREO	
⊗	1W	2W	4W + 4W	5W + 5W
A8	YES	YES	---	---
B5	YES	YES	---	---
C3	---	---	YES	YES
C4	YES	---	YES	YES
C5	---	YES	---	---
C6	---	---	YES	YES
C7	---	---	YES	YES
E	---	---	YES	YES
48	YES	YES	---	---
1540	T 630mA L	T 1A L	T 2.5A L	T 2.5A L
2102	3N3	3N3	33P	33P
2103	10U	10U	---	---
2105	2U2	2U2	---	---
2106	---	---	22N	22N
2187	220U 25V	220U 25V	1000U 25V	1000U 25V
2188	220N	---	---	---
2189	---	220N	---	---
2196	---	---	10N	10N
2533	10U 25V	10U 25V	100U 25V	100U 25V
2540	680U 16V	680U 16V	1500U 25V	1500U 25V
2850	220P	220P	---	---
2852	220P	220P	---	---
2856	---	---	330P	330P
2859	---	---	330P	330P
2860	4N7	4N7	330P	330P
3183	6K2*	6K2*	---	---
3184	5K6	5K6	JMP	JMP
3190	---	---	1R 0.5W	1R 0.5W
3193	0R05	0R05	---	---
3196	---	---	0R05	0R05
3511	3K3	3K9	6K8	6K8
3539	270R	270R		390R
3572	---	---	820R	820R
3808	0R05	0R05	---	---
3810	0R05	0R05	---	---
3850	8K2	8K2	270R	270R
3852	8K2	8K2	270R	270R
3854	100K	100K	47K	47K
3856	---	---	47K	47K
5525	SOPS MONO	SOPS MONO	SOPS 4W+4W	SOPS 5W+5W
5538	JMP	JMP	FERRITE	FERRITE
6449	BYT42M	BYT42M	BYW32	BYW32
6540	BYT42M	BYT42M	---	---
6541	---	---	BYV98-200	BYV28-200
7187	TDA8941/N1	TDA8943SF/N1	TDA8944J	TDA8946J
9004	---	---	JMP	JMP
9113	JMP	JMP	---	---
9143	JMP	JMP	---	---
9144	---	JMP	---	---
9151	---	JMP	---	---
9449	---	---	JMP	JMP
9450	---	---	JMP	JMP
9802	JMP	JMP	---	---
9809	JMP	JMP	---	---

*NOT PLACED IN SOFTWARE MASK /0763 AND /0776

⊗	VST	PLL
A2	YES	---
A5	YES	---
A6	YES	---
A7	---	YES
1001	UV1315AI	UV1316
3612	10K	JMP
3680	---	JMP
6602	HZT33	BZX79-C33

⊗	MONO 1 SPEAKER	MONO 2 SPEAKER
66	---	YES
9145	JMP	---

⊗	STEREO NICAM+A2	STEREO A2
7701	TDA9875A/2	TDA9870A/2

⊗	OLD MICRO *	NEW MICRO
C2	YES	---
3879	47K	24K
3898	---	1K
9140	---	JMP
9763	JMP	---

* SOFTWARE MASK /0763 /0776 /0946 /1052

⊗	1SCART	1SCART +LATERAL AV	1SCART + FRONT AV	2SCART + AV
A1	---	---	---	YES
A3	YES	YES	YES	---
A4	---	---	---	YES
B6	---	---	---	YES
C1	---	---	---	YES
C8	---	YES	---	YES
C9	---	---	YES	---
2714	---	18P	---	18P
2757	---	0R05	0R05	330N
2782	330N	330N	330N	330N
2783	---	0R05	0R05	330N
2825	0R05	0R05	0R05	2U2
3662	270R	270R	270R	---
3671	100R	100R	100R	3K
3714	---	100R	---	100R
3762	---	0R05	0R05	15K
3762	15K	15K	15K	15K
3805	---	0R05	0R05	---
9296	---	JMP	JMP	---
9714	---	JMP	JMP	---
9891	JMP	JMP	JMP	---

		MONO				STEREO			
	⊗	PAL BG	PAL I	PAL/SECAM BG DK	PAL/SECAM BG L L' I	PAL BG	PAL I	PAL/SECAM BG DK	PAL/SECAM BG L L' I
	B1	---	---	---	YES	---	---	---	YES
	B2	---	---	---	YES	---	---	---	---
	E1	---	---	---	---	---	---	---	YES
	E2	---	---	---	---	---	---	---	YES
	1015	G1961/G1975	J1952	K2955	K2962	G1984	J1981	K2977	K2962
	1032	5.5	6.0	5.5	5.5	5.5	6.0	5.5	5.5
	1033	---	---	6.5	6.0	---	---	6.5	6.0
	2017	47U	47U	47U	100U	47U	47U	47U	100U
	2191	JMP	JMP	JMP	JMP	JMP	JMP	JMP	JMP
	2608	---	---	---	10P	---	---	---	---
	2609	---	---	---	10P	---	---	---	---
	3020	0R05	0R05	0R05	12K	0R05	0R05	0R05	12K
	3125	---	---	---	10K	---	---	---	JMP
	6020	---	---	---	2V4	---	---	---	2V4
	9608	---	---	---	YES	---	---	---	---
	9609	---	---	---	YES	---	---	---	---
TXT	7015	TDA9350PS/N2	TDA9350PS/N2	TDA9351PS/N2	TDA9351PS/N2	TDA9350PS/N2	TDA9350PS/N2	TDA9351PS/N2	TDA9351PS/N2
NO TXT		TDA9370PS/N2	TDA9370PS/N2	TDA9381PS/N2	TDA9381PS/N2	TDA9370PS/N2	TDA9370PS/N2	TDA9381PS/N2	TDA9381PS/N2

7.- CIRCUIT DESCRIPTION

7.1.- SMALL SIGNAL & MICROCONTROLLER/TEXT (Diagram A)

The small signal is processed by IC 7015. This IC called Ultimate One Chip (UOC) also has an embedded microcontroller.
The CTR-AA chassis is designed to use 5 possible IC's in position 7015, 3 for PAL systems, (TDA9350 with teletext; TDA9380 and TDA9370 without teletext) and 2 for multi-standard sets (TDA9351 with teletext; TDA9381 without teletext). The associated circuitry is the same for TXT and non-TXT models.

In this chapter 7.1 TV sets with mono sound and PAL systems are explained. The associated circuitry for sets with SECAM L/L' systems is explained in chapt. 7.7, whereas for stereo sets can be seen in chapt. 7.8.

The small signal part includes IF detection, video processing, chroma decoder, RGB, sync processor and sound decoder (mono sets). It is fully controlled by the embedded microcontroller.
The microcontroller contains a 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).
The IC for TXT sets (TDA935x) 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).

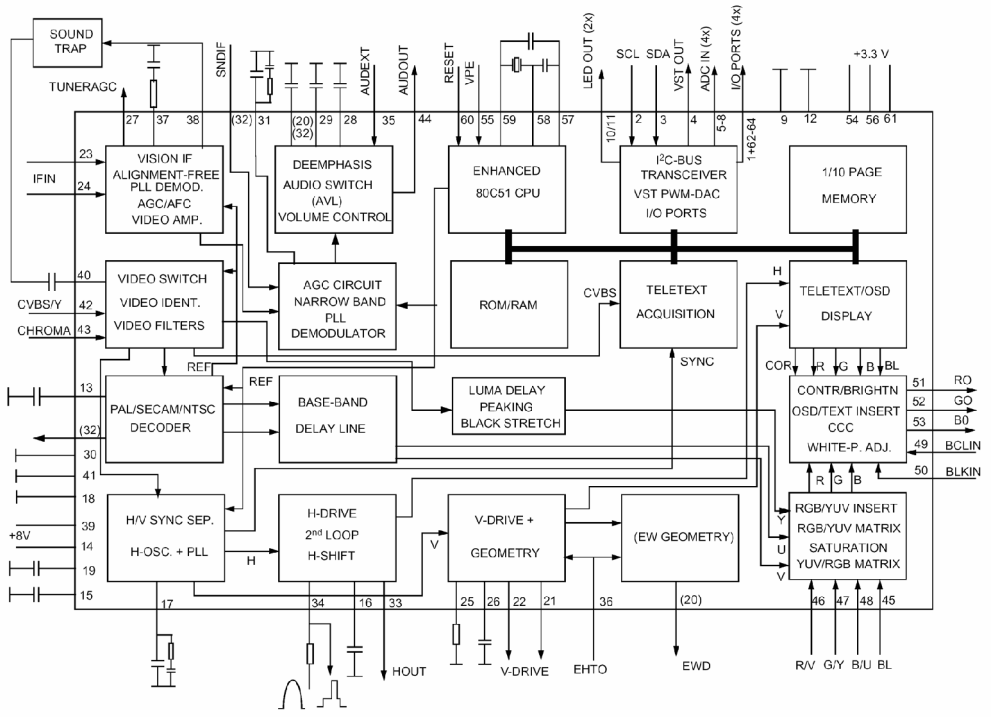


Fig. 7.1: TDA93XX block diagram

7.1.1.- IF detection

IF detection is intercarrier type, that means that sound and picture are detected in the same circuit (PIF).
- IF amplifier (pins 23, 24): The IF signal coming from pin 11 of the tuner (1001) is filtered by the IF SAW filter (1015) and applied to IF amplifier of IC7015 by means of pin 23 and 24 input. The IF bandpass characteristic is determined by the SAW (Surface Acoustic Wave) filter.
- PLL demodulator (pins 37, 58, 59): The IF-signal is demodulated by means of a PLL detector, which one is used to regenerate the IF reference signal. Reference signal is determined by the PLL loop-filter pin 37 and calibrated by microcontroller crystal (pins 58, 59). It is alignment free.
Demodulation is achieved by multiplying reference signal with the incoming IF-signal.
- AGC (pin 27): The IF AGC time constant is internally fixed. The tuner AGC voltage (pin 27) is applied to pin 1 of the tuner and adjusted by microcontroller (see chap. 8.3).
- Video output (pin 38): This baseband CVBS signal with 2.5Vpp (sync inclusive) 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 system and 6.5 MHz for DK system.

