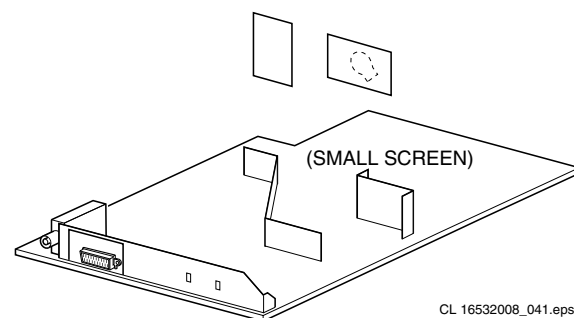


Service
Service
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Service Manual

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**PHILIPS**

1. Technical Specifications, Connections and Chassis Overview

- Index:**
 - Technical Specifications.
 - Connections.
 - Chassis Overview.
- Note:**
 - Below described specifications are not valid for *one* product, but for the *whole* product range. See Product Survey for *specific* models.
 - Figures can deviate slightly from the actual situation, due to different set executions.

- A/V connections
: NTSC 3.58, 4.43
: PAL 60
- Channel selections
: 100 channels
: U, V, S, H
- Aerial input
: 75 Ω , IEC-type

1.1.2 Miscellaneous

- Audio output
: 1 x 4 W or,
: 2 x 3 W or,
: 2 x 5 W + 10 W (sw) + 2 x 3 W
- Mains voltage
: 90 - 276 V or,
: 150 - 276 V
- Mains frequency
: 50 Hz or,
: 60 Hz
- Ambient temperature
: + 5 to + 45 deg. C
- Maximum humidity
: 90 %
- Power consumption
: 36 W (14") to
: 52 W (21")
- Standby Power consumption
: < 3 W

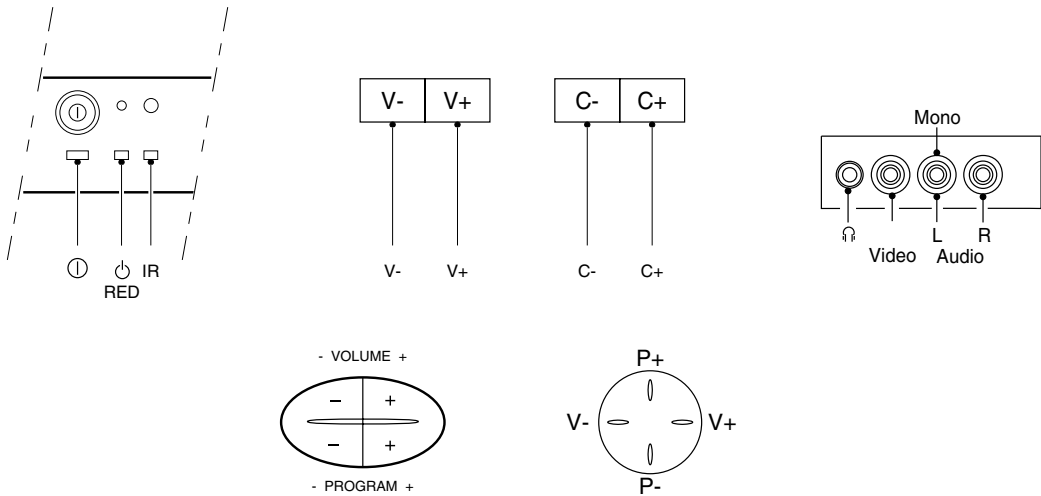
1.1 Technical Specifications

1.1.1 Reception

- Tuning system
: PLL
- Colour systems
: NTSC
: PAL B/G, D/K, I
: SECAM B/G, D/K, K1
- Sound systems
: FM-mono
: FM-stereo

1.2 Connections

1.2.1 Front (or Side) Connections and Front (or Top) Control



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Figure 1-1

- A/V In (if present)**
 - Video CVBS (1 Vpp / 75 Ω)
 - Audio L (0.2 Vrms / 10 k Ω)
 - Audio R (0.2 Vrms / 10 k Ω)
 - Headphone (8 - 600 Ω / 4 mW)
-

