

Service Service Service



14PV110/01/07/58 **21PV548**/01/39/58
14PV202/01/07/39 **37TR210**/39
14PV220/01/07/58 **37TR220**/03
14PV227/01/07/37 **37TVB60**/39
14PV350/01/07/39 **51TR300**/03/39
14PV354/01/07/39 **51TVB70**/39
14PV358/01/07/39
20PV230/01/07
21PV340/01/39

AA

Service Manual

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Survey of versions:

/01/03	PAL B/G (with VPS)
/07	PAL I (UHF & VHF)
/39	PAL/SECAM B/G, D/K, K1, I, L, L'
/58	PAL/SECAM B/G, D/K

Survey of remote controls:

14PV110, 14PV202, 14PV220, 14PV227, 14PV350, 14PV354, 14PV358, 20PV230, 21PV340, 21PV548	RT712/201	8622 667 12201
37TR210/39, 37TVB60/39, 37TR220/03, 51TR300/03, 51TVB70/39	RT712/101	8622 667 12101

Tapedeck:

14PV110, 14PV202, 14PV220, 14PV227, 14PV350, 14PV354, 14PV358, 20PV230, 21PV340, 37TR210/39, 37TR220/03, 37TVB60/39, 51TR300, 51TVB70/39	TAPE DECK WDAT-P2/0 LP
21PV548	TAPE DECK WDAT-P4/0 LP

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1.3 Technical specification

Mains voltage	: 198 - 264 V
Mains frequency	: 45 - 65 Hz
Power consumption	: 14": < 46W, : 20": < 60W : 21": < 70W : 14" Standby: < 6W : 20" Standby: < 4W : 21" Standby: < 4W
Ambient temperature	: +10°C to +35°C
Relative humidity	: 20 - 80 %
Dimensions	: 14": 369 XR 375 XR 402mm (W/H/D) : 20": 504 XR 492 XR 516mm : 21": 506 XR 482 XR 516mm
Weight	: 14": 11.9kg, : 20": 20.4kg : 21": 22.4kg
Fast forward/rewind time	: 260/170s, 100/100s (E180)
Video resolution	: >240 lines
Audio SP	: 80Hz-10kHz (±6dB)
Audio LP	: 80Hz - 5kHz (±6dB)

2.2 Changes

2.2.1 Updating the service manual

All modifications and/or supplements to the Service Manual are published by means of Service Information bulletins.

Each Service Information is numbered:

TVCR 99-01 GB



A Service Information bulletin consists of a front page which, if needed, is followed by supplementary and/or replacement sheets.

Replacement sheets should replace existing sheets in the Service Manual. These sheets are identified by an additional letter after the page number.

Example: Page 5-1a replaces page 5-1 in the Service Manual.

Supplementary sheets should be inserted between existing sheets in the Service Manual. These sheets are identified by an additional figure after the page number.

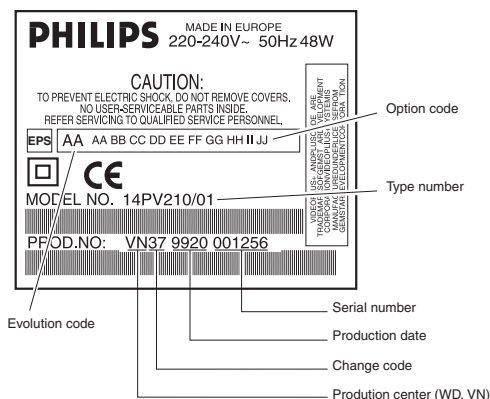
Example: Page 5-1-1 should be inserted after page 5-1.

2.2.2 Modifications in the set

All important parts of the set (such as the tape deck, the printed circuits and modules) are equipped with a sticker. Those stickers provide a number of important information.

Type plate

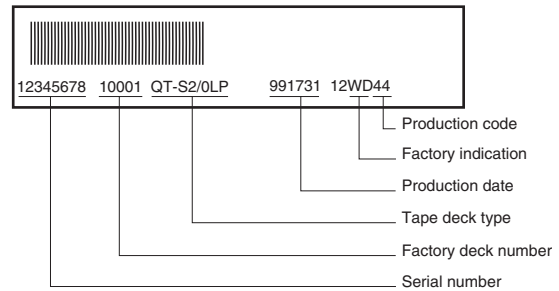
The type plate is located on the back cover.



Note:

- In case of an important change in the set, the production code on the type plate is incremented: E.g. 37 becomes 38.
- In case of a major change in the set, the evolution code is incremented: E.g. AA becomes AB.

Tape deck



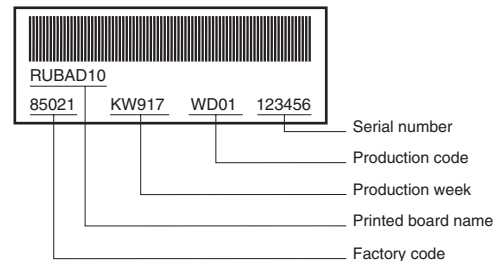
Note:

- The production code and the serial number on the tape deck do not correspond to the production code and the serial number on the type plate.

Printed circuits

The sticker is generally located on the copper side of the board.

Example:



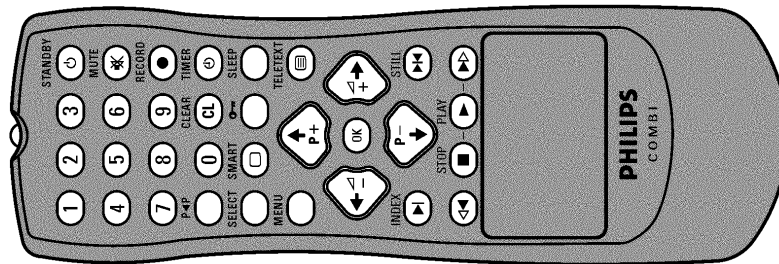
Note:

- The production code number might not always be mentioned.
- In case of an important modification, the last figure of the factory code number (point number) is increased by one: E.g. 8502.1 becomes 8502.2

3. Direction for use

OPERATING INSTRUCTIONS IN BRIEF

The remote control



[0..9] **Number buttons:** 0 - 9

[STANDBY] **Standby:** Turn machine off, cancel current function.
Press for more than 3 seconds: cancel current recording

[MUTE] **Volume off:** To switch the volume on or off

[RECORD] **Record:** To record the programme selected

[P-P] **Previous programme number:** To select the respective previously selected programme number

[CLEAR] **Delete:** Delete last entry (data)

[TIMER] **TIMER:** To programme recordings (e. g. with ShowView) or to alter/clear programmed TIMER recordings

[SELECT] **Red button / select functions:** e.g.: in the Timer overview, select TELETEXT function

[SMART] **Green button / SMART PICTURE:** To call up preset-picture settings, select TELETEXT function

[Yellow button / parental control:] To switch parental control on/off, select TELETEXT function

[SLEEP] **Blue button / sleep timer:** to select the switch-off time in 15 minutes intervals, select TELETEXT function

[MENU] **Menu:** To call up or close the main menu

[TELETEXT] **TELETEXT:** To switch TELETEXT on or off

[P+] **Select:** Next programme number / in the menu: next line

[P-] **Select:** Previous programme number / in the menu: previous line

[Left/Right] **Select:** Reduce volume / in the menu: to the left or to select settings/values

[Up/Down] **Select:** Increase volume / in the menu: to the right or to select settings/values

[OK] **Store/Confirm:** To store or confirm entry

[INDEX] **Index search:** Search for the previous/next recording code on the tape in combination with [Left/Right]

[STILL] **Still picture:** Stop the tape and show the current picture as a still picture

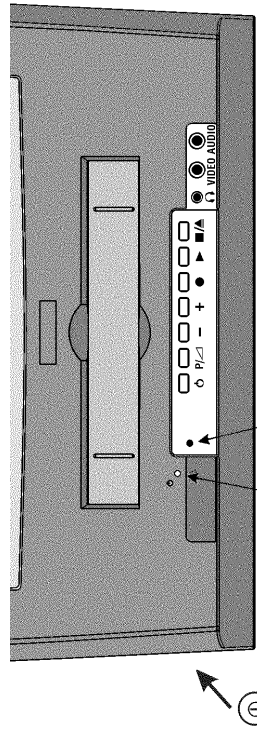
[Left/Right] **Rewind:** During STOP or STANDBY: rewind, during PLAYBACK: reverse picture search

[STOP] **Pause/Stop:** Stop the tape, except with programmed recordings (TIMER)
Press for more than 3 seconds, eject tape

[PLAY] **Playback:** To play a recorded cassette

[Right/Left] **Forward wind:** During STOP or STANDBY: forward wind, during PLAYBACK: forward picture search

Front of the set

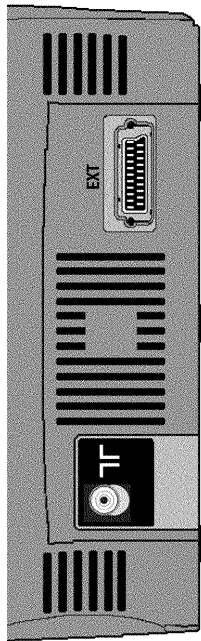


- 1** **Power switch:** To switch off the machine
Caution: If you switch off using the power switch, TIMER-recordings are not possible!
- 2** **Standby:** Switch machine off, cancel current function.
Press for more than 3 seconds: cancel current recording
- P/Δ** **Volume/OTSR:** In connection with the button **+**, **-** to regulate the volume. Press and hold longer than 3 seconds, this activates the OTSR (Sat recording) function.
- **Programme number minus:** previous programme number
- +** **Programme number plus:** next programme number
- **Record:** To record the programme currently selected
- ▶** **Playback:** To play a recorded cassette
- /▲** **Pause/Stop, eject cassette:** To stop the tape; when STOP is pressed, the cassette will be ejected from the machine

Sockets on the front:

- white socket** **Audio input socket:** To connect a camcorder or video games (audio)
- yellow socket** **Video input socket:** To connect a camcorder or video games (video)
- small socket** **socket for headphones:** To connect headphones

Back of the set



- T** **Aerial input socket:** To connect the aerial cable
- EXT** **Scart socket:** To connect a satellite receiver, decoder, video recorder, etc.

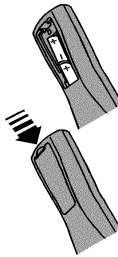
The control lights at the front of the machine

- STANDBY ●** **Standby light:** lights up when the TV-Video Combi has been switched on by means of the main switch; it blinks when a button is pressed on the remote control
- RECORD ●** **Recording light:** lights up during recording, Timer recording; blinks when timer recording is unable to start

1. CONNECT THE TV-VIDEO COMBI

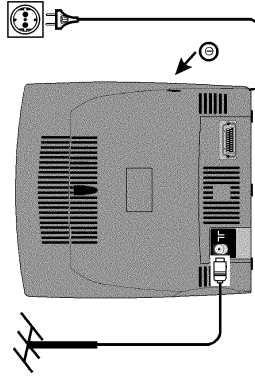
Placing the batteries in the remote control

- 1 Open up the battery compartment of your remote control and place the batteries in it as shown in the picture.



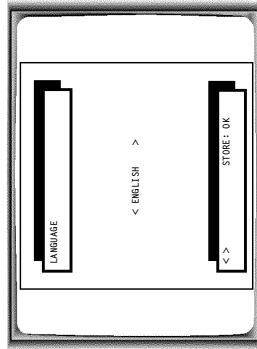
- 2 Close the battery compartment.

Connecting the cables



- 1 Insert the aerial plug into the ANT socket.
- 2 Insert the plug of the mains cable into the wall socket.

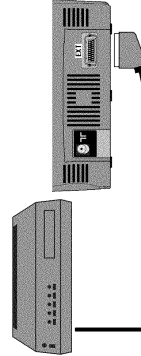
- 3 If the little red standby light (STANDBY) at the front panel of the set is not lit, please switch on the set using the main power switch. The power switch (ON) is located on the left side panel of the set. This text will appear on the TV screen.



- 4 Then, read the section 'Initial installation' in the chapter 'INSTALLING YOUR VIDEO RECORDER'.

Connecting a decoder or other equipment

You can also connect additional equipment to the EXT socket, for instance, a decoder, satellite receiver or camcorder.

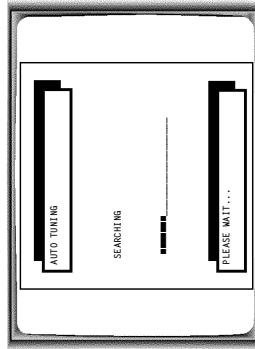


- ⚠ The respective scart socket is usually marked 'AV' or 'VCR' on the decoder or satellite receiver.

2. INSTALLATION

Initial installation

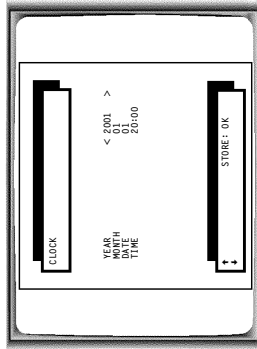
- 1 Select the desired language for the on-screen display (OSD) using the [←→] or [←→] buttons.
- 2 Confirm with the [OK] button.
- 3 Select the country you are in using the [←→] or [←→] buttons. If your country doesn't show up, select 'OTHERS'.
- 4 Confirm with the [OK] button.
- 5 After you have connected the aerial, confirm the picture on the TV screen with [OK] on the remote control. The automatic TV channel search starts. This picture will appear on the screen:



Wait until all TV channels have been found. This can take several minutes.

- 6 When the TV channel search is complete, 'STORED' will briefly appear on the TV screen.

- 'YEAR', 'MONTH', 'DATE', 'TIME' will appear on the TV screen.



- 7 Check the displayed year in line 'YEAR'. If required, please change the year with the number buttons [0-9] on the remote control.
- 8 Select the next line with [↑] or [↓].
- 9 Check 'MONTH', 'DATE' and 'TIME' in the same way. When all information is correct, confirm with [OK]. The initial installation is now complete.
- 10 If you have connected a satellite receiver, please read the section 'satellite receiver'.

- ⚠ If you have connected a decoder, you must install it as described in the next section.

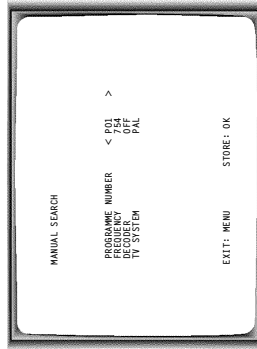
- ⚠ If you experience sound distortion or no sound at all with some TV channels, you may have selected the wrong TV system for these TV channels. In the chapter 'Manual TV channel search' you will find the information on how to change the TV system.

- ⚠ Several functions can be blocked for certain applications. Read 'Hesit mode' in chapter 'ADDITIONAL FUNCTIONS'.

Allocating a decoder

Some TV stations will send coded TV channels, that you can only watch when you use a purchased or hired decoder. You can connect such a decoder (descrambler) to your TV-Video Combi. With the following function, the connected decoder will automatically be activated for the TV channel you want to watch.

- 1 Select the TV channel for which you want to use the decoder with the [FP+] , [FP-] button on the TV-Video Combi or the number buttons [0-9] on the remote control.
- 2 Press the [MENU] button on the remote control. The main menu will appear.
- 3 Select the line 'MANUAL SEARCH' with the menu buttons [FP+] or [FP-] and confirm with the [↔] button.

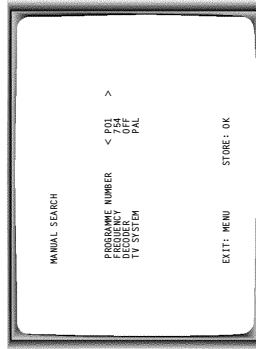


- 4 Select the line 'DECODER' with the menu buttons [FP-] or [FP+] .
- 5 Select 'ON' with the menu buttons [↔] or [↔] .
When you select 'OFF', the decoder will not be allocated.
- 6 Confirm with the [OK] button.
- 7 To end, press the [MENU] button.
Your decoder has now been allocated to this TV channel.

Manual TV channel search

In certain cases the 'Automatic TV channel search' may not be able to find all of the TV channels (e.g. coded TV channels). In that case, use this manual method to set the channels.

- 1 Press the [MENU] button on the remote control. The main menu will appear.
- 2 Select the line 'MANUAL SEARCH' with the [FP-] or [FP+] button and confirm with the [↔] button.



- 3 In the line 'PROGRAMME NUMBER', select the function with the buttons [↔] or [↔] or use the number buttons [0-9] on the remote control to select the desired programme number, e.g. 'P01'.
- 4 Select the line 'FREQUENCY' with the menu buttons [FP-] or [FP+] .
- 5 Enter the frequency of the desired TV channel with the number buttons [0-9].
If you don't know the frequency of the desired TV channel, press [↔] in line 'FREQUENCY' to start the automatic search.
Repeat automatic search until you have found the desired TV channel. A changing frequency number will appear on the TV screen.
- 6 If you want to allocate a decoder, in line 'DECODER' select 'ON' using the button [↔] .
- 7 To change the TV system, in line 'TV SYSTEM', select the respective TV system using the buttons [↔] or [↔] .

- ⚠ In case of video/audio interferences, choose the TV system which offers the least audio/video interference.

- 8 To store the TV channel, press [OK]. 'STORED' will briefly appear on the TV screen.
If you would like to search for more TV channels, start again at step 2.
- 9 To end, press the [MENU] button.

Satellite receiver

You can receive channels from the satellite receiver via the scart socket [EXT].

- 1 To do this, select the channel number 'E1' using the button [0] on the remote control. You will have to select the channels to be received by the satellite receiver on the receiver itself.
- 2 Use the number buttons [0-9] on the remote control to select the channels on the TV-Video Combi.

Special installation functions

You can select one of the following installation functions in order to adapt your TV-Video Combi to your own specific requirements.

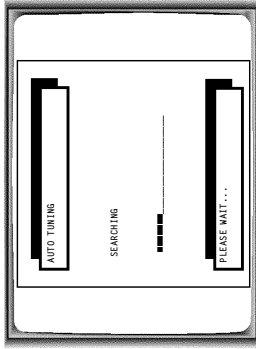
Automatic TV channel search

Your TV-Video Combi will search for all TV channels.

- ⚠ When you start this function, existing programmed recordings may be deleted.
- ⚠ If you want to start the automatic TV channel search again, follow the instructions below.
- 1 Press the [MENU] button on the remote control. The main menu will appear.
 - 2 Select the line 'AUTO TUNING' with the menu buttons [FP-] or [FP+] .
 - 3 Press the [↔] button.

- 4 Select the country you are in using the [↔] or [↔] buttons. If your country doesn't show up, select 'OTHERS'.

- 5 Confirm with the [OK] button. The 'Automatic TV channel search' starts.



- 6 When the TV channel search is complete, 'STORED' will briefly appear on the TV screen.
- 7 To end, press the [MENU] button.

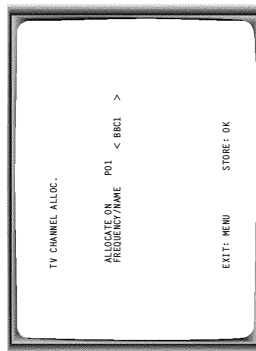
Information on how to search for a TV channel manually can be found in the section 'Manual TV channel search'.

Sorting and clearing TV channels manually

You can allocate a programmed TV channel to a random programme number (e.g.: 'PO1') or you can delete a TV programme recorded by mistake.

When you start this function, existing programmed recordings may be deleted.

- 1 Press the **MENU** button on the remote control. The main menu will appear.
- 2 Select the line 'TV CHANNEL ALLOC.' with the menu buttons **FP+** or **FP+**.
- 3 Confirm with the **OK** button. 'ALLOCATE ON PO1' will appear in the display.



- 4 Use the buttons **←/→** or **↔** to select the stored TV channel to which you wish to allocate the programme number PO1.
- 5 Confirm this allocation with **OK**. The following message will briefly appear on the TV screen: 'STORED'.
- 6 After that, the allocation for the next-highest programme number will appear on the screen, e.g.: 'ALLOCATE ON PO2'.

Use the buttons **←/→** or **↔** to select the stored TV channel which you wish to allocate the programme number to, e.g.: PO2.

If you want to delete a TV programme recorded by mistake, press the button **CLEAR**.

- 8 Confirm this allocation with **OK**. The following message will briefly appear on the TV screen: 'STORED'.

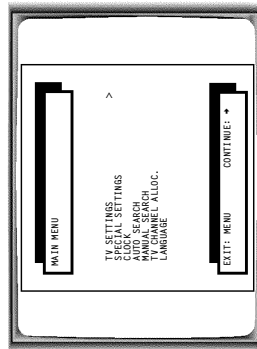
If you confirm the last possible allocation using the **OK** button, you will automatically be taken back to the main menu.

- 9 Repeat steps 6 to 8 until you have given a programme number to all TV channels you wish to allocate.
- 10 To stop the allocation, press the **MENU** button.
- 11 To exit the main menu, press the **MENU** button.

Setting the language

You can select one of various languages for the on-screen display (OSD).

- 1 Press the **MENU** button on the remote control. The main menu will appear.



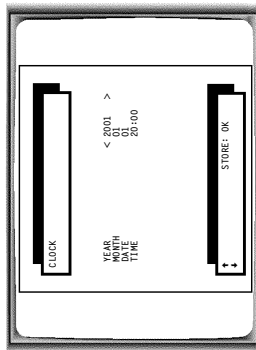
- 2 Select the line 'LANGUAGE' and confirm with the **↔** button.
- 3 Select your language with the buttons **←/→** or **↔** and confirm with **OK**. 'STORED' will briefly appear on the display.
- 4 To end, press the **MENU** button.

Setting the time and date

If a TV channel which transmits TELETEXT/PC is stored under programme number 'PO1', time and date will automatically be taken from the TELETEXT/PC information. (SMART CLOCK)

The next section 'Automatic setting of time/date (SMART CLOCK)' will show you how to turn 'SMART CLOCK' on and off.

- 1 Press the **MENU** button on the remote control. The main menu will appear.
- 2 Select the line 'CLOCK' using the **FP+** or **FP+** buttons and confirm this selection with the button **↔**.



- 3 Check the year displayed in the line 'YEAR'. If required, please change the year with the number buttons **0-9** on the remote control.
- 4 Select the next line with **FP+** or **FP+**.
- 5 Check 'MONTH', 'DATE' and 'TIME' in the same way.
- 6 When all information is correct, confirm with **OK**. 'STORED' will briefly appear on the display.
- 7 To end, press the **MENU** button.

Automatic time and date setting (SMART CLOCK)

If a TV channel which transmits TELETEXT/PC information is stored under programme number 'PO1', the time and date are automatically set by the TELETEXT/PC information.

The time will automatically be adjusted to winter time and summer time.

- 1 Press the **MENU** button on the remote control. The main menu appears.
- 2 Select the line 'CLOCK' with the button **FP+** or **FP+** and confirm with the **↔** button.
- 3 Select the line 'SMART CLOCK' with the button **FP+** or **FP+**.
- 4 Select 'ON' (SMART CLOCK switched on) or 'OFF' (SMART CLOCK turned off) using the buttons **←/→** or **↔**.
- 5 Use the **OK** button to store this information. 'STORED' will briefly appear on the display.
- 6 To end, press the **MENU** button.

3. TV SET FUNCTIONS

Selecting a TV channel

Select the required TV channel (= the programme number) with the **[FP ±]**, **[FP -]** buttons or with the digit buttons **[0-9]** on the remote control.

- ▷ The connected decoder can only be used for one TV programme. If you would like to switch to a different TV channel which also requires the decoder during recording, the following message will appear on the screen: 'DECODER IN USE'.

Channel number of the scart socket

- 1 Select the channel number 'E1' using the button **[0]** on the remote control.

Channel number of the sockets AV on the front

- 1 Select channel number 'E1' using the button **[0]** on the remote control and then select channel number 'AV' using the button **[FP -]**.
- 2 Use the number buttons **[0-9]** on the remote control to select the channels on the TV-Video Combi.

Volume control

- You can adjust the volume using the **[←/→-]**, **[←/→+]** buttons on the remote control.
- ▷ If you would like to change the volume on the machine, press the button **[F7/→]** on the TV-Video Combi and change the volume using the buttons **[+]** or **[-]**.
 - ▷ If you want to mute the sound temporarily (e.g. during a telephone call), press the **[MUTE/⊞]** button on the remote control. When you press the **[MUTE/⊞]** button again, the sound will return at its original volume level.
 - ▷ While the sound is turned off, ***K*** will appear on the screen.

Contrast Plus

With the 'Contrast Plus' function, the contrast of the TV pictures is automatically adapted to the picture content.

- 1 To switch this function on, select 'ON' in the line 'CONTRAST PLUS'.
- ▷ If you select 'OFF', the function will be switched off.

Automatic volume control (Automatic Volume Leveller AVL)

The function 'Automatic Volume Leveller' (AVL) regulates the volume automatically. This will minimise sudden changes in TV volume, e.g. when commercial spots are being transmitted or when switching TV channels.

- 1 To switch this function on, select 'ON' in the line 'AVL' using the button **[←/→+]**.
- ▷ If you select 'OFF', the function will be switched off.

Selecting the picture setting (SMART PICTURE)

'SMART PICTURE' adjusts the picture setting with a single button on the remote control.

- 1 Press the **[SMART]** button. This will show the current picture setting.
- 2 Press **[SMART]** repeatedly and you will be able to choose different settings:
 - 'PERSONAL': Your personally selected setting (see section 'Picture settings')
 - 'NATURAL': natural picture settings (preset, not changeable)
 - 'RICH': detailed picture (preset, not changeable)
 - 'SOFT': interferences are suppressed (preset, not changeable)

How do I read TELETEXT?

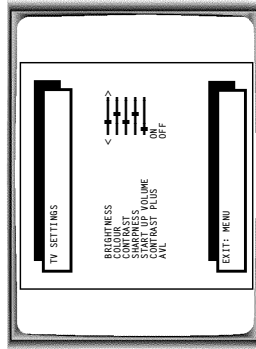
Many TV channels transmit TELETEXT information along with their TV channels. With this TV-Video Combi you can retrieve this information and display it on the screen using the built-in TELETEXT decoder.

- 1 Press the **[TELETEXT/⊞]** button to switch the TELETEXT decoder on. Your TV-Video Combi will now show TELETEXT for the TV channel you have selected.
- 2 If you want to select another page, type in the number of the page with the number buttons **[0-9]** on the remote control.
 - ▷ With the colour buttons on your remote control you can directly select the page numbers shown at the bottom of the TV screen.
 - ▷ The button **[CLEAR]** takes you back to the start page.
- 3 Press the **[TELETEXT/⊞]** button to switch the TELETEXT decoder off.

Special TELETEXT functions

In TELETEXT mode you can use the special TELETEXT functions. These are shown along the bottom of the TV screen.

- 1 During TELETEXT operation, press the **[MENU]** button. The following symbols are shown along the bottom edge of the TV screen:
 - [EB]**: enlarge font
 - [EZ]**: switch TELETEXT decoder off temporarily
 - [E@]**: select TELETEXT sub-page
 - [E@]**: recall hidden information
 - [ES]**: stop page changes
 - [E@]**: show TELETEXT in transparent mode
- 2 Select the respective function using **[←/→-]** or **[←/→+]**.
- 3 Confirm with the **[OK]** button.
 - ▷ To call up a TELETEXT sub-page enter the number of the sub-page after confirming the entry with the button **[OK]** using the buttons **[0-9]**.
e.g.: for sub-page 5 enter '0005'.

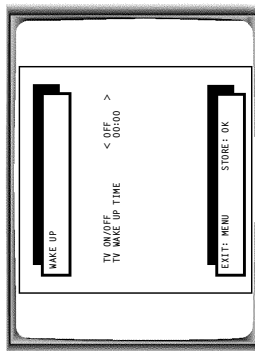


4. IMPORTANT NOTES FOR OPERATION

Wake up function (WAKE-UP)

You can programme your TV-Video Combi to switch on at a predetermined time and wake you up. The TV-Video Combi will switch on at the predetermined time playing the channel last selected and switches itself off automatically after one hour.

- 1 Press the **[MENU]** button on the remote control. The main menu will appear.
- 2 Select the line 'WAKE UP' with the menu buttons **[FP-]** or **[FP+]** and confirm with the **[ENTR]** button. This picture will appear on the screen:



- 3 Use the buttons **[FP-]** or **[FP+]** to select the line 'TV ON/OFF'.
- 4 Use the button **[ENTR]** in the line to select 'ON' (wake up timer activated).
If you select 'OFF' the timer will be switched off.
- 5 Use the buttons **[FP-]** or **[FP+]** to select the line: 'TV WAKE UP TIME' for the wake up time of the TV set.
- 6 Enter the desired time using the **[←/→]** or **[ENTR]** buttons or with the number buttons **[0-9]**.
- 7 Store these settings using the **[OK]** button.
- 8 To end, press the **[MENU]** button.
- 9 Use the buttons **[FP+]**, **[FP-]** or the numeric buttons **[0-9]** of the remote control to select the programme which you want to be woken up to.
- 10 Switch off the TV-Video Combi with the button **[STANDBYⓐ]**.

- ⚠ If you do not press a button, the alarm (TV-Video Combi) is switched off automatically after one hour.
- ⚠ If you press the button **[STANDBYⓐ]** the current alarm is (TV-Video Combi) is switched off.
- ⚠ If you want to continue to use the TV-Video Combi, press another button besides the button **[STANDBYⓐ]**.

Switch-off function (SLEEP TIMER)

You can programme your set to switch-off automatically after a predetermined period.

- 1 Press the **[SLEEP]** button on the remote control. The screen will show the time remaining until switch-off, e.g.: '+0:15'
- 2 Press the button **[SLEEP]** repeatedly to extend the time until switch-off in 15 minute increments.
The maximum time period to be set until switch-off is 4 hours.

The machine now counts backwards to the switch-off time.

- ⚠ If you would like to turn this function off, push the **[SLEEP]** button on the remote control and then press **[CLEAR]** when the time remaining until switch-off appears.
- ⚠ '---' will appear on the screen.
- ⚠ To check the time until switch-off, press the **[SLEEP]** button on the remote control.
- ⚠ If a recording is in process, only the screen will be switched off by the switch-off function.

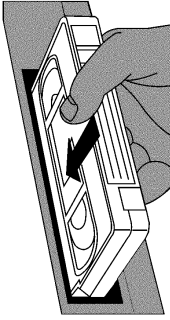
General information

- We suggest that, from now on, you switch off your TV-Video Combi with the **[ENTR]** button on the front of the set or with the **[STANDBYⓐ]** button on the remote control. When the set is in the standby mode, a small red lamp (STANDBYⓐ) at the front of the set will be alight.
- You can switch the machine on with the **[FP+]**, **[FP-]** or **[0-9]** buttons or by inserting a cassette.
- ⚠ **Attention:** If you use the power switch **[ON]** on the side panel, you switch off the set completely from the mains power supply. No programmed recordings are possible in this state. The red standby lamp (STANDBYⓐ) at the front of the set will not be alight. After some time, the date and clock settings will be lost. We therefore advise you to keep your TV-Video Combi connected to the mains and keep the mains switch **[ON]** on at all times to ensure that programmed recordings can be made and that the television works normally. The power consumption will be low.
- **Attention:** If you switch off the appliance using the power switch **[ON]**, make sure that you have removed the tape by pressing the **[EJECT]** button.
- If the TV-Video Combi does not receive a signal for more than 15 minutes, it switches off automatically to conserve energy.
- If the TV-Video Combi is not plugged into the mains, the TV channel and timer information is stored for approx. one year, and the clock information is stored for approx. 30 minutes.
- If a TV channel which transmits TELETEX/PDC is stored under programme number 'P01', time and date will automatically be taken from the TELETEX/PDC information after an interruption of the power supply to the set.

5. PLAYBACK FUNCTIONS

Playing a pre-recorded cassette

- 1 Put a cassette into the cassette slot (see illustration). The cassette will be pulled in automatically.



- 2 Press the button [PLAY] to play the cassette. The screen displays for example:



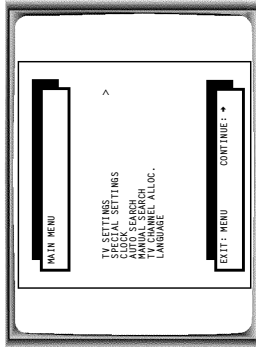
Tape position indication

By pressing [OK] you can show the present tape position on the TV screen. You can read the elapsed playing time in hours and minutes.

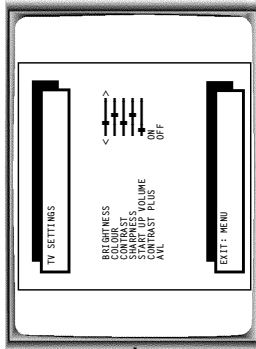
- 3 To stop, press the [STOP] button.
- 4 To eject the cassette, press [EJECT] on the front of the TV-Video Combi while it is in Stop mode. You may also use the [STOP] button on the remote control for more than 3 seconds.
- 5 Before transportation, make sure that there is no cassette in the TV-Video Combi.
- 6 With recordings which were recorded at the speed LP (Long Play), during some special functions (e.g.: still picture, picture search,...) the colour will automatically be switched off.
- 7 Some hired cassettes may have poor picture or sound quality. This is not a fault in your machine. Please read the section 'Selecting the picture settings (SMART PICTURE)', or 'Eliminating picture interference'.
- 8 Some functions will automatically switch off after a while (e.g.: pause, still picture, picture search). This helps to protect the cassette and avoids wasting power.
- 9 During playback, the machine will automatically switch between the speeds 'LP/SP'. Please read the section 'Selecting the recording speed (SP/LP)' in the chapter 'MANUAL RECORDING'.

Summary of user guide

The OSD menu offers the following functions. More details on each can be found in the appropriate chapter.



Main menu

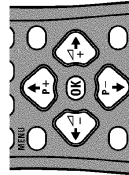


Chapter TV SET FUNCTIONS - Picture settings

User guide (OSD)

The OSD (On-screen display) shows the various functions in the form of a menu on the television screen. Thus, you can comfortably check your settings. There is a summary of the menus on this page. The main button functions are displayed in a help line along the bottom of the screen.

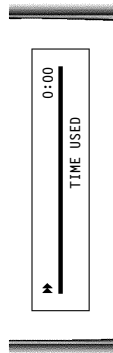
- To call up the main menu: With the [MENU] button.
 - To select a line: With the [UP] or [FP+] button.
 - To enter or change your selection: With the [OK], [LEFT] or [RIGHT] button.
 - To cancel: With the [STANDBY] button.
 - To store/confirm: With the [OK] button.
 - To close the main menu: With the [MENU] button.
- △ If the symbol 'X' appears on the right end of the menu line instead of '>', the function of this line is not possible.



- △ The summary of the OSD menus are examples and are intended to help you select the various functions. Sometimes, they may slightly differ from the OSD menus on your TV-Video Combi.

Searching for tape position with the picture (picture search)

- 1 While a cassette is playing, press the [◀] (reverse) or [▶] (forward) button once or several times. The screen displays for example:



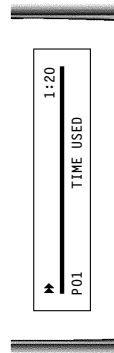
- 2 To stop at the desired position, press the [PLAY] button.
 - △ The picture quality is lessened during picture search. The sound is deactivated.

Still picture

- 1 Press the [STILL] button. A still picture will appear on the screen.
- 2 Each time you press [STILL] again, the picture will move on one step.
 - △ Interference stripes may appear on the screen during still picture.
- 3 To exit the still picture, press the [PLAY] button.

Searching for tape position without the picture (winding)

- 1 Stop the tape with the [STOP] button.
- 2 Press the [◀] (reverse) or [▶] (forward) button. The following will appear on the screen:



- 3 To stop at the desired position, press the [STOP] button.

'Instant View' function

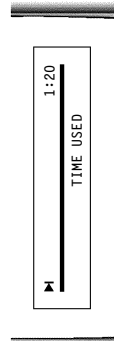
With this function you can switch to picture search during wind and rewind.

- 1 If you hold the [◀] (rewind) or [▶] (forward) button during wind or rewind, you will switch to picture search.
- 2 When you release this button, the TV-Video Combi automatically switches back to wind and rewind.

Automatic search for a tape position (index search)

At the start of each recording, an index code is written on the tape.

- 1 In order to search for the previous or next index code, press the [INDEX] button and then the [◀] button for the previous code or the [▶] button for the next code. The following may appear on the screen for the next code:



- 2 When the TV-Video Combi finds the marker, it will automatically switch to playback mode.

Skipping commercials automatically

With this function you can skip approx. 120 sec. blocks of commercial time on the tape during playback.

- 1 During playback, press the [PLAY] button.
- 2 The TV-Video Combi forwards the tape by 120 seconds of commercial time and then automatically switches back to playback.
 - △ If the commercial is still on, you can reactivate this function.
 - △ If you press the button [PLAY] during the winding process, the TV-Video Combi switches back to playback.

Eliminating picture interference (tracking)

If the picture quality is poor during playback, you can manually adjust the tracking.

- 1 Press and hold the button [FP+] or [FP-] during playback until the playback quality reaches its best. 'T+' will appear on the screen when the button [FP+] is pressed. 'T-' will appear when you press the button [FP-].

This setting will remain until the cassette is removed.

6. MANUAL RECORDING

Use the 'Manual recording' function to spontaneously start recording (e.g. to record a TV show already in progress).

- Please refer to section **'Recording without automatic switch-off'**, if you want to manually start and stop your own recording.
- Please refer to section **'Recording with automatic switch-off'**, if you would like to start your own recording but want it to end automatically (e.g. not to record all the way to the end of the cassette).
- Please refer to section **'Automatic recording from a satellite receiver'**, if a recording is to be controlled automatically via a satellite receiver.

Recording without automatic switch-off

- 1 Place a cassette in the machine.
- 2 Use the button **[FP+]** or **[FP-]** to select the programme number which you would like to record from, e.g. 'P01'. This picture will appear on the screen:



- △ If a TV channel sends a channel name, this is displayed on the screen.
- △ Programme number 'E1' is provided for recording from external sources (via the [EXT] scart socket). Programme number 'AV' is for recording from the audio and video front sockets.

- 3 To record the TV programme, press the button **[RECORD]** on the remote control or the button **[RECORD]** on the TV-Video Combi.
 - △ During recording, the recording lamp 'RECORD' on the front of the machine lights up. The following will appear on the screen:



- △ Use the button **[OK]** to display the current tape position on the screen.

Auto-assembling

You can use the auto-assembling function to join individual recordings without any flickering between them.

- 1 While the cassette is playing, search for the next recording's position on the tape.
- 2 Press the **[STOP]** button on the remote control. 'ir' appears on the TV screen.
- 3 Now start recording as usual by pressing the **[RECORD]** button on the remote control.
- 4 Stop recording with the **[STOP]** button.

Selecting the recording speed (SP/LP)

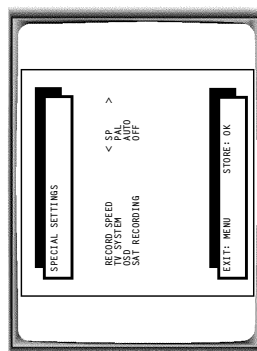
You can reduce the recording speed by half. This makes it possible to record, for example, eight-hours instead of four-hours on an 'E240' (four-hour) cassette.

- 1 Press the **[MENU]** button on the remote control. The main menu will appear.
- 2 Select the line 'SPECIAL_SETTINGS' with the buttons **[FP-]** or **[FP+]** and confirm with the **[OK]** button.
- 3 Choose the desired recording speed in the line 'RECORD SPEED' using the buttons **[←]** or **[→]** or **[←←]** or **[→→]**.
 - △ 'LP': LongPlay = half recording speed (double recording period).
 - 'SP': StandardPlay = normal recording speed.
- 4 Confirm with the **[OK]** button.
- 5 To end, press the **[MENU]** button.
 - △ The picture quality with LP recordings will not be as good as it is with SP recordings.
 - △ For playback, the correct speed will automatically be selected.

Automatic recording from a satellite receiver (SAT RECORDING)

You can only use this function, if you have a satellite receiver which can control other equipment via a scart cable and a 'programming' function.

- △ Make sure that the scart socket [EXT] of the TV-Video Combi is connected to the respective scart socket of the satellite receiver. Please read chapter 'CONNECT THE TV-VIDEO COMBI', section 'Connect decoder or additional equipment'.
- 1 Press the **[MENU]** button on the remote control. The main menu will appear.
 - 2 Select the line 'SPECIAL_SETTINGS' with the buttons **[FP-]** or **[FP+]** and confirm with the **[OK]** button.



- 3 Select the line 'SAT_RECORDING' with the buttons **[FP-]** or **[FP+]**.
- 4 Select 'ON' with the buttons **[←]** or **[→]** or **[←←]** or **[→→]**.
 - △ If you want to switch off the function, select 'OFF'.
- 5 Confirm with the **[OK]** button.
- 6 To end, press the **[MENU]** button.
- 7 Place a cassette in the machine.
- 8 Programme the satellite receiver with the desired information for the recording (programme number of the TV channel, start time and end time).
 - △ The information on how to programme your satellite receiver can be found in the instruction manual for your satellite receiver.

7. PROGRAMMED RECORDING (TIMER)

Use programmed recording to automatically start and stop a recording at a later date.

The TV-Video Combi requires the following information for each programmed recording:

- * the date you want to make the recording
- * the programme number for the TV channel you want to record
- * the start and stop time of the recording
- * VPS/PDC on or off

The TV-Video Combi stores all above mentioned information in a so-called TIMER-Block. You can programme up to 6 TIMER blocks a whole month in advance.

VPS (Video Programming System) / **PDC** (Programme Delivery Control)

With 'VPS/PDC', the TV station controls the start time and the length of the programmed recording. If a TV programme begins earlier or ends later than planned, the TV-Video Combi switches on and off at the **right time**.

Usually the start time is the **same** as the VPS/PDC time. If a different VPS/PDC time is indicated, e.g.: '20:15 (VPS/PDC 20:14)', the **VPS/PDC time** '20:14' must be entered **exactly to the minute** during programming.

If you would like to programme a time that differs from the VPS/PDC time, you must switch off 'VPS/PDC'.

- 3 To end, press the **[MENU]** button.

Now the TV-Video Combi is ready to record. The start and end of the recording are controlled via the start socket **[EXT]**.

- △ While you are recording, the red recording light at the front of the TV-Video Combi will be alight.

Activating a SAT recording using OTSR (OTSR = One Touch Sat Recording)

In the previous section we described how to activate the TV-Video Combi for recording from the SAT receiver by means of the screen menu (**[1]** through **[6]**). However, this can be done in a much simpler and quicker manner with the touch of a button.

- 1 Press the button **[P/S]** on the front of the machine for more than 3 seconds until the timer lamp (TIMER ●) lights up and remains on.

Now the TV-Video Combi is ready to record. The start and end of the recording is controlled via the start cable.

- △ How to switch off this function is described in the previous chapter 'Automatic recording from a satellite receiver (SAT RECORDING)'.

Programming a recording (with 'ShowView')

When entering the ShowView programme number, the TV-Video Combi receives all necessary information to programme a recording.

SHOWVIEW

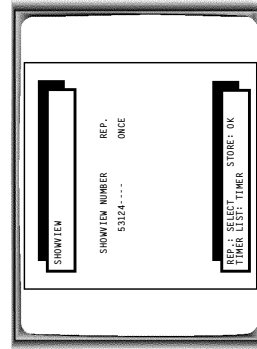
- 1 Press the **[TIMER(2)]** button on the remote control.

- 2 Enter the entire ShowView number. This number which can consist of up to nine digits, is listed in your TV guide next to the start time of the respective TV programme.
e.g.: 5-3124 or 5-3124

- △ If you would like to use 'VPS/PDC' to programme the recording and an additional start time is indicated, e.g.: (VPS/PDC21.09), you must enter the ShowView number for the 'VPS/PDC' time.
e.g.: (VPS/PDC21.09) 405-564-888

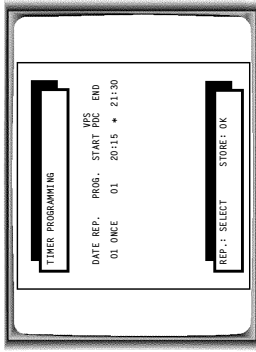
Enter 405564888 for programming using 'VPS/PDC'.
If you make a mistake, you can clear your entry using the **[CLEAR]** button.

- △ Use **[SELECT]** to select repeated daily or weekly recording.
'ONCE': One-time recording.
'MO-FR': Daily recordings from Monday through Friday.
'WEEK.': Recordings on the same day every week.



- 3 Use **[SELECT]** to select repeated daily or weekly recording.
'ONCE': One-time recording.
'MO-FR': Daily recordings from Monday through Friday.
'WEEK.': Recordings on the same day every week.

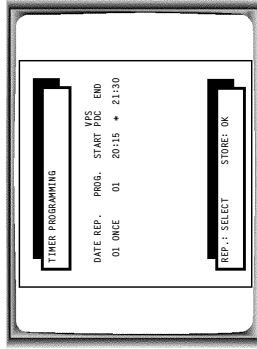
- 4 Confirm with the **[OK]** button. Upon confirmation the respective information will appear on the TV screen.



- 5 If 'SELECT PROG. NR.' appears on the screen, the TV channel has not yet been allocated to the ShowView number. Select the desired programme number using the number buttons **[0-9]** on the remote control and confirm with the **[OK]** button.
- 6 If 'SHOWVIEW NUMBER NOT VALID' appears on the screen, the ShowView number is incorrect. Correct your entry or cancel using the **[MENU]** button.
- 7 If 'MO-FR PROGRAMMING NOT POSSIBLE FOR WEEKEND' appears on the TV screen, you have programmed a daily recording for the wrong day. Daily programming can only be used for recordings to be made from Monday to Friday.
- 8 If you want to switch 'VPS/PDC' on or off, select the entry field 'START' using the buttons **[←/→]** or **[↔]**. Switch 'VPS/PDC' on or off using the button **[SELECT]**. If '*' appears on the screen, 'VPS/PDC' has been switched on.
- 9 Please check the start time. The section 'VPS (Video Programming System) / PDC (Program Delivery Control)' contains further information regarding 'VPS/PDC'.
- 10 If all information is correct, press the **[OK]** button.
- 11 The programming information has been stored in a TIMER block.
- 12 Insert a cassette that is not erase protected.
- 13 TIMER recording only functions if the machine is not being used for other video recorder functions like for example for playback.

Programming a recording (without 'ShowView')

- 1 Press the **[TIMER]** button on the remote control **twice**. The free TIMER block will be highlighted.
- 2 Press the **[TIMER]** button. The current information will appear on the screen.



- 3 Use the buttons **[↔]** or **[←/→]** to select different entry fields: 'DATE' (Date), 'PROG.' (Programme number), 'START' (Start time), 'END' (End time). Enter or change your information with **[↑/↓]** or **[←/→]**, or with the number buttons **[0-9]**.
- 4 Use the **[SELECT]** button in the entry field 'DATE' to select repetitive daily or weekly programming. 'ONCE': One-time recording 'MO-FR': Daily recordings from Monday through Friday. 'WEEK.': Recordings on the same day every week.
- 5 Use the **[SELECT]** button in the entry field 'START' to switch 'VPS/PDC' on or off. If '*' appears on the screen, the function has been switched on.
- 6 If all information is correct, press the **[OK]** button.
- 7 The information has been stored in a TIMER block.
- 8 Insert a cassette that is not erase protected.
- 9 TIMER recording only functions if the machine is not being used for other video recorder functions like for example for playback.

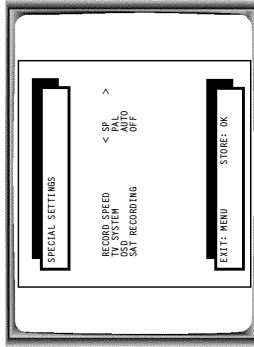
- 10 If the TV-Video Combi is used a few minutes before beginning a programmed recording session for playback (for example), 'PRESS OK TO START RECORDING' will appear on the screen. Change cassettes or press the button **[STOP]** if you want to use this cassette for recording. Confirm this message with the button **[OK]**, to continue the programmed recording session.
- 11 During recording, the red recording light at the front of the machine (RECORD) will be alight.
- 12 If the end of the cassette is reached during a recording, the TV-Video Combi will automatically eject the cassette.
- 13 If you forgot to insert a cassette, 'NO CASSETTE' will appear.
- 14 If you have inserted a cassette with erase protection when you want to start a recording, the cassette will be ejected automatically.
- 15 If 'ALL TIMERS OCCUPIED' appears on the TV screen when you press the **[TIMER]** button, you have used up all the available TIMER blocks. If you want to clear or check a programmed recording (TIMER block), select it with **[↑/↓]** or **[←/→]**.
- 16 If the message 'DATA ERROR' appears on the screen momentarily, the data for the recording was not transferred. Please check date, start time and end time of the programmed recording.
- 17 Programme number 'E1' is provided for recording from external sources (via the **[EXT]** scart socket).

8. ADDITIONAL FUNCTIONS

Changing the TV system

If you play recordings made on another video recorder or if you record from another source, the automatic TV system switch-over may lead to colour distortion. You can switch off the automatic TV system switch-over as follows:

- 1 Press **[MENU]** on the remote control **before you start recording** or **during playback**. The main menu will appear.
- 2 Select the line 'SPECIAL SETTINGS' with the buttons **[FP -]** or **[FP +]** and confirm with the **[↵]** button.



- 3 Select the line 'TV SYSTEM' with the buttons **[FP +]** or **[FP -]**.
- 4 Select the TV system with **[↵]** or **[↵]**.
- 5 Confirm with the **[OK]** button. 'STORED' will briefly appear on the screen.
- 6 To end, press the **[MENU]** button.
 - △ If you change the programme number, the TV system is switched back to automatic switch-over for the recording.
 - △ If you eject the cassette, the TV-system for playback will switch to 'AUTO' (automatic switch-over) again.

How to check or change a programmed recording (TIMER)

- 1 Press **[TIMER]** on the remote control **twice**.
- 2 Use the **[FP -]** or **[FP +]** buttons to select the programmed recording (TIMER) you wish to check or change.
- 3 Press the **[TIMER]** button.
- 4 Select the entry field with the **[←]** or **[→]** or **[↵]** button.
- 5 Change any displayed information with the **[FP -]** or **[FP +]** button or with the **[0-9]** buttons.
- 6 Confirm with the **[OK]** button.
- 7 Make sure that the cassette you have inserted is not erase protected.

△ **TIMER** recording only functions if the machine is not being used for other video recorder functions like for example for playback.

△ If the TV-Video Combi is used a few minutes before beginning a programmed recording session for playback (for example), 'PRESS OK TO START RECORDING' will appear on the screen. Change cassettes or press the button **[STOP]** if you want to use this cassette for recording. Confirm this message with the button **[OK]**, to continue the programmed recording session.

Cleaning a programmed recording (TIMER)

- 1 Press **[TIMER]** on the remote control **twice**.
- 2 Use the button **[FP -]** or **[FP +]** to select the programmed recording (TIMER) which you wish to clear.
- 3 Press the **[CLEAR]** button. The selected programmed recording (TIMER) has now been deleted.
- 4 To end, press the **[MENU]** button.

Parental control (Child lock)

This function protects your TV-Video Combi from unwanted use. All button functions on the front of the machine are blocked.

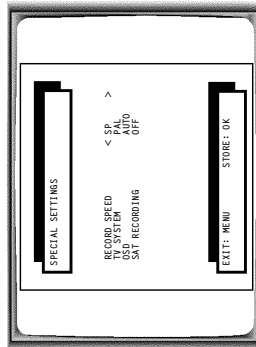
△ Programmed recordings will still be recorded in spite of the parental control and cannot be interrupted.

- 1 Please make sure the **TELETEXT** decoder is switched off using the button **[TELETEXT]**.
- 2 Press the **[<]** button on the remote control **for approx. 5 seconds**. The standby lamp (**STANDBY**) on the front of the machine blinks for approx. 3 seconds to confirm this action. Keep the remote control in a safe place.
- 3 If you want to switch the parental control function off, press the **[>]** button on the remote control **for approx. 5 seconds**. The standby lamp (**STANDBY**) on the front of the machine blinks for approx. 3 seconds to confirm this action.
 - △ If a button at the front of the machine is pressed while parental control is active, 'CHILD LOCK ACTIVE' will appear on the screen for a few seconds. The standby lamp (**STANDBY**) blinks as long as a button on the front is pressed.

Switching OSD information on/off

You can tailor the on-screen display (OSD) of the current mode (e.g.: playback, record...), to your personal needs.

- 1 Press the **[MENU]** button on the remote control. The main menu will appear.
- 2 Select the line 'SPECIAL SETTINGS' with the buttons **[F-]** or **[F+]** and confirm with the **[↔]** button.



- 3 In the line 'OSD', select one of the options shown using the button **[↔]**.
'AUTO':
The OSD information appears with every selected mode for a few seconds and disappears again.
'MAX':
Additionally, date and time are displayed with every selected mode.
'OFF':
The OSD information is switched off. However, you can use the button **[OK]** to display the OSD information on the screen.
- 4 Confirm with the **[OK]** button.
- 5 To end, press the **[MENU]** button.

Hotel mode

You can block the following functions for certain applications: Automatic channel search, manual channel search, programme allocation and language selection. Furthermore, you can adjust the highest permissible volume level.

This is how you activate the hotel mode:

- 1 Select the highest desired volume level for hotel mode using the buttons **[↔]** or **[↔]**.
- 2 Select programme number 38 using the buttons **[0.3]** on the remote control.
- 3 Press and hold the **[STOP]** button on the remote control.
- 4 Also, press and hold the button **[M/A]** on the TV-Video Combi until 'H+' appears on the screen.

The respective functions are now blocked, the volume can only be raised up to the level programmed.

- △ To switch off hotel mode, repeat steps **[2]** to **[4]** until 'H-' appears on the screen.

Continuous playback of a cassette

You can play a cassette continuously. As soon as the end of the cassette or end of the recording is reached (30 seconds of blank tape), it is rewound to the beginning and the playback starts over again.

- 1 Please make sure the TELETEXT decoder is switched off using the button **[TELETEXT]**.
- 1 Place a cassette in the machine.
- 2 Press the **[PLAY]** button to start continuous playback.
- 3 Hold the button **[SELECT]** down on the remote control until 'R+' appears on the screen (continuous playback function switched on).
△ If you press a button while the continuous playback mode is activated, 'R+' will appear on the screen simultaneously with the counter.
△ If you want to switch the continuous playback function off, press and hold the **[SELECT]** button on the remote control, until 'R-' appears on the TV screen (continuous playback switched off).

4. Mechanical Instructions

Caution:

During all removal and assembly work, ensure that the mains plug has been unplugged.
To prevent any of the electronic components being destroyed, plugs on the device should only be connected or disconnected when the device is at zero current.
When inserting the TVCR unit, fit the lift flap into the "Lift flap opener"!

4.1 Service position for the recorder part

The service position is used for testing and replacing mechanical or electrical elements. To move the VCR unit into service position in accordance with fig. 4-1, proceed as follows:

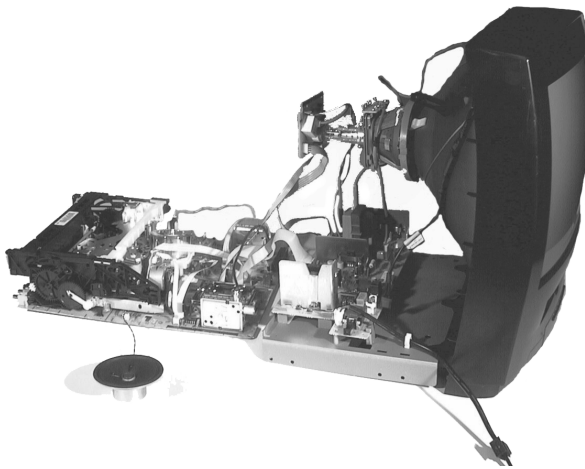


Figure 4-1

1. Remove the rear panel after unfastening the 4 screws 55 (see figure 4-2).

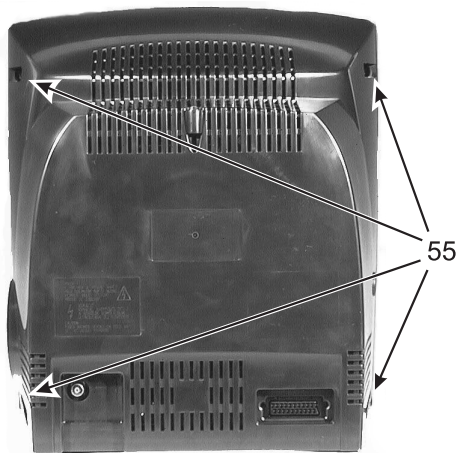


Figure 4-2

2. Remove the 4 screws 1001/12 (see figure 4-3).
3. Remove the mains cable from the cable guides (see figure 4-3).
4. Not for 14" devices: Remove the mains plug from the frame along with its mount (fastened with snap-on hook).

