SERVICE MANUAL

Quadro

Brown goods

TV SETS 14", 21" STV2248 chasis

MODELS: CTV-55A15 TXT MkII

CTV-55AF15 TXT MkII

CTV-37A15 TXT MkII

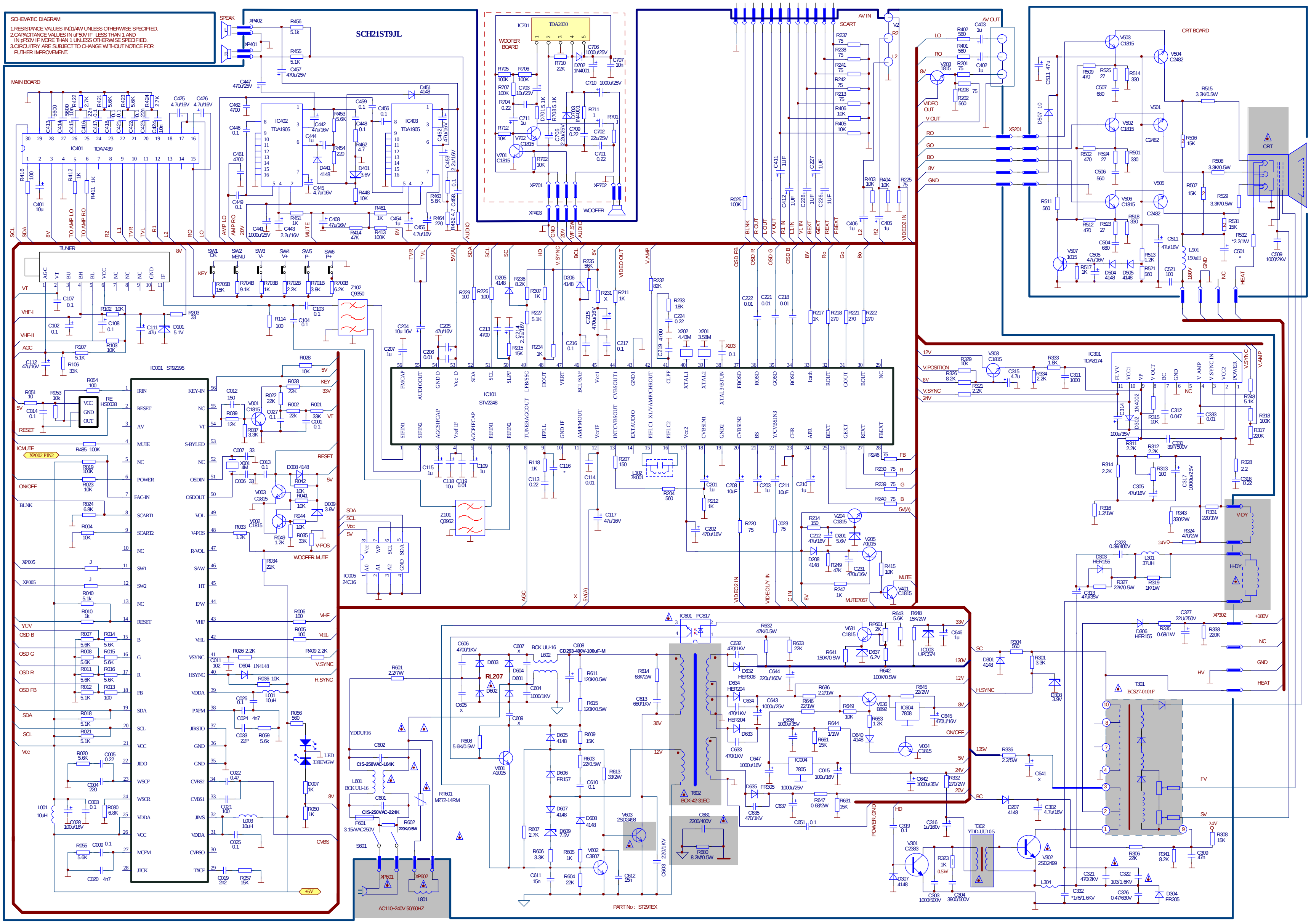

SCHEMATIC DIAGRAM
1.RESISTANCE VALUES INΩ1/4W UNLESS OTHERWISE SPECIFIED.
2.CAPACITANCE VALUES IN uF50V IF LESS THAN 1 AND
IN pF50V IF MORE THAN 1 UNLESS OTHERWISE SPECIFIED.
3.CIRCUITRY ARE SUBJECT TO CHANGE WITHOUT NOTICE FOR
FUTHER IMPROVEMENT.
SCH21ST9JL
MAIN BOARD
WOOFER BOARD
CRT BOARD
IC401 TDA7439
IC402 TDA1905
IC403 TDA1905
IC701 TDA2030
IC001 ST92195
IC101 STV2248
IC301 TDA8174
IC005 24C16
IC601 PC817
IC003 UPC574
IC004 7805
IC604 7808
T602 BCK-42-31EC
T301 BCS27-0101F
T302 YDD-UU10.5
TUNER
AV IN
AV OUT
SCART
CRT
V-DY
H-DY
AC110~240V 50/60HZ
PART No : ST29TEX

TABLE OF CONTENTS

1. INTRODUCTION

CTV5 is a Voltage Synthesis Tuning and control system for multi-standard TV receivers with on-screen-display (OSD) for all relevent control functions. The system is based on I2C bus controlled video processing IC STV223X/4X which also controls mono sound. The Nicam and Zweiton demodulation is done using IC STV8203. It is also possible to do picture geometry correction using IC STV9306.

The user interface is menu based control system with P+ ,P- ,V+ , V- , MENU OK and TV/AV keys on Remote / local keyboard . Hence any menu related function could be accessed using these six keys.

Teletext is done by the microcontroller on-chip teletext module.

1.1 Definitions , acronyms and abbreviations

ADC	Analogue to Digital Converter
AFC	Automatic Frequency Control
AV	Audio Video peripheral TV signal source
DAC	Digital to Analogue Converter
I^2C	Inter IC bus, 2-wire, bidirectional multi-master bus
IDENT	Horizontal coincidence signal, transmitter IDENTification
FE	Front End
LS	Loud Speaker
MS	Multi Standard
NV-memory	Non-Volatile memory
OSD	On Screen Display
PP	Personal Preference
VST	Voltage Synthesis Tuning
Video proc.	STV2238, integrated I^2C bus controlled PAL/SECAM/NTSC TV-processor
PIF	Picture Intermediate Frequency.
SIF	Sound Intermediate Frequency.
NICAM	Near Instantaneous Companded Audio Multiplex

1.2 References

ST92195 Datasheets
STV223X/4X Datasheet
STV8203A Datasheet
TDA7439/7449 Datasheet
STV9306 Datasheet

2. SPECIFICATION SUMMARY

2.1 Hardware

The microcontroller has 24/32/48/64K ROM, 256 bytes RAM, 0/256/512 bytes Aux RAM, bit-level I^2C, on-chip 0/1/7 page teletext, OSD.

2.2 Tuning

| Voltage synthesis tuning system via 14-bits PWM-DAC.
| Automatic search tuning based on AFC and IDENT.
| Tuning in VST system in 3 bands (VHF-L,VHF-H,UHF).
| Fine up and down tuning.
| Auto Program function to find and store all transmitters.
| Automatic PAL/SECAM/NTSC recognition.
| Suitable for negative and positive modulation.
| Programme-Up/Down keys to select 99 programmes.
| Silent tuning.

2.3 Control

| 8 Local Keys (P+, P- , V+ , V- , Menu , OK, TV/AV ,Service)
| Max 32 Remote Keys

2.4 OSD (On Screen Display)

MENU CONTROL

Picture Menu	Brightness (64 Steps) Contrast (64 Steps) Colour (64 Steps) Sharpness (16 Steps) Tint (64 Steps , Only for NTSC)
Sound Menu	Bass (64 Steps) Treble (64 Steps) Balance (16 Steps) Volume (64 Steps)
Install Menu	Auto Tune Manual Tune Fine Tune (+ - 64 Steps from centre frequency) Store .

Setup Menu

The Setup Menu contains 4 submenus:

Timer

Time (Hour = 0 ... 23 , Minute = 0 ... 59)
On Timer (Hour = 0 ... 23 , Minute = 0 ... 59)
Off Timer (Hour = 0 ... 23 , Minute = 0 ... 59)
On Timer Pr (1 ... 99)

Organize

Program (1 ... 99)
Label (4 digit with each program , A to Z , + ,-, SPACE , 0 to 9)
Picture (AUTO / PAL , SECAM , NTSC1, NTSC2)
RF Std (BG , DK , I , LL', MN) for Europe
Skip (Yes / No)

Function

Blue back (Yes/No)
Children Lock (Yes/no)

Language

English
French
German
Italian
Spanish
Portuguese
Greek
Dutch
Danish
Swedish
Finnish.
Norwegian.

2.5 SOUND :

- Volume control in 64 steps .
- Stereo Sound .
- Multistandard Nicam and Zweiton demodulation.
- Automatic mute during program change.
- Fully suitable for FE -sound output on AV1 connector.

2.6 PERI-TV :

| AV has FE audio /video input / Output , RGB inputs (Full SCART)
| Auto SCART level detection

2.7 MEMORY :

| Storage of last Sound and Picture settings.
| Storage of last Channel, Power status.
| Storage of Tuning information of the 99 programs.
| Storage of Label of 99 programs (Each of 4 characters)
| Storage of Service settings .
| Storage of Alarm settings.
| Storage of Nicam / Zweiton standard of 99 programs.
| Storage of Child-Lock value.
| Storage of Customer character LOGO.

2.8 POWER ON :

| If the TV is in ON state before the mains switch is made OFF , at power-on-reset via mains switch ,the TV goes in to POWER ON mode . If the Set is in Standby before the mains switch is made OFF, at power-on-reset via mains switch ,the TV goes in to Standby mode.
| The program provides a fixed delay of 1 second and screen blanking of about 500 msec to allow SMPS to stabilise.
| After power-on-reset of microcontroller and first time switching of the set, the system tunes to program 1 and recalls analog picture and sound controls from the EEPROM.
| If the set is in standby , the TV set comes out of standby using Digit keys , P+ and P- keys.

2.9 Standby :

| Sleep timer selection of in steps of 10 minutes till a maximum of 120 minutes.
Automatic switching to standby mode when there is no valid signal for 5 minutes.

2.10 Adjustments

Initialize EEPROM (ROM default values programmed into EEPROM).