1.2.2 Rear Connections

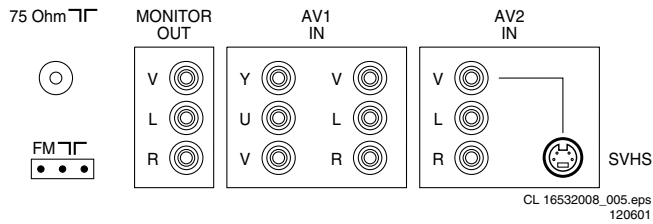


Figure 1-2

Monitor Out

1 - Video	CVBS (1 Vpp / 75 Ω)	⊕⊗
2 - Audio	L (0.5 Vrms / 1 kΩ)	⊕⊗
3 - Audio	R (0.5 Vrms / 1 kΩ)	⊕⊗

YUV In (if present)

1 - Y	0.7 Vpp / 75 Ω	⊕⊗
2 - U	0.7 Vpp / 75 Ω	⊕⊗
3 - V	0.7 Vpp / 75 Ω	⊕⊗

AV1 In

4 - Video	CVBS (1 Vpp / 75 Ω)	⊕⊗
5 - Audio	L (0.5 Vrms / 10 kΩ)	⊕⊗
6 - Audio	R (0.5 Vrms / 10 kΩ)	⊕⊗

AV2 In

1 - Video	CVBS (1 Vpp / 75 Ω)	⊕⊗
2 - Audio	L (0.5 Vrms / 10 kΩ)	⊕⊗
3 - Audio	R (0.5 Vrms / 10 kΩ)	⊕⊗

AV2 In (SVHS)