7.1.2.- Sound processor

- FM demodulation (pins 31, 29): FM sound is filtered from CVBS (pin 38) by a loop-filter (pin 31) and demodulated. Decoupling sound demodulator is made by a capacitor on pin 29.
- De-emphasis and audio out (pin 28): De-emphasis is made by C2102 at pin 28. The signal at this pin is driven to the euroconnector sound output (see Diagram C) by transistor 7104.
- External audio input (pin 35). The External Audio signal from pins 2 and 6 of Euroconnector 1 (or from the Audio in the A/V connector, if the set has one) enters through this pin. The selection of external or internal audio is made through an internal switch, which is controlled by bus I²C (see INT/EXT, chapt. 7.1.8)
- Audio out (pin 44): After a volume control (by I²C), this output is driven to the input IN+ of the final sound amplifier IC7187 (Diagram C).

7.1.3.- Video processing

- Video switches (pins 40, 42): The internal CVBS signal proceeding of pin 38 is now fed to pin 40 of 7015. External CVBS proceeding from pin 20 of Euroconnector is present on pin 42 of 7015. The IC switches between internal and external are controlled by I²C bus (see INT/EXT, chapter 7.1.8).

The selected CVBS signal is internally supplied to the synchronization, teletext acquisition circuits and the video identification circuit for IF ident.

- Luminance processor: CVBS is also internally applied to luminance processor, which is composed of chrominance trap filter, luminance delay line and peaking circuits. Sharpness control modifies peaking by I²C.

7.1.4.- Chroma processing

This circuit is an internal (no pins associated) automatic decoder for Pal and NTSC systems commanded by I²C bus.

- ACC and chroma filter: Video signal coming from video switches is supplied to PAL/NTSC chroma bandpass filter via a variable gain amplifier which is controlled by ACC and ACL detection circuits.

The dynamic range of the ACC is 26dB and detects only the burst amplitude. The ACL is a chroma amplitude detector and is active when the chroma/burst ratio exceeds approximately 3. It ensures that CVBS signal to chroma bandpass filter is limited for large.

- PLL/DCO: Chroma PLL is integrated and it operates during the burstkey period; the DCO (digital controlled oscillator) generates a subcarrier signal Fsc in phase-lock with the incoming burst signal. The reference signal for the DCO (Fref.) is derived from the crystal oscillator (1679). Different colour frequencies are internally switched by I²C. The hue control rotates the DCO reference phases (H0, H90) from -40 to 40 degrees for NTSC signal via I²C bus.
- PAL/NTSC demodulation: The 0ª & 90ª signals are supplied to the burst demodulator circuits to obtain (B-Y) and (R-Y) respectively. Chroma delay lines used in demodulators are internal.

7.1.5.- RGB processor

- External RGB inputs (pins 46, 47, 48): RGB inputs coming from euroconnector (see diagram C), are AC coupled (C2291/92/93) and converted internally in YUV signals. Then are switched with internal YUV (YUV SWITCH) by fast blanking.
- Fast blanking external (pin 45): 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 R-Y, G-Y and B-Y in the internal MATRIX circuit. Saturation control is received by I²C bus.
- Black stretcher: Internally the luminance signal is connected to the YUV select circuit and via the input clamps it is supplied to the black stretcher. The black stretcher circuit, fully integrated, extends the grey signal level. This extension is dependent upon the difference between actual black level and the darkest part of the incoming video.

RGB adder: RGB signals are obtained in this circuit by adding R-Y, G-Y and B-Y proceeding from matrix and Y proceeding from black stretcher.

- RGB OSD: RGB inputs for OSD and TXT are internally inserted to RGB signals. Fast blanking used is also internal. 45).
- Beam current limiter (pin 49): The beam current limiter circuit functions as an average beam current limiter (BCL) as well as peak white limiter (PWL). Both functions reduce the contrast and brightness of RGB signals.

Contrast reduction begins when Vpin 49 < 3.1V and brightness reduction begins when Vpin 49 < 1.8V.

BCL: Average beam current present at pin8 of 5445 (Diagram D) is feedback to pin 49. When beam current is high, voltage of C2462 is lower, D6462 conducts and Vpin 49 decreases.

PWL: This circuit is an internal detection circuit, which comes into action if the difference between measurement DC level and white level exceeds approximately 2.6V. Then a current of 200µA is internally produced to discharge 2298 and Vpin 49 decreases.

- RGB output circuit (pins 51, 52 and 53): RGB outputs are driven to RGB amplifier (Diagram B).
- Continuous Cathode Calibration (CCC) (pin 50): This circuit is an auto-tuning loop which stabilizes the black level (offset) as well as the cathode drive level (gain) of each gun. Pulses in 3 consecutive lines R, G and B (pins 51, 52, 53) at the end of frame blanking are used on alternating fields, one field for black level, following for cathode drive

level.
Cathode currents of 8mA for black level and 20mA for cathode drive level are stabilized. Cathode current is present at pin5 of IC7200 (Diagram B) and measured on pin 50 (Cut-OFF Info). RGB outputs are adapted to keep cathode currents measured, for example when VG2 voltage is adjusted, DC level of RGB outputs is automatically corrected.
- Warm-up detection circuit (pin 50): At the start up a DC voltage of 2.5V is present in the RGB outputs (pins 51, 52, 53). As soon as beam current is detected on pin 50, 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: The horizontal oscillator starts is commanded by microcontroller. During start up circuit provides a softer operating horizontal output with a higher frequency.
- Hor. sync. separator: Fully integrated sync. separator with a low pass filter, slicing level at 50% of the synchronized pulse amplitude.
- Horizontal Phi 1 detector (pin 17): This circuit locks the internal line frequency reference on the CVBS input signal. It is composed of a phase comparator and an internal VCO of 25MHz (1600*15625). The free running frequency is stabilized using the 12 MHz reference of the X-tal oscillator.
Phi 1 detector filter is made by external components at pin 50. Phi 1 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 34): Line Fly Back input, is obtained by the network R3456/C2408 (Diagram D) and R3371/R3372.
- Sand Castle (pin 34): Sand Castle output obtained at this pin is used only internally. Levels of sandcastle pulse are 5.3V for burst detection, 3V for line blanking and 2V for frame blanking.
- Horizontal Phi 2 detector (pin 16): The flyback position respect line blanking on TRC cathode is controlled by this circuit. Phi 2 detector filter is made by C2305 pin 16. Horiz. shift can be adjusted by I²C (see chapter 8). EHT compensation is made through R3305.
- HOUT (pin 33): Horizontal output is an open collector which one drives the horizontal driver stage (T7440 diagram D).

7.1.7.- Vertical synchro and vertical drive
- Vert. sync. separator: It is an internal integrator to separate frame sync. pulses from CVBS.
- Vertical divider system: The divider system uses a counter that delivers the timing for the vertical ramp generator in the geometry processor. The clock is derived from the horizontal line oscillator. Mode used is automatic 50/60Hz identification with 50Hz priority.
- Vertical sawtooth generator (pin 25, 26): A reference current of 100mA is realized at pin 25 by means of an internal reference voltage (3.9V) and resistor R3341. This 100mA reference current is used to derive a 16mA current to charge C2340 (pin 26) during vertical scan. The charge current can be adjusted with the I²C bus control, (VERT. SHIFT). The external capacitor is discharged during vertical retrace by the vertical divider system.
- Vertical geometry processor: The saw tooth signal that is derived from the sawtooth generator can be controlled by I²C bus. Control adjustments are: S-CORRECT, VERT.SLOPE, VERT.AMP and VERT.SHIFT (See chapter 8).
- Vert. output stage (pins 21, 22): The vertical geometry processor has a differential current output to drive a DC coupled frame deflection (7401).
- EHT compensation (pin 36): A voltage inversely proportional of beam current, proceeding of pin 8 of line transformer (5545 diagram D) is applied to pin 36 to stabilize vertical amplitude from EHT variations.
- Vertical guard input (pin 50): A vertical retrace pulse proceeding from pin 8 of IC7401, is added to cut-off voltage at pin 50 (this pin has 2 separated functions, cut-off function see chapter 7.1.5). If there is not pulse or its level is not correct (should be above 3.65V, 0.8msec.), the set goes to standby mode. (See chapter 7.6.1 Protections).

