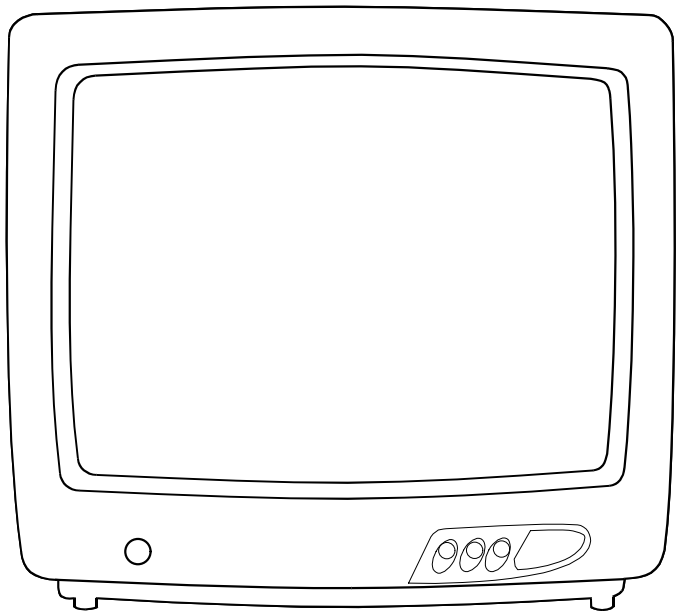
SERVICE MANUAL

Manual Number: 668200



MATSUI 1410R/1410T/2010R

TV

Version 1.1

This Manual is available in Electronic format.

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MATSUI 1410R/1410T/2010R

TV

SERVICE MANUAL

Specifications are subject to change without notice.

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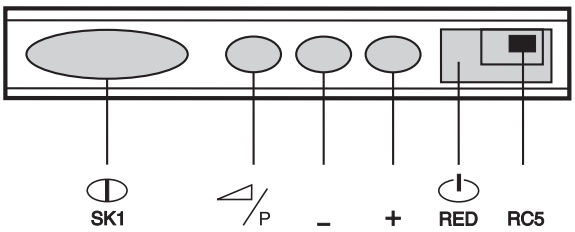
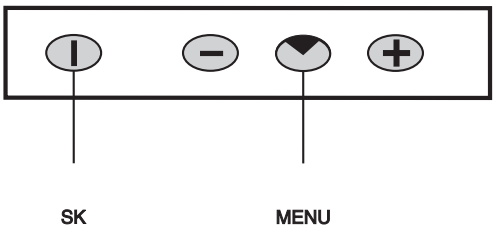
Contents

Technical specifications

CHASSIS CTN

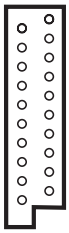
Mains voltage	: 220 - 240 V ± 10% AC; 50 Hz (±5%)
Power cons. at 220V~	: 35 W (stand-by 6W)
Aerial input impedance	: 75Ohms - coax
Min. aerial input VHF	: 30:V
Min. aerial input UHF	: 40:V
Max. aerial input VHF/UHF	: 180mV
Pull-in range colour sync.	: ± 300 Hz
Pull-in range horizontal sync.	: ± 600 Hz
Pull-in range vertical sync.	: ± 5 Hz
Picture tube range	: 14"
	: Mono 4" round full range 25W 1W.
TV Systems	: PAL BG : PAL I : PAL BG / SECAM BGDK : PAL BGI / SECAM BGLL'
Indications	: On screen display (OSD) green and menu : 1 LED (red in ON and blinking red in stand-by)
VCR programs	: 0 to 79
Tuning and operating system	: VST
UV1315AS / IEC (VST)	: VHFa: 48 - 102 MHz : VHFb: 138 - 224 MHz : UHF: 470 - 861 MHz
U1343AS / IEC (VST)	: UHF: 470 - 861 MHz
Local operating functions	: Vol/Prog, +, -, contrast, colour and brightness.





2. Connection facilities

Euroconector:



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

Head phone:

8 - 600S /60mW 3,5mm ø.

Mechanical instructions

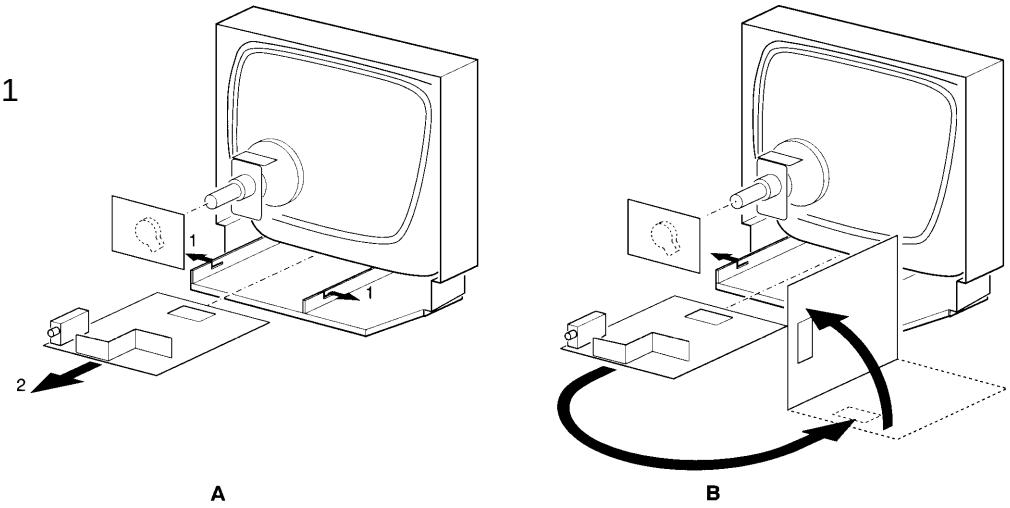
For the main carrier two service positions are possible (3.1).

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

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

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

Fig. 3.1



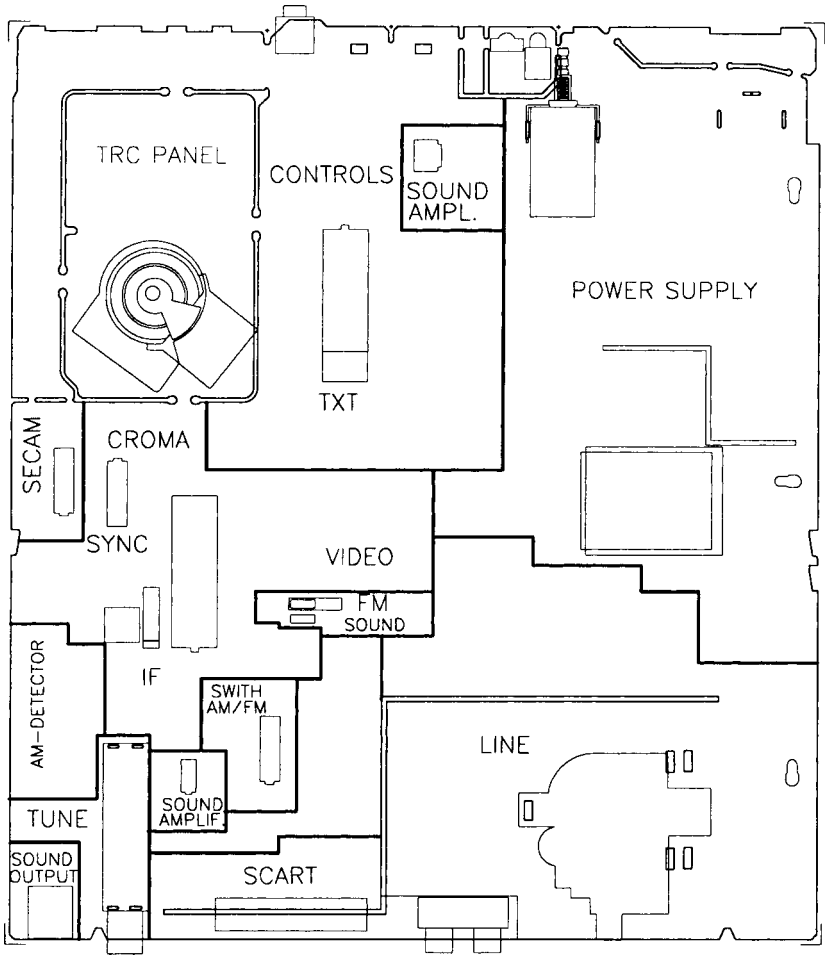
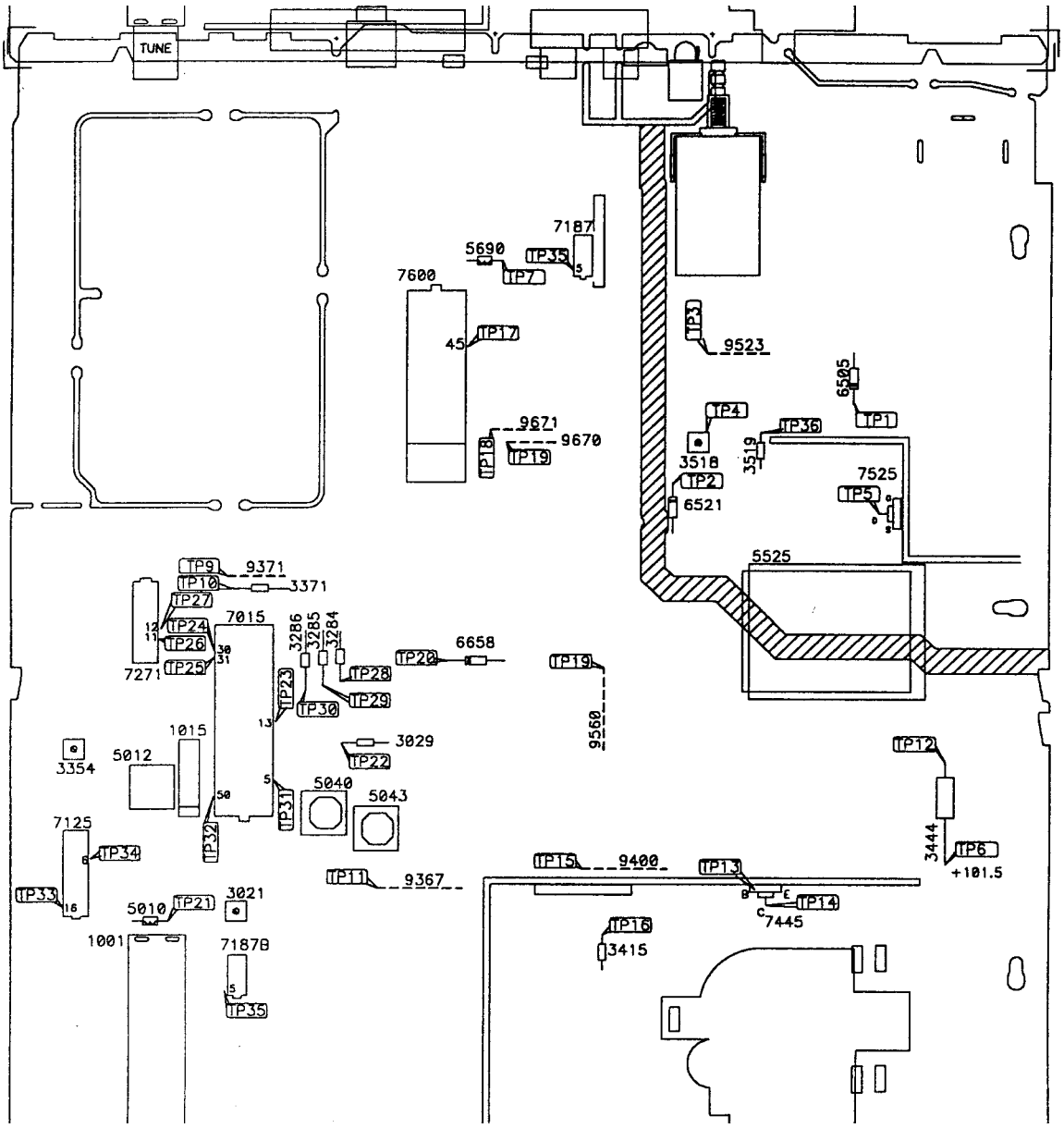
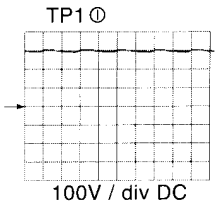


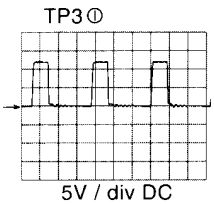
Fig. 3.2

Overview oscillograms / Testpoints

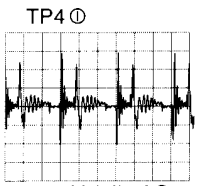




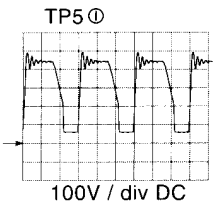
100V / div DC
5ms / div



5V / div DC
5µs / div



20mV / div AC
5µs / div

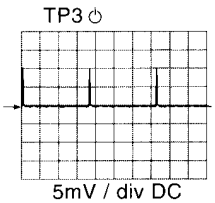


100V / div DC
5µs / div

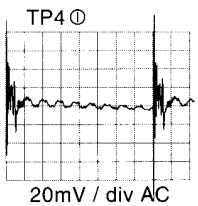
TP1⏁ 300V DC

TP2⏀13V5 DC

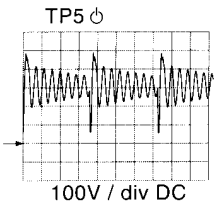
TP2⏁ 12V DC



5mV / div DC
20µs / div



20mV / div AC
10µs



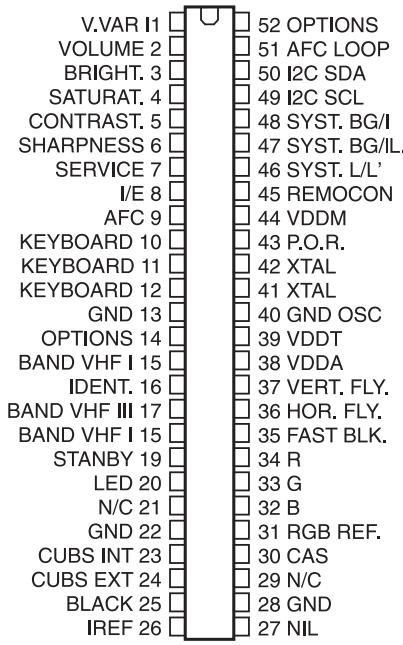
100V / div DC
20µs / div

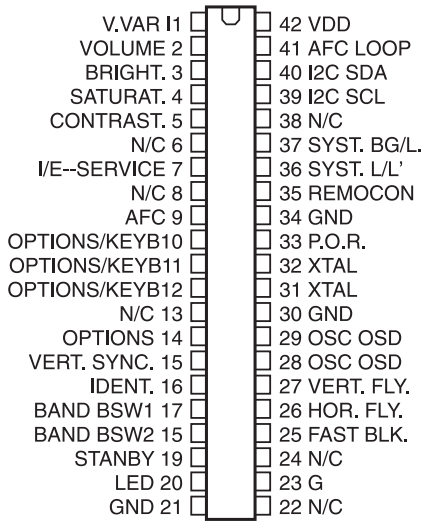
Description of microprocessor and TXT in CTN chassis

MICROPROCESSOR + TXT

The CTN model chassis is designed to accept three different microcontrollers: the TMP47C634, the SAA5288 and the SAA5290.

The three microcontrollers are mounted in the same position, by placing pin 1 at the same point. The TMP47C634 has 42 pins while the SAA52XX models have 52 pins. The circuitry connected to the pins is practically the same. From pin 21 on the Toshiba model, the equivalent pin on the SAA52XX unit will be 10 numbers higher (e.g., pin 33 on the TMP47C634 corresponds to pin 43 on the SAA52XX).