Through Service menu-1 the following parameters could be adjusted:

| Adjust Red Gain
| Adjust Green Gain
| Adjust Blue Gain

| Adjust DC Red
| Adjust DC Green
| Adjust DC Blue
| Adjust APR threshold
| Input the customer character LOGO.
| Adjust Red cutoff.
| Adjust Green cutoff
Through Service menu-2 the following parameters can be adjusted:

| Adjust Tuner AGC
| Adjust H-position
| Adjust V-position
| Adjust V-amplitude
| Adjust Sub_tint
| Adjust Sub_brightness
| VCO Coarse.
| VCO Fine.
| VCO Coarse L'
| VCO fine L'
Through Service menu-3 (STV9306, if there is no STV9306 then this menu is not displayed):

| Adjust V-Amplitude (50Hz/60Hz).
| Adjust V-Position
| Adjust C-Correction
| Adjust S-Correction
| Adjust H-Amplitude
| Adjust EW-Amplitude
| Adjust EW-Trap
| Adjust EW-Shape
Through Service menu-4 (Design menu) following parameters are adjusted

| Adjust Tuner AGC gain.
| Adjust Option1
| Adjust Option2
| Adjust Option3
| Adjust Option4
| Adjust Option5
| Adjust Sttext
| Adjust HPOS_OSD
| Adjust VPOS_OSD
| Adjust HPOS_OSD_Teletext
| Adjust VPOS_OSD_Teletext

3. BASIC HARDWARE DESCRIPTION

3.1 Basic Hardware Specification

The CTV5 system has following components :

| ST92195 MCU + OSD + TXT controller with CTV5 software inside.
| 24C08 1K byte Non Volatile memory (EEPROM).
| STV2238/46/48 Bus Controlled Multi-standard TV Processor.
| STV8203A Bus controlled Multistandard TV Sound Demodulator.
| TDA7439/7449 Bus controlled Audio processer.
| STV9306 Bus Controlled Vertical deflection system with E-W correction output circuit.
| M3004LAB Remote Controlled Transmitter.
| Voltage Synthesis Tuner.

Communication between microcontroller (master) and all I^2C bus controlled devices (slaves) is done using a two-wire bidirectional I^2C bus.

3.2 Microcontroller ST92195

Microcontroller + OSD +Teletext decoder + VPS/PDC/WSS decoder are embedded in one chip. For the details of microcontroller please refer to the ST92195 data sheet.

3.3 Non Volatile Memory 24C08

The 24C08 is a 8K-bit 5V electrically erasable programmable read only memory (EEPROM), organised as four pages of each 256 by 8 bits. Data and instructions are transferred via the I2C-bus. Minimum programming time is 10 ms. Data retention is at least 10 years, independent of the power-on/off status. The number of erase/write cycles per address is greater than 10^5 for 24C08B.

3.4 Multi Standard TV Processor STV223X/4X

STV223X/4X is a fully bus controlled IC for TV including PIF, SIF , Luminance , Chrominance and deflection processing. It is a bus controlled PAL / SECAM / NTSC single chip TV Processor.
For details of STV223X/4X features please refer to the STV223X/4X datasheet.

3.5 Multi Standard Sound Demodulator STV8203A

The STV8203A provides all the necessary circuitry for demodulation of all Nicam and German Stereo audio transmission.
For details of STV8203A features please refer to the STV8203A datasheet

3.6 Sound Processor TDA7439/TDA7449

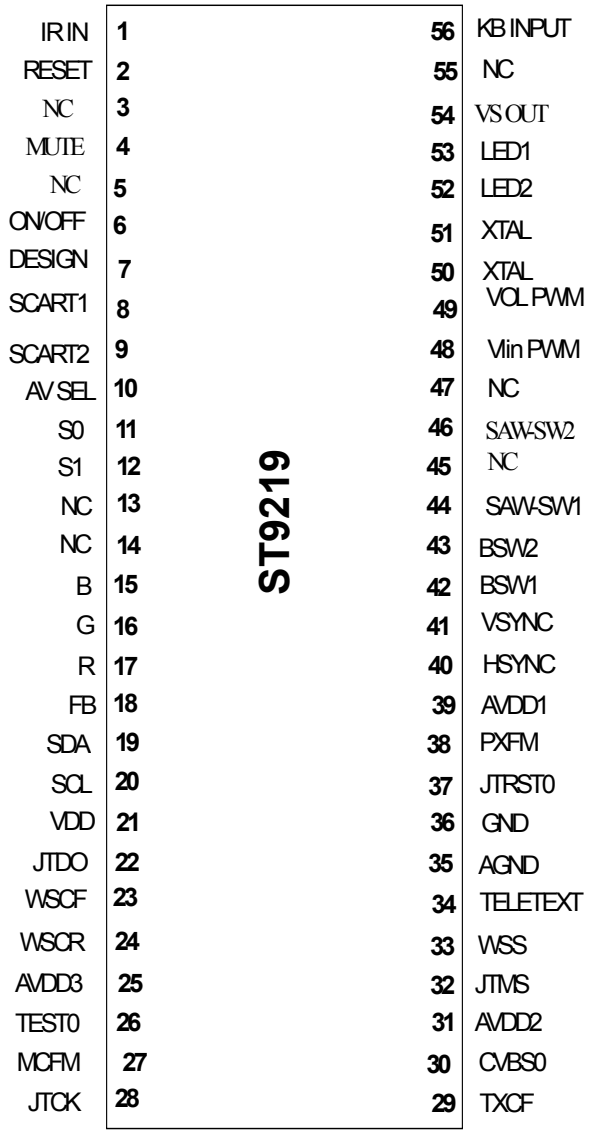
The TDA7439/7449 is a volume tone (bass and treble) balance(Left/Right) processor for quality audio.
TDA7449 provide 2 stereo inputs while TDA74439 provide 4 inputs.
For details of TDA7439/7449 features please refer to the TDA7439/7449 datasheet

3.7 E-W Correction processor STV9306

The STV9306 is a fully bus controlled IC for vertical deflection and designed for use in 110° , 4:3 or 16:9 CRT application. It integrates both vertical deflection and E-W correction circuit necessary for design of 110° chassis

3.7 Remote Control Transmitter M3004LAB1

See Appendix -A . For details see M3004LAB1 datasheet.



4. ST92195 PIN DESCRIPTION

Pin	Pin Name	Signal Name	I / O	Function
1	P2.0	IRIN	I	IR Input
2	RESET	RESET	I	Hardware Reset
3	P0.7	NC	I/O	Not Used
4	P0.6	MUTE	O	MUTE OUTPUT PIN
5	P0.5	NC	I/O	Not Used
6	P0.4	ON/OFF	O	STANDBY OUTPUT

7	P0.3	DESIGN	I	Service menu control
8	P0.2	SCART1	I	Identify scart entering
9	P0.1	SCART2	I	Identify scart entering
10	P0.0	AV SEL	O	AV SELECTION
11	P3.7	S0	O	AV/TV
12	P3.6	S1	O	AV/TV
13	P3.5	NC	I/O	Not Connected
14	P3.4	NC	I/O	Not Connected
15	B	B	O	OSD Blue colour Signal
16	G	G	O	OSD Green colour Signal
17	R	R	O	OSD Red colour Signal
18	BLANK	BLANK	O	OSD Blanking Output
19	P5.1	SDA	I/O	I2C data line
20	P5.0	SCL	O	I2C clock line
21	VDD	VDD		+5 V Digital Supply
22	JTDO	JTDO		Test Pin
23	WSCF	WSCF		Analog Pin For VPS / WPP
24	WSCR	WSCR		Analog Pin For VPS / WPP
25	AVDD3	AVDD3		+5V Analog VDD For PLL
26	TEST0	TEST0		Test Pin
27	MCFM	MCFM		Analog Pin for display pixel
28	JTCK	JTCK		Test Pin
29	TXCF	TXCF		Analog pin for VPS /WSS
30	CVBSO	CVBSO		Test Pin
31	AVDD2	AVDD2		Analog Power supply
32	JTMS	JTMS		Test Pin
33	CVBS2	CVBS2	I	CVBS In for VPS / WSS
34	CVBS1	CVBS1	I	CVBS In for Teletext Slicer
35	AGND	AGND		Analog Ground
36	GND	GND		Digital Ground
37	JTRST0	JTRST0		Test Pin
38	PXFM	PXFM		Analog Pin for display pixel
39	AVDD1	AVDD1		Analog Power Supply
40	HSYNC	HSYNC	I	Horizontal Sync Input
41	VSYNC	VSYNC	I	Vertical Sync Input
42	P4.0	BSW1	O	Band Switch 1
43	P4.1	BSW2	O	Band Switch 2
44	P4.2	SAW_SW1	O	SAW Filter Switch 1
45	P4.3	NC	I/O	Not Connected
46	P4.4	SAW_SW2	O	SAW Filter Switch 2
47	P4.5	NC	I/O	Not Connected
48	P4.6	Vlin PWM	O	V-linearity PWM OUTPUT
49	P4.7	VOL PWM	O	VOL PWM OUTPUT
50	XTAL	XTAL		Clock Oscillator
51	XTAL	XTAL		Clock Oscillator
52	P2.5	LED2	O	LED DRIVER
53	P2.4	LED1	O	LED DRIVER
54	P2.3	VS	O	VST Voltage Ouput
55	P2.2	NC	I/O	Not Connected
56	P2.1	KB INPUT	I	KEY INPUT

4.1 RESET :

Reset is active low Input. The ST9+ is initialized by the Reset Signal. With the deactivation of RESET , program execution begins from program memory locations 00h and 01h.

4.2 R,G,B,BLANK :

Red / Green / Blue / Fast Blanking. On Screen Display DAC outputs.

4.3 XTAL :

These pins connect a parallel resonant crystal of 4 MHz.

4.4. BAND SWITCHING OUTPUTS :

	BSW1	BSW2	SELECTED BAND
	0	**0**	**NOT USED**
	0	1	VHF_L
	1	0	VHF_H
	1	1	UHF

4.5 AV STATUS :

4.5.1 SCART 1 / SCART 2 (pin 8 & pin 9)

SCART_SW pin of the microcontroller monitors the status of the AV SCART Connector. When the signal at this pin goes from low to high , the set will automatically switch to AV and when it goes from high to low the set will automatically switch to the previous source.

4.5.2 AV SELECTION (pin 10)

10 pin status	0	1
AV MODE	AV1 / RGB	AV2 / S-VHS

4.5.3 TV / AV SELECTION (11 pin / 12 pin)

S0-11 pin	0	1	0	1
S1-12 pin	0	0	1	1
TV / AV MODE	TV	AV1/RGB	AV2	S-VHS

4.6 KEYBOARD INPUT :

It is ADC input of the micro. The Voltage at the select ADC Pin of the micro is monitored and depending on the voltage value at this pin it is decided as to which key is pressed.