5. Unplug the degaussing coil (see figure 4-3).
6. Unplug the speaker.
7. Remove the high voltage cable (EHT) from its mount (see figure 4-3).

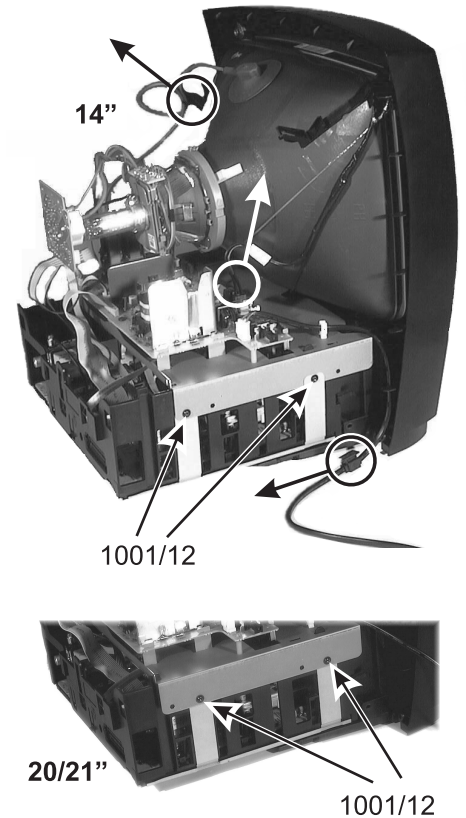


Figure 4-3

8. Lift the TV/VCR unit slightly towards the rear and carefully remove from the device (see figure 4-4).

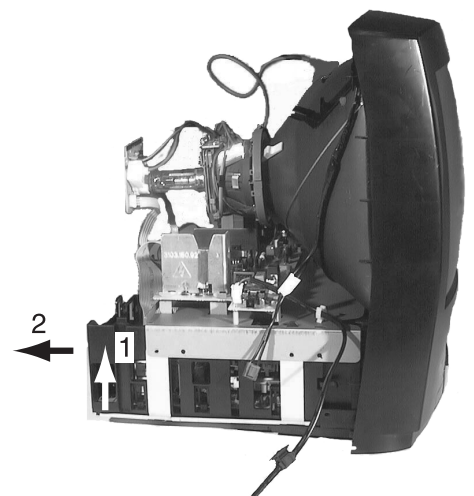


Figure 4-4

9. Remove the large signal board and shield from the groove and place underneath the picture tube.

10. To take the drive motherboard unit out of the groove, remove the 6 screws 1001/9 and 1001/10 (see figure 4-6). First slide the lift backwards by 5cm after unfastening the two lift locks (see figure 4-5).

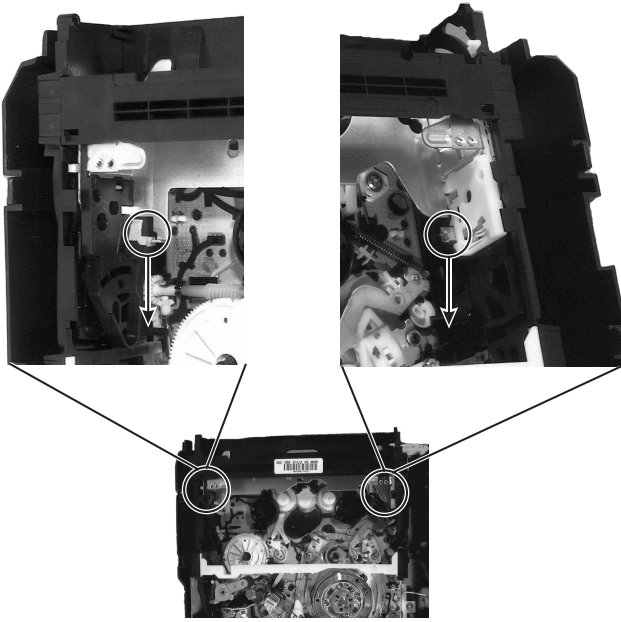


Figure 4-5

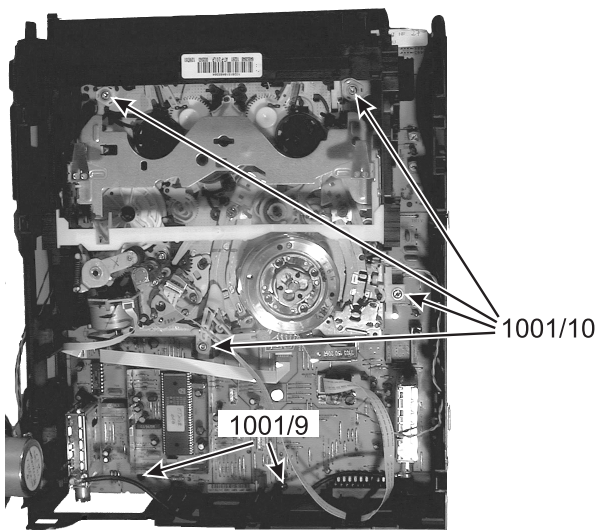


Figure 4-6

11. Remove cables running through the groove Motherboard such as the eraser head cable and cable A/C head to the motherboard from the guides (see figure 4-7).
12. Unplug plugs 1910, 1920 and 1921 (see figure 4-7).

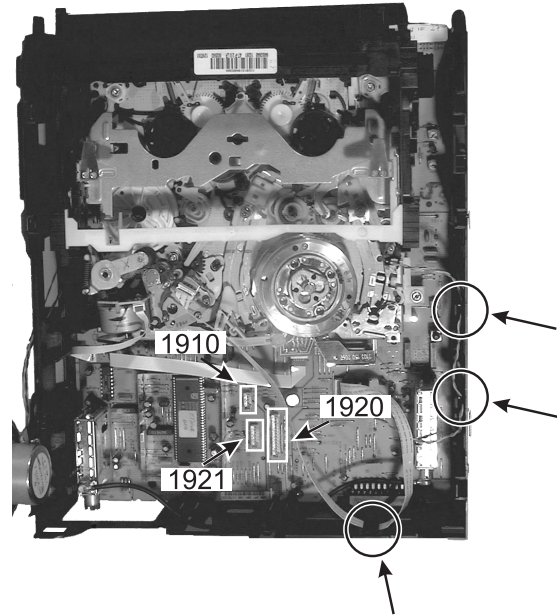


Figure 4-7

13. Turn the unit over, unlock the 10 snap-on hooks (see figure 4-8) and lift the groove upwards.

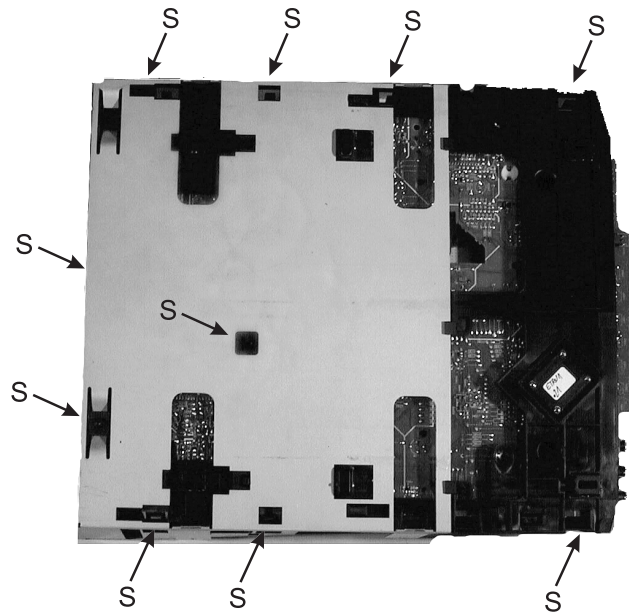


Figure 4-8

14. Plug the plugs 1910, 1920 and 1921 back in.

Caution:

- During the assembly of the set you have to be careful, that the LSB with its shielding have to fixed in different positions dependent on the screen size (14" or 20"/21") (see figure 4-3).
- The drive must always be in a horizontal position for adjustments and measurements in playback mode.
- For assembly work, the FFC cables need to be inserted back into the guides.

4.1.1 Removing the drive

1. Remove earthing screw 1001/11 (see figure 4-9).
2. Remove the connection cable from the drive to the small signal Board.
3. Lift the drive backwards slightly in order to remove the plug connection to the capstan motor. Press together the 2 snap-on hooks (S) with pointed pliers and lift the drive (see figure 4-9). The drive can now be separated from the motherboard.

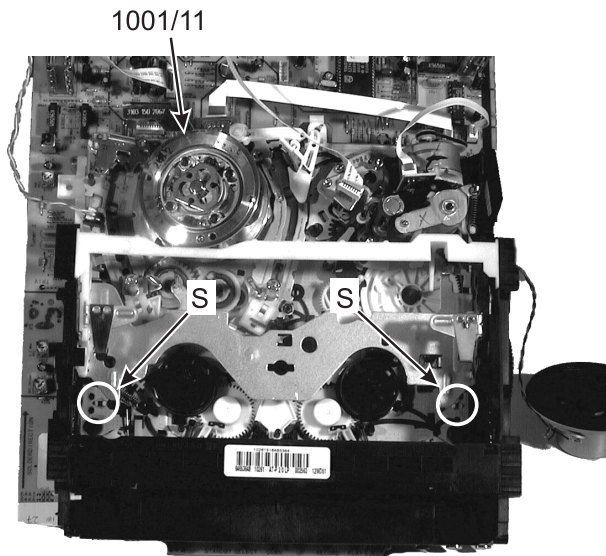


Figure 4-9

The device can be operated with the drive in "dummy mode" (see division 5.1 Service test program).

4.2 Service position for the large signal board

1. Removing the recorder part.
2. The large signal board can be removed after unfastening the two screws 50 from the shield (see figure 4-10).

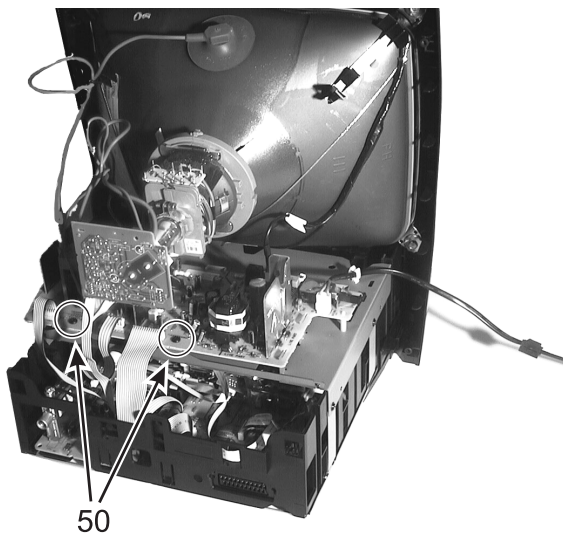


Figure 4-10

4.3 Removing the picture tube

1. Discharge the anode to picture tube earth.
2. Carefully remove the picture tube board.
3. Disconnect the connection between the deflection unit and the demagnetising coil connection from the large signal board.
4. Place the device upside-down on a soft cloth.

5. Service Modes, Repair Tips

5.1 Service test program

Service Status Menu

```

SERV STATUS
I 0          VCR 0000
L 0          TV  0000
ES 1/1
R 1          ETAU1-0U -16
LR 0/0      ETXU2-0U -10
ST 0000

DE 00 00 00
ST 0C 0C 0C

EE

TU 0
DU 0

SERV CONTR
  
```

Figure 5-1

Service Control Menu

```

SERV CONTR
NVM CLR
OP      006 032 088 055
        140 002 019
SPC     0
GAP     0
CLK     128
TV_DEF
ABS     0
T1 AGC  27
T1      PH
T2      PH
AL      15

TV ADJ

SERV STATUS
  
```

Figure 5-2

5.1.1 Introduction

The software for the microprocessors contains a test program for service test purposes (Service mode), which is divided into three different OSD pages:

Service status

This menu displays the drive status, the functions of various sensors and the last three errors to occur. The operating hours for the drive are also displayed, along with the mask numbers for the deck and control- μ Ps.

Service control

All software-controlled adjustments and resets can be performed on this level.

TV Adjustments

Selecting the line '>TV ADJ' leads to a third level which is used for various picture settings.

5.1.2 Calling up the service test program

Press the „STOP“ button on the remote control, then the „PLAY“ button on the unit, and hold down both buttons for approx. 5 seconds.

The first page in Service mode is displayed (see figure 5-1). By selecting the ">SERV CONTR" line and pressing the "►" button you can access the second page in service mode (see figure 5-2).

All drive functions are available from Service mode.

The service menu can be switched on and off by pressing the "MENU" button, and the Service mode remains activated. The normal menu for picture and audio settings, etc. is therefore only available again after Service mode is exited. In Service Mode the Automatic Tracking is deactivated. To exit the service test program, press the "STANDBY" button or switch off the unit.

5.1.3 Service status menu

Function of the Init switch

The Init switch is located on the drive. This button is used to display the status or the position of the drive, in combination with the loading pulses.

The following diagram (see figure 5-3) displays the status of the Init switch in relation to the drive positions.

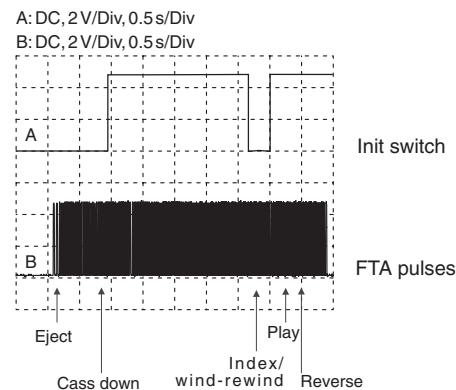


Figure 5-3

Loading pulses

```

SERV STATUS
I 0          VCR 0000
L 0          TV  0000
...
  
```

This display is used to indicate the evaluation of the „FTA“ pulse (IC7899/pin66). This means that the rotations of the loading motor are recorded using a photo transistor, which results in the alternating display of „0“ and „1“.

Tape start/tape end detection

```

SERV STATUS
...
L 0          TV  0000
ES 1/1
R 1          ETAU1-0U -16
...          ETXU2-0U -10
  
```

The start or end of the tape is detected by evaluating the „TAS“ (Tape Start...S) and „TAE“ (Tape End...E) signals. If the tape reaches the start or end of the tape, the display switches from „0“ to „1“.

Record protection

SERV STATUS			
...			
L	0	TV	0000
ES	1/1		
R	1	ETAU1-0U	-16
...		ETXU2-0U	-10

The control line „RECP“ (Record Protection) gives information on whether or not the record protection on the tape is activated.

- 0 ... record protection OFF
- 1 ... record protection ON

Pulses from the reel tables

SERV STATUS			
...			
R	1	ETAU1-0U	- 16
LR	0/0	ETXU2-0U	- 10
ST	0000		
...			

The evaluation of the tachometer winding signals „WTR“ (Wind Tacho Right...R) and ‘WTL’ (Wind Tacho Left...L) results in the alternating display of „0“ and „1“.

Drive status

SERV STATUS			
...			
R	1	ETAU1-0U	- 16
LR	0/0	ETXU2-0U	- 10
ST	0000		
...			

Figure 5-4

This involves a counter for the „FTA“ pulses. The counter status gives information on the current position of the drive (see figure 5-3 and see figure 5-4).

Mode	Tape Deck Status
Eject	007 ±4
Index/Wind/Rewind	191 ±4
Stop	198 ±4
Play/Pause	214 ±4
Reverse	237 ±4

Figure 5-5

Operating hours counter

SERV STATUS			
I	0	VCR	0000
L	0	TV	0000
...			

There are 2 operating hours counter in the device. “VCR” displays how long the video recorder part has been operating (record, play).
TV displays how long the picture tube has been operating.
Both displays are hexadecimal!

Drive error codes

SERV STATUS			
...			
DE	00 00 00		
ST	0C 0C 0C		
EE			

The last 3 drive errors to occur are stored in the EEPROM. The line „DE“ provides information on the type and „ST“ on the time of the error which has occurred.
The error data can be deleted by pressing the “CLEAR” button with the line “DE” or “ST” selected.

DECK ERROR	
0	No error
F0	Threading error
F1	No capstan pulses
F2	Tape broken
F3	no pulses left reel
F4	no pulses right reel
F5	head motor error

F0 Threading error

Occurs with missing threading pulses “FTA”.

F1 Capstan error

This error occurs if there are no “FGD” pulses.

F2 Tape broken

The tacho signals from the left-hand reel “WTL” and the right-hand reel “WTR” are used as a reference for this monitoring function.

F3/F4 Left/right reel blocked

Missing reel pulse ‘WTL’ or “WTR”.

F5 Head drum blocked

The “PG/FG” signal is used for this monitoring function. This is derived from the EMF from the non-current carrying coil in the head motor and provides information on the position and speed of the head drum.

Note: If one of the signals described is not available, the unit attempts to move the lift to the „EJECT“ position.

DECK ERROR STATUS			
0C	Standby	37	Record
1F	Play -3	70	Index
29	Still picture	84	Cleaning
2A	Play +2/+3	AC	Play -5
2C	Play -9	AD	Play +5
2D	Eject	C5	Standby Eject
2E	Play +9	D4	Slow motion 1/14
2F	Play -1	D7	Slow motion 1/7
30	Pause	D8	Slow motion 1/2
32	Rewind	DF	Gap adjustment
34	Wind	EE	Record Pause
35	Play	F7	Slow motion 1/10
36	Stop		

I2C-bus error

```

...
SERV STATUS
DE 00 00 00
ST 0C 0C 0C
EE 2E 00 00

```

The communication between the μ -controller and all I2C-bus modules is checked each time the power is switched back on.

Note: If an error occurs during communication with the EEPROM (7818) or the UOC (7200), it is no longer possible to boot up the device. An optical signaling device using the LEDs has been integrated for this situation.

- Standby LED flashing quickly: Protection active
- Standby LED flashing slowly: Error in UOC (7200)
- Record LED flashing quickly: Error in EEPROM (7818) / Power Supply Burst Mode
- Record LED flashing slowly: IIC Bus; SDA or SCL has short-circuited to earth

The following table gives an overview of all the I2C-bus modules and their bus addresses.

ERROR IIC BUS			
Pos.	Description		Address
1700	Tuner 1		C0
1760	Tuner 2		C6
7004	SYCA	LA71595M	E2
7960	VPS/PDC	SDA5650	20

Display on the second tuner (only for 2 tuner sets)

```

...
SERV STATUS
TU 0
DU 0

```

For repair work, it can be useful to display the picture from the second tuner, which is only used for recording. After selecting the "TU" line, the cursor button "►" can be used to switch over between tuner 1 (TV) and tuner 2 (VCR).

Dummy Mode - operation without a drive

```

...
SERV STATUS
TU 0
DU 0

```

For measurements and signal tracing without a drive, the unit can be switched to Dummy Mode. This switches off all the motors and the sensors are ignored. The drive can be removed following activation (see Instructions for Removal). All drive statuses can now be selected (Play, Record,...) and the electronics (Video, Audio, IO) are switched to the relevant operating mode.

Note: To prevent damage to the tape, Dummy Mode should not be switched On/Off whilst the tape is playing.

Caution: Unplug the unit from the mains before installing the drive.

 μ -controller mask numbers

```

SERV STATUS
R 1
LR 0/0
ETAU1-0U - 16
ETXU2-0U - 10

```

CONTROL-Micro-Controller (AIO)

TXT-Micro-Controller (Painter)

The mask and version numbers of the control- μ P and UOC are displayed in the right-hand part on the control menu. The first 5 characters identify the mask names (e.g. ETAU1), the next two characters stand for the mask number (e.g. 1U) and the last 3 characters stand for the build number (e.g. 054).

5.1.4 Service control menu**Deleting the EEPROMs**

```

SERV CONTR
NVM CLR
OP 006 032 088 055
140 002 019
...

```

The EEPROM (IC7818/SSB) stores all user-specific data (timer data, program data) and various setting values (gap position, picture settings). Under certain circumstances, it may sometimes be useful to delete the user-specific data.

Pressing the "OK" button when the line "NVM CLR" is selected will initialize the following data after a reset:

- all timer data
- station data
- date, time

The device is set to "virgin" mode.

The following values for the TV part, which are programmed at the factory, are taken from the ROM in the μ -controller:

- contrast
- brightness
- definition
- colour
- audio (volume, loudness, bass)

The following data are stored:

- all setting values
- option codes
- operating hours
- error codes

Caution:

After replacing the EEPROMs, only the values programmed at the factory are transferred. User-specific data and all setting values are reset to the medium values.

The unit should therefore be completely re-set (see Chapter 8 Settings) and configured.

Gap position

The description of this setting is given in Chapter 8 Electrical settings

Option codes

SERV CONTR						
NVM	CLR					
OP		006	032	088	055	
		140	002	019		
...						

The characteristics of the unit are defined using the option codes. These are 7 three-figure codes which are printed on the nameplate on the unit (see figure 5-6). After replacing the EEPROMs (IC7818/SSB), the codes should be entered in the same order as in the service control menu. After selecting the line "OP>" and call-up with "▶", the input can be started using the number buttons on the remote control. Press the "OK" button on the remote control to confirm the individual option bytes.

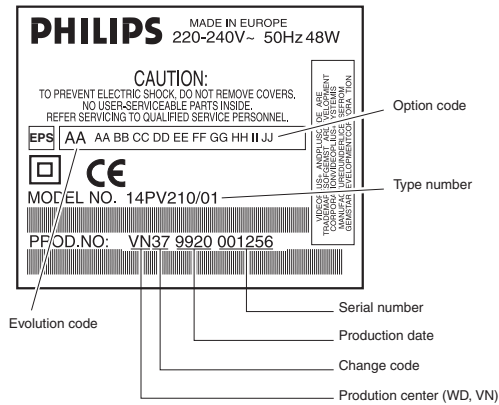


Figure 5-6

Basic TV settings

SERV CONTR						
TV	DEF					
ABS			0			
...						

For various adjustments in the TV section, the picture settings (contrast, brightness....) have to be set to defined values. By pressing the "OK" button on the "TV DEF" line, the values programmed at the factory are loaded.

Autom. black current control (ABS LOOP)

SERV CONTR						
TV	DEF					
ABS			0			
...						

For repair purposes, it can be useful to deactivate the ABS (Automatic Black current Stabilisation). This deactivates the control, which, depending on the „ABS“ information (IC 7200 pin 50), varies the level of the RGB outputs (pins 51,52,53). The control loop can be switched on and off using the menu arrow button "▶".

Note: After leaving the service menu ("MENU" button or STD-BY), the ABS Loop is re-activated automatically.

The following settings can be found in Chapter 8, Electrical Settings:

- TV adjustments
- Tuner 1 AGC
- Tuner 1 Type
- Tuner 2 Type
- Tuner 2 AFC reference
- Audio linear playback
- SPC adjustment
- GAP Position
- Clock adjustment

5.2 Hotel mode

For operation in hotels, hospitals, etc., there is the option of blocking various unit functions (settings) and limiting the volume to a required maximum level.

Proceed as follows to activate hotel mode:

- Set the volume to the maximum value required
- Select program number 38 (if it cannot be selected using program Up/Down, enter it directly using the numerical buttons)
- Hold down the "STOP" button on the remote control and on the unit together for approx. 5 sec. until "H+" appears on the screen.

Deactivating hotel mode:

- Select program number 38 (if it cannot be selected using program Up/Down, enter it directly using the numerical buttons)
- Hold down the "STOP" button on the remote control and on the unit together for approx. 5 sec. until "H-" appears on the screen

5.3 Repair tips

5.3.1 Replacement procedure for leadless components (chip)

The following procedures are recommended for replacing leadless components used in this unit.

1. Preparation for replacement

- Soldering iron
Use a pencil-type soldering iron that uses less than 30W
- Solder
Use Eutectic solder (Tin 63%, Lead 37%)
- Soldering time
Maximum 4 seconds.

Note:

- Leadless components must not be re-used after removal.
- Excessive mechanical stress and rubbing of the component electrode must be avoided.

2. Removing the leadless components

Grasp the leadless component body with tweezers and alternately apply heat to both electrodes. When the solder on both electrodes has melted, remove leadless component with a twisting motion.

Note:

- Do not attempt to lift the component off the board until the component is completely disconnected from the board with a twisting motion.
- Be careful not to break the copper foil on the printed circuit board.

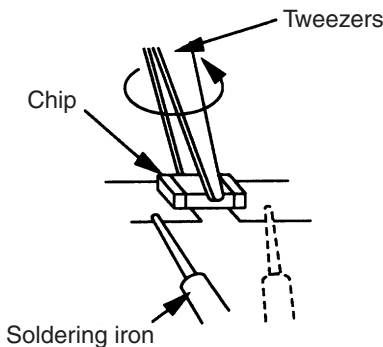
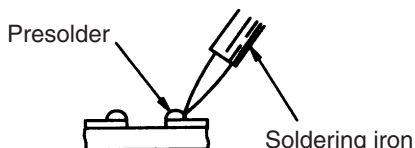


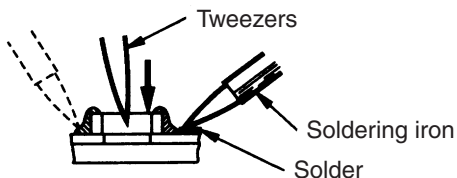
Figure 5-7

3. Installation of leadless components

- Presolder the contact points on the circuit board



- Using tweezers press down the part and solder both electrodes as shown below.



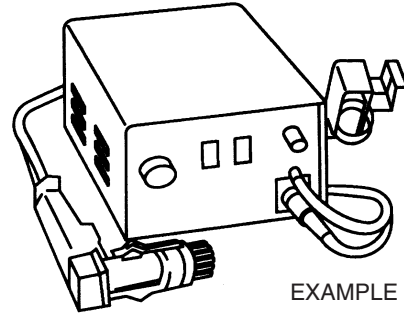
Note:

Do not glue the replacement component to the circuit board.

5.3.2 How to remove/install the Flat Pack IC

How to remove the Flat Pack IC

- Using a hot air Flat Pack IC unsoldering equipment



EXAMPLE

Figure 5-8

- Prepare the hot air Flat Pack IC unsoldering equipment. Then apply hot air to Flat Pack IC for 5 - 8 seconds.
- Remove the Flat Pack IC with tweezers while applying the hot air.

CAUTION:

To avoid damage, do not apply the hot air to the chip parts around the Flat Pack IC for long periods.

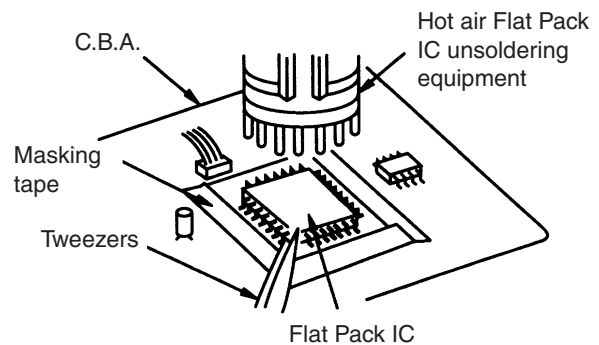


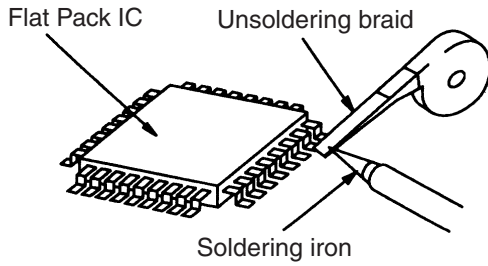
Figure 5-9

Put masking tape around the Flat Pack IC to protect adjacent parts.

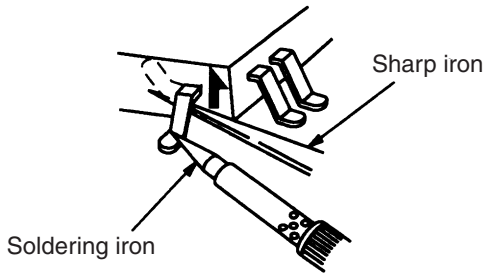
The Flat Pack IC is fixed to the P.C.B. with glue; therefore take care not to break or damage any foil under the IC or on each pin when removing it.

- Using a soldering iron

- Use unsoldering braid to remove the solder from all pins of the Flat Pack IC. Apply solder flux to all pins of the Flat Pack IC, to allow easy removal.



b. Lift up each lead of the Flat Pack IC individually, using a sharp pin or non-solder wire (iron wire), while heating the pins using a fine tip soldering iron or a hot air blower.



• **Using iron wire**

a. Use unsoldering braid to remove the solder from all pins of the Flat Pack IC. Apply solder flux to all pins of the Flat Pack IC, to allow easy removal.

b. Affix the wire to workbench or solid mounting point (see figure 5-9)

c. Pull up the wire as the solder melts in order to lift the IC lead from the P.C.B. contact pad, while heating the pins using a fine-tip soldering iron or hot air blower.

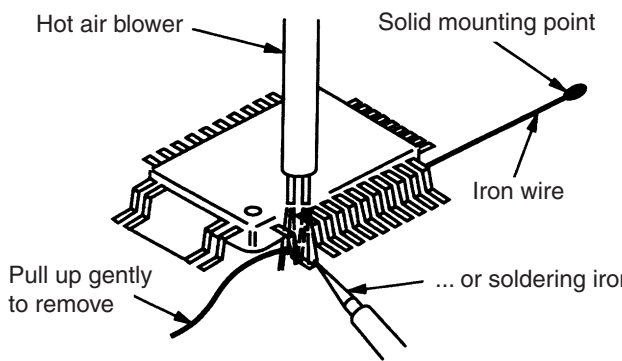


Figure 5-10

Note:
When using a soldering iron care must be taken to ensure that the Flat Pack IC is not held by glue or the P.C.B. may be damaged if force is used.
If the IC is glued, heat the IC with hot air to loosen the glue.

• **Using a special removal device**

- a. Apply extra tin-lead solder onto the pins
- b. Heat the IC to melt the glue which has been used to affix it
- c. Use a solder removing device with a special punch which matches the contours of the IC to remove the IC.

At the other corners there are printed conductors which may be damaged!

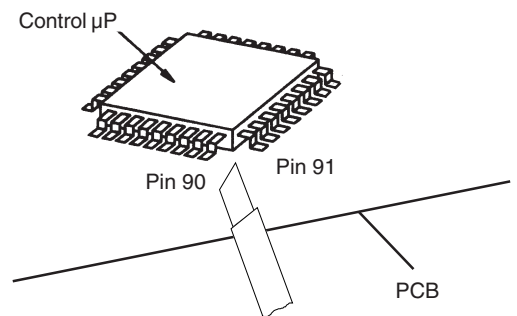
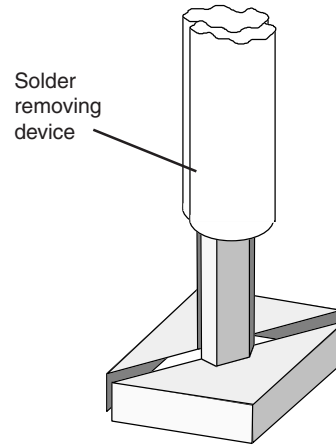
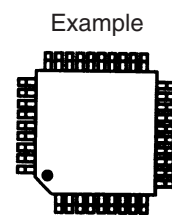


Figure 5-11

How to install the Flat Pack IC

a. Use unsoldering braid to remove the solder from the foil of each pin of the Flat Pack IC on the P.C.B. in order to install the replacement Flat Pack IC more easily.

b. The "dot" mark on the Flat Pack IC indicates pin 1. Make sure this mark matches the 1 on the P.C.B. when positioning for installation. Then pre-solder the four corners of the d. Flat Pack IC. (see figure 5-11).



Pin 1 on Flat Pack IC is marked by a "●".

Figure 5-12

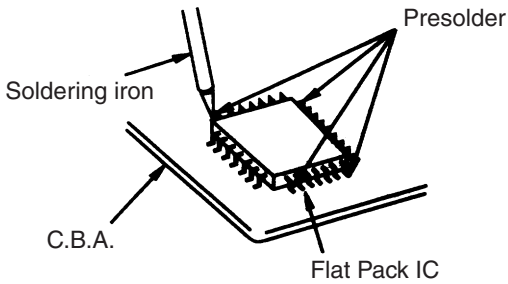


Figure 5-13

c. Solder all pins of the Flat Pack IC. Make sure that none of the pins have solder bridges between pins on the Flat Pack IC.

5.4 Note

All integrated circuits and many other semiconductor devices are electrostatically sensitive and therefore require the special handling techniques described in the "SAFETY INSTRUCTIONS" section of this manual.

5.5 Voltage measurements

Color bar signal in SP REC and PB modes.

Note:
Voltage indications for the REC. and PB mode on the schematic diagrams are shown below:

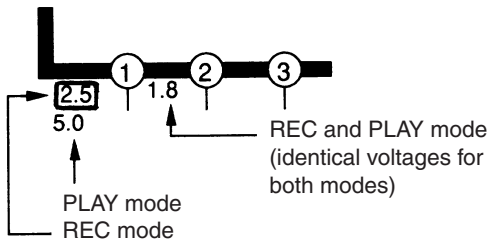


Figure 5-14

5.6 How to read wave forms

- ① Connecting point
- ② Aplitude
- ③ Time base
- ④ Operating mode of the VCR

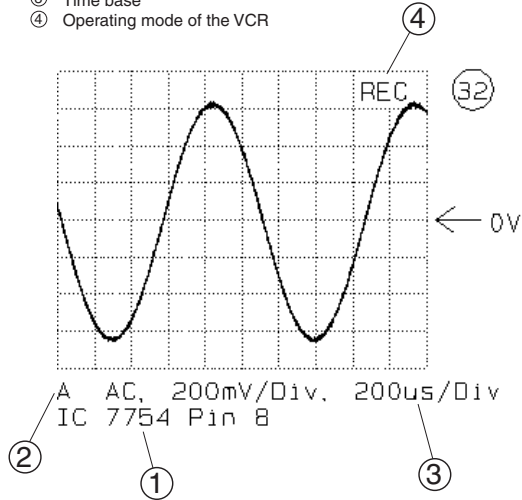


Figure 5-15

5.7 Voltage indication of Zener diodes

The Zener voltage of Zener diodes is indicated as such on schematic diagrams:
Example: BZX79C20.....Zener voltage: 20 Volts

5.8 How to identify connectors on schematic diagrams

Each connector is labeled with a connector number and a pin number indicating to what component it is connected; in other words, its counterpart.

Use the Connecting Wiring Diagram to find the connections between associated connectors.

Example:
The connections between C.B.A.s are shown below:

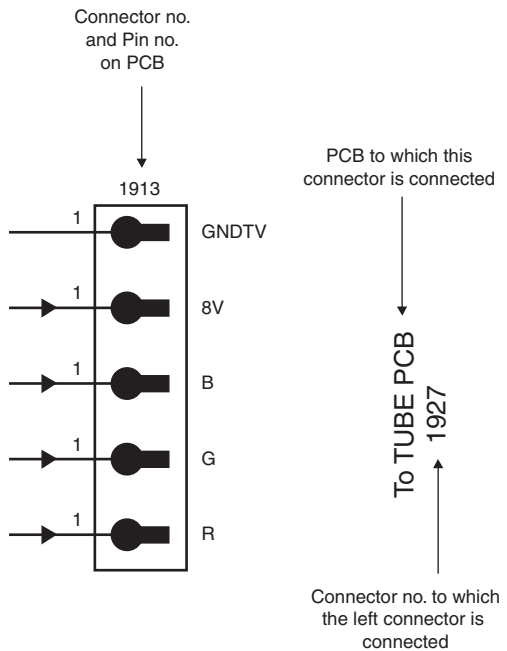
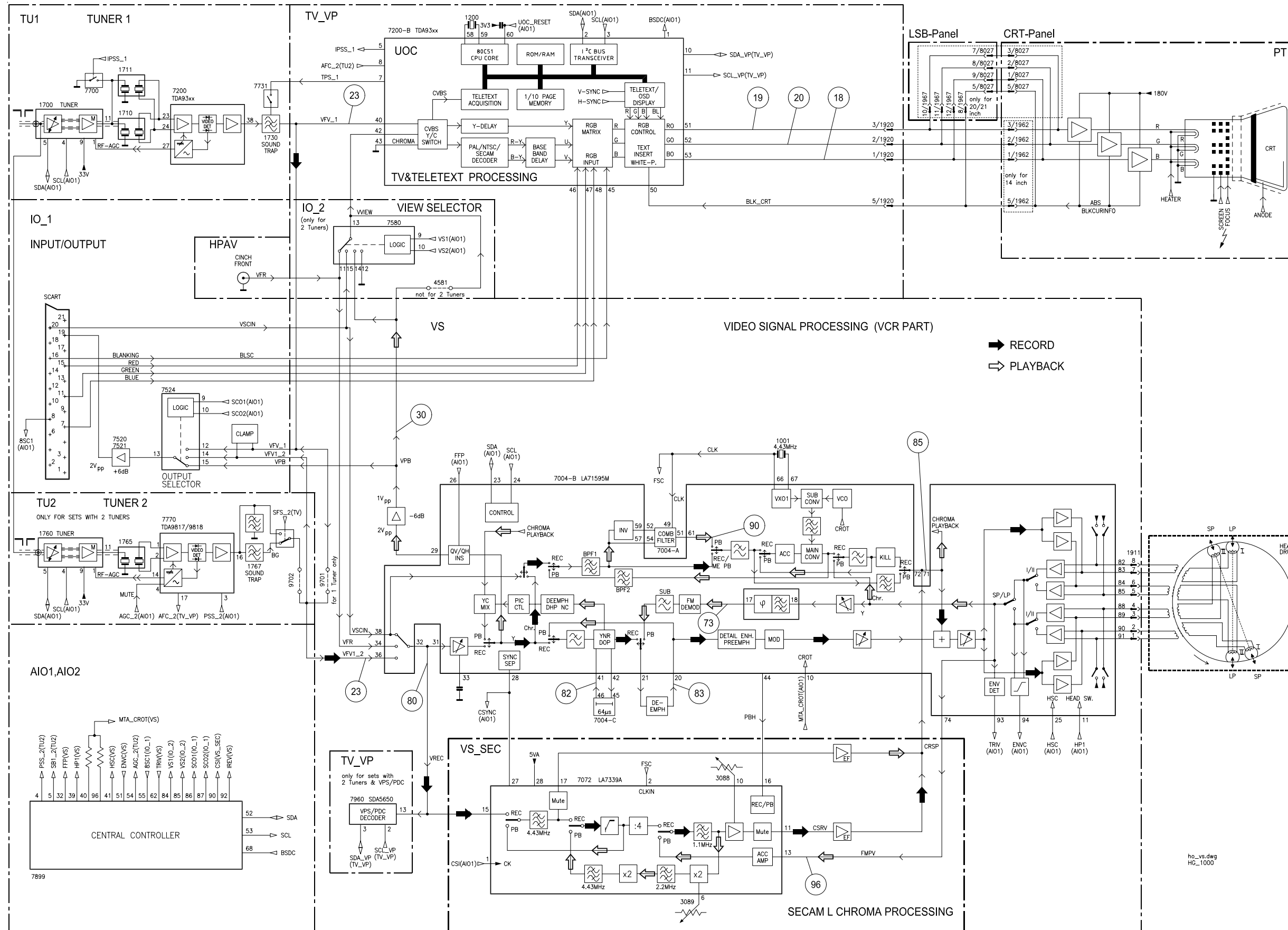


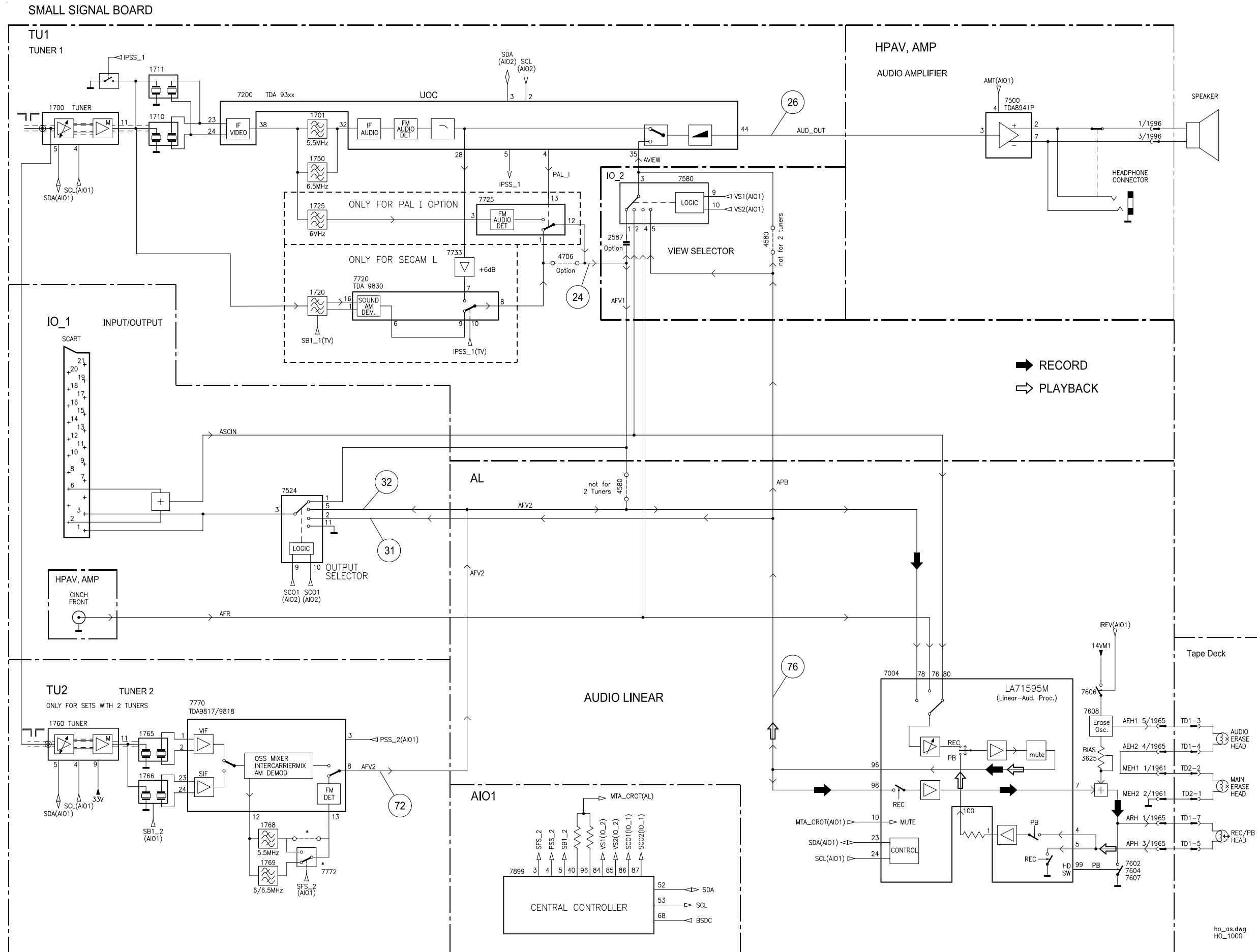
Figure 5-16

6. Block Diagrams, Waveforms, Wiring Diagram

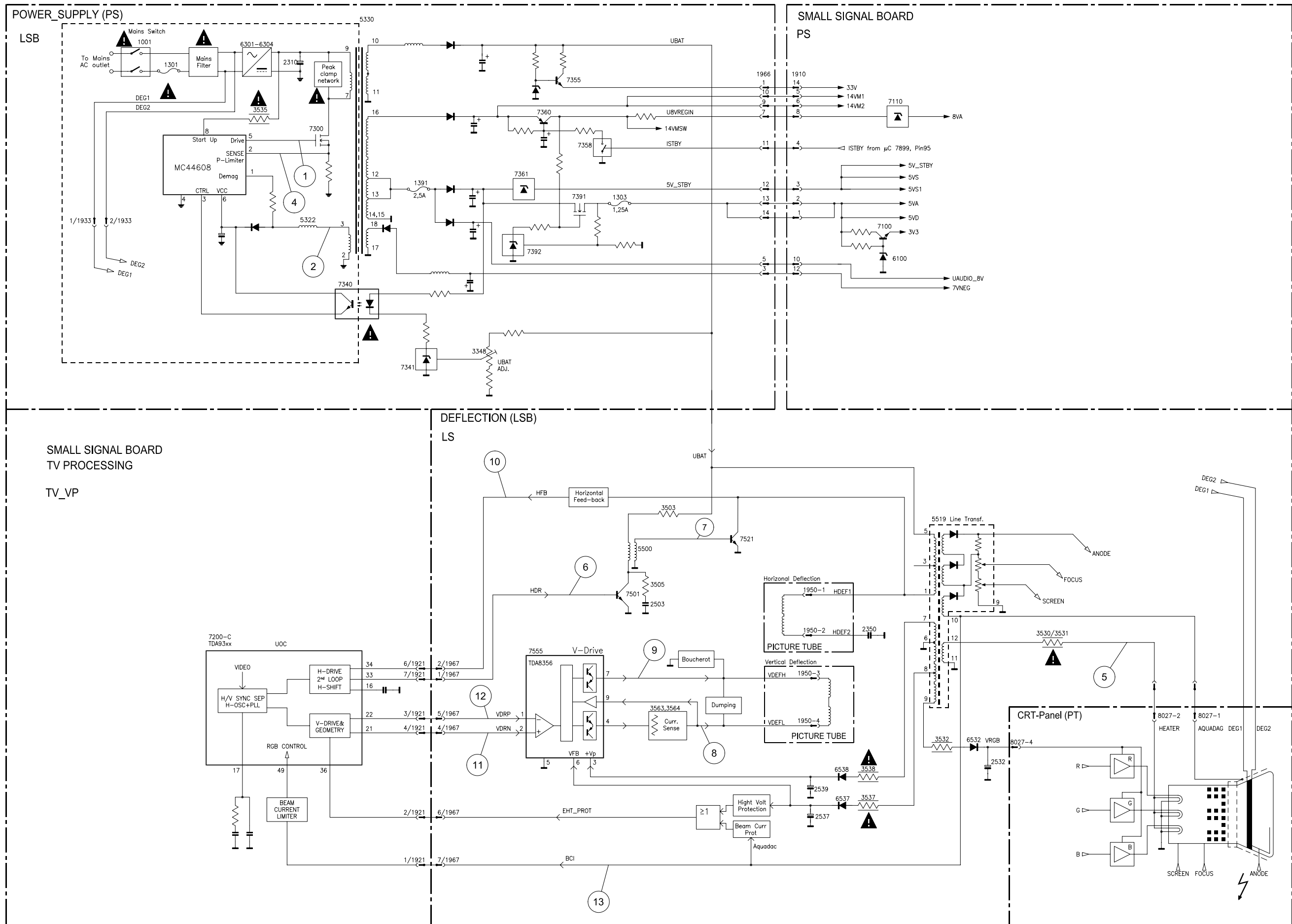
6.1 Block Diagram Video



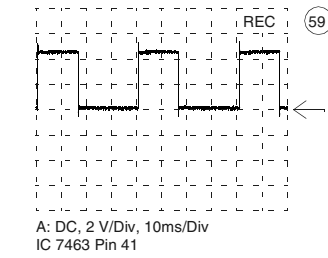
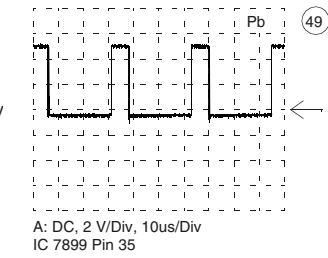
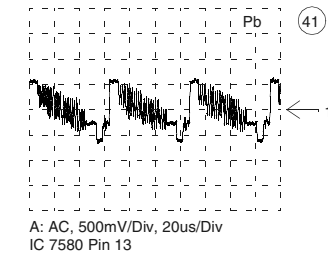
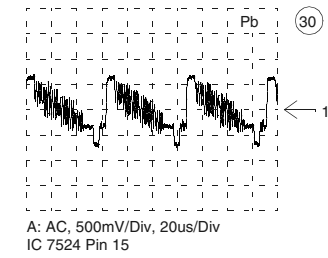
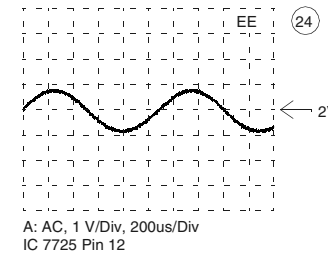
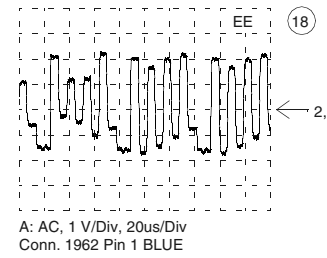
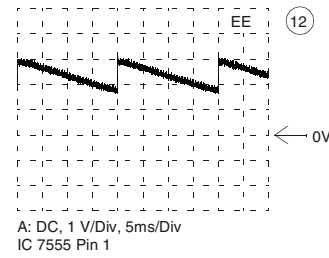
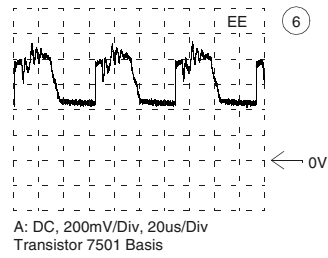
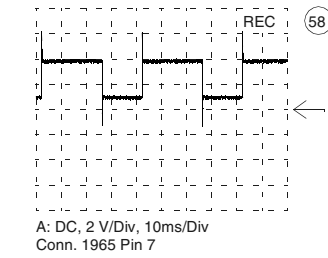
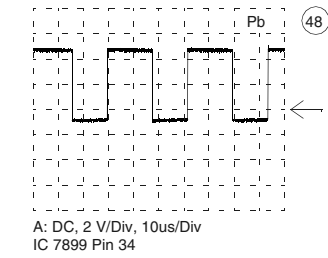
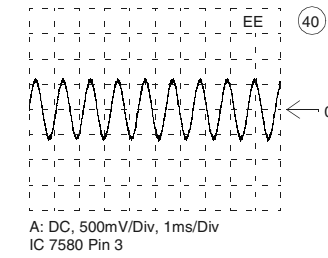
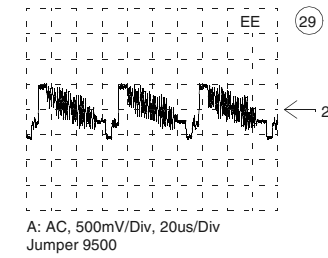
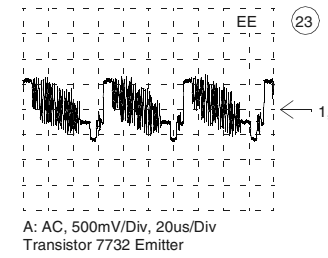
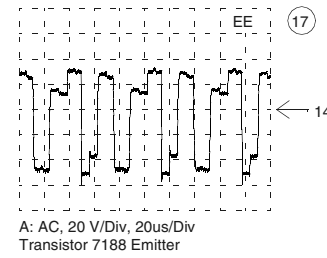
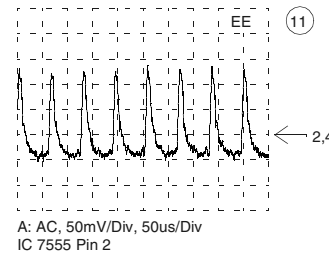
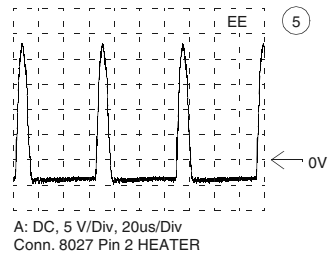
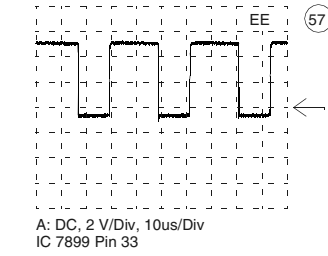
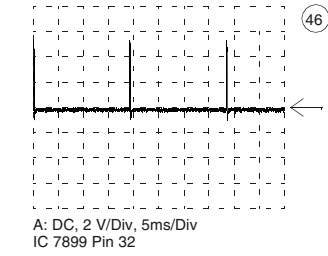
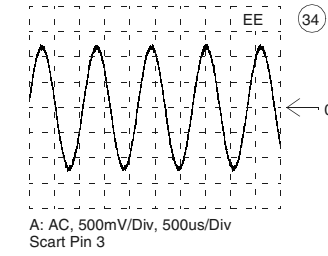
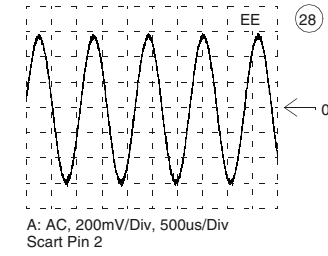
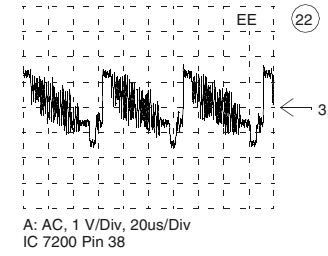
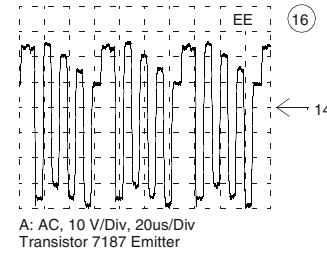
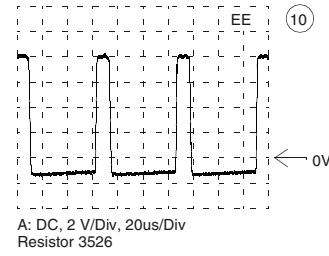
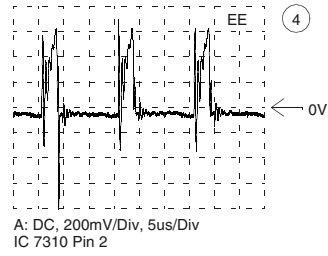
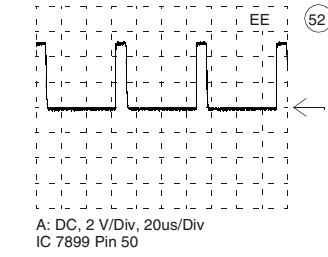
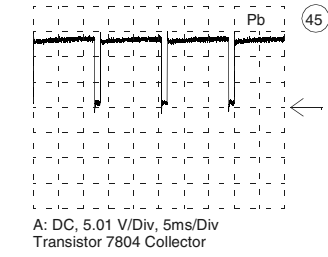
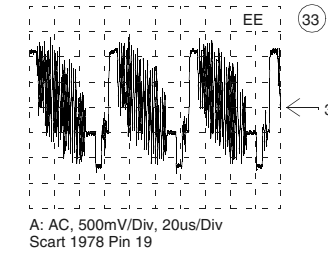
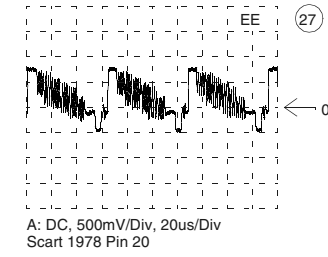
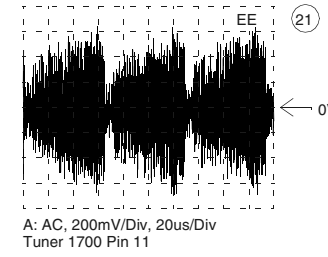
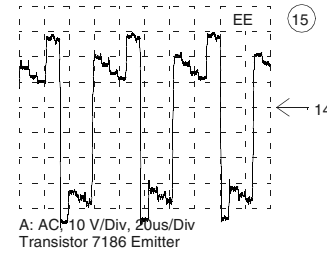
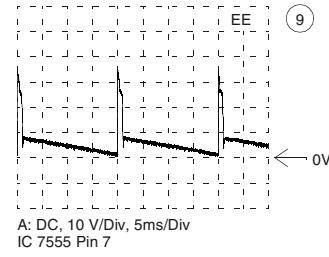
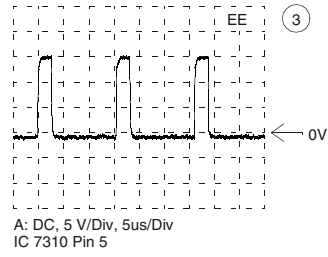
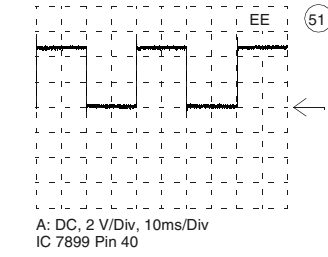
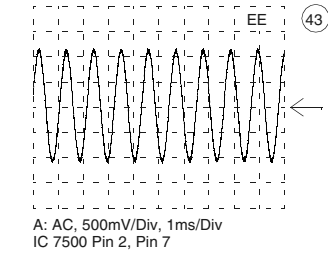
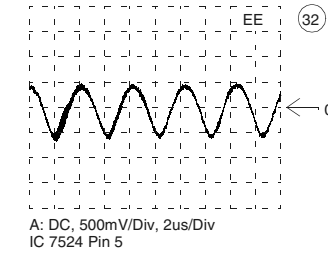
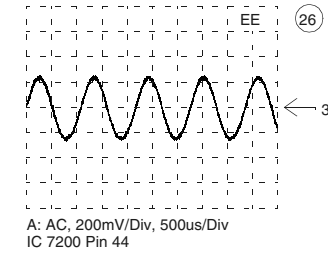
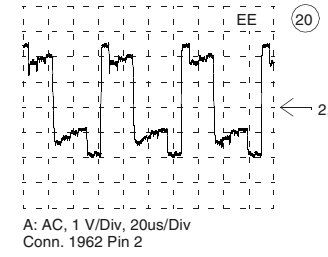
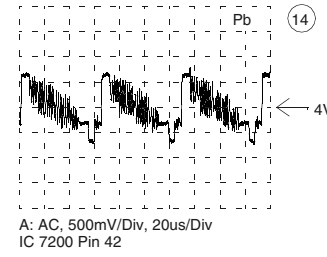
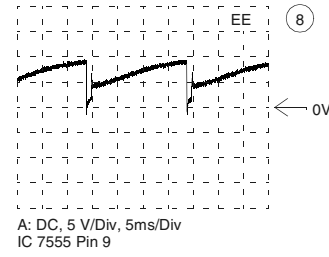
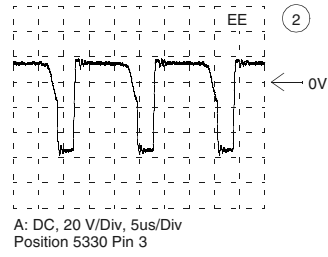
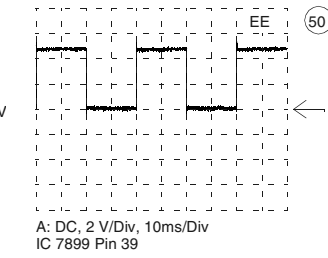
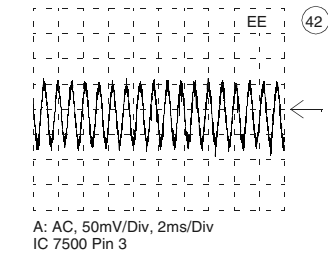
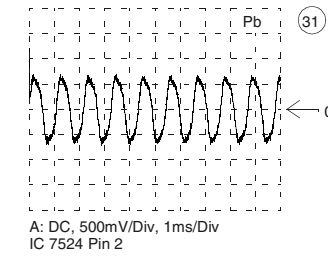
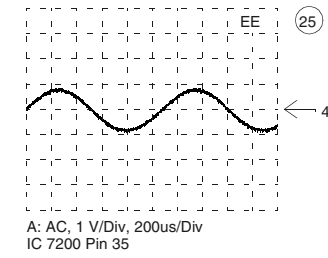
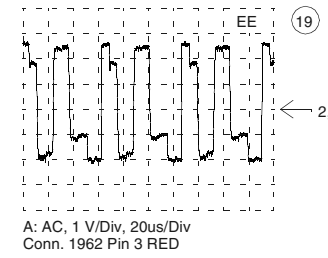
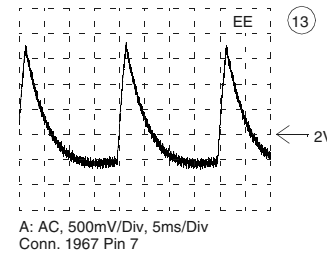
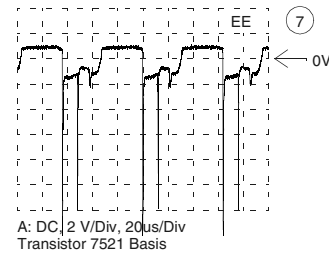
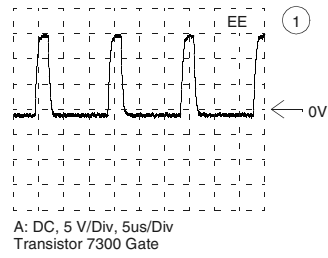
6.2 Block Diagram Audio