The difference between the TMP47C634 and the SAA52XX is an improvement in the OSD (it goes from two lines to a full screen, thus making it possible to implement the MENU) and the addition of new functions in the software (24-h timer, child block, etc.). The SAA5290 also has a TXT decoder.
Following is an explanation of the different functions of the microcontrollers with indications as to the pin number assigned to each integrated circuit and the differences between the microprocessors, where applicable:
- Integrated circuit power supply: The TMP47C634 has a single +5V power supply (pin 42 VVD). The SAA52XX has several power supplies for the microcontroller (pin 44 VDDM), the analog converter and the OSD (VDDA pin 38 and VDDT pin 39), as well as for the final phase of RGB outputs (RGBREF pin 31).
- LED (pin 20): The LED lights up with a low current when the television set is ON and with a high current when the set is on Standby.
- RC5 (pin 35 on the TMP47C634; pin 45 on the SAA52XX): The commands transmitted by the remote control handset are received by infrared receiver 1685 and passed to the microcontroller for decoding.
- Switching voltages of the BG/L-L/L'-BG/I systems (pins 36, 37 and 38 on the TMP47C634; pins 46, 47 and 48 on the SAA52XX). These signals are only used on Multistandard units. These pins are used for switching the system for decoding sound and video. These signals are inverted and set at the correct level by transistors 7672 and 7673, respectively. Once they are transformed, together with the signal from pin 48 (BG/I), they make up the system status lines (See table).
- Oscillator: The TMP47C634 has a 4-MHz oscillator which is determined by a 4-MHz ceramic resonator on pins 31 and 32. The SAA52XX has a 12-MHz oscillator which is determined by a 12-MHz crystal between pins 41 and 42.
- On-Screen Display (OSD): In order to synchronize the OSD information with the picture signal, the VERT FLYBACK signal is added in inverted form to the integrated circuit (pins 15 and 27 on the TMP47C634 and pin 37 on the SAA52XX), as is the HOR FLYBACK signal (pin 26 on the TMP47C634 and pin 36 on the SAA52XX). The SAA5290 also uses these signals to synchronize the TXT. On the TMP47C634 there is an LC network on pins 28 and 29 which controls the OSD.
The TMP47C634 has only the green output activated (pin 23) and this is inverted with transistor 7658 so that the correct level is reached. The SAA52XX models have three outputs, R, G and B (pins 32, 33 and 34) with emitter followers (7641, 7642 and 7644).
The pin for erasing the RGB picture signal for inserting OSD (pin 25 on the Toshiba and 35 on the SAA52XX) is connected with diode 6679 to pin 21 on the TDA836X.
- Tuning: The unit has a VST (Voltage Synthesized tuning) system. This system works by tuning to a station on the tuner through a linear variation of the tuning voltage (0V2 to 5V). It is available on pin 1 of the mC and converted to an adequate level on the selector/dial (0V to 33V), using T7605 and +101.5V. The AFC signal (Automatic Frequency Control) of detector FI is added to the tuning voltage V-VARI by R3689 and R3688 to compensate for the slow variation of the tuning feature.
While searching for the station, pin 41 is set on high which means that the AFC voltage will not be added to the V-VARI. If an IDENT signal is received on pin 16 while searching for a station, the mC will check via entry pin 9 whether the tuning is correct and whether the AFC signal can be activated again. The SAA52XX has 3 pins (15 VHF1, 17 VHFIII AND 18 UHF) for band switching and provides voltage to the corresponding pin. The TMP47C634 has only two pins (17, 18) for band switching which decode the 3 tuning lines using transistors 7003 and 7004.
The SAA52XX models also have pin 30, which they use to limit the CAS voltage in automatic tuning so that noise signals are not memorized.
- Picture and sound adjustments: volume control (pin 2), brightness control (pin 3), colour control (pin 4) and contrast control (pin 5); the SAA52XX models also have sharpness control (pin 6).

The RC networks are used to convert the modulated pulse output to a DC voltage level. Some of these settings can be preprogrammed in the memory for all channels as a personal preference (PP). Mute is controlled internally on the mC during automatic station search or when the signal received is interrupted (detected via the IDENT signal on pin 16).
- Service: If pin 7 is connected to earth when the set is turned on from the IR, the unit will go into Service Default Mode (see Chapter 8).
- INT/EXT and mute on programme 0. The microcontrollers have a pin for switching to external (pin 7 on the TMP47C634 and pin 8 on the SAA5290) via transistors 7876 and 7877. This signal is added to the signal from SCART pin 8 so that either of them can be used to switch to external.
On units without SCART, this signal is used for muting the sound and picture on programme 0.
On the SAA52XX models, this line is also an input line so that the microcontroller knows if the unit is on external. This way, the correct video signal is switched on the TXT and the sound is not muted on external, even if there is no pilot signal.
- EEPROM bus 12C memory (pins 39 and 40 on the TMP47C634; pins 49 and 50 on the SAA52XX); The microcontroller is connected to non-volatile memory IC7685 (EEPROM) via bus 12C. Personal preferences (PP) and channel data are stored in the memory. The system can memorize 79 channels (with the data on tuning voltage, band and system) and the personal preferences.
- Standby (pin 19); The Standby switching signal is on pin 19 of the mC. If the Standby signal is “low”, it reduces the start-up voltage of oscillator pin 36 on the TDA836X, thus cutting the line voltages.
- Control and options keypad; The decoding principle is different depending on the unit. On the TMP47C634, it decodes a matrix between pins 11, 12 and 13 while on the SAA52XX, it only checks to see if the pin is earthed. The TMP47C634 also checks for diodes 6603, 6604 and 6605 via pin 14 on the microcontroller (see options table on diagram).
The SAA52XX reads the options via pins 14 and 52, which will be “1” or “0” depending on the components (2690, 3600, 3650 and 3657).
- TXT: The SAA5290 has an internal teletext decoder. The following functions have been programmed on the software: TXT input/output, show, freeze, temporary cancellation, clock, subcode, zoom, index, flof, page +/-, X/26 and 8/30 packet decoding (station identification and start-up page). Synchronization is received from the HOR FLY and VERT FLY signals, as is the OSD (this means that if the video signal is lost, the TXT does not become unsynchronized). The teletext information is extracted from the video signal inserted on pins 23 (internal video) and 24 (external video) via condensers 2635 and 2636.
Pin 27 corresponds to the NIL control signal, which pulse switches transistor 7640 and keeps the picture from interlacing when applied to the vertical deflector.
All remaining circuitry (oscillator, RGB output, fastblanking, etc.) is shared with the microcontroller.

SYSTEM	L/L'	BG/L	*I*
BG	L	L	L
I	L	L	H
DK	L	L	L
L	L	H	L
L'	H	H	L

Small signal

IC 7015 (TDA836X) is a single-chip video processor with built in IF- detector, luminance and chrominance separator, PAL chroma decoder, RGB processing , horitzontal&vertical syn. processor, FM sound- decoder,

IF (INTERMEDIATE FRECUENCY) DEMODULATION (ic7015/6A)

IC 7015/6A contains the IF detector. The 38.9 MHz IF signal is a present at the output pin 11 of the tuner (33.4 MHz for a signal according to the SECAM L' system).

Bandpass filter; The IF bandpass characteristic is determinated by the bandpass of the SAW (Surface Acoustic Wave) filter 1015.

* For PAL BG sets a SAW filter with 5.5 MHz bandwich is used (33.4 to 38.9 MHz).
* For PAL I sets a SAW filter with a bandwinch of 6.0 MHz is used (33.4 to 39.4 MHz).
* For PAL BGI/SECAM BGLL' sets a SAW filter with 6.0 MHz bandwich is used to enable BGILL' reception.
* For LL' reception BG/L is "high", D6014 conducts and so the 33.4 MHz is tuned to a lower frecuency with C2014 (32.9 to 38.9 MHz).
* For BGIDK reception BG/L is "low", D6014 does no conduct. With C2013 the bandpass filter is tuned at 33.4 MHz (32.4 to 38.9 MHz).
* For PAL BG/SECAM BGDK sets a SAW filter with a bandwich of 6.5 MHz is used without switching possibilities (32.4 to 38.9 MHz).

Demodulation and AGC; After the bandpass filter the IF signal is supplied to the IF-detector IC7015/6A pins 45 and 46. This IC7015 6A is suitable for a both negative (BGIDK) and positive (LL') modulation controlled by the BG/L switching signal (" high" for LL' positive modulation, "low" for a BGDIK negative modulation) at pin 1 IC7015/6F (pin 1 IC7015/6F is at DC level input pin for positive/negative switching of IC7015/6A). This control also determinates whether the AGC circuit controls at the top white level (positive modulation) or at the top sync level (negative modulation).

The high-frecuency AGC voltage is available at pin 47. The take over level of the high-frecuency (delayed) AGC control can be set at pin 49 by means of R3021. For switching to diferent IF for the SECAM L' system (33.4 MHz) the demodulation reference circuit 5040 at pins 2 and 3 IC7015/6A is switched by switching signal L/L'.

* For BGILDK reception L/L' is "low", D6042 conduct and so coil 5043 is connected in parallel to 5040. The circuit is tuned to 38.9 MHz.
* For reception L/L' is "high", D6042 does nor conduct. The circuit is tuned to 33.4 Mhz by L5040 only.
  Note: For sets with LL' reception L5040 is tuned at 33.4 MHz, for sets without LL' reception L5040 is tuned at 38.9 MHz (or 39.5 MHz for PAL I only sets).
  Automatic Frecuency Control (AFC) signal at pin 44 is obtained from the reference signal of the IF-detector and the control is modified internally in IC7015/6A for positive or negative modulation. C2037 smoothes the AFC voltage.

SOURCE SELECT, LUMINANCE AND CHROMINANCE SEPARATION (IC7015/6B)

Sound trap; The baseband CVBS signal of pin 7 IC7015/6A (nominal amplitude of 2Vpp) also contains the 5.5 or 6.0 MHz FM sound signal (FM intercarrier sound). This sound signal is filtered out with a 5.5 MHz (6.0 MHz PAL I) ceramic filter (1032 and/or 1033).

Source select: The CVBS signal is now fed to pin 13 IC7015/6B to the source selector switch in IC7015/6B. Pin INT/EXT = 0V gives internal CVBS (pin 13), pin 16 INT/EXT = 8V gives external CVBS (pin 15) (external signal SCART CVBS IN from the CVBS IN cinch or pin 20 scart-connector).

Luminance and chrominance separation: chrominance signal is filtered out (-20dB) by a luminance notch filter which is internallly calibrated at the subcarrier frecuency (4.43 or 3.58). The IDENT status signal is coming from pin 14 IC7015/6B. In case of no horizontal sync (so no signal detected) by the sync processor IC7015/6E, pin 14 IC7015/6B is made "low", TS7651 does not conduct so pin 16 of the µC is "high". The IDENT signal is internally fed to ensuring stable OSD even without transmiter signal (IC7015/6D can be switched to different time constants).

CHROMINANCE DECODING (IC7015/6C)

CVBS is extracted from the baseband CVBS signal from the IF-detector via crystals 1032. PAL (and NTSC if applicable) chroma decoding inside IC7015/6C, SECAM chroma decoding inside IC7250.

Inside IC7015/6C the PAL (or 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 IC7015/6C). The 4.43 MHz reference crystal for chrominance demodulation in IC7015/6Cis in present at pin 35 of IC7015/6C.

Pin 27 shoud be 5V5 (via R3280) to force IC7015 in the PAL/SECAM mode; by then IC7015/6C is in the PAL decoding mode and via pin 27 feeds throught the chroma signal to the SECAM chroma decoder IC7250 (so IC7015/6C searches for PAL and IC7250 searches for SECAM).

Via a bidirectional communication line between pin 32 of IC7015/6C and pin of IC7250 both IC7015/6C and IC7250 "know" wether a PAL or a SECAM signal is detected:

- On AC level there is a 4,43 calibration for calibration of thr PLL and chroma cloche filter of IC7250.
- On DC level there is a SECAM or PAL switching line enabling automatic selection of IC7015/6C and IC7250 to supply R-Y and B-Y to the delay line IC7271.

* If IC7015/6C has detected a PAL signal, Vpin 32 is made 1V5. By then the demodulated R-Y and B-Y at output pins 30 and 31 od IC7015 / 6C are fed to delay line IC7271.
* If IC7015/6C has detected a PAL signal, Vpin 32 is made 5V. By then the demodulated R-Y and B-Y at output pins 30 and 31 of IC7015/6C are not fed to the delay line IC7271.
* If IC7250 has detected SECAM Vpin 1 IC7250 becomes "low", sinking typical 150 µA from the 5V from pin 32 IC7015/6C. Only in case the sinking current at pin 32 IC7015/6C is typical 150 µA, only by then IC7015/6C "knows" IC7250 has detected SECAM demodulated R-Y and B-Y are fed to the delay line IC7271 via output pins 9 and 10 of IC7250.

RGB DEMATRIXING (IC7015/6D)

RGB-dematrixing dematrixies the -(R-Y), -(B-Y) and the Y signals; the sandcastle pulse coming from the IC7015/6E synchronises RGB dematrixing and suppresses the RGB signals during line and frame flyback.

Control by µC for contrast, brightness and saturation (0V5 to 4V5).

RGB-source select switches between internal RGB and external RGB (OSD or SACART) via pin 21 of IC7015/6D (via resp OSD FAST BLANKING from OSD generator and FAST BLANKING from SACART or µP INT/EXT from µC).

HORIZONTAL SYNCHRONISATION (IC7015/6E) diagram B

Start up of the hor. oscillator via +11A gives start up current into pin 36 5V8 the hor. oscillator starts running approx. 25 KHz and only when IC7015 supply pin 10 = 8V the line frecuency changes to 15625 Hz.

Hor, sync., separator separates hor pulses out of CVBS and so synchronises the free-running hor. sawtooth generator. Both the line and frame frecuencies are internally locked to the chroma oscillator on pin 35 IC7015/6C.

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 connstant of the sync. circuit automacallly determinated by IC7015/6E. Pin 38 is both sandcastle output and hor. flyback input.
Selection automacally determinated by the input current (sandcastle a few µA, flyback 100-300 µA determinate by R3371).

Amplitudes of sandcastle pulse; burst 5V3, line blanking is 3V, frame blanking 2V.

At standby (STANDBY "low") TS7580 blocks and TS7581 conducts and so the line is shut down at stand by.

VERTICAL (VERT.) SYNCHRONISATION (IC7015/6E) diagram B

Vert. sync. separator separates frame sync. pulses from CVBS and so synchronises frame oscillator. IC7015/6E compares phase of flyback pulse with phase of sawtooth at pin 42 (from external RC network); if phase not correct the duty cycle of hor. **Pre-amplifier** in IC7015/6E amplifies sawtooth (pin 43 of IC7015/6). Via BCI' frame correction is realised for high beam currents; If beam current increases (more white), EHT decreases so picture will become too big. BCI and so BCI' decrases for increasing beam current (diagram C) and the picture will be corrected.

SOUND DETECTION (IC7015/6F) diagram D

There are two audio paths: for the BG, I and DK systems FM modulated intercarrier sound (sound extracted from baseband CVBS from IF detector), for the LL' systems AM modulated quasi-split sound (sound extracted directly from the tunner).

FM demodulation; For FM modulated sound the sound signal is filtered throught filter 1135 or 1136 from the baseband picture signal. For BGDK or BGILL' sets the switching signal BG/I is used to select the current crystals.

* For I (or DK) reception BG/I is "low", TS7170 does not conduct, D6170 conduct and so crystal 1136 (6.0 MHz for I and 6.5 MHz for DK) is switched parallel to 1135.
* For BG reception BG/I is "high", TS7170 conduct, D6170 does not conduct and 1136 is not switched in parallel to 1135 (5.5 MHz only).
* For PAL BG or PAL I only sets only 1135 is used (resp. 5.5 MHz or 6.0 Mhz). FM-mono sound demodulation takes place in IC7015.6F. No adjustament required for BG or I demodulation as automatic PLL tuning (4.2 to 6.8 MHz).
  Sound frecuency characteristic is defined by de-emphasis C2112 at pin 1. Volume control on DC level at pin 5. Selection between FM sound or AM sound/EXT sound (from input pin 6) by pin 16 IC7015/6B.

AM demodulation; Interferences signals at 30,9 MHz are removed from IF signal coming fron tuner by SAW filter 1137 (double band pass caracteristic) the required frequency spectrum is fed to the AM demodulation IC7125. The doble characteristic is necessary because for the L system the sound is at 32,4 MHz and for L´at 39,9 switched by switching signal L/L´and TS 7126 TS7127

* For L´ reception (L/L´ is "high") IF signal is present in pin 2.
* For L reception (L/L´ is "low") IF signal is present in pin 1.

The demodulated signal at pin 6 of IC7125 is supplier to the source selection switch in IC7140 , C2126 and 2127 are AGC related storage capacitos.

Source selection: INT/EXT is "low " for internal and "high" for external . This signal is made from uP INT/EXT and pin 8 of the scart. If one of these 2 signals is "high" external is selected. BG/L is "low" for FM sound (BGIDK) and "high" for AM sound (LL').

* Top switch in IC7140 select between AM sound (pin 5) and EXT sound from SCART +AV (pin3) by pin 9 INT/EXT. The output of this selector (pin 4 IC7150) is fed to input pin 6 of FM demodulator IC7015/6F .
  Here selection is made between FM sound (pin 5) and EXT sound from SCART+ AV (pin 3) by pin 9 INT/EXT. The output of this selector (pin 4 IC7150) is fed to input pin 6 of FM demodulator IC7015/6F.
* Middle switch in IC7140 selects between AM (pin 1) and FM sound (pin 2) for SCART AUDIO OUT by pin 10 (BG/L is "high" for AM pin1, "low" for FM pin2).
* Bottom switch in IC7140 connects +8 to pin 1 IC7015/6F to switch the IF-detector and AGC (both IC7015/6A) to positive modulation for SECAM LL´(BG/L so pin 11 IC7140 is "high" for AM LL´ positive modulation so pin 13 to +8).

Anti-plop; At switch on the set C2183 is not charged, anode C2183 is "high", TS7183 conducts and so mutes the output amplifier IC7187. As soon as C2183 is charged anode C2183 is "low", TS7183 stops muting.