KEY IN (Pin 56)	KEY PRESSED
0.3~ 0.7V	Volume – (120 ohm)
0.8 ~ 1.2V	Volume +(270 ohm)
1.3 ~ 1.7V	Program-(470 ohm)
1.8 ~ 2.2V	Program+(680 ohm)
2.3 ~ 2.7V	MENU(1 Kohm)
2.8 ~ 3.2V	OK(1.5 Kohm)
3.3 ~ 3.7V	AV/TV(2.2 Kohm)

3.8 ~ 4.2V	Analog(3.3 Kohm)

4.7 Power mode control :

The STD-BY Output specifies if the set is in Stanbby mode or operating mode.

STD-BY (Pin 6)	Mode
0	Standby
1	Operating

4.8 I2C Lines :

Pins 19 (SDA) and 20 (SCL) of the MCU are the I2C Lines. The I2C bus is a 2 wire bidirectional bus. The CTV5 has an on-chip bit level I2C interface . This means the hardware takes the bus arbitration , the reception and transmission of data bits and generation of START and STOP condition. The software must handle the bits (i.e save a received bit and prepare the bits which must be transmitted.)
CTV5 supports 1K bytes EEPROM (ST24C08) used for storage of analog controls , Service settings, Alarm Settings, tuning data for 99 pre-selected programmes and label for each of them. The I2C address of the EEPROM is shown in the next chapter.
The Video processor STV223X/4X is controlled via I2C on address 8A hex.

4.9 Design pin 7:

It is available to enter SERVICE MENU when it is high for the voltage at pin 7 of MCU. It is forbidden to enter the SERVICE MENU when the voltage level is low at pin 7 of MCU.

5. FUNCTIONAL DESCRIPTION

This section describes all functions and hardware requirement of CTV5. Overall control of the system is done by the microcontroller which :

| Decodes the data from the Remote controller.
| Decides on which local key is pressed
| Controls the On Screen Display.
| Exchanges information via I2C bus.
| Selects the proper tuner band and generates the 14 bit data for the internal Voltage synthesised tuning DAC.
| Selects proper IF and Sound demodulator.
| Selects proper Nicam /Zweiton decoder/demodulator .
| Controls analog picture settings and picture geometry.
| Switches between internal and external audio and video signals.

5.1 Interface Description :

5.1.1 Remote Control Handset :

A remote control handset compatible with CTV5 can be designed using **M3004LAB1.**

5.1.2 Remote control decoding :

The infra red remote control pulses are modulated at a frequency of 38 Khz .The remote control signal (active high) from the IR receiver is fed to the external interrrupt input IR-INPUT (pin 1) of the microcontroller.

The following table lists all remote commands to which standard remote control responds to.

Name	Code	TV Mode	Menu Mode	Service Mode	TXT Mode
0	0x10	0	0	-	0
1	0x11	1	1	-	1
2	0x12	2	2	-	2
3	0x13	3	3	-	3
4	0x14	4	4	-	4
5	0x15	5	5	-	5
6	0x16	6	6	-	6
7	0x1e	7	7	-	7
8	0x18	8	8	-	8
9	0x19	9	9	-	9
TENS(-)	0x1a	TENS	-	A	-
Review	0x28	Channel review	-	-	Reveal
Standby	0x20	Power on/off	Power on/off	Power on/off	Power on/off
Mute	0x36	Mute/unmute	Mute/unmute	Line gain adjust	
Sleep	0x09	Sleep	-	-	-
PP(VSM)	0x2e	Vedio PP	Channel move	Service exit	GREEN key
Audio PP	0x2d	Audio PP			CYAN key
Analog	0x33	Audio adjust		Sub brightness	YELLOW key
Recall	0x2a	Status recall			
Menu	0x2b	Menu switch		Auto center VCO	Run_time _mode _choice
P+	0x1c	Channel+	Menu item up	Item up	Page plus
P-	0x1b	Channel-	Menu item down	Item down	Page minus
V+	0x24	Volume+	Increase value	Value+	
V-	0x25	Volume-	Decrease value	Value-	
AV	0x29	Sourse changed	Channel delete	Auto adjust VCO	
Service	0x05	Service in	-		
NICAM	0x35	NICAM	-	-	
OK	0x2c	-	Sub menu enter	Menu switch	RED key
Txt	0x31	Enter txt	-	-	Exit txt
Index	0x01		-	-	Index
Size	0x0e				Size
Mix	0x0c				Mix

Cancel	0x0b				Cancel
Stop	0x06				Stop
Reveal	0x0a				Reveal
Subcode	0x04				Subcode

5.1.3 Non Volatile Memory :
The CTV5 tuning and sound system requires 1KBytes non volatile memory (24C08). With such a memory the system is able to stores tuning information and label of the 99 preselected programs along with the last picture /sound control settings, Service and Alarm Settings.

The following is EEPROM Address map defined in EEPROM.h:
Signature Byte (address = 0 & 1023):
Value = 0xDC

Service Signature Byte (address = 1 & 1022):
Value of service in= 0x66, Value of service out= 0x99.

Power related byte (address =3):
EEPROM_TV_OPTIONS
EEPROM_STANDARD_SELECTION
EEPROM_P_PP
EEPROM_S_PP
EEPROM_LAST_CHANNEL
EEPROM_LANGUAGE
EEPROM_POWER_STATUS
START VIDEO Byte(address = 10):
EEPROM_BRIGHTNESS
EEPROM_CONTRAST
EEPROM_COLOR
EEPROM_SHARPNESS
EEPROM_TINT
EEPROM_VOLUME
EEPROM_BALANCE
EEPROM_BASS
EEPROM_TREBLE

Service RGB Byte (address = 19)
EEPROM_RED_GAIN
EEPROM_GREEN_GAIN
EEPROM_BLUE_GAIN
EEPROM_DC_RED
EEPROM_DC_GREEN
EEPROM_DC_BLUE
EEPROM_APR_THRESHOLD
EEPROM_RED_CUT_OFF
EEPROM_GREEN_CUT_OFF

Service Byte (address = 28)
EEPROM_AGC
EEPROM_HORIZONTAL_SHIFT
EEPROM_VERTICAL_POSITION
EEPROM_VERTICAL_POSITION_60
EEPROM_VERTICAL_AMPLITUDE
EEPROM_VERTICAL_AMPLITUDE_60
EEPROM_BRIGHT_MAX
EEPROM_BRIGHT_MIN
EEPROM_SUB_TINT
EEPROM_PLL1
EEPROM_PLL0
EEPROM_PLL1_L1
EEPROM_PLL0_L1

Design Byte (address = 41)
EEPROM_AGC_GAIN_ADJUST
EEPROM_MISC1
EEPROM_MISC2
EEPROM_MISC3
EEPROM_MISC4
EEPROM_MISC5
EEPROM_MISC6
EEPROM_HPOS_OSD
EEPROM_VPOS_OSD
16 EEPROM_HPOS_OSD_TELETEXT
EEPROM_VPOS_OSD_TELETEXT

Service STV9306 Byte (address = 52)
EEPROM_V_SAW50
EEPROM_V_SAW60
EEPROM_V_SH50
EEPROM_V_SH60
EEPROM_V_SC
EEPROM_V_CC
EEPROM_EW_VDC
EEPROM_EW_AMP
EEPROM_EW_SHAPE
EEPROM_EW_TRAP
EEPROM_S_BRIGHTNESS(address =62)
EEPROM_S_COLOR(address =63)
EEPROM_S_CONTRAST(address =64)

Alarm Byte (address = 65):
EEPROM_ALARM_SET

EEPROM_ALARM_CHANNEL
EEPROM_ALARM_ON_HOUR
EEPROM_ALARM_ON_MINUTE
EEPROM_ALARM_OFF_HOUR
EEPROM_ALARM_OFF_MINUTE

Child Lock Byte (address = 71):
EEPROM_CHILDKEY_CODE1
EEPROM_CHILDKEY_CODE2
EEPROM_CHILDKEY_CODE3
EEPROM_RUN_TIME_CHOICE_TABLE (address = 74)

LOGO data : (start address = 80 or 0x50)

Offset	*bit 7*	*bit 6*	*bit 5*	*bit 4*	*bit 3*	*bit 2*	*bit 1*	*bit 0*
0	Lenght should < MAX_LOGO LENGTH =12 (ASCII char)							
1-12	LOGO characters (ASCII char)							

Tuning Data : (Offset=96,Total = 99 * 3 Bytes)

	bit 7	*bit 6*	*bit 5*	*bit 4*	*bit 3*	*bit 2*	*bit 1*	*bit 0*
0	Band	Band	Tuning Value bit 13 8					
1	Tuning Value bit 7 0							
2	Chroma Standard			Skip	Super sense*	RF Standard		

* Only for the SUPER TUNER is used.

Name /Label Data : (Total = 99 * 4 Bytes)

Offset	*bit 7*	*bit 6*	*bit 5*	*bit 4*	*bit 3*	*bit 2*	*bit 1*	*bit 0*
0	X	X	Character 1 bits 5 0					
1	X	X	Character 2 bits 5 0					
2	X	X	Character 3 bits 5 0					
3	X	X	Character 4 bits 5 0					

Fine Tune data : (Total = 99 *1 Bytes)

Offset	*bit 7*	*bit 6*	*bit 5*	*bit 4*	*bit 3*	*bit 2*	*bit 1*	*bit 0*
0	X	Fine tune bits 6 0						

Nicam/Zweiton data : (Total = 99 *1 Bytes)

Offset	*bit 7*	*bit 6*	*bit 5*	*bit 4*	*bit 3*	*bit 2*	*bit 1*	*bit 0*
Dual2	Mono	X	X	X	X	X	X	X

5.2 Tuning :

This section describes the tuning algorithm , the corresponding OSD is described in the user interface section.

5.2.1 Automatic tuning based on Voltage Synthesis Principle :

CTV5 provides an automatic tuning system in 3 different tuning bands . The search tuning function requires a IDENT signal and AFC window status , which is read via I2C from STV223X/4X. AFC status could be in one out of the following 5 states:

| F pll - Fo < -300 Khz
| -300KHz < F pll - Fo < -60 KHz
| -60 KHz < F pll - Fo < +60 KHz
| +60 KHz < F pll - Fo < +300 Khz
| +300 KHz <F pll - Fo

If the search is activated while the TV is tuned to a station (IDENT available) , CTV5 will first try to escape from it. The tuning voltage will be increased until ident fails. After this the search for the new transmitter can start.

