

CONTENTS

CIRCUIT DESCRIPTION OF THE 11AK20S CHASSIS	2
1. GENERAL INFORMATION :	2
2. IF STAGE :	2
2.1 Video and Sound IF System & Switch IC STV8223:	3
2.2 Multi-Standard Video IF, Sound IF and Switch IC (STV 8224)	3
3. SIGNAL PROCESSING PART :	4
3.1 Bus-controlled Multi-Standard TV Processor IC, STV 2118 :	4
3.1.1 Deflection Circuit:	4
3.1.2 Filters :	5
3.1.3 Video Circuit :	5
3.1.4 Chroma Circuit :	5
3.1.5 Other Functions :	5
3.2 Base Band Chroma Delay Line IC STV 2180 :	6
4. HORIZONTAL OUTPUT AND EHT STAGE :	6
5. VERTICAL OUTPUT STAGE (TDA 1771)	6
6. SOUND OUTPUT STAGE (TDA2822M) :	6
7. POWER SUPPLY (SMPS) :	6
8. uC (MICROCONTROLLER) :	7
9. CRT BASE-BOARD :	7
MANUAL ADJUSTMENT PROCEDURES OF THE 11AK20S CHASSIS	8
How to enter and exit the SERVICE Menu:	8
How to use the ADJUST Menu:	8
AGC Adjustment:	8
Vertical Amplitude Adjustments:	8
Vertical Shift and Horizontal Shift Adjustments:	8
Vertical Linearity Adjustment:	8
White Point Adjustment:	8
Black point Adjustment:	8
How to use the OPTION BYTES:	9
AFC Adjustment:	10
GENERAL BLOCK DIAGRAM OF THE 11AK20S CHASSIS	11

CIRCUIT DESCRIPTION OF THE 11AK20S CHASSIS

1. GENERAL INFORMATION :

This document provides detailed information about the fully μ C controlled Television Chassis named 11AK20S. 11AK20S is based on the bus controlled circuits in which all the filters, traps and delay lines have been integrated. Therefore the numbers of external components are reduced and the user, service and factory adjustments are made through μ C BUS control.

This chassis has been designed mainly for the 90°, 14" picture tubes.

This chassis has a SMPS circuitry, which has been designed to get low stand-by power consumption (less than 3W) as an option. On the other hand, it also has wide range (90-270V 50/60 Hz) mains as an option.

The chassis covers many transmission and colour standards such as PAL B/G/I, SECAM B/G/D/K/L/L' and play-back NTSC M (3.58), play-back NTSC (4.43) using same Main Printed Circuit Board by means of optional components and settings. Tuning system is Voltage Synthesized for all systems.

Furthermore, chassis has also European Wide-range teletext solution as an option. This solution supports all the European teletext standards as 1-page normal text modes.

The chassis has an Euro AV Plug (Scart Socket). The pictures in 4:3 and 16:9 format can be displayed via this connection. Other optional external connections are front AV input RCA jacks, back AV output RCA jacks and Headphone jack.

The software has been developed with an user-friendly menu driven interface supporting all possible chassis versions with a storage capacity of 100 programs.

2. IF STAGE :

The inputs for IF stage are IF inputs from Tuner to produce front-end Video and Audio, the external inputs are Video and Audio from the Scart or from the front AV RCA jack to be able to select the internal or external video and audio according to the control signals which originates from microcontroller and STV2118. (Furthermore, the RGB inputs which are direct inputs to the STV2118 via the scart can also be selected by the software). Then, the resultant video and audio signals are sent to video processing stage and audio output stage, respectively. Furthermore, front-end video and audio signals are sent to scart and or back AV RCA jacks. This part also produces some control signals for tuner and microcontroller.

This stage was designed for processing positive (optional) and negative modulated mono and one scart applications.

STV 8223 is the IF IC that is used in only negative modulation. There is an alignment which is the VCO adjustment (VL101). The procedure of alignment can be described briefly as follows :

- The IF signal is applied to the IF inputs in accordance with the standards (for B/G 38.9MHz) at pin #1 and 2 of SAW filter (Z101).
- Adjust the VL101 until getting $2.5 V_{dc}$ at pin #9 of μ C (IC501).

This stage is also used for negative and positive modulated, mono applications. STV 8224 (negative and positive modulation and FM sound) (IC 101) and STV 8225 (AM sound) (IC102) are the IF IC's.

There are two alignments in this case, which are the VCO adjustment (VL101) for B/G - L standards and VC101 for L' standard. The procedure of the alignments can be described briefly as follows :

- The system is Switched to B/G standard reception,
- The IF signal is applied to the IF inputs in accordance with the standards (for B/G 38.9MHz) at pin #1 and 2 of SAW Filter Z101.
- Adjust the VL101 until getting $2.5 V_{dc}$ at pin #9 of μ C.
- The system is Switched to L' standard reception,
- The IF signal is applied to the IF inputs in accordance with the standards (for L' 33.9MHz) at pin #1 and 2 of SAW Filter Z101.
- Adjust the VC101 until getting $2.5 V_{dc}$ at pin #9 of μ C.

2.1 Video and Sound IF System & Switch IC STV8223:

STV 8223 is a picture and sound IF processor for negative application. The architecture of the video and sound demodulator, which are both based on PLL structure, allows a very good linearity of the Intermediate Frequency Response and an application with very few external components and adjustments.

The volume on the audio signal is controlled through a DC level (pin #13) which is provided from STV 2112/ 2116/2118 where all the I²C decoding is realized.

STV 8223 also provides the audio and video switches for scart - AV applications. The IF inputs at pins #19 and #20 are driven by Tuner via Saw filter (Z101). The baseband signal(CVBS) produced from these IF inputs appears at pin #3. This signal is used to produce video signal and intercarrier sound signal. This internal video signal, which is produced by using the Z107 trap filter, is fed to pin #10 of this IC for internal-external (coming from scart) video switching and to the base of the buffer transistor Q102 for the video output of the scart connector. The intercarrier signal used to reproduce the sound, passes through the band pass filter Z103 with center frequency 5.5MHz for B/G standard or Z104 for I (6.0MHz) or Z105 for D/K (6.5MHz) in according to selected system by intercarrier signal switching circuitry (D106, D107, D108, D109) and resultant signal is applied to the pin #8 of the IC which is the input of limiter and SIF PLL stage. The switch control signal is supplied by microcontroller. The limiter and SIF PLL output pin #15 which is connected to the deemphasis capacitor drives audio out of the scart connector and AV jack. The external inputs of IC, which are pin #12 for video and pin #16 for audio, are connected to the related scart connector inputs or AV RCA jack inputs. The internal-external selection for monitoring is made by control voltage at pin #8 produced by microcontroller and switching between 4/3 and 16/9 picture modes is also carried out by the voltage level at pin #8 of the scart. The selected video at pin #11 drives video processing stage. On the other hand, the selected audio is processed in volume control stage in according with DC control voltage at pin #13 and then, it is sent from pin #14 to sound output stage.

The IF block produces control signals, which are AGC for tuner at pin #23 in according to voltage of pin #24 controlled by microcontroller pin #48.

2.2 Multi-Standard Video IF, Sound IF and Switch IC (STV 8224) and AM Sound IF IC (STV 8225) :

STV 8224 is a picture and sound IF processor for negative and positive applications. The architecture of the video and sound demodulator, which are both based on PLL structure, allows a very good linearity of the Intermediate Frequency Response and an application with very few external components and adjustments. The volume on the audio signal is controlled through a DC level (pin #13) which is provided from STV 2112/ 2116/2118 where all the I²C decoding is realized.