7.1.8.- Microcontroller/ Teletext
CTR chassis can work with several different microcontroller versions. The numbers that appear at the end of the description of the IC 7015 indicate wich is the software mask version: TDA93xxPS/N2/MMMM.
Versions /0586,/0763,/0776,/0946 and /1052 correspond with the same software used in the previous CTU chassis. New software versions, /1196 and /1227, have now been introduced which make it possible to control a chassis with double scart, adding some new features like format function 16:9, which is accessed through the remote control (and with automatic Scart switching), the Plug & Play start up menu and the External and Sleep-timer keys.

Following there is an explanation of the different functions of the microcontroller indicating pins number assigned:
- Tuning: The different systems available depend on the models in question, these could be Voltage Synthesized Tuning (VST) or Phase-Locked-Loop tuning (PLL).
*** Voltage Synthesized Tuning (pins 4, 11 and pin 8 or 10):** 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 4 of the µC and converted to an adequate level for the tuner using T7605.

While searching, µC are always reading internally AFC (Automatic Frequency Control) and video identification

signals.
When video signal is identified, µC stops searching and do a fine tuning to reach a right AFC value.
- Band switching: There are two outputs for band switching pin 11 for VHFI and pin 8 (one scart chassis) or pin 10 (double scart chassis) for VHFIII. The µC controls the channel band in the tuner by a voltage of +5V at the correspondent output. UHF band is controlled by means of transistor 7601. If the set is in VHF, one of the pins VHFI or VHFIII are high and transistor conducts in such a way the UHF voltage is 0V. If the set is in UHF, pins 8 and 11 are low, transistor is cut and the set is in UHF.

*** PLL Tuning (pins 11 and 8 or 10, depending on the chassis external connectors):** The tuning and band switching are totally controlled through bus I²C, which is based between pins 8 (chassis 1 scart) or 10 (chassis double scart) and 11 of the µC, and pins 4 and 5 of the tuner (1001). Neither the varicap voltage nor the band switching is used. Pin 2 of the selector has an extra voltage of 33V, stabilised by the zener 6602
- Control key (pin 5): Pin 5 is activated by a DC voltage. When control keys are not activated, a voltage of 3V3 is produced by R3618. If one control key is activated, this pin is connected to ground directly or by a resistor R3665, R3667 (Diagram B), decreasing its voltage.
There are 3 voltage levels depending of the key used: 0V for MENU, 1V for P- and 1.9V for P+.
- Mute output (pin 6): This pin is a 3 state output used to control the sound amplifier (see chapter 7.4). States are 0V, open and Vcc (3.3V). In a chassis with new software version it is also used to generate the Standby signal from the source.
- INT/EXT1 input (pin 7): 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 IC switches internally video and audio to external. In both cases the user can switch to internal changing the channel.
If the set includes function 16/9, it will switch to that function directly through INT/EXT (between 4,5 and 7V), although it can also be modified through the remote control.
- INT/EXT2 input (pin 8 in a double scart chassis): the TV can switch to the second euroconnector input through the remote control handset (External key), or alternatively through pin 8 of euroconnector 2 (see diagram C).
- LED (pin 10 in one scart TV sets or pin 8 in double scart TV set): The LED (D6636 or D6663 diagram B) lights up with a low current when the television set is ON and with a high current when the set is in Standby. While the set is receiving a remote control signal, the led is blinking.
- Picture controls (brightness, contrast, colour, sharpness) are processed internally by I²C bus.
- Sound controls: Sound controls are processed internally by I²C bus
- Standby: When the set is switched to stand by, line stops (pin 33). In addition to this, pin 1 with old software masks, pin switch to low level to make Power Supply in burst mode (see stand by 7.5.4). In new software masks, this function is realized through mute control pin.
- OSD outputs: The RGB and fast blanking signals used for On-Screen Display (OSD) and also for TXT are internally inserted to RGB outputs (pins 51, 52, 53).
- Oscillator (pins 58, 59): A 12-MHz oscillator is determined by a 12-MHz crystal (1679) between pins 58 and 59.
- P.O.R (pin 60): Power on reset (POR) is internal, 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 done also by a short circuit between pins 60 and 61.
- RC5 (pin 62): The commands transmitted by the remote control handset are received by infrared receiver (1685 diagram B) and passed to the microcontroller for decoding.
- EEPROM (pins 63 and 64): The microcontroller is connected to non-volatile memory IC7685 (EEPROM) via bus I²C.
The following information is 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**.**

7.1.9.- Supplies and decoupling
- Small signal analog supply (pins 14, 39): The same +8V supply coming from line deflection is connected to pins 14 and 39 for small signal processing. A separated supply (C2036) feeds video and sound traps circuit.
If +8V supply is not present at pin 39 or pin 14 during the first 4 seconds after switch ON the TV set, the microprocessor goes to Standby mode (See chapter 7.6 Protections).
- Digital supply (pins 54, 15): A +3V3 supply is used for digital circuit of TV processor (pin 54). A decoupling capacitor for this supply is present at pin 15 (C2301). Pin 54 is used also to supply the µC.
- Bandgap decoupling (pin 19): The bandgap circuit provides a very stable and temperature independent reference voltage of 4.0 V which one is used specially in the analogue video processor part.
- µC supplies (pins 54, 56, 61): The µC has several +3V3 supplies,
?Pin 54: Analogue supply (Oscillator, ADC).
??Pin 56: Digital supply to µC core.
??Pin 61: Supply to all output ports of the µC.
When the set is in stand by, the µC switch to stand by mode, only 3V3 supplies are present but consumption is reduced.

7.2.- RGB AMPLIFIERS (diagram B)

The RGB signals available at pins 51, 52 and 53 of IC7015 (Diagram A) must be amplified and inverted in order to reach the level required for driving the tube. The integrated circuit IC7200 (TDA6107) is used for this purpose.
RGB inputs (pins 2, 3, 1): These signals are connected to negative inputs of internal operational amplifiers. There is and internal reference voltage of 2.5V for the amplifiers. Negative feedback of amplifiers are internal resistors.
RGB outputs (pins 8, 7, 9): These outputs are applied to the RGB cathodes of the tube. Series resistors (3203, 3216 and 3229) are added for flash-over protection.

- Cathode current feedback (pin 5): Cathode current used in Continuous Cathode Calibration circuit (See 7.1.5) is obtained at this pin and feedback to pins 50 of IC7015 (Diagram A)
- White adjustment: Gain and cut-off point of RGB amplifiers can be adjusted by I²C in the service menu (See chapter 8)
- Anti-spot circuit: When the set is switched off, the capacitor 2208 keeps charged and a negative voltage is put at VG1 of the tube.

7.3.- DEFLECTION (Diagrams A, D)

7.3.1.- Frame deflection (Diagrams A)

Full bridge vertical deflection output performed by the integrated circuit TDA8357J/TDA8359J (7401).
- Frame supplies (pins 3, 6): There are 2 supply voltages, +15V (pin 3) is the main supply and +55V (pin 6) is used to supply the output stage during flyback time.
- Vertical inputs (pins 1, 2): (pins 21, 22): The output currents proceeding from pins 21, 22 of IC7015 are converted to voltages by resistors R3411/12 in such a way that 2 inverted sawtooth are present in the differential inputs of amplifier (pins 1, 2).
- Vertical outputs (pins 4, 7): Vertical output is DC coupled to deflection coil. That means linearity adjustment is not necessary.
- Feedback input (pin 9): A voltage proportional to current deflection is present in R3415/16 and a feedback to pin 9.
HF loop stability is achieved by a damping resistor R3402, wich needs current compensation during flyback pulses, wich is obtaniend through R3413 and D6413.
- Vertical flyback: This signal is internally added to vertical output (pin 7) using supply voltage at pin 6.
- VGUARD circuit (pin 8): This circuit generates a high level during flyback period, and is used to protect the TV set in case of a vertical failure. (See protections, chapter 7.6)

7.3.2.- Line deflection (Diagram D)

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 33).
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):
- Frame supply (+15V):Main frame supply present at capacitor C2455.
- +55V: This supply is found at the 2455 capacitor and is used for frame flyback, to supply line driver (T7440) and for varicap voltage (+33V, D6602 diagram A)
Note: Before the line is started, the driver is supplied by the +13C voltage from the power supply (C2540).
- +8V: This voltage is used for small signal circuits and is present at C2467 capacitor.
- +5V stabilized: An additional voltage of +5V for tuner (1001 diagram A) is obtained from +8V by D6479 and T7479.
- FF: The heather voltage is reduced by R3235/38 and 5235 (Diagram B) to obtain 6.3Veff at the CRT (see CRT table Chap. 10.2).