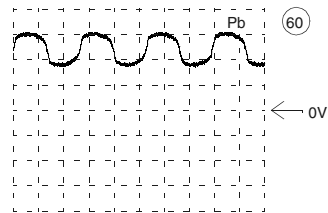


6.4 Block Diagram Supply & Deflection

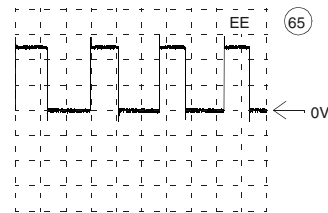


6.5 Waveforms

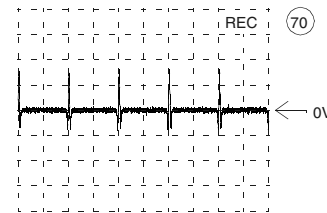




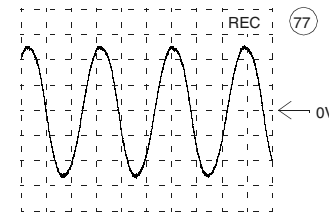
A: DC, 1 V/Div, 500us/Div
IC 7463 Pin 35



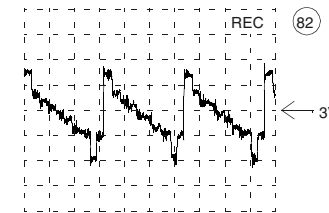
A: DC, 2 V/Div, 10ms/Div
IC 7463 Pin 34



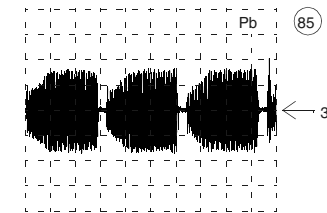
A: DC, 200mV/Div, 20ms/Div
Conn. 1948 Pin 5



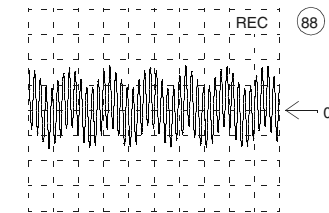
A: DC, 10 V/Div, 5us/Div
Conn. 1961 Pin 1



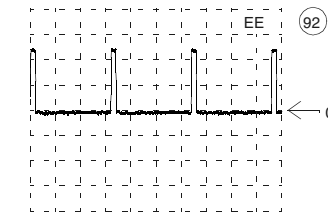
A: AC, 100mV/Div, 20us/Div
IC 7004 Pin 41



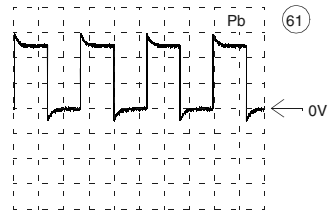
A: AC, 100mV/Div, 20us/Div
IC 7004 Pin 72



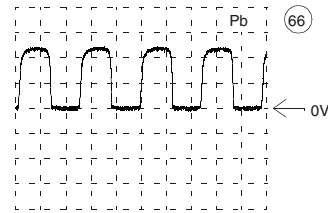
A: AC, 200mV/Div, 1us/Div
IC 7004 Pin 74



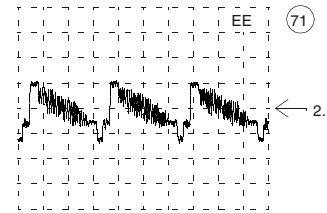
A: DC, 2 V/Div, 20us/Div
IC 7004 Pin 28



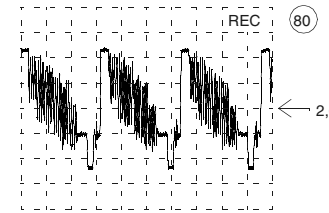
A: DC, 2 V/Div, 500us/Div
IC 7463 Pin 30



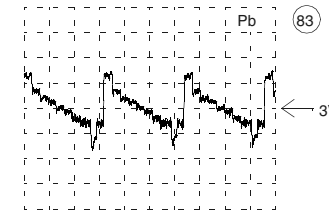
A: DC, 2 V/Div, 200ms/Div
IC 7463 Pin 38



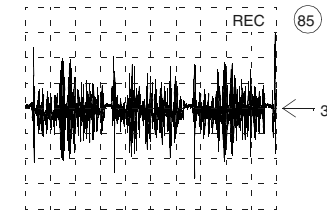
A: AC, 500mV/Div, 20us/Div
IC 7770 Pin 16



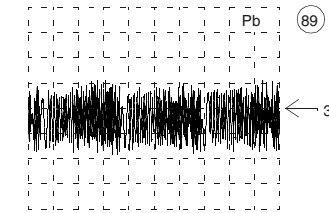
A: AC, 200mV/Div, 20us/Div
IC 7004 Pin 31



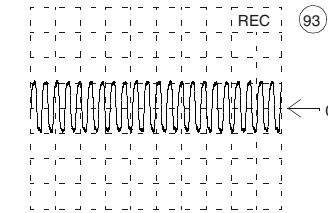
A: AC, 200mV/Div, 20us/Div
IC 7004 Pin 20



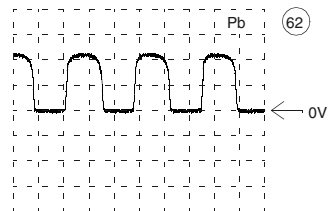
A: AC, 100mV/Div, 20us/Div
IC 7004 Pin 72



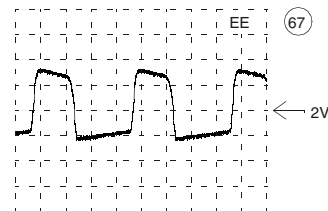
A: AC, 100mV/Div, 20us/Div
IC 7004 Pin 17



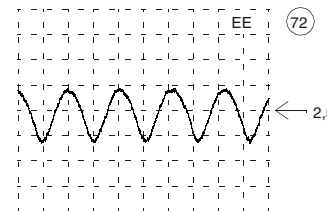
A: AC, 200mV/Div, 500ns/Div
IC 7072 Pin 2



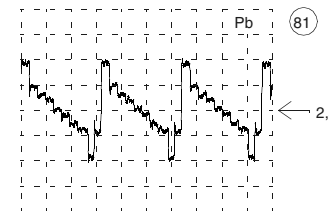
A: DC, 2 V/Div, 500ms/Div
IC 7463 Pin 37



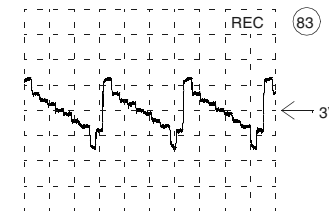
A: AC, 2 V/Div, 10ms/Div
IC 7463 Pin 39



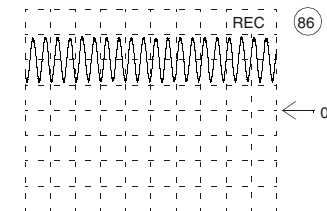
A: AC, 500mV/Div, 2us/Div
IC 7770 Pin 8



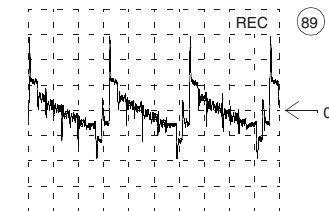
A: AC, 100mV/Div, 20us/Div
IC 7004 Pin 45



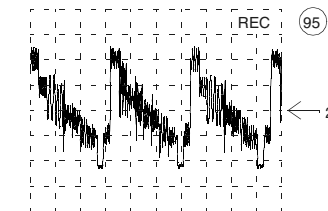
A: AC, 200mV/Div, 20us/Div
IC 7004 Pin 20



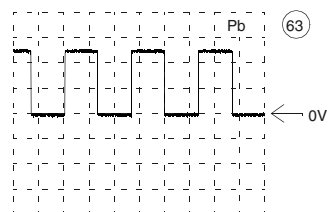
A: DC, 2 V/Div, 500ns/Div
Conn. 1911/1912 Pin 3



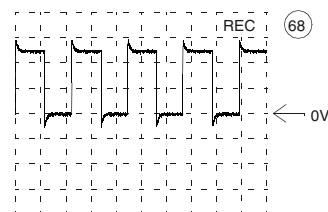
A: AC, 200mV/Div, 20us/Div
IC 7004 Pin 17



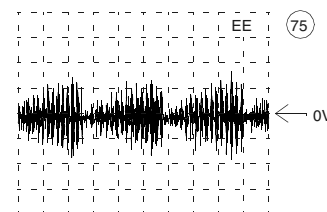
A: AC, 200mV/Div, 20us/Div
IC 7072 Pin 15



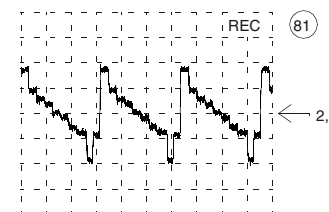
A: DC, 2 V/Div, 500ms/Div
IC 7463 Pin 31



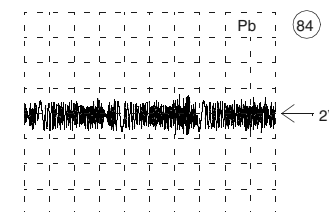
A: DC, 2 V/Div, 1ms/Div
IC 7463 Pin 6



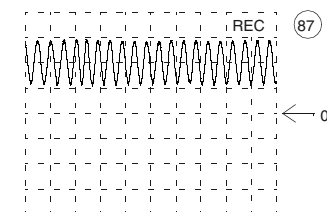
A: DC, 200mV/Div, 20us/Div
Tuner 1760 Pin 11



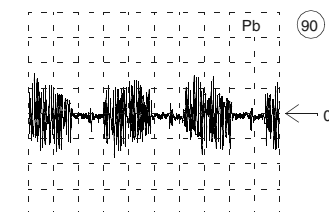
A: AC, 100mV/Div, 20us/Div
IC 7004 Pin 45



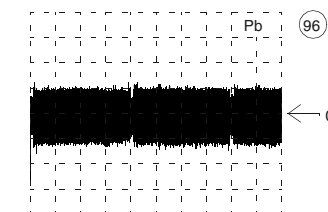
A: AC, 200mV/Div, 20us/Div
IC 7004 Pin 18



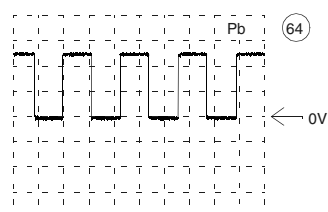
A: DC, 2 V/Div, 500ns/Div
Conn. 1911/1912 Pin 2



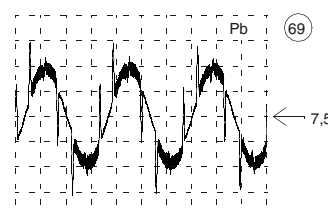
A: AC, 100mV/Div, 20us/Div
IC 7004 Pin 51



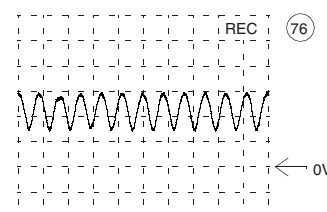
A: AC, 50mV/Div, 5ms/Div
IC 7072 Pin 13



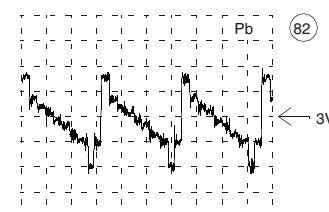
A: DC, 2 V/Div, 200ms/Div
IC 7463 Pin 33



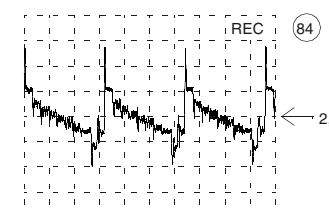
A: AC, 2 V/Div, 2ms/Div
Conn. 1948 Pin 1-3



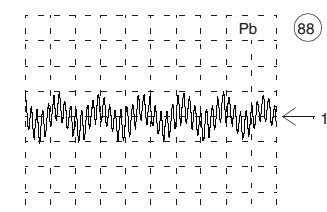
A: DC, 1 V/Div, 5us/Div
IC 7004 Pin 96



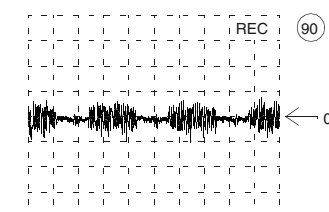
A: AC, 100mV/Div, 20us/Div
IC 7004 Pin 41



A: AC, 200mV/Div, 20us/Div
IC 7004 Pin 18

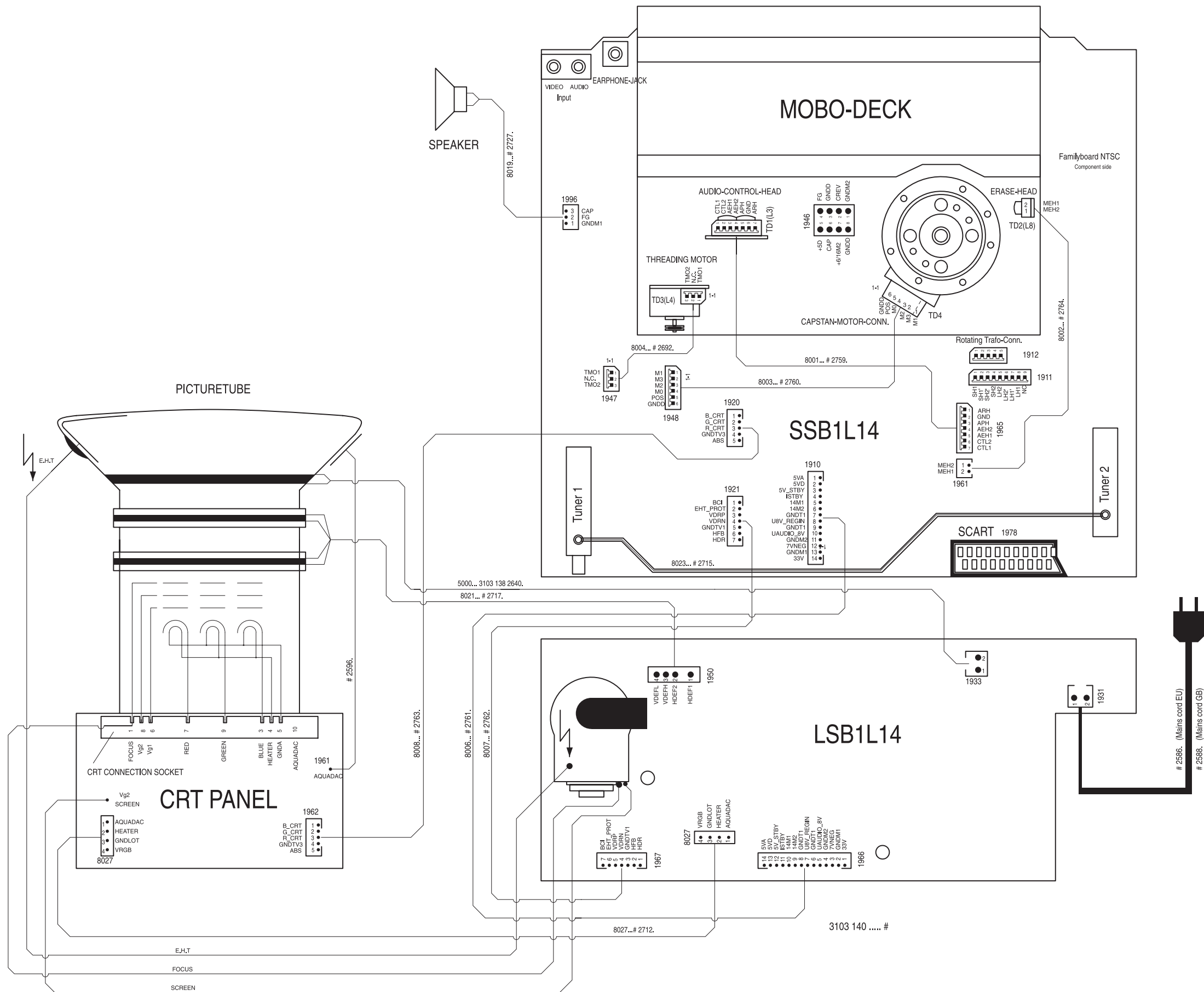


A: AC, 200mV/Div, 1us/Div
IC 7004 Pin 74

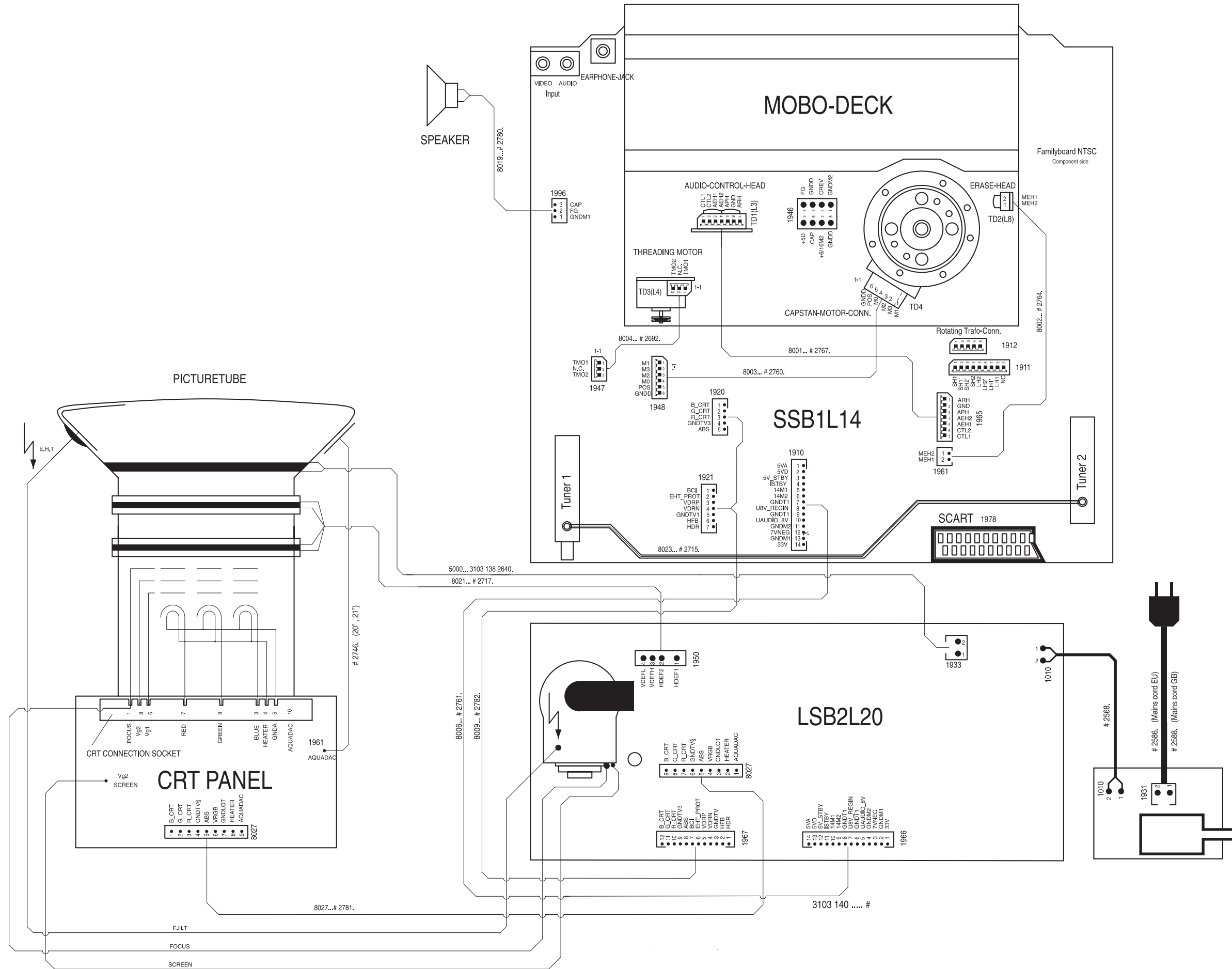


A: AC, 100mV/Div, 20us/Div
IC 7004 Pin 51

6.7 Wiring Diagram 14"

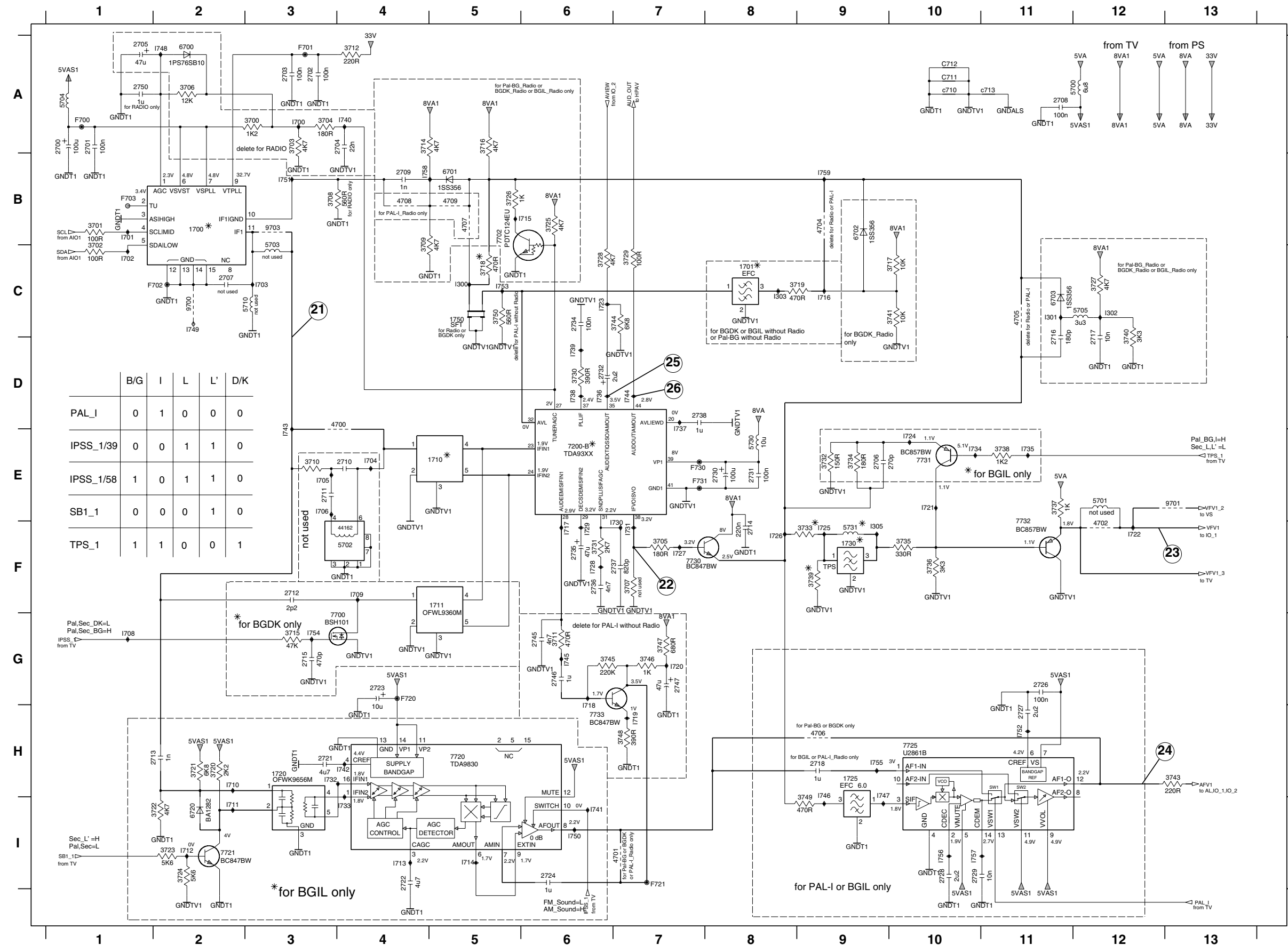


6.8 Wiring Diagram 20"/21"



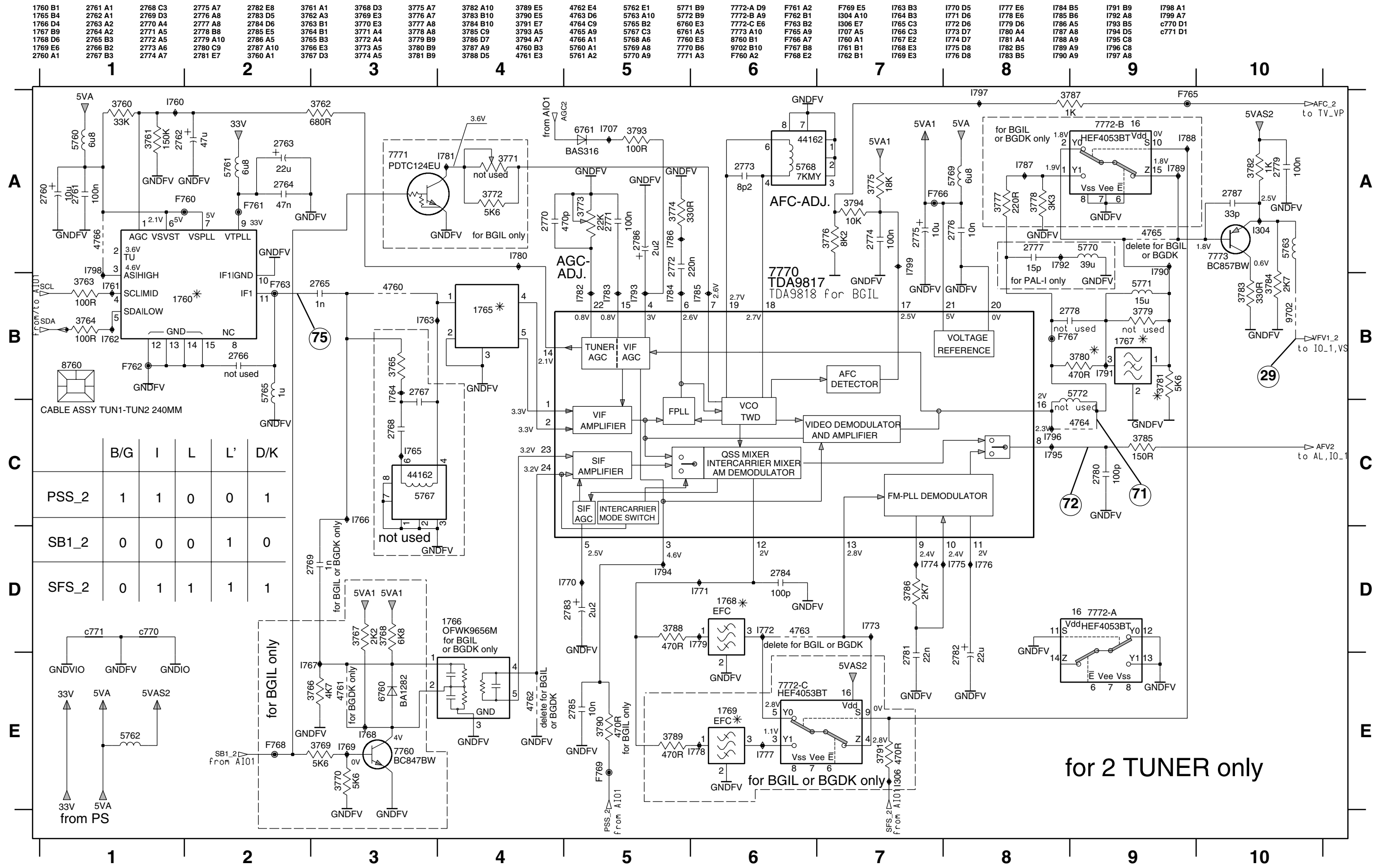
7. Circuit Diagrams and PWB Layouts

7.1 Tuner 1 (TU1) - Small Signal Board SSB



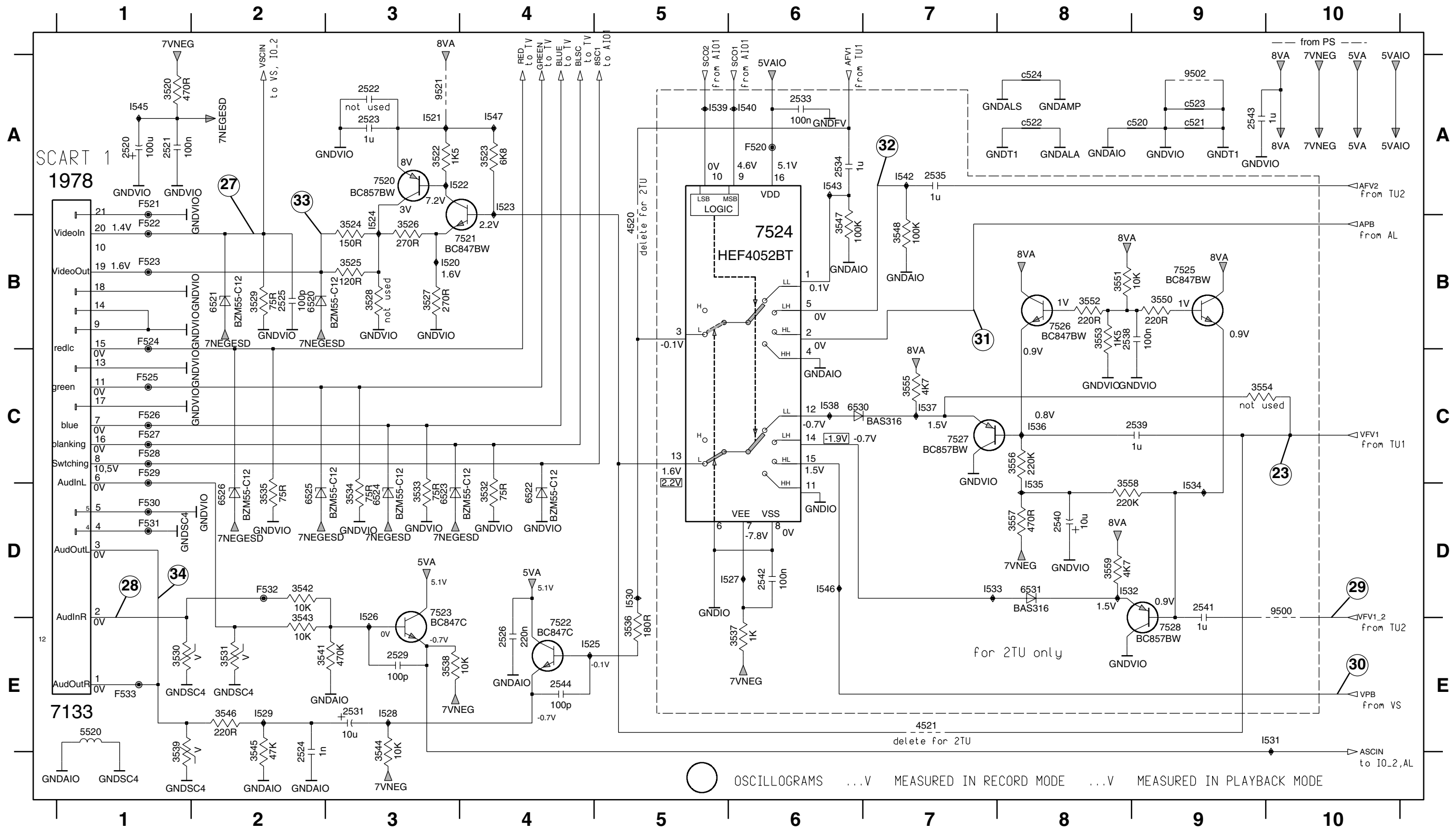
1700 B2	7732 F11
1701 C8	7733 H6
1710 E4	9700 C2
1711 F5	9701 E3
1720 H3	9703 B3
1725 H9	C711 A10
1730 F9	C712 A10
1750 C5	F700 A1
1750 A1	F701 A3
1701 A1	F702 C2
1702 A3	F703 B1
1720 A3	F720 G4
1704 A4	F721 I7
1705 A1	F730 E7
1706 E9	F731 E7
1707 C2	I300 C5
1708 A11	I301 C11
1709 B4	I302 C12
1710 E4	I303 C8
1711 E3	I305 F9
1712 F3	I700 A3
1713 H2	I701 B1
1714 F8	I702 C1
1715 G3	I703 C3
1716 D11	I704 E4
1717 D12	I705 E3
1718 H9	I706 E3
1721 H3	I708 G1
1722 I4	I709 F4
1723 G4	I710 H2
1724 I6	I711 I2
1726 G11	I712 I2
1727 H11	I713 I4
1728 I10	I714 I5
1729 I10	I715 B6
1730 E8	I716 C9
1731 E8	I717 F6
1732 D6	I718 H7
1734 C6	I719 H6
1735 F8	I720 G7
1736 F6	I721 E10
1737 F7	I722 F12
1738 D7	I723 C6
1746 G6	I724 E10
1746 G8	I725 F9
1747 G7	I726 F8
1750 A1	I727 F7
1750 A3	I728 F6
1751 F6	I729 F6
1752 C1	I730 F7
1753 A3	I731 F7
1754 A3	I732 H3
1755 F7	I733 I4
1756 A2	I734 E10
1757 F7	I735 E11
1758 B3	I736 D6
1759 B4	I737 D7
1760 E3	I738 D6
1761 G6	I739 D6
1762 A4	I740 A4
1763 A4	I741 I6
1764 G3	I742 H4
1765 C5	I743 E3
1766 C10	I744 D7
1767 C9	I745 G6
1768 H2	I746 H9
1769 H2	I747 H9
1770 H2	I748 A2
1771 C2	I749 C2
1772 I2	I750 I6
1773 I2	I751 B3
1774 B6	I752 H11
1775 B5	I753 C5
1776 C12	I754 G3
1777 C5	I755 H9
1778 C7	I756 I10
1779 D6	I757 I10
1780 F6	I758 B4
1781 F9	I759 B9
1782 F9	I760 B9
1783 F9	I761 B9
1784 F9	I762 I2
1785 F9	I763 I2
1786 F9	I764 I2
1787 F9	I765 I2
1788 F9	I766 I2
1789 F9	I767 I2
1790 F9	I768 I2
1791 F9	I769 I2
1792 F9	I770 I2
1793 F9	I771 I2
1794 F9	I772 I2
1795 F9	I773 I2
1796 F9	I774 I2
1797 F9	I775 I2
1798 F9	I776 I2
1799 F9	I777 I2
1800 F9	I778 I2
1801 F9	I779 I2
1802 F9	I780 I2
1803 F9	I781 I2
1804 F9	I782 I2
1805 F9	I783 I2
1806 F9	I784 I2
1807 F9	I785 I2
1808 F9	I786 I2
1809 F9	I787 I2
1810 F9	I788 I2
1811 F9	I789 I2
1812 F9	I790 I2
1813 F9	I791 I2
1814 F9	I792 I2
1815 F9	I793 I2
1816 F9	I794 I2
1817 F9	I795 I2
1818 F9	I796 I2
1819 F9	I797 I2
1820 F9	I798 I2
1821 F9	I799 I2
1822 F9	I800 I2

7.2 Tuner 2(TU2) - Small Signal Board SSB

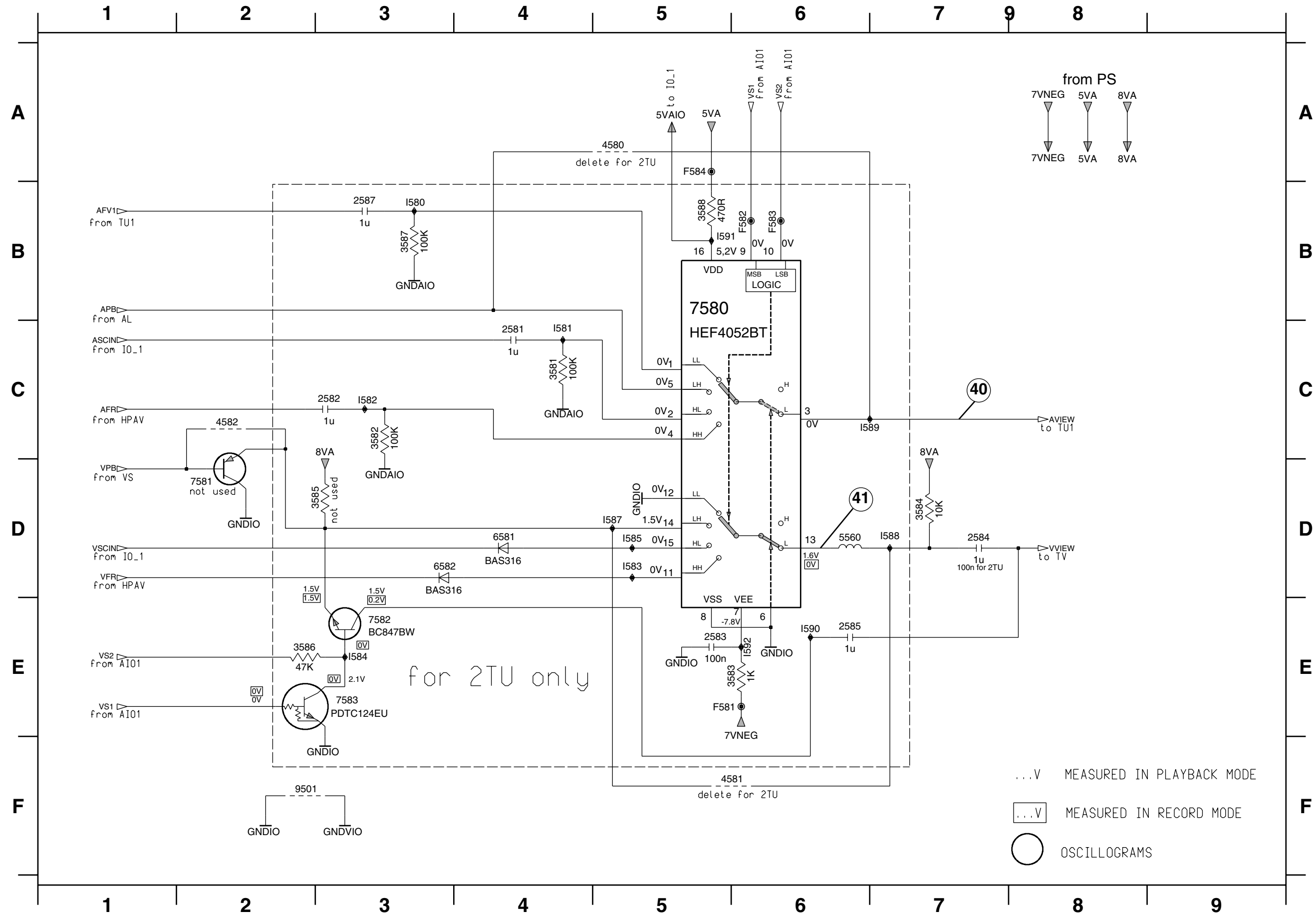


7.3 Input/Output 1 (IO_1) - Small Signal Board SSB

1978 A1	2525 B2	2535 A7	2543 A9	3525 B3	3531 E2	3537 E6	3544 E3	3551 B8	3557 D8	6520 B2	6526 D2	7523 E3	9500 D10	F523 B1	F529 C1	I521 A3	I527 D6	I533 D7	I539 A5	I547 A4
2520 A1	2526 E4	2538 B8	2544 E4	3526 B3	3532 D4	3538 E3	3545 E2	3552 B8	3558 D8	6521 B2	6530 C6	7524 B6	9502 A9	F524 B1	F530 D1	I522 A3	I528 E3	I534 D9	I540 A6	c520 A9
2521 A1	2529 E3	2539 C9	3520 A1	3527 B3	3533 D3	3539 E1	3546 E2	3553 B8	3559 D8	6522 D4	6531 D8	7525 B9	9521 A3	F525 C1	F531 D1	I523 A4	I529 E2	I535 D8	I542 A7	c521 A9
2522 A3	2531 E3	2540 D8	3522 A3	3528 B3	3534 D3	3541 E2	3547 B6	3554 C9	4520 B5	6523 D3	7520 A3	7526 B8	F520 A6	F526 C1	F532 D2	I524 B3	I530 D5	I536 C8	I543 A6	c522 A8
2523 A3	2533 A6	2541 D9	3523 A4	3529 B2	3535 D2	3542 D2	3548 B7	3555 C7	4521 E7	6524 D3	7521 B4	7527 C7	F521 A1	F527 C1	F533 E1	I525 E4	I531 E10	I537 C7	I545 A1	c523 A9
2524 E2	2534 A6	2542 D6	3524 B3	3530 E1	3536 E5	3543 E2	3550 B9	3556 C8	5520 E1	6525 D2	7522 E4	7528 E9	F522 B1	F528 C1	I520 B3	I526 D3	I532 D8	I538 C6	I546 D6	c524 A8

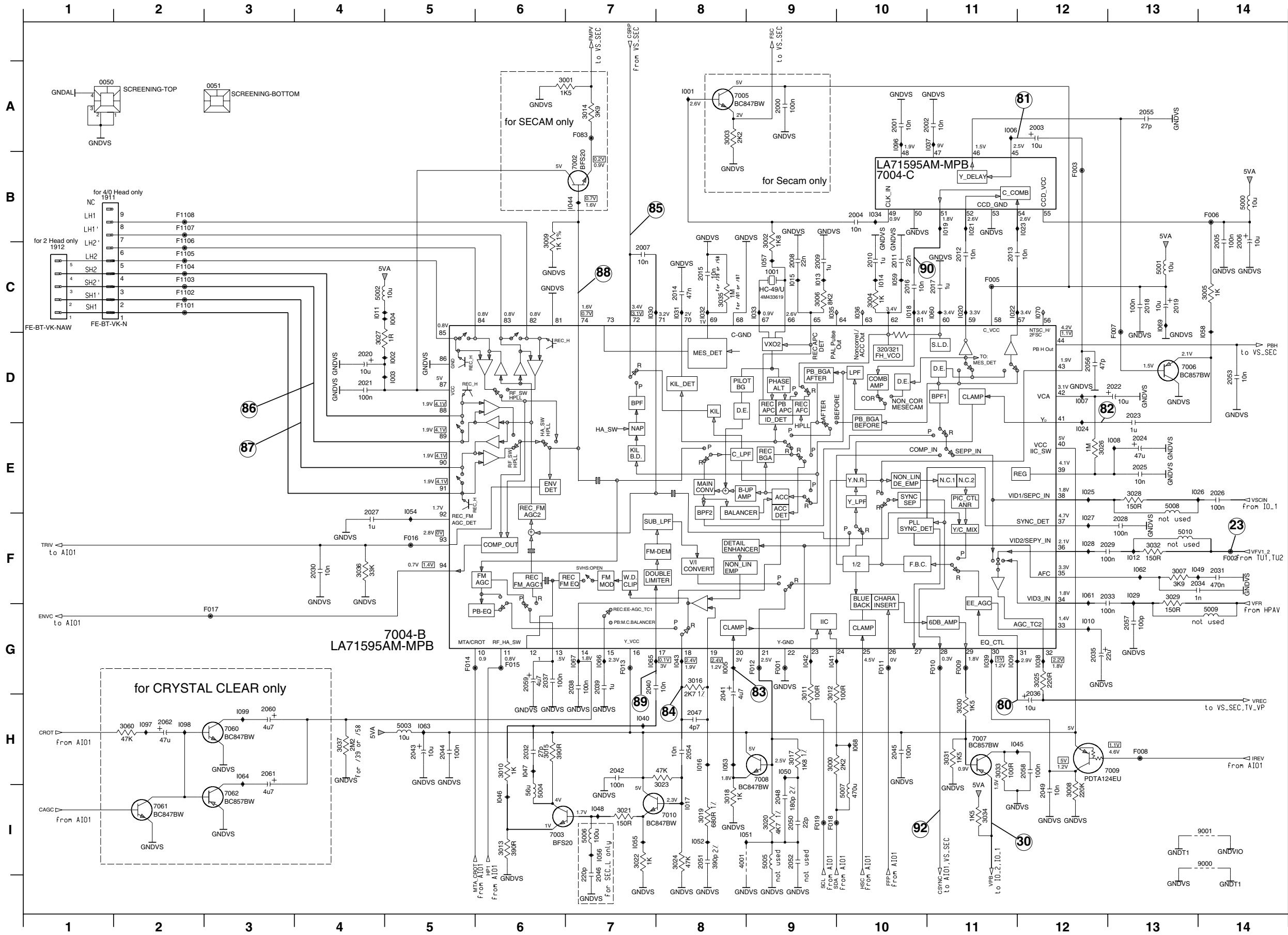


7.4 Input/Output 2 (IO_2) - Small Signal Board SSB



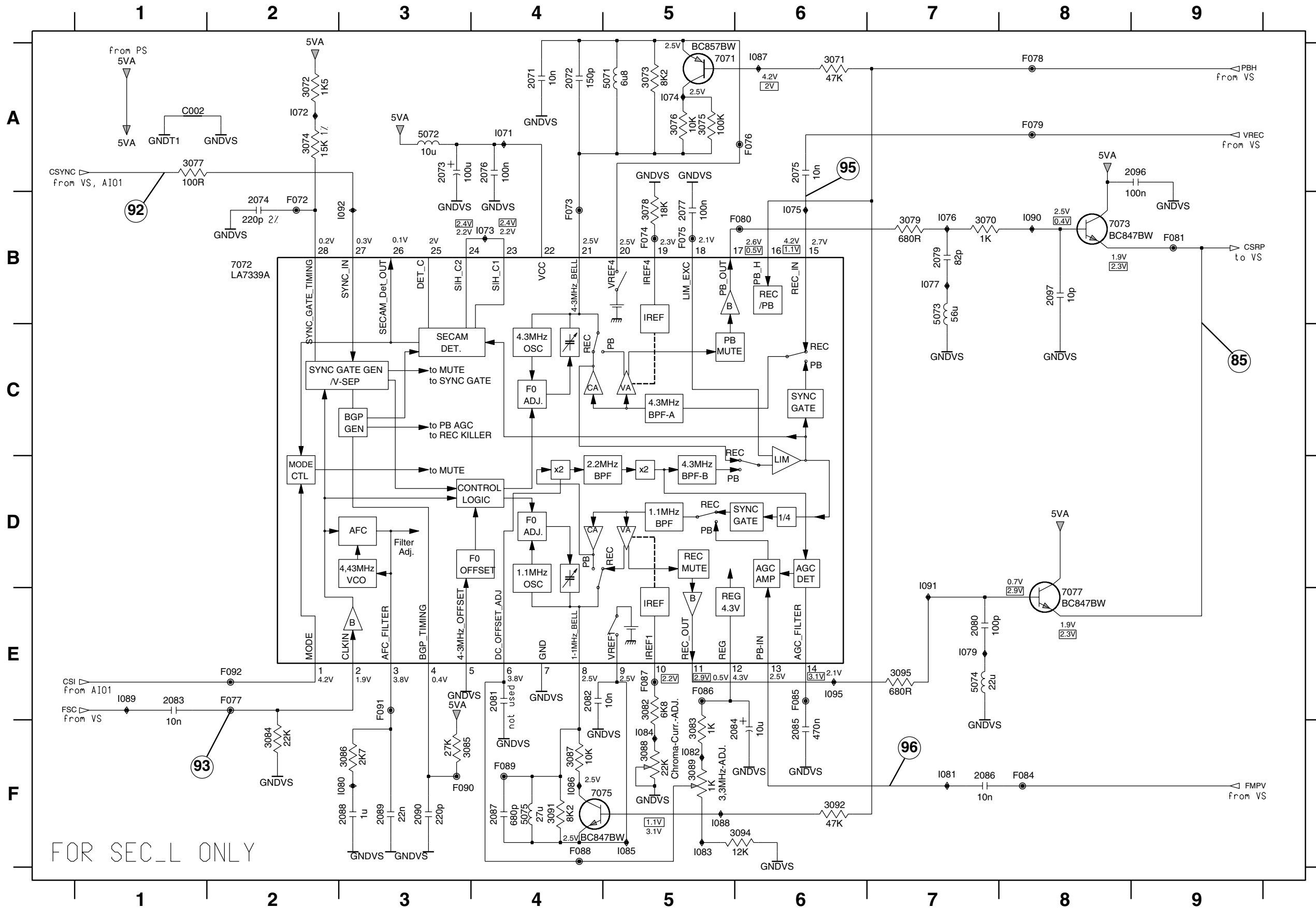
- 2581 C4
- 2582 C3
- 2583 E5
- 2584 D7
- 2585 E6
- 2587 B3
- 3581 C4
- 3582 C3
- 3583 E6
- 3584 D7
- 3585 D3
- 3586 E2
- 3587 B3
- 3588 B5
- 4580 A5
- 4581 F6
- 4582 C2
- 5560 D6
- 6581 D4
- 6582 D3
- 7580 B5
- 7581 D2
- 7582 E3
- 7583 E3
- 9501 F2
- F581 E5
- F582 B6
- F583 B6
- F584 A5
- I580 B3
- I581 C4
- I582 C3
- I583 D5
- I584 E3
- I585 D5
- I587 D5
- I588 D7
- I589 C6
- I590 E6
- I591 B5
- I592 E6

7.6 Video Signal Processing (VS) - Small Signal Board SSB



0050 A1	5009 G14	1099 H3
0051 A3	5010 F13	
1001 C9	7002 B7	
1911 B2	7003 I6	
1912 C1	7004-B G5	
2000 A9	7004-C B10	
2001 A10	7005 A8	
2002 A11	7006 D13	
2003 A12	7007 H11	
2004 B10	7008 H9	
2005 B14	7009 H13	
2006 B14	7010 I8	
2007 C7	7060 H3	
2008 C9	7061 I2	
2009 C9	7062 I3	
2010 C10	9000 I14	
2011 C10	9001 I14	
2012 C11	F001 G9	
2013 C11	F002 F14	
2014 C8	F003 B12	
2015 C8	F005 C11	
2016 C10	F006 B14	
2017 C11	F007 C13	
2018 C13	F008 H13	
2019 C13	F009 G11	
2020 D4	F010 G11	
2021 D4	F011 G10	
2022 D13	F012 G9	
2023 D13	F013 G7	
2024 E13	F014 G5	
2025 E13	F015 G6	
2026 E14	F016 F5	
2027 F4	F017 G3	
2028 F13	F018 I9	
2029 F12	F019 I9	
2030 F4	F083 A7	
2031 F14	F101 C2	
2032 H6	F102 C2	
2033 F12	F103 C2	
2034 F13	F104 C2	
2035 G12	F105 C2	
2036 H12	F106 C2	
2037 G6	F107 B2	
2038 G7	F108 B2	
2039 G7	I001 A8	
2040 G7	I002 D5	
2041 G8	I003 D5	
2042 H7	I004 C5	
2043 H5	I005 G8	
2044 H5	I006 A11	
2045 H10	I007 D12	
2046 I7	I008 E13	
2047 H8	I009 G11	
2048 I9	I010 G12	
2049 I12	I011 C4	
2050 I9	I012 F13	
2051 I8	I013 C9	
2052 I9	I014 C10	
2053 D14	I015 H3	
2054 H8	I016 H8	
2055 A13	I017 I8	
2056 D12	I018 C10	
2057 G13	I019 B11	
2058 H12	I020 C11	
2059 G6	I021 B11	
2060 H3	I022 C11	
2061 H3	I023 B12	
2062 H2	I024 E12	
3000 H9	I025 E12	
3001 A7	I026 E13	
3002 B9	I027 F12	
3003 A8	I028 F12	
3004 C10	I029 F13	
3005 C14	I030 C7	
3006 C9	I031 C8	
3007 F13	I032 C8	
3008 H12	I033 C9	
3009 B6	I034 B10	
3010 H6	I035 C9	
3011 G9	I036 C10	
3012 G9	I037 A11	
3013 I6	I038 G12	
3014 A7	I039 G11	
3015 H6	I040 H7	
3016 G8	I041 G9	
3017 H9	I042 G9	
3018 I8	I043 G8	
3019 I8	I044 B7	
3020 I9	I045 H11	
3021 I7	I046 I6	
3022 I7	I047 H6	
3023 H8	I048 I7	
3024 I8	I049 F13	
3025 G12	I050 H9	
3026 E12	I051 I8	
3027 D4	I052 I8	
3028 E13	I053 H8	
3029 F13	I054 E5	
3030 H11	I055 I7	
3031 H11	I056 I7	
3032 F13	I057 C9	
3033 H11	I058 C14	
3034 I11	I059 C10	
3035 C8	I060 C11	
3036 F4	I061 F12	
3037 H4	I062 F13	
3060 H2	I063 H5	
4001 I8	I064 H3	
5000 B14	I065 G7	
5001 C13	I066 G7	
5002 C4	I067 G7	
5003 H5	I068 H10	
5004 I6	I069 C13	
5005 I9	I070 C12	
5006 I7	I096 A10	
5007 I10	I097 H2	
5008 E13	I098 H2	