STV 8224 also provides the audio and video switches with STV 8225 for one scart applications.

The IF inputs at pins #19 and #20 are driven by Tuner via SAW filter (Z101) which is K6256 for B/G - L/L' applications. This saw filter is switchable according to a control signal produced by microcontroller(pin #13). The baseband signal(CVBS) at pin #3 is produced from these IF inputs and selection between external and internal is carried out according to the switching control signal at pin #4. This control signal comes from STV2118.

The baseband signal is used to produce the video signal and on the other hand to produce intercarrier sound signal. This internal video signal is fed to pin #10 of this IC for internal-external (from scart) video switching and to the base of the buffer transistor Q102 for the video output of the scart connector. For the internal and external video switching, external video enters from pin #12, and then, selected video is sent from pin #11 to video processing part.

The intercarrier signal, used for reproducing the sound, passes through the band pass filter Z103 with center frequency 5.5MHz for B/G standard and resultant signal is applied to the pin #8 of the IC STV 8224 which is the input of limiter and SIF PLL stage. The limiter and SIF PLL output pin #15 which is connected to the deemphasis capacitor drives pin #5 of the IC STV 8225 as FM Sound Input in order to be able to select the appropriate (FM or AM) audio signal for producing audio out of the scart connector. The selected signal at pin #9 of STV8225 drives external audio output connections. On the other hand, the audio switch in STV 8224 is used to select the internal FM signal or the output of STV 8225 (pin #7), which selects the internal AM signal or External audio signal (at pin #11) coming from scart socket. The selected audio is processed in volume control stage in according with DC control voltage at pin #13 and then, it is sent from pin #14 to sound output stage. The IF signal is filtered at Z102 saw filter which is switchable according to the control signals produced by microcontroller for L or L' mode. Output of SAW is connected to pin #1 and #14 of SIF IC STV 8225(IC 102) for AM demodulation of sound. The audio switches in STV 8225 selects the signals according to DC voltage at pin #10 of STV8225.

The IF block produces control signals, which are AGC for tuner at pin #23 in according to voltage of pin #24 controlled by microcontroller and AFC for microcontroller at pin #48.

There are two main switching circuits. First one is the Z101(Saw Filter) switching of L' standart and the second one is the Trap Filters Switching circuit which includes only sound traps. Since this chassis doesn't include the M,N standarts, only one video trap(Z107) is existed in the chassis. Therefore, there is no need for trap switching of video.

The control voltage for L' switching circuitry is produced by microcontroller(pin #13). The logic of this signal, which is defined by MAC-15, is as given in Table 2.1.

Selected Mode	L/L' Switching Voltage	Adjusted Frequency
Modes other than L'	HIGH	38.9 MHz
L'	LOW	33.9 MHz

Table 2.1 The Logic of the L/L' Switching Voltage (based on MAC-15)

This control voltage is applied to R121. When this voltage is LOW, diode D105 is ON and VC101, C129 and C130 are connected in parallel to the reference tank circuit VL101. On the other hand, This circuit is disconnected when L/L' voltage is HIGH since D105 is OFF.

In according to selected system configuration, it must be used multistandard switched type SAW filters. For this reason an optional circuitry is applied this stage by D101, D102, (and if using L/L', D103 ,D104 for SIF SAW Z102).

3. SIGNAL PROCESSING PART :

This part processes video coming from IF part, RGB coming from Scart and Controller in order to drive Horizontal and Vertical deflection stages and CRT baseboard and to produce some control voltages by means of Bus-controlled PAL-SECAM-NTSC TV Processor IC, STV 2112/2116/2118 and 64msec Delay Line IC, STV2180. The detailed functional descriptions of these IC's are given in the following subsections.

3.1 Bus-controlled Multi-Standard TV Processor IC, STV 2118 :

The STV 2118 (IC 401) is a fully bus controlled IC for TV Luma, Chroma and Deflection processing. In order to make the alignments by microcontroller via I²C, the required data are transferred from microcontroller into the related registers of STV 2118. The main inputs for this IC are as follows :

- I²C Inputs from microcontroller
- Y/CVBS Input from IF Part, external CVBS from scart or front AV RCA jack, external RGB and Fast Blank signals coming from Scart.
- OSD TELETEXT RGB and Fast Blank signals from microcontroller
- BCI (Black Current Information) from CRT Baseboard
- BCL (Beam Current Limiting) information from Horizontal Output Stage
- Line Flyback Sample from Horizontal Output Stage
- Delayed R-Y and B-Y signals from Delay Line IC STV 2180

Detailed Features and the internal block diagram of the IC STV 2118 are given in following subsections:

3.1.1 Deflection Circuit:

The deflection part includes a fully integrated sync-separator locked to a 503 kHz VCO with external resonator (X401) , two phase locked loops for horizontal deflection, vertical count down with 50 Hz and 60 Hz operation for field frequency.

Vertical output pulse is 10.5 lines long at pin #35, furthermore horizontal output pulse is 28 msec on open collector pin #36.

The horizontal output is at high level when Vcc increases from 0V to 6.8V. On shutting down, the horizontal pulse disabled when Vcc is below 6.2V.

When vertical pulses are disappeared, horizontal output is disabled by microcontroller for keeping CRT phosphor.

Line position adjustment is controlled by bus using related service mode.

Bus controlled output voltage at pin #34 is used to adjust vertical amplitude at vertical output stage via R705, R706 and R707.

Bus controlled vertical position information is produced from high level of the vertical pulse pin #35 and this signal is used to adjust vertical positioning at vertical output stage via R701, R703, R704, C701, D701 and Q701.

The sandcastle signal at pin #37 is used to control the external baseband chroma delay line (STV 2180 -IC 402- pin #6).

3.1.2 Filters :

All filters (integrated trap filter, integrated chroma bandpass, integrated bell filter for SECAM, integrated delay line) are tuned with a reference PLL.

The PLL consists of a lowpass filter, a phase comparator, a loop filter (an external capacitor C423 on pin #8). The reference signal is the continuous carrier wave from the VCO (4.43 MHz or 3.58 MHz). The PLL will adjust the center frequency of the lowpass so that it will be equal to the reference signal. The tuning voltage of the PLL (memorized on pin #8) will adjust all other filters.

The cloche filter is fine-tuned with a second PLL operating during frame retrace. Tuning voltage is memorized on an external capacitor C424 at pin #9.

3.1.3 Video Circuit :

Video part includes two RGB inputs, automatic cut-off control, DC cut-off adjustment, RGB gain adjustments, beam current limiting. Furthermore, user video settings (contrast, saturation, brightness and sharpness controls) are performed by this block. RGB output pins are as follows: R output is pin #29, G output is pin #28 and B output is pin #27.

The beam current information is fed to pin #31 via R411 and D403. This control voltage will act on contrast first, then the brightness will be decreased when contrast attenuation reaches -5dB.

Automatic cut-off function is realized according to the BCI signal at pin #30. Sequential cut-off current measurements are made during three lines after frame blanking signal.

3.1.4 Chroma Circuit :

The chroma part includes PAL, SECAM, NTSC demodulator. An external base band delay line (STV 2180 IC402) is used in this concept. R-Y and B-Y outputs of STV 2118 (pin #40 and pin #41) are sent to STV 2180 to get 64 msec delayed signals.

The PAL, SECAM or NTSC standard selection is made by automatic standard identification. A crystal osc. (X403) for NTSC-M/3.58 is used in only p.back NTSC M models.

RGB selection is made by microcontroller via bus control.