7.4.- SOUND AMPLIFIER (Diagram C)

Sound amplifier is a Bridge Tied Load (BTL) amplifier including short circuit protection, mute and standby mode.
IC used can be TDA8941P for 14" and 17" models, TDA8943SF for 20" and 21" models. Behaviour is the same for both models.
- Supply (Vcc, SVR): Main supply (Vcc) is taken from +13A of Power Supply (C2540 diagram D). The IC creates internally a half supply, present in SVR pin and decoupled by 10uF capacitor (C2182).
- Sound input (IN+): Amplifiers have differential inputs (IN+,IN-). Audio input is connected to IN+ decoupled by 220nF capacitor (C2181/85) and IN- is decoupled to ground by other 220nF capacitor (C2179). To avoid oscillations there is a 1n5 (C2198/95) capacitor connected between both inputs.
- Mode input (MODE): This input is commanded by mute signal proceeding from the µC (pin 6 of 7015 diagram A) and has three modes depending of the voltage level:
* **Standby mode** (Vmode = Vcc): Consumption is very low (used during stand by).

In this case Vmute=0V, T7657 and T7659 are cut, MODE signal is high
* **Mute mode** (2.5V<Vmode<Vcc): No sound output (used when the set is switched on/off, there is no signal, channel search, change of program, etc.)
In this case pin 6 of 7015 is open T7659 conducts (by resistor divider), T7657 are cut and MODE voltage is 5,5V.
* **Operating mode**: (Vmode<0.5V): Sound output present (normal operation). In this case Vmute=3V3 both transistors conduct, mute signal is low.
- Sound output (OUT+/OUT-): Amplified sound is driven to the loudspeaker.

Headphones output has been connected in such a way that when headphones are connected, loudspeaker is switched off.

7.5.- POWER SUPPLY (Diagram D)

Mains isolated switched mode power supply (SMPS). controlled in variable frequency mode.
IC7514 (KA5Q0565RT) includes control circuit and output MOSFET. Output feedback is done by means of an optocoupler (7515).
- 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 in stand by. Standby is done cutting line deflection and making the supply in burst mode in such a way that power consumption is very low.

7.5.1.- Degaussing and Rectifier

- 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.- Regulation

- Power MOSFET (pin 1): Power stage is done by an internal MOSFET between pin1 and ground. Current is sensed by an internal resistor and limited to 5A peak. (See chapter 7.6.2 Protections)
- Start up and supply (pin 3): When the set is switched on, a current via R3527 and R3528 is applied to pin 3. When C2514 is charged to 15V, the power supply starts and the internal MOSFET conducts. A voltage across transformer windings is built up. The voltage across winding 4-2 is rectified by diodes D6523/25 and used to supply the IC on pin 3.
Voltage of pin3 depends on the output voltage and is about 24V. If Vpin3 is lower than 9V supply stops and if it is higher than 28V, output voltage is limited. (See chapter 7.6.2 Protections)
- Sync (pin 5): A pulse voltage proceeding from winding 4-2 is applied to this pin. A delay is added by means of C2524, R3522 and R3526 to synchronize starts conduction of MOSFET at minimum Vds voltage.
- Secondary feedback (pin 4): Line supply feedback is obtained at pin 4 by divider R3531/34/19, the differential amplifier (IC7533) and the optocoupler (IC7515). Voltage at this pin is about 1.1V
- Output regulation: IC7514 stabilizes output voltage by controlling T-on and so the frequency and the duty cycle.
Output control is done by the following way:
If line output is higher, current input of the differential amplifier (IC7533) is higher (amplifier has a reference voltage of 2.5V).
Current in IC7533 and also in the optocoupler (IC7515) is higher.
Voltage in pin 4 is lower, T-on is internally reduced and output is reduced.
Output voltage of supply can be adjusted by R3518.

7.5.3.- Secondary side

- Line supply: Line supply present at capacitor C2530 should be adjusted to the correct value (depending on the TRC) by means of P3534.
- Sound supply (+13V): This supply is used for sound output amplifier and to feed 3V3 stabilizer.
- µC supply (+3V3): +5V3 is regulated by T7575, D6570 and T7571.

7.5.4.- Stand by

When the set is put in standby, line driver (pin33 of IC7015, diagram A) stops and deflection supply is not loaded. Only a reduced load to supply the µC (+3V3) is necessary.
To reduce more the power consumption, during standby T7572 is cut by STBY signal (pin1 or pin 6 of IC7015, depending on software version, diagram A), then current in IC7533 is increased by means of D6531 and output voltages are reduced.
As a consequence of this, the supply switches to burst mode operation. During working time C2514 is charged till 12V, then supply stops and C2514 is discharged till 11V.

7.6.- PROTECTIONS

If TV does not start or it switches to stand by, try to start again in a few minutes and if problem remains check protection pins explained following.

7.6.1.- Protections in IC7015 (Diagram A)

- Pins 14, 39:

If +8V supply is lower than 6V (pin 39 or pin 14) during the first 4 seconds after switch ON the TV set, the microprocessor goes to Standby mode (See also chapter 7.1.9).

- Pin 50:

If the vertical retrace pulse at this pin is not correct (should be above 3.65V, 0.8msec) during the first 4 seconds after switch ON the TV set, the vertical guard blanks the RGB outputs and the TV switch to Standby (See also chapter 7.1.7).

This protection operates in the following situations:

- When the vertical deflection fails and there is no pulse.
- When the vertical retrace pulse is higher than 0.9msec. (for example vertical amplitude is too high)
- An extra protection is obtained when there is too much current in the CRT (for example +200V supply is missing), because in this case, DC level of pulse is lower by means of cut-off signal. (See fig. 7.6.1)

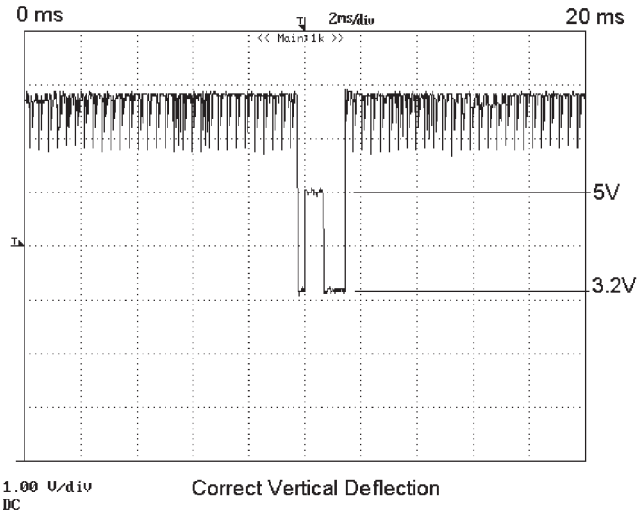


Fig 7.6.1: Pin 50 correct signal

To repair the set more easily, Vguard protection can be disabled, in this case the vertical guard blanks the RGB outputs, but TV does not enter in Standby mode. To disable Vguard, item 8 of Service menu MANUAL C-O should be 01 (See chapter 8.1).

Due to a change in MANUAL C-O is difficult to do if the set switch to Standby, Vguard can be disabled also connecting a diode (1N4148) in series with a 2K2 resistor between pins 10 and 7 of IC7015 (Anode at pin 10). Be careful to disconnect this network after the set is repaired.

7.6.2.- Protections in IC7514 (power supply, diagram D)

- Over-current: Primary current is sensed on pin 1by an internal resistor for the IC. If this current is increased to 3.5A peak, supply works in an intermittent way (ON and OFF). That can be provoked for a short circuit on secondary outputs.
- Lock: If voltage on pin 3 is higher than 28V, over voltage protection limits output voltage. If voltage on pin 3 is lower than 9V the under voltage protection stops the supply. This will not start again until the TV set will remain about 5 minutes switched off in order to allow C2514 discharging.

7.7.- SETS WITH SECAM L/L' SYSTEMS

Multistandard TV is achieved by means of small changes in CTR-AA chassis:

- To decoder SECAM signals, small signal IC(7015 diagram A) is changed toTDA9351 for TXT models and toTDA9381 for no Teletext.
- To have specific software for multi standard, SYS OPTIONS Item of Service Menu should be adjusted at 04.
- For AM sound (standard L/L'), an extra circuit based onTDA9830 (7125 diagram B) is added.