At switch off of the set the +8A drops very fast. As C2183 is still charged, the anode of C2183 becomes approx. -8V DC. By then the DC volume control signal VOLUME is shorted via zener D6183, so IC7015/6F is muted.

Power Supply

Mains isolated switched mode power supply (SMPS), control IC7514 (TDA4605) gives oscillation, variable frequency, variable duty cycle, switching FET, no opto coupler, no thrystor switching windings on the secondary side, slow start circuitry and no standby mode of the power supply. Via sense windings 4-2 frequency and duty cycle control on the primary side.
Duty cycle and frequency of the power depends on T-on of FET TS7525 which is controlled by IC7514. This IC detects variations of the +100 (at the secondary side of 5525 at winding 5-7) via sensing windings 4-2 at the primary side of 5525. The switching period of TS7525 is divided in three main areas T-on, T-off and T-dead:
During T-on energy is extracted from the mains into the primary winding 8-12 of transformer 5525 with a linear increasing primary current (slope depends on voltage across C2505). Via T-on regulation the duty cycle and the frequency of the SMPS and so the +100 can be controlled.
During T-off energy "inside" transformer is supplied to the load via secondary windings of 5525. Current through secondary side of the transformer decreases linear with firm slope.
During T-dead no energy is extracted or supplied. During T-dead the L-prim is demagnetised (polarity L-prim and C2524 is switched).

PRIMARY SIDE

Degaussing; R3501 is a dual PTC (2 PTC's in one housing). After switch on set, PTC is cold so low-ohmic and so degaussing current is very high. After degaussing, PTC is heated so high-ohmic, so in normal operation degaussing current very low.
Mains voltage is filtered by L5500, full wave rectified by diodes 6502-6505 and smoothed by C2505 to VIN (300 V DC for 220V AC mains).
Start up; Via start up circuitry via R3507 the DC voltage VIN is used to start up IC7514. As soon as the supply voltage Vpin6 12V the IC7514 starts; the internal oscillator of IC7514 drives TS7525 into conduction at the lowest frequency (during start up C2523 determines the frequency; as C2523 is uncharged at start up this gives a low start). The power supply automatically starts up.
Take over IC7514; During start up a voltage across winding 4-2 is built up. At the moment the voltage across winding 4-2 reaches approx. +15V, D6521 starts conducting and takes over the +15 supply voltage at pin 6 IC7514.

CONTROL CIRCUITRY

+100 feedback for frequency and duty cycle control; Sense windings 4-2 has same polarity as winding 5-7. During T-off winding 5-7 and so winding 4-2 are positive. D6515 conducts and so charges C2515; the DC level across C2515 is a reference for the +100. Via R3518, R3517 and R3508 this DC-voltage is brought to the required level for input pin 1 IC7514; this voltage is used for frequency and duty cycle control of IC7514.
R3518 is a potentiometer and so +100 can be adjusted.
IC7514 controls +100 by controlling T-on and so the frequency and the duty cycle; IC7514 compares voltage at pin 1 with an internal reference voltage.

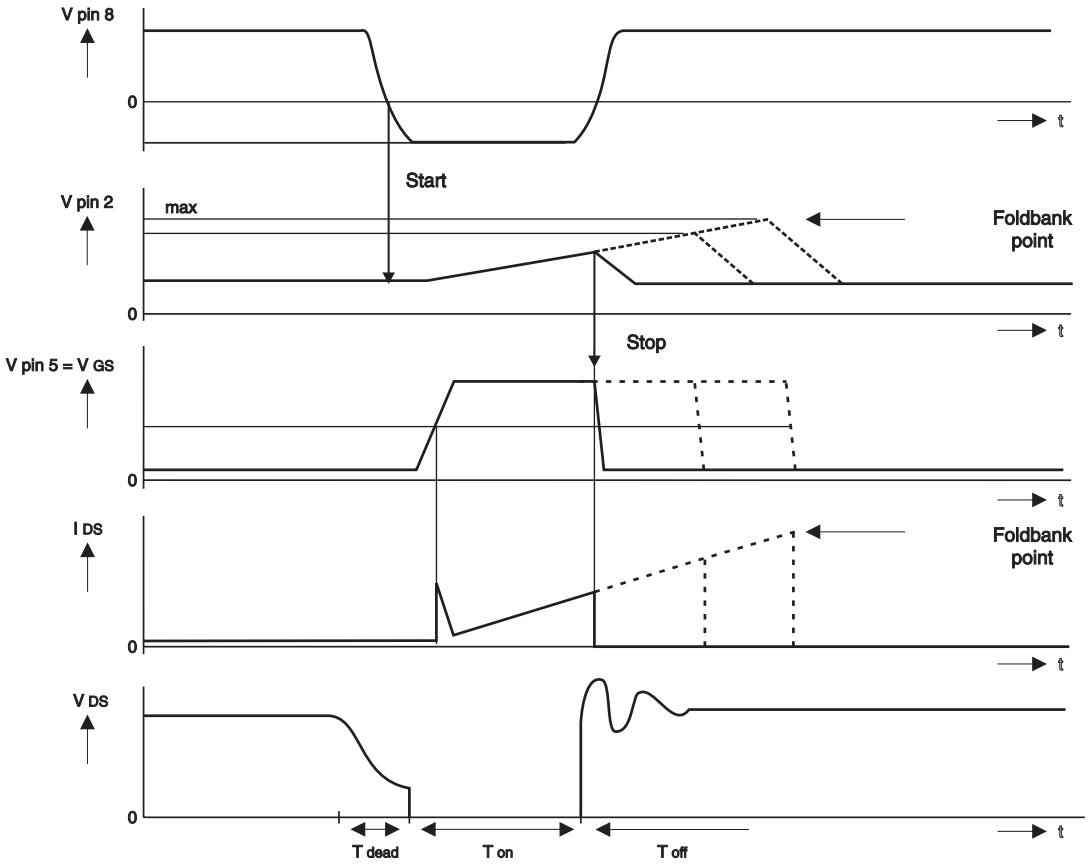
* In a stable situation the voltage at pin 1 is the same as the internal reference voltage, so frequency and duty cycle remains the same.
* If +100 increases the voltage at pin 1 increases, and so the frequency and duty cycle and so the +100 will be decreased (new balance of voltage at pin 1 and the reference voltage and so new lower stable frequency and duty cycle).
* If +100 decreases, the voltage at pin 1 decreases. The frequency and duty cycle and so the +100 will be increased.

The voltage at pin 1 is in a stable situation typical 400 mV.
Undervoltage protection; If Vpin6 supply voltage drops under 7V25, the logic in IC7514 will shut the output at pin 5. The power supply will stop running.
Overvoltage protection; The power at pin 3 IC7515 is a measure for the mains voltage and so the DC Vin across C2505. As soon as the voltage Vpin3 6V6, the logic in IC7514 will shut the output at pin 5. The power supply will stop running.
Overload protection; If the secondary load becomes too high, the T-on becomes too long. The internal sawtooth used for oscillation is measured over C2509 at pin 2 IC7514. If Vpin2 3V (foldback point) the IC will switch into overload mode giving protection (hick-up or burst mode): IC7514 switches TS7525 and so power supply "off" as long as I-prim is too high, starts up again, if I-prim still too high switches "off" again, etc.

SECONDARY SIDE

±100 for the line output stage ±100A for the tunning (V VARI), +11 for sound output amplifier, +11A for start up of the line circuitry, ±5 for pull up and +5A for µC and EEPROM. No secondary protections are available.

Power supply signals



Electrical adjustments

Adjuntaments on the main panel (fig.7.2).

1.1. +100V power supply voltage.
Connect a voltmeter (DC) across C2530.
Adjust **R3518** for a voltage of +101V5 for 14" or +106V5 for 20" sets at back picture (beam current 0 mA).

1.2. Horizontal centring.
Is adjusted with potenciometer **R3354**.

1.3. Picture height.
Is adjusted with potenciometer **R3410.**

1.4. Focussing.
Is adjudted with potenciometer in the line output transformer.

1.5. If filter (only for sets with SECAM LL' reception possibility).
Connect a signal genetor (e. g. PM5326) via a capacitor 5p6 to pin 17 of the tunner an adjust the frequency for 33.4 MHz.
Connect an osciloscope to pin 1 of filter 1015.
Switch on the set and select a program with system Europe (BG/L "low" for BGIDK reception).
Adjust L5040 for a minimum amplitude.

1.6. AFC.

a. For a sets with SECAM LL' reception possibility:
Connect a signal generator (e. g. PM5326) as indicated in point 1.5. Connect a volmeter to pin 44 of IC7015/6A.

Adjust the frecuency for 38.4 MHz and a select a program with system France (L/L' is "higt" for reception).

Adjust **L5040** for 3V5 (DC).
Next adjust the frecuency for 38.9 MHz. Select a program Europe (L/L' is "low" for BG- ILDK reception).
Adjust **L5043** for 3V5 (DC).

b. For sets without SECAM LL' reception possibility:
Connect a signal generator (e. g. PM5326) as indicated above and adjust the frecuency for 38.9 MHz (for a PAL I at 39.5 MHz). Connect a voltmeter to pin 44 of IC7015/6A.
Adjust L5043 for 3V5 (DC).

1.7. RF AGC.
If the picture of a strong local transmiter is reproduced distorted, adjust potenciometer R3021 until the picture is undistorted.

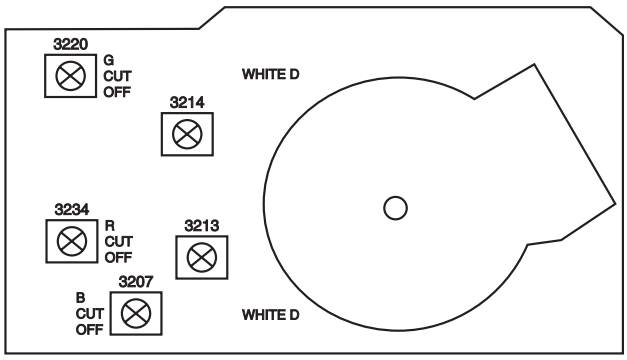
Or: Connect a pattern generator (e. g. PM5518) to the aerial amplitude=1mV.
Connect a multimeter (DC) at pin 5 of tunner.
Adjust R3021 so that voltage at a pin 5 of tuner is 3V7 ±0V5(DC).

2. Adjustaments on the CRT panel (Fig. 7.1).

2.1. Vg2 cut-off points of picture tube.
Apply a pattern generator (e. g. PM5518) and a set it to a white raster pattern.
Adjust contrast and Vg2 at minimum (Vg2 with potentiometer in the line output transformer to the left).
Adjust brightness until the DC voltage across potentiometer 3213 is 0V.
Adjust R3207 (B), R3220 (G) and R3234 (R) for a black level of 115V on the collectors of transistors 7205, 7218 and 7227.
Adjust Vg2 potentiomete until the gun that first emits ligth is just no longer visible. Adjust the two other guns with the respective controls (3207 3220 or 3234) until just no light will be visible.

2.2. Grey sacle (white D).
Apply a test pattern signal and the set for normal operation. Allow the set to warm up for about 10 minutes.
Adjust R3213 and R3214 until the desired grey scale has been obtained.

FIG. 7.1



Repair facilities

Test points

The CTN chasis is equipped with test points, TP1, TP2, etc in the service printing on the component side of the monoboard.
Using these test points it is possible to set a quick diagnosis on the top of the monoboard.

Functional blocks

On both the service printing on the copper and the component side, functional blocks are given. These blocks indicate the functionaly of that specific part of the circuit.

Service Default Mode

The CTN software contains a "Service Default Mode" .
To activate this mode the service pin of the microcomputer (pin 7-IC7600) should be short-circuited to earth while switching on the set with the mains switch (shorting pin 7 can be done on the copper side via the 2 copper squares or on the component side by pin 7 and the shielding of the µC) When the set in the Service Default Mode and "S" appears on the screen.
In the Service Default Mode the set is in a pre-defined mode In this mode all analog settings (volume, contrast, brighness and saturation) are in the mid position and the set is tuned to program number 1.
The Service Default Mode is left via switching off the set by the mains switch or via standby on the remote control.

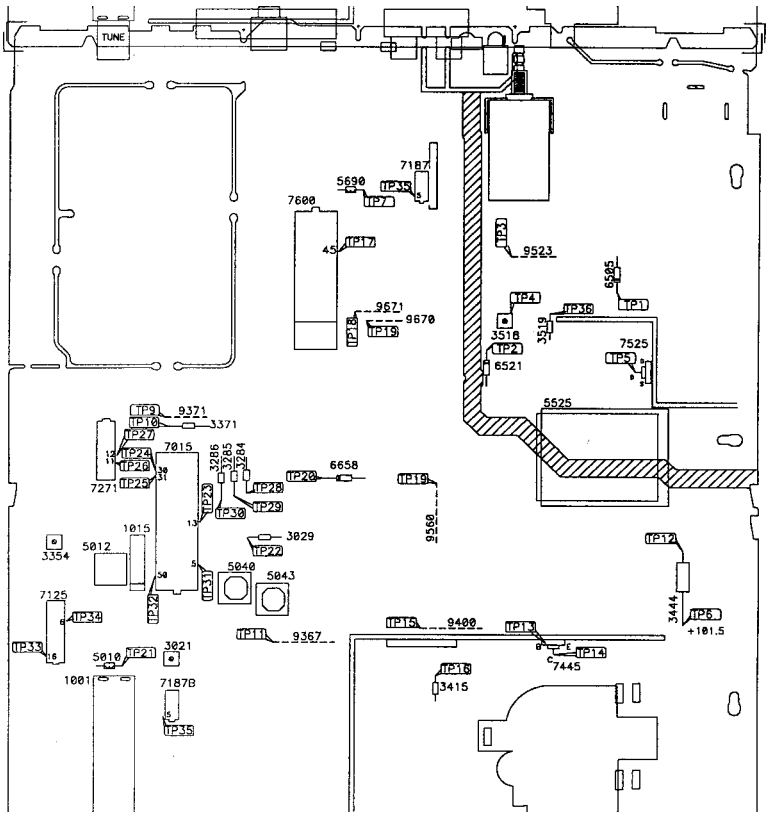
Error messages

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

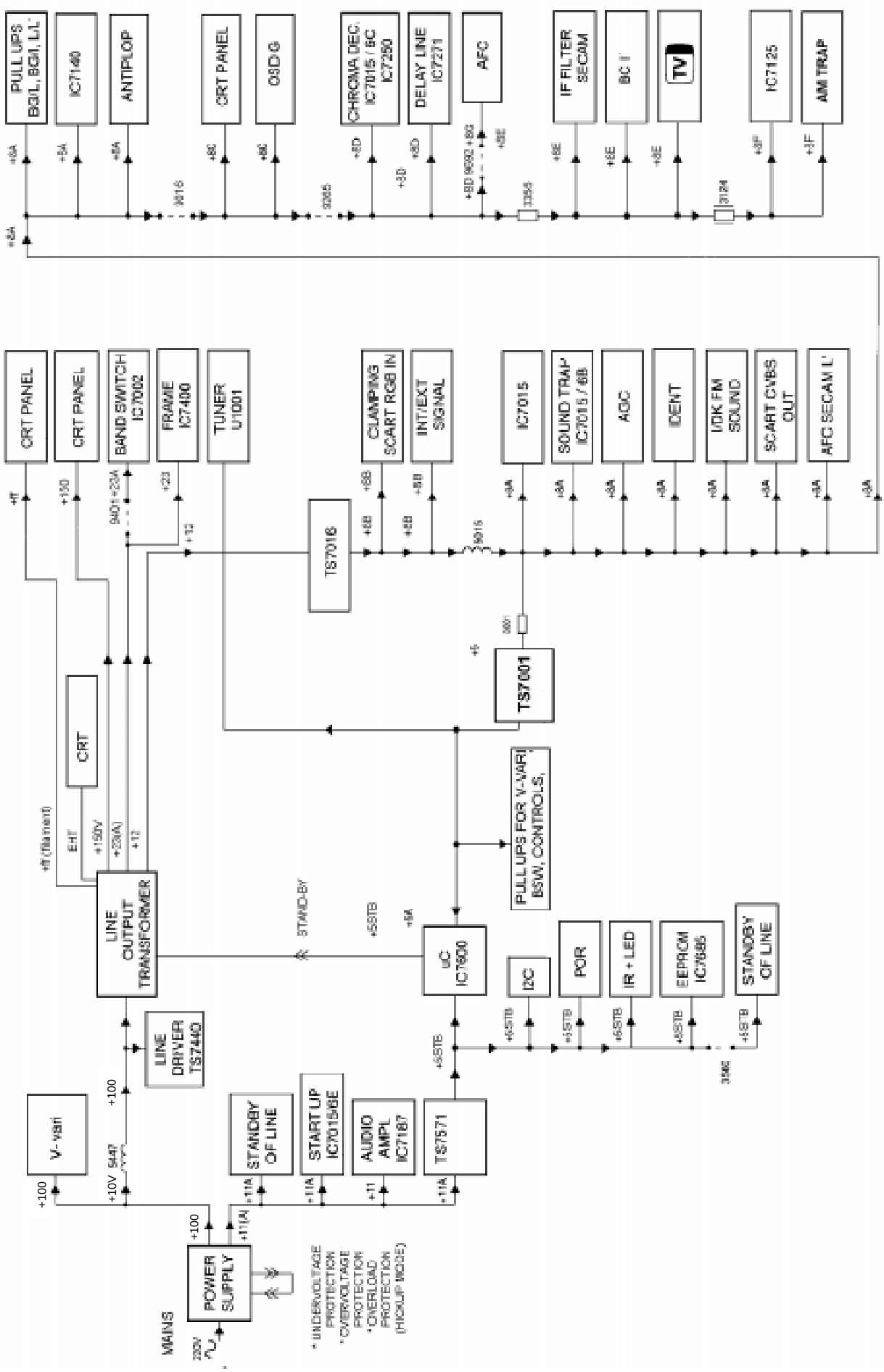
Error message	Error description	Possible defect-tive component
F1 en OSD y LED parpadea	Error interno µC	IC7600
F2 en OSD y LED parpadea	Error Eeprom	IC7685

Note: 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).

