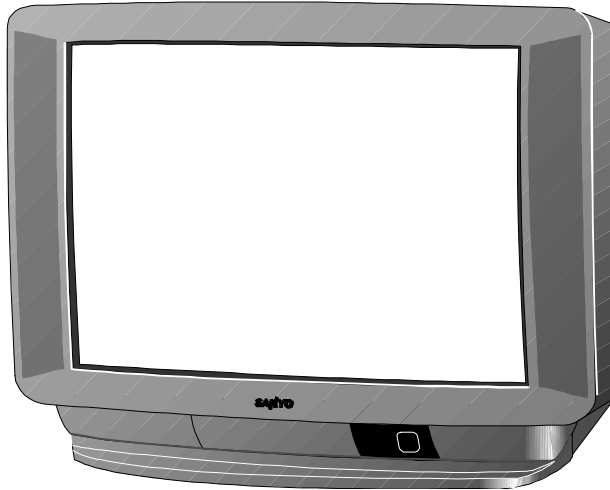


Service Manual

Colour Television

Models: **CE28FN1-E**
CE25FN1-E
CE21FN1-E



CRT 28" A59EAK071X11
 CRT 25" A66EAK071X11
 CRT 21" A51EAL155X10
 CRT 21" A51EAL155X11

CHASSIS No 2103
EB5-A

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Give complete "SERVICE PART No" for parts order or servicing, it is shown on the rating sheet on the cabinet back of the TV set.

Note

This TV receiver will not work properly in foreign countries where the television transmission system and power source differ from the design specifications. Refer to the specifications for the design specifications.

1. Safety instructions

Read this page before doing any operation of adjustment, maintenance or repair the TV set described.

Only skilled personnel of Sanyo Technical Service should do the adjustment, maintenance or repair of TV set.

2. WARNING


For the correct and safe use of the TV set, it is essential that the service personnel follow the process of safety generally accepted and the safety precautions specified in this manual.

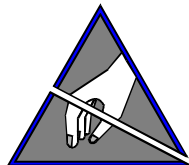
An isolation transformer should be connected in the power line between the receiver and the AC line when a service is performed on the primary side of the converter transformer of the set.

3. Precaution against X-Rays

The primary source of X-RADIATION in the television receiver is the picture tube. The picture tube is specially constructed to limit X-RADIATION emissions. For continued X-RADIATION protection, the replacement tube must be the same type as the original including suffix letter. Excessive high voltage may produce potentially hazardous X-RADIATION. To avoid such hazards, the high voltage must be maintained within specified limit. If high voltage exceeds specified limits, take necessary corrective action. Follow the instructions carefully for +B1 volt power supply adjustment, and high voltage adjustment to maintain the high voltage within the specified limits.

COMPLIANCE TO STANDARDS

All of those marked with * or  must be replaced with original parts



WARNING! This TV set contains components which are particularly sensitive to static electricity (ESD). It is recommended that all due precaution be taken handling integrated circuits and semiconductors.

4. Technical characteristics

Cathode-ray tubes	21" (54 cm) Model CE21FN1-E 25" (65 cm) Model CE25FN1-E 28" (70 cm) Model CE28FN1-E In-Line gun type. Black Matrix.
Tuning system	Voltage synthesis, 100 programs in non volatile memory, AFT, fine tuning (first 10 programs), automatic, semiautomatic and manual channel search.
Program selection	Sequential selection from the controls on the set. Direct selection of any program from the remote-control device.
Receiving channels (Cable and Aerial)	Band I channels E2 ... E4; S1 ... S10; Band III channels E5 ... E12; S11 ... S41; Band IV-V channels E21 ... E69.
TV system	B/G and D/K systems
Colour system	PAL, NTSC 4.43
Audio power	2 x 8 W rms, 10% distortion
Speakers	2 x 8 Ω, full range
Aerial	External aerial-socket 75 Ω IEC.
Headphones	Jack stereo 3,5 mm (with independent control).
AV connectors	1 SCART connector 21-pin, standard CENELEC AV and RGB. 1 SCART connector 21-pin, standard CENELEC AV and S-video. 1 RCA type Video input (front). 2 RCA type Audio R/L input (front).
Power source	220 Vac ... 240 Vac, 50 Hz.
Power consumption CE25FN1-E and CE28FN1-E	108 W (maximum). 72 W (IEC 107-1) 2.5 W (stand-by).
Power consumption CE21FN1-E	87 W (maximum). 65 W (IEC 107-1) 2.3 W (stand-by).
STEREO Systems	Nicam and A2.
Sound effects	Active 3D Surround. Pseudo Stereo. Bass boost. Auto volume
Comb Filter	Models CE25FN1-E and CE28FN1-E
Clock function	Auto capture from teletext.
Alarm function	Programmable over 24 hours.
Timer function	Switch on and off are programmable over 24 hours.
Teletext	Level 1.5 Ftof, Top and List. 10 teletext pages memory. East european TXT included.
Hotel mode	Can be programmed in Hotel and Hotel Rental mode.