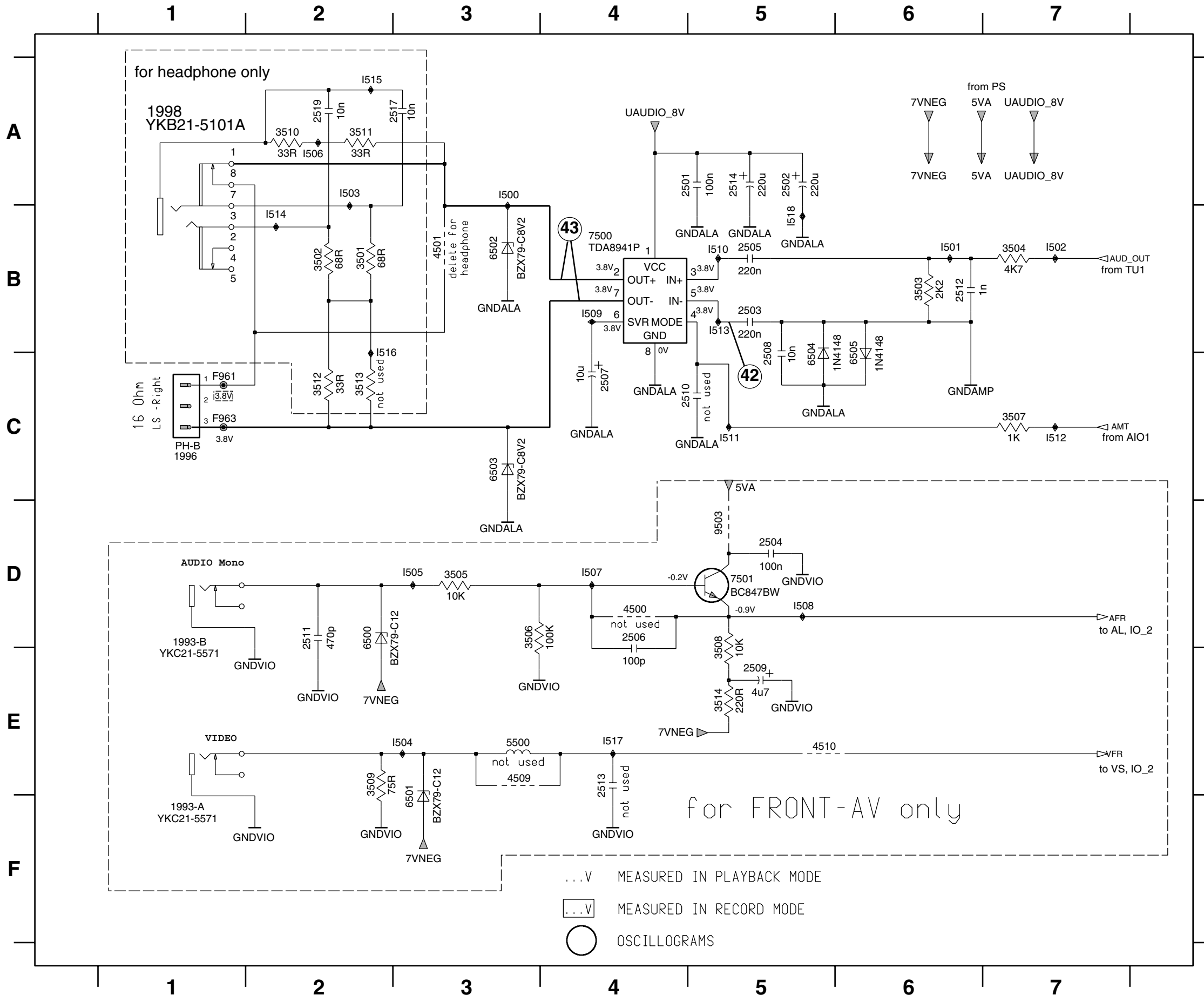
7.8 Chroma Processing SECAM L (VS_SEC) - Small Signal Board SSB



- 2071 A4 I076 B7
- 2072 A4 I077 B7
- 2073 A3 I079 E7
- 2074 B2 I080 F3
- 2075 A6 I081 F7
- 2076 A4 I082 F5
- 2077 B5 I083 F5
- 2079 B7 I084 F5
- 2080 E7 I085 F5
- 2081 E4 I086 F4
- 2082 E4 I087 A6
- 2083 E1 I088 F5
- 2084 F5 I089 E1
- 2085 F6 I090 B8
- 2086 F7 I091 D7
- 2087 F4 I092 B3
- 2088 F3 I095 E6
- 2089 F3 c002 A1
- 2090 F3
- 2096 A9
- 2097 B8
- 3070 B7
- 3071 A6
- 3072 A2
- 3073 A5
- 3074 A2
- 3075 A5
- 3076 A5
- 3077 A1
- 3078 B5
- 3079 B7
- 3082 E5
- 3083 F5
- 3084 F2
- 3085 F3
- 3086 F3
- 3087 F4
- 3088 F5
- 3089 F5
- 3091 F4
- 3092 F6
- 3094 F6
- 3095 E7
- 5071 A5
- 5072 A3
- 5073 B7
- 5074 E7
- 5075 F4
- 7071 A6
- 7072 B2
- 7073 B8
- 7075 F5
- 7077 E8
- F072 B2
- F073 B4
- F074 B5
- F075 B5
- F076 A6
- F077 E2
- F078 A8
- F079 A8
- F080 B6
- F081 B9
- F084 F8
- F085 E6
- F086 E5
- F087 E5
- F088 F4
- F089 F4
- F090 F3
- F091 E3
- F092 E2
- I071 A4
- I072 A2
- I073 B4
- I074 A5
- I075 B6

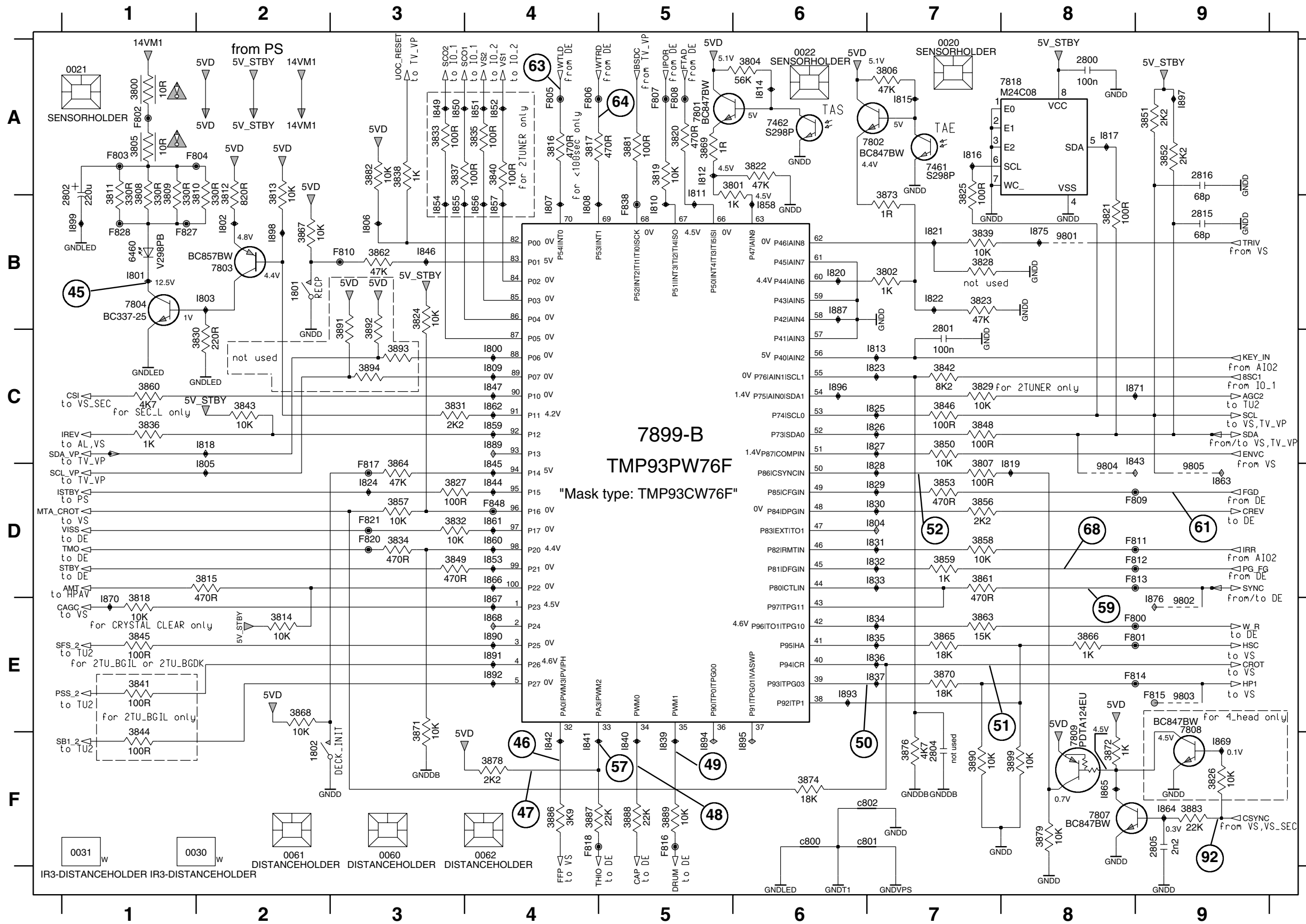
FOR SEC_L ONLY

7.9 Audio Amplifier, Headphones, AV Inputs (HPAV,AMP) - Small Signal Board SSB



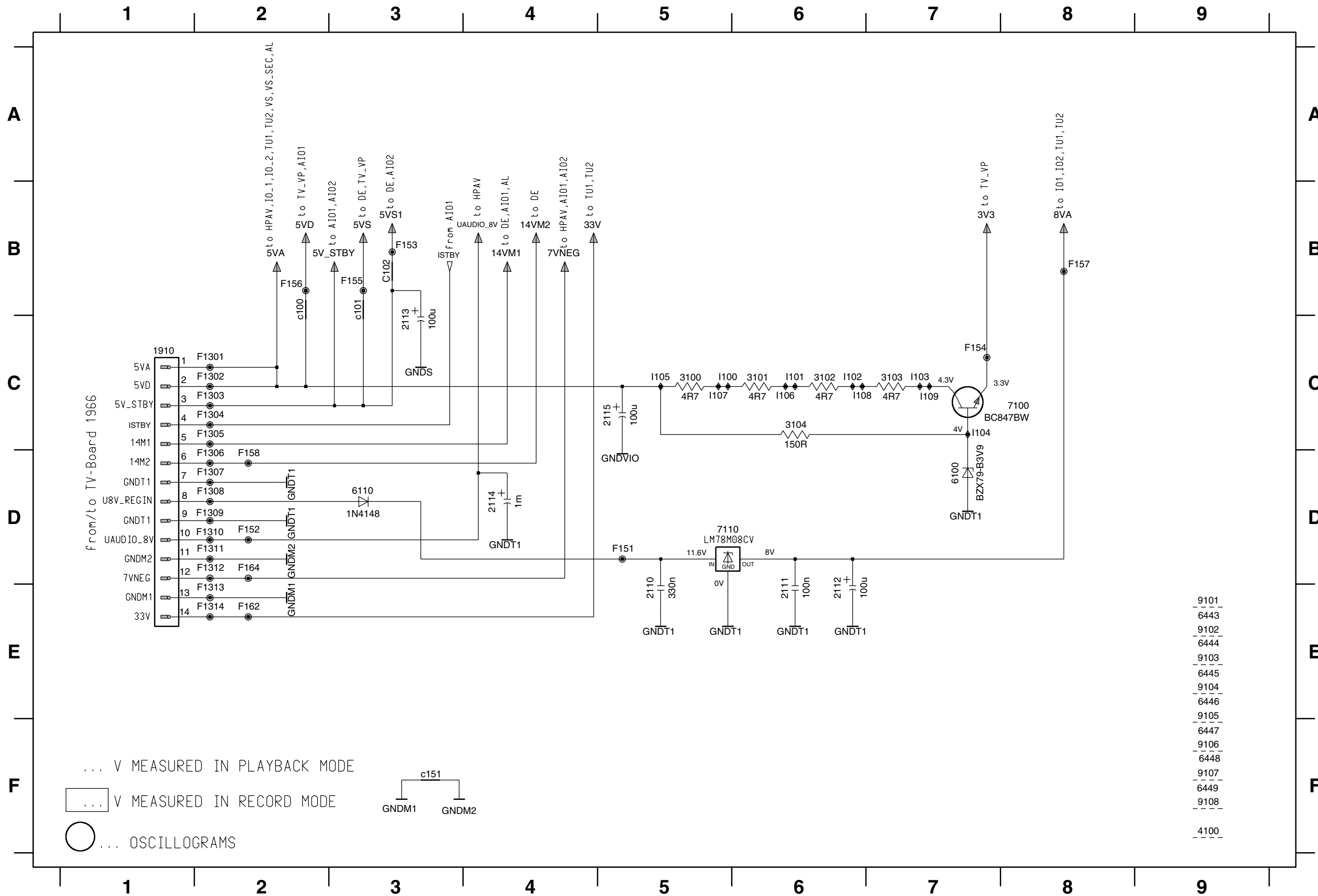
- 1993-A F1
- 1993-B D1
- 1996 C1
- 1998 A1
- 2501 A5
- 2502 A5
- 2503 B5
- 2504 D5
- 2505 B5
- 2506 D4
- 2507 C4
- 2508 C5
- 2509 E5
- 2510 C5
- 2511 D2
- 2512 B6
- 2513 E4
- 2514 A5
- 2517 A3
- 2519 A2
- 3501 B2
- 3502 B2
- 3503 B6
- 3504 B7
- 3505 D3
- 3506 D3
- 3507 C7
- 3508 E5
- 3509 E2
- 3510 A2
- 3511 A2
- 3512 C2
- 3513 C2
- 3514 E5
- 4500 D4
- 4501 B3
- 4509 E3
- 4510 E5
- 5500 E3
- 6500 D2
- 6501 F3
- 6502 B3
- 6503 C3
- 6504 C5
- 6505 C6
- 7500 B4
- 7501 D5
- 9503 D5
- F961 C1
- F963 C1
- I500 A3
- I501 B6
- I502 B7
- I503 A2
- I504 E3
- I505 D3
- I506 A2
- I507 D4
- I508 D5
- I509 B4
- I510 B5
- I511 C5
- I512 C7
- I513 B5
- I514 B2
- I515 A2
- I516 B2
- I517 E4
- I518 B5

7.10 Control 1, Central & Deck Control (AIO1) - Small Signal Board SSB



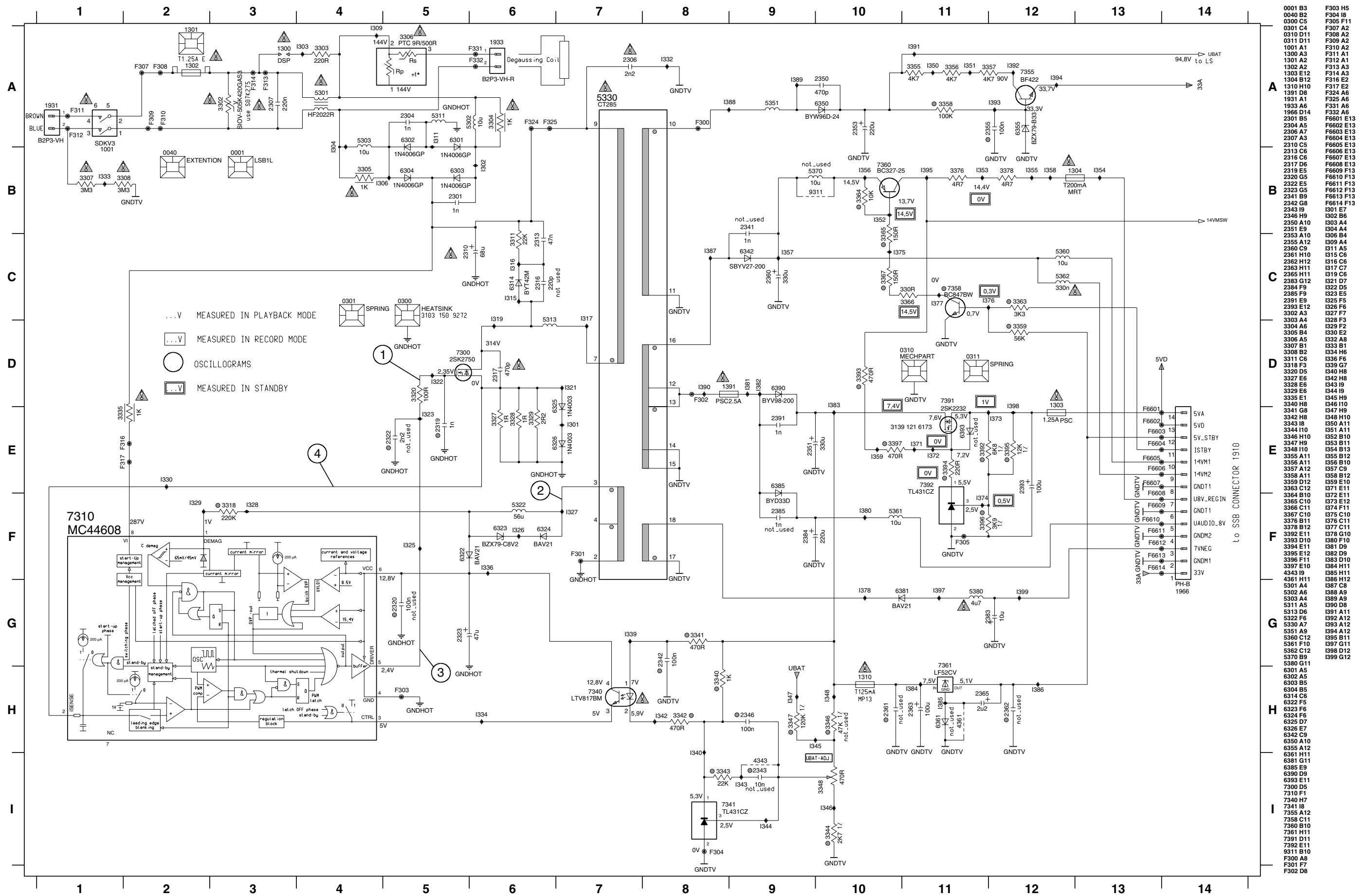
0020 A7	7461 A7	1866 D4
0021 A1	7462 A6	1867 E4
0022 A6	7501 A5	1868 E4
0030 F1	7802 A7	1869 F9
0031 F1	7803 B2	1870 E1
0060 F3	7804 B1	1871 C8
0061 F2	7807 F8	1875 B8
0062 F4	7808 F9	1876 E9
1801 B2	7809 E8	1887 B6
1802 F2	7818 A7	1889 C4
2800 A8	7899-B C5	1890 E4
2801 C7	9801 B8	1891 E4
2802 A1	9802 E9	1892 E4
2804 F7	9803 E9	1893 E6
2805 F9	9804 D8	1894 F5
2815 B9	9805 D9	1895 F6
2816 A9	F800 E8	1896 D9
3800 A1	F801 E8	1897 A9
3801 A6	F802 A1	1898 B2
3802 B7	F803 A1	1899 B1
3804 A6	F804 A2	1899 B1
3805 A1	F805 A4	c800 F6
3806 A7	F806 A4	c801 F7
3807 D7	F807 A5	c802 F7
3808 A1	F808 A5	
3809 A1	F809 D9	
3810 A2	F810 B3	
3811 A1	F811 D9	
3812 A2	F812 D9	
3813 A2	F813 D9	
3814 E2	F814 E8	
3815 D2	F815 E9	
3816 A4	F816 F5	
3817 A4	F817 C3	
3818 E1	F818 F4	
3819 A5	F820 D3	
3820 A5	F821 D3	
3821 B8	F827 B1	
3822 A6	F828 B1	
3823 B7	F838 B5	
3824 B3	F848 D4	
3825 A7	I800 C4	
3826 F9	I801 B1	
3827 D3	I802 B2	
3828 B7	I803 B2	
3829 C7	I804 D7	
3830 C2	I805 C2	
3831 C3	I806 B3	
3832 D3	I807 B4	
3833 A3	I808 B4	
3834 D3	I809 C4	
3835 A4	I810 B5	
3836 C1	I811 A5	
3837 A3	I812 A5	
3838 A3	I813 C7	
3839 B7	I814 A6	
3840 A4	I815 A7	
3841 E1	I816 A7	
3842 C7	I817 A8	
3843 C2	I818 C2	
3844 F1	I819 C8	
3845 E1	I820 B6	
3846 C7	I821 B7	
3848 C7	I822 B7	
3849 D3	I823 C7	
3850 C7	I824 D3	
3851 A9	I825 C7	
3852 A9	I826 C7	
3853 D7	I827 C7	
3856 D7	I828 D7	
3857 D3	I829 D7	
3858 D7	I830 D7	
3859 D7	I831 D7	
3860 C1	I832 D7	
3861 D7	I833 D7	
3862 B3	I834 E7	
3863 E7	I835 E7	
3864 D3	I836 E7	
3865 E7	I837 E7	
3866 E8	I839 F5	
3867 B2	I840 F5	
3868 E2	I841 F4	
3869 A5	I842 F4	
3870 E7	I843 C9	
3871 E3	I844 D4	
3872 F8	I845 C4	
3873 B7	I846 B3	
3874 F6	I847 C4	
3875 F7	I849 A3	
3878 F4	I850 A3	
3879 F8	I851 A4	
3881 A5	I852 A4	
3882 A3	I853 D4	
3883 F9	I854 B3	
3886 F4	I855 B3	
3887 F4	I856 B4	
3888 F5	I857 B4	
3889 F5	I858 B6	
3890 F7	I859 C4	
3891 B3	I860 D4	
3892 B3	I861 D4	
3893 C3	I862 C4	
3894 C3	I863 D9	
3899 F8	I864 F9	
6460 B1	I865 F8	

7.13 Power Supply Part (PS) - Small Signal Board SSB



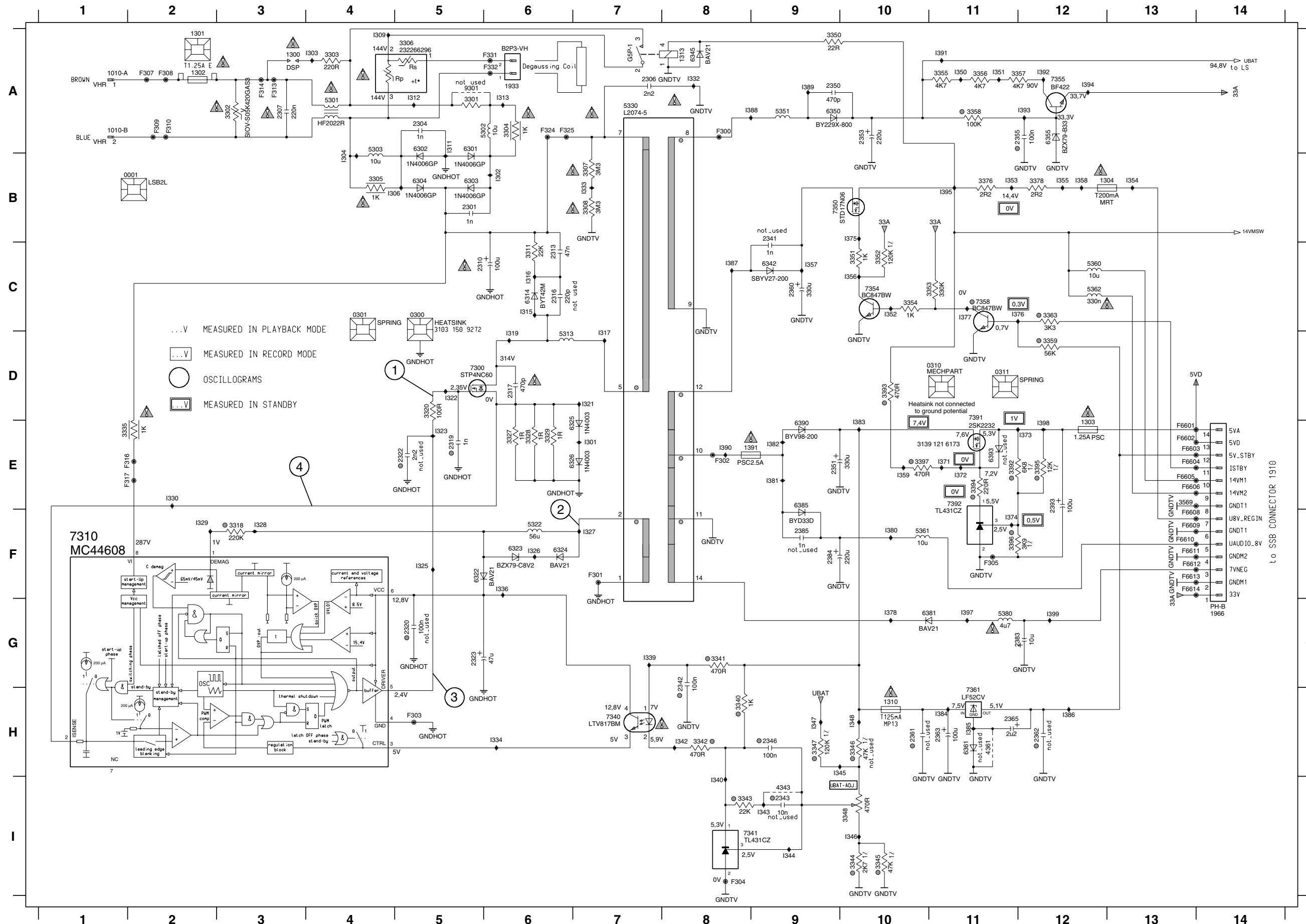
- 1910 C1
- 2110 E5
- 2111 E6
- 2112 E6
- 2113 C3
- 2114 D4
- 2115 C5
- 3100 C5
- 3101 C6
- 3102 C6
- 3103 C7
- 3104 C6
- 4100 F9
- 6100 D7
- 6110 D3
- 7100 C8
- 7110 D5
- 9101 E9
- 9102 E9
- 9103 E9
- 9104 E9
- 9105 F9
- 9106 F9
- 9107 F9
- 9108 F9
- C102 B3
- F1301 C2
- F1302 C2
- F1303 C2
- F1304 C2
- F1305 C2
- F1306 D2
- F1307 D2
- F1308 D2
- F1309 D2
- F1310 D2
- F1311 D2
- F1312 D2
- F1313 E2
- F1314 E2
- F151 D5
- F152 D2
- F153 B3
- F154 C7
- F155 B3
- F156 B2
- F157 B8
- F158 D2
- F162 E2
- F164 D2
- I100 C5
- I101 C6
- I102 C6
- I103 C7
- I104 C7
- I105 C5
- I106 C6
- I107 C5
- I108 C6
- I109 C7
- c100 B2
- c101 B3
- c151 F3

7.14 Power Supply 14" (PS) - Large Signal Board LSB1L14



- 0001 B3
- 0040 B2
- 0300 C5
- 0301 C4
- 0310 D11
- 0311 D11
- 1001 A1
- 1300 A3
- 1301 A2
- 1302 A2
- 1303 E12
- 1304 B12
- 1310 H10
- 1391 D8
- 1931 A1
- 1933 A6
- 1966 D14
- 2301 B5
- 2304 A5
- 2306 A7
- 2307 A3
- 2310 C5
- 2313 C6
- 2316 C6
- 2317 D6
- 2319 E5
- 2320 G5
- 2322 E5
- 2323 E5
- 2341 B9
- 2342 G8
- 2343 I9
- 2346 H9
- 2350 A10
- 2351 E9
- 2353 A10
- 2355 A12
- 2360 C9
- 2361 H10
- 2362 H12
- 2363 H11
- 2365 H11
- 2383 G12
- 2384 F9
- 2385 F9
- 2391 E9
- 2393 E12
- 3302 A3
- 3303 A4
- 3304 A6
- 3305 B4
- 3306 A5
- 3307 B1
- 3308 B2
- 3311 C6
- 3318 F3
- 3320 D5
- 3327 E6
- 3328 E6
- 3344 I9
- 3345 H9
- 3346 H8
- 3347 H9
- 3348 I10
- 3355 E11
- 3356 A11
- 3357 A12
- 3358 A11
- 3359 D12
- 3363 C12
- 3364 B10
- 3365 C10
- 3366 C11
- 3367 C10
- 3376 B11
- 3378 B12
- 3392 E11
- 3393 D10
- 3394 E11
- 3395 E12
- 3396 F11
- 3397 E10
- 4343 I9
- 4361 H11
- 5301 A4
- 5302 A6
- 5303 A4
- 5311 A5
- 5313 D6
- 5322 F6
- 5330 A7
- 5351 A9
- 5360 C12
- 5361 F10
- 5362 C12
- 5370 B9
- 5380 G11
- 6301 A5
- 6302 A5
- 6304 B5
- 6304 C6
- 6322 F5
- 6323 F6
- 6324 F6
- 6325 D7
- 6326 E7
- 6342 C9
- 6350 A10
- 6355 A12
- 6351 H11
- 6381 G11
- 6385 E9
- 6390 D9
- 6393 E11
- 7300 D5
- 7310 F1
- 7340 H7
- 7341 I8
- 7355 A12
- 7358 C11
- 7360 B10
- 7361 H11
- 7391 D11
- 7392 E11
- 9311 B10
- F300 A8
- F301 F7
- F302 D8
- F303 H5
- F304 I8
- F305 F11
- F307 A2
- F308 A2
- F309 A2
- F310 A2
- F311 A1
- F312 A1
- F313 A3
- F314 A3
- F316 E2
- F317 E2
- F324 A5
- F325 A6
- F331 A3
- F332 A6
- F602 E13
- F603 E13
- F604 E13
- F605 E13
- F606 E13
- F607 E13
- F608 E13
- F609 F13
- F610 F13
- F611 F13
- F612 F13
- F613 F13
- F614 F13
- I301 E7
- I302 B6
- I303 A4
- I304 A4
- I306 B4
- I309 A4
- I311 A5
- I315 C6
- I316 C6
- I317 C7
- I319 C6
- I321 D7
- I322 D5
- I323 E5
- I325 F5
- I326 F6
- I327 F7
- I328 F3
- I329 F2
- I330 E2
- I332 A6
- I333 B1
- I334 H6
- I336 H6
- I340 H6
- I342 H6
- I343 I9
- I344 I9
- I345 H9
- I346 I10
- I347 H9
- I348 H10
- I350 A11
- I351 A11
- I352 B10
- I353 B11
- I354 B13
- I355 B12
- I356 B10
- I357 C9
- I358 B12
- I373 E12
- I374 F11
- I375 C10
- I376 C11
- I377 C11
- I378 G10
- I380 F10
- I381 D9
- I382 D9
- I383 D10
- I384 H11
- I385 H11
- I386 H12
- I387 C8
- I388 A9
- I389 A8
- I390 D8
- I391 A11
- I392 A12
- I394 A12
- I395 E11
- I397 G11
- I398 D12
- I399 G12

7.15 Power Supply 20"/21" (PS) - Large Signal Board LSB2L21

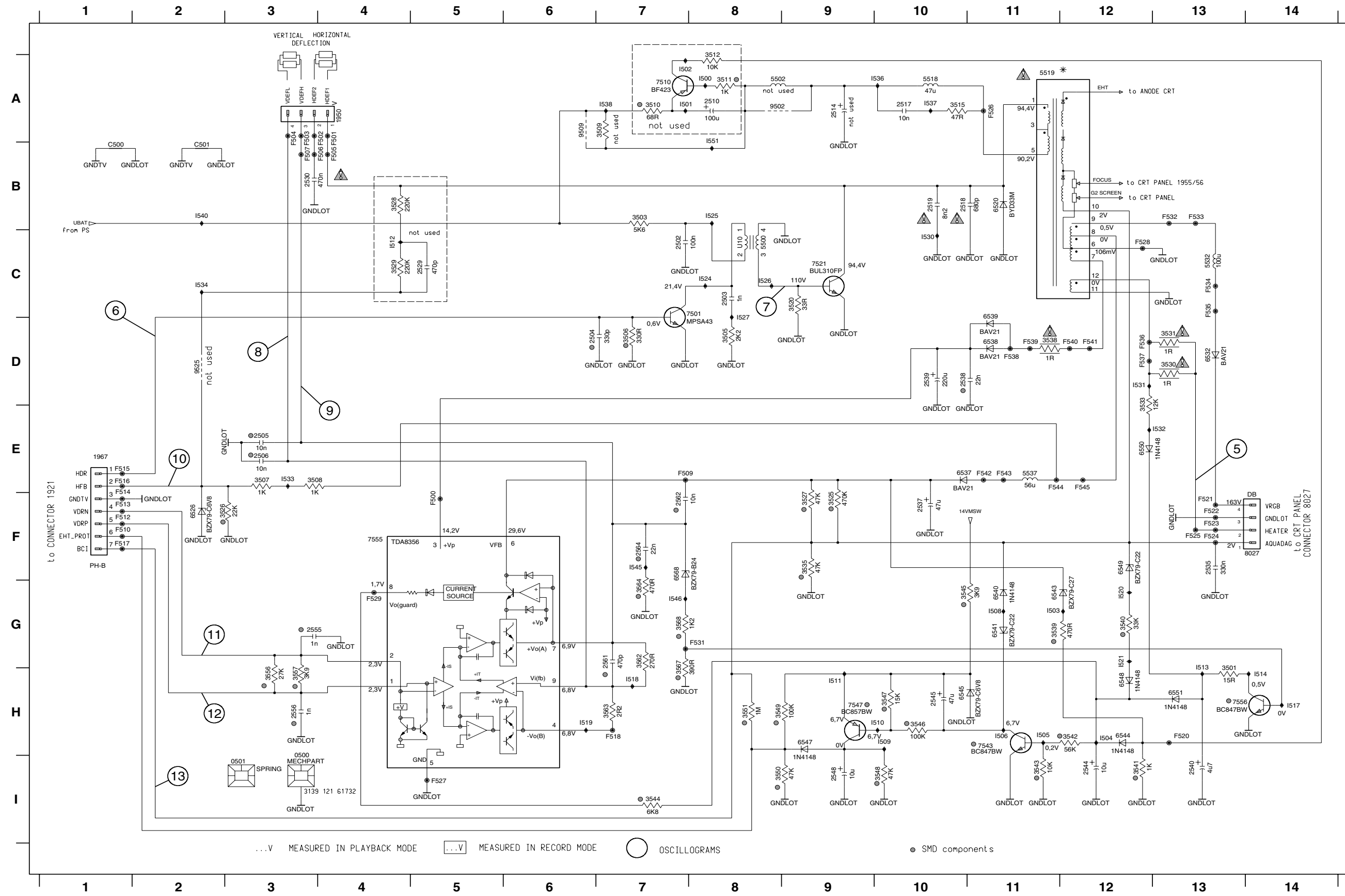


0001 B1	F301 F7
0300 C5	F302 E8
0301 C4	F303 H5
0310 D11	F304 I8
0311 D11	F305 F11
1010-A A1	F307 A2
1010-B A1	F308 A2
1300 A3	F309 A2
1301 A2	F310 A2
1302 A2	F313 A3
1303 E2	F314 A3
1304 B12	F316 E2
1310 H10	F317 E2
1313 A8	F324 A6
1391 E8	F325 A6
1393 A6	F331 A6
1866 G14	F332 A6
2301 B5	F6601 E13
2304 A5	F6602 E13
2306 A7	F6603 E13
2307 A3	F6604 E13
2310 C5	F6605 E13
2313 C6	F6606 E13
2316 C6	F6608 F13
2317 D6	F6609 F13
2319 E5	F6610 F13
2320 G5	F6611 F13
2322 E5	F6612 F13
2323 G5	F6613 F13
2325 A9	F6614 F13
2342 G8	I301 E7
2343 I9	I302 B6
2346 H9	I303 A4
2350 A9	I304 B4
2351 E9	I306 B4
2353 A10	I309 A4
2355 A12	I311 A5
2360 C9	I312 A5
2361 H10	I313 A6
2362 H12	I315 C6
2363 H11	I316 C6
2365 H11	I317 D7
2383 G12	I319 D6
2384 F9	I321 D7
2385 F9	I322 D5
2393 E12	I323 E5
3301 A5	I325 F5
3302 A3	I326 F6
3303 A4	I327 F7
3304 A6	I328 F3
3305 B4	I329 F2
3306 A5	I330 E2
3307 B7	I332 A8
3308 B7	I333 B7
3311 C6	I334 H6
3318 F3	I336 F6
3320 D5	I339 G7
3321 E6	I340 I8
3328 E6	I342 H8
3329 E6	I343 I9
3335 E1	I344 I9
3340 H8	I345 H8
3341 G8	I346 I10
3342 H8	I347 H9
3343 I8	I348 H10
3344 I10	I350 A11
3345 I10	I351 A11
3346 H10	I352 C10
3347 H9	I353 B11
3348 I10	I354 B13
3350 A9	I355 B12
3351 C10	I356 C10
3352 C10	I357 C9
3353 C11	I358 B12
3354 C10	I359 E10
3355 A11	I371 E11
3356 A11	I372 E11
3357 A12	I373 E12
3358 A11	I374 F11
3359 D12	I375 B10
3363 C12	I376 C11
3376 B11	I377 C11
3378 B12	I378 G10
3392 E11	I380 F10
3393 D10	I381 E9
3394 E11	I382 E9
3395 E12	I383 E10
3396 F11	I384 H11
3397 E10	I385 H11
3398 E13	I386 H12
4343 I9	I387 C8
4361 H11	I388 A9
5301 A4	I389 A9
5302 A6	I390 E8
5303 A4	I391 A11
5313 D6	I392 A12
5322 F6	I393 A12
5330 A7	I394 A12
5351 A9	I395 B11
5360 C12	I397 G11
5361 F10	I398 E12
5362 C12	I399 G12
5380 G11	
6301 A5	
6302 A5	
6303 B5	
6304 B5	
6314 C6	
6322 F5	
6323 F6	
6324 F6	
6325 E7	
6326 E7	
6342 C9	
6345 A8	
6350 A9	
6355 A12	
6361 H11	
6381 G11	
6385 E9	
6390 E9	
6393 E11	
7300 D5	
7310 F1	
7340 H7	
7341 I8	
7350 B9	
7354 C10	
7355 A12	
7358 C11	
7361 H11	
7391 D11	
7392 E11	
9301 A5	
F300 A8	

...V MEASURED IN PLAYBACK MODE
 ...V MEASURED IN RECORD MODE
 ○ OSCILLOGRAMS
 ...V MEASURED IN STANDBY

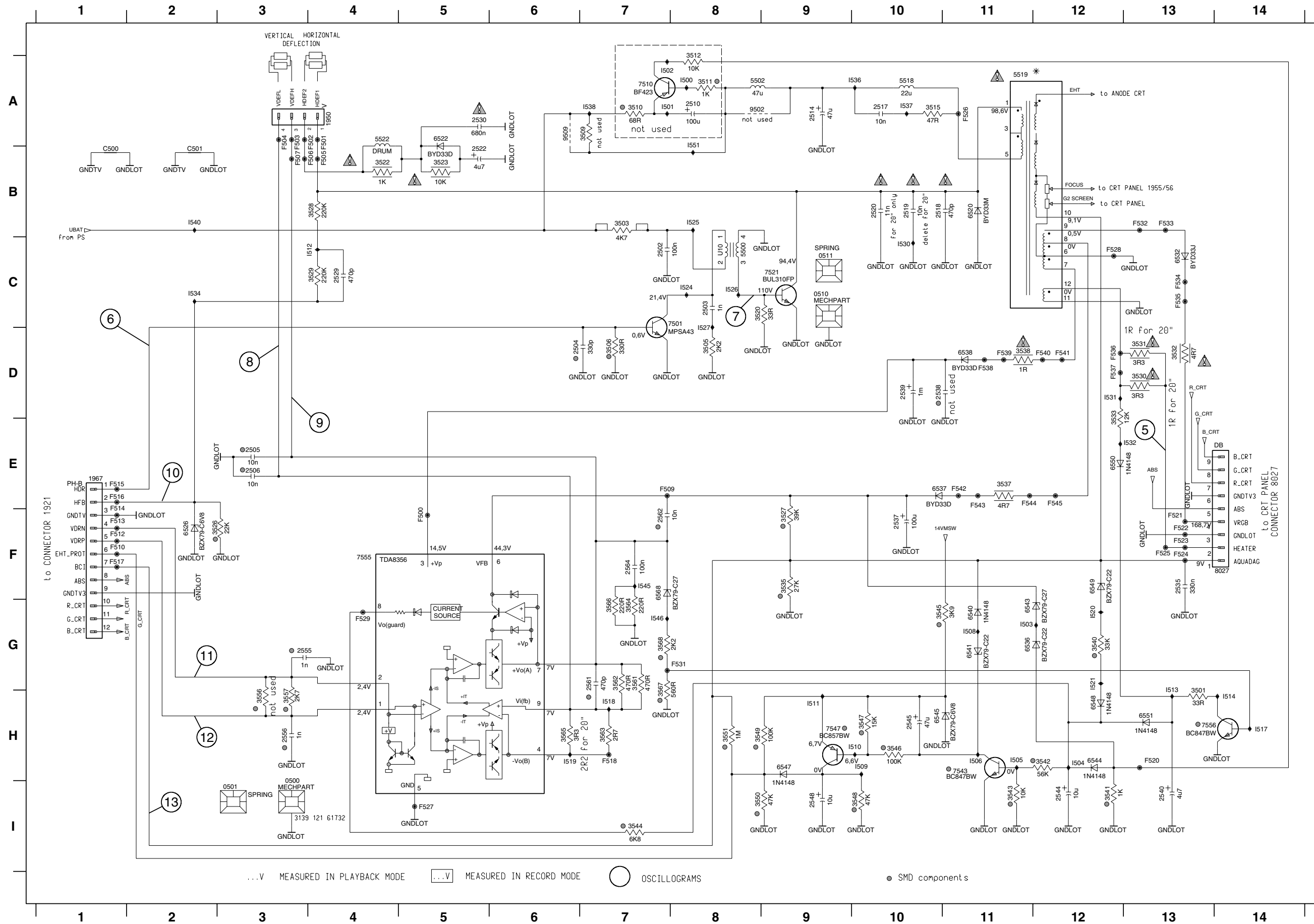
to SSB CONNECTOR 1910

7.16 Deflection 14" (LS) - Large Signal Board LSB1L14



- 0500 I3
- 0501 I3
- 1950 A4
- 1957 E1
- 2502 C7
- 2503 C8
- 2504 D6
- 2505 E3
- 2506 E3
- 2510 A8
- 2514 A9
- 2517 A10
- 2518 B10
- 2519 B10
- 2529 C5
- 2530 B3
- 2535 F13
- 2537 F10
- 2538 D10
- 2539 D10
- 2540 I13
- 2544 I12
- 2545 H10
- 2548 I9
- 2555 G3
- 2556 H3
- 2561 G7
- 2562 F7
- 2564 F7
- 3501 H13
- 3503 B7
- 3505 D8
- 3506 D7
- 3507 E3
- 3508 E3
- 3509 A7
- 3510 A7
- 3511 A8
- 3512 A8
- 3515 A10
- 3520 C9
- 3525 F9
- 3526 F2
- 3527 F9
- 3528 B4
- 3529 C4
- 3530 D13
- 3531 D13
- 3533 D12
- 3535 F9
- 3538 D11
- 3539 G11
- 3540 G12
- 3541 I12
- 3542 H12
- 3543 I11
- 3544 I7
- 3545 G10
- 3546 H10
- 3547 H10
- 3548 I10
- 3549 H8
- 3550 I8
- 3551 H8
- 3556 H3
- 3557 H3
- 3562 G7
- 3563 H7
- 3564 G7
- 3567 G7
- 3568 G7
- 3569 C8
- 5502 A8
- 5518 A10
- 5519 A11
- 5532 C13
- 5537 E11
- 6520 B11
- 6526 F2
- 6532 D13
- 6537 E10
- 6538 D11
- 6539 D11
- 6540 G11
- 6541 G11
- 6543 G11
- 6544 H12
- 6545 H10
- 6547 H9
- 6548 H12
- 6549 F12
- 6550 E12
- 6551 H13
- 6568 F7
- 7501 C7
- 7521 C9
- 7543 H11
- 7547 H9
- 7555 F4
- 7556 H14
- 8027 F13
- 9502 A3
- 9509 A6
- 9525 D2
- C500 B1
- C501 B2
- F500 F5
- F501 A4
- F502 A4
- F503 A3
- F504 A3
- F505 B4
- F506 B4
- F507 B3
- F509 E7
- F510 F1
- F512 F1
- F513 F1
- F514 F1
- F515 E1
- F516 E1
- F517 F1
- F518 H7
- F520 H13
- F521 F13
- F522 F13
- F523 F13
- F524 F13
- F525 F13
- F526 A11
- F527 I5
- F528 C12
- F529 G4
- F531 G8
- F532 B13
- F533 B13
- F534 C13
- F535 C13
- F536 D12
- F537 D12
- F538 D11
- F539 D11
- F540 D12
- F541 D12
- F542 E11
- F543 E11
- F544 E11
- F545 E12
- I500 A8
- I501 A7
- I502 A7
- I503 G11
- I504 H12
- I505 H11
- I506 H11
- I508 G11
- I509 H10
- I510 H10
- I511 H9
- I512 C4
- I513 G13
- I514 H14
- I517 H14
- I518 H7
- I519 H6
- I520 G12
- I521 G12
- I524 C8
- I525 B8
- I526 C8
- I527 C8
- I530 C10
- I531 D12
- I532 E13
- I533 E3
- I534 C2
- I536 A10
- I537 A10
- I538 A7
- I540 B2
- I545 F7
- I546 G7
- I547 G7
- I551 A8

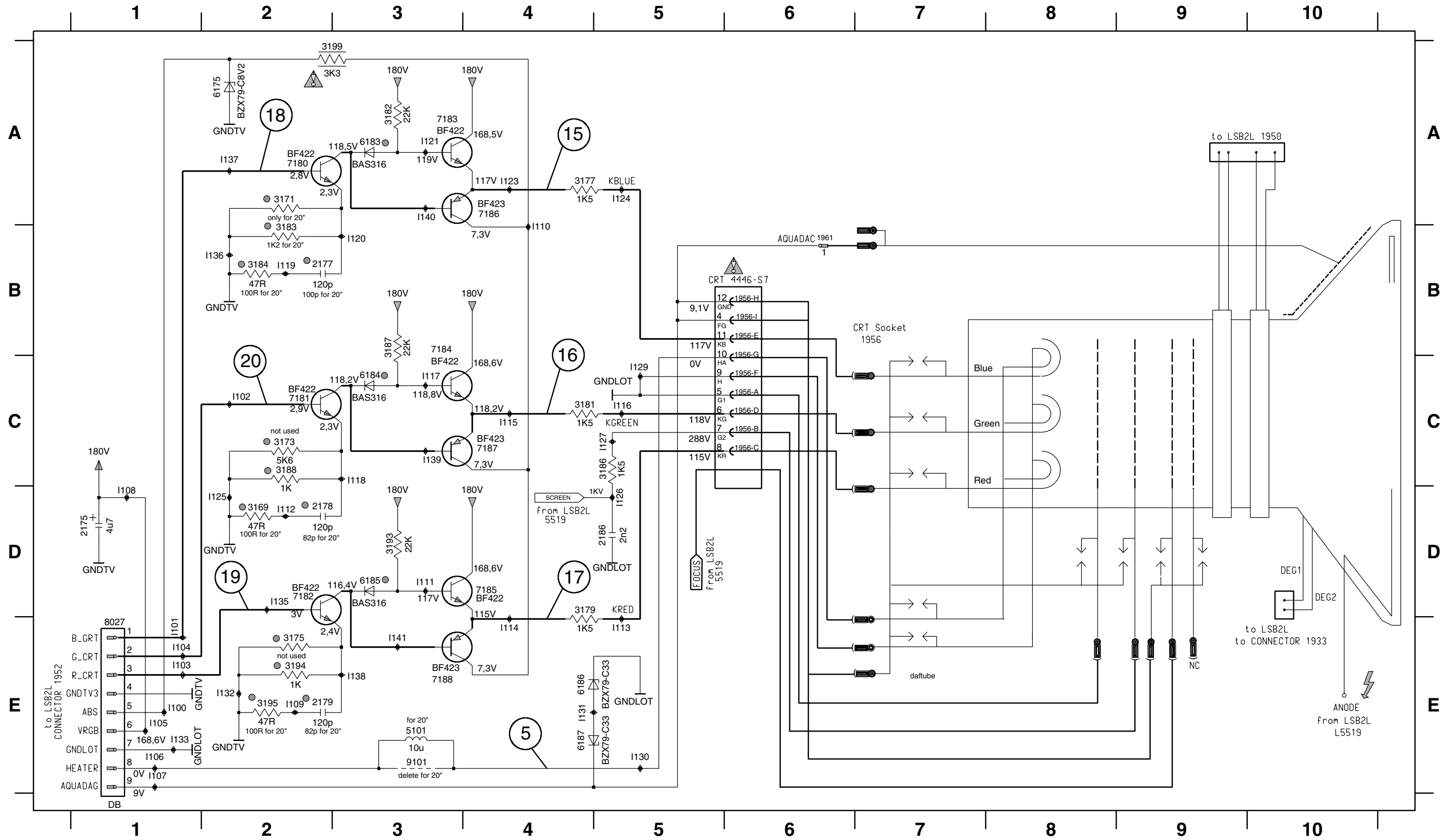
7.17 Deflection 20"/21" (LS) - Large Signal Board LSB2L21



0500 I3	F522 F13
0501 I3	F523 F13
0510 C9	F524 F13
0511 C9	F525 F13
1950 A4	F526 A11
1967 E1	F527 I5
2502 C7	F528 C12
2503 C8	F529 G4
2504 D6	F531 G8
2505 E3	F532 B13
2506 E3	F533 B13
2510 A8	F534 C13
2514 A9	F535 C13
2517 A10	F536 D12
2518 B10	F537 D12
2519 B10	F538 D11
2520 B10	F539 D11
2522 B5	F540 D12
2529 C4	F541 D12
2530 A5	F542 E11
2535 F13	F543 E11
2537 F10	F544 E11
2538 D10	F545 E12
2539 D10	I500 A8
2540 I13	I501 A7
2541 I12	I502 A7
2545 H10	I503 G11
2548 I9	I504 H12
2555 G3	I505 H11
2556 H3	I506 H11
2561 G7	I508 G11
2562 F7	I509 H10
2564 F7	I510 H10
3501 H13	I511 H9
3503 B7	I512 C4
3505 B7	I513 G13
3506 D7	I514 H14
3509 A7	I517 H14
3510 A7	I518 H7
3511 A8	I519 H6
3512 A8	I520 G12
3515 A10	I521 G12
3520 C8	I524 C8
3522 B4	I525 B8
3523 B5	I526 C8
3526 F2	I527 C8
3527 F9	I530 C10
3528 B4	I531 D12
3529 C4	I532 E13
3530 D13	I534 C2
3531 D13	I536 A10
3532 D13	I537 A10
3533 D12	I538 A7
3535 F9	I540 B2
3537 E11	I545 F7
3538 D11	I546 G7
3540 G12	I551 A8
3541 I12	
3542 H12	
3543 I11	
3544 I7	
3545 G10	
3546 H10	
3547 H10	
3548 I10	
3549 H8	
3550 I8	
3551 H8	
3556 H3	
3557 H3	
3561 G7	
3562 G7	
3563 H7	
3565 H6	
3566 G7	
3567 G7	
3568 G7	
5500 C8	
5502 A8	
5518 A10	
5519 A11	
5522 A4	
5523 B11	
5522 A5	
5522 F2	
5532 C13	
5536 G11	
5540 B11	
5538 D11	
5540 G11	
5541 G11	
5544 H12	
5544 H11	
5548 H12	
5549 F12	
5550 E12	
5551 H13	
5568 F7	
7501 C7	
7510 A7	
7521 C9	
7543 H11	
7547 H9	
7555 F4	
7556 H14	
8027 F14	
9502 A8	
9509 A6	
C500 B1	
C501 B2	
F500 B2	
F501 A4	
F502 A4	
F503 A3	
F504 A3	
F505 B4	
F506 B4	
F507 B3	
F509 E7	
F510 F1	
F512 F1	
F513 F1	
F514 F1	
F515 E1	
F516 E1	
F517 F1	
F518 H7	
F520 H13	
F521 F13	

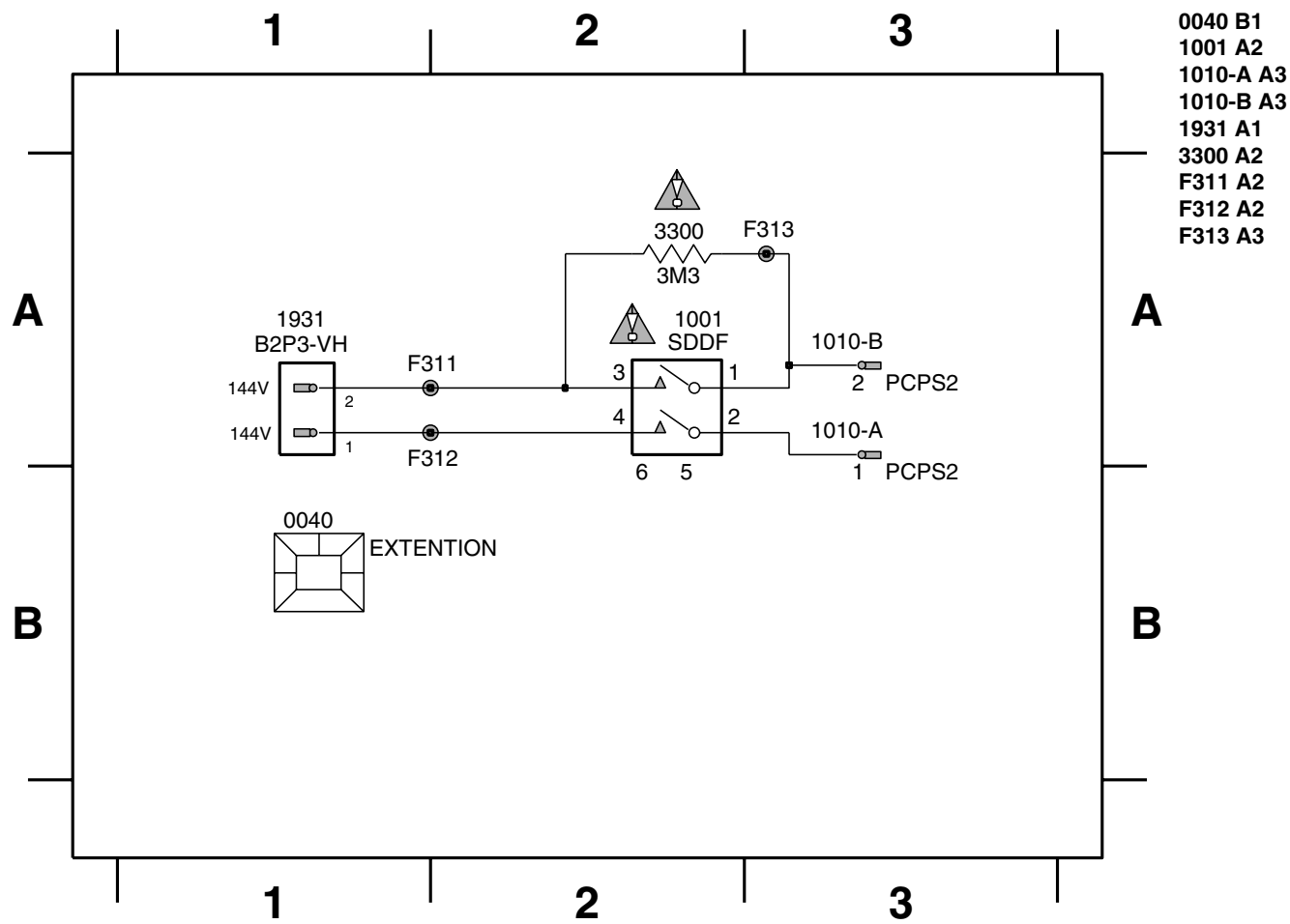
7.19 CRT Panel 20"/21" (PT) - LSB2L21

1956-A C6	1956-F C6	2175 D1	3169 D2	3179 D4	3186 C5	3195 E2	6184 C3	7181 C2	7186 A4	I100 E1	I105 E1	I110 B4	I115 C4	I120 B3	I126 D5	I132 E2	I138 E3
1956-B C6	1956-G C6	2177 B2	3171 A2	3181 C4	3187 B3	3199 A2	6185 D3	7182 D2	7187 C4	I101 E1	I106 E1	I111 D3	I116 C5	I121 A3	I127 C5	I133 E1	I139 C3
1956-C C6	1956-H B6	2178 D2	3173 C2	3182 A3	3188 C2	5101 E3	6186 E4	7183 A3	7188 E3	I102 C2	I107 E1	I112 D2	I117 C3	I123 A4	I129 C5	I135 D2	I140 A3
1956-D C6	1956-I B6	2179 E2	3175 E2	3183 B2	3193 D3	6175 A2	6187 E4	7184 B3	8027 E1	I103 E1	I108 D1	I113 E5	I118 C3	I124 A5	I130 E5	I136 B2	I141 E3
1956-E B6	1961 B6	2186 D5	3177 A4	3184 B2	3194 E2	6183 A3	7180 A2	7185 D4	9101 E3	I104 E1	I109 E2	I114 E4	I119 B2	I125 D2	I131 E4	I137 A2	SCREEN D4