FIG.7.2



Block diagram power supply



List of abbreviations

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

Electrical Instructions

A. ADJUSTMENT OF MAIN PLATE

1. Supply voltage: +100V.
Connect a voltmeter (DC) between the +2530 and mass. With potentiometer 3518, adjust voltage to 101V5 for a 14" tube and 106V5 for a 20" or 21" tube.

2. Horizontal centring
Adjust with potentiometer 3354.

3. Picture height
Adjust with potentiometer 3410.

4. Focus adjustment
Adjust with the potentiometer placed on the line transformer.

5. APC
Connect a signal generator (e.g., PM 5326) as indicated in Fig. 1 and adjust the frequency to 38.9 MHz. (PAL I: 39.5 MHz). Connect a voltmeter to pin 44 of IC 7015:C and adjust voltage with 5040 to 3.5V (DC).

6. AGC - RF
When the image of a powerful local TV station is distorted, adjust with potentiometer 3021 until the problem is solved.

B. ADJUSTMENTS ON PICTURE TUBE PANEL

1. Tube cutoff (Voltage Vg 2)
Connect a picture white signal to the antenna.
Connect pin 25 of IC7015:E to mass.
Adjust the brightness until the DC voltage on potentiometer 3214 is zero.
Using potentiometers 3234, 3207 and 3220, adjust the level of black on the collector of transistors 7227, 7205 and 7218 to 125V for a 14" or 21" tube, 130V for a 20" tube.
Adjust potentiometer Vg^2 until the light from the gun that comes on first is barely visible.
Adjust the other two guns with the other controls (3234, 3207 or 3220) until the light disappears.

2. Grey scale
Connect the test signal to the antenna and adjust TV controls as normal.
Let the TV warm up for at least 10 minutes. Adjust 3214 and 3213 until the desired grey scale is achieved.

PURITY AND CONVERGENCE ADJUSTMENT
NOTE:
The instructions for adjusting colour purity and convergence described below should be used only if the tube is replaced or when full adjustment is necessary in any other cases. Even when the deflection yoke is replaced, it is not necessary to move the rubber wedges ("G" in Fig. 3). Small corrections can be made using the multipole unit.

I. Colour purity. (Fig. 3)
1. Slightly loosen screw "F" (if CRT has a multipole unit).
2. Move the deflection coil and remove the three rubber wedges ("G").
3. Slide the deflection coil as far as possible against the tube bulb and tighten screw "F" so that the deflection coil can be moved with a certain amount of resistance.
4. Position the multipole unit as shown in the diagram, tighten screw "A" and turn safety ring "B" anticlockwise.
5. Place the TV facing either EAST or WEST and insert tube. Connect a single crosshatch signal to the antenna and turn up the brightness as high as possible. Let the TV warm up for 10 minutes.
6. Adjust the static convergence using tabs "C" and "D" (see Chapter II if necessary).
7. Block the green and blue guns by disconnecting resistors 3216 and 3203, respectively.
8. Turn the colour purity rings with tab "E" so that the vertical red line coincides as closely as possible with the centre of the screen and, at the same time, make sure the centre horizontal line is as correctly aligned as possible.
9. Connect a picture white signal and make sure the red vertical line is in the centre of the screen. If it is not in the centre, connect the crosshatch signal again and move the red vertical line in the right direction, making sure that the image does not stray too far from vertical.
10. Connect a picture white signal and move the deflection coil until the inside of the screen is uniformly red.
11. Connect the green and blue guns and make sure that no spots appear on the white screen obtained. If spots appear, they can be corrected by turning rings "E" and/or moving the deflection coil.
12. Tighten screw "F".
13. Now adjust the static and dynamic convergence.

II. Static convergence (Fig. 3).
(If CRT has a multipole unit)
1. Connect a crosshatch signal and let the TV warm up for 10 minutes.
2. Block the green gun by disconnecting 3216 and turning attachment ring "B" anticlockwise.
3. Turn the 4-pole magnetic rings with tab "C" so that the blue and red crosshatch pattern is superimposed in the centre of the screen.
4. Connect the green gun and disconnect the blue gun by disconnecting resistor 3203.
5. Turn the 6-pole magnetic rings with tab "D" so that the red and green crosshatch pattern is superimposed in the centre of the screen.
6. Connect the blue gun and set the multipole unit using ring "B".

III. Dynamic convergence
NOTE:
Dynamic convergence is obtained by moving the deflection coil horizontally and vertically. In order to ensure the exact position of the deflection yoke, three rubber wedges are placed between the glass of the tube bulb and the deflection coil as shown in Fig. 4a or 5d.

1. First adjust colour purity and static convergence.
2. Connect a crosshatch signal and disconnect the green gun by disconnecting resistor 3216.
3. Eliminate the central, horizontal and vertical blue and red lines by moving the deflection coil vertically. If the position of the deflection coil is correct, place the rubber wedge (1) either straight up (Fig. 4a) or straight down (Fig. 5a).
   The placement of the wedge as in Fig. 4a is correct if the deflection coil is facing down.
4. By moving the deflection coil horizontally, the horizontal red and blue line is superimposed in the top and bottom of the screen and the red and blue vertical line to the left and right. If the position of the deflection coil is correct, place wedges (2) and (3) as shown in Fig. 4b or 5b. Firmly press the adhesive part of the wedge against the tube glass.
5. Now place wedge (4) as in Fig. 4c or 5c and press so that it adheres to the tube.
6. Remove wedge (1) and place it as shown in Fig. 4d or 5d.
7. Connect the green gun.

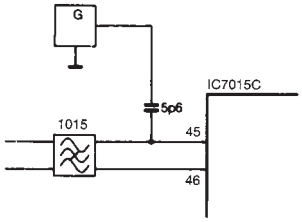


Fig. 1

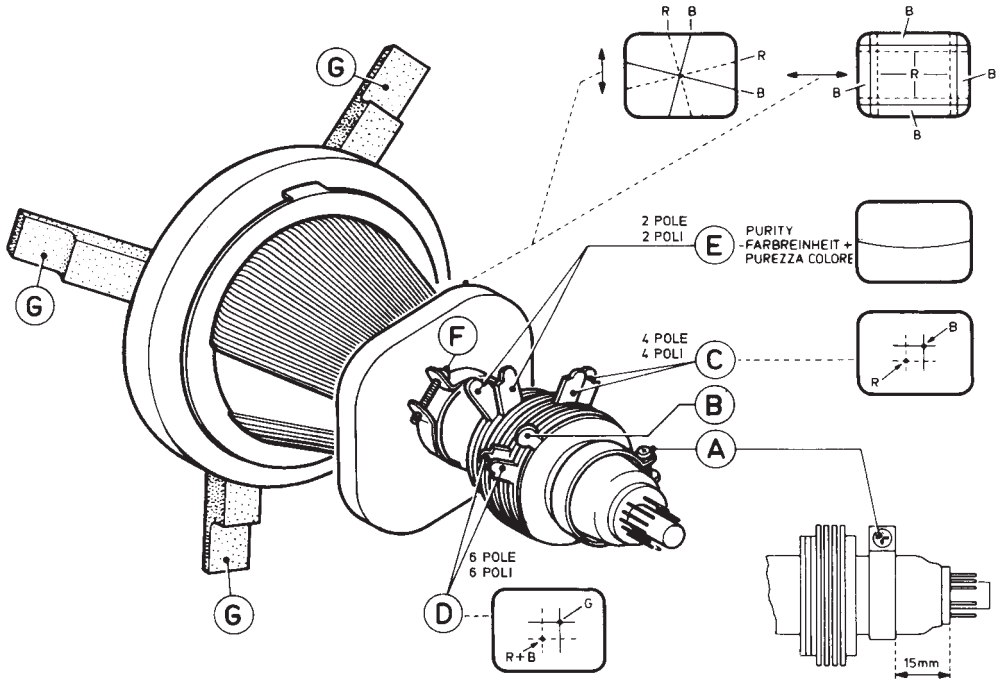


Fig. 3

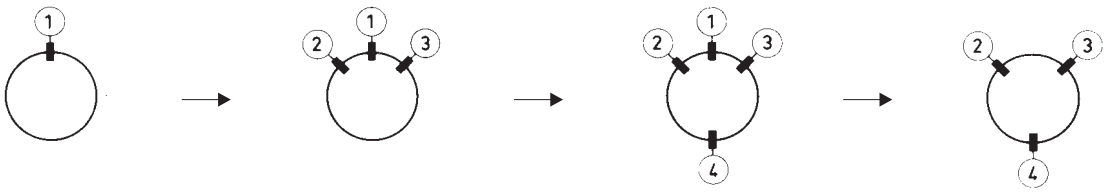


Fig. 4a Fig. 4b Fig. 4c Fig. 4d

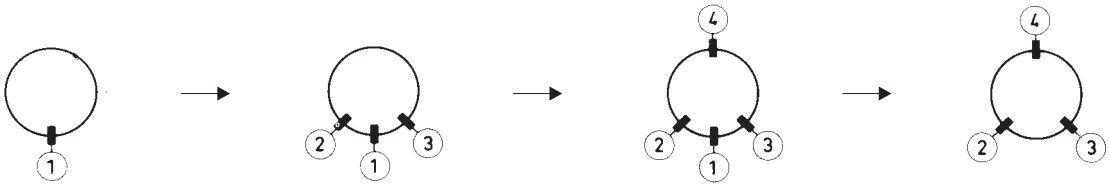


Fig. 5a Fig. 5b Fig. 5c Fig. 5d

Safety instructions, maintenance instructions, warning and notes

Safety Instructions for Repairs

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

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

Maintenance Instructions

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

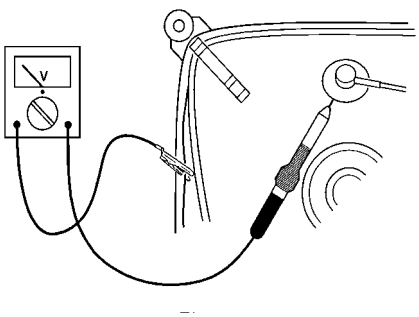


FIG. 11.1

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. 11.1., 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.

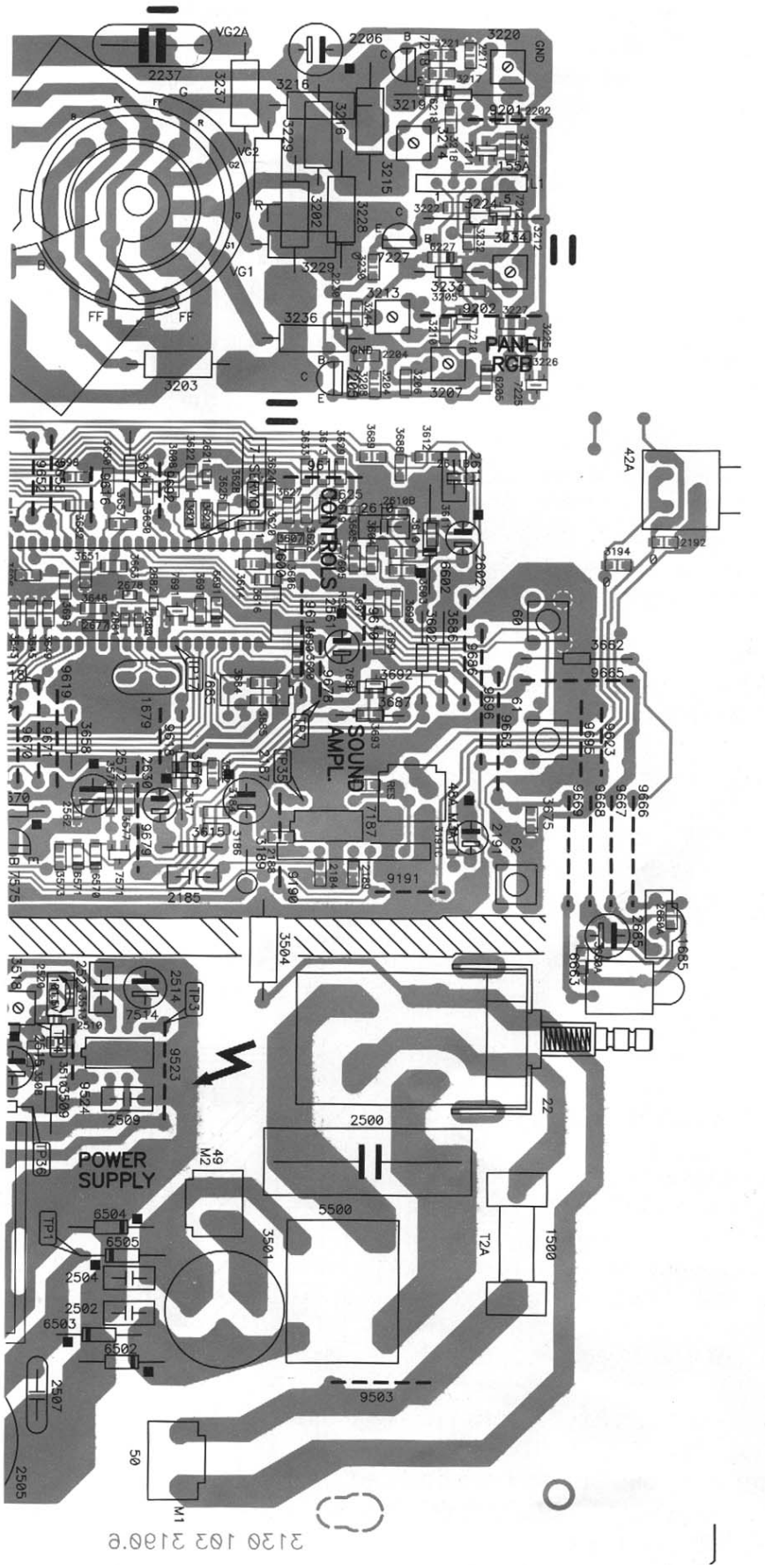
3. The direct voltages and waveforms should be measured relative to the nearest earthing point on the printed circuit board.

4. The direct voltages and waveforms are measured in the Service Default Mode (see chapter 8). Use a colour bar pattern of a pattern generator (e.g. PM5518).