5. Safety

It fulfils the safety requirements established in the regulation:

- EN 60065:93

6. EMC (Electromagnetic Compatibility)

It fulfils the EMC requirements established in the regulation:

- EN 55013:1990/A12:1994
- EN 55020:1994
- EN 60555-2:1987

7. Factory special mode

The factory mode is a special TV working mode intended to help in the manufacturing process and it is identified on the screen with the message "FAC". This mode is never suited for customer use.

The main differences respect to normal mode are:

- 1- The standby mode is always disabled.
- 2- The Blue-back (no sync. signal present) is disabled.
- 3- The customer adjustments (volume, contrast ...) work faster.

In case of finding the TV set in Factory mode, it must be taken out of this state. To do so, enter the clock setting menu on the customer OSD and then exit.

8. "HOTEL" and "RENTAL" modes

The TV set has a special mode of operation that is adapted for use in hotels, hospitals... Its main purpose is to avoid the manipulation of the basic TV settings. This mode is stored in NVM, so it is maintained even though the TV set is disconnected from the mains.

Its main features are:

1. The maximum volume level is limited to the volume chosen when the mode is entered.
2. Channel searching and fine tuning are disabled.
3. The TV set always switches on with the normalisation settings and users can not memorise any of their personal preferences.
4. Language selection and child lock are disabled.
5. It is possible to force the TV set to always switch-on in a selected program between the 1st and 8th or AV1.

To activate this mode, hold down the "VOL -" front key and simultaneously, press the "RECALL" remote control key. A message like "HOTEL: 00 " will appear waiting for two digits entry.

The most significant digit indicates the selected mode:

'0': normal mode '1': HOTEL mode '2': RENTAL mode

The second digit indicates the programme in which the set will switch on:

'0': the same as it was selected when the TV set was switched off (normal mode)
 '1' to '8': always this programme selection (1 to 8).
 '9': always AV1 mode

The 'RENTAL' mode has the same features as the 'HOTEL' mode and additionally the front keys are inhibited so it is only possible to change the program with the remote control. In order to exit from this mode, the colour saturation level must be set to zero.

9. Automatic channel search reactivating

In order to reset the initial automatic channel search function, start a channel search in AUTO mode from the user tuning menu and switch-off the TV set before any station is found. The next time the TV set is switched on, it will start an automatic channel-search.

11. Power supply

First, let's define some TV states or working modes to clarify later explanations:

State	Description
SMPS_B_LOW	The power supply is in low consumption (low voltage). The deflection is stopped.
SMPS_B_HIGH	The power supply works at nominal voltage. The deflection can be on or off.
STANDBY	The micro stops "B_HIGH" port oscillation and the power supply is on "SMPS_B_LOW".
ON	The power supply is on "SMPS_B_HIGH" and deflections are on.
ERROR_N	Protect situation. The power supply is on SMPS_B_LOW and the micro shows the error by the led indicator. The TV is not allowed to switch-on (except ERROR_5).

The power supply works in switched mode with "flyback" self oscillating topology and with control in current mode. The outputs of the source are shown in the block diagram. Also there are:

- B8: feeds the power supply controller. The initial source in switch-on situation is extracted through R803+R816.
- B9: feeds the optocoupler primary part.

The power supply sends two signals to the micro processor:

- -PD&FAIL: Switch-off immediately (mains off).
- 16/9&BSYNC: Mains pulses synchronism and 16/9 control. The micro analyses this line in order to switch correctly from SMPS_B_LOW to SMPS_B_HIGH.

In STAND-BY mode all the voltage outputs are reduced except the microprocessor supply (it remains at 5 volts). The triac TR830 disconnects the PTC800 supply.