7.7.1.- IF detection (IC 7015, diagram A)

- The UOC has an alignment free IF-PLL demodulator. SECAM-L' signals only occur in VHF band I and have their picture and sound carrier interchanged, compared to SECAM-L and PAL-B/G channels. For SECAM-L' the IF

picture carrier is situated at 33.4 MHz and the AM-sound carrier at 39.9 MHz. The IF frequency is automatically switched to the right frequency by the microcontroller. (33.40 MHz for SECAM-L' in France and 38.90 for Europe).
- The Saw Filter (1015) is changed to a double Nyquist slope filter (K2962).One slope at 38.9 MHz is used for PAL-B/G and SECAM-L and the other at 33.4 MHz is used for SECAM-L'.
- The Tuner AGC time constant should be slower than for negative modulation, because the IC7015 reduces AGC current, so AGC capacitor 2017 is bigger and an extra series resistor 3020 is necessary. To prevent IF over load when jumping to a very strong transmitter (search-tuning), a diode 6020 is placed in parallel.

7.7.2.- Sound processor (IC 7125, diagram B)
AM demodulation: In Multi standard sets, also AM demodulation for LL' systems is necessary. AM sound is extracted directly from the tuner instead of from base band video.
- AM input (pins 1, 16): IF signal containing AM signal at 32,4 MHz for L system or 39,9 MHz for L', is applied to pin 1 of a double SAW filter (1137). Filter is switched between this two frequencies depending on the system at pin 2 by transistor T7103.
-AGC(pin3): C2109 is AGC related storage capacitor.
-AM Sound output (pin 6, 7, 8): The demodulated signal is present at pin 6 of IC 7125, goes to pin 7 across C2126, and goes out from pin 8.

- AM /FM (mono sets) switching :
* For L/L' systems, AM sound goes through 7106 to the pin 28 of Ic 7015. In this case, the FM sound from IC 7015 is muted.
* For BG systems, FM demodulation is made using the IC 7015 (seer chapt. 7.1.2). In this IC the AM sound is supressed with a mute signal on pin 12 of the IC 7125, that is obtanied from the C with the BG/L signal. This signal also cuts the 7102 transistor to avoid the load of the input pin 28 of the IC 7015.

7.7.3.- Chroma processing (IC7015)
This circuit is an internal (no pins associated) automatic decoder for Pal and Secam systems commanded by I²C bus.

7.8.- STEREO SETS

The CTR Stereo chassis is based on the TDA9875A chip for NICAM systems (digital stereo) and A2 (analog stereo), and on the TDA9870A chip for only A2 (or Zweiton) systems. This is a single-chip Digital TV Sound Processor for TV sets. In the stereo chassis the sound part in the IC7015 is disabled. All sound signals, analog (Stereo and MONO) and digital (Nicam) are processed in IC7101 (TDA9875A). BG and DK standards use NICAM and A2 sound system, and L and I standard only use NICAM.

7.8.1.- Sound IF (IC 7701 diagram E)
- SIF input (pin 12): SIF signal is filtered from video signal coming from pin 38 of IC7015 (Diagram A) by a passband 5.5MHz to 6.5Mhz filter (C2740/41/42 and L5741).
- AGC, ADC: SIF is passed through an AGC circuit and then digitized by an 8-bit ADC operating at 24.576 MHz. The gain of the AGC amplifier is controlled from the ADC output. Then signal is separated in 2 ways, one for FM and other for NICAM.
- NICAM demodulation: NICAM signal is transmitted in a DQPSK code at a bit rate of 728 Kbit/s. NICAM demodulator performs DQPSK demodulation and feeds the resulting bitstream and clock signal onto the NICAM decoder. A timing loop controls the frequency of the crystal oscillator to lock the sampling rate to NICAM decoder: The device performs all decoding functions in accordance with the “EBU NICAM 728 specification”.
- FM demodulation: FM signal is fed via a band-limiting filter to a demodulator. If signal is stereo A2, decoder recovers the left and right signal channels from the demodulated sound carriers. A stereo identification signal is sent to the µC. If the signal is FM mono, the IC 7701 demodulates the signal too.
- Oscillator (pins 18, 19): The circuitry of the crystal oscillator is fully integrated, only an external 24.576 MHz crystal is needed.

7.8.2.- Controls (IC 7701 diagram E)
- Control bus (pins 4, 5): Stereo is fully controlled for the µC of IC7015 (Diagram A) via I²C bus (pins 2 and 3 from IC7015). Status information present in internal registers of IC7101 is read by µC to determine whether any action is required. Control is exercised by the µC also, writing in other internal registers of IC7101.
- Audio processing: After demodulation, digital signal is selected (FM, A2 or NICAM) and processed according µC control.
Following functions are provided: Forced mono, stereo, channel swap (between channel 1 and 2 with dual signals), spatial effects (pseudo stereo and spatial), Automatic Volume Level (AVL), volume, balance, bass and treble.

7.8.3.- Audio Outputs (IC 7701 diagram E)
- DACs (pins 54, 55): Then signals are transformed to analog by DACs and sent to the outputs. Post filter capacitors

for DACs are at pins 54 and 55.
- Sound outputs (pins 60, 61): After a volume control (by I²C), sound outputs (MAIN R and MAIN L) are driven to the inputs IN+ (pins 12 and 6) of the final sound amplifier IC7187C (Diagram C).
- Headphone outputs (pins 57, 58): Headphone outputs are driven by followed emitters 7780 and 7781 to the headphones. These outputs are independent of loudspeakers outputs and controls are separated.

7.8.4- Sound Amplifier (IC187C diagram C)
The IC used in stereo models could be either TDA8944J (4+4W) or TDA8946J (5+5W). It's a double amplifier, that means 2 supplies, 2 inputs and 2 outputs.
- It has very similar characteristics to TDA8941 and TDA8943, being different in that it includes two amplifiers. The modes available are the same as those in IC TDA8941 and TDA8943 (see chapt. 7.4).
- Right channel input (IN2+, IN2-): The right side input is connected to IN2+ through a 220 nF (C2181) capacitor, while the IN2- input is decoupled from earth by another 220 nF (C2179) capacitor. To prevent oscillations a 1n5 (C2198) capacitor is introduced between the inputs.
- Left channel input (IN1+, IN1-): The left side input is connected to IN1+ through C2184 (220nF), while the IN1- input is decoupled from earth through C2193 (220nF). To prevent oscillation a C2183 (1n5) is used between the inputs.
- Sound outputs (OUT1+/-, OUT2+/-): The amplified sound is directed to the attached loudspeakers.

7.8.5.- IC 7701 Supplies
- +5V stabilizer: +5V supply for stereo processor is obtained from +12V (C2454 diagram D) by D6702 and 7478. This voltage comes to supply voltages of IC1701 (pins 59, 15, 64)
- Digital supplies (pins 15, 64): +5V supplies at pins 15 and 64 are used for digital circuits of stereo processor.
Power ON reset (pin 16): When the set starts, C2754 is slow charged by an internal 50K resistor to +5V. When digital supplies are present and oscillator is working, reset is done if pin 16 is low (Vpin16<1.5 V).
- Analog supply voltage (pin 53, 59): There is a +5V supply for analog outputs (DACs and operational amplifiers) at pin 59. A 50% reference voltage (2.5V) for these circuits is present at pin 53.
- ADC supply voltage (pins 38, 39, 40 and 46): A 3.3V supply voltage is obtained internally and decoupled on pin 38 by C2758. Positive and negative reference voltage for ADC is present at pins 39 and 40. A 50% reference voltage (1.65V) for ADC is present at pin 46.
- Front-end supply (pins 7, 8, 11): A separated 3.3V supply voltage (decoupled on pin 7 by C2750) is necessary for IF demodulator. By means of a 200mA current generator at pin 8, a 2V reference voltage is produced at pin 7.

7.8.6.- External connections (Euroconnectors and the AV input)
Stereo sets are equipped with 2 euroconnectors and one Audio Video input per RCA connector. Euroconnector 1 has video (CVBS), audio and RGB inputs, while euroconnector 2 has video, audio and SVHS (CHROMA). The euroconnector 1 input is always an internal signal (RF), while euroconnector 2 can be switched between internal and the euroconnector 1 input (copy function).

The video switching goes through IC 7801 (TDA4053B), the SVHS and RGB switches in IC 7015 and the audio switches in the stereo IC 7701. The control signals are activated through micro-controller (7015). In the event that 7701 should intervene, it will be controlled by 7015, by means of bus I²C.
- Video inputs: The 3 inputs coming from the euroconnectors and the audio jack go to IC 7801. The SWB control signal comes from pin1 of IC7015, while the SWA signal comes from pin 20 of IC7701 and is controlled by bus I²C. The µC controls the switching according to which external input is selected (Ext1, Ext2, AV through SWB signal) and which euroconnector 2 output is selected through the user menu (through SWA signal).
- External audio input: External audio (R and L) proceeding of pins 6 and 2 of euroconnector 1 (Diagram C) is applied to pins 33 and 34 of IC7101 and digitalized by an ACD circuit. Audio Inputs from Euroconnector 2 goes to pins 36 and 37. Pins 31 and 32 have the audio input coming from lateral AV connector. Selection between internal or external is done from the µC (IC7015) by I²C bus (see INT/EXT, chapter 7.1.8).
- External audio outputs: Signal at pins 47, 48 are driven directly to the euroconnector 1 sound outputs (see Diagram C). Pins 51 and 52 are the euroconnector 2 audio outputs.