1 -	gnd	⊥
2 -	gnd	⊥
3 - Y	1 Vpp / 75 Ω	⊕⊗
4 - C	0.3 Vpp / 75 Ω	⊕⊗

1.3 Chassis Overview

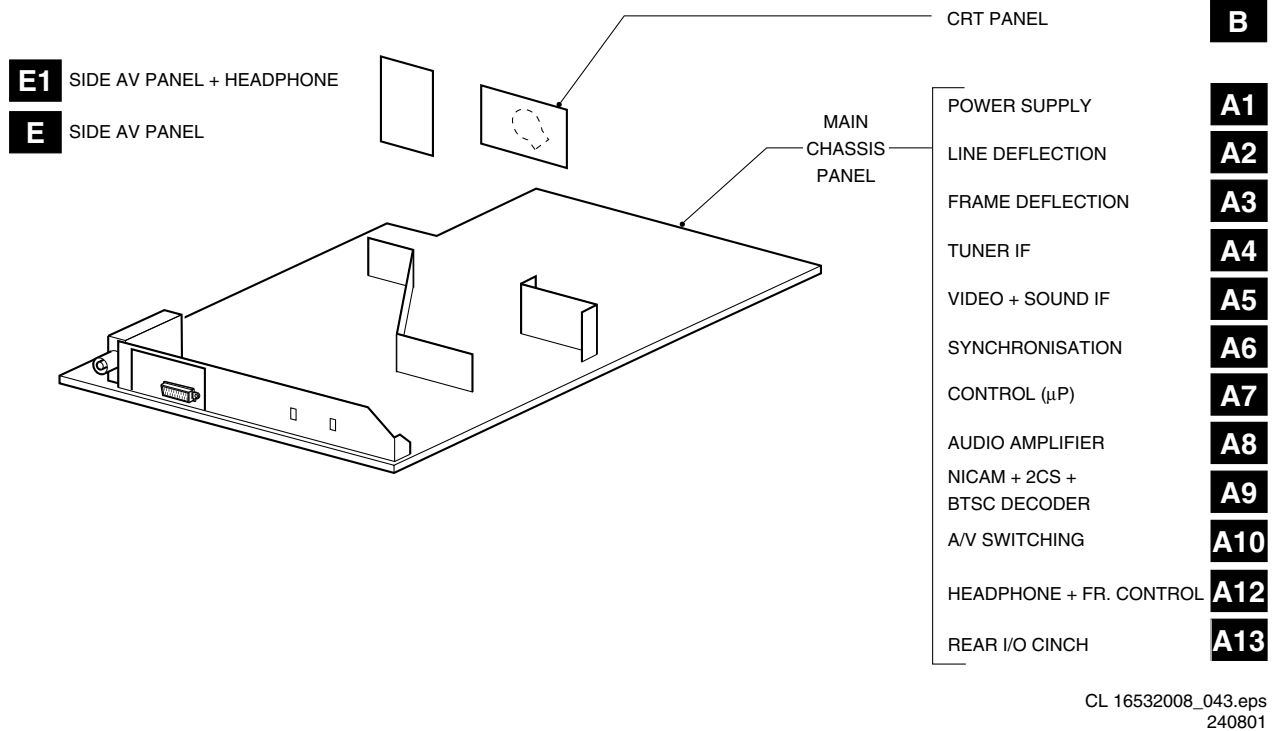



Figure 1-3

2. Safety & Maintenance Instructions, Warnings, and Notes

2.1 Safety Instructions For Repairs

Safety regulations require that during a repair:

- Due to the 'hot' parts of this chassis, the set must be connected to the AC power via an isolation transformer.
- Safety components, indicated by the symbol , should be replaced by components identical to the original ones.
- When replacing the CRT, safety goggles must be worn.

Safety regulations require that after a repair, the set must be returned in its original condition. Pay particular attention to the following points:

- General repair instruction: as a strict precaution, we advise you to re-solder the solder connections through which the horizontal deflection current is flowing, in particular:
 - all pins of the line output transformer (LOT)
 - fly-back capacitor(s)
 - S-correction capacitor(s)
 - line output transistor
 - pins of the connector with wires to the deflection coil
 - other components through which the deflection current flows.

Note: This re-soldering is advised to prevent bad connections due to metal fatigue in solder connections and is therefore only necessary for television sets more than two years old.

- Route the wire trees and EHT cable correctly and secure them with the mounted cable clamps.
- Check the insulation of the AC power cord for external damage.
- Check the strain relief of the AC power cord for proper function, to prevent the cord from touching the CRT, hot components, or heat sinks.
- Check the electrical DC resistance between the AC plug and the secondary side (only for sets that have an isolated power supply). Do this as follows:
 1. Unplug the AC power cord and connect a wire between the two pins of the AC plug.
 2. Turn on the main power switch (keep the AC power cord unplugged!).
 3. Measure the resistance value between the pins of the AC plug and the metal shielding of the tuner or the aerial connection of the set. The reading should be between 4.5 MΩ and 12 MΩ.
 4. Switch the TV OFF and remove the wire between the two pins of the AC plug.
- Check the cabinet for defects, to prevent the possibility of the customer touching any internal parts.

2.2 Maintenance Instructions

It is recommended to have a maintenance inspection carried out by qualified service personnel. The interval depends on the usage conditions:

- When the set is used under normal circumstances, for example in a living room, the recommended interval is three to five years.
- When the set is used in an environment with higher dust, grease or moisture levels, for example in a kitchen, the recommended interval is one year.
- The maintenance inspection includes the following actions:
 1. Perform the 'general repair instruction' noted above.
 2. Clean the power supply and deflection circuitry on the chassis.
 3. Clean the picture tube panel and the neck of the picture tube.

2.3 Warnings

- In order to prevent damage to ICs and transistors, avoid all high voltage flashovers. In order to prevent damage to the picture tube, use the method shown in Fig. 2-1, to discharge the picture tube. Use a high voltage probe and a multi-meter (position VDC). Discharge until the meter reading is 0 V (after approx. 30 s).