The tuning voltage is increased till the transmitter is found. When the tuning reaches the top of the band , it will change to the next higher band. The band is tuned in the following order :

VHF-L VHF-H UHF

During the search CTV5 continuosly scans its IDENT and AFC status, read via I2C bus. Good performance hence relies completely on the behaviour of these two signals**.**

5.2.2 Automatic Following :

Once the system is tuned via automatic tuning , the signal will stay locked by means of automatic following (Using digital AFC). This transmitter following will continue as long as the transmitter identification signal stays present.

Once fine tune is activated the automatic following is disabled.

If Compilation option of FINE_TUNE_STATUS is selected ,the AFC status is stored with the individual program. If the fine tune value of a particular program is not zero, the AFC following for that program is disabled.

5.3 Sound System :

Presently the mono sound is received from STV223X/4X. This is fed as Mono I/P to STV8203A. In case the Nicam or Zweiton signal is not detected it switches to Mono input.

If in auto tuning “France” is selected , AM sound system will be selected . Also in Organize menu if RF std. is selected as LL’ , AM sound system will be selected.

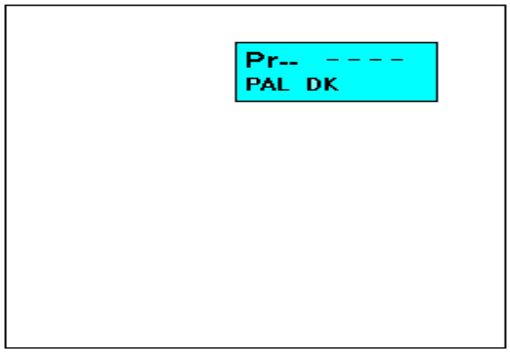
By pressing “NICAM” key on remote in normal mode , it is possible to change the language, if the standard is NICAM DUAL or Zweiton DUAL.

6. USER INTERFACE :

6.1 Direct Controlled Functions :

6.1.1 Digit Entry :

Programs 1 to 99 can be directly accessed through keys 0 to 9 on remote. but for programs 10~99, it can be accessed by pressing key -/-- first, Say if you want to access program 23 , press key -/-- to see -- on the screen , then press 2 and within 3 seconds of pressing 2 , press key 3. If key 3 is not pressed within 3 seconds the program accessed is program number 2. Digit entry is



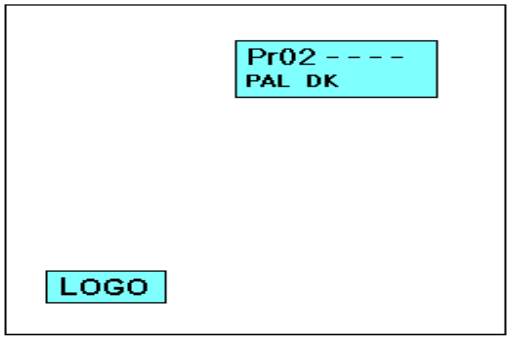
not possible in AV mode.

6.1.2 Program + / - key :

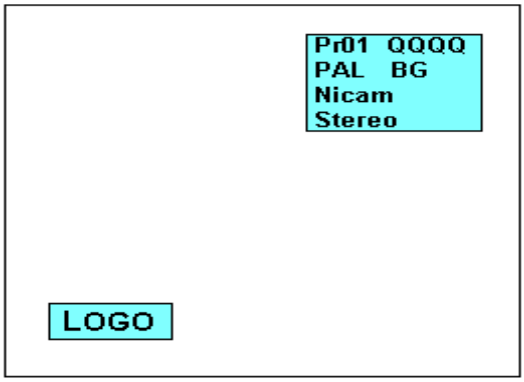
The P+/P- keys can be used to select 1 ...99 unskipped programs. The program which is skipped can't be accesed through program UP / DOWN keys.

6.1.3 The status and time display:

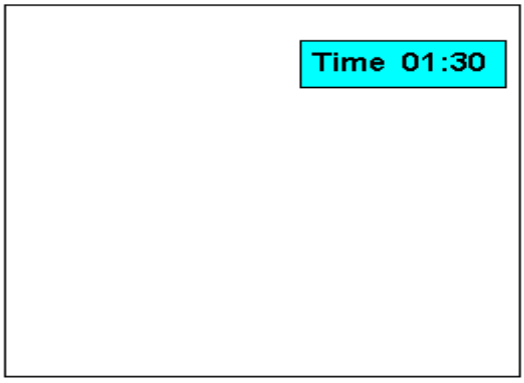
When STATUS key is pressed for the first time ,the source status along with time appears on screen for 5 seconds .



If the Nicam is detected the OSD will be as following:



When STATUS key is pressed for the second time, the time will always dispalyed as following:

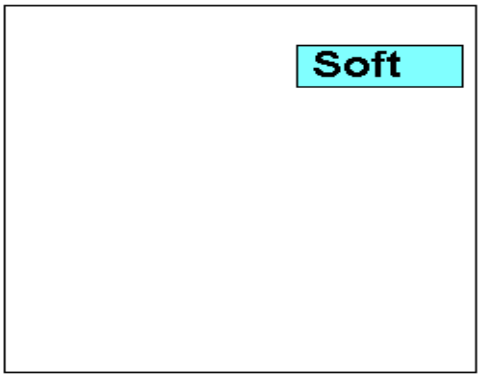


When STATUS key is pressed for the third time, all the OSD will hide.

6.1.4 Image ambiance Key (PICTURE_PP):

The TV picture can be adapted to suit the current lighting conditions. Press Successively to select the desired settings.

Soft **Dynamic** **Favourite** **Standard**

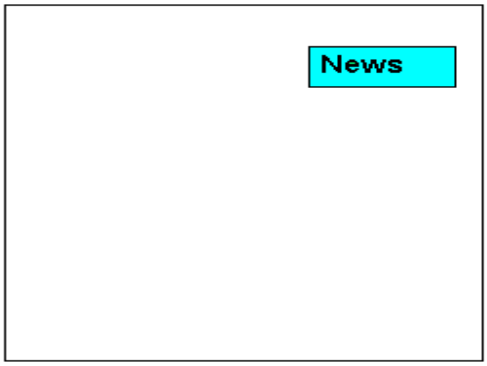


STANDARD, SOFT and DYNAMIC are preset values of Brightness,Contrast and Colour, whereas FAVOURITE is the last analog setting that the user had set.

6.1.5 Sound ambiance Key (SOUND_PP) :

The TV picture can be adapted to suit the current conditions. Press Successively to select the desired settings.

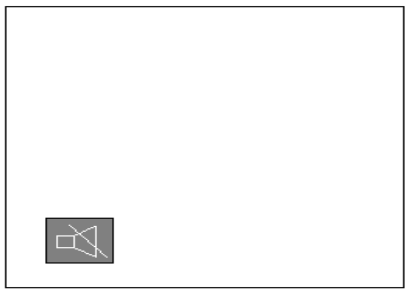
Music News Favourite Standard



STANDARD, SOFT and DYNAMIC are preset values of BASS TREBLE and BALANCE, whereas FAVOURITE is the last analog setting that the user had set.

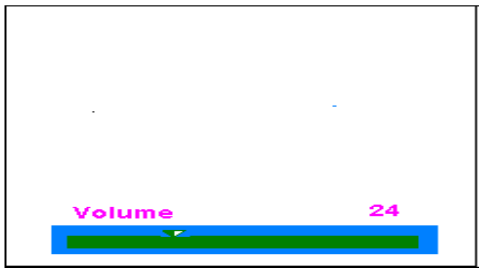
6.1.6MUTE :

Sound can be switched OFF immediately with MUTE command. A second reception of this command returns the sound to previous level.
Sound mute is cancelled by a Volume + /- command.
When MUTE is activated the display appears as follows:



6.1.7 Volume Control :

Volume can be controlled using V+/V- keys. The Volume string and bar are displayed at the bottom of the screen.



6.1.8 ANALOG SETTING

Press key “ANALOG” you will have the right to choose the picture and sound settings as follow: VOLUME→BRIGHT→ CONTRAST → COLOR →SHARPNESS→TINT(NTSC only)→BASS→TREBLE→BALANCE

6.1.9 AV1/ AV2 , SVHS , RGB Selection :

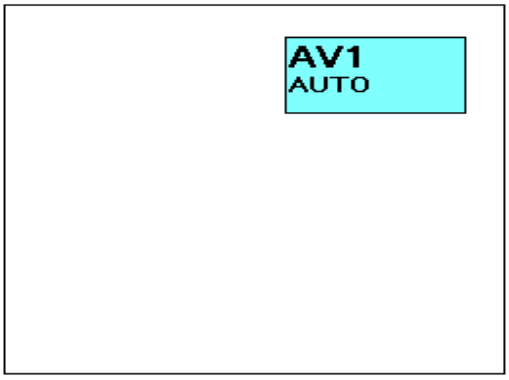
The AV1 input, AV2 input, SVHS and RGB mode (External inputs) can be selected by pressing the AV key. All those modes can be enabled or disabled in the servise mode one by one.
You can individually define whether or not to include AV1,AV2 , SVHS and RGB mode.
If all these inputs are defined then by successively pressing AV key the source changes in the following sequence :

AV1 AV2 SVHS Mode RGB Mode RF

In case SVHS is not defined then the sequence will be as follows :

AV1 AV2 RGB Mode RF

In case of the AV2 disabled, the AV1 will displaying “AV” when it is selected.
Inside the menu, AV command is not functional.
In RF mode the PLL1 time constant is set as “Auto” and in other modes (AV1,AV2, SVHS, RGB) it is set as “short time constant”.



6.1.10 Standby :

Pressing the standby key switch will put the set in Standby mode if it is ON.
If the Set is in Standby, Pressing Standby key , P+/P- Key or any digit key will put the set in ON condition.
The last power status is stored in the EEPROM. If the set was in standby before mains switch was put OFF , by again turning ON the mains switch the set will go to standby. If the set was in ON condition before main switch was put OFF , by turning ON the mains switch the set will go in ON condition with the most recent program, Sound and picture settings recalled from EEPROM.

6.1.11 Sleep Timer :

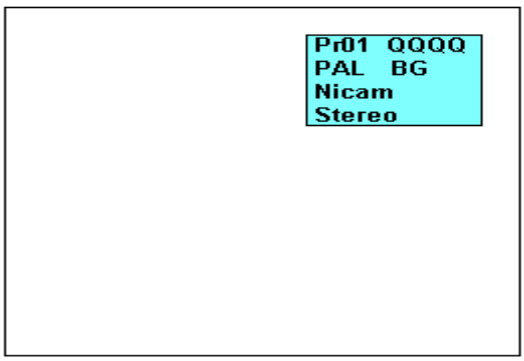
The set will switch OFF if the sleep timer expires . The Sleep timer can be set in steps of 10 minutes with a maximum of 120 minutes.