- ...V MEASURED IN PLAYBACK MODE
- [...V] MEASURED IN RECORD MODE
- OSCILLOGRAMS
- SMD components

7.20 Mains Switch Board 20"/21" (MS) - LSB2L21

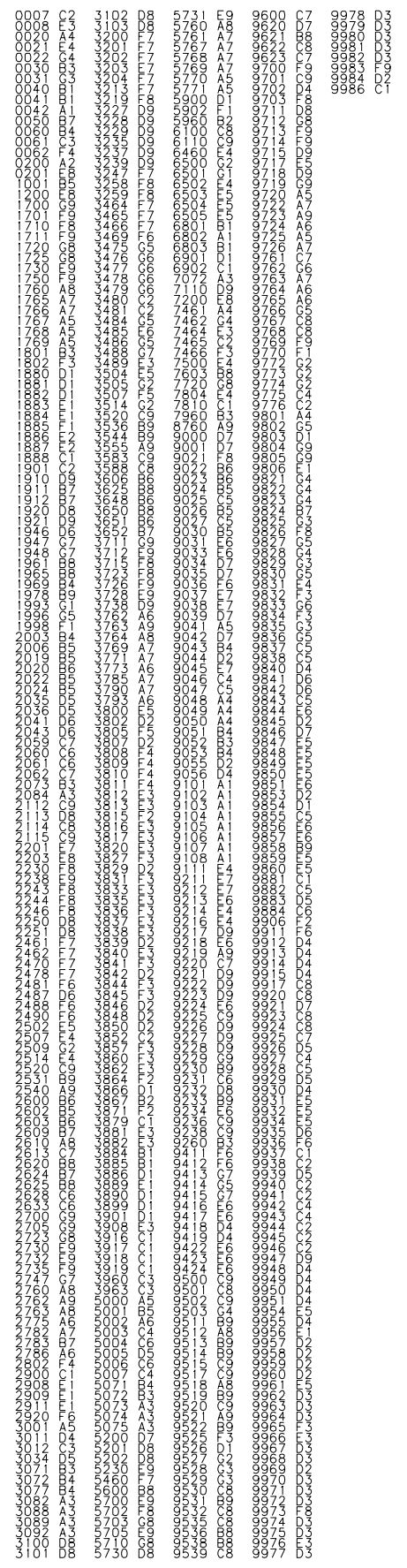
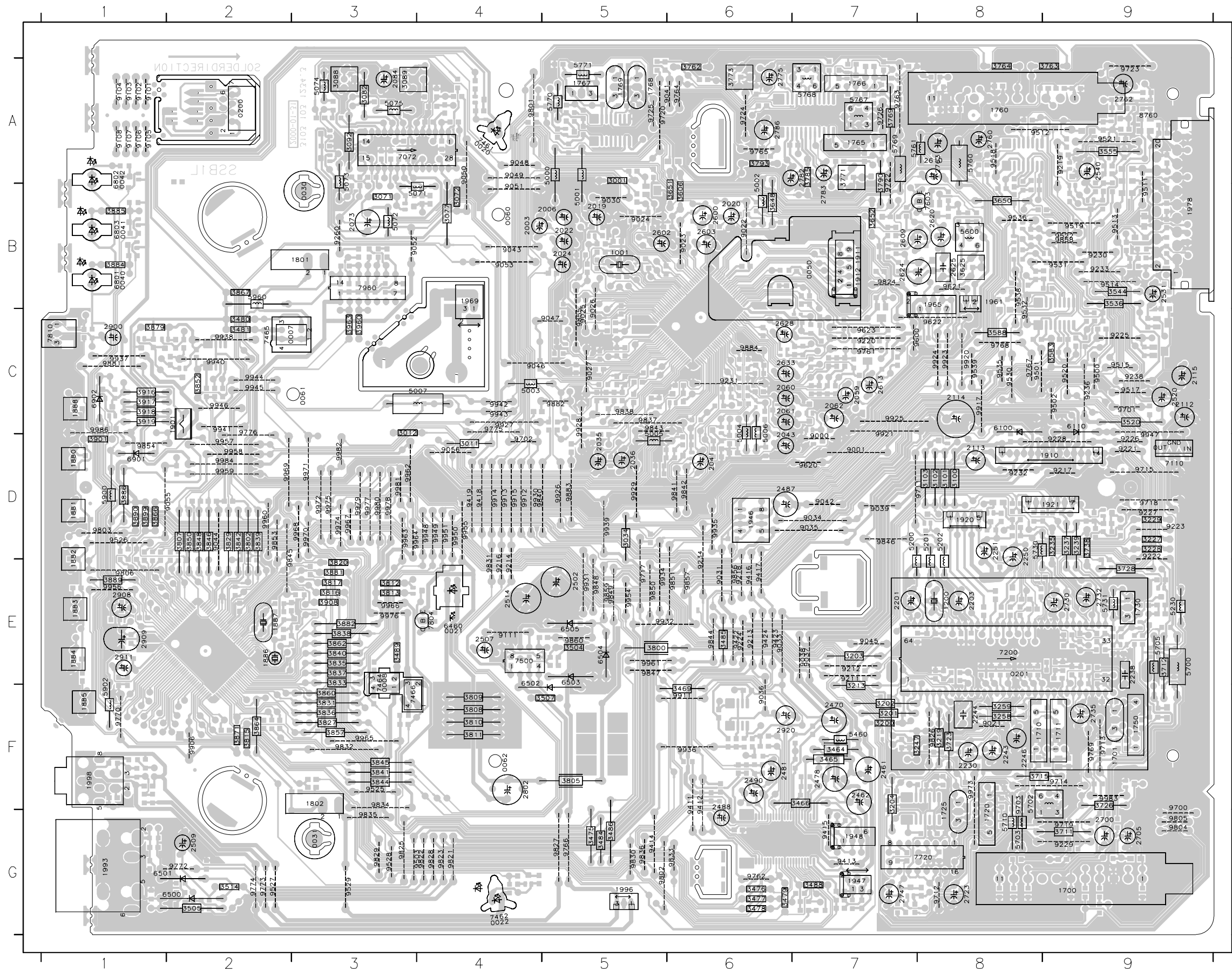


7.21 Diversity Matrix Tuner 1 / 2

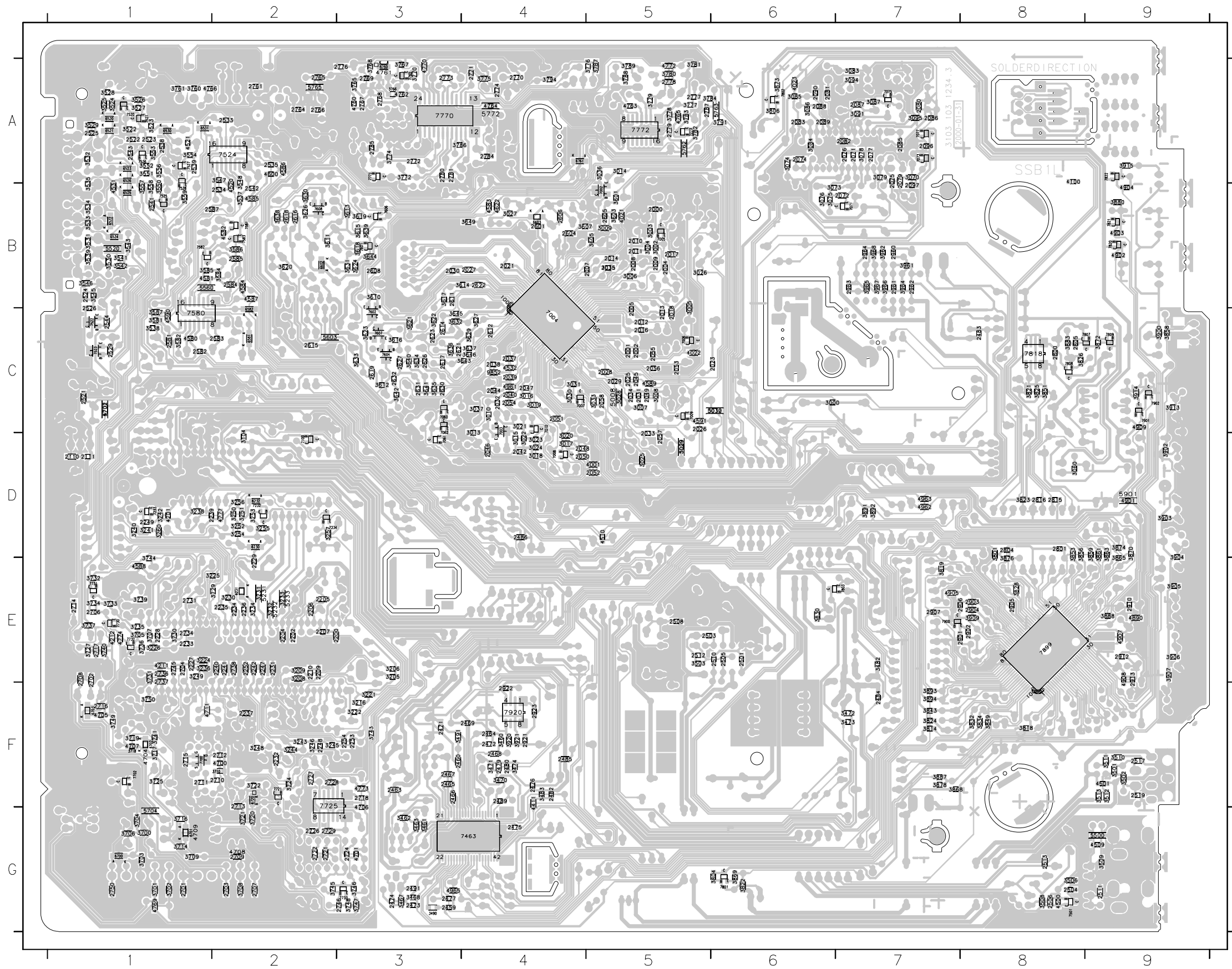
Pos.	PAL B/G FM-MONO	PAL I FM-MONO	PAL, SEC B/G, D/K FM-MONO	PAL B/G/I, SEC L, L' FM/AM-MONO	Function TUNER 1
1700	ENV57D57G3	ENV57D57G3	ENV57D57G3	-	Tuner PANASONIC 1Tuner Set
1700	ENV57D59H6	ENV57D59H6	ENV57D59H6	-	Tuner PANASONIC 2Tuner Set
1700	TEDE9 213A	TEDE9 213A	TEDE9 213A	TEDE9 213A	Tuner ALPS 1Tuner Set
1700	TEDE9 703A	TEDE9 703A	TEDE9 703A	TEDE9 703A	Tuner ALPS 2Tuner Set
1701	EFC 5.5	-	EFC 6.5	EFC 5.5	FM IF Sound BP
1710	G1961M	G1965M	G1965M	G1965M	Interc. OFW
1730	TP5,5	TP6,0	TW02B(5,5/6,5MHz)	TW03B(5,5/6,0MHz)	Video Trap
3718	-	-	470E	-	
3733	680E	470E	390E	330E	Trap Input
3739	680E	560E	390E	330E	Trap Input
5731	15uH	15uH	8,2uH	8,2uH	Trap-Coil
7200	TDA9350/60/80	TDA9350/60/80	TDA9351/61/81	TDA9351/61/81	UOC

Pos.	PAL B/G FM-MONO	PAL I FM-MONO	PAL, SEC B/G, D/K FM-MONO	PAL B/G/I, SEC L, L' FM/AM-MONO	Function TUNER 2
1760	ENV57D58G3E	ENV57D58G3E	ENV57D58G3E	-	Tuner PANASONIC
1760	TEDE9 218A	TEDE9 218A	TEDE9 218A	TEDE9 218A	Tuner ALPS
1765	G1961M	G1965M	K3953M	K3953M	Video/Interc. OFW
1767	TPS5,5	TPS6,0	TPS5,5	TPS5,5	Video Trap
1768	EFC5,5	EFC6,0	EFC5,5	EFC5,5	Sound-Filter
1769	-	-	EFC6,5	EFC6,0	Sound-Filter
3780	470E	470E	470E	390E	Trap Input
3781	5k6	5k6	5k6	5k6	Trap Output
7770	TDA9817	TDA9817	TDA9817	TDA9818	Demodulator

7.22 Small Signal Board (SSB) - Components Side

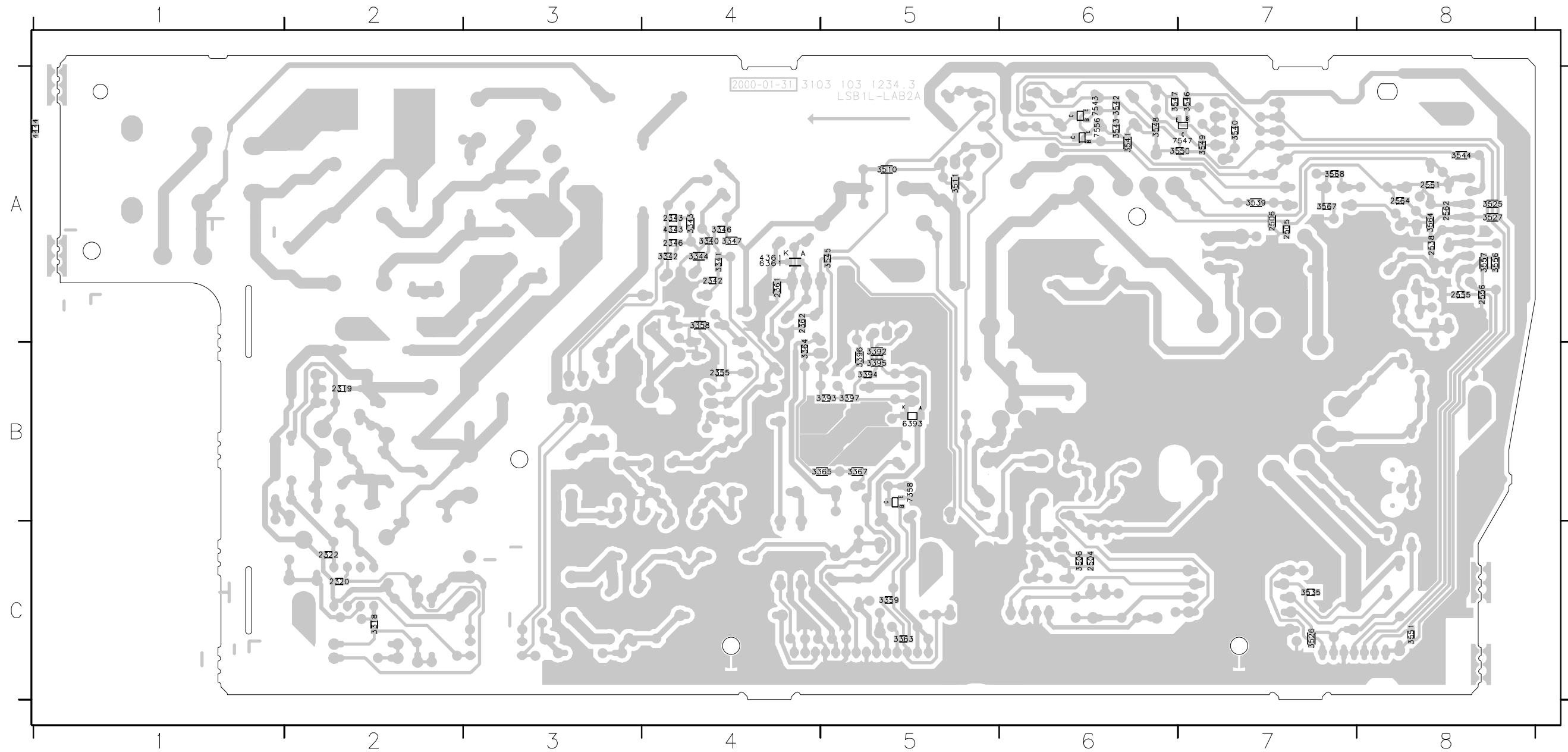


7.23 Small Signal Board (SSB) - Solder Side



Part No.	Quantity	Part No.	Quantity
7770	1	7850	1
7772	1	7851	1
7774	1	7852	1
7775	1	7853	1
7776	1	7854	1
7777	1	7855	1
7778	1	7856	1
7779	1	7857	1
7780	1	7858	1
7781	1	7859	1
7782	1	7860	1
7783	1	7861	1
7784	1	7862	1
7785	1	7863	1
7786	1	7864	1
7787	1	7865	1
7788	1	7866	1
7789	1	7867	1
7790	1	7868	1
7791	1	7869	1
7792	1	7870	1
7793	1	7871	1
7794	1	7872	1
7795	1	7873	1
7796	1	7874	1
7797	1	7875	1
7798	1	7876	1
7799	1	7877	1
7800	1	7878	1
7801	1	7879	1
7802	1	7880	1
7803	1	7881	1
7804	1	7882	1
7805	1	7883	1
7806	1	7884	1
7807	1	7885	1
7808	1	7886	1
7809	1	7887	1
7810	1	7888	1
7811	1	7889	1
7812	1	7890	1
7813	1	7891	1
7814	1	7892	1
7815	1	7893	1
7816	1	7894	1
7817	1	7895	1
7818	1	7896	1
7819	1	7897	1
7820	1	7898	1
7821	1	7899	1
7822	1	7900	1
7823	1	7901	1
7824	1	7902	1
7825	1	7903	1
7826	1	7904	1
7827	1	7905	1
7828	1	7906	1
7829	1	7907	1
7830	1	7908	1
7831	1	7909	1
7832	1	7910	1
7833	1	7911	1
7834	1	7912	1
7835	1	7913	1
7836	1	7914	1
7837	1	7915	1
7838	1	7916	1
7839	1	7917	1
7840	1	7918	1
7841	1	7919	1
7842	1	7920	1
7843	1	7921	1
7844	1	7922	1
7845	1	7923	1
7846	1	7924	1
7847	1	7925	1
7848	1	7926	1
7849	1	7927	1
7850	1	7928	1
7851	1	7929	1
7852	1	7930	1
7853	1	7931	1
7854	1	7932	1
7855	1	7933	1
7856	1	7934	1
7857	1	7935	1
7858	1	7936	1
7859	1	7937	1
7860	1	7938	1
7861	1	7939	1
7862	1	7940	1
7863	1	7941	1
7864	1	7942	1
7865	1	7943	1
7866	1	7944	1
7867	1	7945	1
7868	1	7946	1
7869	1	7947	1
7870	1	7948	1
7871	1	7949	1
7872	1	7950	1
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7875	1	7953	1
7876	1	7954	1
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7922	1	8000	1

7.25 Large Signal Board (LSB1L) 14" Solder Side



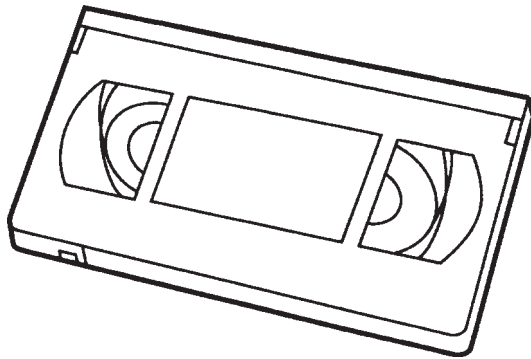
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8. Electrical settings

8.1 Measuring instruments

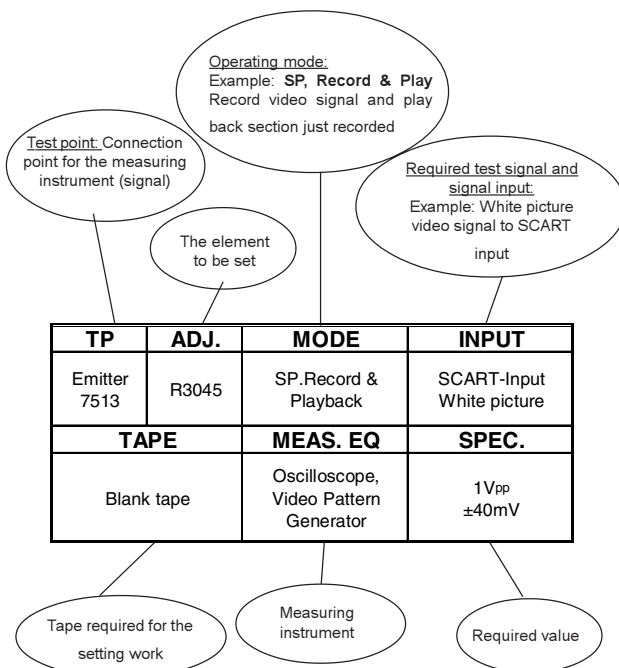
The following instruments are required to carry out the electrical setting work:

1. Dual trace oscilloscope
 - Voltage range : 0.001 ~ 50V/Div.
 - Frequency range : DC ~ 50 MHz
 - Probe : 10:1; 1:1
1. Digital Multimeter
2. Frequency meter
3. Sine-wave generator: 0 ~ 50MHz
4. Test pattern generator
5. Plastic adjustment tool
6. Isolating transformer (regulating transformer)
7. VHS test cassette 4822 397 30103
8. SPC test cassette 4822 397 30268

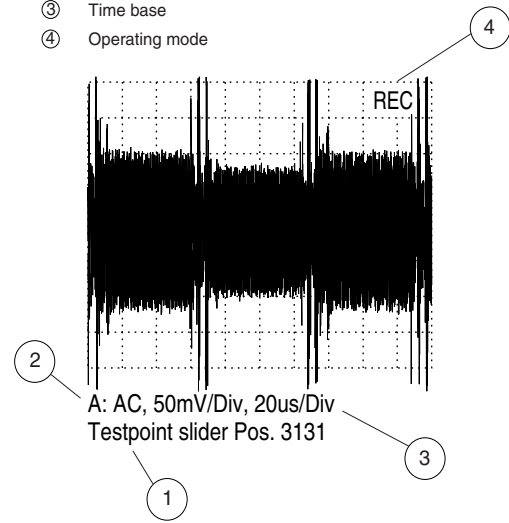


Counter Reading Start	0	0040 ±8	0310 ±12
Video	Blank	B&W Pattern	Color Bars
Audio	Blank	6kHz (mono)	40Hz, 3kHz, 15kHz (Mono & Stereo)

8.2 Setting instructions



- ① Connecting point
- ② Amplitude
- ③ Time base
- ④ Operating mode



8.3 Settings

The following settings are described below:

1. Power supply unit
2. Clock setting
3. Tuner 1
4. Tuner 2
5. Servo-system
6. Luminance and chrominance
7. Audio part
8. TV and picture tube part

8.3.1 Power supply unit (PS)

UBAT [R3348]

Purpose:

Ensure correct functioning

Consequences of incorrect settings:

The correct functioning of the TV and VCR is not guaranteed.

TP	ADJ.	MODE	INPUT
C2353	R3348	Mains switch ON	SCART-Input White picture
TAPE		MEAS. EQ	SPEC.
		Digital Voltmeter	14" = 90V±0,1V 20",21" = 95V±0,1V (see description below)

Note:

C2353 and R3348 are located on the TVB-board (PS part)

PROCEDURE:

- Set potentiometer R3348 to the centre position.
- Switch the device to the SCART input; apply a white picture.
- Set the brightness and contrast to middle position.
- Connect the multimeter to C2353.
- Set a voltage of 90V (for 14") or 95V (for 20", 21") using the potentiometer R3348.
- After making the setting, reset the original brightness and contrast values.

8.3.2 Clock setting

Purpose:

Precise setting of the clock

Consequences of incorrect settings:

The clock gains or loses time.

TP	ADJ.	MODE	INPUT
IC7899 Pin 71	Service Menu	Service Mode	No Input signal
TAPE		MEAS. EQ	SPEC.
		Frequ. Counter	See description below

Note:

IC7899 is located on the SSB-board (AIO2 part)

PROCEDURE:

- Call up Service mode (press the "STOP" button on the remote control, then the "PLAY" button on the device, and hold down both buttons for approx. 5 seconds).
- Connect the frequency meter to IC 7899 pin 71 and measure the 1Hz signal to at least 6 decimal places
- In the Service menu, select the "SERV CONTR" line using the "▼" button and press "►".
- Select the line "CLK>" using the "▼" button and press "►".
- The uncorrected clock frequency of approx. 8192 Hz is output at measuring point 7899, pin 71.
- Connect a frequency meter to IC 7899 pin 71, measure the signal to at least 6 decimal places and note down the value (f_{mess}).

Note:

The input can be cancelled by pressing the "MENU" button (Service menu is switched off). Pressing "MENU" again switches the Service menu back on.

Calculating the deviation (in ppm):

f_{meas}measured frequency

f_{nom}set-point frequency (8192.00 Hz)

Deviation = $1 \times 10^6 \times (f_{\text{meas}} - f_{\text{nom}}) / f_{\text{nom}}$

Calculating the correction value:

Correction value = deviation / 0.763 + 128 (rounded to whole figure)

The correction value calculated must be between 0 and 255 (if this is not the case, the quartz needs to be replaced)

- Press any key on the device. This closes the output of the quartz frequency and the microprocessor goes back to normal operating mode.
- The number keys on the remote control are then used to enter the correction value calculated as a 3-digit number (value must be between 0 and 255).
- The entered value is saved after pressing the OK button on the remote control

8.3.3 Tuner 1 (TV)

Automatic gain control AGC 1*Purpose:*

Set the automatic gain control

Consequences of incorrect settings:

If the input level is too low, the AGC synchronisation will not function correctly in the TV circuits. If the level is too high, the picture may be distorted.

TP	ADJ.	MODE	INPUT
Tuner 1700 Pin 11	Service Menu	Service Mode	5mV (74dB μ V) on aerial input channel 24 PAL-White picture no audio carrier
TAPE		MEAS. EQ	SPEC.
		Oscilloscope (10:1 Probe), Video Pattern Generator	550mV _{pp} -1dB (See description below)

PROCEDURE:

- Call up Service mode (press the "STOP" button on the remote control, then the "PLAY" button on the device, and hold down both buttons for approx. 5 seconds).
- In the Service menu, use the "▼" button to select the "SERV CONTR" line and press "►".
- Select the "T1 AGC" line using the "▼" button
- Use the "◀" and "▶" arrow buttons to set the level on the tuner output to 550 mVpp.

Note: Tuner 1700 is located on the SSB-board (TU1 part).

Tuner 1 Type*Purpose:*

Set the tuner type used

Consequences of incorrect settings:

No reception in UHF range.

TP	ADJ.	MODE	INPUT
	Service Menu	Service Mode	5mV (74dB μ V) on aerial input channel 40 (623MHz)
TAPE		MEAS. EQ	SPEC.
		Video Pattern Generator	See description below

PROCEDURE:

- In Manual Tuning Mode set channel 40 and save it under a program number.
- Call up Service Mode (press the "STOP" button on the remote control, then the "PLAY" button on the unit, and hold down both buttons for approx. 5 seconds).
- In the Service Menu, select the "SERV CONTR" line using the "▼" button and press "►".
- Select the line "T1" using the "▼" button.
- Use the arrow buttons "◀" and "▶" to switch between "PH" and "AL" and the position at which the test picture is displayed, save using the "OK" button.

8.3.4 Tuner 2 (TU2)

Automatic frequency control AFC2 [5768]*Purpose:*

Correct functioning of the demodulator switching.

Consequences of incorrect settings:

Poor or distorted reception in VCR circuits

Preparation:

Connect pin 1 of tuner 1760 to pin 10.

TP	ADJ.	MODE	INPUT
IC7770 Pin 17	L5768	TV	38,9MHz / 200mV _{pp} on Pin 11 Tuner 1760
TAPE		MEAS. EQ	SPEC.
		Digital Voltmeter, Frequ. Generator	2,5V ±0,2V

Note:

IC7770 and L5768 are located on the SSB-board (TU2 part).

Automatic gain control AGC 2 [3773]*Purpose:*

Set the automatic gain control

Consequences of incorrect settings:

If the input level is too low, the AGC synchronisation will not function correctly in the VCR circuits. If the level is too high, the picture may be distorted.

TP	ADJ.	MODE	INPUT
Tuner 1760 Pin 11	R3773	TV	5mV (74dB μ V) on aerial input channel 24 PAL-White picture no audio carrier
TAPE		MEAS. EQ	SPEC.
		Oscilloscope (10:1 Probe), Video Pattern Generator	550mV _{pp} -1dB

Note:

Tuner 1760 and R3773 are located on the SSB-board (TU2 part).

Tuner 2 Type*Purpose:*

Set the tuner type used

Consequences of incorrect settings:

No reception in UHF range.

TP	ADJ.	MODE	INPUT
	Service Menu	Service Mode	5mV (74dB μ V) on aerial input channel 40 (623MHz)
TAPE		MEAS. EQ	SPEC.
		Video Pattern Generator	See description below

PROCEDURE:

- In Manual Tuning Mode set channel 40 and save it under a program number.

- Call up Service Mode (press the "STOP" button on the remote control, then the "PLAY" button on the unit, and hold down both buttons for approx. 5 seconds).
- In the Service Menu, select the "SERV CONTR" line using the "▼" button and press "▼".
- Select the line "T2" using the "▼" button.
- Use the arrow buttons "◀" and "▶" to switch between "PH" and "AL" and the position at which the test picture is displayed, save using the "OK" button.

8.3.5 SERVO-SYSTEM (DE)

Gap position*Purpose:*

Ensure correct head changeover during playback.

Consequences of incorrect settings:

Poor head changeover, changeover visible in picture, or picture fluctuations.

TP	ADJ.	MODE	INPUT
	Service Menu	Service Mode, Playback	
TAPE		MEAS. EQ	SPEC.
VHS Alignment Tape 4822 397 30103			See description below

PROCEDURE

- Insert VHS test cassette (4822 397 30103)
- Call up Service mode (press the "STOP" button on the remote control, then the "PLAY" button on the device, and hold down both buttons for approx. 5 seconds).
- In the Service menu, use the "▼" button to select the "SERV CONTR" line and press "▶".
- Use the "▼" button to select the "GAP" line and press "OK".

The setting is made automatically and the corresponding values are stored in the EEPROM.

Following a successful setting, the device will display "1" on the OSD. If there is an error, "0" will be displayed.

Possible causes:

Poor video signal,
Head disc is defective,
 μ P defective.

8.3.6 Luminance and chrominance (VS,VS_SEC)

SECAM recording current [R3088]*Purpose:*

Ensure optimal chrominance level during recording.

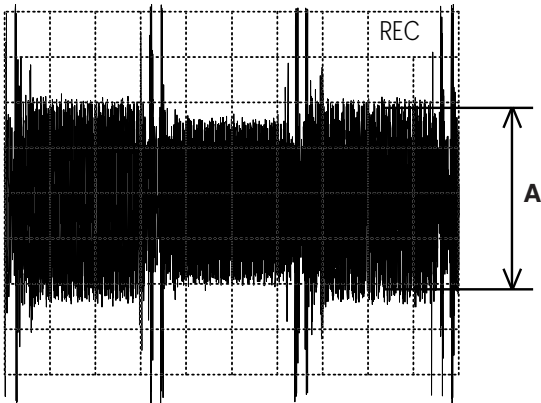
Consequences of incorrect settings:

If the chroma level is too high during recording, cross patterns may appear in coloured areas. If the level is too low, colour noise interference may occur.

TP	ADJ.	MODE	INPUT
CSRP, E/7073	R3088	Record	SECAM-Red picture (75% Saturation) on SCART
TAPE		MEAS. EQ	SPEC.
Blank Tape		Oscilloscope, Video Pattern Generator	240 mV _{pp} ±15mV _{pp} (see Fig. below)

Notes:

With varying frame amplitudes, the setting is made for the greatest amplitude. R3088 is located on the SSB-board (VS_SEC part).



A: AC, 50mV/Div, 20us/Div

Testpoint slider Pos. 3131

Figure 8-1

3.3MHz adjustment [R3089] (only for SECAM)**Purpose:**

To adjust the mixing oscillator

Consequences of incorrect settings:

Cross patterns in coloured areas, coloured noise.

TP	ADJ.	MODE	INPUT
	R3089	SP. Record & Playback	SECAM-Red picture (75% Saturation) on SCART
TAPE		MEAS. EQ	SPEC.
Blank Tape		Video Pattern Generator	See description below

PROCEDURE:

- Play back red image recorded.
- Use R3089 to set the interference to a minimum level.

Note: R3089 is located on the SSB board (VS_SEC part).

Studio picture control SPC**Purpose:**

Set the reference level for the SPC.

Consequences of incorrect settings:

Resolution too low or "strays" during playback.

TP	ADJ.	MODE	INPUT
	Service Menu	Service Mode, Stop	PAL-Black picture on SCART
TAPE		MEAS. EQ	SPEC.
SPC-Alignment Tape 4822 397 30268		Video Pattern Generator	See description below

PROCEDURE

- Insert the SPC test cassette (4822 397 30268).
- Call up Service mode (press the "STOP" button on the remote control, then the "PLAY" button on the device, and hold down both buttons for approx. 5 seconds).

- In the Service menu, use the "▼" button to select the "SERV CONTR" line and press "▶".
- Use the "▼" button to select the "SPC" line and press "OK".

The setting is made automatically and the corresponding values are stored in the EEPROM.

Following a successful setting, the device will display "1" on the OSD. If there is an error, "0" will be displayed.

Possible causes:

Poor video signal,
Head disc is defective,
µP defective.

8.3.7 Audio part**Erase frequency [5600]****Purpose:**

Set optimal erase frequency.

Consequences of incorrect settings:

Erase frequency or harmonic waves may cause interference.

TP	ADJ.	MODE	INPUT
Connector 1965 Pin5	L5600	Record	PAL-White picture
TAPE		MEAS. EQ	SPEC.
Blank Tape		Frequ. Counter Video Pattern Generator	70kHz ±10kHz

Note:

Connector 1965 and L5600 are located on the SSB-board (AL part).

BIAS magnetic biasing current [R3625]**Purpose:**

Set optimal magnetic biasing current.

Consequences of incorrect settings:

If the level is too high, the treble response in the linear tone is too low. If the level is too low, the treble response is too great, and the harmonic distortion is increased.

TP	ADJ.	MODE	INPUT
1965 Pin1	R3625	Record	PAL-White picture
TAPE		MEAS. EQ	SPEC.
Blank Tape		AC-Millivoltmeter, Video Pattern Generator	15V _{RMS} ±1V (see description below)

Note:

R3625 and Connector 1965 Pin 1 are located on the SSB-board (AL part).

Checking the magnetic biasing current setting:

Apply a sine-wave signal with an amplitude of 50mV_{eff} to the SCART audio input. Record the 1kHz signal and 10kHz signal for 30 seconds each. Play back the recording and check that the amplitude difference is in the ±3dB range. If this is not the case, correct the value for the magnetic biasing current. If the treble is too low, the bias current should be reduced slightly. If the distortion is too great, the bias current should be increased slightly. (approximate value: +1V = -1dB Treble).

Audio playback level*Purpose:*

Ensure a uniform level for recording and playback.

Consequences of incorrect settings:

Level fluctuations during playback.

TP	ADJ.	MODE	INPUT
Pin 1/3 SCART (AudOutR)	Service Menu	SP. Record & Playback	PAL-White picture 500mV _{RMS} /1kHz on Pin 2 and 4 SCART
TAPE		MEAS. EQ	SPEC.
Blank Tape		AC-Millivoltmeter, Video Pattern Generator	500mV _{RMS} ±50mV (see description below)

PROCEDURE:

- Call up Service mode (press the "STOP" button on the remote control, then the "PLAY" button on the device, and hold down both buttons for approx. 5 seconds).
- In the Service menu, use the "▼" button to select the "SERV CONTR" line and press "▶".
- Use the "▼" button to select the "AL" line.
- Play back the 1kHz sine-wave signal recorded.
- Use the arrow buttons "◀" and "▶" to set the audio level on the SCART output to 500mVRMS

8.3.8 TV and picture tube settings (TV_VP, LS)*Preparation:*

- Demagnetise the picture tube (connect the device - cooled to room temperature - to the mains).
- Allow the device to warm up for around 15 minutes.
- Set up the screen to face eastwards
- ABS Loop ON (Service menu)
- Switch "CONTRAST PLUS" in the "PICTURE" menu to "OFF".

Cut-off*Purpose:*

Set the operating point setting for ABS Loop

Consequences of incorrect settings:

Incorrect colour temperature with a dark picture. White peak missing.

TP	ADJ.	MODE	INPUT
quadratic contact surfaces R,G,B (CRT-PCB)	SCREEN- pot. on Line transf.	TV	PAL-Black picture with Burst on SCART
TAPE		MEAS. EQ	SPEC.
		Digital Voltmeter, Video Pattern Generator	14" = 139V±3V 20" = 140V±3V 21" = 150V±3V (see description below)

PROCEDURE:

- Call up Service mode (press the "STOP" button on the remote control, then the "PLAY" button on the device, and hold down both buttons for approx. 5 seconds).
- In the Service menu, use the "▼" button to select the "SERV CONTR" line and press "▶".
- Use the "▼" button to select the "TV DEF" line and press "OK".
- Increase the brightness so that the black picture becomes slightly brighter.
- Determine the quadratic contact surfaces at which there is the highest voltage on picture tube plug 1955 on the R,G,B pins 3, 7 and 9 (see quadratic contact surfaces).

- Set the relevant cathode (with the highest voltage) using the SCREEN controller (lower controller on the line transformer).

Remark: SCREEN is the lower controller on the transformer.

Focus*Purpose:*

Ensure optimal picture sharpness.

Consequences of incorrect settings:

Blurred picture

TP	ADJ.	MODE	INPUT
	FOCUS-pot. on Line Transf.	TV	Crosshatch pattern on SCART
TAPE		MEAS. EQ	SPEC.
		Video Pattern Generator	Best picture sharpness

Note:

Before adjustment, set the sharpness in the "PICTURE" menu to the centre value. Remark: FOCUS is the upper controller on the transformer.

Horizontal picture position*Purpose:*

Ensure correct horizontal picture position

Consequences of incorrect settings:

Missing picture information on the edge of the screen

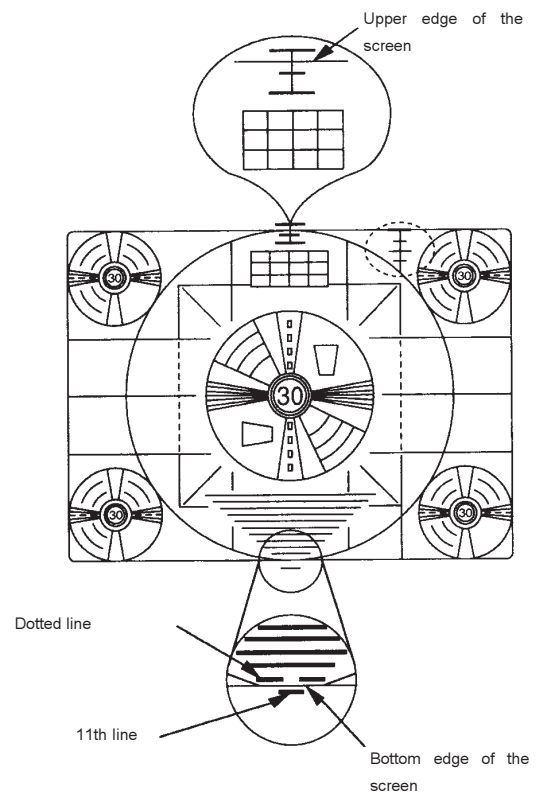


Figure 8-2

TP	ADJ.	MODE	INPUT
	Service Menu	Service Mode, Playback	
TAPE		MEAS. EQ	SPEC.
VHS-Alignment Tape 4822 397 30103			See description below (and Fig. 8-2)

PROCEDURE:

- Call up Service mode (press the "STOP" button on the remote control, then the "PLAY" button on the device, and hold down both buttons for approx. 5 seconds).
- In the Service menu, use the "W" button to select the "SERV CONTR" line and press "▶".
- Use the "▼" button to select the "TV ADJ" line and press "▶".
- Start the playback
- Use the arrow buttons "◀" and "▶" to position the test picture precisely in the centre of the screen (left and right-hand corners are of equal size).

Vertical picture position, picture amplitude and slope*Purpose:*

Set optimal vertical picture size and position

Consequences of incorrect settings:

Missing picture information on the edge of the screen, or a distorted picture.

TP	ADJ.	MODE	INPUT
	Service Menu	Service Mode, Playback	
TAPE		MEAS. EQ	SPEC.
VHS-Alignment Tape 4822 397 30103			See description below (and Fig. 8-2)

PROCEDURE:

- Call up Service mode (press the "STOP" button on the remote control, then the "PLAY" button on the device, and hold down both buttons for approx. 5 seconds).
 - In the Service menu, use the "▼" button to select the "SERV CONTR" line and press "▶".
 - Use the "▼" button to select the "TV ADJ" line and press "▶".
 - Start the playback
- 1) Slope
 - Press the "▼" button several times until "V SL" appears (the bottom half of the picture is blanked).
 - Use the arrow keys "◀" and "▶" to set the middle line of the test picture precisely in the centre of the vertical screen.
 - 2) Picture position
 - Select the line "V SL" using the "▼" button.
 - Use the arrow keys "◀" and "▶" to adjust the test picture in the vertical middle of the screen.
 - 3) Picture amplitude
 - Press the "▼" button several times until "V AMP" appears (the bottom half of the picture is blanked).
 - Use the arrow keys "◀" and "▶" to set the bottom and the top edge of the circular test picture according to figure 8-2.

Adjusting the whiteness*Purpose:*

Setting the R,G,B cathode ray currents

Consequences of incorrect settings:

Incorrect depiction of colours.

TP	ADJ.	MODE	INPUT
	Service Menu	TV	PAL-Black/White picture on SCART
TAPE		MEAS. EQ	SPEC.
		Video Pattern Generator	See description below

PROCEDURE:

- Adjust the "SMART PICTURE" picture setting to "NATURAL" using the "SMART
- Set the tint in the "PICTURE" menu to "NATURAL". (optional)
- Call up Service mode (press the "STOP" button on the remote control, then the "PLAY" button on the device, and hold down both buttons for approx. 5 seconds).
- In the Service menu, use the "▼" button to select the "SERV CONTR" line and press "▶".
- Use the "▼" button to select the "TV ADJ" line and press "▶".
- Press the "▼" button several times until "B" appears.
- Use the "◀" and "▶" arrow buttons to set the blue level required. (typical: 25 ± 3 steps)
- Press the "▼" button until "R" appears.
- Use the "◀" and "▶" arrow buttons to set the red level required. (typical: 40 ± 3 steps)
- If necessary, press the "▼" button several times until "B" or "R" appears, and repeat the adjustment.

9. Circuit description

9.1 Switched-mode power supply PS (Large Signal Board)

9.1.1 Technical data:

Mains voltage	: 195-264 Vrms
Maximum output	: 60W / 80W (continuous output / maximum output)
Operating frequency	: 55 ... 76 kHz (SOPS)
Efficiency	: approx. 75 % at maximum output

Eight different direct voltages are made available at the power supply outputs.

Functional principle:

This power supply unit functions according to the blocking oscillator principle. The mains voltage is rectified in the supply voltage part [1931 to 2323] and buffered in the capacitor [2310]. From this direct voltage [2310] energy is transferred into the transformer [5330, pins 9-7] during the conductive phase of the switching transistor [7300] and is stored there as magnetic energy. This energy is passed to the secondary outputs on the power supply in the blocking phase of the switching transistor [7300]. Using the switch-on time of the switching transistor [7300], the energy transferred in every cycle is regulated in such a way that the output voltages within the tolerances are unaffected by changes in the load or input voltages. The power transistor is controlled by the integrated circuit [7310].

9.1.2 Normal mode:

In normal mode for the power supply, the periodic processes in the circuit are primarily divided into the conductive phase and blocking phase of the switching transistor [7300]. During the conductive phase of the switching transistor [7300], current flows from the rectified supply voltage at capacitor [2310] through the primary coil on the transformer [5330, pins 9-7], transistor [7300] and the resistors [3327, 3328, 3329] to earth (see figure 9-1). The positive voltage on pin 9 of the transformer [5330] can be assumed to be constant for a switching cycle. The current through the primary coil on the transformer [5330] rises linearly. A magnetic field representing a certain volume of the primary current is formed inside the transformer. In this phase the voltages on the secondary coils are polarized in such a way that the diodes [6342, 6350, 6381, 6385 and 6390] are blocked. A current is fed to the CTRL input on the IC [pin 3, 7310] from the controller around [7341] via the optocoupler [7340]. Once the switch-on time for the switching transistor [7300] has been reached, which matches the current being supplied on the CTRL input, the switching transistor is switched off. Once the switching transistor has switched off, the blocking phase begins. No more energy is transferred to the transformer. However, the inductivity of the transformer now attempts to maintain the current which flowed through it at a constant level ($U=L \cdot di/dt$). As the primary current circuit is interrupted by the switching transistor [7300] being switched off, the current flows through the secondary coils. The polarity of the voltages on the transformer is reversed, which means that the diodes [6342, 6350, 6381, 6385 and 6390] become conductive and current flows into the capacitors [2351, 2353, 2360, 2363, 2383 and 2384] and the load. This current is also ramp-shaped (di/dt negative, therefore decreasing).

The switched-mode power supply is controlled by changing the conductive phase of the switching transistor (see figure 9-1) so that either more or less energy is transferred from the

rectified supply voltage to the transformer on [2310]. The control information is provided by the control element [7341]. This compares the voltage UBAT and the 5V output voltages via the voltage dividers [3346, 3347, 3348, 3344] with an internal 2.5V reference voltage. The output voltage from [7341] passes via an optocoupler [7340] (for the galvanic isolation of primary and secondary part) as a current value in the PIN 3 on the IC [7310]. The switch-on time for the switching transistor [7300] is reversed proportionally to the value of this current.

9.1.3 Start-up with mains on:

After switching on, the mains switch capacitor [2323] is loaded via the start-up resistor [3335] and a current source between pins 8 and 6 on the IC [7310]. Once the voltage at [2323] and therefore the supply voltage V_{cc} on the IC [7310] reaches approx. 13V, the IC starts to function and issues pulses on its output PIN 5. These pulses are used to control the gate on the power transistor [7300] (see figure 9-1). The frequency is permanently set in the IC (approx. 75 kHz). The power consumption for the IC in normal mode is approx. 5 mA.

If V_{cc} falls below approx. 10V (e.g. with power limiting) or exceeds approx. 15V (e.g. if the control circuit is interrupted), the output on the IC [7310, PIN 5] is blocked. All output voltages on the power supply and therefore also V_{cc} are reduced. After V_{cc} has fallen below approx. 6.5V, a new start-up cycle begins. (See also section "Overload, power limiting, burst mode")

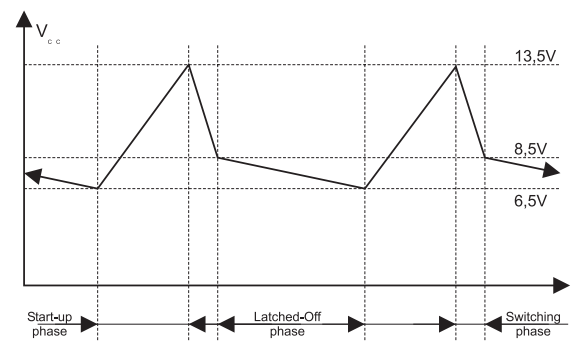


Figure 9-1

9.1.4 Standby mode:

In the operating condition "Standby" on the device, the control line "ISTBY" is used to switch off the output voltage on the power supply unit 8VA, 5VA and 5VD to keep the power taken up from the mains low. The power supply itself continues to function in the operating condition "Standby" constantly with an operating frequency of 75kHz.

9.1.5 Overload, power limiting, burst mode:

With an increasing load on one or more mains supply outputs, the switch-on time for the power transistor [7300] also increases, and the peak value for the triangular current through this power transistor therefore also increases. The voltage image of this current characteristic is conveyed from the resistors [3327, 3328 and 3329] to pin 2 on the IC [7310]. If the voltage on PIN 2 reaches 1V in one switching cycle, the conductive phase of the switching transistor is ended immediately. This check is carried out in each individual switching cycle. This procedure ensures that no more than approx. 95W can be taken up from the mains supply (=power limiting).

If the mains supply reaches the power limit, with increasing output loading the output voltages V_{cc} on the IC [7310] will fall. If V_{cc} is less than approx. 10V, the output on the IC [7310, PIN 5] is blocked. All output voltages and V_{cc} fall. After V_{cc} has fallen below approx. 6.5V, a new start-up cycle begins. If the overload condition or short-circuit continues to exist, the power limiting will be initiated immediately and the voltages fall once again, followed by another start-up attempt (= **burst mode**). The power taken up from the mains in burst mode is low.

9.1.6 Supply voltage part

The supply voltage part covers the plug on the mains cable [1931] through to the capacitor [2310]. The a.c. supply voltage is rectified by diodes [6301, 6302, 6303 and 6304] and buffered with capacitor [2310]. The line reactor [5301] and capacitor [2307] create a filter to isolate the interference arising in the switched-mode power supply from the open mains supply. The components [1300], [3303] and [3302] protect the power supply unit against short-term mains overvoltages, e.g. from the indirect effects of lightning.

9.2 Deflection - large signal processing LS (LSB)

The following functional units form part of the "large signal" functional group:

- TV-IC (IC7200) controlled using I²C bus
- Horizontal deflection stage
- Vertical deflection stage
- RGB stage
- Beam current feedback control stage
- Picture tube
- Circuit breaker

9.2.1 TV-IC TDA935x, TDA936x and TDA938x (IC7200) controlled using I²C bus

The TV-ICs used are from the TDA 93xx series which can process various television standards depending on the device type.

The following functional blocks are used for large signal processing:

- Sync pulse separation from the video signal selected
- Horizontal synchronization via two PLL control loops
 - a) $\phi 1$ control loop to achieve frequency synchronization with the video signal. The control voltage produced is filtered on pin 13.
 - b) $\phi 2$ control loop to adjust the phase angle of the screen content relative to the grid on the screen. The control information is output on pin 33 (H drive). The feedback signal (HFB) is input on pin 34.

Horizontal soft-start and soft-stop function:

Soft-start: For the first 100ms, the horizontal oscillator functions at a continuously falling frequency beginning at 32kHz to 15.6kHz. The soft start reduces the switch-on current peaks when starting up the horizontal deflection stage.

Soft stop:

The horizontal oscillator increases the line frequency continually from 15.6kHz to 32kHz. In addition, the RGB outputs on pins 51, 52 and 53 are notched up to achieve a partial discharge of the picture tube. The soft stop period is dependent on the beam current and can last up to 43ms. The high voltage in the picture tube is therefore reduced to below 10kV and thus effectively suppressing the cold-cathode emissions (persistence after the picture tube has been switched off).

Vertical divider:

Synchronizes itself according to the vertical sync pulses and determines the scan time and the ramp-down time for the vertical ramp.

Vertical saw-tooth voltage generator:

Supplies symmetrical saw-tooth currents to pins 21 and 22. The steepness and the curved s-shape of these currents can be changed to a limited extent using the I²C bus.

Beam current limiting stage:

Evaluates the voltage available at pin 49 thus engaging and reducing the amplification in the brightness and contrast limiting stage. This, in turn, reduces the output voltages for the RGB stage on pins 51, 52 and 53.

Voltage on pin 49 = 3.1V: Not involved in the brightness and contrast limiting stage.

Voltage on pin 49 between 1.8 and 3.1V: Contrast reduction active.

Voltage on pin 49 between 1.0 and 1.8V: Brightness and contrast are reduced.

Circuit-breaker evaluation and high voltage compensation stage:

Evaluates the voltage level on pin 36.

Voltages greater than 3.9V indicate a fault in the large signal range. If this level is exceeded, the horizontal output stage is stopped immediately via "Softstop". This prevents a reloading of the picture tube.

Voltages between 1.5 and 2.5V on pin 36 engage and correct the vertical ramp (change the vertical amplitude according to the picture tube anode current by max. +-5%).

RGB functional unit with automatic black value and color temperature stabilization:

Black value and color temperature stabilization corrects high voltage-related and age-related modifications to the picture tube. To do this, pulses are forwarded to the RGB stage in lines 19, 20, 21 and 22 regardless of the adjacent video signal. The cathode currents set in this process are conveyed to the TV-IC on pin 50 via transistors T7186, T7187 and T7188 and resistor 3234 and the cathode cut-off voltages and the color temperature are held constant internally in the IC.

The adjacent video signal on pin 40 or 42 is separated into the TV-IC into the Y and chroma components, passes through various function blocks depending on the television standard, the can then also be changed via the I²C bus in terms of brightness, contrast, definition and color temperature.

9.2.2 Horizontal deflection stage

T7501 and transformer 5500 are used as the driver stage for line transistor T7521. During the conductive phase, the primary current for the line transformer L5519 and the horizontal deflection current flow via T7521. During the block phase, the energy stored in the line transformer is used to generate the high voltage and for the horizontal line flyback. In the subsequent scan phase, the horizontal deflection current changes polarity and is clamped to earth via diode D6520. The feedback voltage on the vertical stage supply is supplied to the TV-IC on pin 34 via an RD network. The TV-IC then uses this information for RGB blanking during the line flyback and as control information for the $\phi 2$ control loop.

9.2.3 Vertical deflection stage

TDA8356 (IC7555) is an IC with direct voltage coupling and with integrated bridge output stage and integrated non-return switch. It is controlled by the TV-IC via pins 21 and 22. The status of the vertical IC is checked back via an RD network (R3544, R3567, R3568 and D6568) on the circuit breaker. In the case of a deviation of the "normal pulse" voltages, the circuit breaker engages, preventing excessive local heating of the picture tube (screen burn protection).

9.2.4 RGB stage

The RGB signals are sent to the picture tube printed board from the TV-IC (IC7200), their voltage is amplified at the board using T7180, 7181 and 7182, the current is buffered once again via the subsequent push-pull stages and supplied to the picture tube cathodes via resistors R3177, 3179 and 3181. After each vertical frame flyback, T7185, 7186 and 7187 supply measurement signals for automatic cathode calibration to pin 50 on the TV-IC.

9.2.5 Beam current feedback control stage

The voltage on root capacitor C2535 is a precise reflection of the total of cathode currents flowing. This information is conveyed via an RCDT network to the TV-IC pin 49 which controls the brightness reduction stages in the TV-IC according to the voltage values.

9.2.6 Picture tubes

The picture tubes used with a 90° deflection angle do not require grid corrections, i.e. no image geometry correction stages are necessary.

9.2.7 Circuit breaker (RDC network around T7543, T7547, T7510 and T7556)

Pin 36 is the circuit breaker input on the TV-IC. In normal mode there are approx. 2V. In case of an error, there will be a high level of = 3.9V thus permitting a soft-stop of the horizontal deflection stage. In addition, the high-level must be present for at least 500ms for detection by the AIO SW. The AIO software then sets the device to high-power standby mode, thus preventing a self-initiated re-start of the device in the case of a decay fault. The device can be reset at any time by pressing a preset key in On mode.

The stage with T7510 is initiated when the line transformer primary current is too great, the stage with T7543 or T7556 when there is a risk of excess high voltage or if there is an error in the vertical stage and the stage at T7547 is initiated when the beam current is too great

9.3 Control part AIO1 (small signal board)

9.3.1 Microprocessor TMP93CW76F

The microcontroller "AIO" TMP93CW76F [7899] is a 16 bit microcontroller with integrated ROM and 2.5 kB RAM. It includes the following functions.

PWM outputs.

- A/D converters
- Composite sync input
- Special servo inputs for VCR functions
- I²C bus interface

Its primary function is to control the entire TVCR combi device.

- Evaluation of the keyboard matrix
- Activation of the LEDs
- Decoding of the remote control commands from the infrared receiver [7810]
- Control of the drive functions
- Control of the various functional groups in the device via I²C bus
- Back-up mode

Following connection to the mains, a negative pulse on the reset input on the μ P is generated by the positive edge of the IPOR signal using the switching on the transistor [7900]. The μ P will then start in dual-clock mode, i.e. both quartzes [1887,1886] oscillate (normal mode). The time is derived from the slow quartz [1886] (32.768kHz), and the system clock is generated with the fast quartz [1887] (16 MHz). In the event of a mains failure (back-up mode) there is no reset by the transistor switching [7900] on the reset input on the μ P. Instead the mains failure is registered via the IPOR interrupt 3 [7899 pin 67] and the μ P is switched to "sleep mode" (low power consumption). The 16 MHz quartz is switched off and the 32kHz quartz is then used as the clock and system clock frequency. The operating voltage for the AIO is buffered by a back-up cell [2909]. A diode [6901] prevents this gold capacity from discharging.