3.1.5 Other Functions :

Volume Control and Mute output is pin #10. The voltage range for volume control is 0.5V to 5V, whereas below 0.1V is used for muting. The output of this pin is controlled by microcontroller via I²C bus and the value is saved in related register of the STV 2118.

The selection of the IF standard (Positive or Negative Vision Modulation) and the TV/AV mode is controlled by I²C bus. The selection is converting in four voltages which are used to control the IF IC's STV 8224 and STV 8225 on pin #11. Related voltage levels and their situations are tabulated as follows:

SITUATION		VOLTAGE RANGE (V ₁₁)	
STANDARD	SOURCE	MAX.	MIN.
NEGATIVE	TV	0.7	0
POSITIVE	TV	3.8	2.9
POSITIVE	AV	6.1	5.2
NEGATIVE	AV	9	7.88

Table 3.1 Related voltage levels and their situations for pin #11 of STV 2118

3.2 Base Band Chroma Delay Line IC STV 2180 :

The STV 2180 is an integrated base band chroma delay line with one line delay, which has been designed to match chroma decoders with color difference signal outputs (R-Y) and (B-Y). This IC has dual switched capacitors delay line with 3 MHz clock and integrated filters to suppress the residual clock components. It designed to work in conjunction with STV 2112/2116/2118 and it allows an adjustment free application.

The inputs for this IC are as follows :

- (R-Y) at pin #2 coming from STV 2118
- (B-Y) at pin #14 coming from STV 2118
- Sandcastle Pulse at pin #6 coming from STV 2118

On the other hand, outputs of this IC are as follows :

- Delayed (R-Y) at pin #3
- Delayed (B-Y) at pin #4

4. HORIZONTAL OUTPUT AND EHT STAGE :

The horizontal pulses, from pin #36 of IC401, are connected to base of driver transistor Q601 through Q601, R603, C601. The driver circuitry (Q601, R604, C602, L602, R608) drives the horizontal deflection output transistor BU808DFI (Q602). TR601 is the EHT (Extra High Tension) transformer. The 112V supply voltage for the stage is connected at #2. TR601 transformer generates EHT, focus and G2 voltages, required by picture tube. Furthermore, the 200V supply for video output, 26V supply for vertical output and heater drive current are derived from this transformer. The beam current information from pin #8 of TR601 is used for reducing the contrast at excessive long term average beam current and compensation voltage to vertical output to stabilize picture height. The flyback signal sample (AC coupled and clipped by R606, C614, C604, D602, D601) is used to generate sandcastle pulse for video processor IC and horizontal pulse (Q603) required by uC.

5. VERTICAL OUTPUT STAGE (TDA 1771)

The TDA1771 (IC701) vertical deflection integrated circuit is used for output of vertical stage. Trigger pulses from STV2118 feeds to pin #3 of TDA1771. The signal produced by built in ramp generator synchronizes input trigger pulses. Amplitude is adjusted by an independent input pin (#4). Built in voltage generator output, feedback information by pin #8, internal sawtooth signal and amplitude information are applied to output OP-AMP. This output stage has also thermal protection and flyback generator for reliability and effectivity. Applied pulse from STV2118, contains vertical position information as maximum dc level of signal and is extracted by Q701 and fed as a part of feedback to output stage. Vertical shift DC supply is obtained via R716. The amplitude control is supplied by STV2118. Vertical deflection output stage is supplied by +26V output of FBT and D605, C603 circuitry.

6. SOUND OUTPUT STAGE (TDA2822M) :

TDA2822M is used as the AF output amplifier. It is supplied by +12V coming from a separate winding in the SMPS transformer (T802). Pin #14 of the STV8223 (or STV 8224) is AC coupled to the input pin #7 of the TDA2822M via a resistor divider. Maximum audio output power at 10% THD is 1.5W. Q301 for start up muting and Q302 for muting by uC are used, and an alarm signal by uC is fed to this input.

7. POWER SUPPLY (SMPS) :

The DC voltage sources required at various stages of the chassis are provided by an SMPS controlled by the IC801 (MC44603 for common models and MC44604 for 'low power consumption on stand by mode' models). This IC is designed for driving, controlling and protecting the switching MOSFET transistor of SMPS (Q801). This supply has three outputs; one 112V output which is used for horizontal output and 33V generation needed by tuner section, one 16V output for all small signal sections an uC and one for audio output section. This chassis may be used in 90 - 270 volt with appropriate optional circuitry and components. The uC which is supplied by a source designed regulator with zener diode (D814) controls stand by mode by switching Q803 (for 44604 application Q806).

8. uC (MICROCONTROLLER) :

The microcontroller hardware that is member of the ST9 family has a TV receiver control software with menu control and Teletext decoding. It controls the chassis through I²C bus, PWM outputs and I/O ports. Dominant features of controller are optional teletext, outputs for OSD, IR control signal receiving.

The controller has I²C communication ports at #19, #20; OSD/TeleText driver (R,G,B,FBI) at #17, #16, #15, #18; PWM control outputs for VST #54; vertical linearity adjustment #49; AGC adjustment #48. Other control outputs are for muting #47; system switches #12, #13, #44; tuner switches #9, #10 and the inputs are AFC information from IF #52; keyboard #3, #4, #5, #6; TV,AV,RGB and 4:3-16:9 switching #55, #43; horizontal sync #40; vertical sync #41 ; infrared #1 and reset #2.

The controller has also a software which is able to control some service adjustments: R,G,B gain; R,G cutoff; vertical shift; vertical linearity; horizontal shift; vertical amplitude for 50Hz and 60Hz; AGC. Furthermore , a menu with 4 languages and a symbol menu is optional.

To enter the service mode, press 4725 in the main menu.

Parameters can be selected by program up and down, parameter adjustments can be done by volume up and down buttons. In order to exit the service mode press TV button.

TELETEXT: The video signal coming from the IF stage is fed to the uC. R, G, B signals are extracted from CVBS input by the software. Then R,G,B and FBL signals are sent to the related inputs of STV2118

9. CRT BASE-BOARD :

When RGB signals enter the input of the video amplifier stage (CRT base-board), they are amplified by means of three symmetrical video amplifier stages. For this purpose three 2SC2482 high voltage, video output transistors are used. So, high gain-bandwidth product is achieved. Furthermore black level changes at the output amplifiers caused by temperature or component agings are compensated by means of a closed loop control system. For this reason the cathode current information (ICAT) is sent to STV2118.

MANUAL ADJUSTMENT PROCEDURES OF THE 11AK20S CHASSIS

How to enter and exit the SERVICE Menu:

- Enter the Main Menu
- Press the digits 4, 7, 2, and 5, respectively
- Press MENU key to exit
- There're two selections in the Service Menu: 'ADJUST...' and 'OPTIONS...'

How to use the ADJUST Menu:

- Enter the Service Menu,
- Move the selection bar on the item 'ADJUST...' using the " \uparrow " or " \downarrow " keys,
- Select the item 'ADJUST...' using the "<" or ">" keys,
- The items below will be displayed (one of them at one time),

1) AGC (Automatic Gain Control)	8) HSH (Horizontal Shift)
2) VA1 (Vertical Amplitude for 4:3, 50Hz)	9) WG (White Point GREEN)
3) VA2 (Vertical Amplitude for 16:9, 50Hz)	10) WR (White Point RED)
4) VA3 (Vertical Amplitude for 4:3, 60Hz)	11) WB (White Point BLUE)
5) VA4 (Vertical Amplitude for 16:9, 60Hz)	12) CR (Cut-off Red)
6) VSH (Vertical Shift)	13) CG (Cut-off Green)
7) VL (Vertical Linearity)	14) OSH (OSD Horizontal Position)
- Press " \uparrow " or " \downarrow " keys till the desired item is displayed,
- Press "<" or ">" keys to change the values.