6.1.12 Auto ShutOff Timer :

When no Front end IDENT (from RF) is detected for 5 minutes ,the set will switch to standby automatically .

6.1.13 NICAM Status change and display :

If not in Teletext mode , pressing the “I/II” key on remote displays the Nicam/Zweiton / Mono Standard on third line (BG, DK, I , LL1) and stereo mode in the next line (Dual1, Dual2).
If the “mono” displayed in Red color, that means the Nicam/Zweiton is available and the user have force the sound to mono mode. However, if the “mono” in Green color, maybe the Nicam/Zweiton is not available now.



6.2 Menu Controlled Function :

6.2.1 General Menu Operations :

To minimize the number of keys on remote , the less frequent used functions are only accessible via menus. These menus are controlled by following keys.

- MENU button select the diffirent menus.It is also used to return from a submenu to menu.
- P+ and P- keys for selecting items in a particular menu.
- V+ and V- keys for changing the value of selected item .
- OK key to enter a Sub menu.

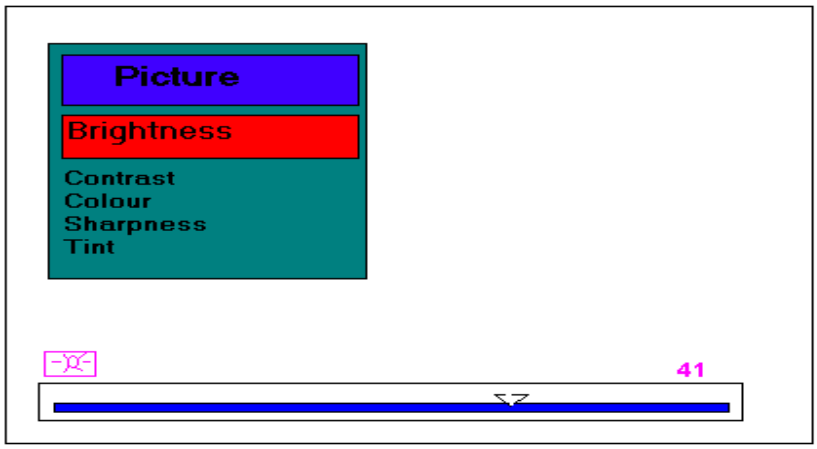
6.2.2 PICTURE MENU :

If press the Menu key for the first time, we can get Picture menu.

The Picture menu has following items :

a) Brightness (64 Steps)
b) Contrast (64 Steps)
c) Colour (64 Steps)
d) Sharpness (16 Steps)
e) TINT (Only for NTSC , 64 Steps)

These items could be selected through P+/P-keys. Item value can be modified by V+/V-keys. The graphic and numeric display of the control level of selected item is displayed at the bottom of the screen.



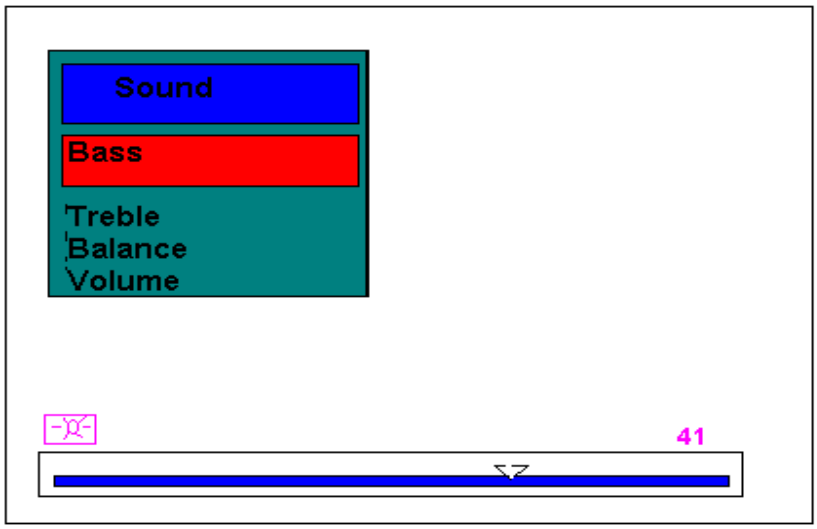
6.2.3 SOUND MENU :

If the Menu key is pressed for the second time, we can get Sound menu.

The Sound menu has following items :

a) Bass (64 Steps)
b) Treble (64 Steps)
c) Balance (64 Steps)
d) Volume (16 Steps)

These items can be selected through P+/P- keys. Item value can be modified by V+/V-keys. The graphic and numeric display of the control level of selected item is displayed at the bottom of the screen.



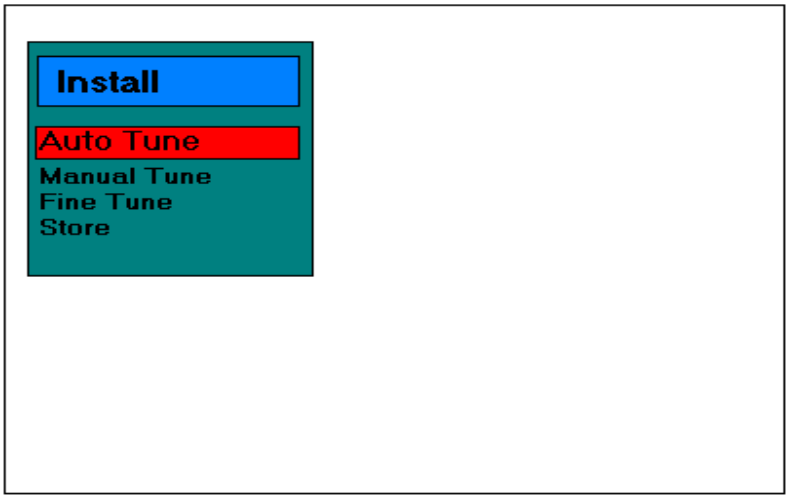
6.2.4 INSTALL MENU :

The Install menu has following 4 items :

a) Auto Tune
b) Manual Tune
c) Fine Tune
d) Store

These items are accessed using P+/P- key.

For Auto Tune :



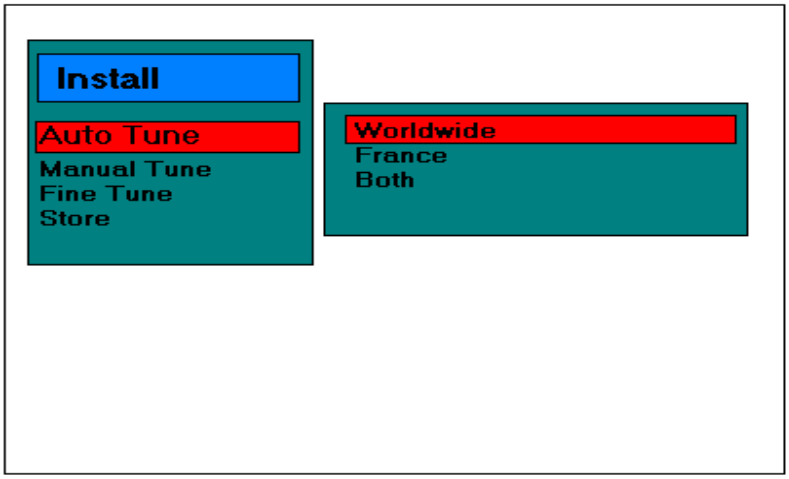
If Secam_LL' is enabled :

If **"**MARKET_FRANCE**"** is selected in option3 bit 4, then by pressing "OK" key on Autotune will make another sub menu appears to select between Worldwide, France & Both.

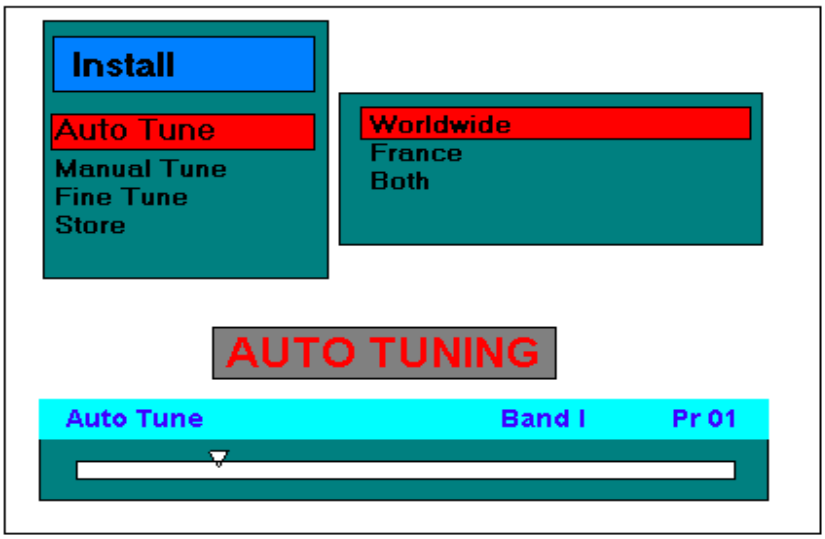
If "Worldwide " is selected and OK key is pressed , then PIF modulation bit in STV223X/4X is selected as negative and sound demodulation bit is selected as FM.

If "France" is selected and OK key is pressed , then PIF modulation bit in STV223X/4X is selected as Positive and sound demodulation is selected as AM. For band I , L' bit in STV223X/4X is set as 1 and VCO Coarse L' and VCO Fine L' values stored in the EEPROM during Service menu will be loaded in the corresponding STV223X/4X registers.

If "Both" is selected and OK key is pressed ,then it will scan all 3 bands with "worldwide" selected followed by scanning the 3 bands with "France" selected . This function is mainly used for regions closed to France where you have SECAM LL' and other standards are broardcasted.