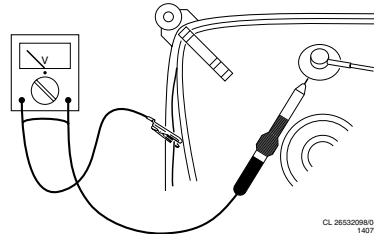









Figure 2-1

- All ICs and many other semiconductors are susceptible to electrostatic discharges (ESD) . Careless handling during repair can reduce life drastically. When repairing, make sure that you are connected with the same potential as the mass of the set by a wristband with resistance. Keep components and tools also at this potential. Available ESD protection equipment:
 - Complete kit ESD3 (small tablemat, wristband, connection box, extension cable, and ground cable) 4822 310 10671.
 - Wristband tester 4822 344 13999.
- Together with the deflection unit and any multi-pole unit, flat square picture tubes form an integrated unit. The deflection and the multi-pole units are set optimally at the factory. Adjustment of this unit during repair is therefore not recommended.
- Be careful during measurements in the high voltage section and on the picture tube.
- Never replace modules or other components while the unit is switched ON.
- When you align the set, use plastic rather than metal tools. This will prevent any short circuits and the danger of a circuit becoming unstable.

2.4 Notes

- Measure the voltages and waveforms with regard to the chassis (= tuner) ground () or hot ground () depending on the area of circuitry being tested.
- The voltages and waveforms shown in the diagrams are indicative. Measure them in the Service Default Mode (see chapter 5) with a color bar signal and stereo sound (L: 3 kHz, R: 1 kHz unless stated otherwise) and picture carrier at 475.25 MHz (PAL) or 61.25 MHz (NTSC, channel 3).
- Where necessary, measure the waveforms and voltages with () and without () aerial signal. Measure the voltages in the power supply section both in normal operation () and in standby (). These values are indicated by means of the appropriate symbols.
- The picture tube panel has printed spark gaps. Each spark gap is connected between an electrode of the picture tube and the Aquadag coating.
- The semiconductors indicated in the circuit diagram and in the parts lists are completely interchangeable per position with the semiconductors in the unit, irrespective of the type indication on these semiconductors.

3. Directions for Use

PREPARATION

Antenna Connection

- Connect the aerial plug to the antenna socket **T** on the back cover.
- Insert the mains plug into the wall socket.

Mains Connection

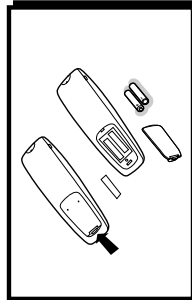
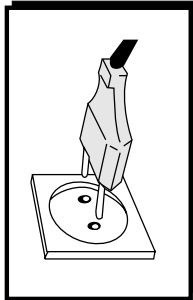
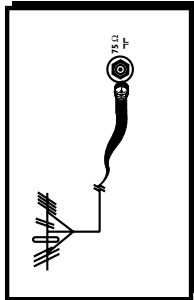
- For correct mains voltage, refer to type sticker at the rear of the TV set
 - Consult your dealer if mains supply is different.
- Note :** This diagram is not representative of the actual plug and socket.