9.3.2 Bus systems

The communication between the μ P and the other functional groups is conducted via the I²C bus 1 (SDA, SCL). The clock rate is approx. 65 kHz.

Functional groups on the I²C bus 1:

- E²PROM M24C08 [7818]
- Tuner 1 [1700]
- Tuner 2 [1760]
- Teletext+TV-IC TDA 93xx "UOC" [7200]
- Signal electronics IC LA71595M [7004]

Communication between the TXT-IC [7200] and the VPS/PDC-IC SDA5650 [7960] is conducted via I²C bus 2 (SDA_VP, SCL_VP). The clock rate is approx. 43 kHz. Only the VPS/PDC information is transferred via this bus for devices with 2 tuners.

9.3.3 E²PROM

The E²PROM M24C08 [7818] is an electric erasable and writeable, non-volatile memory. (Data is retained even following an operating voltage failure). The E²PROM stores data specific to the device, such as the head changeover position, preset stations, option bytes, etc. The data is accessed by the μ P via the I²C bus.

9.3.4 TELETEXT, VPS, PDC part TV_VP (SSB)

Teletext/VPS/PDC-IC TDA93xx

The TDA93xx "UOC" (Ultimate One Chip) comprises one TV chip and a microprocessor with integrated Teletext decoder including OSD ("Painter").

The processor is reset by the main processor AIO [7899] via the UOC_RESET line. Communication is carried out via the I²C bus 1 (SDA,SCL) and via the interrupt line BSDC.

As the processor works with an operating voltage of 3.3 V, the majority of the outputs are switched as open drain outputs. External pull-up resistors are used for adjustment to the 5V logic.

The Painter decodes the following data types from the VVIEW or the VV1-Video: WST (World Standard Teletext) 625/525, Closed Caption, VPS, WSS (Wide Screen Signaling). The extracted data is stored either in the memory

or in the special function registers (SFR). The time can also be read from the TXT header line or from the PDC format 1 (for "Time download").

The following modes (data formats) are identified:

- VPS (Timer data and station name)
- PDC Format 2 (Timer data and station name)
- PDC Format 1 (station name and time)
- TXT header line (time for "Time download")

The data to be displayed by Teletext pages or OSD pages are written to the memory. The display unit generates the necessary RGB signals which are conveyed internally in the IC to the TV chip. The synchronization is also carried out inside the IC.

VPS/PDC-IC SDA5650 for devices with 2 tuners

For 2-tuner devices, a second VPS/PDC-IC is required as VPS/PDC data needs to be available both for the program on the screen and for the program just recorded. This is achieved using the VPS/PDC-IC SDA5650 [7960]. This IC can also decode VPS, PDC formats 1 and 2, as well as the TXT header line. The VPS/PDC data are read from the vertical blanking gap and stored in the internal RAM. This data is transferred to the UOC [7200] via the I²C bus 2 and from there is forwarded from the central controller (AIO).

9.4 Operating unit AIO2 (SSB)

9.4.1 Keypad evaluation

There are 7 different keys on the SSB. A resistor network is used, depending on the key pressed, to generate a specific direct voltage value via the resistor 3901 on the key-in line. This is decoded via an analog/digital (A/D) port (7899-B, PIN 56).

9.4.2 IR receiver and signal evaluation

The IR receiver [7810] contains a selectively controlled amplifier as well as a photo-diode. The photo-diode changes the received transmission (approx. 940nm) in electrical pulses, which are then amplified and demodulated. On the output of the IR receiver [7220], a pulse sequence with TTL level which corresponds to the envelope curve of the received IR remote control command, can be measured. This pulse sequence is read into the controller via the input IRR [7899-B, Pin 46] for further signal evaluation.

9.4.3 Tape end - LED - control :

The LED current is switched using transistor at [7804]. The ON time is approx. 1 msec, the OFF time approx. 12 msec during playback and 1msec to 5.5msec during the rewind functions.

The LED current is typically 150 mA. In order to prevent interference from the relatively high pulsed current 'spreading' through the entire unit, the LED is fed from the 14VM1, and filtered by 2 resistors [3800, 3805] with 10R each and electrolytic capacitors [2802] each with 100µF.

9.5 Deck electronics DE (SSB)

The Deck Interface IC MP63100 [7463] contains the following functional groups:

- CTL - stage (tape synchronization)
- Sensor interface
- Power on reset
- Head drum motor driver
- Loading motor driver
- Capstan motor control

9.5.1 CTL stage

The IC M63100 [7463] contains a read/write stage for the CTL track with the option of overwriting an existing CTL track without any interference. The playback stage is fitted with a "digital" five-stage AGC. This logic circuit identifies the size of the output signal supplied by the CTL head, and then selects the best amplification ratio in the playback stage using comparators.

The CTL head voltage can vary greatly. The slowest tape speed is in LP mode. The highest speed is used during rewind. To ensure that the duty cycle in the tape sync is always reproduced correctly (important for detecting VISS marks), the amplifier must not be overdriven.

Parallel to the CTL head is the RC element consisting of capacitor [2479] and resistor [3471]. Capacitor [2479] together with the CTL head inductivity causes a resonance peak at around 10 kHz. On the other side of the resonance frequency, there is a sharp fall in the frequency transmission characteristic. This effectively suppresses stray high frequency pick-up. The CTL head signal amplitude in standard play is around 1mV_{pp} (typ.), which means that the gain of the playback amplifier has to be correspondingly high. The polarity on the playback amplifier can be reversed with the video - index - search - system (VISS) voltage. This is the only way it is possible for the µP to write a VISS mark to the band without spikes. The Write/Read (W/R) signal is used to switch over between record and playback:

W = "H", R = "L".

9.5.2 Power on reset (POR) generator

The POR generator contained in the M63100 [7463] only requires one external capacitor [2477], which specifies the length of the POR pulse. For 10 nF, t_{por} is approx. 10 msec. The response threshold of the reset circuit is between 4.5 and 4.8 V. Supply fluctuations which are shorter than t_{por}/100 area and which do not fall below 4.0 V, do not trigger the POR. The µP is reset using the inverted POR.

9.5.3 The sensor interface :

The four comparators in the M63100 [7463] are used to convert sensor signals to the logic level. The outputs are protected by a current limiter and thermal overload protection. Only the non-inverting inputs on each comparator are accessible from the outside. The other inputs are connected to an internal reference of nom. 2.5V. The fixed hysteresis of the comparators of approx. 18 mV is also located internally.

The comparators are connected as follows:

Comparator 1: In = FTA, pin 39; Out = FTAD, pin 34:
FTA = threading tachometer. This signal comes from a forked light barrier in the deck. An infra-red light beam is interrupted by a 4-blade impeller (butterfly). The output amplitude of the photoelectric barrier in the low level must be less than 2V and in the high level greater than 3V to ensure correct evaluation. An additional hysteresis is created with a resistor [3476].

Comparator 2: In = WTR, pin 38; Out = WTRD, pin 33: WTR = Winding tachometer right, from a reflection photoelectric barrier. The level is the same as for the FTA.

Comparator 3: In = WTL, pin 37; Out = WTLD, pin 31 : WTL = Winding tachometer left, from a reflection photoelectric barrier. The level is the same as for the FTA.

Comparator 4: In = FG, pin 35; Out = FGD, pin 30: FG = capstan tachometer. This signal stems from an amplifier for the tachometer hall sensor on the motor unit plug [1946 PIN 4]. The output impedance is 10 kOhm. The amplitude of the near sinusoidal signal is normally 1 V_{pp}. It should not fall below 300 mV_{pp}. It is AC-coupled via a capacitor [2485]. In order for a bias current to flow, the input pin 31 must be passed via a resistor [3474] to the reference voltage on pin 4. A capacitor [2480] for filtering out high-frequency interference is arranged in parallel to the bias resistor.

9.5.4 Interface to the head drum motor driver part

The head drum control voltage (speed and phase control information) is output via a μ P output [7899-B Pin 35], (PWM 14-bit). This pulse-wide modulated signal is fed to the motor driver IC M63100 [7463-Pin 11] and integrated with the capacitor [2469]. This IC already has a completely integrated 'start-up' circuit fitted. For the commutation, the head drum motor driver uses the e.m.f. on the non-current carrying motor coil (transformer principle). The motor speed is also discharged from there at the same time. The phase of the head disc is discharged from a position coil. Speed and phase are multiplexed into one signal [7463 Pin 6] and output. During this process the falling edge of the signal is the speed (FG/450Hz) and at 25Hz the position pulse (PG) has a positive edge.

The connection from the motor driver M63100 [7463] on the motherboard to the head drum motor is made using plug connector [1948].

- DRUM is the speed/phase control signal. The resolution is 14 bits.
- PG/FG is the combined POS/tacho signal from M63100 [7463].

9.5.5 Interface to the loading motor driver part

The loading motor driver part is constructed as a bridged dual power operational amplifier (OP AMP). It can supply max. +/ -0.8A output current. The output current is limited to approx. 0.7A by the internal resistance of the loading motor (18 Ohm typ.) (start-up or motor is blocked).

Between the IC outputs [7463, pins 22 and 24], a Boucherot circuit [3467] 1 Ω , [2474] 100 nF suppresses a spurious 3MHz oscillation from the output stage. One half of the bridge is controlled via the TMO Pin 27 line and acts as a comparator. The other half is an amplifier/integrator with a x 3.9 gain. A change in the input voltage (THIO) on pin 25 of between 0 and 5V results in a change in the output voltage of between 0V and almost supply voltage. With 50% modulation (THIO = 2.5 V) pin 24 has approx. 7 V. The 100nF capacitor [2473] in the negative feedback of the op-amp filters out the PWM frequency of approx. 39kHz. During POR, the μ P issues "H" to the THIO line, whilst TMO is "L". This ensures that no current is flowing in the motor for the duration of the POR pulse. This prevents the motor being destroyed in case of prolonged running or blockage. This circuit produces one disadvantage, however. Namely, that if the 5 V supply fails (e.g. because the 5V fuse has blown), residual voltages may be passed to the IC inputs via the adjacent 14 V voltages. These residual voltages trigger the comparator and the op-amp is opposite ways, causing a short-circuit in the blocked loading motor after one minute. To circumvent this problem, a separate reference voltage divider is used internally for the comparator. Both outputs on the M63100 [7463] will therefore go to "common mode" in the case of the above error.

9.5.6 Interface to the capstan motor

The driver IC on the capstan motor is activated via connector [1946].

CAP is the signal for the capstan speed. This voltage may vary without load between 0 and 5 V.

The rotational direction of the motor is determined using CREV (capstan reverse). The maximum current input for the motor is limited to 1A. Typical values in PLAY mode are 0.2...0.3 A.

Evaluation of the tape deck switches

There are two switches available:

- INIT Initialization switch
- RECP Record protection

LED control

STBY-LED

The red STBY-LED can be lit in 2 different brightness levels. In standby mode it is brighter than in the normal operating condition. It also flashes when remote control signals are received. It is controlled via the μ P Pin 9

Pin 9 "low" = normal mode (LED normal brightness)

Pin 9 "high" = standby mode (LED extra bright)

TIMER-LED (on for 21" devices)

The red TIMER-LED is only active when a timer has been programmed. It is controlled via the μ P-Pin 8 and is active when the μ P-Pin 8 is on "high".

RECORD-LED

The red RECORD-LED is only active when the device is in Record. It is controlled via the μ P-Pin 10 and is active when the μ P-Pin 10 is on "high".

9.6 AUDIO IO,TU,AMP,HPAV (SSB)

9.6.1 General

The demodulator in the TV processor TDA93xx [IC7200-B] and the external demodulators TDA9830 [IC7720] and U2681B [IC7725] are used for the audio demodulation from front end 1.

With the 2 tuner version the IF signal from front end 2 is demodulated using demodulator TDA9817/TDA9818 [IC7770].

The switch in the TV processor [IC7200-B], the switch in the YCA processor LA71595M [IC7004-A] and the analog switch HEF4052 (view selector: IC7580, Scart output selector: IC7524) is used as the audio I/O switch.

The linear audio part in the YCA processor [IC7004-A] is used as the record/playback amplifier with the following functionality: audio input selector switch and ALC stage (automatic level control), audio output changeover switch (tape playback mode), record amplifier / record equalizer, playback amplifier / playback equalizer and head changeover switch.

The integrated modules are controlled via the I²C bus; the analog switches are switched via control lines.

The audio output stage TDA8941P [IC7500] drives the headphone output and the speaker.

9.6.2 Audio I/O 1-tuner version

The input selection between the internal and external front end is carried out via the audio changeover switch in the TV processor [IC7200-B]. The signals from the front end external (pin 78), Scart (Pin 80) and front cinch (pin 76) pass via the input source switch in the YCA processor [IC7004-A], which is also used as the record signal selector, (output pin 96) to the input (pin 35) on the TV processor. Buffer amplifiers are provided (Scart:T7523, front cinch: T7501) are fitted for the Scart and front cinch inputs.

In playback, the signal is passed via the output switch in the YCA via pin 96 to the TV processor. The TV processor conveys the selected signals via the output (pin 44) to the audio output stage IC7500 (speaker / headphones). The Scart output selector HEF4052 [IC7524] switches the signal from the front end and tape (playback mode) via pin 3 to the Scart output. A driver stage [T7522] is used for the Scart output.

9.6.3 Audio I/O 2-tuner version

The input selection between the internal front end (tuner 1) and the external signals is carried out via the audio changeover switch in the TV processor [IC7200-B]. The view selector HEF4052 [IC7580] switches the signals from the external front end demodulator (pin 1), Scart (pin 2), front cinch (pin 4) and tape playback (pin 5) via the output (pin 3) to the input (pin 35) on the TV processor which forwards it to the audio output stage IC7500 (speaker / headphones). The signals from the Scart and front cinch inputs are passed via the buffer amplifier (Scart: T7523, front cinch: T7501).

The Scart output selector HEF4052 [IC 7524] is provided to switch the audio signal from the front end (tuner1 / tuner2) and from the tape (playback mode) to the Scart output. The selected audio signal then runs through driver stage T7909 on pin 3, before it is output on the Scart output.

The signal for the recording is supplied by the demodulator from tuner 2 [IC7770]. The input source switch (front end external: pin 78, Scart: pin 80 and front cinch: pin 76) in the YCA LA71595M [IC7004-A] is used as the record input selector.

View mode & sound control

In receive mode the signal supplied from the internal demodulator on the TV processor [IC 7200-B] also passes internal to the input switch. The signal generated by the external demodulators IC 7720 and IC 7725 passes to the input (pin 35) on the TV processor where it reaches the volume controller via the input switch. The volume is set via an electronic potentiometer in the TV processor which is controlled by a I²C bus. The automatic level control stage AVL (Automatic Volume Levelizing), for which the time constant is defined on pin 20 [C2738], can be activated or deactivated via the I²C bus control.

From the output on the TV processor (pin 44), the signal controlled in the level is passed to the input (pin 5) on the audio output stage [IC7500]. The output on the audio output stage (pin 2, pin 7), which is used as a bridge circuit (BTL) passes the amplified signal via the headphone jack to the speaker.

In the audio output stage there is a mute stage which is used for a defined mute activation in transition operating conditions. This mute stage is switched on pin 4 with the control line AMT.

9.6.4 Audio linear AL (SSB)

Audio linear recording

The signal inputs for recording or loop through are the pins 76,78 and 80 from the linear audio part of the IC LA71595M [7004-A]. During record and loop through, the selected signal passes through the linear amplifier and then a mute stage and before leaving the IC on pin 96. This is output leading to

the I/O part. The attenuation chain on pin 96 sets the required level for the ALC (Automatic Level Control) detector, and the level for the recording amplifier. The time constant for the ALC detector is specified with R3605 and C2602 on pin 77. R3634, R3640, C2626 and C2627 define the frequency response for the recording amplifier. The output for the recording amplifier is pin 7. The recording current is then added to the bias current via resistor R3642 and flows via the audio head to pin 4, where an electronic switch in the IC is closed.

In longplay mode, the frequency characteristic is adjusted using the RC network R3635, R3641, C2630, C2631 for the recording amplifier.

The coil L5600 and transistor T7608 create the erasing oscillator for the main erasing head, audio track erasing head and generate the bias current for the audio head. The bias current is set using potentiometer 3625.

To prevent spikes, the erasing oscillator is switched on slowly. This is realized using the switching stage T7603, C2609, R3611 and R3613.

Audio linear playback

During playback the switch [T7604, T7607] controlled by pin 99 is closed. The playback signal from the head is amplified in the equalizer stage (time constant between pin 1 and pin 3) and conveyed on pin 1. Resistor R3633 and capacitor C2619 determine the head resonance during playback.

In longplay mode the frequency characteristic is adjusted for playback using R3627 and C2617.

The output of the playback amplifier (pin 1) is passed via the filter R3632, C2623 on pin 100, where an electronic potentiometer set the playback level via the I²C bus. The amplifier and head tolerances are equalized here. The amplification (playback level) can be adjusted via the software control (I²C bus) in service mode.

Audio linear muting

The mute stage in the linear audio part of the IC LA71595M [7004-A] is controlled by the combination control line MTA_CROT which is connected on pin 10 (VS part). The mute stage is activated by shifting the CROT control signal (square-wave pulse 1.7 V_{pp}) in the upper direct voltage range (> 2.2 V).

9.7 Receiver part TU1,TU2 (SSB)

The TVCR receiver part design permits both a 1-tuner front end and a 2-tuner front end to be realized using component options. The second tuner and the relevant front end circuit sections permit the VCR and TV parts to receive transmissions from the applied aerial signal independently from one another.

9.7.1 Front end 1 (TV tuner)

The first tuner on the SSB, pos. 1700 is designed as a single or splitter tuner combination. With a two-tuner device, the splitter divides the incoming aerial signal into signals for the TV tuner and the VCR tuner connected using a short HF cable connection.

The front end 1 comprises the following parts :

- Tuner
- IF amplifier & video demodulator in the IC TDA 935X, [7200] with FM-PLL demodulator
- AM audio demodulator IC TDA 9830, [7720]
- FM audio demodulator IC U2861B,[7725] for PAL I

The relevant component options can be found in the version list and the circuit diagram.

The IF signal from tuner 1, pin 11 is provided for demodulation via OFW pos. 1710 to the front end part of the TV ICs TDA 935X, pos.7200-B on pins 23 and 24. The OFW 1711 in B/G-D/K versions switches the pass band characteristic over depending on the position of the sound carrier. The IC pos.7200 TDA 9350/60/80 demodulates video signals in the standard PAL B/G, PAL I and audio signals PAL B/G. The IC TDA 9351/61/81 also demodulates video signals in the standard SECAM D/K,L,L'. The demodulated video signal and the FM audio intercarrier signal appears on pin 38.

The FM audio intercarrier signal on pin 38 reaches the filters pos. 1701, 1725, 1750 via a driver stage pos. 7730, and is passed to the audio demodulation, freed of video components.

FM audio intercarrier signals B/G and D/K are passed to the TV-IC on pin 32 of the audio demodulation. Via the AUDIOOUT pin 28 and the amplification stage 7733, the NF audio signal is fed to the FE audio output signal AFV1.

PAL I FM audio intercarrier signals are fed to the demodulator IC 7725 U2861B on pin 3 for audio demodulation. The NF audio signal is conveyed to the FE audio output signal AFV1 via pin 12.

The AM audio required for the SECAM L,L' TV standard is obtained from the IC TDA 9830 pos. 7720. To do this, the IF coming from tuner 1 is connected using the control line SB1_1 to the relevant input on the OFW pos. 1720 for selection (pin 1 SEC L' 40.4MHz/pin 2 SEC L 32.4MHz). The demodulated AM audio signal exits the IC 7720 pin 8 and is conveyed to the FE audio output signal AFV1.

The video trap pos. 1730 frees the video signal from sound carrier remainders. For SECAM L,L' signals the video trap is circumvented by the switch 7731. Via emitter follower pos. 7732, the front end video signal reaches VFV1 for further processing. The TV-IC has an AFC which does not require any adjustment. The HF AGC is adjusted using the service menu.

Front end 2 (VCR tuner)

From the splitter in tuner 1 comes the aerial signal to tuner 2 on the SSB Pos.1760. The IF signal from tuner 2 is processed by demodulator IC of type TDA9817T/18T pos.7770. The demodulator is used to demodulate pos. or neg. modulated picture carriers.

9.7.2 The front end 2 comprises the following parts :

- Tuner
- IF amplifier & video demodulator in the IC TDA 9817, [7770] with FM-PLL demodulator
- IF amplifier & video demodulator in the IC TDA 9818, [7770] with FM-PLL and AM demodulator

The relevant component options can be found in the version list and the circuit diagram.

9.7.3 IF selection

The IF frequency of the picture carrier is 38.9 MHz for all systems except SECAM L' (33.9MHz). For PAL BG-SECAM DK and for PAL BG/I-SECAM L/L' a quasi-split sound system is used; i.e. for picture and sound carriers, separate surface wave filters (OFW) are required [1765, 1766]. For all other standards an intercarrier system is used, i.e. for picture and sound carriers a common OFW with sound staircase can be used [1765].

9.7.4 IF demodulator

TDA 9818

The IF signal from tuner 2 is processed by demodulator IC of type TDA 9818 [7770]. The TDA 9818 is used to demodulate pos. or neg. modulated picture carriers. For the best possible video signal performance the IF signal is conveyed via an OFW [1765] depending on the standard. The sound IF carrier is selected in the audio OFW [1766] which is switched over for SECAM L'. The output signal for this OFW is further processed in the TDA 9818. FM carriers are converted from the IF level into the audio IF position and further processed in the sound demodulator. The AFC coil [5768] on the TDA 9818 is adjusted so that when a signal is supplied to the IF output of the tuner with a frequency of 38.9 MHz, the AFC voltage on pin 17 on the TDA 9818 is at 2.5V. The setting of the picture carrier frequency for SECAM L in the TDA 9818 is achieved by connecting pin 7 of the IC to earth via resistor [3772]. The AFC voltage on pin 17 TDA 9818 should then also be 2.5V at 33.9 MHz.

The HF-AGC is set using the AGC controller [3773] so that with a sufficiently large input signal (74 dB_{μV}) the voltage at the IF output on the tuner [1760-Pin 11] is 500 mV_{pp}. The setting must be carried out when the audio carrier is switched off. The demodulated video signal appears at pin 16 [7770]. The video trap [1767] creates a reduction in adjacent channel and sound carrier remainders in the video.

TDA 9817

As for TDA9818, without the processing option for AM audio and positive video modulation (SECAM L,L').

9.8 Video input/output

HPAV,IO_1,IO_2,TU1,TU2,TV_VP,VS (SSB)

9.8.1 Block diagrams

Video branch 1tuner

Video branch 2tuner

The entire video-in/out processing can be divided into three selectors:

a) View selector:

This selector is primarily located in part of the TV [7200] (View Selector 1) where either tuner1 (VFV1 / PIN 40) or an external signal (VVIEW / PIN 42) is selected. The selected signal is forwarded to the picture tube in the TV-IC. The data decoding for Teletext and OSD is carried out internally. The second part of the view selector is realized using a selector switch [7580] (HEF4052). This selects either the signal from the front socket (VFR), from the Scart (VSCIN) or the output from the signal processing (VPB, IC7004-PIN 29) and is connected from the AIO [7899] via the VS1 and VS2 control lines. The selected signal then passes directly to the external input on the TV-IC. For certain device conditions, a mute feature can be realized by selecting IC7580-PIN 12. For devices with only one tuner the second view selector is not fitted. In this case, the output on the signal processing (VPB) is connected to the external input on the TV-IC.

b) Record selector:

This entire selector is located in the video signal processing [7004] and is controlled using the bus lines SCL/SDA from the AIO. The selection is carried out from the signals from Scart (VSCIN / PIN 38), front cinch (VFR / PIN 34) and the front end (VFV1_2 / PIN 36).

The selected signal is available on PIN 32 [7004] and is used on PIN 31 [7004] for the internal processing or as the VREC signal for the Secam signal processing. Depending on the device type, the VFV1_2 signal either represents the front end video for tuner1 with 1-tuner devices or tuner2 with 2-tuner devices.

c) Output selector:

This is used to select the signal on the Scart socket. The switch is part of an HEF4052 [7524] (second part for audio) and is controlled via SCO1 / SCO2 by the AIO [7899]. The selection is made from the video signals VFV1 (tuner1), VFV1_2 (tuner2, if fitted) and VPB. For certain device statuses, a mute feature can be realized by selecting IC7524-PIN 11. The selected signal (IC7524-PIN 13) is amplified using transistor stage [7520/7521] by a factor of 2 (equals 6dB) and output on PIN 19 / Scart via [3524/3525] (75? source impedance).

For devices with two tuners, there must not be any DC step changes during the switchover. For this reason, both signals (VFV1 and VFV1_2) are connected to the switch via clamp transistors [7525/7526] and emitter follower [7527/7528]. Diodes [6530] and [6531] are used to improve the crosstalk characteristics.

9.9 Video signal processing VS,VS_SEC (SSB)**9.9.1 Switchover functions on the signal electronic ICs LA71595M [7004-B]:**

The signal electronics IC LA71595M [7004] are controlled by the AIO via the I²C on pins 23 and 24.

As groups 5 and 6 are only transferred with an HP1 change, it must be ensured that for measurements the HP1 line is always connected to the SE-IC or is replaced by the corresponding signal.

REC/PB via IIC Bus

During RECORD pin 30 must be connected at 5V via [7009] (IREV=LOW) to switch on the video write current stages.

PAL/SECAM/MESECAM/NTSC via IIC Bus**SP/LP/SLP via IIC Bus****VIDEO INPUT SELECTOR SWITCH via IIC Bus**

Via the IIC Bus a distinction is made between the signals VFR (pin 34), VFV1_2 (pin 36; tuner 1 in 1-tuner devices or tuner2 in 2-tuner devices) and VSCIN (pin 38).

VIDEO ENTRY

Using the feature frame pulse signal (FFP) on pin 26, the artificial picture pulse is entered for playback features. A test image can also be created.

Loop through < 0.8V

Test picture = 1.2 ... 3.8V

Artificial picture pulse > 4.2V

LP/SP head pair changeover

The changeover between the long play head pair (LP) and standard play head pair (SP) is made via the HSC signal (pin 25).

4/x scanner in playback: SP head pair: 0V <= HSC <= 0.8V

LP head pair: 1.2V <= HSC <= 2.8V

2/x scanner in playback: always 3.2V <= HSC <= 5V

Head changeover

The video head changeover is carried out using the HP1 signal (pin 11).

In order to keep the audio linear interference as low as possible, the HP1 polarity should be selected as inverse and the HP1 level the same level as for the CROT signal pin 10.

PB: SP1 / LP1: 1.2V <= HP1 <= 2.8V

SP2 / LP2: 0V <= HP1 <= 0.8V

Envelope curve comparator

If the ENVC signal (pin 94) is HIGH, the FM envelope curve on the LP head is larger than the SP heads and vice versa.

9.9.2 Recording :**Luminance**

The input signal is connected in the IC [7004] and is available uncontrolled on pin 32 as VREC (for SECAM chroma processing and VPS/PDC-IC). Via an electrolytic capacitor [2036] it reaches pin 31. In the IC [7004] the video signal first goes through an amplification control process (time constants determined by C [2035]). After the AGC the video signal reaches the terminal stage FBC (feedback clamp), then the video signal divides on 3 paths:

- *Loop through signal path:* The video signal is amplified by 6dB after the video keying and is available controlled on pin 29 as a VSB signal (OSD keying, data slicer -> I/O, front end,...).
- *Y-REC path:* The video signal passes via a 3.5 MHz low pass filter to the vertical emphasis comprising the YNR block (part of this circuit block is used in REC for the vertical emphasis), a 1H-CCD delay line integrated into the SE IC [7004-C] and an external emitter follower [7006]. This vertical emphasis can be switched via IIC and is only active in LP. The Y-signal before the 1H-CCD can be measured on pins 43 and 45 on the IC [7004-C] (separated only by coupling electrolytic capacitor). The Y-signal after the 1H-CCD is fed back from pin 46 IC [7004-C] via the emitter follower [7006] on pin 41 IC [7004]. After the vertical emphasis the Y-signal runs via pin 21 [7004], the emitter follower [7008] (the filter at the base of the emitter follower has no function in REC mode, due to the low resistance of the output stage pin 21 [7004]), via pin 20 [7004] and a terminal stage to the detail enhancer. After this the Y-signal is conveyed to the non-linear emphasis, the linear emphasis (time constant via pins 18, 19 - because of the low resistance of the of pin 18 output stage and the transistor [7010] used for impedance decoupling, the linear emphasis does not affect the FM playback all-pass network) and the white/dark clipping stage. The signal generated in this way then triggers the FM modulator directly. The FM-Y-signal generated in this way is conveyed via the REC-EQ filter and the REC-FM-AGC1 to the Y/C addition point. The FM-Y-signal can be measured after the REC-EQ filter on pin 12 [7004].
- *Chroma - REC path:* see Recording chrominance PAL

Chrominance PAL

The chroma signal is separated from the video signal after the terminal stage FBC (see "Recording Luminance") by the band pass filter BPF1 and reaches the ACC stage via a delay unit (D.E.) and a low pass filter (LPF). The ACC amplifier stage controls the chroma amplitude for the subsequent stages (time constant via capacitor [2038] an PIN 14 [7004]). The chroma signal is then conveyed to the main converter (main conv.). The main converter mixes the 5.06MHz subcarrier with the 4.43 MHz chroma signal to the 627kHz chroma FM signal. The subcarrier is a mixture of 4.43MHz (the REC APC time constant on pin 65 compares quartz and burst frequency) and $(40 + 1/8) f_H = 627\text{kHz}$ (generated by $321 f_H - \text{VCO}$ equals $8(40 + 1/8) f_H$, time constant pin 60/62 and phase rotation conforming to the VHS standard, control pin 10 [7004] (CROT)). Via a low pass filter (C_LPF) and the color killer stage (KIL), the converted chroma signal reaches PIN 72 on the IC [7004], where it is added directly to the Y FM signal internally in the IC via a capacitor [2007]. The color killer can either identify the incoming signal itself (PAL yes/no, PAL: chroma signal out, SECAM L: chroma signal killed) or set via the I²C bus to PAL, MESECAM or SECAM L. The quartz oscillation (pin 66) is used for chroma processing, in addition to the reference frequency, and also for generating the pulse frequency for the combi-CCD pin 49 integrated into the IC [7004].

MESECAM

The signal path is virtually identical to the path for PAL.

The differences are:

No phase rotation.

The filter characteristic for the chroma band passes becomes wider.

Free-running quartz frequency.

SECAM L

The video signal (VREC) from the SE IC pin 32 [7004] passes via the SECAM L SE IC pin 15 [7072] and via a band pass filter (4.3MHz BPF-A) to reach the cloche filter (CA filter components PIN 21), which reverses the emitter-side Hf pre-emphasis. The C-signal is then limited (LIM, time constant pin 18) and divided to 1/4 of the frequency in the frequency divider. In SYNC GATE the C-signal is suppressed during the H-sync. period. The harmonic waves created during the division by four and the gating are suppressed in the band pass filter (1.1MHz BPF) and then prepared in the anti-cloche filter (filter components pin 8) for VHS standardized recording. The setting resistance [3088] located on pin 10 [7072] can be used to set the amplitude of the REC-chroma signal pin 11 [7072]. This REC-chroma signal, after an external trap (3.9MHz, suppression of the 3rd harmonic in the low frequency REC chroma), passes via transistor [7077] as a CSR signal to SE IC pin 72 [7004] and is added to the FM-Y signal in the SE IC.

As the SECAM SE IC (LA7339A) has an automatic cloche and anti-cloche equalization, only the REC-chroma signal level now needs to be set.

FM Signal

After the addition of the FM-Y signal and C-signal, this FM signal is adjusted by the REC-FM-AGC2 controlled by the IIC bus to the preset amplitude (reference: pin 74 [7004] resistor [3009]). The head pair selection is carried out via the control line HSC.

9.9.3 Playback:**FM Signal**

The FM signal coming from the scanner is amplified by around 60dB. Depending on the level of the HSC and HP1 line, the amplified FM signal is connected on pin 74 [7004]. The envelope curve signal for the currently active head (TRIV) is output on pin 93 [7004]. In addition, the envelope curves for the SP and the LP head currently being read from the tape are compared and output as an ENVC signal. The FM signal (FMPV) present on pin 74 [7004] is used internally for Y, SECAM, MESECAM and NTSC M/N playback and externally for SECAM playback.

Luminance

The FM playback signal is first adjusted to a constant level in the AGC stage and filtered in the FM processing (PB-EQ). The signal exits the IC [7004] on pin 18, passes via an emitter follower [7010] with trap (1.07MHz - only in SECAM devices - in order to suppress extra chroma remainders externally) to a phase shifter [7003] and reaches pin 17 once again in the IC [7004]. The FM-Y signal limited using the double limiter is demodulated (FM-DEM) and filtered using a low pass (SUB_LPF). The demodulated Y signal is also affected by the recording-side pre-emphasis. This now removes the linear de-emphasis at the base of the emitter follower [7008]. The filter circuit is effective, as pin 21 [7004] becomes an open collector output in playback mode, whose load impedance is determined by the de-emphasis circuit. The Y signal is then terminated after the E follower (Pin 20 [7004]), filtered using a low pass, and carried by the vertical noise canceller or dropout compensator (Y.N.R.). To do this the Y-signal exits the IC [7004] (out: pin 43, in: pin 41) and is delayed in the internal CCD by 1H. The CCD-1H delay line is effective for the Y signal first as a comb filter (vertical noise

suppression) and secondly as a line storage device for the dropout compensation. The subsequent switching stages are: The non-linear de-emphasis (NON_LIN DE_EMP), horizontal noise canceller (N.C.1 / N.C.2) and the picture control switching to the increase in edge steepness (PIC_CTL ANR; sharpness). The chroma signal is then added to the luminance signal (Y/C MIX) and output as a FBAS signal via a clamping (FBC), the video keying (CHARA INSERT) and a 6dB amplifier (6dB_AMO) (pin 29 [7004]).

Chroma PAL

From the FMPV playback signal the 627-kHz chroma signal is filtered using a low pass (C_LPF). The ACC amplifier amplifies and controls the chroma amplitude. To reduce the low frequency chroma flickering, an additional capacitor [7060.7062] is connected during playback for each video head. The switchover is carried out using the CROT control signal. During feature mode, no capacitors are connected (CAGC = High) to ensure fast chroma control.

In the main converter (MAIN CONV), the chroma signal is mixed with 5.06 MHz back to the original 4.43 MHz. The 5.06 MHz are produced in playback from the free-running quartz oscillator and from the $(40+1/8)$ fH = 627 kHz frequency derived from the 321fH-VCO. After the main converter, the chroma signal is mostly freed of crosstalk from additional traces using a 2H comb filter (internal CCD connections: pin 57 -> 54; pin 59 -> 52 and pins 51 -> 61). The chroma signal is then filtered using low pass (LPF), checked by the color killer, filtered once more by a band pass, looped through pin 72 and 71 and then added to the Y signal.

Chroma MESECAM

The signal path is virtually identical to the path for PAL.

The differences are:

No phase rotation.

The comb filter is not active.

Chroma SECAM L

During playback the FM signal is passed from the tape via pin 74 [7004] and an emitter follower [7002] (FMPV) to pin 13 [7072], adjusted in the AGC for the amplitude and conveyed via the same band pass (1.1MHz BPF) as for recording. The NF pre-emphasis for recording is then reversed using the cloche filter (external filter components pin 8; these are the same components as for recording). In the following stages the frequency of the signal is doubled, filtered using a band pass (2.2MHz BPF) and doubled once more. There is then another band pass (4.3MHz BPF-B) followed by the limiter (LIM) already used for recording. The signal is then suppressed once again during the H-sync. Period and conveyed through a band pass filter (4.3MHz BPF-A; also used in recording). Before the SECAM chroma signal exits the IC via pin 17 [7072], it is run through a Hf pre-emphasis again (anti-cloche; external filter components pin 21; these are the same components as for recording). After pin 17 there is a trap at 2.4MHz which suppresses the second harmonic of the chroma from the tape, a low pass filter which improves the harmonic of the high frequency chroma and a transistor [7073], the emitter on which is connected to pin 72 (CSR) on the SE IC [7004].

NTSC

During the playback of NTSC signals, the original NTSC chroma is converted into a 4.43MHz NTSC chroma signal. This necessitates a changeover in the chroma part internal in the IC:

The internal CCD is switched over to a 1H comb filter for crosstalk reduction. Line and picture frequencies remain unchanged in accordance with the NTSC standard. The result is a 60Hz NTSC Y-signal with a 4.43MHz NTSC C-signal.

PAL M,N

As for chroma PAL.

9.9.4 General

SECAM: Automatic cloche and anti-cloche equalization:

During the vertical blanking gap, an oscillator is formed using the external filter components (pin 21 or pin 8) for the cloche or anti-cloche and the resultant resonance frequency is divided and compared with a frequency derived from the 4.43MHz oscillation (reference signal from the SE IC [7004]). Depending on the deviation, fewer or more internal capacities are connected in parallel to the external cloche and anti-cloche filter components. This process is carried out during each vertical blanking gap and therefore also improves the temperature stability.

Chroma selection for REC and PB pins 71 and 72 SE IC [7004]: Both the PB and the REC chroma in PAL (MESECAM, PAL M/N) as well as in SECAM are conveyed into the SE IC [7004] on pin 71 [7004]. In all PAL and MESECAM modes the DC voltage at the base of the output emitter follower pin 72 [7004] is 3.2V and the two bases for the transistors [7077] and [7073] for the SECAM chroma signals are on 0V -> the PAL/MESECAM chroma signals are added to the FM-Y signal or to the PB-Y signal according to REC or PB. In SECAM PB mode only the transistor [7073] has 2.5V DC voltage at the base. In SECAM REC mode only the transistor [7075] has 2.5V DC voltage at the base.

9.10 TV signal processing TV_VP (SSB)**9.10.1 I²C bus controlled TV-IC TDA93xx (IC7200) (TV IC part of the ultimate one chip)**

The center of this switching part is the TV part of the UOC IC7200, the I²C bus-controlled PAL/NTSC/SECAM TV processor TDA93xx.

The most important integrated modules for video processing are:

- CVBS switchover
- Luminance delay line
- Chroma band pass filter with switchable center frequency
- PAL / NTSC / SECAM decoder
- HPLL

9.10.2 Differences between the individual IC versions (TV part) :

IC version	TDA 93x0	TDA 93x1
PAL decoder	X	X
SECAM decoder		X
NTSC decoder		X

General

The ultimate one chip (UOC) basically comprises a "Painter" (=Teletext+OSD+μP) chip and a TV IC chip in its own common housing with its own internal connection between the two chips.

The TV IC chips used in the UOCs can process different television standards depending on the type. These TV parts are sub-divided into chips with and without East-West image geometry processors. In the Epsilon TVCR, however, only types without East - West correction are used.

The following functional blocks are used for large signal processing:

- Sync pulse separation from the video signal selected
- Horizontal synchronization via two PLL control loops
 - a. φ1 control loop to achieve frequency synchronization with the video signal. The control voltage produced is filtered on pin 17.
 - b. φ2 control loop to adjust the phase angle of the screen content relative to the grid on the screen. The control information is output on pin 33 (H drive). The feedback signal (HFB) is input on pin 34.
- Horizontal soft-start and soft-stop function
- Soft start: For the first 100ms, the horizontal oscillator functions at 32kHz and then switches over to 16kHz. The soft start reduces the switch-on current peaks when starting up the horizontal deflection stage.
- Soft stop: The horizontal oscillator switches from 16kHz to 32kHz line frequency. In addition, the RGB outputs on pins 51, 52 and 53 are notched up to achieve a partial discharge of the picture tube. The soft stop period is dependent on the beam current and can last up to 100ms. The high voltage in the picture tube is therefore reduced to below 10kV and thus effectively suppressing the cold-cathode emissions (persistence after the picture tube has been switched off).
- Vertical divider: Synchronizes itself according to the vertical sync pulses and determines the scan time and the ramp-down time for the vertical ramp.
- Vertical saw-tooth voltage generator: Supplies symmetrical saw-tooth currents to pins 21 and 22. The steepness and the curved s-shape of these currents can be changed to a limited extent using the I²C bus.
- Beam current limiting stage: Evaluates the voltage available at pin 49 thus engaging and reducing the amplification in the brightness and contrast amplification which reduces the output voltages for the RGB stage on pins 51, 52 and 53.
 - Voltage on pin 49 >= 3.5V: Not involved in the brightness and contrast amplification stage.
 - Voltage on pin 49 between 2.5 and 3.5V: Contrast is reduced.
 - Voltage on pin 49 between 1.5 and 2.5V: Brightness and contrast are reduced.
 - During the vertical frame flyback time (approx. 0.8ms) the voltage on 49 needs to be < 3.65V, whereas the vertical scan time (approx. 19.2ms) < 3.65V. If these voltage values do not apply, this status is evaluated as an error in the vertical stage and the RGB output voltages on pins 51, 52 and 53 become as small as possible (RGB is blanked). This information is forwarded to the main controller AIO (IC7899) via the I²C bus, and the controller then switches off the horizontal driver stage in the TV-IC via soft-stop. This state protects the screen against excessive local heating if the vertical stage is defective (screen burn protection).
- Circuit-breaker evaluation and high voltage compensation stage: Evaluates the voltage level on pin 50. Voltages > 3.9V indicate a fault in the large signal range. If this level is exceeded, the horizontal output stage is stopped immediately, preventing reloading of the screen. Voltages between 1.5 and 2.5V on pin 50 engage and correct the vertical ramp. (Changes the vertical amplitude)
- RGB functional unit with automatic black value and color temperature stabilization: Black value and color temperature stabilization corrects high voltage-related and age-related modifications to the picture tube. The adjacent video signal on pin 40 or 42 is separated into the TV-IC into the Y and chroma components, passes through various function blocks depending on the television standard, the can then also be changed via the I²C bus in terms of brightness, contrast, definition and color temperature.

9.10.3 Beam current feedback control stage

The voltage on root capacitor C2535 is a precise reflection of the total of cathode currents flowing. This information is conveyed via an RCDT network to the TV part on the UOC (pin 49) which controls the brightness reduction stages internal to the TV-IC according to the voltage values.

9.10.4 OSD synchronization

The display is synchronized for the IC7200 (TV part on the UOC) via the horizontal sync (internal connection) and the vertical sync (internal). Due to this "external" (by the TV part of the UOC) synchronization, the display from the "Painter" part of the UOC is in "Slave Sync Mode". All display timings are derived from these signals. No artificial sync is generated due to the slave sync mode.

The keying of the RGB signals generated by the Painter part is carried out via the connections internal to the UOC.

9.10.5 Video signal processing

In the IC7200, the IF signal (IF-IN pins 23,24) is demodulated, runs through a video amp mute stage and exits the IC at pin 38. From there, the signal is conveyed further, as described in the Chapter Front end 1. The "internal" front end video VFV1 then reaches pin 40 (CVBS_INT). An additional video source for the internal switchover is the video to pin 42 (CVBS_EXT). The source selection is made in the IC using the CVBS switch controlled by the I²C bus. The Teletext decoder ("Painter" part in the UOC) receives the video signal via an internal connection.

9.10.6 Chroma signal processing

The filters used internally in the TV part are active filters which are calibrated automatically. The medium frequencies of the chroma band pass filter can be switched using the I²C bus to optimize it for the various input signals. The color decoder can decode PAL, NTSC and SECAM signals (depending on the IC type), has a color killer stage, and two demodulators for the color difference signals. The demodulated color difference signals are conveyed internally to the base band delay line to improve the cross color performance (comb filter effect).

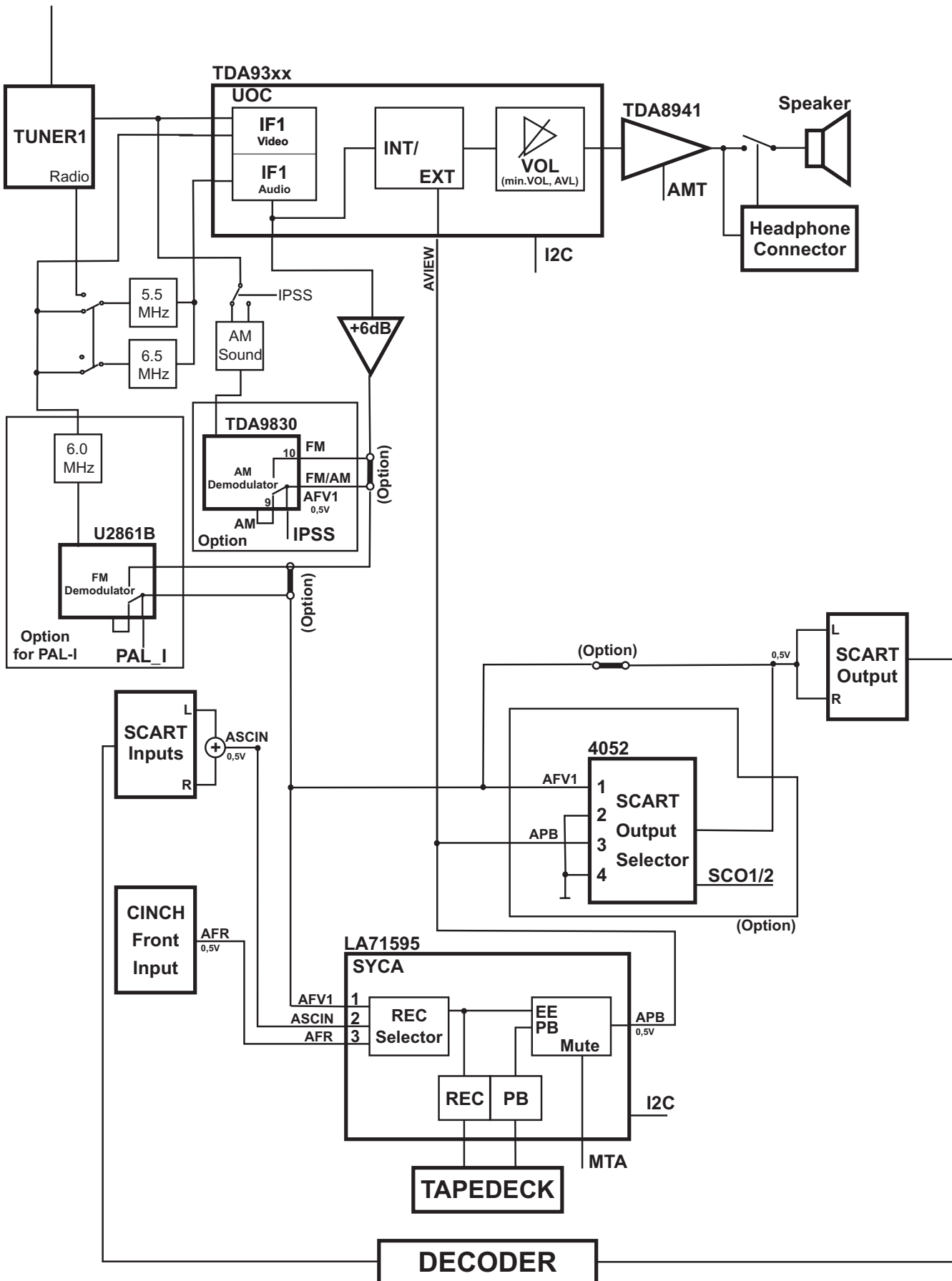
9.10.7 RGB signal processing

The RGB signals are formed via matrix switches from the luminance signal and the color difference signals. The TV part also has an RGB input stage (pin 46, 47, 48). These signals can be keyed using the fast blanking signal (pin 45). (RGB signals from the Scart sockets RED, GREEN, BLUE and blanking pulses). The RGB output signals (pins 51, 52, 53) are fed directly to the picture tube printed board via plug pos.1920.

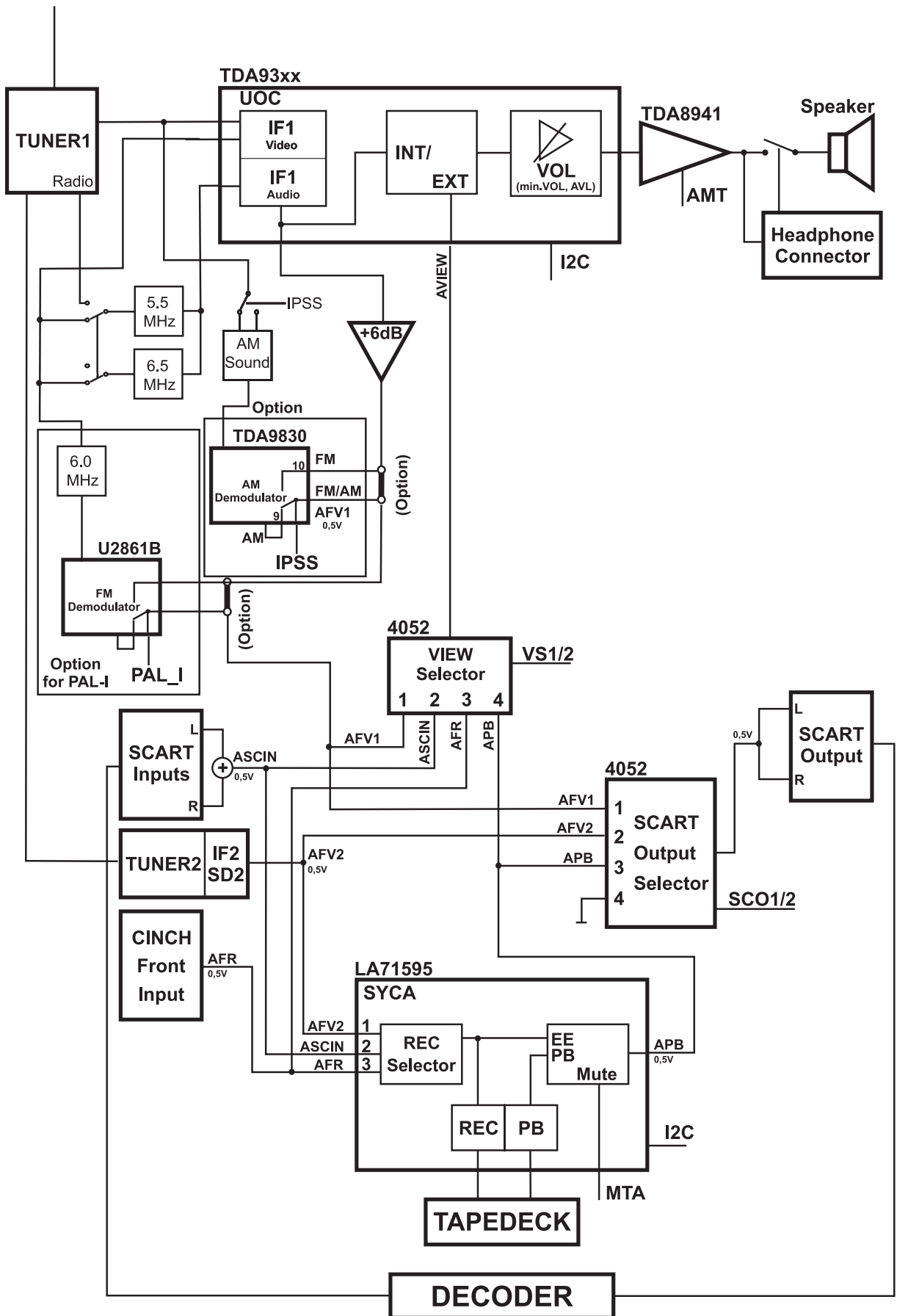
9.10.8 TV synchronization

In the TV part, the separated sync pulses are carried to the first phase detector ("φ-1 loop") and the coincidence detector. The coincidence detector is used to detect whether or not the line oscillator is synchronized. The "φ-1 loop" is used to synchronize the horizontal oscillator with the separated sync pulses of the selected video signal. The "φ-2 loop" corrects oscillations in the actual horizontal deflection depending on the beam current relative to the horizontal oscillator. For the timing of the vertical ramp, the vertical divider is used, which is synchronized to the vertical sync pulse.