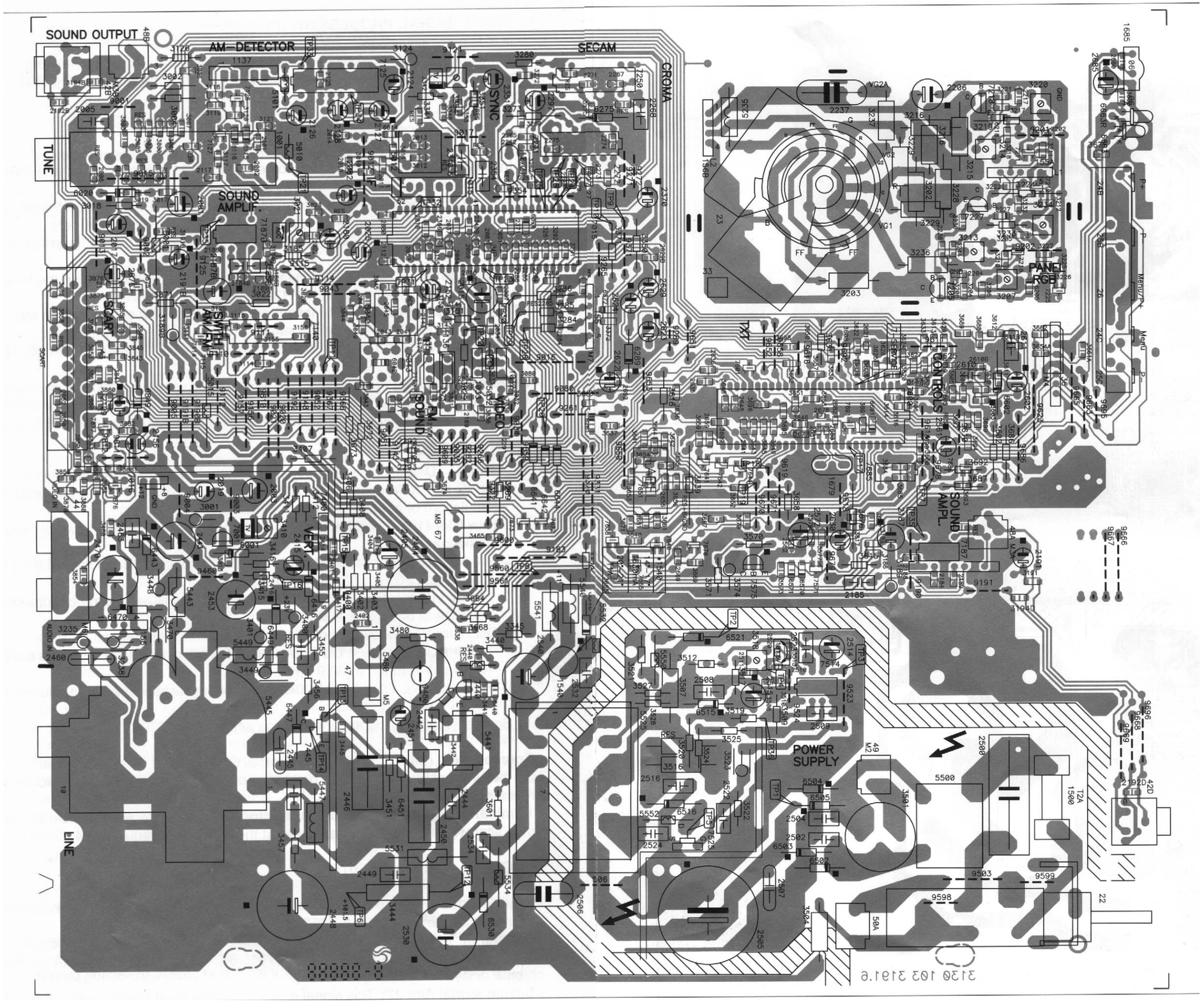
5. The DC voltages and oscillograms are where necessary measured with (⊓) and without (⊼) aerial signal (settings as in Service Default Mode; see chapter 8).
Voltages and oscillograms in the power supply section have been measured for both normal operation (⏻) and in the stand-by mode (⏻). As an input signal a colour bar pattern has been used.

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

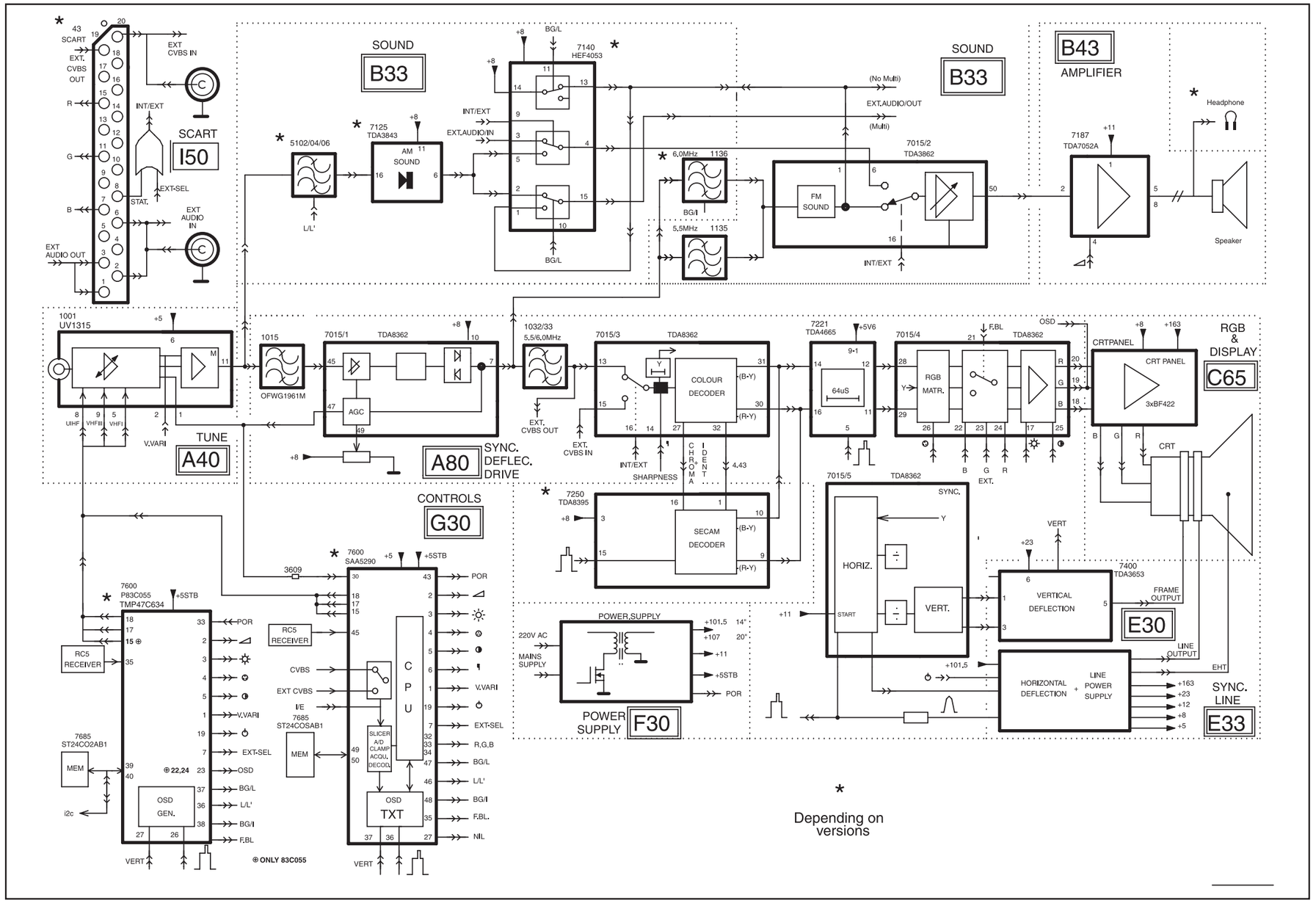
PCB LAYOUT


VG2A
2237
3237
3216
2206
3220
GND
3219
9201
3229
3215
3202
3228
7227
VG1
3213
9202
3236
PANEL
RGB
3203
3207
FF
FE
CONTROLS
SOUND
AMPL.
42A
2192
9194
9191
2185
2514
9523
2509
8524
POWER
SUPPLY
6504
6505
2504
2502
6503
6502
2507
2505
50
M1
2500
5500
3501
T2A
1500
9503
3504
49
M2
22
TP1
TP3
TP35
TP36

PCB LAYOUT


SOUND OUTPUT
AM-DETECTOR
SECAM
CHROMA
SYNC
TUNE
SOUND AMPLIF.
SCART
SWITCH
VIDEO
SOUND IF
VERT.
LINE
PANEL RGB
CONTROLS
SOUND AMPL.
POWER SUPPLY