Switching on the Set

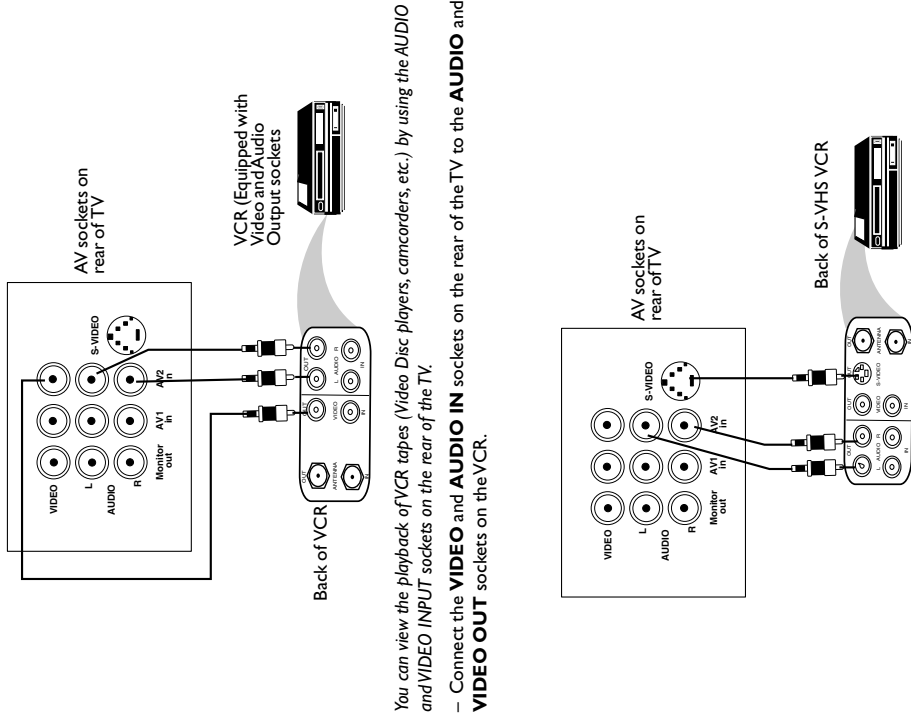
- Press the main power button to switch on/off the TV.
- If the set is on standby (indicator is red), press the **Power** button on the remote control to switch on set.

Using the Remote Control

- Insert the correct type of batteries into the compartment.
- Ensure the batteries are placed in the right direction.



CONNECTING THE AUDIO/VIDEO SOCKETS (PLAYBACK)



The S-Video connection on the rear of the TV is used for the playback of S-VHS VCR tapes, Video Discs, Video Games or Compact Disc-Interactive (cd-i) discs. Better picture detail and clarity is possible with the S-Video playback as compared to the picture from a normal antenna (RF) connection.

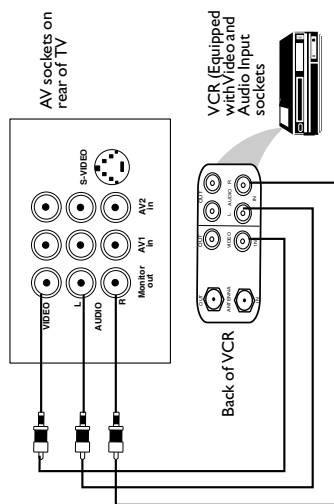
- Connect the **S-VIDEO** socket on the rear of the TV to the **S-VHS OUT** socket on a S-VHS VCR.
- Connect the **AUDIO IN** sockets from the rear of the TV to the **AUDIO OUT** sockets on the VCR. **Note :** You need not connect the **VIDEO IN** socket of the TV if **S-VIDEO IN** socket is connected.

FUNCTIONS OF REMOTE CONTROL

- 1 Power button**
 - Switch set off temporarily to standby mode. (The red light indicator lights up when the set is on standby mode).
 - To switch on set from standby mode, press Channel +/-, Digit (0-9) or Power button.
- 2 Teletext Colour/Personal Zapping buttons**
 - In teletext mode, the colour buttons allow you to access directly an item or corresponding pages. As Personal Zapping buttons, you can surf up to 10 personal channels for each button. For detailed description of functions, refer to section "Personal Zapping".
- 3 Teletext buttons**
 - Allows you to access teletext information. For detailed description of functions, refer to section on "Using the Teletext".
- 4 Smiley button**
 - Allows to add and store your personal preference channels in your Personal Preference list. For detailed description of functions, refer to section on "Using your Personal Zapping feature".
- 5 Timer Button**
 - Allows you to set the clock to switch to another channel at a specified time while you are watching another channel or when the set is on standby mode.
- 6 Smart Sound Button**
 - Press the Smart Sound button repeatedly to access 4 different types of sound settings and choose your desired setting.
- 7 Menu Button**
 - Displays the main menu. Also exits menu from screen.
- 8 Cursor Up Button**
 - Allows you to select the next item on the menu.
- 9 Cursor Left Button**
 - Allows you to select the sub-menus and adjust the settings.
- 10 Volume + / - Button**
 - Increases or decreases volume.
- 11**
 - Allows you to switch from Stereo to Mono sound during stereo transmission or to choose between language I or language II during dual sound transmission.
- 12 A/Ch(Alternate channel) Button**
 - Allows you to change between the current channel and the previous channel.