7.8.7.- Multi Stereo TV Set (SECAM L/L')
- FM and stereo demodulation is done by IC 7701. AM is done by IC7125.
- The AM sound output of the IC 7125 is applied to pin 29 of IC 7701, the internal switching being automatic depending on whether we select the demodulation of the AM sound or the demodulation of the NICAM carrier. Then BG/L signal and transistors T7106/7102 are not necessary.
- The control signal for L/L systems comes from pin 9 of IC 7701.

8.- ELECTRICAL ADJUSTMENTS

8.1.- SERVICE MODE

The signal processor IC7015 is fully controlled by I²C, so that the most of adjustments of the set can be made by service menu.
- Enter in Service mode:
- Select program 75 and press at the same time OSD key (+) on RC and MENU key on local key board during 4 seconds.
Service mode is indicated by an S symbol on the down left corner of the screen.
Note: Controls (volume, contrast, brightness and saturation) will be pre-adjusted to the mid position.
- 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):

PARAMETER Nº	ITEM Description	Value Hex
1	ADJUST VG2	PRG
2	CATH.DRIVE	0C
3	TXT V-SHIFT	02
4	TXT H-SHIFT	02
5	V-GUARD DISA	PRG
6	AGC START	25
7	OSD LEVEL	02
8	MANUAL C-O	01
9	R CUT-OFF	20
10	G CUT-OFF	20
11	BRIGHTNESS	PP
12	CONTRAST	PP
13	R GAIN	20
14	G GAIN	20

PARAMETER		ITEM	Value
Nº (*)	Nº	Description	Hex
15	15	B GAIN	20
16	16	S-CORRECT	20
17	17	VERT.SLOPE	20
18	18	HOR.SHIFT	20
19	19	VERT.AMP	20
20	20	VERT.SHIFT	20
--	21	16:9 ENABLED	01
--	22	16:9 RATIO	08
--	23	SECOND SCART	00
--	24	A/V CONNECTOR	00
21	25	SYS OPTIONS	00
22	26	MENU OPTIONS	00
23	27	RESERVED	-
24	28	READ STATUS	PRG

Table 8.1. Service menu. Settings are hexadecimal values
Note: Column Nº (*) refers to micros with these guards: /0763 /0776 /0946 y /1052

- 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 an item is selected, using V+, V- keys of remote control it can be adjusted. Items V-GUARD DISA, RESERVED and READ STATUS have fixed values = pre setting values, rest of items see 8.2 to 8.6.
- 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

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 R3534 for a required voltage depending on the model and the TRC used (see CRT table, Chap. 10.2)
- Focusing
Adjust with the potentiometer placed on the line output transformer.

8.3.- 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.

8.4.- WHITE D

8.4.1.- 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)

8.4.2.- Grid 2

- Connect a white pattern generator.
- Adjust contrast at 00 and brightness at 36. (00 and 24 in the service menu because hexadecimal values are used)
- Put parameter 1 of the service menu ADJUST VG2 = 1. An arrow will be displayed on the left upper corner.
- Adjust VG2 potentiometer (in line transformer) till the arrow will be transformed to a square.
- In a few seconds, arrow will disappear and ADJUST VG2 parameter will be come back to 00.

8.4.3.- 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 and 15).

8.5.- GEOMETRY

- Connect a circle pattern generator with the controls at nominal conditions and enter to service menu.
Adjust to have picture centred in vertical position by service menu item 16.
- 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.
Adjustments only if necessary:
- TXT Shift:
Vertical and horizontal shift of OSD or TXT can be adjusted by items 3 and 4 of service menu.
- Vertical slope:
When item 17 is selected, only upper part of the screen can be seen. Vertical slope is adjusted when centre line of the pattern is just visible.
- Vertical S correction:
S correction can be adjusted by item 20 of service menu.

8.6.- OPTIONS

8.6.1.- System options

The chassis system is described in option SYS OPTIONS of the service menu, and the following alternatives are possible:

VALUE	TDA93x1 - MULTI	TDA93x0 - NOT MULTI
00H	PALBG	PALBG
01H	PALI	PALI
02H	PALSECAM BG	PALBG - I
03H	PALSECAM BG - DK	PALBG - DK
04H	PALSECAM BG - L - LP	
05H	PALSECAM BG - I - L - LP	
06H	PALSECAM BG - I - DK - L - LP	

Table 8.2: SYSTEM OPTIONS Adjust

8.6.2.- Menu Options
The various types of menus are described in MENU OPTIONS, and these include the following alternatives:

MENU OPTIONS	VALUE	MONO	STEREO
Menu	00H	X	X
Bars	01H	X	
Basic Bars (NO Scart)	02H	X	
Stereo Menu with double Scart	03H		X
Menu only UHF	04H	X	X
Bars only UHF	05H	X	
Basic Bars only UHF (NO Scart)	06H	X	
Stereo Menu with double Scart only UHF	07H		X

Table 8.3: MENU OPTIONS Adjust

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: S01M00 means: SYS OPTIONS = 01 (Pal I)
MENU OPTIONS = 00 (16 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.

If the microcontroller detects an incompatible option setting with the chassis configuration, it changes them automatically. This case is only detected first time that the TV set is switch on, and an error message E7 is displayed (see cap. 8.7). Options should be checked according to the identification label.

8.6.3.- Option 16:9 and adjustment of screen format 16:9 (only micros with software mask /1196 and /1227)
- Adjust parameter 21 (16:9 ENABLED) in order to activate/deactivate format option 16:9. By adjusting parameter 22 (16:9 RATIO), we modify format ratio 16:9.

16:9 ENABLED	VALUE
Button 16:- not respond. Not scart levels	00H
Button 16:9 functioning and Scart levels	01H

Table 8.4: 16:9 ENABLED adjust

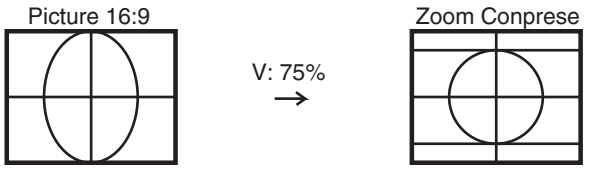


Fig.8.1: Format 16:9 ratio adjust

8.6.4.- Optional connectors (stereo TV sets)
Parameters 23 and 24 of the service menu allow us to configure external connections to the chassis, depending on whether we have double euroconnectors (PAR. 23 = 01) and a lateral AV connection (PAR. 24 = 01).

8.7.- PLUG & PLAY

To exit Plug&Play:

1.- Select your language and press the Menu key (or Install).
2.- Press right arrow key to start tuning
3.- Cancel by pressing Menu key (or Install)
4.- Press Menu key (or Install) to exit the Sort Programs Menu

To enter Plug&Play:

1.- Press the Local Menu key and the Install key of your remote control continuously for 4 seconds.

8.8.- ERROR MESSAGES

The microcomputer also detects errors in circuits connected to the I²C (Inter IC) bus. These error messages are communicated via OSD (On Screen Display):

Error message	Error description	Component
E1	New EEprom memory	Adjust needed
E2	EEprom communication error	IC 7685
E3	µC internal error (RA M)	IC 7015
E4	Internal bus communication	IC 7015
E5	SDA2/ SCL2 bus wrong communication	IC 7701 (stereo)
No sound menu	SDA2/ SCL2 bus no communication	IC 7701 (stereo)
E6	EEprom data error	IC 7685
E7	Not allowed options * (see 8.6)	Item 21 y 22 service menu
E8	Vertical guard protection	Pin 50, IC 7015

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 ith 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.