12. Microprocessor and Teletext

The microprocessor (IC100) main tasks are the following:

- video processor control
- audio processor control
- NVM access
- IR decoding
- Teletext processing and display
- OSD generation
- tuning and AFT
- failure checking
- ...

13. Video processor/Comb filter

The video processor (IC400) has the following functional blocks: video Intermediate frequency, mono sound (not used), vertical and horizontal synchronism, geometry processor, video switching and filtering, colour decoder and RGB processing. All the adjustments are performed by the microprocessor via the I2C bus.

13.1 Video Intermediate Frequency Section

- I.F Amplifier: The input signal comes from the tuner (TU250) through the S.A.W. filter SF200 (band pass filter of the video information and the picture carrier).
- PLL Demodulator and VCO: The VCO does not need any adjust neither external coil. The frequency adjustment is performed through the I2C bus. The components associated with the PLL are connected to the pin 5 (PLLLF).
- Video buffer: The demodulated video signal is present at pin 6 (IFVO) with a typical level of 2Vpp.
- AGC: It controls the IF amplifier gain in order to maintain its amplitude constant. The capacitor connected to the pin 53 (DECAGC) determines the AGC time constant.
- Tuner AGC: It reduces the gain when a high level aerial signal is received. The level at which this reduction is performed is I2C bus adjusted (AGC in the service menu).
- AFC: The AFC information is accessible via I2C bus.
- Video identification: The video identification information is accessible via I2C bus.

13.2 Horizontal and vertical synchronisation

- Horizontal sync separator
- Horizontal oscillator: it is internal and only needs the crystal oscillator X400 as a reference frequency.
- PHI-1 detector: It is a PLL that synchronises the horizontal oscillator with the video signal. The components associated with the PHI-1 are connected to the pin 43 (PH1LF). The PHI-1 time constant and the noise

detector are controlled via I2C bus.

- PHI-2 detector and Sandcastle generator: The PHI-2 detector performs a stable picture. It synchronises the horizontal oscillator with the horizontal flyback signal (pin 41, FBISO) to generate the horizontal output (pin 40, HOUT). The components associated with the PHI-2 are connected to the pin 42 (PH2LF). The picture phase is adjusted via I2C (HOR SHIFT in the service menu). The flyback input pin 41 (FBISO) is combined with the sandcastle output and provides a three level sandcastle signal. The levels are: 2V → vertical retrace; 3V → horizontal retrace; 5.3V → Burstkey.
- Horizontal output (pin 40, HOUT): It is a open collector type and the duty cycle in normal condition is 45% high and 55% low. A built in slow start/stop circuit ensures a smooth start/stop behaviour of the line deflection. Also during switching off via stand by the RGB drive is set to maximum to discharge the EHT CRT capacitance.
- Coincidence detector
- Vertical sync separator
- Vertical divider

13.3 Geometry

- Vertical sawtooth generator: it delivers the reference signals for vertical and horizontal geometry processor. An accurate reference current is used to charge the external capacitor during vertical scan. The resistor R426 in pin 52 (IREF) determines this reference current. It is a Metal Film resistor with 1% tolerance in order to provide a temperature stabilisation and lower dispersion. The ramp capacitor (C425) is connected to pin 51 (VCS). It is a polycarbon one in order to provide temperature stabilisation.
- Vertical geometry processor: it performs the sawtooth signal and it has a differential current output in pins 47 (VDRA) and 46 (VDRB) for a DC coupled vertical output stage (drive). Control functions accessible via I2C are VERT SLOPE, VERT AMPL, S-CORREC, VERT SHIFT (see service menu).
- Horizontal geometry processor (E/W drive): it has a single-ended current output for E-W drive (pin 45 EWD). This current is amplified and applied to the diode modulator of the horizontal deflection. The adjustments are accessible via I2C (EW AMPLIT, PARABOLA, CORNER PAR, TRAPEZIUM in the service menu).
- EHT tracking (pin 50, EHTO): this tracking makes the picture size independent of EHT variations due to the beam current.

13.4 Filters and video switches

- Video signal selection: the input selector has CVBS_INT(pin 13), CVBS_EXT (pin 17), CVBS/Y (pin11) and CHROMA (pin 10) as inputs which can be selected via I2C bus. The selected video signal is present at pin 38 (CVBSO).
- Filter calibration: it is an auto-tuning loop which calibrates every field retrace. The filters are the chrominance bandpass and the chrominance trap.
- Chrominance signal processing: this circuit keeps constant the colour saturation level.
- Luminance signal processing: the selected video signal is supplied to the chrominance trap. The output signal is supplied to the peaking and coring stages. Both are controlled via I2C bus. The output (pin 28 LUMOUT) is fed through a band pass filter (L409, R439 and C440) as internal luminance signal (pin 27 LUMIN).