NOTE: The Service Menu below shows the ranges of the adjustment parameters.

AGC Adjustment:

- Enter a 60dBmV RF signal level from channel C-12,
- Connect a digital voltmeter to AGC test point (or to pin1 of the tuner),
- Set the AGC parameter to zero and note the AGC voltage value,
- Increase the AGC parameter till the AGC voltage decreases 1V below the noted voltage value,
- Check that picture is normal at 90dBmV signal level.

Vertical Amplitude Adjustments:

- There're four adjustment parameters: Two for 50Hz and two for 60Hz.
- Enter a PAL B/G test pattern via RF,
- Change vertical slope till horizontal black lines on both the upper and lower part of the test pattern become very close to the upper and lower horizontal sides of picture tube and nearly about to disappears,
- Check and do the same adjustment if it becomes improper after some other geometric adjustments.

Vertical Shift and Horizontal Shift Adjustments:

- Enter a test pattern for geometric adjustments via RF,
- Change Vertical Shift till the test pattern is centred vertically and horizontally
- Check and do the same adjustment if it becomes improper after some other geometric adjustments

Vertical Linearity Adjustment:

- Enter a cross-hatch pattern via RF,
- Change VL parameter till the size of squares on both the upper and lower part of test pattern become equal to the squares laying on the vertical centre of the test pattern,
- Check and do the same adjustment if it becomes improper after some other geometric adjustments.

White Point Adjustment:

- Enter a white pattern via RF,
- Set all of the 3 parameters (WR, WG, WB) firstly to zero,
- Set the values till you get a pure white screen. (To to do a correct adjustment use a colour analyser).

Black point Adjustment:

- Set CR and CG parameter values firstly to zero,
- Set the values to do this adjustment.

How to use the OPTION BYTES:

- Enter the Service Menu,
- Move the selection bar on the item 'OPTIONS...' using the "P" or "D" keys,
- Select the item 'OPTIONS...' using the "<" or ">" keys,
- Select the desired option,
- Use the digit keys to do the adjustments. The digit keys 0 through 7 are used to change the bits 0 through 7, respectively.

NOTE: The Service Menu below shows the meanings of each bit.