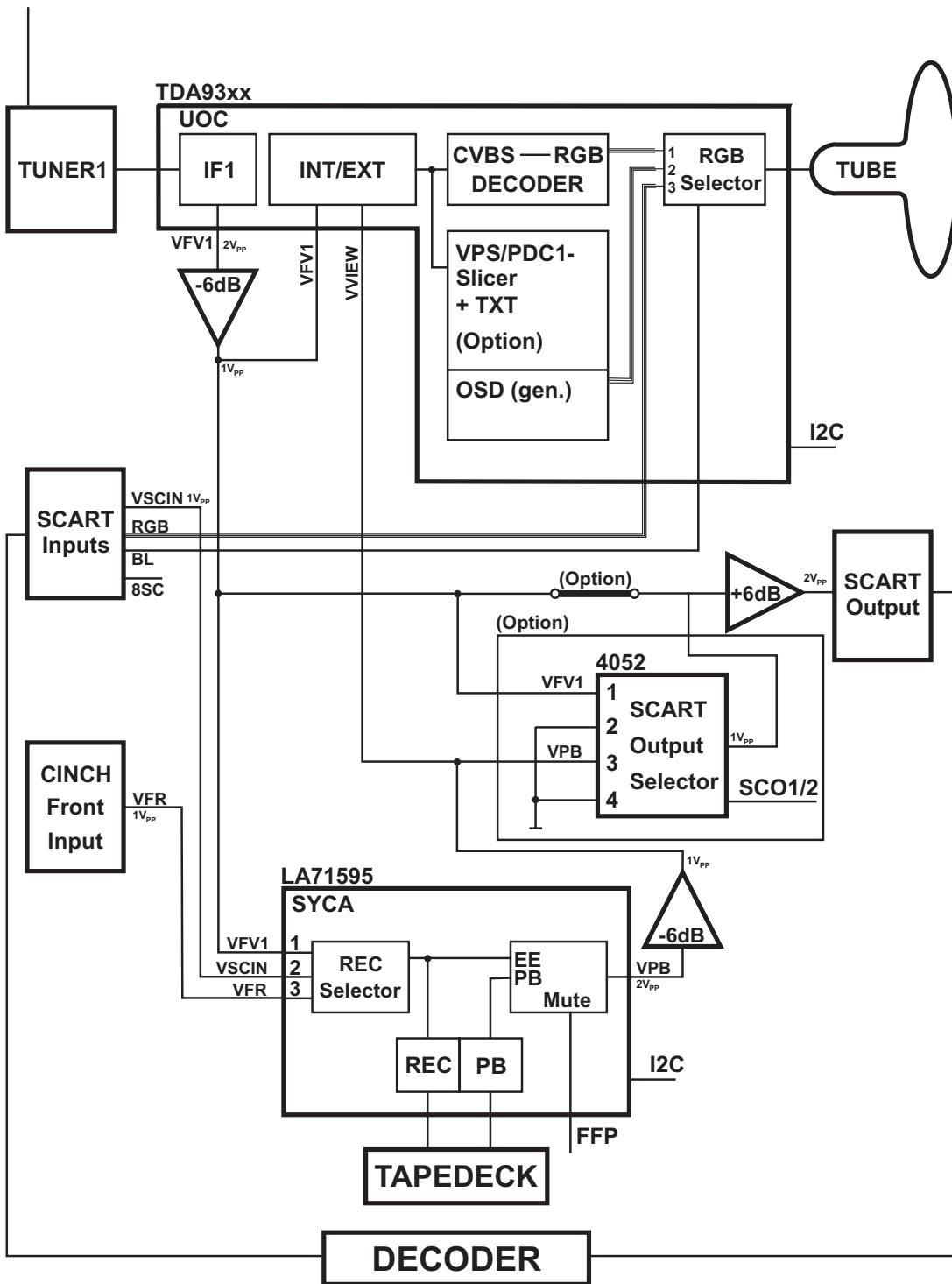
Audio 1 Tuner



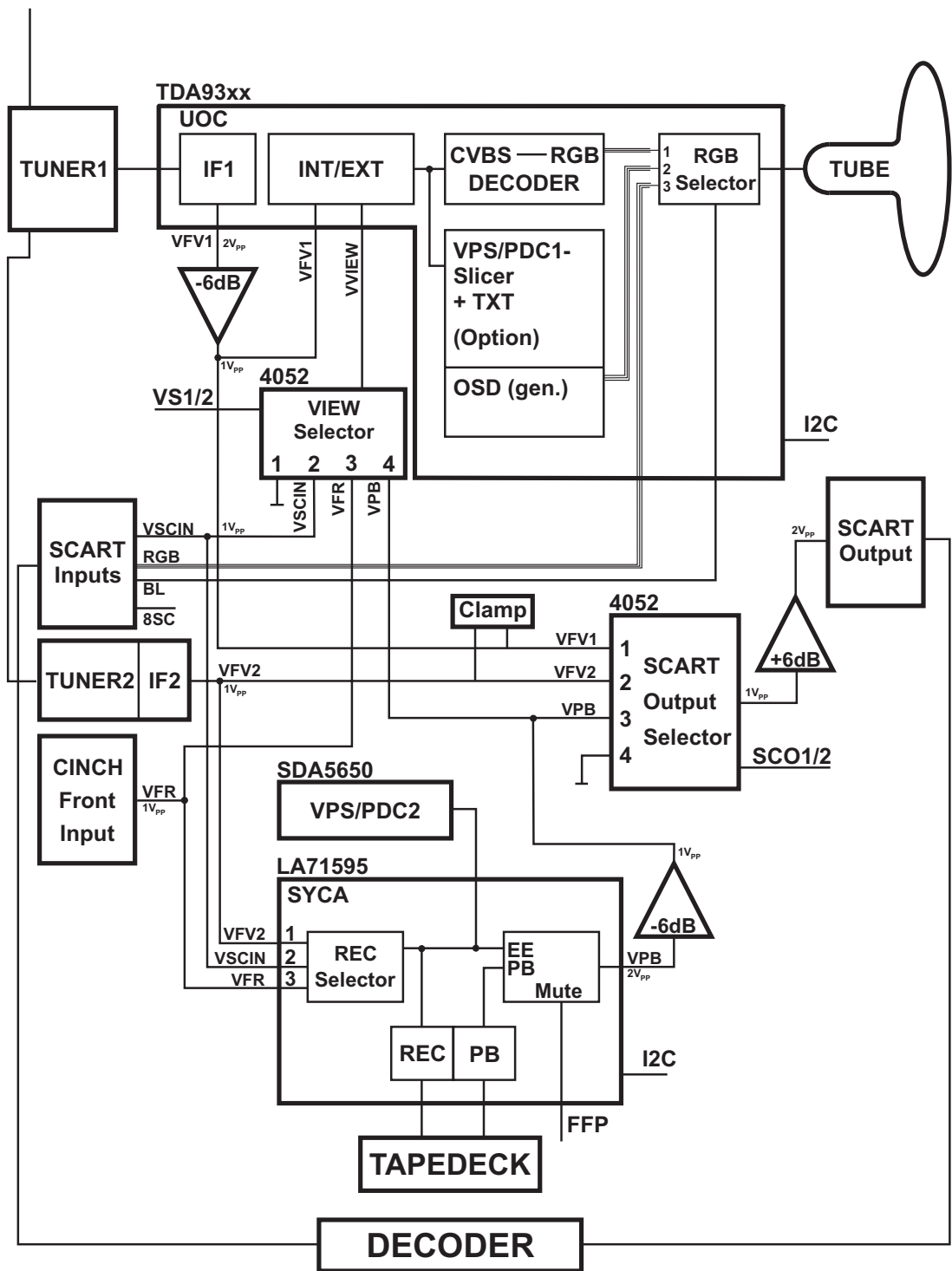
Audio 2 Tuner



Video 1 Tuner



Video 2 Tuners



9.11 List of Abbreviations

8SC1	Scart 1 pin 8 input	SDA_VP	IIC bus data VPS/PDC
ABS	Automatic black current stabilisation	STBY	Low Power Stand-by on/off
AEH1/2	Audio erase head	STBY-LED	Standby LED control
AFR	Audio from front connector	SYNC	Control track pulse Out
AFV1	Audio from frontend 1	SYNC	Control track pulse In
AFV2	Audio from frontend 2	TAE	Tape end detection
AGC1	Automatic gain control, tuner 1	TAS	Tape start detection
AMT	Audio mute	THIO	Loading motor in/out
APB	Audio mono playback	Timer-LED	Timer LED control
APH	Playback audio from head	TMO	Loading motor on/off
AQUADAG	Tube ground	TMO1/2	Threading motor connection
ARH	Audio record to head	TPS_1	Sound trap switch
ASCIN	Audio input scart 1	TRIV	Tracking information video
AUD_OUT	Audio from frontend	UBAT	Supply for high tension
AVIEW	View Select audio	UOC_Reset	Reset for UOC
B_CRT	Blue signal to CRT panel	VDEFH	Deflection voltage high
BCI	Beam current information	VDEFL	Deflection voltage low
BLSC	Blanking pulse RGB loophrough	VDRN	Vertical drive negative
BLUE	Blue signal	VDRP	Vertical Drive positive
BSDC	Busy Slow Data Command	VFR	Video from front connector
CAGC	Chroma Automatic gain control	VFV1/VFV2/	
CAP	Capstan control voltage	VFV1_2	Video from frontend
CREV	Capstan reverse	VISS	Control sync pulse inversion
CROT/MTA_CROT	Colour rotation on/off	VPB	Video from signal electronics
CSCP	Colour phase switching for LP feature mode	VMOD	Video to the modulator
		VREC	Video record from I/O
CSI	Colour system information	VS1	View Select 1
CSRP	Chrominance secam record/playback	VS2	View Select 2
		VSCIN	Video input scart 1
CSYNC	Composite sync pulse	VVIEW	View Select video
CTL1/2	Control track signal	W_R	Control track write/read
DEG1/2	Degaussing	WTLD	Wind tacho left digital
DRUM	Head wheel control	WTRD	Wind tacho right digital
EHT	High tension		
EHT_PROT	High tension protection		
ENVC	Envelope comparator signal		
FFP	Feature frame pulse		
FGD	Capstan tacho pulse digital		
FMPV	FM video playback		
FOCUS	Focus control signal		
FSC	Colour subcarrier		
FTAD	Threading tacho digital		
G_CRT	Green signal to CRT panel		
G2_SCREEN	Grid 2 screen		
GREEN	Green signal		
HDEF1/2	Horizontal deflection		
HDR	Horizontal drive		
HFB	Horizontal flyback		
HP1	Head pulse video		
ILED	LED-tower supply		
INIT	Deck switch		
IPOR	Inverse power on reset		
IPSS_1	Inverse PAL-SECAM switch, tuner 1		
IREV	Dubbing oscillator on/off		
IRR	Signal from remote control receiver		
ISTBY	Inverse stand by		
KEY_IN	Analog voltage from keyboard matrix		
MEH1/2	Main erase head		
MTA	Audio mute		
PAL_I	PAL I for tuner 1		
PBH	Pb-switch		
PG_FG	Head wheel position/-speed		
R-CRT	Red signal to CRT panel		
Record-LED	Record LED control		
RECP	Record protection		
RED	Red signal		
SCL	IIC bus clock		
SCL_VP	IIC bus data VPS/PDC		
SCO1	Scart output selection 1		
SCO2	Scart output selection 2		
SDA	IIC bus data		

10. Tape deck

10.1 Drive assembly

This tape deck has three motors; one providing precision drive for the scanner unit; the second providing direct drive for the capstan and belt drive for the reel tables; the third motor drives the lift and tape threading/dethreading operations.

Special features are:

- Quick start
- Short winding time
- Automatic cleaning of video heads by cleaning roller

To obtain a high repair standard we have developed a range of service kit's. These kit's covers the spare parts which are engaged together.

The tape deck's sensors are located on the motherboard underneath the tape deck, and included in its circuitry, lay out and parts list.

10.1.1 Deck parts replacement

The procedure for the removal and refitting of the following parts is described; only the lift, the scanner, the capstan motor and the A/C head are fixed by screws.

All the other deck assembly parts are held only by snap hooks.

For the replacement of parts on the underside of the tape deck, remove the tape deck from the motherboard.

Manual extraction of cassette:

If, after the Eject button has been pressed, the drive does not unthread and eject the cassette, the dethreading/eject operation can also be carried out manually by turning the wheel at the rear of the threading motor.

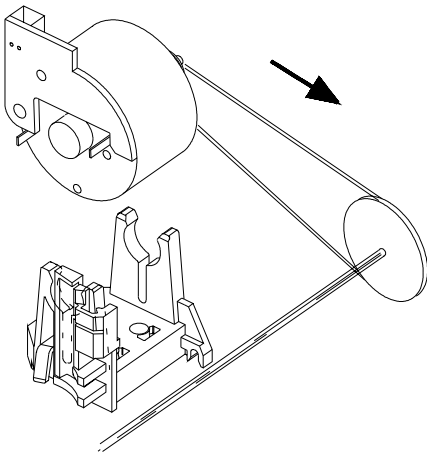
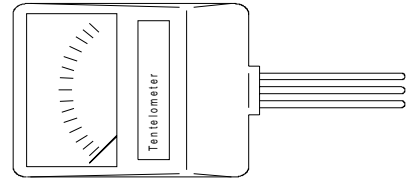


Figure 10-1

IMPORTANT:

After each repair has been carried out in the drive assembly, the first operation after repairing must be to bring the cassette compartment into „eject“ position by hand.

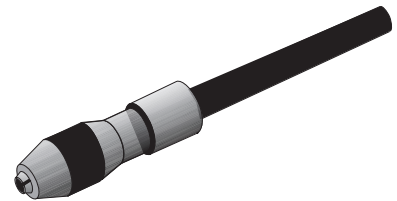
Auxiliary tools for deck adjustment:



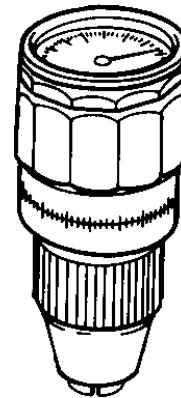
Tentelometer 4822 395 90584



Tool for tapetension adjustment 4822 395 50188



Handle 4822 256 90493



Torquemeter: 600 gf-cm 4822 395 90232
90 gf-cm 4822 395 80196



Post adjustment screwdriver 4822 395 50275

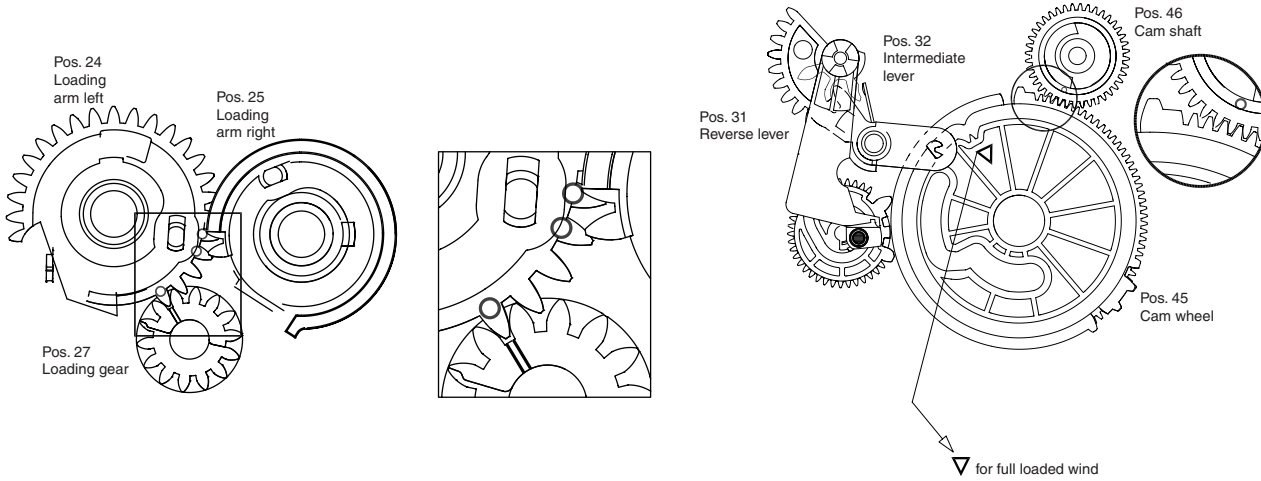
Testcassette 4822 397 30103

Nylon gloves 5322 395 94022

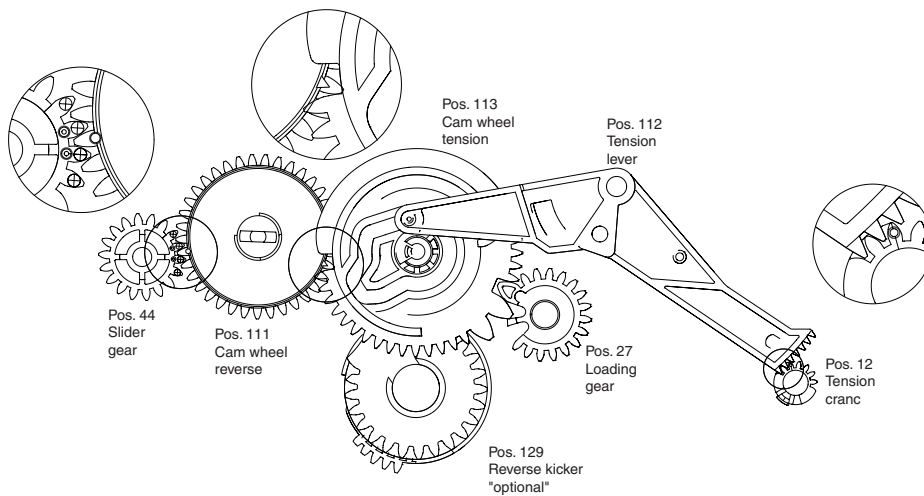
10.1.2 Deck layout diagram

Deck in position „threaded out“. The following diagrams indicate the relative position of the gearwheels and levers when the deck is in the threaded out (cassette-compartment down) position.

Top view



Underside view



10.1.3 The lift

Refitting the lift compartment:

Ensure the lift compartment is down and gear A is rotated one click stop anticlockwise from the down position. The removal and refitting of the lift can be carried out in all deck positions with the exception of „eject“ (ensure that gears 103/105 are free and if present the cassette loader gear 2 pos.105 is positioned to the rear).

To remove the lift:

Free the holding bracket (see figure 10-2) by rotating it up and back from the upper end. Unscrew the 4 screws on the underside of the deck. Carefully remove the lift vertically, noting the position of the record protect operating lever.

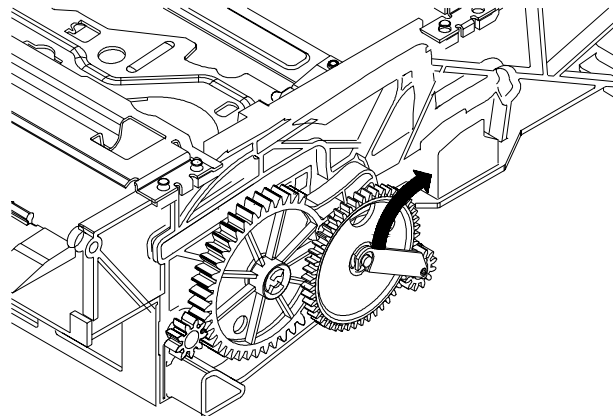


Figure 10-2

10.1.4 Scanner replacement

Removal:

Nylon gloves should be worn when handling the head disc.
Remove the deck from the set/mobo.
Unscrew the three scanner screws on the underside of the deck.
Pull out the scanner from the top. (see figure 10-3)

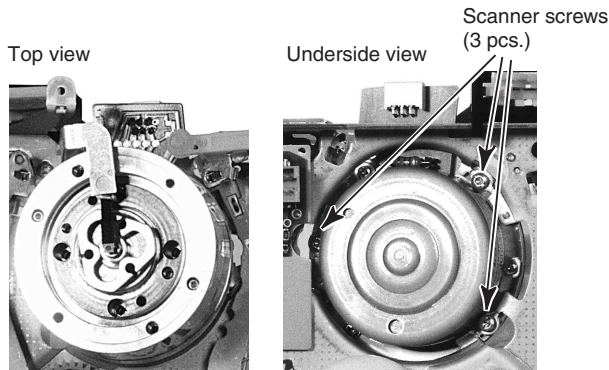


Figure 10-3

Installation:

Insert the scanner (with protective cover) carefully from top.
PCB and flex foil to the rear.
Be shure that the scanner is engaged to the referenc pin located on the chassis.
Turn the tape deck, holding the scanner in the deck by hand and fix it by use of the tree scanner screws.
Remove carefully the protective cover from top.

After replacing the scanner, carry out the following adjustments and checks:

Head switching puls.
Writing current adjustment.
Tape path alignment.
Check and adjust if necessary.

10.1.5 A/C Head (Combi head) (Pos. 36)

Remove the fixing spring (A) (see figure 10-4)
Remove the fixing screw and replace the A/C head.
Use a new fixing spring (included with new A/Chead) for reassembly.

After the A/C head has been replaced, all adjustments described in paragraph "A/C Combi head" and paragraph 10.2.2 have to be carried out.

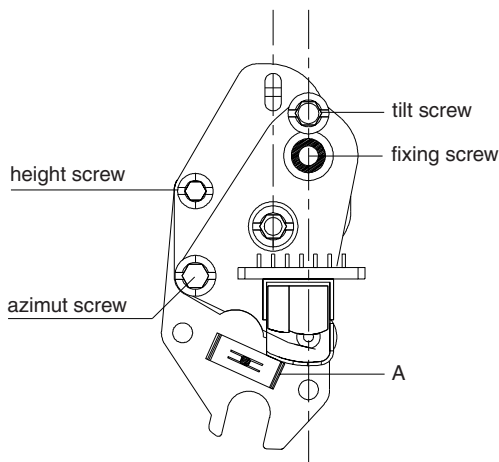


Figure 10-4

10.1.6 Threading motor (Pos. 38)

Remove the belt and disconnect the connector plug.
Remove the threading motor from the motor supports (see figure 10-5).

During reassembly ensure that the threading motor is correctly located in the front and rear supports.

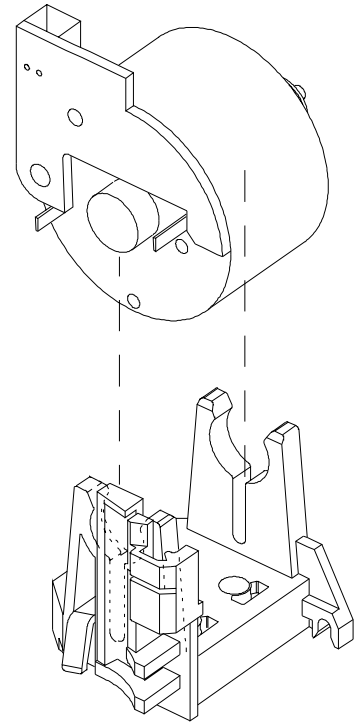


Figure 10-5

10.1.7 Capstan motor (Pos. 127)

Remove the tape deck.
Remove the belt (pos.126) on the underside;
Remove the three capstan motor fixing screws (see figure 10-6) and withdraw the capstan motor downward from the drive assy.

The reassembly is carried out in reverse order. Make sure that the capstan is free of grease.

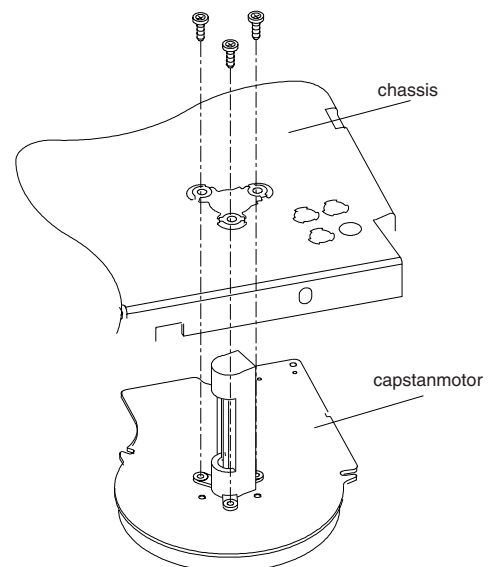


Figure 10-6

10.1.8 Pressure roller (Pos. 37)

Remove the tape deck.

Unhook and remove the pressure roller tension spring. Release the pressure roller guide (pos. 41) from the guide in the threading motor holder by pressing the top of the motor guide rearwards and rotating the pressure roller guide assembly clockwise by approximately a quarter of a turn (see figure 10-7). The pressure roller and guide can now be lifted clear.

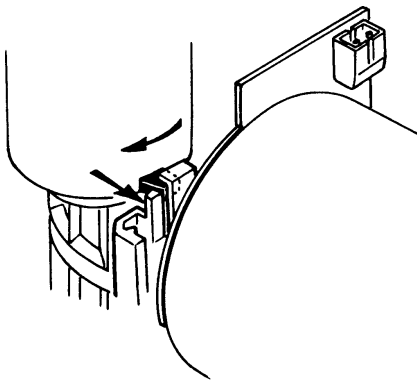
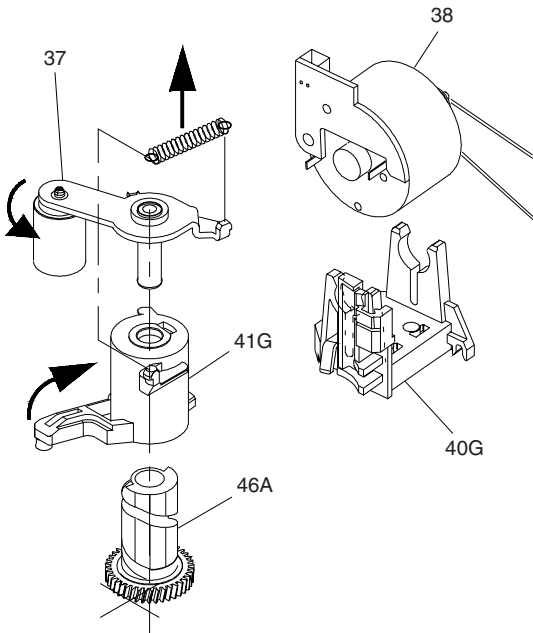


Figure 10-7

Ensure that no grease from the pressure roller guide gets to the capstan or pressure roller. The reassembly is carried out in reverse order.

10.1.9 Roller unit right (Pos. 26)

Remove the tape deck.

Compress the two snap hooks by means of a pair of tweezers and remove the roller assy from the roller unit right (see figure 10-8).

Unhinge the loading arm right from the holding plate and push the latter towards the front of the deck to remove from the guide (right).

NOTE:

During reassembly ensure the link from 25 is engaged in the hole of the holder plate 26.

After replacing the roller unit (right), the tape path has to be checked, and adjusted if necessary.

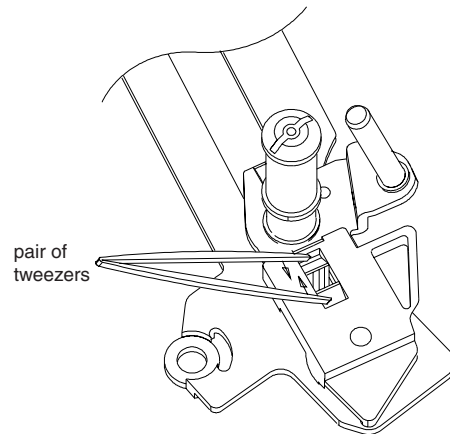


Figure 10-8

10.1.10 Roller unit left (Pos.23)

Set the drive assy to „Eject“ position.

Unhook the tension arm spring (pos. 11), to avoid the tension arm spring being pre-loaded.

At the bottom side of the drive assy remove the tension lever (pos.112).

Compress the two snap hooks by means of a pair of tweezers and remove the roller assy (A) from the plate (B).

Unhinge the loading arm (left) from the holding plate and remove the latter downward from the drive assy through the recess in the chassis (see figure 10-9).

The reassembly is carried out in reverse order.

NOTE :

During reassembly

1. Place the carriage holding plate in the assembly with the half-round cutout nearest the rear of the deck.
2. When the loading arm is refitted ensure the pin on the underside of 23 is through the link of 24B.

After replacing the roller unit (left) the tape path has to be checked (see division 10.2.1 Tape path), and adjusted if necessary.

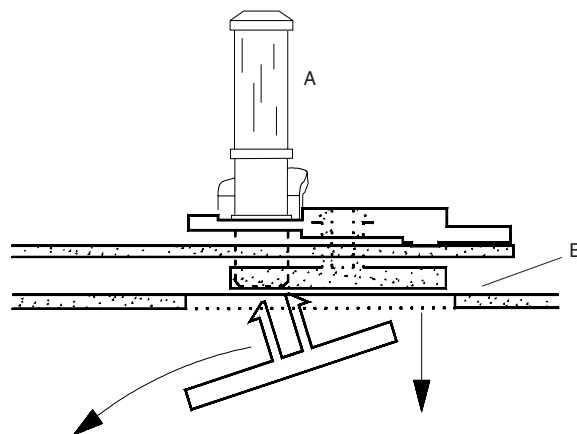


Figure 10-9

10.2 Adjustments

Adjustments must not be made in the service position.

10.2.1 Tape path

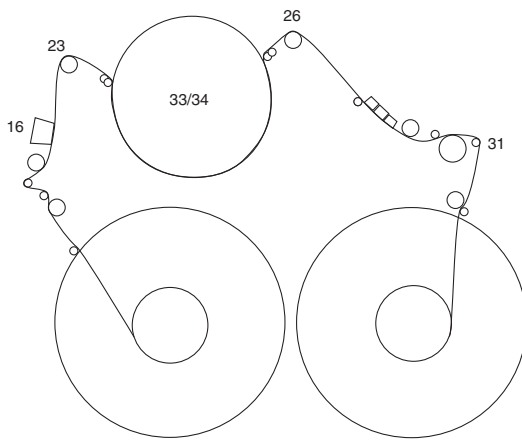


Figure 10-10

Roller left unit/roller unit right

Preparation:

Connect one input of a dual trace oscilloscope to observe the tape sync pulse CTL. The other input (DC coupled) to observe the tracking information TRIV.

Trigger the oscilloscope externally on the head pulse HP1 ("SWIN").

Playback the black and white section of the alignment test tape.

Set the deck in the condition where the video heads are running along the upper edge of the tracks only by:

- Activate manual tracking (press up or down button for more than 3 seconds) and watch the tape sync pulse move to the left in relation to the TRIV signal.
- Note the extreme left hand position reached by the sync pulse, repeat as necessary.
- Stop the movement of the pulse when the TRIV signal reduces to 1/2 to 2/3 maximum amplitude by pressing the normal play button. A noisy picture (disturbances) is visible on the TV set and the CTL pulse should be to the left of the display.

The recorder will hold this position until the next "eject" is carried out.

This condition works only if X-distance is adjusted.

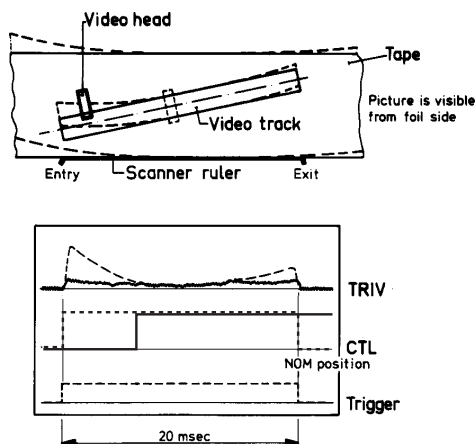


Figure 10-11

Adjustment:

Adjust the left and right roller units to make the tracking signal TRIV straight and flat as possible (see figure 10-11).

A/C Combi head

Tilt angle adjustment

Set the drive to feature mode (e.g. +7)

Adjustment :

By means of the tilt angle adjusting screw move the tape until the lower edge just touches the tape guide A1 (see figure 10-12) the tape must not be distorted at the lower edge (by pressing onto guide).

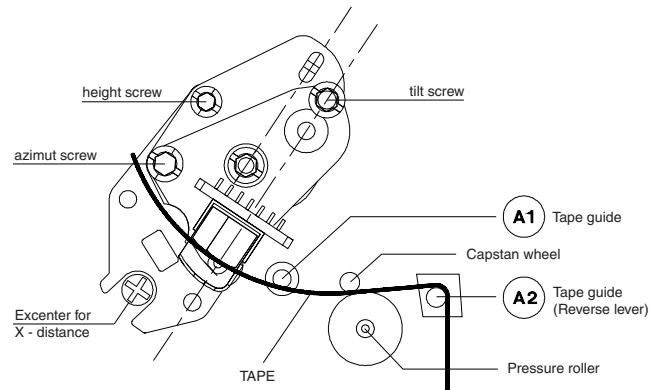


Figure 10-12

Adjustment of the azimuth angle and the head height:

Connect an oscilloscope to the linear Audio output. Play the section of the test cassette with the audio signal 400 Hz.

Adjust for maximum output voltage by means of the height adjustment screw

Play the section of the test cassette with the audio signal 8 kHz.

Adjust to maximum output voltage by means of the azimuth adjustment screw (see figure 10-12).

If necessary, repeat this procedure

Check the tilt angle adjustment

If the tape path was completely out of adjustment or if several components in the tape path have been replaced, it is possible, that the adjustments described in paragraph "Roller left unit/roller unit right" and paragraph "A/C Combi head" have to be repeated several times.

10.2.2 Adjustment of the horizontal distance (x-distance)

Before this adjustment is carried out, insert the test cassette (start from Eject position). Call the service test program (tracking value will take up its nominal position) and press the „play“ button.

Playback the black/white part of the test cassette.)

Display the TRIV signal on an oscilloscope (DC-coupled) and adjust for maximum voltage by means of the excentric screw (see figure 10-12).

10.2.3 Brake band and tape tension

Due to further development it is no longer necessary to make these adjustments after replacement of the brake band.

If the brake band or tape tension are completely misadjusted, set them to a center position; set the drive to „play“ and adjust the brake band until the edge of the elbow of the tape tension arm is aligned with the left inner edge of the left guide (see figure 10-13).

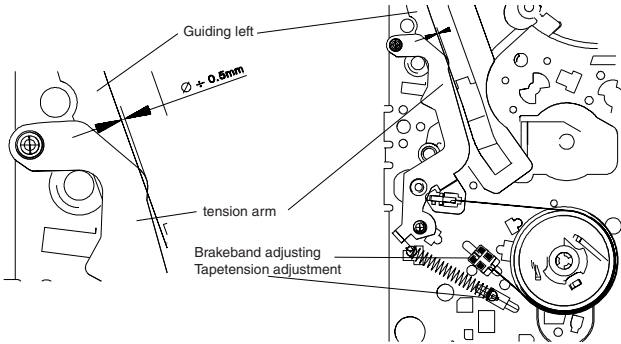


Figure 10-13

10.2.4 Friction clutch control check

Set the drive to „Play“ position.

Place the torquemeter on the right reel.

Turn the capstan motor to move the right reel clockwise.

Keep turning, until the indication at the torquemeter no longer changes (see figure 10-14).

The torque has to be 10,5 mNm \pm 25% (105gFcm \pm 25%)

10.2.5 Reverse brake control

Set the drive to „Reverse“ position.

Place a torquemeter on the right reel and turn the latter counterclockwise, until the reel just starts to flip.

The value indicated at the torquemeter has to be 7mNm \pm 3mNm (70 gFcm \pm 30gFcm) (see figure 10-14).

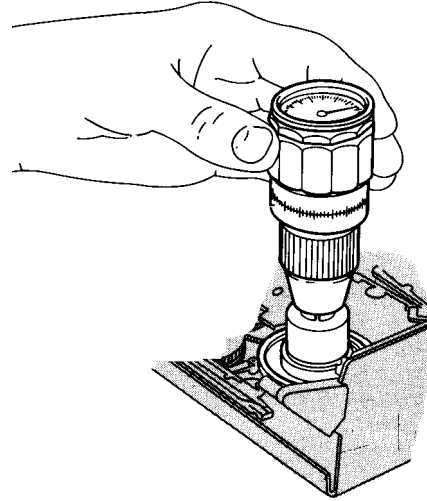
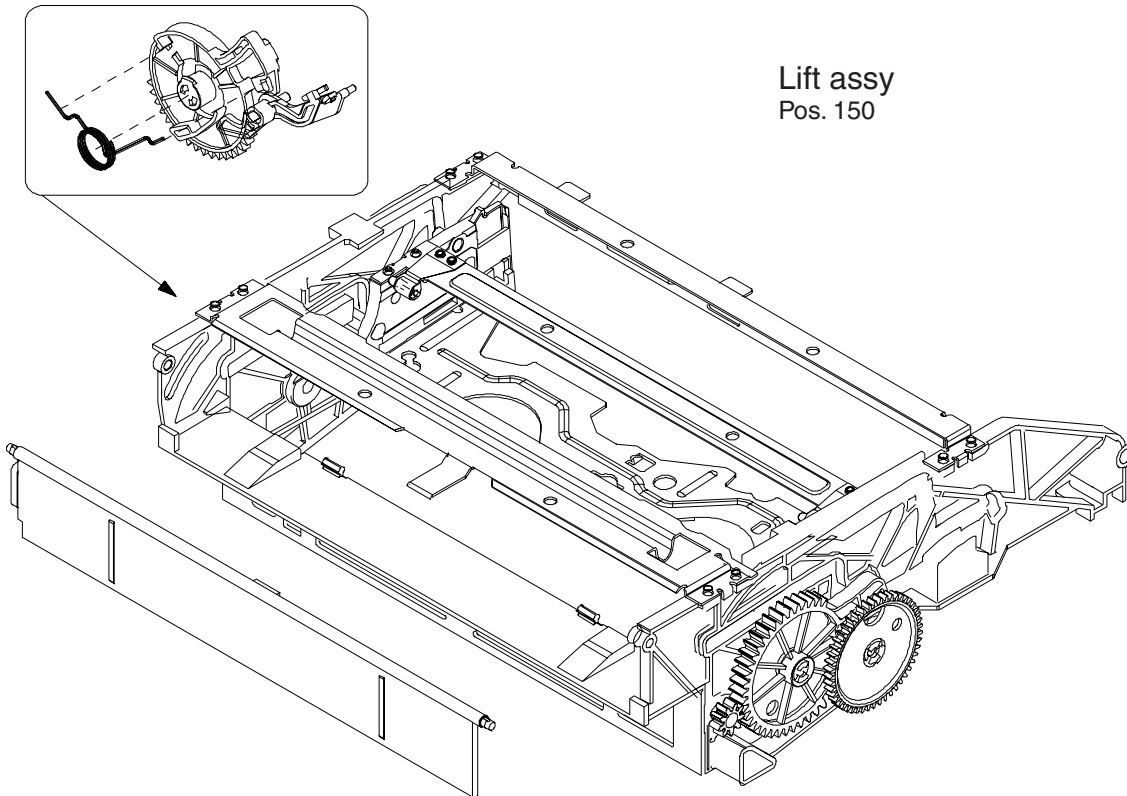


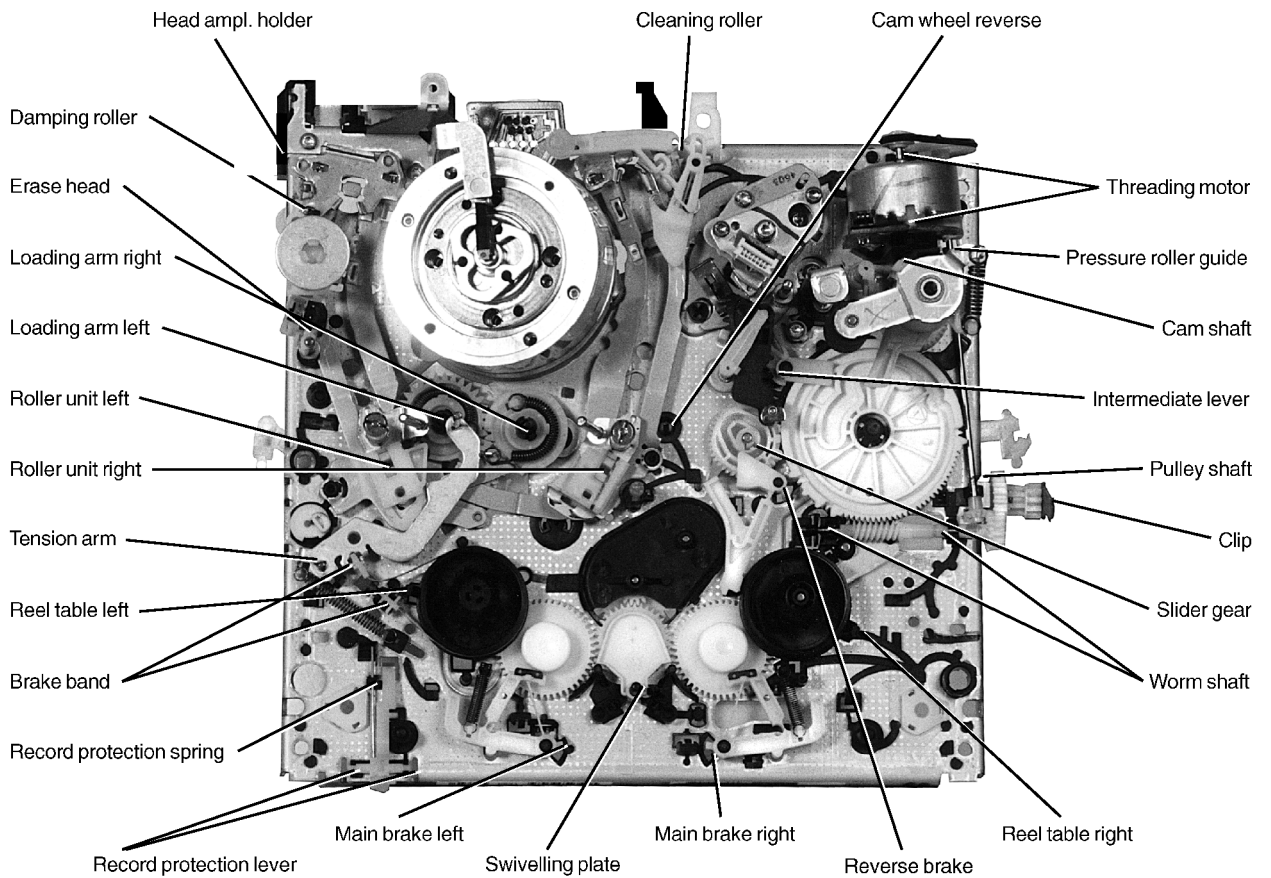
Figure 10-14



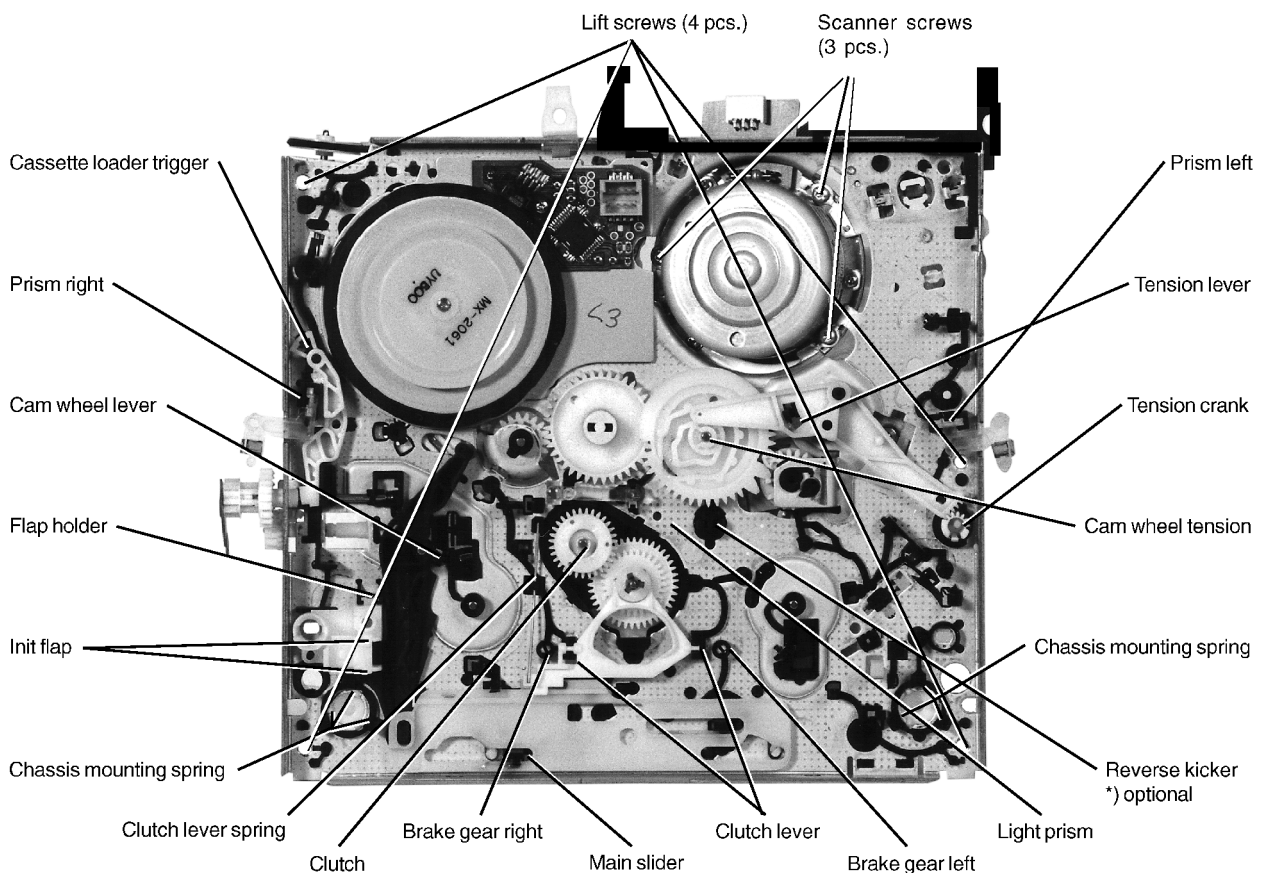
Lift assy
Pos. 150

In order to make the replacement of the deck parts easier, the snap hooks are marked with an arrow.

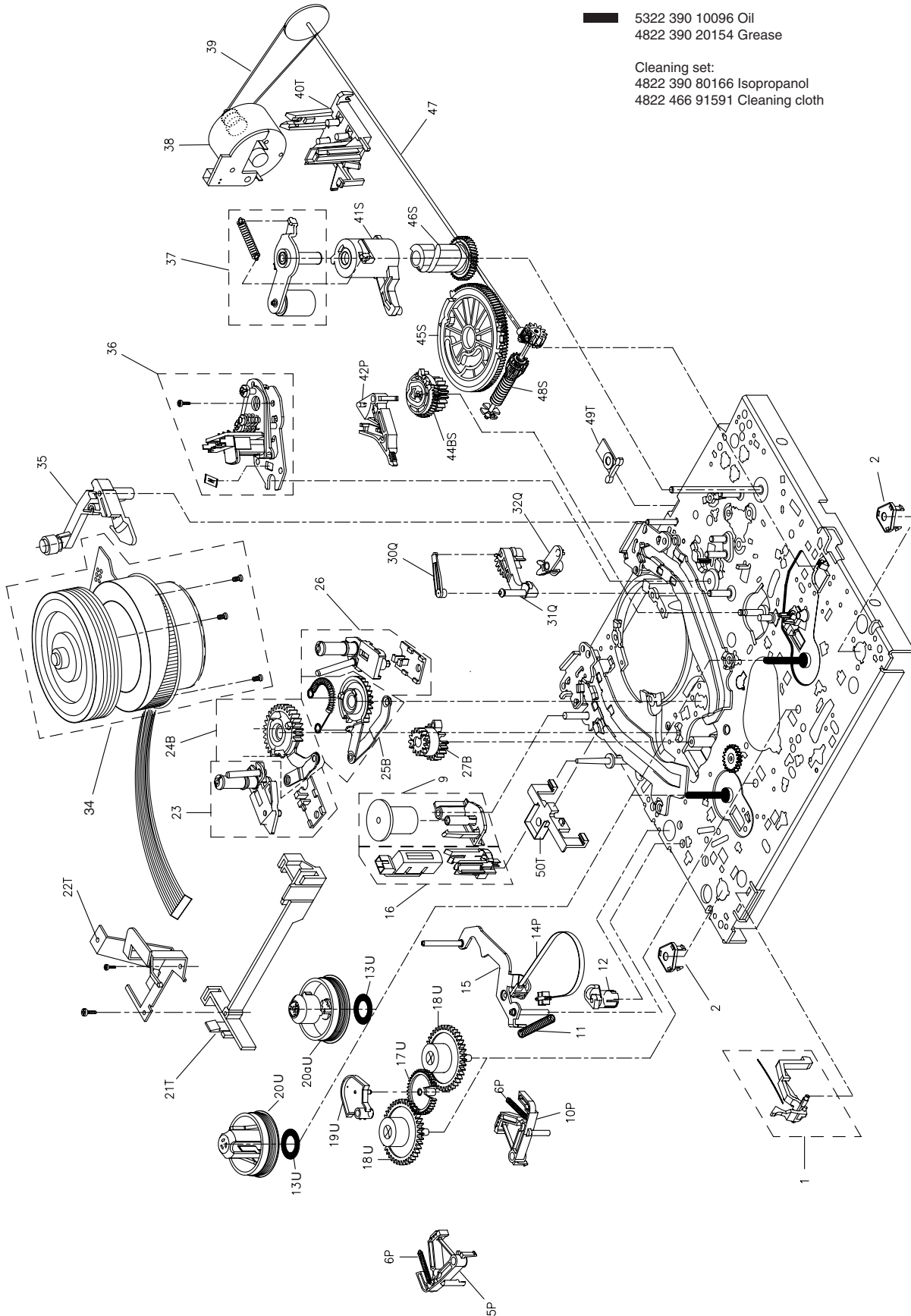
TOP VIEW



UNDERSIDE VIEW



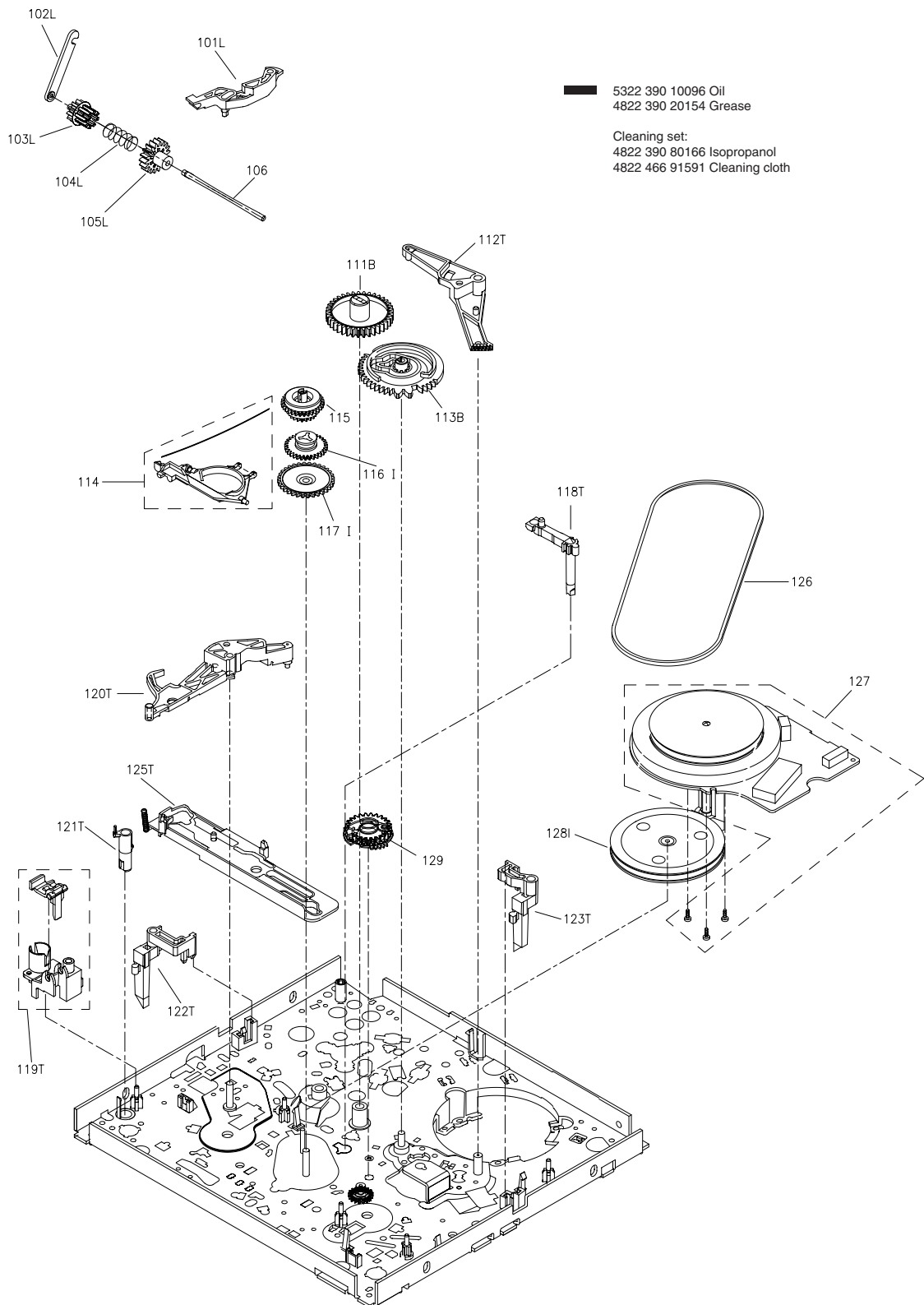
10.3 Deck exploded view (TOP)



5322 390 10096 Oil
 4822 390 20154 Grease

Cleaning set:
 4822 390 80166 Isopropanol
 4822 466 91591 Cleaning cloth

10.4 Deck exploded view (BOTTOM)



10.5 Mechanical parts list

Pos.	Description	K I T S							Code number 4822
		B	I	L	P	Q	S	T	
1	Rec. protection lever (with spring)								402 10202
2	Chassis mounting spring (2x)								492 71022
5	Main brake left				P				
6	Main brake spring (2x)				P				
9	Damping roller *)								528 70782
10	Main brake right				P				
11	Tension arm spring								492 33317
12	Tension crank								403 70551
13	Slip ring							U	
14	Tension band				P				
15	Tension arm								403 70547
16	Erase head								249 10522
17	Swivelling gear							U	
18	Brake gear (2x)							U	
19	Swivelling plate							U	
20	Reel table (S)							U	
20a	Reel table (T)							U	
21	Headamplifier holder						T		
22	Bracket						T		
23	Roller unit left								528 70771
24	Loading arm left	B							
25	Loading arm right	B							
26	Roller unit right								528 70772
27	Loading gear	B							
30	Reverse clip					Q			
31	Reverse lever					Q			
32	Intermediate lever					Q			
34	Scanner assy. 2/0-LP (Head disc and motor)								4803 218 00021
34	Scanner assy. 4/0 (Head disc and motor)								4803 218 00031
35	Cleaning roller								528 70773
36	A/C Head (with clip and screws)								249 10468
37	Pressure roller (with spring)								528 70774
38	Threading motor								361 10809
39	Threading belt								358 20421
40	Motor holder							T	
41	Pressure roller guide						S		
42	Reverse brake				P				
44	Slider gear	B					S		
45	Cam wheel						S		
46	Cam shaft						S		
47	Pulley shaft								528 81462
48	Worm shaft						S		
49	Chassis mounting clip							T	
50	WD-holder							T	

Pos.	Description	K I T S							Code number 4822	
		B	I	L	P	Q	S	T		U
101	Cassette loader trigger				L					
102	Clip				L					
103	Cassette loader gear1				L					
104	Cassette loader spring				L					
105	Cassette loader gear2				L					
106	Spindle									535 93277
111	Cam wheel reverse	B								
112	Tension lever							T		
113	Cam wheel tension	B								
114	Clutch lever (with spring)									403 70549
115	Clutch									528 20736
116	Changing gear			I						
117	Double gear			I						
118	Light prism							T		
119	Init flap and holder							T		
120	Cam wheel lever							T		
121	S-VHS lever							T		
122	Prism rihgt							T		
123	Prism left							T		
125	Main slider							T		
126	Driving belt									358 31166
127	Capstan motor (with screws)									361 10805
129	Reverse kicker with transmission gears *)									522 20451
128	Gear pulley			I						
150	Lift									443 64112
KIT	B									310 31955
KIT	I									310 31963
KIT	L									310 32116
KIT	P									310 32191
KIT	Q									310 10658
KIT	S									310 10661
KIT	T									310 10662
KIT	U							3103		109 09190

*) optional

Um eine hohen Reparaturstandard zu gewährleisten sind mit Ausnahme von Kit T immer alle im Kit enthaltenen Teile zu tauschen.

In order to guarantee a high repairstandard all spare parts included in a kit have to be replaced with the exception of kit T.

Per una riparazione garantita occorre sostituire tutti i pezzi contenuti nei kit, fatta eccezione per il kit T.

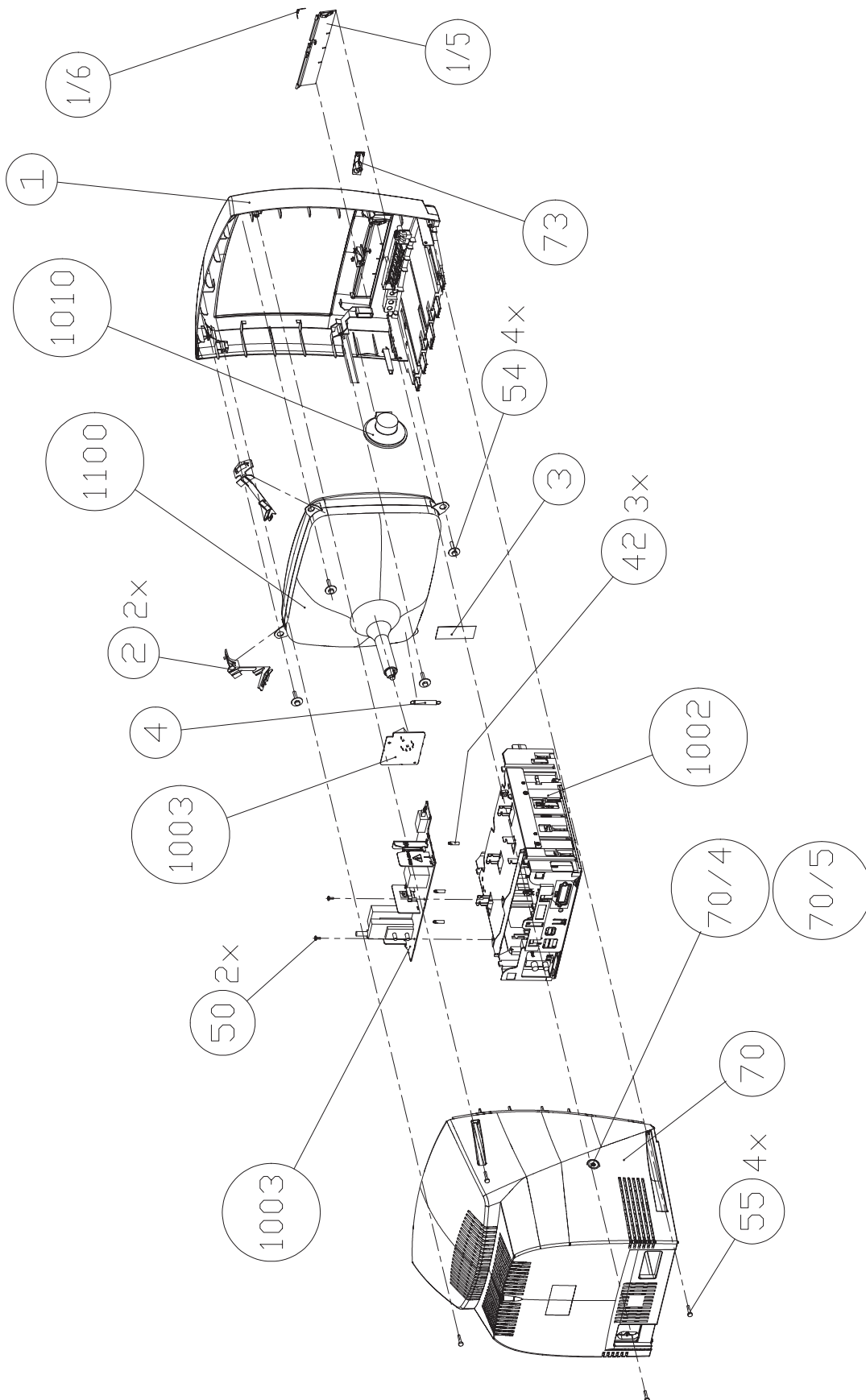
Para obtener un estándar de reparaciones elevado, es necesario cambiar todas las partes contenidas en el kit, la única excepción es para el kit T.

A fin d'obtenir un standard de réparations élevé, toutes les pièces de rechange incluses dans un kit sont à remplacer, exception faite du kit T.