13.5 Colour decoder

- PLL/VCXO: The PLL operates during the burstkey period. In the lock condition the VCXO reference signal (X400 in pin 35) and the burstkey become synchronous. An optimum transient response can be chosen with the loop filter connected to pin 36 (DET). The reference output (4,43MHz in pin 33) can be used for comb filter applications.
- PAL/NTSC Demodulation: The reference signals from the VCXO are supplied to the HUE phase rotator; its outputs are supplied to the (R-Y) and (B-Y) demodulators. The (B-Y)/(R-Y) baseband signals are filtered and supplied via the PAL/SECAM switch to the internal baseband delay line. The signals from the delay line are RYO (pin 30) and BYO (pin 29).
- SECAM Demodulation: It is realised with a PLL type demodulator. The SECAM reference voltage is generated at pin 16 (SECPLL). The demodulated signal is distributed to the (R-Y) and (B-Y) amplifiers and via de PAL/SECAM switch to the baseband delay line.
- Automatic system manager: it can identify PAL/SECAM/NTSC colour standards. The different possibilities are controlled by the I2C bus.

13.6 RGB Processing

- (R-Y)/(B-Y) processing/matrixing: The amplitude of this signals (pins 32 (RYI) and 31 (BYI)) is controlled via the I2C bus (colour saturation) and also this signals are supplied to dynamic skin control. After the R-Y and

B-Y matrixing, the output signals are added with the luminance signal in order to generate the internal RGB signals.

- RGB selector: it is controlled by the FB signal in signal 26 (RGBIN). The external RGB signals are present in pins 23 (RI), 24 (GI) and 25 (BI). The RGB selector output is fed to then RGB control.

13.7 RGB Control

- Contrast and brightness control: There are I2C bus controlled. These adjustments can be reduced by the beam current limiter stage. Furthermore, contrast is affected by the Peak Beam Limiter (Q670 and Q671 circuitry). This circuit's output is the PBL signal to microprocessor's pin 11 and must be 5V with a black pattern on the screen.
- Beam current limiter/vertical guard: The BCLIN (pin 22) input circuit functions as an average beam current limiter as well as a peak white limiter. The vertical deflection works correctly when there is a pulse level above 3.7V during the vertical retrace. The vertical guard function can be I2C controlled. The contrast and brightness reduction begins when BCLIN level is below 3.0V and 2.0V respectively.
- Continuous cathode calibration (AKB): it is divided into two loops: a black level stabilisation and a cathode drive stabilisation. Each gun of the CRT is stabilised sequentially and independently and a feedback current flows to the black current input (pin 18 BLKIN) supplied by the RGB amplifier (IC500). In order to change the cathode levels at the picture tube three I2C bits are available.
- White point adjust and blue stretcher.

13.8 Supply and bandgap decoupling

The IC400 has two supply pins 12 and 37. Both pins must be supplied simultaneously. The nominal supply voltage is 8V. The pins 14 and 44 must be connected to ground.

The bandgap circuit provides a very stable and temperature independent reference voltage that ensures optimal performance of the video processor. Short decoupling (pin 9 DECBG) to pin 14 of the external capacitor is important for stable horizontal drive.

The comb-filter (IC1050) is only performed with a PAL signal. To enhance the image quality its main features are: cross colour reduction (only at vertical frequencies), cross luminance reduction and improved video bandwidth.

The input signal is composite video. It comes from the IC400 (pin 38 CVBSO) to the pin 17 (YEXT/CVBS). It is processed internally and the resultant signals are Luminance (pin 14 Y0) and chrominance (pin 12 C0). These signals return to the colour decoder in the video processor. The comb-filter is switched on through the I²C bus by writing a bit in the video processor. This one outputs a 4,43MHz signal on the REF0 port superposed to a high level one.

With SECAM, NTSC or S-VHS signals the comb-filter is disabled. It bypasses the luminance (pin 17 - YEXT/CVBS- to pin 14 -YO-) and chrominance (pin 10 -CEXT- to pin 12 -CO-) signals. The video processor outputs a low level on pin 33.

In the models without the comb-filter, the jumpers JO1050 and JO1051 bypass the signals.