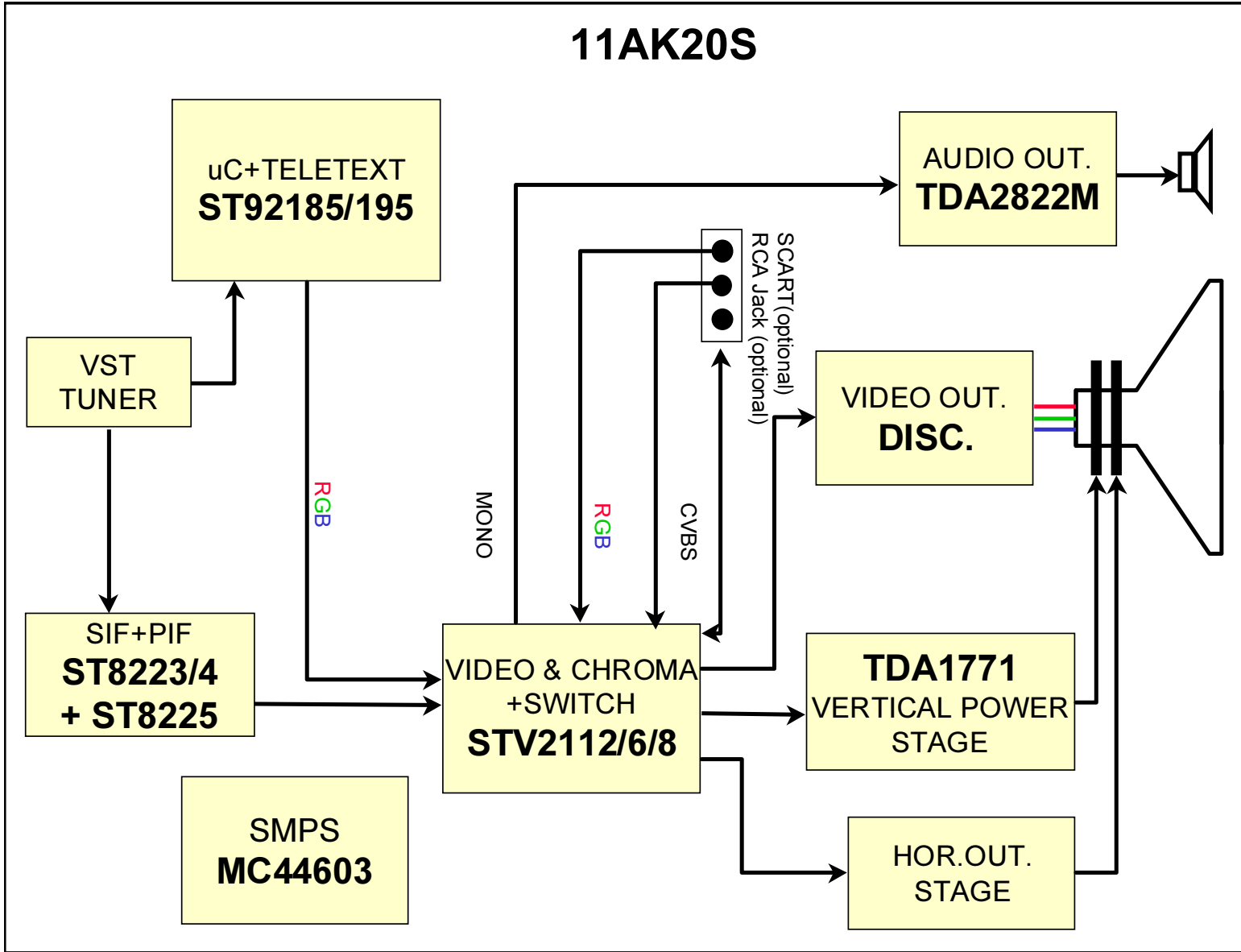
SERVICE MENU																																																																																																																																																															
<p><u>THE SERVICE MENU IS ALWAYS IN ENGLISH...</u></p> <p>SERVICE ADJUST... OPTIONS...</p> <p>ADJUST</p> <table border="1" style="width:100%; border-collapse: collapse; font-size: small;"> <thead> <tr> <th></th> <th></th> <th>MIN</th> <th>MAX</th> </tr> </thead> <tbody> <tr><td>AGC</td><td>Automatic Gain Control</td><td>0</td><td>63</td></tr> <tr><td>VA1</td><td>Vertical Amplitude 4:3 (50 Hz)</td><td>-32</td><td>31</td></tr> <tr><td>VA2</td><td>Vertical Amplitude 16:9 (50 Hz)</td><td>-32</td><td>31</td></tr> <tr><td>VA3</td><td>Vertical Amplitude 4:3 (60 Hz)</td><td>-32</td><td>31</td></tr> <tr><td>VA4</td><td>Vertical Amplitude 16:9 (60 Hz)</td><td>-32</td><td>31</td></tr> <tr><td>VSH</td><td>Vertical Shift(position)</td><td>-4</td><td>3</td></tr> <tr><td>VL</td><td>Vertical Linearity</td><td>0</td><td>63</td></tr> <tr><td>HSH</td><td>Horizontal Shift</td><td>-32</td><td>31</td></tr> <tr><td>WR</td><td>White Point Adjust Red</td><td>-32</td><td>31</td></tr> <tr><td>WG</td><td>White Point Adjust Green</td><td>-32</td><td>31</td></tr> <tr><td>WB</td><td>White Point Adjust Blue</td><td>-32</td><td>31</td></tr> <tr><td>CR</td><td>Cutoff-R</td><td>-32</td><td>31</td></tr> <tr><td>CG</td><td>Cutoff-G</td><td>-32</td><td>31</td></tr> <tr><td>OSH</td><td>OSD Horizontal Position</td><td>1</td><td>127</td></tr> </tbody> </table> <p style="font-size: x-small; margin-top: 10px;">In this menu only one item is displayed</p>			MIN	MAX	AGC	Automatic Gain Control	0	63	VA1	Vertical Amplitude 4:3 (50 Hz)	-32	31	VA2	Vertical Amplitude 16:9 (50 Hz)	-32	31	VA3	Vertical Amplitude 4:3 (60 Hz)	-32	31	VA4	Vertical Amplitude 16:9 (60 Hz)	-32	31	VSH	Vertical Shift(position)	-4	3	VL	Vertical Linearity	0	63	HSH	Horizontal Shift	-32	31	WR	White Point Adjust Red	-32	31	WG	White Point Adjust Green	-32	31	WB	White Point Adjust Blue	-32	31	CR	Cutoff-R	-32	31	CG	Cutoff-G	-32	31	OSH	OSD Horizontal Position	1	127	<p style="text-align: center;">OPTION BYTE 1</p> <table border="1" style="width:100%; border-collapse: collapse; font-size: x-small; margin-bottom: 10px;"> <tr><td style="text-align: center;">7</td><td style="text-align: center;">6</td><td style="text-align: center;">5</td><td style="text-align: center;">4</td><td style="text-align: center;">3</td><td style="text-align: center;">2</td><td style="text-align: center;">1</td><td style="text-align: center;">0</td></tr> <tr><td style="text-align: center;">b7</td><td style="text-align: center;">b6</td><td style="text-align: center;">b5</td><td style="text-align: center;">b4</td><td style="text-align: center;">b3</td><td style="text-align: center;">b2</td><td style="text-align: center;">b1</td><td style="text-align: center;">b0</td></tr> </table> <p style="font-size: x-small; margin-bottom: 10px;"> └─── Receiving System └─── Horizontal position of OSD └─── HUE enable/disable </p> <table border="1" style="width:100%; border-collapse: collapse; font-size: x-small; margin-bottom: 10px;"> <tr><td style="text-align: center;">b2</td><td style="text-align: center;">b1</td><td style="text-align: center;">b0</td></tr> <tr><td style="text-align: center;">0</td><td style="text-align: center;">0</td><td style="text-align: center;">0</td><td style="font-size: x-small;">not to be used</td></tr> <tr><td style="text-align: center;">0</td><td style="text-align: center;">0</td><td style="text-align: center;">1</td><td style="font-size: x-small;">Multi LL (BG-I-L-L')</td></tr> <tr><td style="text-align: center;">0</td><td style="text-align: center;">1</td><td style="text-align: center;">0</td><td style="font-size: x-small;">BG</td></tr> <tr><td style="text-align: center;">0</td><td style="text-align: center;">1</td><td style="text-align: center;">1</td><td style="font-size: x-small;">BG-DK</td></tr> <tr><td style="text-align: center;">1</td><td style="text-align: center;">0</td><td style="text-align: center;">0</td><td style="font-size: x-small;">I</td></tr> <tr><td style="text-align: center;">1</td><td style="text-align: center;">0</td><td style="text-align: center;">1</td><td style="font-size: x-small;">BG-L-L'</td></tr> <tr><td style="text-align: center;">1</td><td style="text-align: center;">1</td><td style="text-align: center;">0</td><td style="font-size: x-small;">BG-DK-I</td></tr> <tr><td style="text-align: center;">1</td><td style="text-align: center;">1</td><td style="text-align: center;">1</td><td style="font-size: x-small;">Multi MN (BG-DK-I-N-PAL M-NTSC M)</td></tr> </table> <table border="1" style="width:100%; border-collapse: collapse; font-size: x-small;"> <tr><td style="text-align: center;">b7</td></tr> <tr><td style="text-align: center;">1</td><td style="font-size: x-small;">HUE enable</td></tr> <tr><td style="text-align: center;">0</td><td style="font-size: x-small;">HUE disable</td></tr> </table>	7	6	5	4	3	2	1	0	b7	b6	b5	b4	b3	b2	b1	b0	b2	b1	b0	0	0	0	not to be used	0	0	1	Multi LL (BG-I-L-L')	0	1	0	BG	0	1	1	BG-DK	1	0	0	I	1	0	1	BG-L-L'	1	1	0	BG-DK-I	1	1	1	Multi MN (BG-DK-I-N-PAL M-NTSC M)	b7	1	HUE enable	0	HUE disable	<p style="text-align: center;">OPTION BYTE 2</p> <table border="1" style="width:100%; border-collapse: collapse; font-size: x-small; margin-bottom: 10px;"> <tr><td style="text-align: center;">7</td><td style="text-align: center;">6</td><td style="text-align: center;">5</td><td style="text-align: center;">4</td><td style="text-align: center;">3</td><td style="text-align: center;">2</td><td style="text-align: center;">1</td><td style="text-align: center;">0</td></tr> <tr><td style="text-align: center;">b7</td><td style="text-align: center;">X</td><td style="text-align: center;">X</td><td style="text-align: center;">X</td><td style="text-align: center;">b3</td><td style="text-align: center;">b2</td><td style="text-align: center;">b1</td><td style="text-align: center;">b0</td></tr> </table> <table border="1" style="width:100%; border-collapse: collapse; font-size: x-small; margin-bottom: 10px;"> <tr><td style="text-align: center;">b0</td></tr> <tr><td style="text-align: center;">1</td><td style="font-size: x-small;">3-Band Tuning (UHF-VHF1-VHF3)</td></tr> <tr><td style="text-align: center;">0</td><td style="font-size: x-small;">1-Band Tuning (UHF)</td></tr> </table> <table border="1" style="width:100%; border-collapse: collapse; font-size: x-small; margin-bottom: 10px;"> <tr><td style="text-align: center;">b1</td></tr> <tr><td style="text-align: center;">1</td><td style="font-size: x-small;">Turkish available</td></tr> <tr><td style="text-align: center;">0</td><td style="font-size: x-small;">Turkish not available</td></tr> </table> <table border="1" style="width:100%; border-collapse: collapse; font-size: x-small; margin-bottom: 10px;"> <tr><td style="text-align: center;">b2</td></tr> <tr><td style="text-align: center;">1</td><td style="font-size: x-small;">Blank Time 600ms (in TVs receiving SECAM)</td></tr> <tr><td style="text-align: center;">0</td><td style="font-size: x-small;">Blank Time 410ms (in TVs not receiving SECAM)</td></tr> </table> <table border="1" style="width:100%; border-collapse: collapse; font-size: x-small; margin-bottom: 10px;"> <tr><td style="text-align: center;">b3</td></tr> <tr><td style="text-align: center;">1</td><td style="font-size: x-small;">RGB enable</td></tr> <tr><td style="text-align: center;">0</td><td style="font-size: x-small;">RGB disable</td></tr> </table> <table border="1" style="width:100%; border-collapse: collapse; font-size: x-small;"> <tr><td style="text-align: center;">b7</td></tr> <tr><td style="text-align: center;">1</td><td style="font-size: x-small;">Symbol Menu</td></tr> <tr><td style="text-align: center;">0</td><td style="font-size: x-small;">Text Menu</td></tr> </table>	7	6	5	4	3	2	1	0	b7	X	X	X	b3	b2	b1	b0	b0	1	3-Band Tuning (UHF-VHF1-VHF3)	0	1-Band Tuning (UHF)	b1	1	Turkish available	0	Turkish not available	b2	1	Blank Time 600ms (in TVs receiving SECAM)	0	Blank Time 410ms (in TVs not receiving SECAM)	b3	1	RGB enable	0	RGB disable	b7	1	Symbol Menu	0	Text Menu
		MIN	MAX																																																																																																																																																												
AGC	Automatic Gain Control	0	63																																																																																																																																																												
VA1	Vertical Amplitude 4:3 (50 Hz)	-32	31																																																																																																																																																												
VA2	Vertical Amplitude 16:9 (50 Hz)	-32	31																																																																																																																																																												
VA3	Vertical Amplitude 4:3 (60 Hz)	-32	31																																																																																																																																																												
VA4	Vertical Amplitude 16:9 (60 Hz)	-32	31																																																																																																																																																												
VSH	Vertical Shift(position)	-4	3																																																																																																																																																												
VL	Vertical Linearity	0	63																																																																																																																																																												
HSH	Horizontal Shift	-32	31																																																																																																																																																												
WR	White Point Adjust Red	-32	31																																																																																																																																																												
WG	White Point Adjust Green	-32	31																																																																																																																																																												
WB	White Point Adjust Blue	-32	31																																																																																																																																																												
CR	Cutoff-R	-32	31																																																																																																																																																												
CG	Cutoff-G	-32	31																																																																																																																																																												
OSH	OSD Horizontal Position	1	127																																																																																																																																																												