Block Diagram



* Depending on versions

TP22 ⏀ 0.5V / div AC 20µs / div

TP30 ⏀ 1V / div DC 10µs / div

TP23 ⏀ 0.5V / div AC 20µs / div

TP31 ⏀ 20mV / div AC 0.5ms / div

TP24 ⏀ 0.1V / div AC 20µs / div

TP32 ⏀ 20mV / div AC 0.2ms / div

TP25 ⏀ 0.1V / div AC 20µs / div

TP35 ⏀ 0.5V / div AC 0.2ms / div

TP26 ⏀ 0.2V / div AC 20µs / div

TP36 ⏀ 0.5V / div DC 5µs / div

TP27 ⏀ 0.2V / div AC 20µs / div

TP36 ⏁ 0.2V / div DC 10µs / div

TP6 ⏀ 96V DC

TP6 ⏁ 114V DC

TP7 ⏀ 5V DC

TP7 ⏁ 5V DC

TP8 ⏁ 2V / div DC 20µs / div

TP10 ⏀ 2V / div DC 20µs / div

TP12 ⏀ 10V / div DC 20µs / div

TP14 ⏀ 100V / div DC 20µs / div

TP16 ⏀ 5V / div DC 5ms / div

TP18 ⏀ 2V / div DC 5ms / div

TP20 ⏀ 1V / div DC 20µs / div

TP28 ⏀ 1V / div DC 10µs / div

TP8 ⏀ 2V / div DC 2µs / div

TP9 ⏀ 0.2V / div DC 20µs / div

TP11 ⏀ 1V / div DC 5ms / div

TP13 ⏀ 2V / div DC 20µs / div

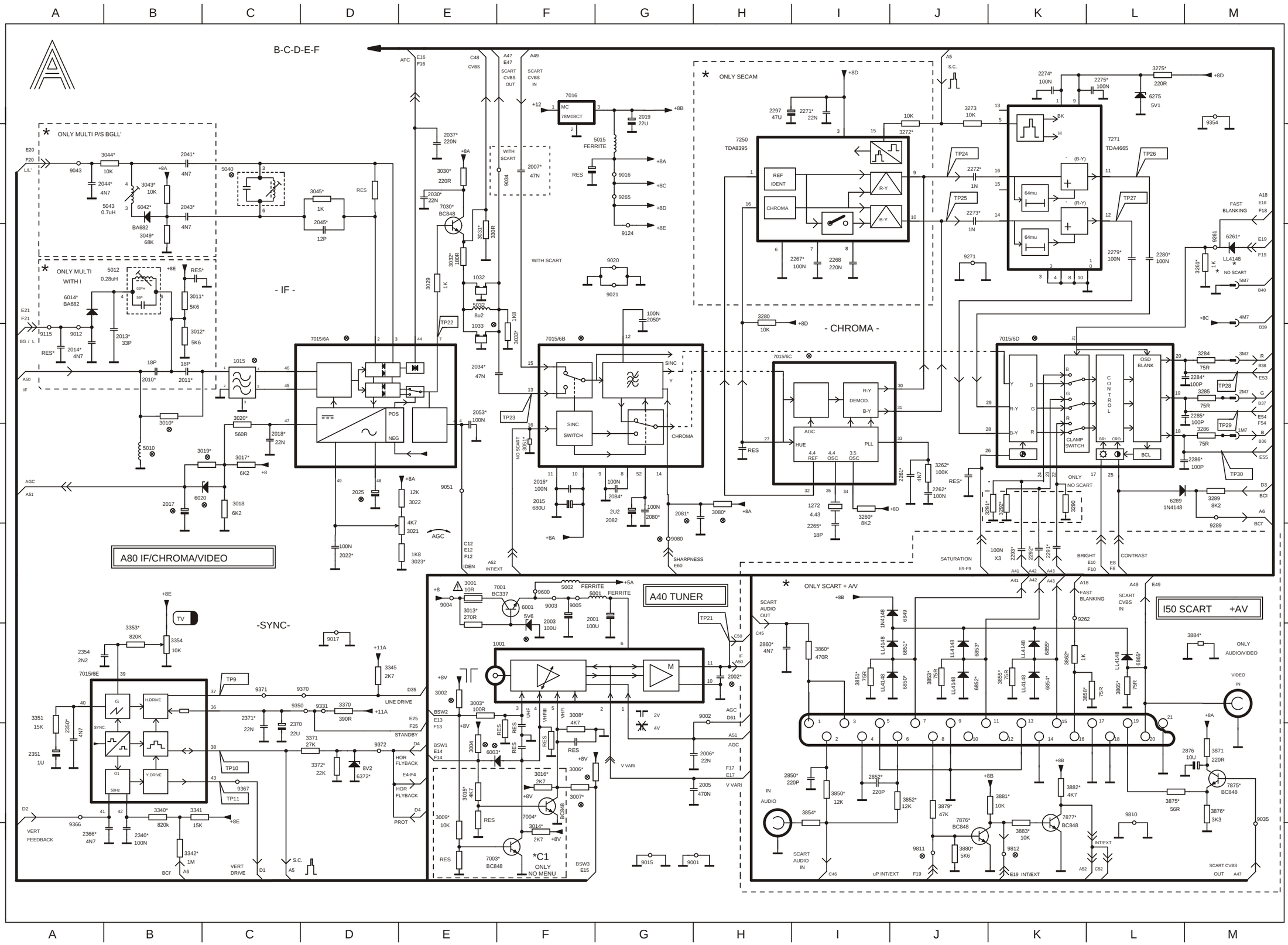
TP15 ⏀ 10V / div DC 5ms / div

TP17 ⏀ 1V / div DC 1ms / div

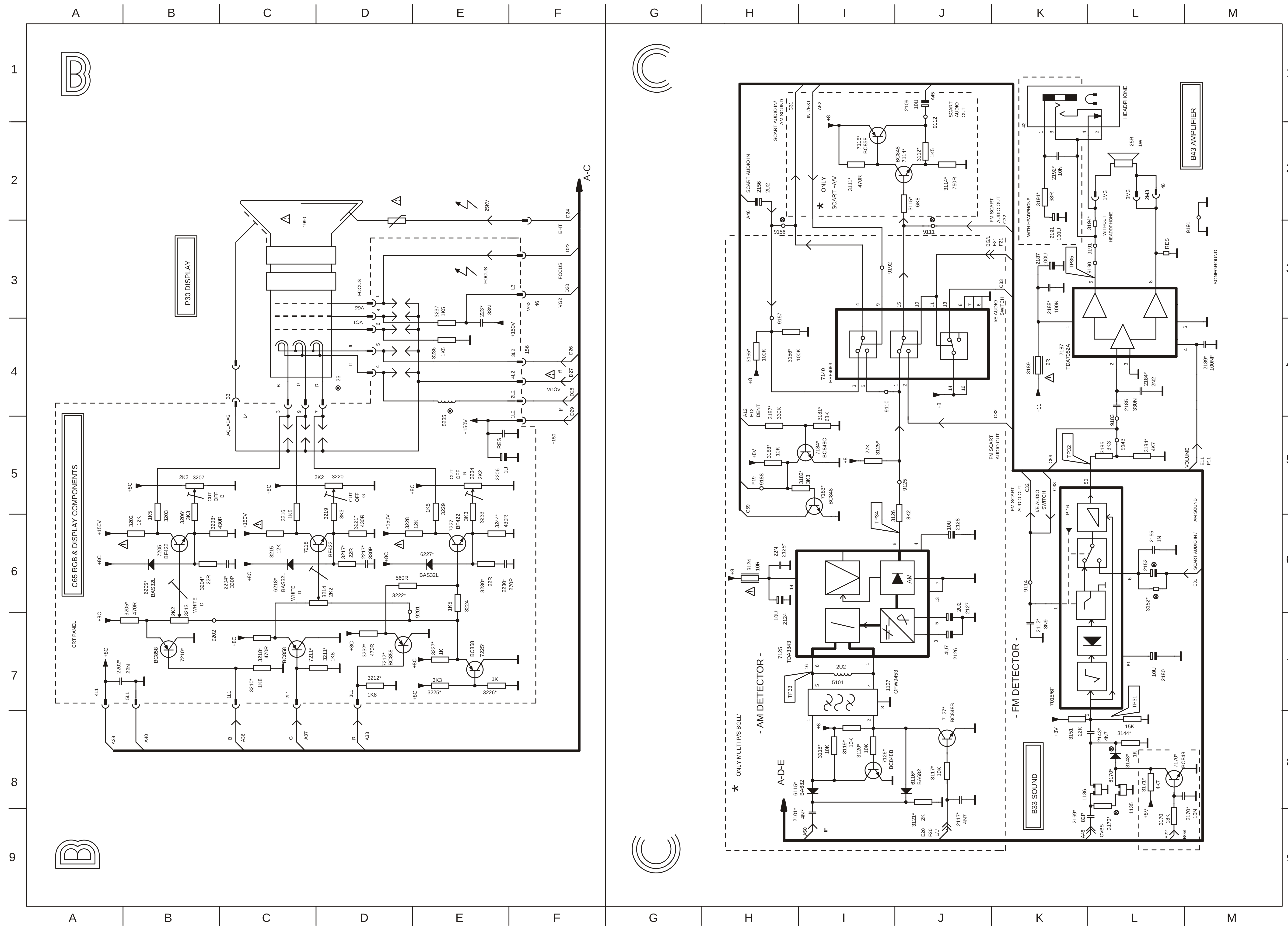
TP19 ⏀ 2V / div DC 20µs / div

TP21 ⏀ 5mV / div DC 50µs / div

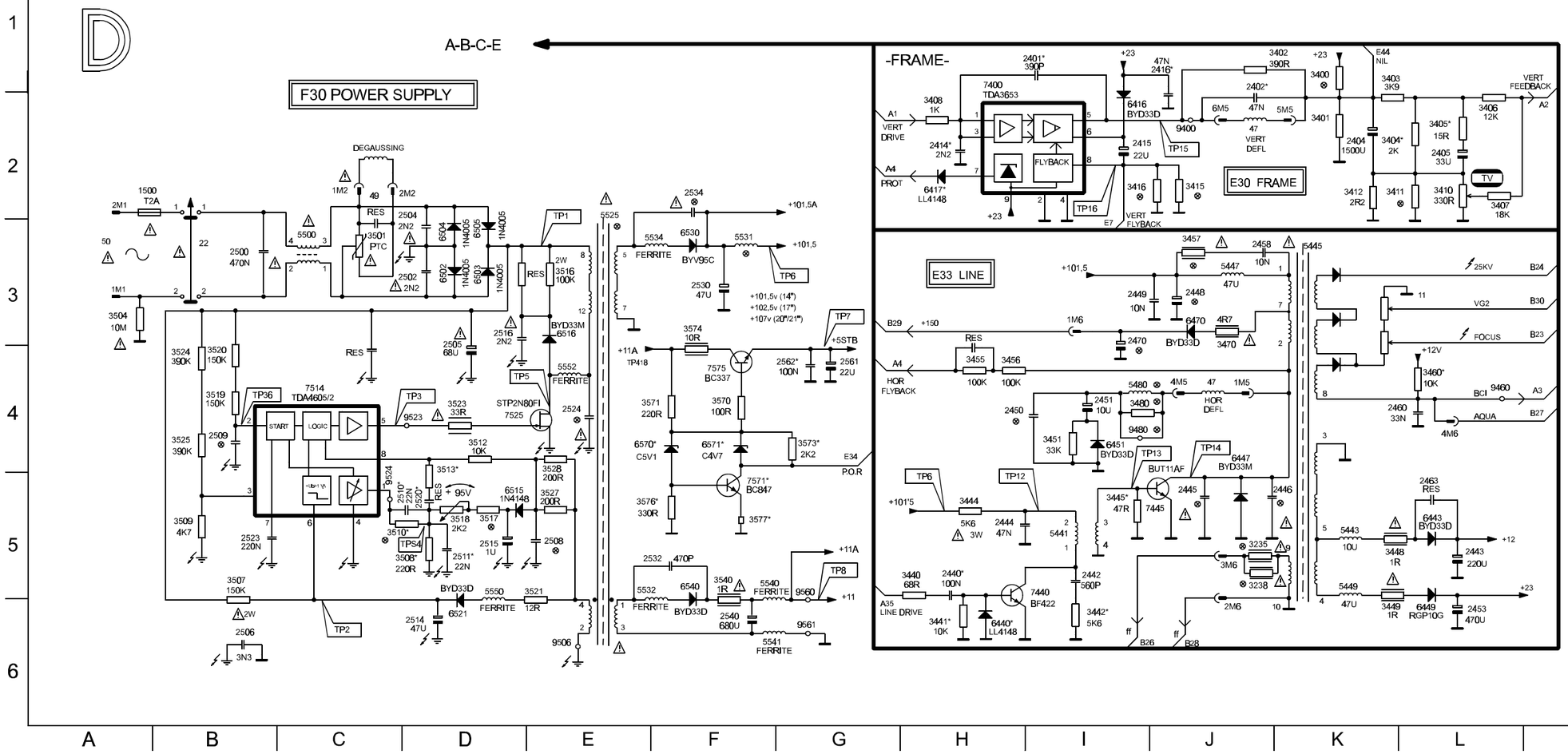
TP29 ⏀ 1V / div DC 10µs / div



1001	F7	3286	M5
1015	C4	3289	M5
1032	E3	3290	K5
1033	E4	3291	K5
1272	I5	3292	K5
2001	G5	3340	B8
2002	H7	3341	B8
2003	F6	3342	B9
2005	H8	3345	D7
2006	H8	3351	A7
2007	F2	3353	B7
2011	B4	3354	B7
2013	B4	3370	D7
2014	A4	3371	D8
2015	F5	3372	D8
2016	F5	3850	I8
2017	B5	3851	I7
2018	C5	3852	J8
2019	G1	3853	J7
2022	D6	3854	I9
2025	D5	3855	K7
2030	E2	3858	L7
2034	F4	3860	I7
2037	E2	3862	K7
2041	B2	3865	L7
2043	B2	3875	L8
2044	A2	3876	M8
2045	D3	3879	J8
2050	G3	3880	J9
2053	E5	3881	K8
2080	G4	3882	K8
2081	H5	3883	K9
2082	G4	3884	M7
2084	G4	5001	G6
2261	J5	5002	F6
2262	J5	5010	B5
2265	I6	5012	B3
2267	I3	5015	G2
2268	I3	5032	E3
2271	I1	5040	C2
2272	J2	5043	B2
2273	J2	6001	F7
2274	K1	6003	F8
2275	L1	6014	A3
2279	L3	6020	C5
2280	L3	6042	B2
2284	L4	6261	M3
2285	L4	6275	L1
2286	L5	6289	L5
2291	K6	6372	D8
2292	K6	6849	J6
2293	K6	6850	J7
2297	H1	6851	J7
2340	B9	6852	J7
2350	A8	6853	J7
2351	A8	6854	K7
2354	A7	6855	K7
2366	B9	6865	L7
2370	C8	7001	F6
2371	C8	7003	F9
2850	I8	7004	F8
2852	I8	7015	D4
2860	H7	7016	F1
2871	M8	7030	E2
2876	M8	7250	H2
3001	E6	7271	L2
3002	E7	7875	M8
3003	E7	7876	J9
3004	E8	7877	K9
3007	F8	9001	H9
3008	F8	9002	H8
3009	E9	9003	F6
3010	B4	9005	F6
3011	B3	9012	A4
3012	B4	9015	G9
3013	E6	9016	G2
3014	F9	9017	D7
3015	E8	9020	G3
3016	F8	9021	G3
3017	C5	9034	F2
3018	C5	9035	M9
3019	C5	9043	A2
3020	C5	9051	E5
3021	E6	9080	G5
3022	E5	9115	A4
3023	E6	9124	G3
3029	E3	9261	M3
3030	E2	9262	K6
3031	E3	9265	G2
3032	E3	9271	J3
3033	F4	9289	M5
3043	B2	9331	D7
3044	B2	9350	D7
3045	D2	9354	M1
3051	F5	9366	A8
3080	H5	9367	C8
3260	I5	9370	D7
3261	M3	9371	C7
3262	J5	9372	D8
3272	J1	9600	F6
3273	J1	9810	L9
3275	L1	9811	J9
3280	H4	9812	K9
3284	M4		
3285	M4		



42	K1
1135	L8
1136	L8
1137	I7
1990	C3
2101	I9
2109	J1
2112	K7
2117	J8
2124	H6
2125	H6
2126	J7
2127	J7
2128	J6
2143	L8
2152	L6
2155	L6
2156	H2
2169	L9
2170	L8
2180	L7
2184	L4
2185	L4
2187	K3
2188	K3
2189	M4
2191	K2
2192	K2
2202	A7
2204	C6
2206	E5
2217	D6
2230	E6
2237	E4
3111	I2
3112	J2
3114	J2
3115	J2
3117	J8
3118	I8
3119	I8
3120	I8
3121	J8
3124	H6
3125	I5
3126	J5
3143	L8
3144	L8
3151	K8
3152	L6
3155	H4
3156	H4
3170	L9
3171	L8
3173	L8
3181	I5
3182	I5
3184	L5
3185	L5
3187	H5
3188	H5
3189	K4
3191	K2
3194	L3
3202	B6
3203	B5
3204	B6
3205	B7
3206	B5
3207	B5
3208	B6
3210	C7
3211	D7
3212	D7
3213	B7
3214	D6
3215	C6
3216	C5
3217	D6
3218	C7
3219	D5
3220	D5
3221	D6
3222	D6
3224	E6
3225	E7
3226	E7
3227	E7
3228	E6
3229	E5
3230	E6
3232	D7
3233	E5
3234	E5
3236	E4
3237	E4
3244	E6
5101	I7
5235	E4
6115	I8
6116	J8
6170	L8
6205	B6
6218	C6
6227	E6
7114	J2
7115	I2
7125	I6
7126	I8
7127	J8
7140	I4
7170	L8
7183	I5
7184	I5
7187	K4
7205	B6
7210	B7
7211	C7
7212	D7
7218	D6
7225	E7
7227	E6
9110	I4
9111	J3
9112	J1
9114	K6
9125	J5
9143	L5
9156	H3
9157	H3
9183	L5
9188	H5
9190	L3
9191	L3
9192	I3
9201	D6
9202	B7



⊗	1W	3W
1540	630MA	1A
7187	TDA7052	TDA7056

⊗	PAL BG	PAL-I	PAL/SECAM BG-DK	PAL/SECAM BG-L-L'	PAL/SECAM BG-L-L'-I
1001	UV1315	UV1343	UV1315	UV1315	UV1315
1015	G1961	J1951	G1961	K3953	G3957
1032	5.5MHz	---	5,5MHz	5.5MHz	5,5MHz
1033	---	6.0MHz	6.5MHz	---	6.0MHz
1135	---	---	6.5MHz	---	6.0MHz
1136	5.5MHz	6.0MHz	5,5MHz	5,5MHz	5,5MHz
2002	---	---	---	5P6	5P6
2017	47U	47U	47U	100U	100U
2025	2U2	2U2	2U2	4U7	4U7
2152	---	---	---	10U	10U
3010	0R05	0R05	0R05	68R	68R
3019	150R	150R	150R	3K6	3K6
3152	0R05	0R05	0R05	---	---
3173	---	---	0R05	---	620R
3604	150R	150R	150R	22R	22R
5010	1U2	1U2	1U2	0U56	0U56
5040	0MUH19	0MUH19	0MUH19	0MUH3	0MUH3
6020	---	---	---	2V4	2V4
6170	---	---	0R05	---	620R
7015	TDA8360/1	TDA8360/1	TDA8362	TDA8362	TDA8362
9111	JMP	JMP	JMP	---	---
9156	JMP	JMP	JMP	---	---

⊗	14	17	20 PH	21 PH	20 SAM	21 SAM
2445	---	220P	---	---	470P	---
2446	8N2	8N2	9N1	9N1	9N1	8N2
2448	10U	47U	47U	47U	47U	47U
2450	470N	330N	330N	470N	330N	470N
2470	10U	22U	22U	22U	22U	22U
3238	---	---	---	---	1R	2R
3400	---	2K4	2K4	2K4	2K4	2K4
3401	2K4	1K2	1K2	1K2	1K2	1K2
3480	---	1K2	1K2	1K2	1K2	1K2
5480	---	AT4042	AT4042	AT4042	AT4042	AT4042
5500	CU15	CU15	CU15D3	CU15D3	CU15D3	CU15D3
9480	JMP	---	---	---	---	---

⊗	14/17"	20/21"
2202	22N	100
2204	330P	470P
2206	1U	10U
2217	330P	470P
2230	270P	470P
2237	15N	33N
2508	6N8	3N9
2509	3N9	3N3
2524	1N	470P
2534	1N	---
3208	430R	360R
3221	430R	360R
3222	560R	390R
3225	3K3	3K9

⊗	14/17"	20/21"
3235	1R	2R
3244	430R	360R
3289	8K2	15K
3404	2K	2K7
3407	18K	12K
3412	2R2	1R5
3415	2K2	1K5
3416	2K2	1K5
3457	27R	47R
3510	750R	1K2
3517	6K2	5K6
5445	LOT 14	LOT 20
5525	SOPS 14	SOPS 20
5531	9X3.5	SPT0508A

22	B3	3509	B5
47	J2	3510	D5
47	J4	3512	D4
49	C3	3513	D4
1500	A2	3516	E3
2401	I1	3517	D5
2402	J2	3518	D5
2404	K2	3519	B4
2405	L2	3520	B4
2414	H2	3521	E5
2415	I2	3523	D4
2416	J2	3524	B4
2440	H5	3525	B4
2442	I5	3527	E5
2443	L5	3528	E4
2444	H5	3540	F5
2445	J5	3570	F4
2446	K5	3571	F4
2448	J3	3573	G4
2449	J3	3574	F4
2450	I4	3576	F5
2451	I4	3577	F5
2453	L6	5441	I5
2458	J3	5443	K5
2460	L4	5445	K3
2463	L5	5447	J3
2470	I3	5449	K5
2500	B3	5480	I4
2502	D3	5500	C3
2504	D3	5525	E3
2505	D4	5532	F5
2506	B6	5534	F3
2508	E5	5540	F5
2509	B4	5541	F6
2510	D5	5550	D6
2511	D5	5552	E4
2514	D6	6416	I2
2515	D5	6417	H2
2516	D3	6440	H6
2520	D5	6443	L5
2523	B5	6447	J5
2524	E4	6449	L6
2530	F3	6451	I4
2532	F5	6470	J3
2534	F2	6502	D3
2540	F6	6503	D3
2561	G4	6504	D3
2562	G4	6505	D3
3235	J5	6515	D5
3238	J5	6516	E3
3400	K1	6521	D6
3401	K2	6530	F3
3402	J1	6540	F5
3403	K2	6570	F4
3404	L2	6571	F4
3405	L2	7400	H2
3406	L2	7440	H5
3407	L2	7445	J5
3408	H2	7514	C4
3410	L2	7525	E4
3411	L2	7571	F5
3412	K2	7575	F4
3415	J2	9400	J2
3416	J2	9460	L4
3440	H5	9480	I4
3441	H6	9506	E6
3442	I6	9523	D4
3444	H5	9524	C5
3445	I5	9560	G5
3448	K5	9561	G6
3449	K5	1M1	A3
3451	I4	1M2	C2
3455	H4	1M5	J4
3456	H4	1M6	I3
3457	J3	2M1	A2
3460	L4	2M2	C2
3470	J3	2M6	J5
3480	I4	3M6	J5
3501	C3	4M5	J4
3504	A3	4M6	L4
3507	B5	5M5	K2
3508	D5	6M5	J2

G30 CONTROLS

A-C-D

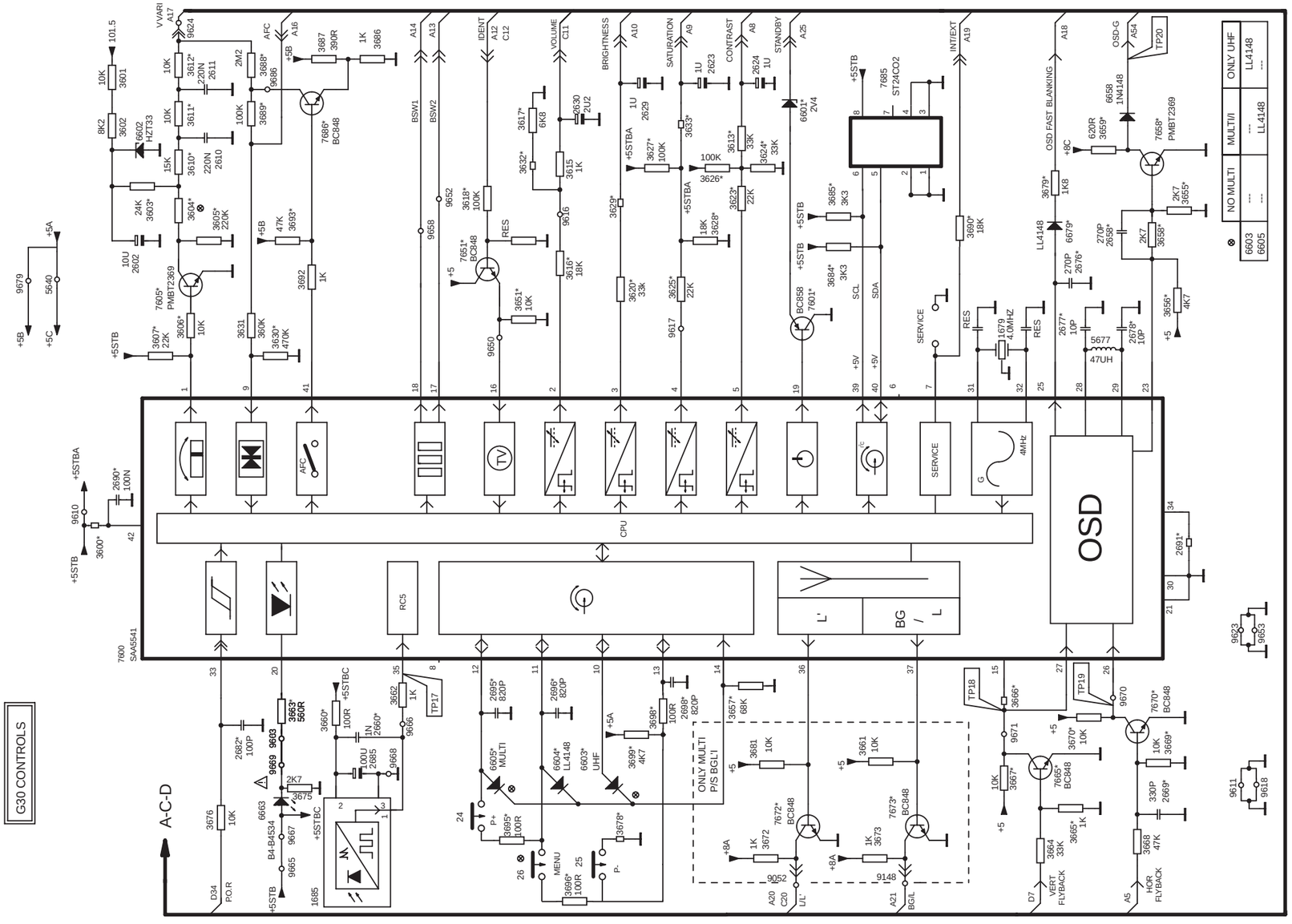
ONLY MULTI P/S BGL'I

⊗	TXT	NO TXT
7600	SAA5531	SAA5541
1679	XTAL 12MHz	CST 12.00
2680	68pF	---
2681	68pF	---

⊗ MENU	NO MULTI	ONLY UHF	MULTI/I	MULTI
3600	---	10K	10K	---
3690	0R05	---	---	0R05
3695	10K	10K	10K	10K
3696	---	---	---	---
3650	---	---	10K	10K
3657	0R05	0R05	---	---
3698	---	---	---	---