14. Audio processor/A3D Surround/Output amplifiers/Sound IF

The audio processor (IC1300) is controlled via I²C bus. It has 3 main sections: analog, digital and DSP (digital signal processing).

- The analog part takes: audio input and output switching, A/D and D/A conversion of input/output sound signals.
- The digital part: demodulates FM (multistandard) and decodes the two carrier signals, controls the sound IF AGC, demodulates DQPSK (multistandard) and decodes NICAM.
- The DSP section takes: sound controls, sound effects for loudspeakers, mute for loudspeakers and headphones, beeper (alarm function) and digital audio switching matrix.

The IC1380 produces the Active 3D Surround (A3DS) effect. The models without A3DS effect use the jumpers JO1381 and JO1382 to bypass the audio signals to the audio amplifier for loudspeakers.

IC300 is the stereo audio amplifier for loudspeakers, it has a variable gain through the resistive dividers R303/R304 and R305/R306 (for channels L and R respectively). The power driven is approximately 8W rms. at 10% of distortion (each channel). The input pins (1 and 5) are connected to the audio processor (IC1300) or to the Active 3D Surround in models that have this feature. Pins 10 and 8 are the loudspeakers power outputs (channels L and R respectively). The microprocessor can mute the audio by setting high the MUTE signal. This pin is used only at TV set switch-on and off and in case of bad aerial reception. In all other situations the mute function is performed by the IC1300.

A fixed gain stereo amplifier is used for headphones (IC350). The input pins (7 and 6 for channels L and R) come from the audio processor headphones outputs. The headphones connector outputs are the pins 1 and 3.

The microprocessor detects the headphones presence via the HP_SW signal. The MUTE signal also affects the headphones audio.

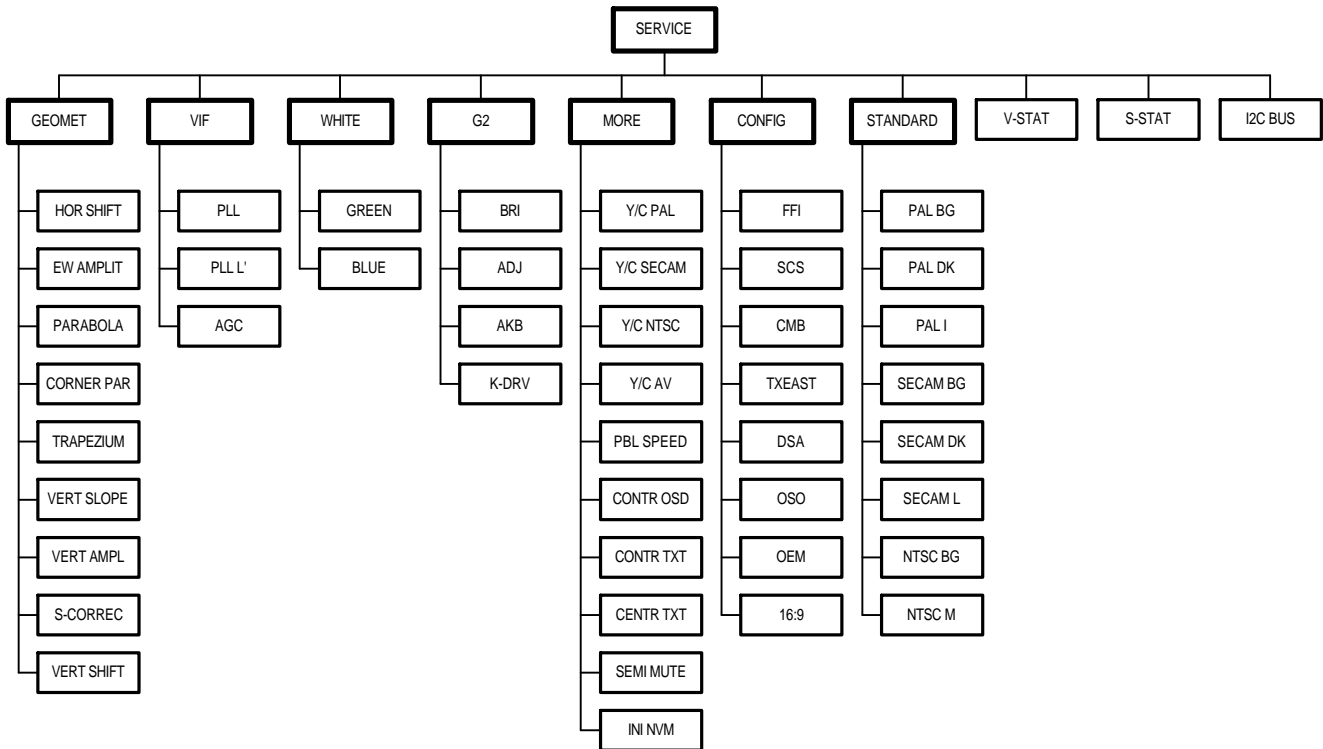
The FM or NICAM-modulated sound IF signal, which inputs the audio processor, is produced by the sound IF circuit, IC1350. This IC takes the signal from the tuner and converts it to the intercarrier frequency. The internal VCO frequency is adjusted by means of L1351.