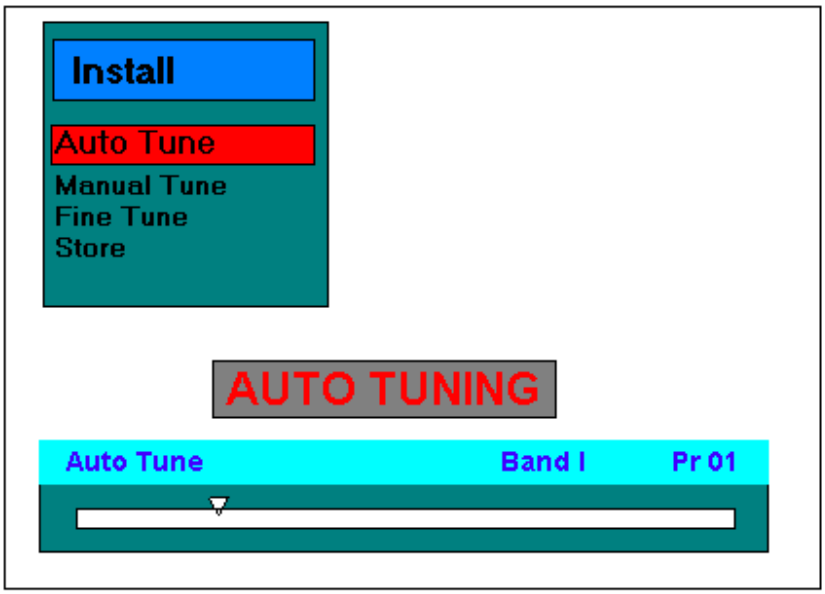


If OK is pressed once more and the auto search process will start:



If Secam_LL' is disabled ::

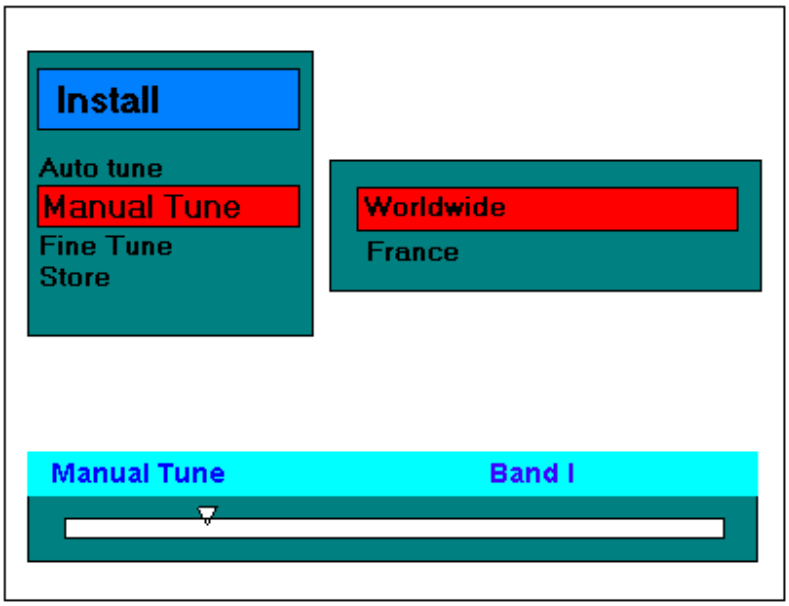
If “MARKET_FRANCE” is not selected in option3 bit 4 then by pressing OK key on Autotune will start the auto search process.



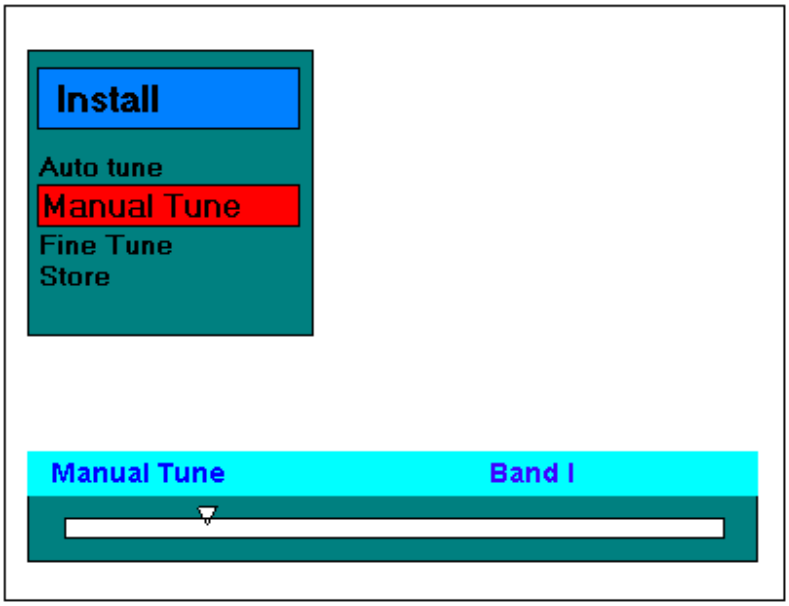
w Auto Tune will automatically search through all the bands for any available stations in transmission and store them consecutively into program numbers 01 onwards.
w Progression of operation will be indicated by moving of bar display , changing of band and program number. The Auto Tune can be aborted using MENU or POWER Key.
w Whenever a program is stored the Colour system is put as “AUTO” . For sound system the Carrier levels (4.5 / 5.5/ 6.0 / 6.5 MHz) are compared and the one with the highest level is tagged with the program. Also the label is reset back to - - - -.

For Manual Tune :

If Secam_LL’ is enabled :
If Manual Tune is selected and OK key is pressed, another sub menu appears to select between Worldwide and France(same as Auto tune but without item “Both”).Now by pressing V+/V- key , Manual tuning will start and display as following on screen.



If Secam_LL' is disabled :
Now by pressing V+/V- key , Manual tuning will start and display as following on screen.

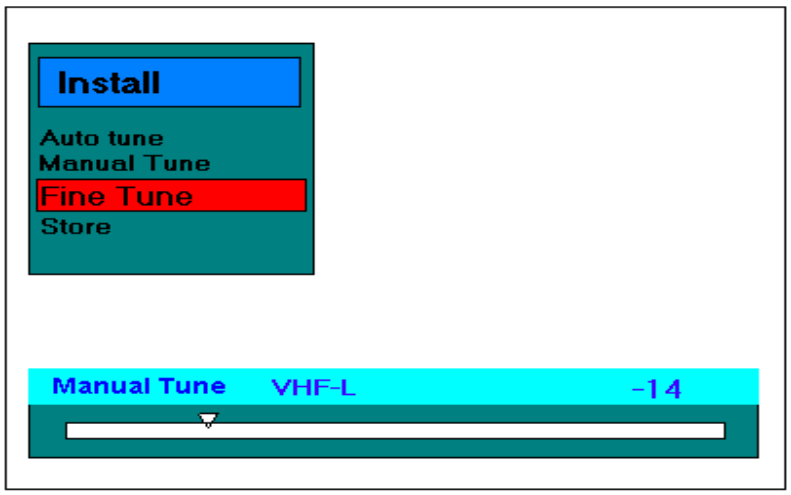


w If V+ key was pressed in Manual Tune ,it will search for next available station and Stop where the signal is received. If V- key is pressed it searches in the negative direction and will search for the previous channel.
w During Manual Tune only MENU and POWER key is recognised , rest of the keys are ignored.

For Fine Tune :

If fine tune is selected, activation of V+ / V- key will tune forward / backward. The bar graph will show the deviation in positive or negative direction with repect to the Stored tuning information.

If user store the fine tune value by using the STORE function, then the value will effective even if the TV set have been shutdown.



For Store :

When OK key is pressed from item "STORE", another submenu appears with 2 items namely Program (Program number to which you want to store the tuning info) and Store.
If item "Program" is selected , activation of V+/V- keys will decrease / increase the program number entry. It can also be done by direct digit keys (Key 0 to 9 on remote handset).
When item "STORE" is selected and OK key is pressed ,the existing tuning information along with AUTO colour standard and sound standard (based on sound carrier strength level) will be stored in the Program number entered in item "PROGRAM" and OK display will appear beside item "STORE"

6.2.5 SETUP MENU

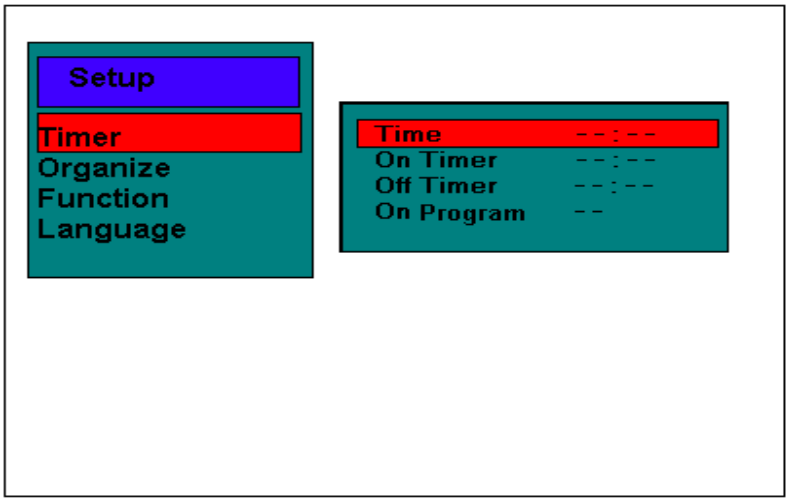
TIMER SUBMENU :

The Timer submenu has following items:

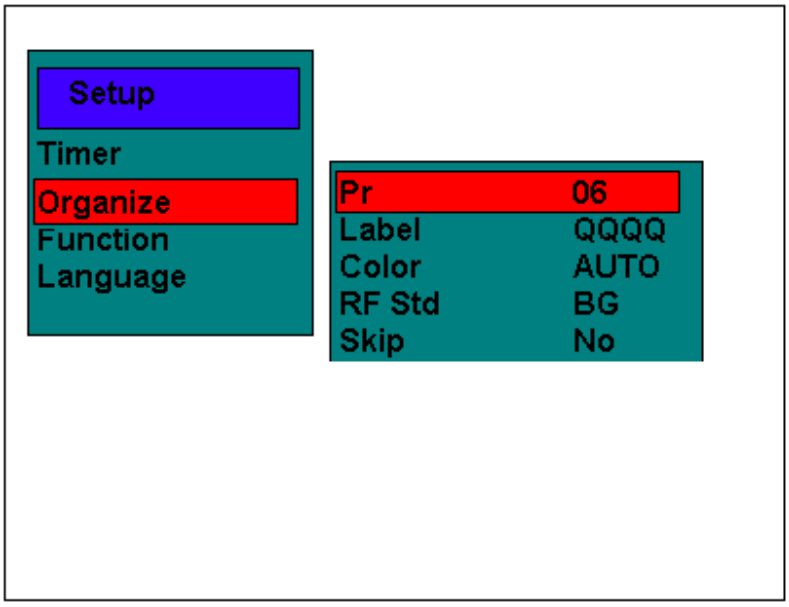
a) Time _ _ : _ _
b) On Timer _ _ : _ _
c) Off Timer _ _ : _ _
d) On Timer Pr_ _

Sub-menu is accessed by using OK key.
For items (a) to (c) the “V-” key is used to change the hour (0 to 23) and “V+” Key to change minutes (0 to 59) . For item (d) “V-” key is used to decrement On Timer Program number and “V+” key is used to increment On Timer Program number(0 to 99).