NO ⊗ MENU	SCART		NO SCART	
	ENGLISH ONLY UHF	GLOBAL	ENGLISH	GLOBAL
3600	10K	---	10K	---
3690	---	0R05	---	0R05
3695	---	---	---	---
3696	0R05	0R05	0R05	0R05
3650	---	---	10K	10K
3657	0R05	0R05	---	---
3698	---	---	10K	---

* ONLY NO MENU



24	F7	7672	H7
25	G8	7673	I7
26	F8	7685	I2
1679	J4	7686	E2
1685	E8	9052	H8
2602	C3	9148	I8
2610	D2	9603	E7
2611	D2	9610	C5
2623	H2	9611	L7
2624	H2	9616	G3
2629	G2	9617	H4
2630	G2	9618	L7
2658	K3	9623	L6
2660	E7	9624	D2
2669	K7	9650	F4
2676	J4	9652	F3
2677	K4	9653	L6
2678	K4	9658	F3
2682	D7	9665	E8
2685	E7	9666	E7
2690	C5	9667	E7
2691	K5	9668	E7
2695	F7	9669	E7
2696	G7	9670	K7
2698	G7	9671	J7
3600	C5	9679	C4
3601	C2	9686	D2
3602	C2		
3603	C3		
3604	D3		
3605	D3		
3606	D4		
3607	D4		
3610	D3		
3611	D2		
3612	D2		
3613	H2		
3615	G3		
3616	G3		
3617	F2		
3618	F3		
3620	G4		
3623	H3		
3624	H3		
3625	H4		
3626	H3		
3627	G3		
3628	H3		
3629	G3		
3630	D4		
3631	D4		
3632	F3		
3633	H2		
3651	F4		
3655	K3		
3656	K4		
3657	H6		
3658	K3		
3659	K3		
3660	E7		
3661	I7		
3662	E7		
3663	E7		
3664	J8		
3665	J7		
3666	J7		
3667	J7		
3668	K8		
3669	K7		
3670	K7		
3672	H8		
3673	I8		
3675	E7		
3676	D7		
3678	G8		
3679	J3		
3681	H7		
3684	I3		
3685	I3		
3686	E2		
3687	E2		
3688	D2		
3689	D2		
3690	J3		
3692	E3		
3693	E3		
3695	F8		
3696	G8		
3698	G7		
3699	G7		
5640	C4		
5677	K4		
6601	H2		
6602	C3		
6603	G7		
6604	G7		
6605	F7		
6658	K2		
6663	E7		
6679	J3		
7600	D6		
7601	H4		
7605	D4		
7651	F3		
7658	K3		
7665	J7		
7670	K7		

CIRCUIT DESCRIPTION

1.- SMALL SIGNAL PROCESSING (Diagram A)

The small signal is processed by TDA8361, (TDA8360 no scart) for Pal sets and TDA8362 for Pal/Secam sets (IC 7015), including IF detection, video processing, chroma decoder, RGB processing, sync processor and FM sound decoder.

1.1- IF detection (IC7015/6A)

- IF input (pins 45,46): The IF signal comes from pin 11 of the tuner to the IF SAW (Surface Acoustic Wave) filter (1015) and the IF-detector IC7015/6A (pins 45 and 46).
- IF filter (1015): The IF bandpass characteristic, determined by the SAW filter, is 33.4 to 38.9 MHz. for BG sets, 33.5 to 39.5 MHz. for PAL I sets and 32.4 to 38.9 MHz. for DK sets.
- IF oscillator (pins 2,3): Carrier frequency, present in coil L5040, is tuned at 38.9 MHz. for BG sets or 39.5 MHz for Pal I sets
- AGC voltage (pin 47): The AGC delayed voltage is applied to pin 1 of the tuner. It should be adjusted for 1mV. antenna signal by means of R3021 (pin 49).
- AFC signal (pin 44): The Automatic Frequency Control is obtained from the reference signal of the IF-detector. C2037 smoothes the AFC voltage.
- Identification (pin 4): The identification output is applied to pin 16 of the µC. This signal is high in case of signal detected.
- Video output (pin 7) : This baseband CVBS signal with 2Vpp of nominal amplitude, also 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 BGLL', 6.0 MHz. Pal I or 6,5 MHz. for DK.

Multistandard sets

-The IC TDA8362 changes automatically between negative (BGIDK) and positive (LL') modulation. The IC also determines if the AGC circuit should control at the top white level of the video (positive modulation) or at the top sync level (negative modulation).
-Saw filter (1015) bandpass characteristic is modified by BG/L switching signal proceeding from the microcontroller:
- For BGIDK reception BG/L is low, D6014 does no conduct and the bandpass filter is tuned by 5012 and 2013 at 32.9MHz. to 38,9 MHz.
- For LL' reception BG/L is high, D6014 conducts and so the bandpass filter is tuned by 5012 and C2014 at 32.4 to 38.9 MHz.

-Oscillator frequency is controlled by the L/L' switching signal:
-For BGIL reception L/L' is low, D6042 conduct and so coil 5043 is connected in parallel to 5040.
- The circuit is tuned to 38.9 MHz.
- For L' reception L/L' is high, D6042 does nor conduct and the circuit is tuned to 33.4 MHz. by L5040 only.

1.2- Source select, luminance and chroma separation (IC7015/6B)

- Source select (pin 13, 15, 16): The internal CVBS signal is now fed to pin 13 IC7015/6B. External CVBS from the pin 20 of Euroconnector is present on pin 15. The source selector switch between internal (pin 16 = 0V.) or external (pin 16 = 8V.).
- Luminance and chrominance separation: Chrominance signal is filtered out (-20dB) by a luminance notch filter which is internally calibrated at the subcarrier frequency (4.43MHz).

1.3- Chroma Decoding (IC7015/6C)

Pal or Secam signals are recognized automatically by the IC. For Pal signals decoding is made in IC7015/6C and for Secam signals in IC7250 (TDA8395).
- Pal signal: This signal is amplified and demodulated. The 4.43 MHz. reference crystal for chrominance demodulation is present at pin 35 of IC7015/6C. The R-Y and B-Y out-puts (pins 30, 31) are applied to chroma delay line IC7221 (TDA4665).
- Secam signal (pin 27): This signal is applied to pin 16 of Secam decoder IC7250.

- Secam reference (pin 32): Pal or Secam signals are recognized using a DC level by bi-directional communication line between this pin and pin 1 of IC7250.

-If IC7015/6C has detected a Pal signal, Vpin 32 is made 1,5V. By then the demodulated R-Y and B-Y outputs (pins 30, 31) are applied to delay line IC7271.

-If IC7015/6C has not detected a Pal signal, Vpin 32 is made 5V. By then the demodulated R-Y and B-Y at outputs (pins 30, 31) are not used.

-If IC7250 has detected a Secam signal, Vpin 1 IC7250 becomes low, sinking typical 150µA. current from pin 32 (5V.) of IC7015/6C, which one detect this current to know that a Secam signal has been detected. In this case R-Y and B-Y signals are applied to the delay line IC7271 via outputs of IC7250 (pins 9 and 10).

This bi-directional communication line uses AC level to calibrate the 4,43MHz. between the PLL and chroma cloche filter of IC7250.

1.4- RGB-dematrixing(IC7015/6D)

- R-Y, B-Y inputs (pins 28, 29): The R-Y and B-Y signals come from delay line (IC7271) and the Y signal comes (internally) from IC7015/6B.

The sandcastle pulse coming (internally) from the IC7015/6E (pin 38) synchronizes RGB dematrixing and suppresses the RGB signals during line and frame flyback.

- Video controls (pins 17, 25, 26): These inputs for contrast, brightness and saturation can be adjusted from 0,5V to 4,5V by the µC. If beam current is limited reducing contrast with D6289 circuit.

- RGB inputs (pins 22, 23, 24): External RGB inputs come from Euroconnector and are switched by fast blanking.

- Fast blanking (pin 21): When voltage of pin 21 is 0,4V. internal RGB is used. For a pin 21 voltage between 0,4V. and 3,5V. the set switch to external RGB.

If voltage of pin 21 is 4V. both internal and external are deleted. The up uses this status to insert RGB signals from OSD generator directly to RGB outputs.

Fast blanking can switch signals for full screen (by a DC voltage) or for a part of the screen (by a pulse voltage).

- RGB outputs (pins 18, 19, 20): See RGB amplifier.

1.5- Horizontal synchro (IC7015/6E)

- Start up (pin 36): When the set is switched on, voltage at pin 36 rises and when exceeds 7V. the horizontal oscillator starts running at approx. 25 KHz. (slow start). After the line starts, main supply of IC7015 (pin 10) comes up to 8V. and the line frequency changes to 15625 Hz.

- **Standby (pin 36)**: This pin is used also for standby function. In this case the voltage is reduced to 3V. by the uP and so the line is shut down.

- Hor. oscillator: This oscillator is fully integrated and internally calibrated. Frequency is obtained derived of chroma oscillator on pin 35 of IC7015/6C.

- Hor. sync separator: This circuit (fully integrated) separates hor. pulses of CVBS proceeding from 7051/6B.

- Oscillator synchro (pin 40): Oscillator is synchronized with video signal by a first control loop circuit. The control voltage is present at pin 39.

- Hor. phase control (pin 39): Line fly-back (pin 38) is synchronized with oscillator by a second control loop circuit. The control voltage is present at pin 39. Phase can be adjusted by 3354.

- Hor. output (pin 37): Oscillator is converted in square wave voltage at this pin.

- **Sandcastle (pin 38)**: This pin is used as line fly-back input and also as sandcastle output. Levels of sandcastle pulse are 5,3V for burst detection, 3V. for line blanking and 2V. for frame blanking.

1.6- Vertical synchro (IC7015/6E)

- Vertical oscillator (pin 42): Frequency is obtained dividing frequency of chroma oscillator on pin 35 IC7015/6C. At pin 42 a sawtooth signal is present. Resistor 3342 is used to correct vertical amplitude with beam current.

- Vert. sync. separator: It separates frame sync. pulses from CVBS and so synchronizes frame oscillator.

- Vert. drive (pin 43): This out-put is used to drive the vertical amplifier (7400)

- Vert. feedback (pin 41): this feedback is proportional to deflection current and is used to correct the vert. drive signal.

2.- RGB AMPLIFIERS (diagram B)

- RGB inputs : The RGB signals available at pins 20, 19 and 18 of IC7015/6D are drived by emitter followers (7210, 7211, 7212), to RGB amplifiers.
- Reference voltage (7225): An internal reference voltage of 2.5V. is produced on the emitter of transistor 7225 to keep the black level stable.
- RGB amplifiers (7205, 7218, 7227): Signal is inverted and drived to the CPT by RGB amplifiers. To improve high frequency amplification there are small capacitors (2204, 2217 and 2230).
- Flash-over protections: Clamping diodes to +8V. (6203, 6216, 6229) and 1K5 series resistors (3203, 3216, 3229) are added for protect the circuit from CPT flash-over.
- White adjustment: The gain of B and G amplifiers can be adjusted by 3213 and 3214.
- Cut-off adjustment: The black level of the CPT can be adjusted by 3207, 3220, 3234 and Vg2.

3.- SOUND CIRCUIT (diagram C)

3.1- FM Sound detection (IC7015/6F)

- FM input (pin 5): FM sound is extracted from baseband video (CVBS) proceeding of IF detector and filtered through 1136 (5.5 MHz. for BG sets, 6.0 Mhz. for Pal I sets, 6.5 Mhz. for DK sets).
- FM demodulation: FM - mono sound demodulation takes place in IC7015/6F. No adjustment is required because demodulation is doing by an automatic PLL (4.2 to 6.8 MHz.).
- De-emphasis (pin 1): Sound frequency characteristic is defined by de-emphasis capacitor C2112 at pin 1.
- External FM audio out (pin 1): The signal at this pin is amplified by T7114 and T7115 to drive the euroconnector sound outputs (pins 1,3).
- External FM audio in (pin 6): External audio proceeding of euroconnector (pins 2,6) is applied to this pin. Selection between internal or external is done by pin 16 of IC7015/6B.
This output is drived to pin 3 of the final sound amplifier IC7187 (TDA7052 or TDA7056).

Multistandard sets:
-FM demodulation: This function is done in the same way that no multi sets. The only difference consist of a second Pal I 6MHz. filter (1135) in addition to the 5,5MHz. BG filter (1136). 6MHz. filter is switched off for BG reception by transistor 7170 depending on BG/I signal.
-AM demodulation: In Multistandard sets, also AM demodulation for LL' systems is necessary. AM sound is extracted directly from the tuner instead of from baseband video.

AM Sound detection (IC7125)
- AM input (pins 1,16): AM signal at 32,4MHz. for L system or 39,9MHz. for L', is removed from IF signal coming from tuner by SAW filter 1137 (double band pass characteristic). Sound is switched by T7126, D6115, TS7127 and D6116 depending on L/L' signal: For L' reception (L/L' is high) IF signal is present at pin 1, and For L reception, IF signal is present at pin 2.
The required frequency spectrum is fed to pins 1 and 16 of the AM demodulation IC7125.
- AGC (pin 3,5): C2126 and 2127 are AGC related storage capacitors.
- AM Sound output (pin 6): The demodulated signal at pin 6 of IC7125 is supplied to the source selection switch (pins 1, 5 IC 7140).

AM Sound switching (IC7140)
- External audio out (pin 15): Audio out is selected between AM sound (pin1) or FM sound (pin2) by internal switch depending on BG/L signal (pin 10).
- Audio in (pins 3, 4, 5): Top switch in IC7140 select between internal AM sound (pin 5) and EXT sound from SCART (pin3) by INT/EXT signal (pin 9). The output of this selector (pin 4) is fed to input pin 6 of FM demodulator (IC7015/6F).
- Internal AM audio switching (pin 13): This pin is switched to 8V when the set is in L or L' system (AM sound). Then, pin 1 of IC7015/6F is 8V. and this IC switches internally its sound input from pin 5 to pin 6, where AM sound is present. (Sound proceeding from pin 4 of IC7140 can be internal AM or external).

3.2- Sound amplifier (IC7187)

Sound amplifier can be TDA7052 for 14" and 17" models or TDA7056 for 20" and 21" models.
Amplified sound is drived to the headphones output and loudspeakers. If headphones are connected, loudspeakers are switched off.
Volume control on DC level is present at pin 4 for TDA7052 or pin 5 for TDA7056.

4.- POWER SUPPLY (Diagram D)

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

4.1- Primary side

- Degaussing: R3501 is a dual PTC (2 PTC's in one housing). After switch on set, PTC is cold so low-ohmic and so degaussing current is very high. After degaussing, PTC is heated so high-ohmic, so in normal operation degaussing current is very low.
- Rectifier: Mains voltage is filtered by L5500, full wave rectified by diodes D6502-D6503-D6504-D6505 and smoothed by C2505 (300V. DC for 220V AC mains).

4.2- Control circuit (IC7514)

- Start up and supply (pin 6): When the set is switched on, a current via R3507 is applied to pin 6. When C2514 is charged to 15V. the power supply starts and a current from pin 5 to T7525 is drived. T7525 and starts conduction and a voltage across transformer windings is built up. The voltage across winding 4-2 is rectified by diode D6521 and used to supply the IC on pin 6.
- Soft start (pin 7): The capacitor C2523 causes a slow increase of the duration of the output pulse during start up.
- IC output (pin 5): This output drives T7525. R3523 is a fuse resistor to protect IC from short circuits in T7525. D6516 limits the maximum voltage in T7525.
- Start conduction of T7525 (pin 8): A voltage proceeding from winding 4-2 is applied to this pin. The zero crossing detector recognizes the complete discharge of the energy stored in the transformer core, in addition to a dead time depending on C2508. This circuit guarantee that T7525 starts conduction at minimum Vds voltage (see signals 4.5 pag 13).
- Primary current info (pin 2): Current primary winding is simulated by a pin 2 voltage.
- Output voltage info (pin 1): The voltage across winding 4-2 is rectified by diode D6515, divided by R3527, R3518 and R3508 and applied to pin 1. Internal control voltage (Vcont) inversely proportional to V pin 1 is generated. Tipical Vpin1 is 400 mV.
- Output regulation (pins 1, 2, 8): IC7514 stabilizes output voltage by controlling T-on and so the frequency and the duty cycle:

Start pulse to T7525 is determined by pin 8 circuit (see signals 4.5 page 13).
Then a sawtood voltage Vpin 2 is generated at pin 2. Stop pulse to T7525 is produced when Vpin 2 reaches Vcont.
Output control is done by the following way:
If output is higher, Vpin 1 is higher, Vcont is lower, T-on and output will be reduced.
If output is lower, output will be increased.
Output voltage of supply can be adjusted by R3518.
Mains voltage variation is stabilized in the following way:
If mains voltage is higher, slope in the sawtood voltage Vpin 2 is higher, stop point is reached before and T-on is reduced.
If mains voltage is lower, T-on is increased.