7	6	5	4	3	2	1	0																																																																																																																																																								
b7	b6	b5	b4	b3	b2	b1	b0																																																																																																																																																								
b2	b1	b0																																																																																																																																																													
0	0	0	not to be used																																																																																																																																																												
0	0	1	Multi LL (BG-I-L-L')																																																																																																																																																												
0	1	0	BG																																																																																																																																																												
0	1	1	BG-DK																																																																																																																																																												
1	0	0	I																																																																																																																																																												
1	0	1	BG-L-L'																																																																																																																																																												
1	1	0	BG-DK-I																																																																																																																																																												
1	1	1	Multi MN (BG-DK-I-N-PAL M-NTSC M)																																																																																																																																																												
b7																																																																																																																																																															
1	HUE enable																																																																																																																																																														
0	HUE disable																																																																																																																																																														
7	6	5	4	3	2	1	0																																																																																																																																																								
b7	X	X	X	b3	b2	b1	b0																																																																																																																																																								
b0																																																																																																																																																															
1	3-Band Tuning (UHF-VHF1-VHF3)																																																																																																																																																														
0	1-Band Tuning (UHF)																																																																																																																																																														
b1																																																																																																																																																															
1	Turkish available																																																																																																																																																														
0	Turkish not available																																																																																																																																																														
b2																																																																																																																																																															
1	Blank Time 600ms (in TVs receiving SECAM)																																																																																																																																																														
0	Blank Time 410ms (in TVs not receiving SECAM)																																																																																																																																																														
b3																																																																																																																																																															
1	RGB enable																																																																																																																																																														
0	RGB disable																																																																																																																																																														
b7																																																																																																																																																															
1	Symbol Menu																																																																																																																																																														
0	Text Menu																																																																																																																																																														
<p style="font-size: x-small;">NOTE: The values of the Option Bytes are written in binary form. The meaning of each bit is explained, above. The digits 0 through 7 are used to change the bit values. These digits are changing the related bits to 0 or 1. Let's change the value of the RGB bit (b3) in Option2, as an example. Firstly, select Option2, and press the digit '3'. The bit value will change from 0 to 1 or from 1 to 0 (toggle). In this way the values of the bits can be set to the desired values, easily.</p>																																																																																																																																																															
<p>CHARACTER SETS FOR TELETEXT</p> <table border="1" style="width:100%; border-collapse: collapse; font-size: x-small; margin-bottom: 10px;"> <tr><td style="background-color: #cccccc;">SET 1</td></tr> <tr><td>English</td></tr> <tr><td>German</td></tr> <tr><td>Swedish</td></tr> <tr><td>Italian</td></tr> <tr><td>French</td></tr> <tr><td>Spanish/Portuguese</td></tr> <tr><td>Czechoslovak</td></tr> </table> <table border="1" style="width:100%; border-collapse: collapse; font-size: x-small; margin-bottom: 10px;"> <tr><td style="background-color: #cccccc;">SET 2</td></tr> <tr><td>Polish</td></tr> <tr><td>German</td></tr> <tr><td>Swedish</td></tr> <tr><td>Italian</td></tr> <tr><td>French</td></tr> <tr><td>Serbocroat</td></tr> <tr><td>Czechoslovak</td></tr> <tr><td>Rumanian</td></tr> </table> <table border="1" style="width:100%; border-collapse: collapse; font-size: x-small;"> <tr><td style="background-color: #cccccc;">SET 3</td></tr> <tr><td>English</td></tr> <tr><td>German</td></tr> <tr><td>Swedish</td></tr> <tr><td>Italian</td></tr> <tr><td>French</td></tr> <tr><td>Spanish/Portuguese</td></tr> <tr><td>Turkish</td></tr> </table>	SET 1	English	German	Swedish	Italian	French	Spanish/Portuguese	Czechoslovak	SET 2	Polish	German	Swedish	Italian	French	Serbocroat	Czechoslovak	Rumanian	SET 3	English	German	Swedish	Italian	French	Spanish/Portuguese	Turkish	<p style="text-align: center;">OPTION BYTE 3 (FOR TELETEXT)</p> <table border="1" style="width:100%; border-collapse: collapse; font-size: x-small; margin-bottom: 10px;"> <tr><td style="text-align: center;">7</td><td style="text-align: center;">6</td><td style="text-align: center;">5</td><td style="text-align: center;">4</td><td style="text-align: center;">3</td><td style="text-align: center;">2</td><td style="text-align: center;">1</td><td style="text-align: center;">0</td></tr> <tr><td style="text-align: center;">b7</td><td style="text-align: center;">b6</td><td style="text-align: center;">b5</td><td style="text-align: center;">b4</td><td style="text-align: center;">X</td><td style="text-align: center;">X</td><td style="text-align: center;">b1</td><td style="text-align: center;">b0</td></tr> </table> <p style="font-size: x-small; margin-bottom: 10px;">Character Set</p> <table border="1" style="width:100%; border-collapse: collapse; font-size: x-small; margin-bottom: 10px;"> <tr><td style="text-align: center;">b1</td><td style="text-align: center;">b0</td></tr> <tr><td style="text-align: center;">0</td><td style="text-align: center;">0</td><td style="font-size: x-small;">Set 1</td></tr> <tr><td style="text-align: center;">0</td><td style="text-align: center;">1</td><td style="font-size: x-small;">Set 2</td></tr> <tr><td style="text-align: center;">1</td><td style="text-align: center;">0</td><td style="font-size: x-small;">Set 3</td></tr> <tr><td style="text-align: center;">1</td><td style="text-align: center;">1</td><td style="font-size: x-small;">not to be used</td></tr> </table> <p style="font-size: x-small; margin-bottom: 10px;">Values of TTX Brightness/Contrast (Bits of OPTION BYTE 3)</p> <table border="1" style="width:100%; border-collapse: collapse; font-size: x-small; margin-bottom: 10px;"> <tr><td style="text-align: center;">b7</td><td style="text-align: center;">b6</td><td style="text-align: center;">b5</td><td style="text-align: center;">b4</td><td style="text-align: center;">Value</td></tr> <tr><td style="text-align: center;">0</td><td style="text-align: center;">0</td><td style="text-align: center;">0</td><td style="text-align: center;">0</td><td style="text-align: center;">0</td></tr> <tr><td style="text-align: center;">0</td><td style="text-align: center;">0</td><td style="text-align: center;">0</td><td style="text-align: center;">1</td><td style="text-align: center;">2</td></tr> <tr><td style="text-align: center;">0</td><td style="text-align: center;">0</td><td style="text-align: center;">1</td><td style="text-align: center;">0</td><td style="text-align: center;">4</td></tr> <tr><td style="text-align: center;">0</td><td style="text-align: center;">0</td><td style="text-align: center;">1</td><td style="text-align: center;">1</td><td style="text-align: center;">6</td></tr> <tr><td style="text-align: center;">0</td><td style="text-align: center;">1</td><td style="text-align: center;">0</td><td style="text-align: center;">0</td><td style="text-align: center;">8</td></tr> <tr><td style="text-align: center;">0</td><td style="text-align: center;">1</td><td style="text-align: center;">0</td><td style="text-align: center;">1</td><td style="text-align: center;">10</td></tr> <tr><td style="text-align: center;">0</td><td style="text-align: center;">1</td><td style="text-align: center;">1</td><td style="text-align: center;">0</td><td style="text-align: center;">12</td></tr> <tr><td style="text-align: center;">0</td><td