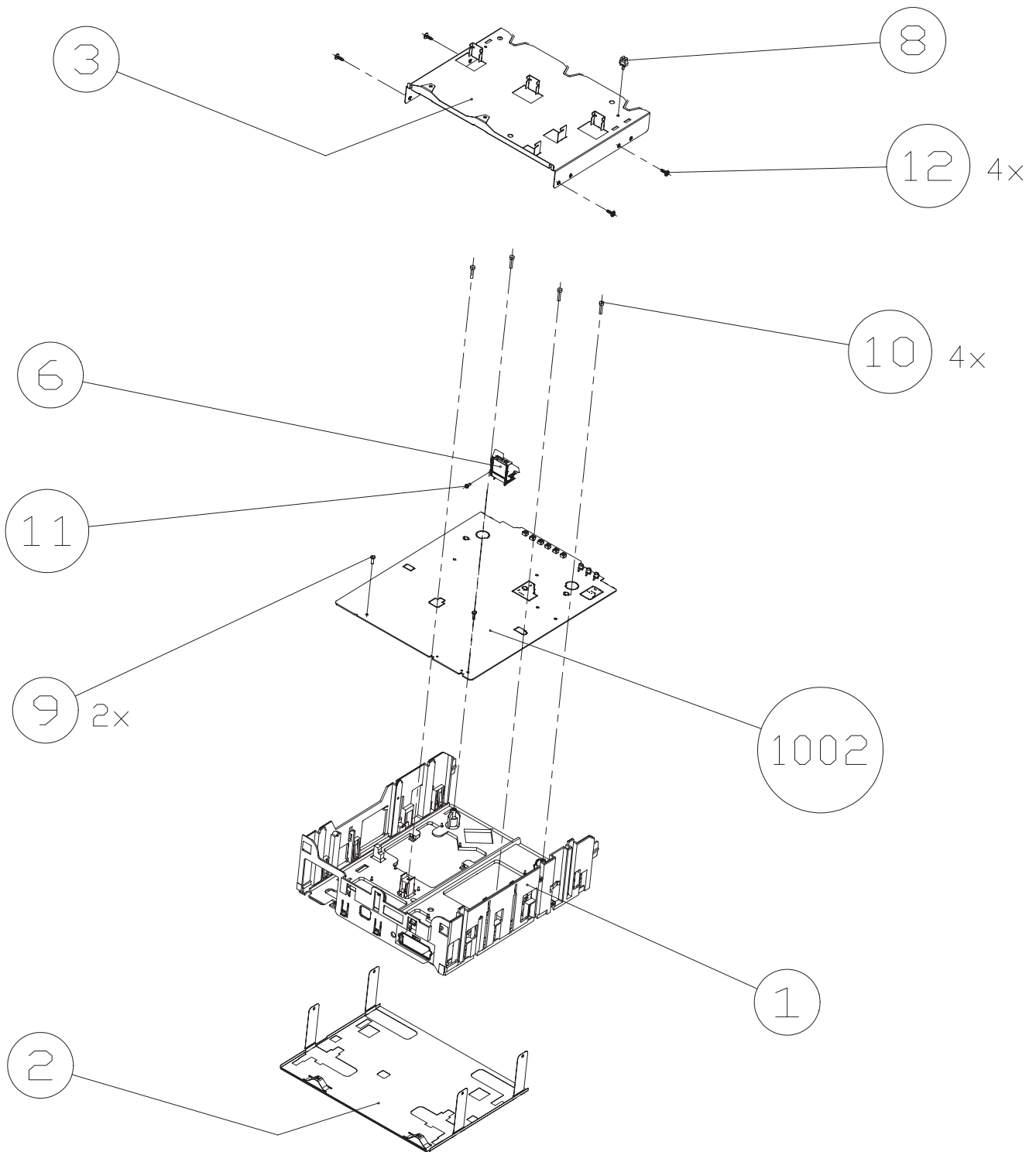
Om een hoge reparatiekwaliteit te waarborgen moeten, met uitzondering van kit T, altijd alle zich in een kit bevindende onderdelen worden vervangen.

11. Exploded View and Parts List

11.1 Exploded View of the Set (14")



11.2 Exploded View Recorder Unit Pos. 1002



12. Electrical parts list

LSB 14 Inch

Various

0040	3103 150 11420	EXTENSION
1001▲	2422 128 02924	SW POW2P4/128A
1300▲	2422 549 43073	SURGE PROTECT
1302▲	2422 086 10899	FUSE5X20ET1A25 250V
1303▲	2422 086 10955	PROT 1.25A
1304▲	2422 086 10772	FUSE 200MA 250V A
1310▲	2422 086 10919	PROT 125mA
1391▲	2422 086 10957	PROT DEV 65V 2.5A PSC
1931	2422 025 11196	CONNECTOR 2PIN
1933	2422 025 15396	CONNECTOR 2PIN
1950	2422 025 16134	CONNECTOR 4PIN
1955▲	2419 501 06009	CRT SOCKET 4454-S
1962	2422 025 10428	SOCKEL 5-FACH JST-PH
1966	2422 025 10773	CONNECTOR 14PIN
1967	2422 025 09407	CONNECTOR 7PIN

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2175	2020 012 93282	4.7 µF 250V
2177	3198 016 31010	100 pF 50V
2178	3198 016 36890	68 pF 50V
2179	3198 016 01210	120 pF 50V
2186	2020 558 90518	2.2 nF 1kV
2301	3198 019 41020	1 nF 500V
2304	3198 019 41020	1 nF 500V
2306▲	2020 554 90127	2.2 nF 250V
2307▲	2022 330 00016	220 nF 275V
2310	2222 151 90053	68 µF 400V
2313	2222 365 45473	47 nF 250V
2317	2020 558 90471	470 pF 1kV
2319	3198 017 31020	1 nF 50V
2323	2020 021 91526	47 µF 25V
2342	3198 017 21040	100 nF 50V
2346	3198 017 21040	100 nF 50V
2350	2020 558 90471	470 pF 1kV
2351	2020 021 91574	330 µF 16V
2353	2020 012 93751	220 µF 100V
2355	3198 017 21040	100 nF 50V
2360	2020 021 91574	330 µF 16V
2363	3198 025 31010	100 µF 25V
2365	3198 025 52280	2.2 µF 50V
2383	3198 025 51090	10 µF 50V
2384	3198 025 22210	220 µF 16V
2393	3198 025 31010	100 µF 25V
2502	2020 308 90151	100 nF 100V
2503	3198 019 41020	1 nF 500V
2504	3198 016 03310	330 pF 50V
2505	3198 017 31030	10 nF 50V
2506	3198 017 01030	10 nF 50V
2517	2222 370 35103	10 nF 250V
2518▲	2020 558 90472	680 pF 1kV
2519▲	2022 333 00171	8.2 nF 1kV
2530	2022 333 00086	470 nF 250V
2535	3198 014 03340	330 nF 50V
2537	3198 025 54790	47 µF 50V
2538	3198 017 42230	22 nF 50V
2539	3198 025 22210	220 µF 16V
2540	3198 025 54780	4.7 µF 50V
2544	3198 025 51090	10 µF 50V
2545	3198 025 34790	47 µF 25V
2548	3198 025 51090	10 µF 50V
2555	3198 017 31020	1 nF 50V
2556	3198 017 31020	1 nF 50V
2561	3198 016 34710	470 pF 50V
2562	3198 017 31030	10 nF 50V
2564	3198 017 42230	22 nF 50V

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3169	3198 021 32210	220 R 0.063W
3173	3198 021 38220	8.2 k 0.063W
3175	3198 021 32230	RST 0603 22k PM5
3177	2322 245 11152	MGL LSR37A1k5 PM2 A
3179	2322 245 11152	MGL LSR37A1k5 PM2 A
3181	2322 245 11152	MGL LSR37A1k5 PM2 A
3182	3198 012 12230	22 k
3183	3198 021 51220	1.2 k 0.1W
3184	3198 021 31010	100 R 0.063W
3186	2120 103 90016	1.5 k
3187	3198 012 12230	22 k
3188	3198 021 51520	1.5 k 0.1W
3193	3198 012 12230	22 k
3194	3198 021 51220	1.2 k 0.1W

3195	3198 021 34790	47 k 0.063W
3199▲	2120 101 90373	3.3 k FUSE
3302▲	2122 550 00149	VDR MAX1120V
3303	3198 013 02210	RS CMP1/2W A220Ω PM2
3304▲	2306 207 03102	1 k NFR25H
3305▲	2306 207 03102	1 k NFR25H
3306▲	2122 663 00011	PTC 265V S 9Ω PM25 Y
3307▲	2322 242 13335	3.3 M
3308▲	2322 242 13335	3.3 M
3311	3198 012 32230	22 k 3W
3318	3198 021 32240	220 k 0.063W
3320	3198 011 01010	100 R 0.17W
3327	2322 156 21008	1.0 R 1%
3328	2322 156 21008	1.0 R 1%
3329	2322 156 22208	2.2 R 0.6W
3335▲	2322 207 33102	1 k FUSE NFR25H
3340	3198 021 31020	1 k 0.063W
3341	3198 021 34710	470 R 0.063W
3342	3198 021 34710	470 R 0.063W
3343	2120 108 92629	22 k 1%
3344	2120 108 92621	2.7 k 1%
3347	2120 108 92638	120 k 1%
3348	2120 368 90118	470 R TRIMMER
3355	3198 011 04720	4.7 k 0.17W
3356	3198 011 04720	4.7 k 0.17W
3357	3198 011 04720	4.7 k 0.17W
3358	3198 021 51040	100 k 0.1W
3359	3198 021 35630	56 k 0.063W
3363	3198 021 33320	3.3 k 0.063W
3364	3198 021 31030	10 k 0.063W
3365	3198 021 51510	150 R 0.1W
3366	3198 011 03310	330 R 0.17W
3367	3198 021 51510	150 R 0.1W
3376	3198 011 04780	4.7 R 0.17W
3378	3198 011 04780	4.7 R 0.17W
3392	2120 108 92626	6.8 ERJ6ΩN
3393	3198 021 34710	470 R 0.063W
3394	3198 021 32210	220 R 0.063W
3395	2120 108 92628	12 k 1%
3396	2120 108 92623	3.9 k 1%
3397	3198 021 34710	470 R 0.063W
3501	3198 011 01590	15 R 0.17W
3503	2120 105 93472	5.6 k 3W
3505	3198 011 02220	2.2 k 0.17W
3506	3198 021 33310	330 R 0.063W
3507	3198 011 01020	1 k 0.17W
3508	3198 011 01020	1 k 0.17W
3515	3198 012 14790	47 R 1W
3520	3198 011 03390	33 R 0.17W
3525	3198 021 54740	470 k 0.1W
3526	3198 021 52230	22 k 0.1W
3527	3198 021 54730	47 k 0.1W
3530▲	2322 205 33108	1 R NFR25
3531▲	2322 205 33108	1 R NFR25
3533	3198 011 01230	12 k 0.17W
3535	3198 021 34730	47 k 0.063W
3538▲	2322 205 33108	1 R NFR25
3539	3198 021 54710	470 R 0.1W
3540	3198 021 33330	33 k 0.063W
3541	3198 021 51020	1 k 0.1W
3542	3198 021 35630	56 k 0.063W
3543	3198 021 31030	10 k 0.063W
3544	3198 021 56820	6.8 k 0.1W
3545	3198 021 33920	3.9 k 0.063W
3546	3198 021 31040	100 k 0.063W
3547	3198 021 31530	15 k 0.063W
3548	3198 021 34730	47 k 0.063W
3549	3198 021 31040	100 k 0.063W
3550	3198 021 34730	47 k 0.063W
3551	3198 021 31050	1 M 0.063W
3556	3198 021 52730	27 K 0.1W
3557	3198 021 53920	3.9 k 0.1W
3562	3198 011 02710	270 R 0.17W
3563	3198 011 02280	2.2 R 0.17W
3564	3198 021 54710	470 R 0.1W
3567	3198 021 33910	390 R 0.063W
3568	3198 021 31220	1.2 k 0.063W

5301▲	2422 549 44511	MAINS 18mH HF2022R
5302	2422 535 94639	10 µH
5303	2422 535 94639	10 µH
5311	2422 535 95097	BOB 2.4µH
5313	2422 535 95097	BOB 2.4µH
5322	3198 018 15690	56 µH
5330▲	3128 138 39570	TRANSFORMER CT285D5
5351	2422 535 95097	BOB 2.4µH
5360	2422 535 95363	10 µH

5361	3198 018 21090	10 µH
5362▲	2422 535 97025	LAL02 A 330N PM10
5380▲	3198 018 14780	A 02 4U7 PM5 A
5500	3112 338 30880	LINE DRIVER TRAF0
5518	2422 535 95367	47 µH
5519▲	3128 138 21370	TFMLOT SLOT
5532	3198 018 11010	100 µH
5537	3198 018 15690	56 µH

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6175	3198 010 28280	BZX79-C8V2
6183	3198 010 10010	1N4148
6184	3198 010 10010	1N4148
6185	3198 010 10010	1N4148
6186	3198 010 23390	BZX79-C33
6187	3198 010 23390	BZX79-C33
6301	9338 386 60673	1N4006GP
6302	9338 386 60673	1N4006GP
6303	9338 386 60673	1N4006GP
6304	9338 386 60673	1N4006GP
6314	9322 126 71673	BYT42M
6322	3198 010 10070	BAV21
6323	3198 010 28280	BZX79-C8V2
6324	3198 010 10070	BAV21
6325	9334 515 80673	1N4003
6326	9334 515 80673	1N4003
6342	9322 103 46673	SBYV27-200
6350	9340 565 00112	BYW96D-24B
6355	3198 010 53390	BZX79-B33
6381	3198 010 10070	BAV21
6385	9337 234 00133	BYD33D
6390	8203 107 03510	BYV98-200C1VISHAY
6520	9337 410 30133	BYD33M A
6526	3198 010 26880	BZX79-C6V8
6532	3198 010 10070	BAV21
6537	3198 010 10070	BAV21
6538	3198 010 10070	BAV21
6539	3198 010 10070	BAV21
6540	3198 010 10010	1N4148
6541	3198 010 22290	BZX79-C22
6543	3198 010 22790	BZX79-C27
6544	3198 010 10010	1N4148
6545	3198 010 26880	BZX79-C6V8
6547	3198 010 10010	1N4148
6548	3198 010 10010	1N4148
6549	3198 010 22290	BZX79-C22
6550	3198 010 10010	1N4148
6551	3198 010 10010	1N4148
6568	9331 669 60133	BZX79-B24

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7180	9332 593 50126	BF422
7181	9332 593 50126	BF422
7182	9332 593 50126	BF422
7183	9332 593 50126	BF422
7184	9332 593 50126	BF422
7185	9332 593 50126	BF422
7186	9332 593 60126	BF423
7187	9332 593 60126	BF423
7188	9332 593 60126	BF423
7300	9322 150 97687	FET POW STP4NC60FP
7310	9322 143 51682	MC44608P75
7340▲	9322 153 43682	OPT CP LTV817BM
7341	9322 083 67676	TL431CZ-AP
7355	9332 593 50126	BF422
7358	3198 010 42310	BC847BW
7360	3198 020 43430	BC327-25
7361	8203 107 03500	LF52CV
7391	9322 135 90687	2SK2232
7392	9322 083 67676	TL431CZ-AP
7501	9335 354 70126	MPSA43
7521	9322 153 03682	BUL310FP(ST00) L
7543	3198 010 42310	BC847BW
7547	3198 010 42320	BC857BW
7555	9352 622 02112	TDA8356/N6
7556	3198 010 42310	BC847BW

LSB 20/21 Inch

Various

0040	3103 150 11420	EXTENSION
1001▲	2422 128 02924	SW POW2P4/128A PIN
1300▲	2422 549 43073	SURGE PROTECT
1302▲	2422 086 10899	FUSE5X20ET1A25 250V

1303	2422 133 07438	PROT DEV 65V 1.25A PSC
1304▲	2422 086 10772	FUSE 200MA 250V A
1310▲	2422 086 10919	PROT 125mA
1313	2422 132 07116	RELAY 1P 5V 10A
1391▲	2422 086 10957	CONNECTOR 2PIN
1931	2422 025 11196	CONNECTOR 2PIN
1933	2422 025 11196	CONNECTOR 2PIN
1950	2422 025 16134	CONNECTOR 4PIN
1956▲	2422 500 80035	CRT SOCKET 4446-S7
1966	2422 025 10773	CONNECTOR 14PIN
1967	2422 025 10772	CON 12 PIN 2.00 PH B

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2175	2020 012 93282	4.7 µF 250V
2177	3198 016 01210	120 pF 50V for 21"
2177	3198 016 01010	100 pF 50V for 20"
2178	3198 016 01210	120 pF 50V for 21"
2178	3198 016 08290	82 pF 50V for 20"
2179	3198 016 08290	82 pF 50V for 20"
2179	3198 016 01210	120 pF 50V for 21"
2186	2020 558 90518	2.2 nF 1kV
2301	3198 019 41020	1 nF 500V
2304	3198 019 41020	1 nF 500V
2306▲	2020 554 90127	2.2 nF 250V
2307▲	2022 330 00016	220 nF 275V
2310	2222 151 90054	100 µF 400V
2313	2222 365 45473	47 nF 250V
2317	2020 558 90471	470 pF 1kV
2319	3198 017 31020	1 nF 50V
2323	2020 021 91526	47 µF 25V
2342	3198 017 31040	100 nF 16V
2346	3198 017 31040	100 nF 16V
2350	2020 558 90471	470 pF 1kV
2351	2020 021 91574	330 µF 16V
2353	2020 012 93751	220 µF 100V
2355	2238 586 59812	100 nF 50V
2360	2020 021 91574	100 µF 16V
2363	3198 025 31010	100 µF 25V
2365	3198 025 52280	2.2 µF 50V
2383	3198 025 51090	10 µF 50V
2384	3198 025 22210	220 µF 16V
2393	3198 025 31010	100 µF 25V
2502	2020 308 90151	100 nF 100V
2503	3198 019 41020	1 nF 500V
2504	3198 016 33310	330 pF 50V
2505	3198 017 31030	10 nF 50V
2506	3198 017 01030	10 nF 50V
2514	2020 012 93595	47 µF 160V
2517	2222 370 35103	10 nF 250V
2518	2020 558 90471	470 pF 1kV
2519	2022 333 00173	10 nF 1kV only for 21"
2520	2022 333 00174	11 nF 1kV only for 20"
2522	2020 012 93282	4.7 µF 250V
2529	2020 558 90471	470 pF 1kV
2530	2022 333 00168	680 nF 250V
2535	3198 014 03340	330 nF 50V
2537	3198 025 51010	100 µF 50V
2539	3198 026 31020	1000 µF 25V
2540	3198 025 54780	4.7 µF 50V
2544	3198 025 51090	10 µF 50V
2545	3198 025 34790	47 µF 25V
2548	3198 025 51090	10 µF 50V
2555	3198 017 31020	1 nF 50V
2556	3198 017 31020	1 nF 50V
2561	3198 016 34710	470 pF 50V
2562	3198 017 31030	10 nF 50V
2564	3198 014 01040	100 nF 50V

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3169	3198 021 51010	100 R 0.1W for 20"
3169	3198 021 54790	47 R 0.1W for 21"
3171	3198 021 51230	12 k 0.1W only for 20"
3177	2322 245 11152	RST MGL LSR37A1k5 PM2
3179	2322 245 11152	RST MGL LSR37A1k5 PM2
3181	2322 245 11152	RST MGL LSR37A1k5 PM2
3182	2322 193 53273	MFLM PR01 S 27k PM5P5
3183	3198 021 51020	1 k 0.1W for 21"
3183	3198 021 51220	1.2 k 0.1W for 20"
3184	3198 021 51010	100 R 0.1W for 20"
3184	3198 021 54790	47 R 0.1W for 21"
3186	2120 103 90016	1.5 k
3187	2322 193 53273	MFLM PR01 S 27k PM5P5
3188	3198 021 51020	1 k 0.1W
3193	2322 193 53273	MFLM PR01 S 27k PM5P5
3194	3198 021 51020	1 k 0.1W
3195	3198 021 54790	47 R 0.1W for 21"
3195	3198 021 51010	100 R 0.1W for 20"
3199▲	2120 101 90373	3.3 k FUSE
3300▲	2322 242 13335	3.3 M
3301	2120 106 90584	RST POW 3W S 2Ω2 PM5

3302▲	2122 550 00149	VDR MAX1120V
3303	3198 013 02210	RS CMP1/2W A220Ω PM2
3304▲	2306 207 03102	1 k NFR25H
3305▲	2306 207 03102	1 k NFR25H
3306	2122 663 00004	9Ω 276VS 500R PM3
3307▲	2322 242 13335	3.3 M
3308▲	2322 242 13335	3.3 M
3311	3198 012 32230	22 k 3W
3318	3198 021 32240	220 k 0.063W
3320	3198 011 01010	100 R 0.17W
3327	2322 156 21008	1.0 R 1%
3328	2322 156 21008	1.0 R 1%
3329	2322 156 21008	1.0 R 1%
3335▲	2322 207 33102	1 k FUSE NFR25H
3340	3198 021 31020	1 k 0.063W
3341	3198 021 34710	470 R 0.063W
3342	3198 021 34710	470 R 0.063W
3343	2120 108 92629	22 k 1%
3344	2120 108 92621	2.7 k 1%
3345	2120 108 93048	RST 0603 ERJ3Ω 47k PM1
3347	2120 108 92638	120 k 1%
3348	2120 368 90118	470 R TRIMMER
3350	3198 011 02290	22 R 0.17W
3351	3198 021 31020	1 k 0.063W
3352	2120 108 92638	120 k 1%
3353	3198 021 33340	330 k 0.063W
3354	3198 021 31020	1 k 0.063W
3355	3198 011 04720	4.7 k 0.17W
3356	3198 011 04720	4.7 k 0.17W
3357	3198 011 04720	4.7 k 0.17W
3358	3198 021 51040	100 k 0.1W
3359	3198 021 35630	56 k 0.063W
3363	3198 021 33320	3.3 k 0.063W
3376	3198 011 02280	2.2 R 0.17W
3378	3198 011 02280	2.2 R 0.17W
3392	2120 108 92626	6.8 k 1%
3393	3198 021 34710	470 R 0.063W
3394	3198 021 32210	220 R 0.063W
3395	2120 108 92628	12 k 1%
3396	2120 108 92623	3.9 k 1%
3397	3198 021 34710	470 R 0.063W
3501	3198 011 03390	33 R 0.17W
3503	2322 257 41472	4.7 k 5W
3505	3198 011 02220	2.2 k 0.17W
3506	3198 021 33310	330 R 0.063W
3515	3198 012 14790	47 R 1W
3520	3198 011 03390	33 R 0.17W
3522▲	2322 207 33102	1 k FUSE NFR25H
3523▲	2322 207 33103	10 k FUSE NFR25H
3526	3198 021 52230	22 k 0.1W
3527	3198 021 53930	39 k 0.1W
3528	2322 241 53224	220 k
3529	2322 241 53224	220 k
3530▲	2322 205 33338	3.3 R FUSE NFR25
3530▲	2322 205 33108	1 R NFR25
3531▲	2322 205 33338	3.3 R FUSE NFR25
3531▲	2322 205 33108	1 R NFR25
3532▲	2322 207 33478	4.7 R FUSE NFR25H
3533	3198 011 01230	12 k 0.17W
3535	3198 021 52730	27 k 0.1W
3537▲	2322 207 33478	4.7 R FUSE NFR25H
3538▲	2322 207 33108	1 R FUSE NFR25H
3540	3198 021 33330	33 k 0.063W
3541	3198 021 51020	1 k 0.1W
3542	3198 021 35630	56 k 0.063W
3543	3198 021 31030	10 k 0.063W
3544	3198 021 56820	6.8 k 0.1W
3545	3198 021 33920	3.9 k 0.063W
3546	3198 021 31040	100 k 0.063W
3547	3198 021 31530	15 k 0.063W
3548	3198 021 34730	47 k 0.063W
3549	3198 021 31040	100 k 0.063W
3550	3198 021 34730	47 k 0.063W
3551	3198 021 31050	1 M 0.063W
3557	3198 021 52720	2.7 k 0.1W
3561	3198 011 04710	470 R 0.17W
3562	3198 011 04710	470 R 0.17W
3563	2120 101 74278	2.7 R
3564	3198 011 02210	220 R 0.17W
3565	3198 011 03380	3.3 R
3565	3198 011 02280	2.2 R 0.17W
3566	3198 011 02210	220 R 0.17W
3567	3198 021 35610	560 R 0.063W
3568	3198 021 32220	2.2 k 0.063W

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5101	2422 535 95363	10 µH
5301	2422 549 44512	MAINS10mH 0A7
5302	2422 535 94639	10 µH
5303	2422 535 94639	10 µH
5313	2422 535 95097	BOB 2.4µH
5322	3198 018 15690	56 µH

5330	8203 107 92130	TRANSFORMER -20/21
5351	2422 535 95097	BOB 2.4µH
5360	2422 535 95363	10 µH
5361	3198 018 21090	10 µH
5362▲	2422 535 97025	LAL02 A 330N PM10
5380▲	3198 018 14780	A 02 4U7 PM5 A
5500	3112 338 30880	LINE DRIVER TRAF0
5502	2422 535 95367	47 µH
5518	2422 535 95365	22 µH
5519	8228 001 38481	TFM LOT SLOT OV2094
5522	3128 138 51940	COI LINCOR

—H—

6175	3198 010 28280	BZX79-C8V2
6183	9340 549 45115	BAS316
6184	9340 549 45115	BAS316
6185	9340 549 45115	BAS316
6186	3198 010 23390	BZX79-C33
6187	3198 010 23390	BZX79-C33
6301	9338 386 60673	1N4006GP
6302	9338 386 60673	1N4006GP
6303	9338 386 60673	1N4006GP
6304	9338 386 60673	1N4006GP
6314	9322 126 71673	BYT42M
6322	3198 010 10070	BAV21
6323	3198 010 28280	BZX79-C8V2
6324	3198 010 10070	BAV21
6325	9334 515 80673	1N4003
6326	9334 515 80673	1N4003
6342	9322 103 46673	SBYV27-200
6345	3198 010 10070	BAV21
6350	9340 380 30127	BY229X-800
6355	3198 010 53390	BZX79-B33
6381	3198 010 10070	BAV21
6385	9337 234 00133	BYD33D
6390	9322 163 82682	BYV98-200 A(VISH)
6520	9337 410 30133	BYD33M A
6522	9337 234 00133	BYD33D
6526	3198 010 26880	BZX79-C6V8
6532	9337 234 20133	BYD33J
6536	3198 010 22290	BZX79-C22
6537	9337 234 00133	BYD33D
6538	9337 234 00133	BYD33D
6540	3198 010 10010	1N4148
6541	3198 010 22290	BZX79-C22
6543	3198 010 22790	BZX79-C27
6544	3198 010 10010	1N4148
6545	3198 010 26880	BZX79-C6V8
6547	3198 010 10010	1N4148
6548	3198 010 10010	1N4148
6549	3198 010 22290	BZX79-C22
6550	3198 010 10010	1N4148
6551	3198 010 10010	1N4148
6568	3198 010 22790	BZX79-C27



7180	9332 593 50126	BF422
7181	9332 593 50126	BF422
7182	9332 593 50126	BF422
7183	9332 593 50126	BF422
7184	9332 593 50126	BF422
7185	9332 593 50126	BF422
7186	9332 593 60126	BF423
7187	9332 593 60126	BF423
7188	9332 593 60126	BF423
7300	9322 150 97687	FET POW STP4NC60FP
7310	9322 143 51682	MC44608P75 L
7340▲	9322 153 43682	OPT CP LTV817BM
7341	9322 083 67676	TL431CZ-AP
7350	9322 142 26687	FET POW STD16NE06-1 L
7354	3198 010 42310	BC847BW
7355	9332 593 50126	BF422
7358	3198 010 42310	BC847BW
7361	9322 163 51687	LF52CV
7391	9322 135 90687	2SK2232
7392	9322 083 67676	TL431CZ-AP
7501	9335 354 70126	MPSA43
7521	9322 153 03682	BUL310FP(ST00) L
7543	3198 010 42310	BC847BW
7547	3198 010 42320	BC857BW
7555	9352 622 02112	TDA8356/N6
7556	3198 010 42310	BC847BW

1200	2422 543 01182	XTL 12MHz 20P HC49/UB	2022	3198 029 31090	10 µF 25V	2244	3198 014 02240	220 nF 50V
1200	2422 543 01203	XTL 12MHz only for 20*/21*	2023	3198 017 41050	1 µF 10V	2246	3198 025 51090	10 µF 50V
1700	2422 542 90096	TUN V+U PLL IEC BG B	2024	3198 029 04790	47 µF 6.3V	2247	3198 023 22240	220 nF 25V
1700	2422 542 90102	TUN SPLIT BG B only for 2 Tuner sets	2025	3198 017 31030	10 nF 50V	2248	3198 017 32220	2.2 nF 50V
1701	2422 549 42824	FILT. 5.5MHz PAL B/G/I, SEC L,L', PAL B/G	2026	3198 023 41040	100 nF 25V	2250	3198 025 51080	1 µF 50V
1701	2422 549 42826	FILTER 6MHz 5 PAL, SEC B/G, DK	2027	3198 017 21050	1 µF 16V	2251	3198 029 31090	10 µF 25V
1710	2422 549 41518	OFWKG1961M PAL B/G	2028	3198 023 21040	100 nF 25V	2252	3198 017 04720	4.7 nF 50V
1710	2422 549 41472	OFWKG1965M PAL B/G/I, SEC L,L', PAL, SEC B/G, D/K, PAL I	2028	3198 017 21040	100 nF 50V	2253	3198 017 31020	1 nF 50V
1711	2422 549 41488	OFWL9360M	2029	3198 023 41040	100 nF 25V	2254	3198 017 31020	1 nF 50V
1720	2422 549 44341	OFWK9656M	2030	3198 017 31030	10 nF 50V	2459	3198 017 32230	22 nF 25V
1725	2422 549 42825	FILTER EFC 6.0MHz	2031	3198 017 44740	470 nF 10V	2460	2022 552 05448	150 pF 50V
1730	2422 549 40808	FILT. TPS6.0MB PAL I	2032	3198 016 32790	27 pF 50V	2461	3198 029 21010	100 µF 16V
1730	2422 549 41595	FILT. BS 5.5MHz PAL B/G	2033	3198 017 01040	100 nF 16V	2462	3198 025 22210	220 µF 16V
1730	2422 549 42393	FILT. 5M5/6M0 PAL B/G, I, SEC L, L'	2034	3198 017 31020	1 nF 50V	2463	3198 023 21040	100 nF 25V only for 20*/21*
1730	2422 549 42392	FILTER 5M5/6M5 PAL, SEC B/G, D/K	2034	3198 017 31030	10 nF 50V	2463	3198 017 21040	100 nF 50V only for 14"
1750	2422 549 03611	FILTER 5MHz 5 SFT*MA	2035	3198 029 22290	22 µF 16V	2464	3198 023 41040	100 nF 50V
1760	2422 542 90101	TUN V+U PLL PH BG B	2036	3198 029 31090	10 µF 25V	2465	3198 023 04730	47 nF 25V
1765	9322 042 72682	OFWK3953M PAL, SEC B/G, D/K, PAL B/G/I, SEC L, L'	2037	3198 023 21040	100 nF 25V	2466	3198 023 04730	47 nF 25V
1765	2422 549 41472	OFWKG1965M PAL I	2037	3198 017 21050	1 µF 16V	2467	3198 023 04730	47 nF 25V
1765	2422 549 41518	OFWKG1961M PAL B/G	2038	3198 023 41040	100 nF 25V	2468	2022 552 05236	5.6 nF 50V
1766	2422 549 44341	OFWK9656M	2039	3198 017 21050	1 µF 16V	2469	3198 017 01040	100 nF 16V
1767	2422 549 40808	FILTER TPS6.0MB PAL I	2040	3198 017 01030	10 nF 50V	2470	3198 029 21010	100 µF 16V
1767	2422 549 41595	FILT. 5.5MHz PAL B/G/I, SEC L,L', PAL SEC B/G, D/K, PAL I, PAL B/G	2041	3198 029 54780	4.7 µF 50V	2471	3198 023 41040	100 nF 25V
1768	2422 549 42824	FILTER EFC 5.5MHz PAL B/G/I, DK, SEC L,L'	2042	3198 023 41040	100 nF 25V	2472	3198 017 32230	22 nF 25V
1768	2422 549 42825	FILTER EFC 6.0MHz PAL I	2043	3198 029 31090	10 µF 25V	2473	3198 017 31030	10 nF 50V
1769	2422 549 42825	FILTER EFC 6.0MHz PAL B/G/I, SEC L,L'	2044	3198 023 41040	100 nF 25V	2474	3198 023 41040	100 nF 25V
1769	2422 549 42826	FILTER 6MHz 5 PAL, SEC B/G, D/K	2045	3198 023 41040	100 nF 25V	2475	3198 016 31010	100 pF 50V
1801	3103 107 90110	SWITCH	2046	3198 016 02210	220 pF 50V	2476	3198 023 41040	100 nF 25V
1802	3103 107 90110	SWITCH	2047	3198 016 04780	4.7 pF 50V	2477	3198 017 31030	10 nF 50V
1880	2422 128 02504	SWITCH	2048	2022 552 05334	180 pF 50V	2479	3198 017 04720	4.7 nF 50V
1881	2422 128 02504	SWITCH	2049	3198 017 31030	10 nF 50V	2480	3198 017 32220	2.2 nF 50V
1882	2422 128 02504	SWITCH	2050	3198 016 02290	22 pF 50V	2481	3198 029 24790	47 µF 16V
1883	2422 128 02504	SWITCH	2051	2022 552 05337	390 pF 50V	2482	3198 023 41040	100 nF 25V
1884	2422 128 02504	SWITCH	2052	3198 016 03310	330 pF 50V	2483	3198 017 31030	10 nF 50V
1885	2422 128 02504	SWITCH	2053	3198 017 31030	10 nF 50V	2484	3198 017 31030	10 nF 50V
1886	2422 543 00056	CRYSTAL 32.768kHz	2054	3198 017 01030	10 nF 50V	2485	3198 023 21040	100 nF 25V only for 20*/21*
1887	2422 543 00761	CRYSTAL 16MHz	2055	3198 016 32790	27 pF 50V	2485	3198 017 21040	100 nF 50V only for 14"
1888	2422 128 02504	SWITCH	2056	3198 016 34790	47 pF 50V	2486	3198 017 04720	4.7 nF 50V
1901▲	2422 086 10919	PROT 125mA	2057	3198 016 31010	100 pF 50V	2487	3198 029 21010	100 µF 16V
1910	2422 025 10773	CONNECTOR 14PIN	2058	3198 017 01040	100 nF 16V	2488	3198 029 31090	10 µF 25V
1911	2422 025 14518	CONNECTOR 9PIN	2059	3198 029 54780	4.7 µF 50V	2490	3198 025 11010	100 µF 10V
1912	2422 025 16741	CONNECTOR 5PIN	2060	3198 029 54780	4.7 µF 50V	2501	3198 017 01040	100 nF 16V
1920	2422 025 10428	SOCKEL 5-FACH JST-PH	2061	3198 029 54780	4.7 µF 50V	2502	2022 020 00625	220 µF 16V
1921	2422 025 09407	CONNECTOR 7PIN	2062	3198 029 24790	47 µF 16V	2503	3198 017 42240	220 nF 16V
1946	3103 107 20720	CAPST.-MOBO-SOCKEL	2071	3198 017 31030	10 nF 50V	2504	3198 017 01040	100 nF 16V
1947	2422 025 14512	CONNECTOR 3 PIN	2072	3198 016 01510	150 pF 50V	2505	3198 017 42240	220 nF 16V
1948	2422 025 14515	CONNECTOR 6 PIN	2073	3198 029 21010	100 µF 16V	2506	3198 016 01010	100 pF 50V
1961	2422 025 09405	CONNECTOR 2 PIN	2074	2022 552 05335	220 pF 50V	2507	3198 029 31090	10 µF 25V
1965	2422 025 14516	CONNECTOR 7 PIN	2075	3198 017 31030	10 nF 50V	2508	3198 017 31030	10 nF 50V
1969	2422 025 14532	CONNECTOR 3 PIN	2076	3198 023 41040	100 nF 25V	2509	3198 029 54780	4.7 µF 50V
1978	3103 100 24010	SCART SOCKET 7133	2077	3198 017 01040	100 nF 16V	2511	3198 016 04710	470 pF 50V
1993	2422 026 04637	CINCH CONN. 2 PIN	2079	3198 016 08290	82 pF 50V	2512	3198 017 31020	1 nF 50V
1996	2422 025 10768	CONNECTOR 3 PIN	2080	3198 016 01010	100 pF 50V	2514	2022 020 00625	220 µF 16V
1998	2422 026 04747	KOPEL-PL YKB21-5101A	2082	3198 017 01030	10 nF 50V	2517	3198 017 01030	10 nF 50V
2000	3198 023 41040	100 nF 25V	2083	3198 017 31030	10 nF 50V	2519	3198 017 31030	10 nF 50V
2001	3198 017 31030	10 nF 50V	2084	3198 029 31090	10 µF 25V	2520	3198 025 11010	100 µF 10V
2002	3198 017 31030	10 nF 50V	2085	3198 017 44740	470 nF 10V	2521	3198 023 21040	100 nF 25V
2003	3198 029 31090	10 µF 25V	2086	3198 017 31030	10 nF 50V	2523	3198 017 41050	1 µF 10V
2004	3198 017 31030	10 nF 50V	2087	3198 016 06810	680 pF 50V	2524	3198 017 31020	1 nF 50V
2005	3198 023 41040	100 nF 25V	2088	3198 017 41050	1 µF 10V	2525	3198 016 31010	100 pF 50V
2006	3198 029 31090	10 µF 25V	2089	3198 017 32230	22 nF 25V	2526	3198 017 42240	220 nF 16V
2007	3198 017 31030	10 nF 50V	2090	3198 016 32210	220 pF 50V	2529	3198 016 01010	100 pF 50V
2008	3198 017 32230	22 nF 25V	2096	3198 023 41040	100 nF 25V	2531	3198 029 31090	10 µF 25V
2009	3198 017 41050	1 µF 10V	2097	3198 016 31090	10 pF 50V	2533	3198 023 41040	100 nF 25V
2010	3198 017 41050	1 µF 10V	2110	2020 552 96327	330 nF 16V	2534	3198 017 41050	1 µF 10V
2011	3198 017 32230	22 nF 25V	2111	3198 023 41040	100 nF 25V	2535	3198 017 41050	1 µF 10V
2012	3198 017 31030	10 nF 50V	2112	3198 025 11010	100 µF 10V	2538	3198 023 41040	100 nF 25V
2013	3198 017 31030	10 nF 50V	2113	3198 025 11010	100 µF 10V	2539	3198 017 41050	1 µF 10V
2014	3198 017 34730	47 nF 16V	2114	2020 024 90262	1000 µF 10V	2540	3198 029 31090	10 µF 25V
2015	3198 017 31030	10 nF 50V	2115	3198 025 11010	100 µF 10V	2541	3198 017 21050	1 µF 16V
2016	3198 017 31030	10 nF 50V	2200	3198 017 01040	100 nF 16V	2542	3198 023 41040	100 nF 25V
2017	3198 017 21050	1 µF 16V	2201	3198 029 01010	100 µF 6.3V	2543	3198 017 41050	1 µF 10V
2018	3198 023 21040	100 nF 25V	2203	3198 029 01010	100 µF 6.3V	2544	3198 016 01010	100 pF 50V
2018	3198 017 21040	100 nF 50V	2204	3198 017 01040	100 nF 16V	2581	3198 017 21050	1 µF 16V
2019	3198 029 31090	10 µF 25V	2205	3198 016 02790	27 pF 50V	2582	3198 017 41050	1 µF 10V
2020	3198 029 31090	10 µF 25V	2206	3198 016 02790	27 pF 50V	2583	3198 023 41040	100 nF 25V
2021	3198 023 41040	100 nF 25V	2207	3198 017 31030	10 nF 50V	2584	3198 017 21050	1 µF 16V only for 1 Tuner
			2227	3198 017 01020	1 nF 50V only for 14"	2584	3198 017 01040	100 nF 16V only for 2 Tuner
			2227	3198 016 04710	470 pF 50V only for 20*/21"	2585	3198 017 21050	1 µF 16V
			2228	3198 017 31020	1 nF 50V	2587	3198 017 41050	1 µF 10V
			2230	3198 025 11010	100 µF 10V	2600	3198 029 24790	47 µF 16V
			2231	3198 017 01040	100 nF 16V	2601	3198 017 01040	100 nF 16V
			2232	3198 017 01040	100 nF 16V	2602	3198 029 22290	22 µF 16V
			2233	3198 017 41050	1 µF 10V	2603	3198 029 24790	47 µF 16V
			2234	3198 017 34730	47 nF 16V	2604	3198 023 21040	100 nF 25V
			2235	3198 017 34730	47 nF 16V	2605	3198 017 01040	100 nF 16V
			2236	3198 017 34730	47 nF 16V	2606	3198 023 21040	100 nF 25V
			2237	3198 017 01040	100 nF 16V	2607	3198 029 22290	22 µF 16V
			2238	2222 470 75104	100 nF 63V	2608	3198 017 31030	10 nF 50V
			2239	3198 017 32230	22 nF 25V	2609	3198 029 24790	47 µF 16V
			2240	3198 017 01020	1 nF 50V	2610	3198 029 31090	10 µF 25V
			2241	3198 017 01020	1 nF 50V	2611	3198 017 01040	100 nF 16V
			2242	3198 017 02220	2.2 nF 50V	2613	3198 029 31090	10 µF 25V
			2243	3198 025 51080	1 µF 50V	2614	3198 023 21040	100 nF 25V

2615	3198 016 03310	330 pF 50V	2960	3198 017 44740	470 nF 10V	3244	3198 021 51050	1 M 0.1W
2616	3198 017 01020	1 nF 50V	2961	3198 017 01040	100 nF 16V	3245	3198 021 32240	220 k 0.063W
2617	3198 017 32220	2.2 nF 50V	2962	3198 017 01040	100 nF 16V	3246	3198 021 31050	1 M 0.063W
2618	3198 023 04730	47 nF 25V	2963	3198 017 33330	33 nF 16V	3246	3198 021 52250	2.2 M 0.1W
2619	2022 552 05341	820 pF 50V	2964	3198 017 32220	2.2 nF 50V	3247	3198 011 01050	1 M 0.17W
2620	3198 029 24790	47 µF 16V				3248	3198 021 31530	15 k 0.063W
2621	3198 017 31030	10 nF 50V				3249	3198 021 34710	470 R 0.063W
2622	3198 017 21050	1 µF 16V				3249	3198 021 32210	220 R 0.063W
2623	3198 016 31020	1 nF 25V				3250	3198 021 32730	27 k 0.063W
2624	3198 029 21010	100 µF 16V				3251	3198 021 31040	100 k 0.063W
2625	2020 300 90611	27 nF 50V				3252	3198 021 32240	220 k 0.063W
2626	3198 017 34720	4.7 nF 50V				3253	3198 021 31020	1 k 0.063W
2627	2022 552 05234	3.9 pF 50V				3254	3198 021 34740	470 k 0.063W
2628	3198 029 22290	22 µF 16V				3255	2120 108 91725	270 k 0.1W
2630	3198 017 31030	10 nF 50V				3258	3198 011 03310	330 R 0.17W
2631	3198 017 32220	2.2 nF 50V				3260	3198 021 58210	820 R 0.1W
2632	3198 017 41050	1 µF 10V				3460	3198 021 32230	22 k 0.063W
2633	3198 029 31090	10 µF 25V				3461	3198 021 54710	470 R 0.1W
2700	3198 029 01010	100 µF 6.3V				3462	3198 021 54710	470 R 0.1W
2701	3198 017 01040	100 nF 16V				3463	3198 021 54710	470 R 0.1W
2702	2020 552 95499	100 nF 50V only for 20"/21"				3464▲	2322 205 33228	2.2 R NFR25
2702	3198 017 21040	100 nF 50V only for 14"				3465	2322 193 95074	0.47 R
2703	2020 552 95499	100 nF 50V only for 20"/21"				3466	3198 011 04710	470 R 0.17W
2703	3198 017 21040	100 nF 50V only for 14"				3467	3198 021 51080	1 R
2704	3198 017 32230	22 nF 25V				3468	3198 021 38230	82 k 0.063W
2705	3198 029 04790	47 µF 6.3V				3470	3198 021 52210	220 R 0.1W
2706	3198 016 32710	270 pF 50V				3471	3198 021 34720	4.7 k 0.063W
2708	3198 017 01040	100 nF 16V				3472	3198 021 53310	330 R 0.1W
2712	3198 016 32280	2.2 pF 50V				3473	3198 021 35620	5.6 k 0.063W
2713	3198 017 01020	1 nF 50V				3474	3198 021 34730	47 k 0.063W
2714	3198 017 42240	220 nF 16V				3475	3198 011 01830	18 k 0.17W
2715	3198 016 34710	470 pF 50V				3476	3198 011 01040	100 k 0.17W
2718	3198 017 41050	1 µF 10V				3477	2120 101 74274	270 k
2721	2020 552 96305	4.7 pF 10V				3479	2322 187 53225	2M 2 SFR16
2722	2020 552 96305	4.7 pF 10V				3481	3198 011 03330	33 k 0.17W
2723	3198 025 51090	10 µF 50V				3482	3198 021 33330	33 k 0.063W
2724	3198 017 41050	1 µF 10V				3484	3198 011 01030	10 k 0.17W
2726	3198 017 01040	100 nF 16V				3485	3198 011 04720	4.7 k 0.17W
2727	3198 017 22250	2.2 µF 10V				3489	3198 011 03910	390 R 0.17W
2728	3198 017 22250	2.2 µF 10V				3490	3198 021 52210	220 R 0.1W
2729	3198 017 21030	10 pF 50V				3491	2120 108 93963	200 k ERJ6ΩN
2730	3198 025 11010	100 µF 10V				3501	3198 021 56890	68 R 0.063W
2731	3198 017 01040	100 nF 16V				3502	3198 021 56890	68 R 0.063W
2732	3198 025 52280	2.2 µF 50V				3503	3198 021 32220	2.2 k 0.063W
2734	3198 017 01040	100 nF 16V				3504	3198 011 04720	4.7 k 0.17W
2735	3198 029 24790	47 µF 16V				3505	3198 011 01030	10 k 0.17W
2736	3198 017 04720	4.7 nF 50V				3506	3198 021 51040	100 k 0.1W
2737	3198 016 08210	820 pF 50V				3508	3198 021 51030	10 k 0.1W
2738	3198 017 21050	1 µF 16V				3509	3198 021 37590	75 R 0.063W
2745	3198 017 34720	4.7 nF 50V				3510	3198 021 53390	33 R 0.1W
2746	3198 017 41050	1 µF 10V				3511	3198 021 53390	33 R 0.1W
2747	3198 029 24790	47 µF 16V				3512	3198 021 53390	33 R 0.1W
2760	3198 029 31090	10 µF 25V				3514	3198 011 02210	220 R 0.17W
2761	3198 023 41040	100 nF 25V				3522	3198 021 31520	1.5 k 0.063W
2762	3198 029 24790	47 µF 16V				3523	3198 021 36820	6.8 k 0.063W
2763	3198 025 52290	22 µF 50V				3524	3198 021 51510	150 R 0.1W
2764	3198 024 44730	47 nF 50V				3525	3198 021 51210	120 R 0.1W
2765	3198 017 01020	1 nF 50V				3526	3198 021 52710	270 R 0.1W
2769	3198 017 31020	1 nF 50V				3527	3198 021 32710	270 R 0.063W
2770	3198 016 34710	470 pF 50V				3529	3198 021 57590	75 R 0.1W
2771	3198 023 41040	100 nF 25V				3530	2322 574 10402	VDR MAX 21VR
2772	3198 017 42240	220 nF 16V				3531	2322 574 10402	VDR MAX 21VR
2773	2020 552 94914	8.2 pF 50V				3532	3198 021 37590	75 R 0.063W
2774	3198 023 41040	100 nF 25V				3533	3198 021 37590	75 R 0.063W
2775	3198 029 31090	10 µF 25V				3534	3198 021 37590	75 R 0.063W
2776	3198 017 31030	10 nF 50V				3535	3198 021 37590	75 R 0.063W
2777	3198 016 31590	15 pF 50V				3536	3198 011 01810	180 R 0.17W
2779	3198 023 41040	100 nF 25V				3537	3198 021 31020	1 k 0.063W
2780	3198 016 31010	100 pF 50V				3538	3198 021 31030	10 k 0.063W
2781	3198 017 32230	22 nF 25V				3539	2322 574 10402	VDR MAX 21VR
2782	3198 029 22290	22 µF 16V				3541	3198 021 34740	470 k 0.063W
2783	3198 029 52280	2.2 µF 50V				3542	3198 021 51030	10 k 0.1W
2784	3198 016 31010	100 pF 50V				3543	3198 021 31030	10 k 0.063W
2785	3198 017 31030	10 nF 50V				3545	3198 021 34730	47 k 0.063W
2786	2020 021 91355	2.2 µF 50V				3546	3198 021 52210	220 R 0.1W
2787	3198 016 33390	33 pF 50V				3547	3198 021 31040	100 k 0.063W
2800	3198 023 41040	100 nF 25V				3548	3198 021 31040	100 k 0.063W
2801	3198 023 41040	100 nF 25V				3550	3198 021 52210	220 R 0.1W
2802	2022 020 00625	220 µF 16V				3551	3198 021 31030	10 k 0.063W
2805	3198 017 34720	4.7 nF 50V				3552	3198 021 32210	220 R 0.063W
2805	3198 017 32220	2.2 nF 50V				3553	3198 021 31520	1.5 k 0.063W
2815	3198 016 36890	68 pF 50V				3556	3198 021 32240	220 k 0.063W
2816	3198 016 36890	68 pF 50V				3557	3198 021 54710	470 R 0.1W
2900	3198 029 22290	22 µF 16V				3558	3198 021 32240	220 k 0.063W
2901	3198 016 31890	18 pF 50V				3559	3198 021 34720	4.7 k 0.063W
2902	3198 016 31590	15 pF 50V				3581	3198 021 31040	100 k 0.063W
2903	3198 016 02290	22 pF 50V				3582	3198 021 31040	100 k 0.063W
2904	3198 016 02290	22 pF 50V				3584	3198 021 31030	10 k 0.063W
2905	3198 023 41040	100 nF 25V				3586	3198 021 54730	47 k 0.1W
2906	3198 017 31030	10 nF 50V				3587	3198 021 51040	100 k 0.1W
2907	3198 017 42240	220 nF 16V				3588	3198 011 04710	470 R 0.17W
2908	3198 029 01010	100 µF 6.3V				3589	3198 021 31510	150 R 0.063W
2909	2020 025 90025	47 mF 5.5V				3590	3198 021 31510	150 R 0.063W
2910	3198 023 41040	100 nF 25V				3591	3198 021 31510	150 R 0.063W



3000	3198 021 32220	2.2 k 0.063W
3001	3198 011 01520	1.5 k 0.17W
3002	3198 021 31820	1.8 k 0.063W
3003	3198 021 32220	2.2 k 0.063W
3004	3198 021 31020	1 k 0.063W
3005	3198 021 51020	1 k 0.1W
3006	3198 021 38220	8.2 k 0.063W
3007	3198 021 33920	3.9 k 0.063W
3008	3198 021 32240	220 k 0.063W
3009	2120 108 91451	1 k 0.1W
3010	3198 021 31020	1 k 0.063W
3012	3198 011 01010	100 R 0.17W
3013	3198 021 33910	390 R 0.063W
3014	3198 021 33920	3.9 k 0.063W
3015	3198 021 33910	390 R 0.063W
3016	2120 108 92621	2.7 k 1%
3017	2120 108 92618	1.8 k 1%
3018	3198 021 31020	1 k 0.063W
3019	2120 108 92614	680 R 1%
3020	2120 108 92624	4.7 k 1%
3021	3198 021 31510	150 R 0.063W
3022	3198 021 31020	1 k 0.063W
3023	3198 021 34730	47 k 0.063W
3024	3198 021 34730	47 k 0.063W
3025	3198 021 52210	220 R 0.1W
3026	3198 021 31050	1 M 0.063W
3027	3198 021 90030	jumper only for 20"/21"
3027	3198 021 31080	1 R 0.063W only for 14"
3028	3198 021 31510	150 R 0.063W
3029	3198 021 31510	150 R 0.063W
3030	3198 021 31520	1.5 k 0.063W
3031	2120 108 93465	1.3 k 1% only for 20"/21"
3031	3198 021 31520	1.5 k 0.063W only for 14"
3032	3198 021 31510	150 R 0.063W
3033	3198 021 51010	100 R 0.1W
3034	3198 011 01520	1.5 k 0.17W
3035	3198 021 31050	1 M 0.063W
3036	3198 021 33330	33 k 0.063W
3037	3198 021 52250	2.2 M 0.1W
3038	3198 021 56810	680 R 0.1W
3060	3198 021 34730	47 k 0.063W
3070	3198 021 51020	1 k 0.1W
3071	3198 011 04730	47 k 0.17W
3073	3198 021 38220	8.2 k 0.063W
3074	2120 108 92514	15 k 1%
3075	3198 021 31040	100 k 0.063W
3076	3198 021 31030	10 k 0.063W
3078	3198 021 31830	18 k 0.063W
3079	3198 021 36810	680 R 0.063W
3082	3198 011 06820	6.8 k 0.17W
3083	3198 021 31020	1 k 0.063W
3084	3198	

7077	3198 010 42310	BC847BW
7100	3198 010 42310	BC847BW
7110	9338 315 60682	L78M08CV
7200	3103 178 56150	OTPROM ASSY ETXU6
7200	3103 178 56110	OTPROM ASSY ETXU2
7200	3103 178 56140	OTPROM ASSY ETXU5
7200	3103 178 56370	OTPROM ASSY ETYU7
7200	3103 178 56100	OTPROM ASSY ETXU1
7200	3103 178 56380	OTPROM ASSY ETYU8
7232	3198 010 42320	BC857BW
7461	3103 138 87290	Kit: 2x Sens. + 1x LED
7462	3103 138 87290	Kit: 2x Sens. + 1x LED
7463	9322 164 65668	M63100BFP(MITJ) L
7464	9322 097 89682	OPT CP TCRT5000L
7465	9322 097 89682	OPT CP TCRT5000L
7466	9322 097 91682	OPT CP TGST1030L
7500	9352 628 51112	TDA8941P/N1 L
7501	3198 010 42310	BC847BW
7520	3198 010 42320	BC857BW
7521	3198 010 42310	BC847BW
7522	9339 672 70685	BC847C only for 20"/21"
7522	3198 010 42040	BC847C only for 14"
7523	3198 010 42040	BC847C only for 14"
7523	9339 672 70685	BC847C only for 20"/21"
7524	9333 729 50653	HEF4052BT
7525	3198 010 42310	BC847BW
7526	3198 010 42310	BC847BW
7527	3198 010 42320	BC857BW
7528	3198 010 42320	BC857BW
7580	9333 729 50653	HEF4052BT
7582	3198 010 42310	BC847BW
7583	3198 010 44320	DTC124EU
7601	3198 010 42310	BC847BW
7602	9335 897 30215	BC856B
7603	9331 795 70126	BC328-40
7603	9331 795 40126	BC327-40
7604	9335 895 60215	BC846B
7606	3198 010 42310	BC847BW
7607	9335 895 60215	BC846B
7608	9322 004 24685	BC817-40
7608	3198 010 43240	BC817-40
7700	9340 547 11215	BSH101A
7720	9350 462 10112	TDA9830/V1 L
7721	3198 010 42310	BC847BW
7725	9322 159 15668	U2861B (TEG0) R
7730	3198 010 42310	BC847BW
7731	3198 010 42320	BC857BW
7732	3198 010 42320	BC857BW
7733	3198 010 42310	BC847BW
7760	3198 010 42310	BC847BW
7770	9352 606 11118	TDA9818T PAL B/G/I, SEC L, L'
7770	9352 621 13118	TDA9817T PAL, SEC B/ G, D/K, PAL B/G, PAL I
7771	3198 010 44320	DTC124EU
7772	9333 729 60653	HEF4053BT
7773	3198 010 42320	BC857BW
7801	3198 010 42310	BC847BW
7802	3198 010 42310	BC847BW
7803	3198 010 42320	BC857BW
7804	3198 020 43530	BC337-25
7807	3198 010 42310	BC847BW
7808	3198 010 42310	BC847BW
7809	3198 010 44220	DTA124EU
7810	9322 154 48667	IR TSOP2236UH1
7818	9322 120 64668	M24C08-MN6
7820	3198 010 44320	DTC124EU
7821	3198 010 44320	DTC124EU
7822	3198 010 44320	DTC124EU
7899	3103 178 56230	OTPROM ASSY ETAU6
7899	3103 178 56210	OTPROM ASSY ETAU4
7899	3103 178 56200	OTPROM ASSY ETAU3
7899	3103 178 56180	OTPROM ASSY ETAU1
7899	3103 178 56220	OTPROM ASSY ETAU5
7899	3103 178 56190	OTPROM ASSY ETAU2
7900	3198 010 44320	DTC124EU
7960	9322 109 82682	SDA 5650
8760	3103 140 27150	CAB. SHIELDED TU1-TU2
9852	3198 021 90020	CHIP JUMPER