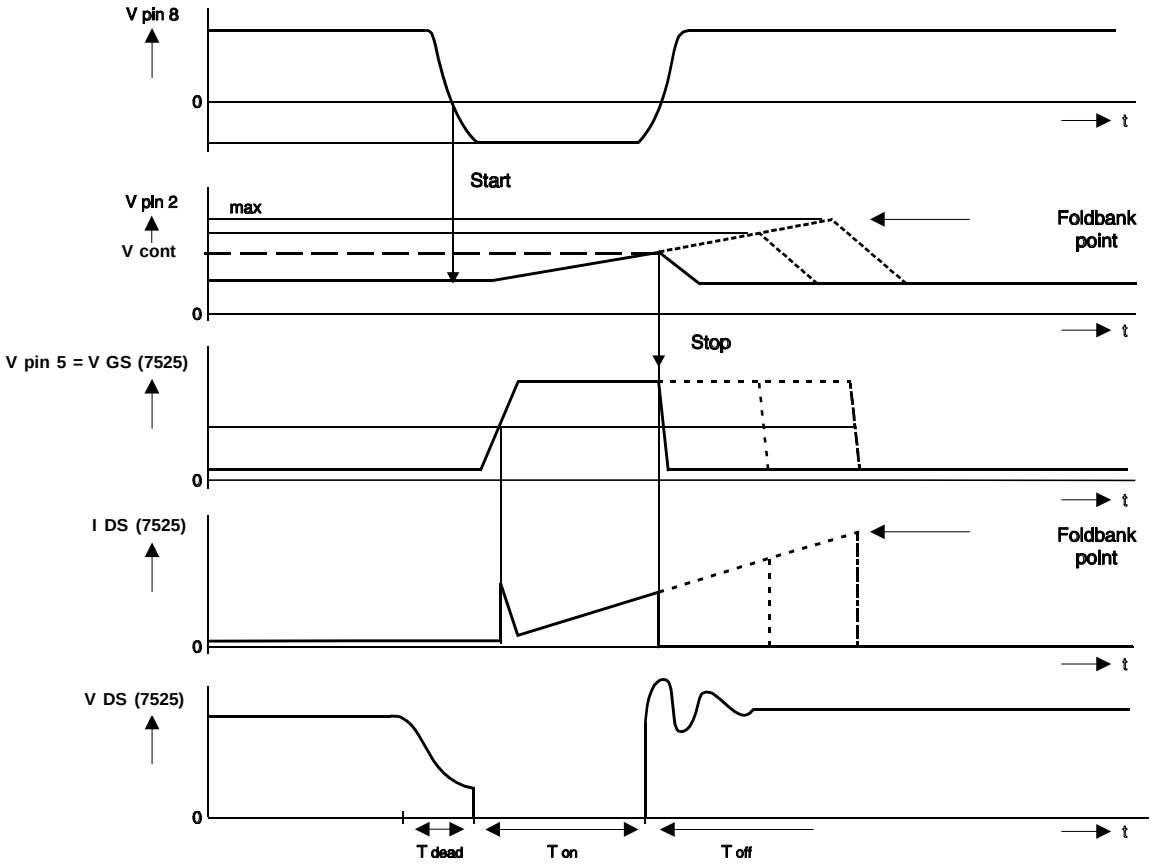
4.3- Protections

- Overload protection (pin 2): This is produced if T-on is increased till Vpin 2 voltage reaches the foldback point (see signals 4.5). The IC will switch into overload mode (off and on continuously).
- Output voltage protections (pin 6): Limiting values of Vpin 6 voltage (7.25 and 16V.) provide under and overvoltage protections for the circuit.
- Mains overvoltage (pin 3): The voltage at pin 3 IC7515 is a measure for the mains voltage and so the DC voltage across C2505. As soon as the voltage Vpin 3 reaches 6.6V. the supply will stop running.

4.4- Secondary side

- Line supply: The value to adjust the supply is 101,5V. for 14" CPT'S, 102,5V. for 17" CPT'S and 107V. for 20"/21" CPT'S. This supply is also used to obtain the +33V. varicap voltage by D6602.
- Auxiliary supply (+11V.): This supply is used for sound output amplifier, for start up the line circuitry and for the stand by of the microprocessor. +5STB is regulated by T7525 and D6575. A +5V. power on reset signal (POR) is obtained during start up by R3573 till T7571 conducts by D6570.

4.5- Power supply signals



5.- DEFLECTION (Diagram E)

5.1- Frame deflection

This function is performed by the integrated circuit TDA3653 (7400).
- Frame supply (pins 6, 8, 9): Pin 9 is used to supply the IC except output stage which one is supplied by pin 6. At pin 6 there is a higher voltage during flyback time. This is produced adding the flyback signal present at pin 8 to a +25V. supply by D6416 and C2415. Pin 8 is also used to drive vertical flyback input at pin 37 of the up. (IC 7600)
- Vertical input (pins 1, 3): The input circuit is driven by pin 44 of IC7015/6E. Vertical signal is amplified and inverted.
- Vertical output (pin 5): Vertical output is applied to deflection coil. DC current is suppressed by C2404. A voltage proportional to current deflection is present in R3411/12 and a feedback of it is sent to pin 42 of IC7015/6 by 3407, so that amplitude can be adjusted by 3410. DC feedback is present in R3406. Linearity is corrected by the network around C2405.
- TRC protection (pin 7): When frame deflection is broken down, the tube is protected blanking all the picture by pin 7 output.

5.2- Line deflection

The final line transistor is driven by the transformer 5441, whose primary winding is driven by the transistor T7440 connected to the line drive output of IC7015/6E.
The horizontal deflection stage is carried out in a conventional way, with the deflection transistor (T7445) and line transformer (5545).
Beam current info (BCI) is present at C2460.
There are the following auxiliary supply voltages obtained from line transformer (5545):
+25V.: To supply frame deflection..
+12V.: To obtain +8V. by IC7016 (diagram A) for small signal, +5V. by T7001 (diagram A) for the tuner and for the microcontroller.

6.- MICROCONTROLLER/TEXT (Diagram E)

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

Following there is an explanation of the different functions of the microcontroller indicating pins number assigned:

- Power supply (pins 31, 39, 44): The IC has several +3,3V power supplies, analog (pin 31), core (pin 39), and periphery (pin 44). All supplies are present during stand by.
- P.O.R. (pin 43): POR (power on reset) is activated when the set is switched on (see 4.4 pag 13). If the system shows abnormal behaviour it is important to reset it switching off/on the set. Reset can be produced also connecting pin 43 to +5V. for an instant.
- LED (pin 20): The LED (6663) lights up with a low current when the television set is ON and with a high current when the set is on Standby. While the set is receiving a remote control signal, the led is blinking.
- RC5 (pin 45): The commands transmitted by the remote control handset are received by infrared receiver (1685) and passed to the microcontroller for decoding.
- Control keys (pins 10, 11, 12): When a control key is activated, the correspondent pin is connected to ground.

- I2C bus (pins 49 and 50): The microcontroller is connected to non-volatile memory IC7685 (EEPROM) via bus I2C. Personal preferences (PP) and channel data are stored in the memory. The system can store 79 channels (with the data on tuning voltage and band) and personal preference.
- Service (pin 7): If this pin is connected to earth when the set is switched on, the unit will go into Service Default Mode (see Repair Facilities in chassis CTN Service Manual).
- Options (pins 14, 21, 52): While start up, the microcontroller checks option pin voltages to know the special features of this chassis. This one is implemented changing the associated components of these pins. Different options (menu, multistandard, etc.) can be seen on tables of diagram E.

- Multistandard out-puts (pins 46, 47, 48): These signals are only used on multistandard units, for switching the system for decoding sound and video. Signals from pins 46 and 47 are inverted and set at the correct level by transistors 7672 and 7673, respectively. After they are inverted together with the signal from pin 48, they make up the system status lines: BG/I is high for Pal I system, BG/ L is high for L and L' systems and L/L' is high for L' system.

- OSD synchronization (pins 36, 37): In order to synchronize the OSD and the TXT information with the picture signal, the VERT FLYBACK signal (pin 37) and HOR FLYBACK signal (pin 36) are added in inverted form to the integrated circuit. Due to this if the video signal is lost, the TXT keeps synchronism. - Video inputs (pins 23 and 24): These inputs are only used on TXT sets. The teletext information is extracted from the video signal inserted on pins 23 (internal video) and 24 (external video), depending on status of INT/ EXT (pin 8).
- Oscillator (pins 41 and 42): A 12-MHz. oscillator is determined by a 12-MHz. crystal between pins 41 and 42.
- Tuning (pins 1, 9, 16, 51): The unit has a VST (Voltage Synthesized Tuning) system. This system works by tuning to a station on the tuner through a linear variation of the tuning voltage (V-VARI) from 0V. to 33V. applied on pin 2 of the tuner. It is generated on pin 1 of the uP and converted to an adequate level for the tuner using T7605. The AFC signal (Automatic Frequency Control) of IF detector is added to the tuning voltage V-VARI by R3689 and R3688 to compensate for the slow variation of the tuning feature.
While searching for the station, pin 51 is set on high, which means that the AFC voltage will not be added to the V-VARI. If an IDENT signal is received on pin 16 while searching for a station, the uP stop searching and checks via input pin 9 if the tuning is correct and whether the AFC signal can be activated again.
- AGC auto tuning (pin 30): This pin is used to limit the AGC voltage in automatic tuning so that noise signals are not memorized.
- Band switching (pins 15, 17, 18): There are 3 outputs for band switching pin 15 for VHFI, pin 17 for VHFIII and pin 18 for UHF. The uP controls the channel band in the tuner by a voltage of +5V. at the correspondent output.
- Picture and sound adjustments (pins 2, 3, 4, 5, 6): Volume control (pin 2), brightness control (pin 3), colour control (pin 4), contrast control (pin 5), and sharpness control (pin 6).
The RC networks are used to convert the modulated pulse output to a DC voltage level. These settings can be pre-programmed in the memory as a personal preference (PP). Mute is controlled internally on the up during automatic station search or when the signal received is interrupted (detected via the IDENT signal on pin 16).
- INT/EXT (pin 8): When this output is 0V. the set is switched to external via transistor (7877). This signal is added to the signal from pin 8 of Euroconnector, so that either of them can be used to switch to external. This line is also used by the microcontroller as an input line, to switch the adequate video input (internal or external) used for decoding TXT.
- Standby (pin 19): When this output is high, the set is switched to stand by. The start-up voltage of the TDA8361A (pin 36) is reduced and the line oscillator stops.
- Fast blanking (pin 35): This pin is used for delete the video picture signal while RGB insertion is produced.
- NIL (Pin 27): This control signal is used (only on TXT sets), to eliminate interlacing for TXT signals. It is applied to the vertical deflection by switching transistor 7640.
- RGB outputs(pins 32, 33, 34): The RGB outputs are used for On-Screen Display (OSD) and also for TXT (TXT character set is used for both functions). RGB signals are applied trough common base amplifiers (7641, 7642, 7644) to RGB outputs of 7015 (pins 20, 19, 18).

PARTS LIST

A	FRONT CABINET GREY	A14GR
B	BACKCOVER GREY	B14GR
C	MAINS KNOB	C
D	KNOB ASSEMBLY	D
E	SENSOR COVER	E
F	OWNERS MANUEL	F
G	MAINS SWITCH E/F/G400	G
H	MICRO SWITCH E/F/G400	H
I	MAIN PCB*NON SERVICE PART	I14
J	CRT PCB	J14
2502	CAP CERPL 2N2 1KV (MURATA	202055890282
2504	CAP CERPL 2N2 1KV (MURATA	202055890282
2516	CAP CERPL 2N2 1KV (MURATA	202055890282
2524	CAP CERPL 1N 1KV (MURATA)	202055890337
2534	CAP CERPL 1N 1KV (MURATA)	202055890337
3203	RES 1K5 1/2W (KAMAYA)	212010308152
3216	RES 1K5 1/2W (KAMAYA)	212010308152
3229	RES 1K5 1/2W (KAMAYA)	212010308152
3236	RES 1K5 1/2W (KAMAYA)	212010308152
3237	RES 1K5 1/2W (KAMAYA)	212010308152
2505	CAP ELEC 68U 385V PM20	222205758689
2446	CAP POL BN2 1KV6 PM10	222237682822
3235	RES NFR25 1R 1/3W	230620403108
3001	RES 10R 1/3W NFR25	230620403109
3523	RES 33R 1/3W	230620403339
3470	RES 4R7 1/3W NFR25	230620403478
3448	RES 1R 1/3W NFR25H	230620703108
3449	RES 1R 1/3W NFR25H	230620703108
3189	RES 2R 1/3W NFR25H	230620703208
3457	RESNFR25H 27R 1/2W PM5	230620703279
3516	RES MET FILM 100K	232219473104
3202	RES 12K 2W PR02	232219473123
3215	RES 12K 2W PR02	232219473123
3228	RES 12K 2W PR02	232219473123
3507	RES MET FILM 150K	232219473154
3444	RES FLM PRO3 5K6 3W	232219533562
3504	RES VR37 10M 1/2W PM5	232224213108
3501	RES PTC 18R 270V 2K	232266296626
1540	FUSE 630MAMP	242208610417
1500	FUSE 2AMP 250V	242208610536
1272	XTL 4.43MHZ HC-49/U	242254300859
1033	CER FILTER 6.0MHZ	242254903572
1015	SAW FILTER	242254941481
5500	MAINS FILTER	311110835001
5441	LINE DRIVER TRAFO U10 3	311233830882
5040	COIL	312212050190
42	CON HEADPHONES E700	312212879791
160	EHT CABLE 14"	312807801731
5445	IND LINE TRANS 14/17	312813820411
5525	IND SOPS TRANS 14"/17"	312813835322
6	LOOP AERIAL	313010020482
3	LOUDSPEAKER 26 OHMS	313010060191
6663	LED B4-B4534 ROJO	313010070023
1685	IR RECEIVER TSOP 1736SA1	313010070024
6530	DIODE BYV37	313010070028
7600	IC SAA5541 MICRO PAINT	313010070310

2450	CAP POL 470N 250V 5%	313010080055
2506	CAP CER Y2 3N3 250VACPM20	313010080068
2500	CAP MKTX2 470N 275V A.C.	313010080071
1679	CER CRYSTAL 12 MHZ	313010080076
1136	CER FILTER 6.0 MHZ	313010080077
1679	CER RESONATOR 12MHZ	313010080220
2	DEGAUSING COIL 14"	313010821271
5	REMOTE CONTROL NO TEXT	313010821361
23	CRT SOCKET	313010861831
1001	TUNER U 1343AS/1	313914712881
7525	SW MODE TRANS STP2N80F1	823009007670
1	TUBE**NON SERVICE PART***	823009009280
7514	TDA4605/3 IC POWER REG	932204988682
7685	IC ST24C02CB1	932206745882
7016	IC REGULATOR MC78M08CT	933623810682
6602	DIODE HZT33	933676010673
6447	DIODE BYD33M	933741030133
6516	DIODE BYD33M	933741030133
7445	TRANS BUT11AF	933760560127
7605	TRANS PMBT2369 SMD	933828890215
7187	IC TDA 7052A	935054410112
7400	TDA3653B/N2 IC	935084350112
7271	IC TDA 4665/V4	935193240112
7015	IC TDA8361 E/N5	935200950112

A	FRONT CABINET 20"	20/21
B	BACK COVER 20"	20
I	MAIN PANEL 14"	14
I	MAIN PANEL 20"	20
J	CRT PANEL 20"	20
1	CRT 14"	823009009280
1	CRT 20"	823020040210
2	DEGAUSING COIL	313010821262
3	LOUDSPEAKER 14" 25OHMS	313010060191
5	REMOTE CONTROL MENU TXT	313010821341
23	CON CRT SOCKET 14"/17" MINI	313010861831
23	CON CRT SOCKET 20/21" NARROW	313010010131
160	EHT CABLE 14"	312807801731
160	EHT CABLE 20"	313010867600
1033	CER TRAP 6,0 MHZ	242254903572
5500	MAINS FILTER 20"	312233831732
6602	DIO HZT33	933676010673
7015	IC TDA8361 E/NS	935200950112
7016	IC MC78M08CT (MOTO)	933623810682
7187	IC TDA 7D66/N2Z	935054420112
7514	IC TDA 4605-2	932204988682
7525	TRA FET STP2N80 FI	823009007670
7600	IC SAA5531 MICRO PAINT TXT	313010070320

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