15. Service menu

The service menu is accessed by holding down the front key “VOL-“ and simultaneously pressing the teletext green key from the remote control. The service menu is a two level structure as shown in the diagram below.

The active keys (local or remote) in service mode are: VOL-, VOL+, P-, P+, MENU and the digits. The navigation through this menu works the same than in the user menu.

- * The P+ and P- keys allow to navigate through the options in the active menu.
- * The VOL+ key opens the second level menu if available. If there is a highlighted adjustment, the VOL- and VOL+ keys allow to change it.
- * The MENU key goes back one level menu. If the active menu is the main one, it exits the service mode.
- * The digit keys allow direct entry for adjustments.
- * The SERVICE mode is exited by pressing any other key.



Adjustment	Meaning	Range	Initial value	Suggested value
HOR SHIFT	Horizontal phase	0 to 63	37	-
EW AMPLIT	Horizontal width	0 to 63	57	- Irrelevant in 90° deflection models
PARABOLA	E/W correction	0 to 63	38	- Irrelevant in 90° deflection models
CORNER PAR	E/W corner correction	0 to 63	30	- Irrelevant in 90° deflection models
TRAPEZIUM	Trapezium correction	0 to 63	21	- Irrelevant in 90° deflection models
VERT SLOPE	Ramp generator amplitude	0 to 63	36	-
VERT AMPL	Vertical amplitude	0 to 63	40	-
S-CORREC	Vertical S-correction	0 to 63	18	-
VERT SHIFT	Vertical centre	0 to 63	36	-
PLL	PLL of video IF	0 to 127	80	80 (imperative)
PLL L'	PLL of video IF in L' system	0 to 127	80	80 (imperative)
AGC	Automatic gain control	0 to 63	16	-
GREEN	White point, green gain	0 to 63	40	-
BLUE	White point, blue gain	0 to 63	36	-
BRI	G2 adjust brightness level	0 to 63	32	0 if cut-off = 160V 5 if cut-off = 150V 32 if cut-off = 130V
ADJ	Service Line Adjust	-	-	-
AKB	Enable/Disable AKB servo	ON/OFF	ON	ON
K-DRV	RGB Drive	0 to 7	5	5 in Ph110° 4 in 90°
Y/C PAL	PAL Phase luma-croma	0 to 15	03	03 in models PAL B/G 110° Irrelevant in 90° models
Y/C SECAM	SECAM Phase luma-croma	0 to 15	00	00 Irrelevant in 90° models
Y/C NTSC	NTSC Phase luma-croma	0 to 15	03	03 Irrelevant in 90° models
Y/C AV	AV inputs Phase luma-croma	0 to 15	10	10 Irrelevant in 90° models
PBL SPEED	Contrast reduction speed when PBL acts	0 to 63	9	9 in 100° models 18 in 90° models
CONTR OSD	OSD Contrast	0 to 63	25	25
CONTR TXT	TXT Contrast	0 to 63	18	18
CENTR TXT	OSD and TXT Centre	0 to 3	1	0
SEMI MUTE	Attenuation (dB) by pushing Mute once	0 to 63	15	15
INI NVM	Non volatile memory initialisation	-	-	-
FFI	PLL constant time of IF	ON/OFF	OFF	OFF
SCS	SCART connectors interchange	ON/OFF	OFF	Equals the OSD with the back cover label
CMB	Enable/Disable the Comb Filter	ON/OFF	OFF	ON in models with Comb-Filter OFF in models without Comb-Filter
TXEAST	Eastern characters set	ON/OFF	OFF	OFF
DSA	Skin tone correction angle	ON/OFF	OFF	OFF
OSO	HV discharge mode	ON/OFF	OFF	ON
OEM	TV set trade-mark	ON/OFF	OFF	OFF in SANYO models ON in SONITRON models
16:9	16:9 picture configuration	ON/OFF	OFF	OFF
PAL B/G	PAL B/G Configuration	ON/OFF	ON	ON
PAL D/K	PAL D/K Configuration	ON/OFF	ON	OFF
PAL I	PAL I Configuration	ON/OFF	OFF	OFF
SECAM B/G	SECAM B/G Configuration	ON/OFF	OFF	OFF in PAL models ON in SECAM models
SECAM D/K	SECAM D/K Configuration	ON/OFF	OFF	OFF
SECAM L	SECAM L Configuration	ON/OFF	OFF	OFF
NTSC BG	NTSC 4.43MHz Configuration	ON/OFF	ON	ON
NTSC M	NTSC 3.58MHz Configuration	ON/OFF	OFF	OFF (imperative)
V-STAT	Video processor status	-	-	-
S-STAT	Sound processor status	-	-	-
I2C BUS	I ² C Bus stop	-	-	-