style="text-align: center;">1</td><td style="text-align: center;">1</td><td style="text-align: center;">1</td><td style="text-align: center;">14</td></tr> <tr><td style="text-align: center;">1</td><td style="text-align: center;">0</td><td style="text-align: center;">0</td><td style="text-align: center;">0</td><td style="text-align: center;">16</td></tr> <tr><td style="text-align: center;">1</td><td style="text-align: center;">0</td><td style="text-align: center;">0</td><td style="text-align: center;">1</td><td style="text-align: center;">18</td></tr> <tr><td style="text-align: center;">1</td><td style="text-align: center;">0</td><td style="text-align: center;">1</td><td style="text-align: center;">0</td><td style="text-align: center;">20</td></tr> <tr><td style="text-align: center;">1</td><td style="text-align: center;">0</td><td style="text-align: center;">1</td><td style="text-align: center;">1</td><td style="text-align: center;">22</td></tr> <tr><td style="text-align: center;">1</td><td style="text-align: center;">1</td><td style="text-align: center;">0</td><td style="text-align: center;">0</td><td style="text-align: center;">24</td></tr> <tr><td style="text-align: center;">1</td><td style="text-align: center;">1</td><td style="text-align: center;">0</td><td style="text-align: center;">1</td><td style="text-align: center;">26</td></tr> <tr><td style="text-align: center;">1</td><td style="text-align: center;">1</td><td style="text-align: center;">1</td><td style="text-align: center;">0</td><td style="text-align: center;">28</td></tr> <tr><td style="text-align: center;">1</td><td style="text-align: center;">1</td><td style="text-align: center;">1</td><td style="text-align: center;">1</td><td style="text-align: center;">30</td></tr> </table> <div style="border: 1px solid black; padding: 5px; font-size: x-small; margin-top: 10px;"> <p>Values of TTX Brightness/Contrast and OSD Horizontal Position:</p> <p>To control the Brightness of the TTX, four of the bits of 'Option Byte 3' is used. In the table just beside the values of TTX Brightness/Contrast are given according to the bit values.</p> <p>To control the horizontal position of the OSD (teletext and menu display positions), the 14th parameter of ADJUST menu is used. The range is from 1 to 127. (As the value of this parameter increases the OSD moves from left to right.) These adjustments have to be done while doing the Service Adjustments.</p> </div>	7	6	5	4	3	2	1	0	b7	b6	b5	b4	X	X	b1	b0	b1	b0	0	0	Set 1	0	1	Set 2	1	0	Set 3	1	1	not to be used	b7	b6	b5	b4	Value	0	0	0	0	0	0	0	0	1	2	0	0	1	0	4	0	0	1	1	6	0	1	0	0	8	0	1	0	1	10	0	1	1	0	12	0	1	1	1	14	1	0	0	0	16	1	0	0	1	18	1	0	1	0	20	1	0	1	1	22	1	1	0	0	24	1	1	0	1	26	1	1	1	0	28	1	1	1	1	30																		
SET 1																																																																																																																																																															
English																																																																																																																																																															
German																																																																																																																																																															
Swedish																																																																																																																																																															
Italian																																																																																																																																																															
French																																																																																																																																																															
Spanish/Portuguese																																																																																																																																																															
Czechoslovak																																																																																																																																																															
SET 2																																																																																																																																																															
Polish																																																																																																																																																															
German																																																																																																																																																															
Swedish																																																																																																																																																															
Italian																																																																																																																																																															
French																																																																																																																																																															
Serbocroat																																																																																																																																																															
Czechoslovak																																																																																																																																																															
Rumanian																																																																																																																																																															
SET 3																																																																																																																																																															
English																																																																																																																																																															
German																																																																																																																																																															
Swedish																																																																																																																																																															
Italian																																																																																																																																																															
French																																																																																																																																																															
Spanish/Portuguese																																																																																																																																																															
Turkish																																																																																																																																																															
7	6	5	4	3	2	1	0																																																																																																																																																								
b7	b6	b5	b4	X	X	b1	b0																																																																																																																																																								
b1	b0																																																																																																																																																														
0	0	Set 1																																																																																																																																																													
0	1	Set 2																																																																																																																																																													
1	0	Set 3																																																																																																																																																													
1	1	not to be used																																																																																																																																																													
b7	b6	b5	b4	Value																																																																																																																																																											
0	0	0	0	0																																																																																																																																																											
0	0	0	1	2																																																																																																																																																											
0	0	1	0	4																																																																																																																																																											
0	0	1	1	6																																																																																																																																																											
0	1	0	0	8																																																																																																																																																											
0	1	0	1	10																																																																																																																																																											
0	1	1	0	12																																																																																																																																																											
0	1	1	1	14																																																																																																																																																											
1	0	0	0	16																																																																																																																																																											
1	0	0	1	18																																																																																																																																																											
1	0	1	0	20																																																																																																																																																											
1	0	1	1	22																																																																																																																																																											
1	1	0	0	24																																																																																																																																																											
1	1	0	1	26																																																																																																																																																											
1	1	1	0	28																																																																																																																																																											
1	1	1	1	30																																																																																																																																																											