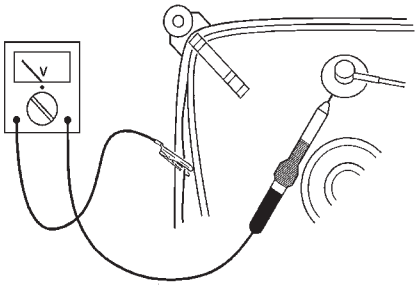


FIG. 9

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. Replacement parts list CTR-AA CHASSIS

10.1 Electrical

MISCELLANEOUS					
DIAG	POS	PART NUMBER	DESCRIPTION	ESPEC	SAF
B	23	313010060681	CON CRT SOCKET 14"/17" MINI CTS	14"	⚠
B	23	313010010131	CON CRT SOCKET 20/21" NARROW	21"/21"RF/21"PRF *	⚠
C	42	313010060151	CON HEADPHONES		
C	43	313D10020351	CON EUROCONN. DOBLE BLACK	2 SCART	
D	160	312807801731	EHT CABLE 14"	14"	⚠
D	160	313010867600	EHT CABLE 20/21"	21"/21"RF/21"PRF *	⚠
A	1001	313914712951	TUNER UV1315AS/I-2	HYPER VST	
A	1015	242A54941518	SAW FILTER G1961/75M	BG MONO	
A	1015	242A54941482	SAW FILTER G1952M	PAL I MONO	
A	1015	313010080480	SAW FILTER K2955M	PAL SECAM BGDK Mono	
A	1015	313010070620	SAW FILTER K2962M	MULTI Mono/Stereo	
A	1015	242254941492	SAW FILTER J1981M	PAL I Stereo	
A	1015	242254941502	SAW FILTER G1984M	PAL BG Stereo	
A	1032	242254940095	CER TRAP 5,5 MHZ	BG	
A	1033	242254903572	CER TRAP 6,0 MHZ	PAL I	
A	1033	242254903595	CER TRAP 6,5 MHZ	SECAM BG/DK	
B	1101	313010080490	SAW FILTER K9650M	MULTI	
D	1500	313010080430	FUS CRIST T 2.5A H 250V 5X20		⚠
D	1540	242208610417	FUS IAC 630MA	MONO 14"	⚠
D	1540	313010080072	FUS IAC 1A	MONO/BIFO 21"	⚠
D	1540	425016313493	FUS IAC 2.5A	STEREO	⚠
A	1679	313010080076	CER CRYSTAL 12 MHZ		
B	1685	313010070044	IR RECEIV. TSOP1836SS3V		
E	1750	313010080076	XTL 24.576 MHZ	STEREO	

CAPACITORS					
DIAG	POS	PART NUMBER	DESCRIPTION	ESPEC	SAF
D	2445	202055890333	CAP CERPL 220P 1KV	SEE CRT TABLE (Page 28)	⚠
D	2445	202055890335	CAP CERPL 470P 1KV	SEE CRT TABLE (Page 28)	⚠
D	2445	423V22024102	CAP CERPL 1N 2KV	SEE CRT TABLE (Page 28)	⚠
D	2446	424E01628682	CAP POL 6N8 1KV6 PM3.5	SEE CRT TABLE (Page 28)	⚠
D	2446	424E01628752	CAP POL 7N5 1KV6 PM3.5	SEE CRT TABLE (Page 28)	⚠
D	2446	424S01623192	CAP POL 9N1 1KV6 PM3.5	SEE CRT TABLE (Page 28)	⚠
D	2446	313S10080340	CAP POL 8N2 1KV6 PM3.5	SEE CRT TABLE (Page 28)	⚠
D	2450	313010080046	CAP POLIP 330N 250V 5%	SEE CRT TABLE (Page 28)	⚠
D	2450	313010080055	CAP POLIP 470N 250V 5%	SEE CRT TABLE (Page 28)	⚠
D	2450	424V12513394	CAP POLIP 390N 250V 5%	SEE CRT TABLE (Page 28)	⚠
D	2450	424E02513224	CAP POLIP 220N 250V 5%	SEE CRT TABLE (Page 28)	⚠
D	2450	424E02513274	CAP POL 270N 250V 5%	SEE CRT TABLE (Page 28)	⚠
D	2500	313010080071	CAP MKTX2 470N 275V A.C.		⚠
D	2502	202055890282	CAP CERPL 2N2 1KV (MURATA)		⚠
D	2504	202055890282	CAP CERPL 2N2 1KV (MURATA)		⚠
D	2505	222205758689	CAP ELECTR 68U 385V PM20		⚠
D	2506	313010080068	CAP CER Y2 3N3 250VAC PM20		⚠
D	2510	202055890337	CAP CERPL 1N 1KV (MURATA)		⚠

COILS AND TRANFORMERS					
DIAG	POS	PART NUMBER	DESCRIPTION	ESPEC	SAF
D	5441	311233830882	LINE DRIVER TRAFO U10 3		⚠
D	5445	313010831160	IND LINE TRAFO LOT 14" CTR	14"	⚠
D	5445	313P10831130	IND LINE TRAFO LOT 21" CTR	21"/ 21" PRF *	⚠
D	5445	313010831140	IND LINE TRAFO LOT 21" CTR RFLAT	21" RF *	⚠
D	5480	313E10831150	IND LINEAR 98UH HXC	21" RF *	⚠
D	5480	312813831292	IND LINEAR DC-12	21"/ 21" PRF *	⚠
D	5500	313Z13857332	MAINS FILTER 21"	21"/21"RF/21"PRF *	⚠
D	5500	311110835001	MAINS FILTER 14"	14"	⚠
D	5525	313K10831112	IND SOPS TRAFO CTR 14" 20"	MONO	⚠
D	5525	313010831102	IND SOPS TRAFO CTR STEREO 4W	STEREO 4W+4W	⚠
D	5525	313010831122	IND SOPS TRAFO CTR STEREO 5W	STEREO 5W+5W	⚠

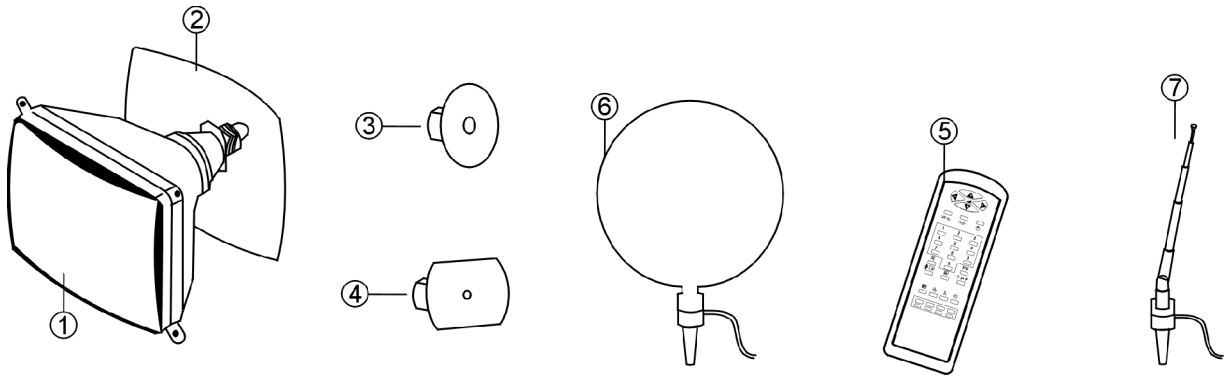
RESISTORS					
DIAG	POS	PART NUMBER	DESCRIPTION	ESPEC	SAF
A	3030	230620403108	RES NFR25 1R 1/3W PM5		⚠
C	3189	230620703108	RES NFR25H 1R 1/2W PM5		⚠
C	3190	230620703108	RES NFR25H 1R 1/2W PM5	STEREO	⚠
B	3203	212010308152	RES CARNCO 1K5 1/2W (KAMAYA)		⚠
B	3205	230620703519	RES NFR25H 51H 1/2W PM5		⚠
B	3216	212010308152	RES CARNCO 1K5 1/2W (KAMAYA)		⚠
B	3226	212010308152	RES CARNCO 1K5 1/2W (KAMAYA)		⚠
B	3229	212010308152	RES CARNCO 1K5 1/2W (KAMAYA)		⚠
D	3235	230620403108	RES NFR25 1R 1/3W PM5	SEE CRT TABLE (Page 28)	⚠
D	3235	230620703519	RES NFR25 2R 1/2W PM5	SEE CRT TABLE (Page 28)	⚠
B	3236	212010308152	RES CARNCO 1K5 1/2W (KAMAYA)		⚠
D	3238	230620403108	RES NFR25 1R 1/3W PM5	SEE CRT TABLE (Page 28)	⚠
D	3238	230620703208	RES NFR25H 2R 1/2W PM5	SEE CRT TABLE (Page 28)	⚠
D	3449	230620703108	RES NFR25H 1R 1/2W PM5		⚠
D	3450	230620703108	RES NFR25H 1R 1/2W PM5		⚠
D	3452	230620403339	RES NFR25H 33R 1/3W PM5	14"	⚠
D	3452	230620703108	RES NFR25H 1R 1/2W PM5	21"/21"RF/21"PRF *	⚠
D	3457	232K19353109	RES MET OXID 10R 1W PM5	21"/21"RF/21"PRF *	⚠
D	3457	232K19353479	RES MET. OXID. 47R 1W PM5	14/17"	⚠
D	3470	230620403478	RES NFR25 4R7 1/3W PM5		⚠
D	3501	232266296626	RES PTC 18R 270V 2K	3501+9508	⚠
D	3501	404H55550189	RES PTC SIMPLE 18R 270V 2K	3501+9509	⚠
D	3504	232224213106	RES VR37 10M 1/2W PM5		⚠
D	3525	230620403109	RES NFR25 10R 1/3W PM5		⚠
D	3530	232219533478	RES PR03 4R7 3W		⚠