16. Adjustment and repair procedures

ADJUSTMENT	SIGNAL	CONDITIONS	TEST POINTS	ADJUSTMENT POINT	ADJUSTMENT PROCEDURE	INSTRUMENTS
Power supply	Philips pattern	Picture: Normalised Sound: Minimum volume	B1 Cathode D850	VR800	Adjust to obtain: 150V \pm 0.5V in CRTs Philips A59/A66EAK071X11 if C651 = 12 nF 148V \pm 0.5V in CRTs Philips A59/A66EAK071X11 if C651 = 11 nF 148V \pm 0.5V in CRTs Videocolor A59/A66EHJ43X38 150V \pm 0.5V in CRTs Panasonic A59/A66ECF50X05 118V \pm 0.5V in CRTs Philips A51EAL155X10/X11	Voltmeter DC Resolution >0,1V
AGC.	UHF Band - mid channel (e.g.CH25)	Aerial signal level: 60dBuV (1mVrms)	Pin 1 of TU250 (AGC)	SERVICE/VIF/AGC	Adjust to obtain 3,3V \pm 0,2V	Voltmeter DC Resolution >0,1V
Sound IF	Any picture		Pin 5 of IC1350	L1351	Adjust to obtain 2,3V \pm 0,15V	Voltmeter DC Resolution >0,1V
Vertical slope	Philips pattern	Picture: Normalised	CRT Screen	SERVICE/GEOMETRY/VERT SLOPE	Adjust to achieve that the centre line of the Philips pattern matches the beginning of the service blanking	Visual adjustment
Vertical centre	Philips pattern	Picture: Normalised	CRT Screen	SERVICE/GEOMETRY/VERT SHIFT	Adjust to centre the picture in vertical direction	Visual adjustment
Vertical size	Philips pattern	Picture: Normalised	CRT Screen	SERVICE/ GEOMETRY/VERT AMPLIT	Adjust just to get the checked board hidden	Visual adjustment
Horizontal centre	Philips pattern	Picture: Normalised	CRT Screen	SERVICE/ GEOMETRY/HOR SHIFT	Adjust to centre the picture in horizontal direction	Visual adjustment
Width (90°)	Philips pattern	Picture: Normalised	CRT Screen	L653	Adjust just to get the checked board hidden	Visual adjustment
Width (110°)	Philips pattern	Picture: Normalised	CRT Screen	SERVICE/ GEOMETRY/EW AMPLIT	Adjust just to get the checked board hidden	Visual adjustment
Pin Cushion (110°)	Philips pattern	Picture: Normalised	CRT Screen	SERVICE/ GEOMETRY/PARABOLA	Adjust to correct the pin cushion distortion in the way that vertical lateral lines become straight	Visual adjustment
Corner Pin Cushion (110°)	Philips pattern	Picture: Normalised	CRT Screen	SERVICE/ GEOMETRY/CORNER PAR	Adjust to correct the pin cushion distortion in the corner in the way that vertical lateral lines become straight	Visual adjustment
Trapezium (110°)	Philips pattern	Picture: Normalised	CRT Screen	SERVICE/ GEOMETRY/TRAPEZIUM	Adjust to obtain the lateral vertical lines parallel	Visual adjustment
G2	Philips pattern	Before SERVICE/G2/BRI must be: 32 en CRTs Philips A59/A66EAK071X11 0 en CRTs Philips A51EAL155X10/X11	CRT Screen	SERVICE/G2/ADJ SCREEN potentiometer	Adjust just to see the service line	Visual adjustment
White point	Philips pattern	Picture: Normalised	CRT Screen	SERVICE/WHITE/GREEN SERVICE/WHITE/RED	Adjust to obtain a white tone acceptable	Visual adjustment
Focus	Philips pattern	Picture: Normalised	CRT Screen	FOCUS potentiometer	Adjust to obtain the best possible focusing in the centre of screen	Visual adjustment
TXT centre	Philips pattern	Picture: Normalised	CRT Screen	SERVICE/MORE/CENTR TXT	Adjust to centre the OSD in the screen	Visual adjustment