The On/Off Timer and Program number will be disabled when the TV set is Power on. However, these setting will keep on when TV in Standby mode.



ORGANIZE SUBMENU :



P+/P- keys in the organize menu are used to jump from one column to other.

In the column “Label” you can access the entries of label character by pressing V+/V- key. P+/P- key in different columns have different significance :

For Pr : V+/V- keys select the program. All the following information gets tagged to the selected program.

For Label : V-/V+ keys select the character to set, and P+/P- keys give access to alphanumeric characters in the sequence A to Z ,+ , -, SPACE and 0 to 9. The label hence gets tagged to the particular program.

For Colour : Select Colour standard as AUTO, PAL , SECAM, NTSC1(4.43MHz), NTSC2 (3.58MHz). The Standard selected gets tagged to the particular program.

For RF Std : Select RF standard as BG/ DK/ I/ MN (For Asia) or BG/ DK/ I/ LL’(for EUROPE) The Standard selected gets tagged to the particular program.

For Skip : To Skip or not the particular channel by pressing P+/P- keys.

For Super sense : Enable/disable.

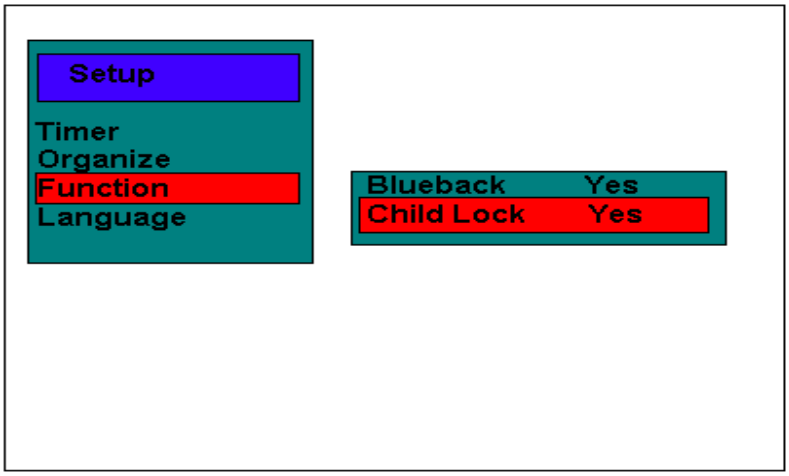
In Organize menu, you can MOVE or DELETE a program

For MOVE : You can move one program to another. In that case all the tuning info, Label, Picture info , RF Std. Info, Skip info and super sense info are transferred from Source Program to destination Program. Say, if you want to move program 2 to program 7, slelect the corresponding Pr 2 (Source) by Pressing PP key. The color of the selected line changes. Now press V+/V- key to go to Pr 7 (Destination) and press PP key. Pr 2 will move to Pr 7.

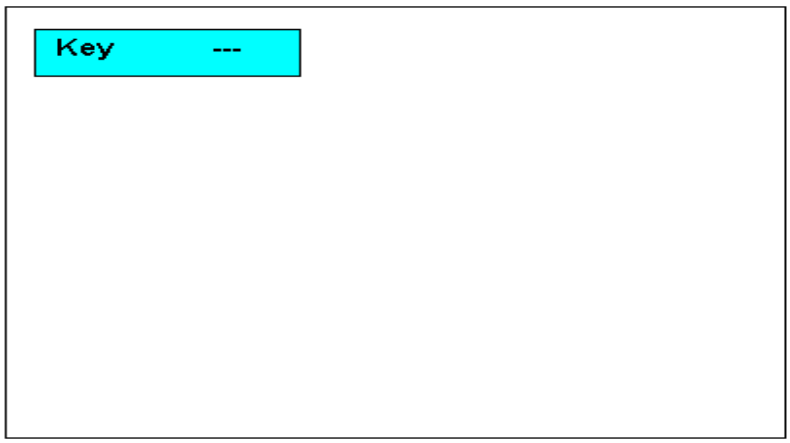
FOR DELETE: Select Program to be deleted using P+/P- key and press AV Key.

FUNCTION SUBMENU :

If the Function is selected and press OK key, the Function submenu will displayed. As one of the items is accessed using P+/P- keys, the setting changed bu using V+/V- keys.



If the “child lock” is changed from “No” to “Yes”, the lock menu will appear. In this mode, three digit can be key in and saved as the locking number. When the next time the TV is power on, the user must key in the locked numbers for enter the TV. And it’s convenience for user to use the PP key three times when they forget the lock number.

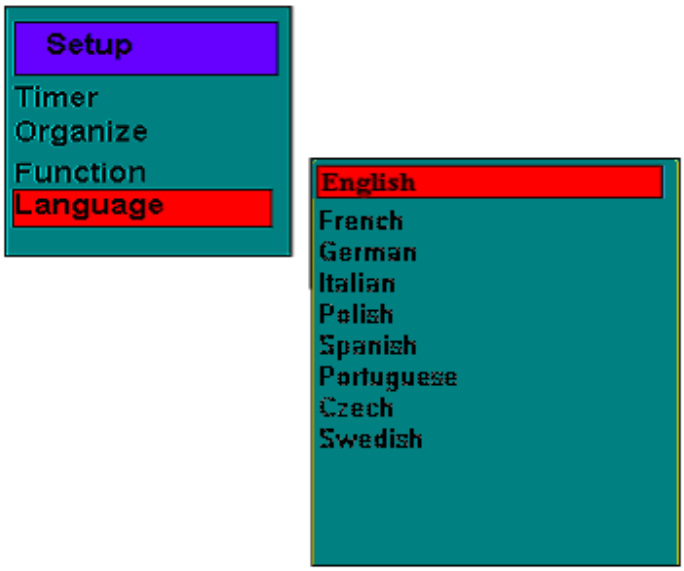


LANGUAGE SUBMENU :

If compilation option “LANGUAGE” is selected then Language menu appears on menu. The Language menu has twelve items as following:

a) English
b) French
c) German
d) Italian
e) Polish
f) Spanish
g) Portuguese
h) Czech
i) Swedish

When one of the languages is accessed by using P+/P- keys, the language is instantaneously updated.



6.3 Service controlled Function

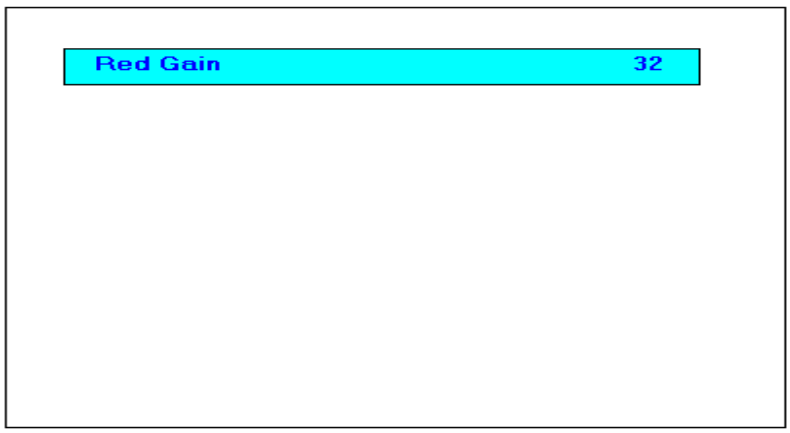
The Service-1 mode is entered by pressing the “SERVICE” key when the TV is in ON condition and not in any Menu mode. In service mode, by pressing “OK” key Service-2 is accessed , by pressing “OK” key again Serivice-3 is accessed. By pressing “PP” key, we come out of Service mode.

6.3.1 SERVICE RGB ADJUSTMENT

The items within the Service-1 mode can be accessed using P+/P- keys and the selected item can be modified by using V+/V- keys. The parameters controlled in the Service-1 menu are :

a) Red Gain (0 ... 63)
b) DC Red (0 .... 127)
c) Green Gain (0 .... 63)
d) DC Green (0 .... 127)
e) Blue Gain (0 .... 63)
f) DC Blue (0 .... 127)
g) APR_threshold (0….15)
h) LOGO (the first show the length of logo, and the followed is the logo)
i) R-Cutoff (0…63)
j) G-Cutoff (0…63)

The display of Service-1 menu is as follows:

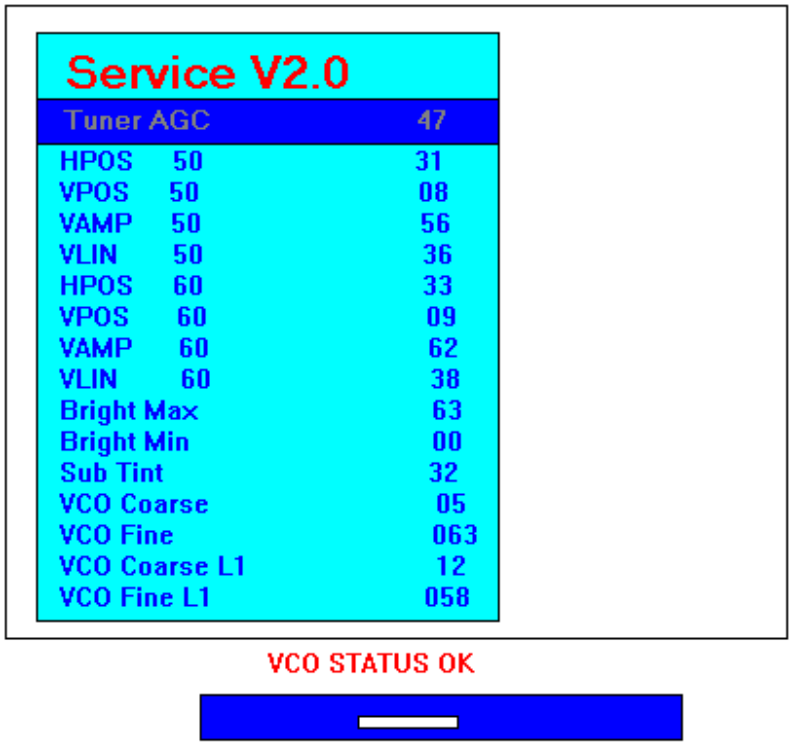


6.3.2 SERVICE MISC ADJUSTMENT

When in Service-1 menu ,if “OK” key is pressed , Service-2 menu appears and the display is as follows.The parameters controlled in the Service-2 menu are :

a) Tuner AGC (0 ... 63)
b) Horizontal position 50 Hz(0 ... 63)
c) Vertical position 50 Hz (0…15)
d) Vertical amplitude 50Hz (0…63)
e) Vertical linearity 50Hz (0…63)
f) Horizontal position 60 Hz(0 ... 63)
g) Vertical position 60 Hz (0…15)
h) Vertical amplitude 60 Hz (0…63)
i) Vertical linearity 60 Hz (0…63)
j) Sub-Bright Maximum (0…63)
k) Sub-Bright Minimum (0…63)
l) Sub Tint (0…63)
m) VCO Coarse (0 ... 15)
n) VCO Fine (0 ... 127)
o) VCO Coarse L1(0 ... 15)
p) VCO Fine L1(0 ... 127)