SEMICONDUCTORS					
DIAG	POS	PART NUMBER	DESCRIPTION	ESPEC	SAF
D	6447	313010070900	DIO RGP15-M	14"	
D	6447	933Z00120113	DIO BY448	21"/21"RF/21"PRF *	
D	6449	313010070410	DIO BYT42M	NO STEREO	
D	6449	933500180153	DIO BYW32	STEREO	
D	6450	313010070410	DIO BYT42M	NO STEREO	
D	6530	313V10070640	DIO BYW36		
D	6540	313010070410	DIO BYT42M	NO STEREO	
D	6541	933500180143	DIO BYV98-200 RASTER 12,5X7	STEREO	
A	6602	933676010673	DIO HZT33		
B	6663	313010070023	LED B4-B4534 ROJO		⚠
A	7015	935272287112	IC TDA9350	PAL TXT	
A	7015	935271364112	IC TDA9351	MULTI TXT	
A	7015	935272830112	IC TDA9370	PAL NO TXT	
A	7015	935273928111	IC TDA9350 NEW SOFT	PAL TXT NEWSOFT	
A	7015	935273699112	IC TDA9351 NEW SOFT	MULTI TXT NEWSOFT	
E	7101	935261494112	IC TDA9870A/V2	STEREO A2	
E	7101	935261354112	IC TDA9875A/2	STEREO NICAM/A2	
C	7187	935262851112	IC TDA8941P/N1	MONO 14/17"	
C	7187	935262854112	IC TDA8943SF/N1	MONO 21"	
C	7187	935262855112	ID TDA8944J/N1	STEREO 5W+5W	
C	7187	935262857112	ID TDA8946J	STEREO 6W+6W	
A	7401	935270164112	IC TDA8359J/N2	21"/21"RF/21"PRF *	
A	7401	935267290112	IC TDA8357J/N2	14"	
D	7445	933760560127	TRA BUT 11AF	14"	
D	7445	934056321127	TRA BUT 11APX-1200	21"/21"RF/21"PRF *	⚠
D	7514	313010070740	IC KA5Q0565RT		⚠
A	7605	933828890215	TRA SMD PMBT2369		
A	7685	932A06715712	IC ST24C04D EEPROM		
A	7801	933372960653	IC SMD HEF4053BT	2 SCART	

CAP CER	CERAMIS CAPACITOR
CAP ELECTR	ELECTROLYTIC CAPACITOR
CAP MKTX2	INTERFERENCE SUPRESSION CAPACITOR X2
CAP POL	POLYESTER CAPACITOR
RES CARNCO	COMPOS. CARBON RESISTOR
RES NFR25 1/3W	FUS RESISTOR 1/3W
RES NFR25H 1/2W	FUS RESISTOR 1/2W
RES PR02 2W	POWER METAL FILM RESISTOR 2W
RES VR37	HIGH VOLTAGE RESISTOR

3502 NEW COMPONENTS RESPECT TO CTU CHASSIS

* 21"RF AND 21"PRF CORRESPOND TO AESTHETICS 21" WITH FLAT PICTURE TUBE. TO IDENTIFY THE CATEGORY OF A TV SET, YOU HAVE TO CONSULT THE CRT TYPE IN THE CRT TABLE (10.2 PAGE 28).



PRECAUTIONS TO BE TAKEN IN CASE OF CHANGING CPT OR CHASSIS

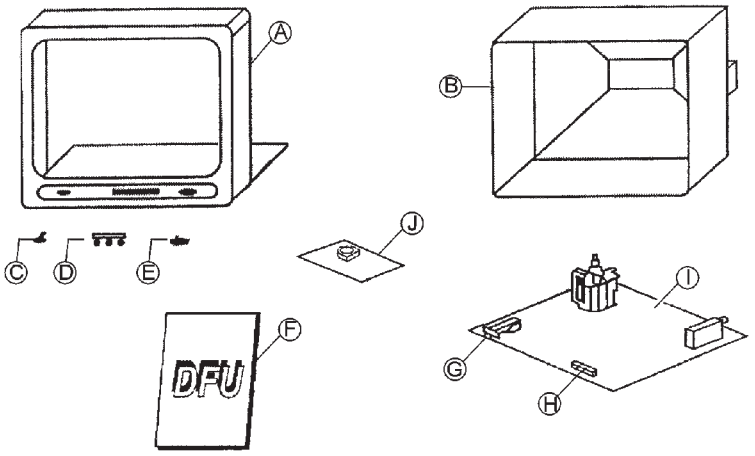
POS 1: CATHODE PICTURE TUBE (CPT) AND ASSOCIATED COMPONENTS:			SAFETY ⚠						
	DESCRIPTION	CODE	2445	2446	2450	3235//3238	3415	VCC	23*
14"	A34 CRT	14" GAMA	8230 090 09280	----	8N2	470N	1R// --	5R6	101.5	Mini
	A33EKC02X013	14" EKRANAS	3130 100 60032	----	8N2	390N	1R// 1R	5R6	101.5	Narrow
21"	A51EAL155X11	21" PHILIPS	8230 090 09290	220 pF	9N1	470N	2R//--	3R6	104.5	
	A51EER131X81 A51EER133X81	21" SAMSUNG	8230 210 64050 823A 210 64050	220 pF	8N2	470N	2R//1R	3R3	104.5	
	A51EFS83X191 A51EFS13X092	21 THOMSON	8230 090 09450 3130 100 60881	470pF	8N2	330N	2R//1R	3R6	106	
	A51QAE320X48P	21" LG	3130 100 60841	470 pF	8N2	390N	2R//--	3R3	104.5	
	A51EJJ01X01	21" EKRANAS	8230 210 69001	470 pF	8N2	330N	1R//1R	3R6	109.5	
	A51EKE01X01		8230 210 69041				1R//--		109.5	
	A51KQQ 30XA A51KQQ 30XO	21" SAMTEL	8230 210 69041 8230 210 69051	---- 470pF	9N1 8n2	330N	2R//1R	3R6	109.5 107	
21" RF **	A51ERF135X80	21"RF PHILIPS	3130 100 60891	1N	6N8	270N	2R//---	3R6	121.5	
	A51ELD032X001	21"RF THOMSON	3130 100 60901	---	7N5	220N	2R//1R	3R6	123.5	
21" PRF **	A51QDX993X032	21"PRF SAMSUNG	3130 100 60981	---	7N5	220N	2R//4R7	5R6	105	

* IF A MININECK TUBE HAVE TO BE REPLACED BY A NARROWNECK TUBE (OR CONTRARIWISE), THE FOLLOWING CHANGES HAVE TO BE MADE:

CRT SOCKET (POS 23) HAS TO BE CHANGED
RED & GREEN SIGNALS HAVE TO BE EXCHANGED (SWAP CABLES 2 AND 3 POS 155/L2)

** 21"RF AND 21"PRF CORRESPOND TO AESTHETICS 21" WITH FLAT PICTURE TUBE.
TO IDENTIFY THE CATEGORY OF A TV SET, YOU HAVE TO CONSULT THE CRT TYPE IN THE TABLE.
21" RF AND 21"PRF ARE NOT COMPATIBLE AMONG THEMSELVES.

POS.	DESCRIPTION	CODE	SAFETY
2	DEGAUSSING COIL 14”	313E 108 21641	⚠
2	DEGAUSSING COIL 21”	313E 108 67781	⚠
3	LOUDSPEAKER 3” 1.5W 25 OHMS TV 14” MONO	3130 100 60191	
4	LOUDSPEAKER 50x90 3W 16 OHMS TV20/21 MONO	3130 100 20401	
4	LOUDSPEAKER 50x90 3W 8 OHMS TV20/21 MONO	3130 100 60301	
4	LOUDSPEAKER 58x126 6W 16 OHMS STEREO	3130 100 60931	
5	REMOTE CONTROL MENU TXT	3130 108 21431	
5	REMOTE CONTROL MENU NO TXT	3130 108 21441	
5	REMOTE CONTROL RF25 STEREO	313W 108 21711	
5	REMOTE CONTROL BARS NO TXT	3130 108 21481	
6	LOOP AERIAL	3130 100 20482	
7	ROOD AERIAL ANLY FOR EIRE	3130 100 20361	



POS.	DESCRIPTION	SAFETY
A	FRONT CABINET	⚠
B	BACKCOVER	⚠
C	MAINS KNOB	⚠
D	KNOB ASSEMBLY	
E	SENSOR COVER	⚠
F	OWNER'S MANUAL	
G	MAINS SWITCH	⚠
H	MICRO SWITCH	
I	MAIN CHASSIS	⚠
J	CPT PANEL	⚠

POSITION	*	SCREEN	*	TV MODEL	*	COLOUR

NG-BLCK
BL-WHITE
GR-GREY
MA-IVORY
GO-DARK GREY
VE-GREEN
RS-PINK
RJ-RED
AZ-BLUE

HOW TO ORDER

EXAMPLE: FRONT CABINET OF TV700TX COLOUR BLUE: ***A * 14 * TV700TX * AZ***