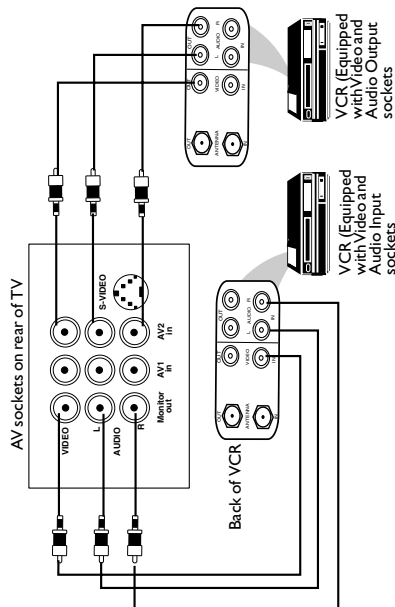
CONNECTING THE AUDIO/VIDEO SOCKETS (RECORDING)

Connection for recording from the TV channel



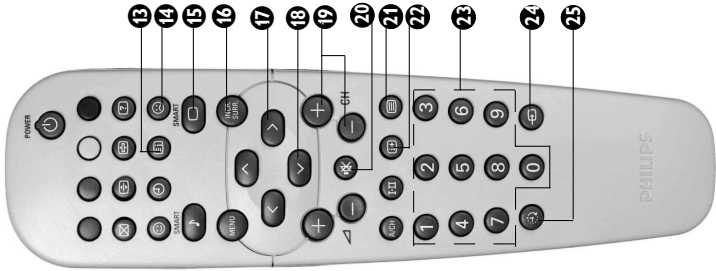
- Connect the corresponding **INPUT** sockets of the VCR to the **MONITOR OUTPUT** sockets on the rear of the TV.
- To enhance the sound of your TV, connect the **AUDIO L** and **R** sockets to an external audio system instead of the VCR. For mono equipment, connect only the **AUDIO L** socket.

Connection for recording from one VCR to another VCR



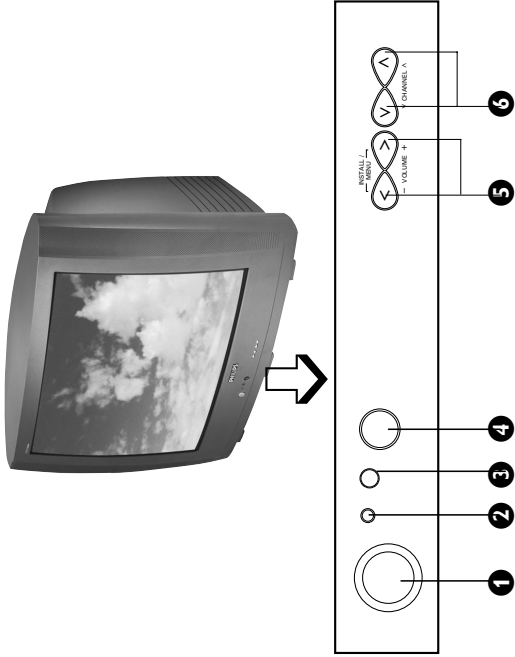
- Connect the sockets of the VCR which you wish to record from, to the corresponding sockets at either **AV1** or **AV2**.
- Connect the sockets of the receiving VCR to the **MONITOR OUTPUT** sockets on the rear of the TV.