Common condition to all adjustments (except AGC): The aerial signal level must be acceptable (the picture doesn't present snow degradation)

16.1 Notes about the adjustment:

Normalised: Factory picture control normal has the following OSD positions:

- **Brightness:** 32 (Push key "+" 32 times starting at minimum position)
- **Contrast:** 58
- **Colour:** 30

16.2 Switch-on sequence.

In case of malfunction it is very important to know the switch-on procedure:

1. When the reset is at low level the microprocessor begins to work.
2. It recalls from NVM the last state before the switch-off.
3. If it is STAND BY, it remains in STAND BY. If it is ON, it continues the switch-on procedure.
4. It waits until a falling edge in the 16/9&BSYNC signal occurs.
5. The port B_HIGH is set (B_HIGH oscillating).
6. It waits until a rising edge in the 16/9&BSYNC signal occurs.
7. It reads the CTL1 signal. If this signal doesn't rise before 160mS the process is stopped indicating ERROR_4.
8. The Video processor is started via I2C bus. If there isn't any answer the process is stopped indicating ERROR_1.
9. There is a 1 second delay.
10. The deflections start. If there are failures the process is stopped indicating ERROR_2 or ERROR_3.
11. It waits until the cathode heater is warm by inspection of the video processor register bit AKB.
12. The picture and the sound are switched on and the procedure is finished.

16.3 Protect modes and failure indication

The microprocessor checks periodically the different parts of the circuit and if it detects any fault in a safety defined part then it puts the TV set in PROTECTED mode. The found error code is indicated by the red LED. The red indicator lamp flashes every 0,3 seconds and stops during 0,7 seconds. The number of flashes depends on the error code (see table below).

Error indication	Meaning
ERROR_1	The Video Processor does not answer
ERROR_2	Vertical Deflection Fault
ERROR_3	Horizontal Deflection Fault
ERROR_4	Power Supply Short-circuit.
ERROR_5	The Sound Processor does not answer
ERROR_6	The non volatile memory does not answer

The 1, 2, 5 and 6 error codes are read via the I²C Bus.

The 3 and 4 error codes are read through the CTL1, CTL2 and -PD&FAIL signals.

In all cases except ERROR_5 the power supply is set in SMPS_B_LOW state.

16.4 Protect mode inhibition

In order to facilitate the TV set repair it is possible to disable the protect mode. By pushing the M key (PL100) in a fault detection situation, the microprocessor resumes normal execution flow except in ERROR_4 state (Power Supply Short-circuit). In this case the microprocessor keeps the power supply in SMPS_B_LOW state (the M key does not act).

16.5 Power supply repair procedure

- When it is necessary to replace the IC800, it is strongly recommended to replace also the current sensor resistors R804 and R805 (they may be also damaged or altered).
- Keep in mind that when the power supply is forced to SMPS_B_HIGH state and without current consumption at the main output (deflection stopped), B6 is the stabilised output. The minimum voltage circuit is working and B6 can go down from the nominal 10 volts to 7,5 volts approximately. Also, in this situation B1 goes up until 160 - 180 volts in TV sets with 110° CRT.

16.6 Non-volatile memory (NVM) replacement, IC125

When the TV set starts up, the microprocessor checks the non volatile memory in order to know if it has been initialised. Even if it detects no initialisation it will continue the start up procedure with a minimum default adjustment values stored in ROM. Then, in case of NVM replacement, it is necessary to initialise the non volatile memory from the SERVICE menu (it will load a complete set of default values) and afterwards adjust all the controls to its correct value.