AFC Adjustment:***For TVs not including 'L/L' Standards:***

- Switched the system to the desired standard,
- Apply the IF signal to the IF inputs in accordance with the standards (38.9MHz for ' B/G ' and ' D/K ', 39.5MHz for ' I ') at pin1 and 2 of SAW filter (Z101)
- Adjust the VL101 until getting $2.5 V_{dc}$ at pin9 of the microcontroller (IC501).

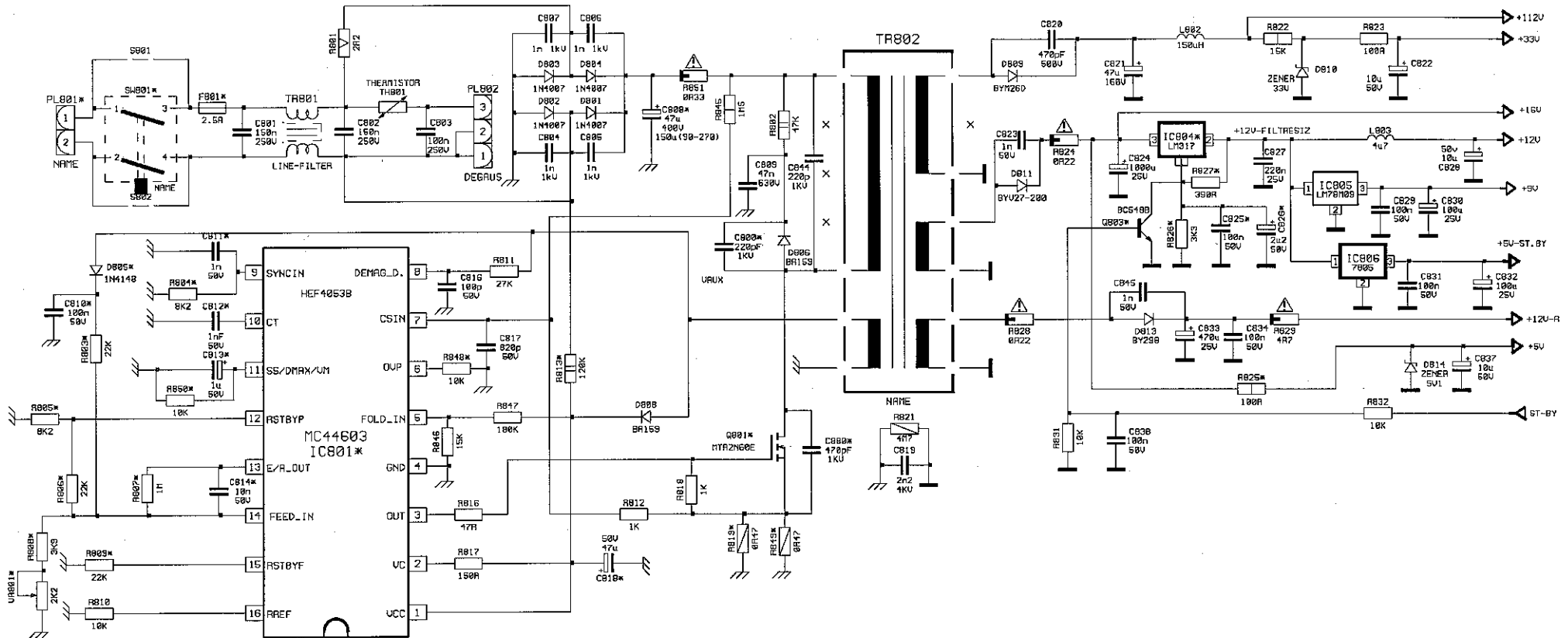
For TVs including 'L/L' Standards:

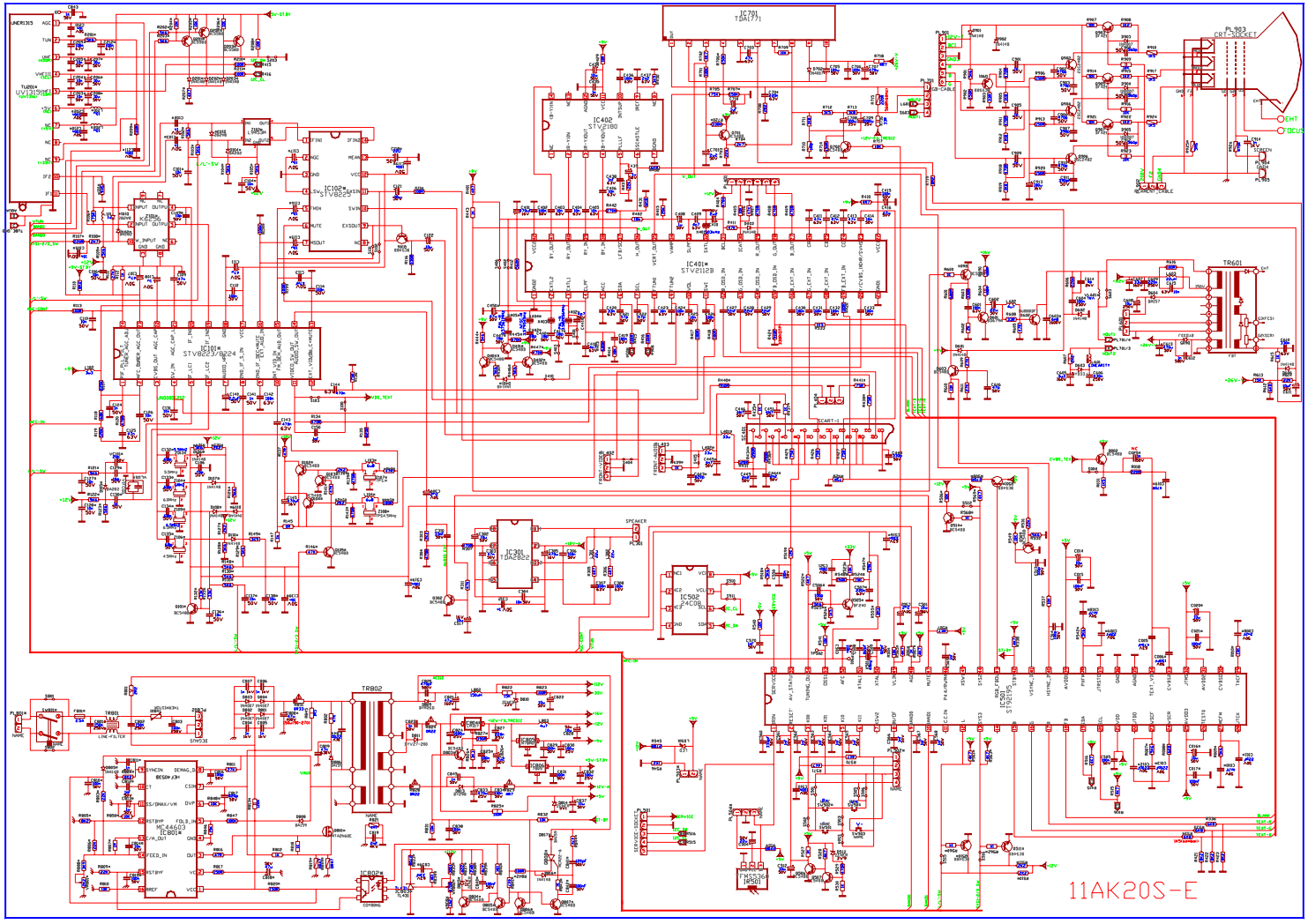
- Switched the system to a desired standard,
- Apply the IF signal to the IF inputs in accordance with the standards (38.9MHz for ' B/G ' and ' D/K ', 39.5MHz for ' I ') at pin1 and 2 of SAW filter (Z101),
- Adjust the VL101 until getting $2.5 V_{dc}$ at pin9 of the microcontroller (IC501),
- Switched the system to the standard ' L ' ,
- Apply the IF signal to the IF inputs in accordance with the standards (33.9MHz for ' L ') at pin1 and 2 of SAW filter (Z101),
- Adjust the VC101 until getting $2.5 V_{dc}$ at pin9 of the microcontroller (IC501).



GENERAL BLOCK DIAGRAM OF THE 11AK20S CHASSIS

POWER SUPPLY SCHEMATIC DIAGRAM (version without opto-coupler)





11AK20S-E