The display of Service-2 menu is as follows :



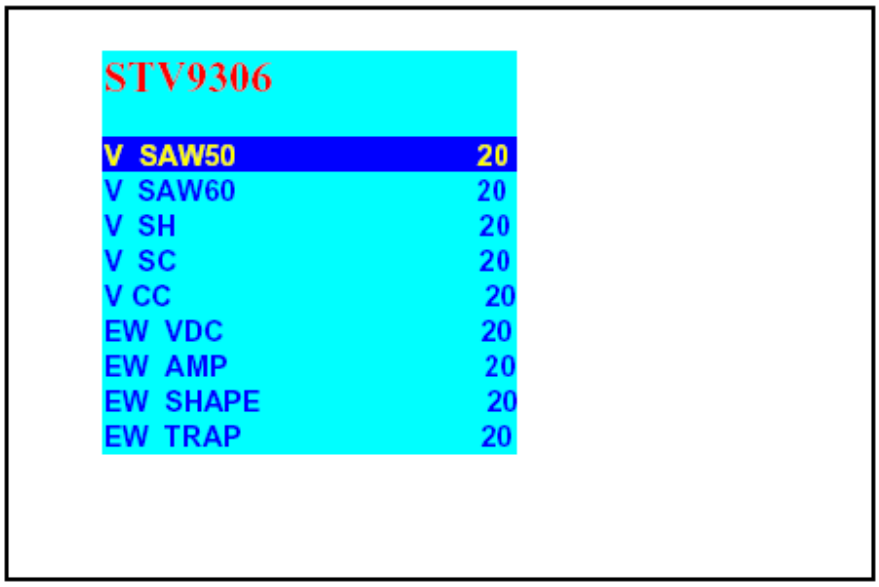
The VCO status bar at the bottom of the screen appears only if either VCO Coarse item or VCO Fine item is selected. The VCO status is read from the Read register of STV223X/4X and guides whether to Increase / Decrease the VCO registers to attain VCO OK Status.
For doing VCO adjustment , Feed a 38.9MHZ Carrier as IF input and adjust VCO Coarse and fine parameters to get VCO OK Status.
If the cursor is in VCO Coarse or Fine, and the display shows VCO OK status, then pressing of "TV/AV" key will automatically put VCO fine to the Centre of the +60 to -60 KHz window.
For doing VCO L1 adjustment ,Feed a 33.9 MHZ carrier as IF input and adjust VCO Coarse L1 and VCO Fine L1 to get VCO OK Status.
If the cursor is in VCO Coarse L1 or Fine L1 , and the display shows VCO OK status, then pressing of "TV/AV" key will automatically put VCO fine for L1 to the Centre of the +60 to -60 KHz window.

Another fast way of adjustment of VCO is to put the selection bar to either VCO Coarse or fine and press the "TV/AV" key. The VCO adjustment is done automatically. Similarly if you put the selection bar to VCO Coarse L1 or Fine L1 and press the "TV/AV" key , the VCO L1 adjustment will be done automatically.

6.3.3 SERVICE STV9306 ADJUSTMENT

When in Service-2 menu, if "Enter" key is pressed, Service-3 menu appears and the display

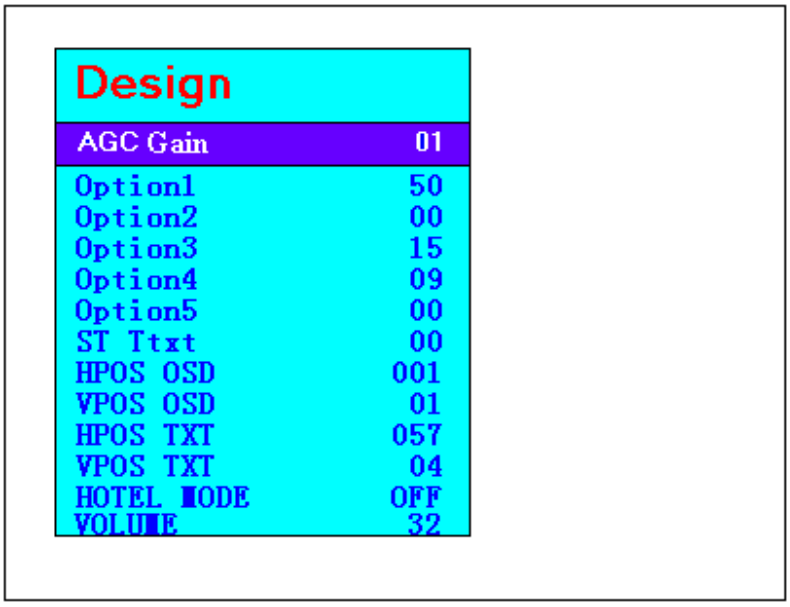
is as follows, if the IC STV9306 have not been detected, then Service-4 (design menu) menu will appears.



1) Vertical amplitude for 50Hz signal.
2) Vertical amplitude for 60Hz signal.
3) Vertical shift (internal separated by 50Hz and 60Hz)
4) S Correction.
5) C Correction.
6) Horizontal width adjustment.
7) Pincushion Correction.
8) E/W Sharp Correction.
9) Trapezium Correction.

6.3.4 SERVICE DESIGN OPTION SETTINF

Design mode:



OPTION1:
b5 = P/N/S crystals application (0=2 crystals, 1= 1 crystals)
b4 = Cutoff Loop (0= OFF, 1=ON)
b3 = Safety_Reset(0=active, 1=non)
b2 = Super tuner (0 = OFF , 1= ON)
b1 = Sound Demod (0 = Intercarrier/MONO, 1 =QSS/NICAM)
b0 = logo display(0 =off, 1= on)
OPTION2: (set to 0 by default)
b5 = HALF_CONTRAST(0 = OFF, 1=ON)
b4 = Color 6dB (0 = OFF , 1 = ON)
b3 = APR Feature (0 = ON , 1= OFF)
b2 = Black Strech (0 = ON , 1= OFF)
b1 = Auto Flesh (0 = ON , 1= OFF)
b0 = Coring (0 = ON , 1 = OFF)
OPTION3:
b5 = AVL (0 = OFF, 1=ON)
b4 = PIF overmodulation (0 = OFF, 1= ON)
b3 = Market_France --- secam LL (0 = OFF, 1 = ON)
b2 = Manual/Auto cutoff (0/1)
b1 = Mute pin low/high –to contol the speaker(0/1)
b0 = TDA7449/TDA7439 (0/1)
OPTION4:
b4 = SCART2 (0 = OFF,1=ON)
b3 = RGB (0 = OFF, 1= ON)
b2 = SVHS (0 = OFF, 1= ON)
b1 = AV2 (0 = OFF, 1= ON)
b0 = AV1 (0 = OFF, 1= ON)
OPTION5:

There are 8 bits used in OPTION 5. They are b0, b1, b2, b3, b4, b5, b6 and b7.
For b0, normally, ST suggests to set it to 0.
For b1, b2, they are used to select teletext languages.
For b3, it's used to enable AV3 and SVHS. When b3 is set to 0, SVHS is enabled. When b3 is set to 1 in binary, the value is 8 in decimal. AV3 is enabled.

b4, b5, b6 and b7 are used to set the brightness of background in teletext mode. When b4 b5 b6 and b7 are all set to 0, the brightness of teletext background is set to minimum level. When b4 b5 b6 and b7 are all set to 1, the brightness of teletext background is set to maximum level.

For CPU with 9 languages(ST92195C7B1/MBF), the setting of the b1 and b2 is describing as below.
1. If b1 = b2 = 0, then the TEXT languages like "ENGLISH, FRENCH, SWEDISH, CZECH, GERMAN, PORTUGUESE (SPANISH), ITALIAN, RUMANIAN " can be decoded.
2. If b1=1, b2=0, then the TEXT languages like "ENGLISH, RUSSIAN, SWEDISH, TURKISH, GERMAN, PORTUGUESE (SPANISH), ITALIAN, RUMANIAN " can be decoded.
3. If b1=0, b2=1, then the TEXT languages like "POLISH, RUSSIAN, SWEDISH, CZECH, GERMAN, SERBIAN, ITALIAN, RUMANIAN " can be decoded.
4. If b1 = b2 =1, then the TEXT languages like "POLISH, RUSSIAN, SWEDISH, CZECH, GERMAN, PORTUGUESE (SPANISH),LETTISH, RUMANIAN "can be decoded.

OPTION6 (ST TEXT)---only for ST engineer
b0 = enable ST to change the process for adjusting Auto gain.
B1,b2,b3 = select the correct process
ROM_M6_P_valid | OSDEPROM_M6_R_valid | ROM_M6_R_valid | EPROM_M6_R_valid
EPROM_M6_R_valid | ROMLESS_H5_P_valid | ROM_H5_P_valid | EPROM_M6_A_valid
/* note: ROMLESS_M6_R_valid == ROM_M6_R_valid*/

APPENDIX A: IR REMOTE CONTROL

The M3004LAB1 transmitter IC is designed for infrared remote control systems. The data format for the remote output is as follows

The pattern is pulse distance coded. These pulses are modulated. Modulated pulses allow receivers with
narrow band preamplifiers for improved noise rejection.
In the modulated transmission the first bit is a constant reference time bit. This is used as a reference time
for the decoding sequence. This is followed by a toggle bit. The toggle bits function is to indicate to the decoder
that next instruction is to be considered as a new command.
The next 3 bits are for the Sub system address. These bits have been hardwired as 101 for CTV5.
The last 6 bits are command bits, the codes of which for different commands are listed in Section 4.7.

Controller Type	ST92195
Crystal frequency of controller	4 MHz
IR Receiver type	TFMS 5380
IR Transmitter type	M3004LAB1
Crystal Frequency of IR Transmitter	455 KHz

For crystal of 455 KHz, t_osc = 2.2 us
Modulation period = Tm = 12 * t_osc = 26.4 us
Basic unit of pulse distance = To = 1152 * t_osc = 2.534 ms
Word distance = 55296 * t_osc = 121.65 ms
Logic “0” = 2To = 5ms (approx)
Logic “1” = 3To = 7.5 ms
Toggle bit = 5ms or 7.5 ms
Reference bit = 7.5 ms