FUNCTIONS OF REMOTE CONTROL



- 13 Main Index Button**
In teletext mode, press button to return to the main index page.
- 14 Frownie button**
Allows to delete stored personal preference channels in your Personal Preference list. For detailed description of functions, refer to section on "personal Zapping".
- 15 Smart Picture Button**
Press the Smart Picture button repeatedly to access 5 different types of picture settings and choose your desired setting.
- 16 Incredible Surround Button**
Allows you to select Incredible Surround sound when transmission is in stereo mode.
Allows you to select Spatial Sound when transmission is in mono mode.
- 17 Cursor Right Button**
Allows you to access the sub-menus and adjust the settings.
- 18 Cursor Down Button**
Allows you to select the next item on the menu.
- 19 Channel + / - Buttons**
Allows you to select channels in ascending or descending order.
- 20 Mute Button**
Mutes sound. To restore sound, press button again.
- 21 Teletext Button**
Refer to section on "Using the Teletext"
- 22 OSD button**
Allows you to display the current channel number. It also allows to exit menu from the screen after control adjustments.
- 23 Digit (0 - 9) Buttons**
Press to select a channel. For a 2-digit channel number, press the first digit and followed immediately by the second digit.
- 24 A/V Button**
Allows you to select the AV channels.
- 25 Sleptimer Button**
Allows you to select a time period after which the set will switch to standby mode automatically.

FUNCTIONS OF TV CONTROLS



1	Mains Power button	Switch mains power on or off.
2	Standby light indicator	Indicate red light when standby mode is activated.
3	Remote Sensor	Acts as a sensor for activating the controls of the TV when remote control handset is aimed at it.
4	Headphone socket	Connect headphone jack to socket for personal listening.
5	Volume </> buttons	Adjust sound volume softer/louder.
6	Channel V / ^ buttons	Select channel in descending/ascending order.

Note

- You can enter the main menu by pressing both the Volume < and > buttons at the same time.
- Press the V or ^ button to select the next item on the menu.
- Press Volume < or > button to access sub-menu and adjust the settings.

SELECTING THE MENU LANGUAGE

Operating instructions generally explain the operation of the TV set using the buttons on the remote control unless otherwise stated. Please read the following instructions carefully and follow the steps as shown to familiarise yourself with the installations and all features available in your set.

The **Language** feature allows you to set the TV's on-screen menu to be shown in your desired language.

Step

Press button

1

Enter main menu.

MENU

2

Select **Install**.

▼

3

Enter the Install menu.

▶

4

Press button repeatedly to cycle through the language list and select the language of your choice.

▶

5

Exit menu from screen.

EXIT

Result on TV Screen

Main▶Picture▶Brightness

▼

Picture▶Brightness

▶

Sound

Features

Install

Colour Temp.

More....

Main▶Language

▼

Language▶English

▶

Auto Store

Manual store

Sort

Channel Edit

Name

Install▶Language▶English

▶

Auto Store

Manual store

Sort

Channel Edit

Name

Install▶Language▶English

▶

Auto Store

Manual store

Sort

Channel Edit

Name

Install▶Language▶English

▶

Auto Store

Manual store

Sort

Channel Edit

Name

AUTOMATIC TUNING OF CHANNELS

Automatic tuning of channels allows you to store each programme automatically.

Step

Press button

1

Enter main menu.

MENU

2

Press button repeatedly until **Install** is selected.

▼

3

Enter install menu.

▶

4

Select **Auto Store**.

▼

5

Start automatic tuning of channels.

▶

6

When tuning is completed, exit menu from screen.

EXIT

Result on TV Screen

Main▶Picture▶Brightness

▼

Picture▶Brightness

▶

Sound

Features

Install

Colour Temp.

More....

Main▶Language

▼

Language▶English

▶

Auto Store

Manual store

Sort

Channel Edit

Name

Install▶Language▶English

▶

Auto Store

Manual store

Sort

Channel Edit

Name

Install▶Language▶English

▶

Auto Store

Manual store

Sort

Channel Edit

Name

Auto Store

Channel

TV

142 MHz

Install▶Language▶English

▶

Auto Store

Manual store


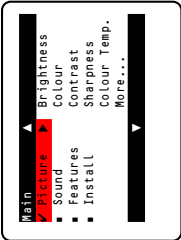

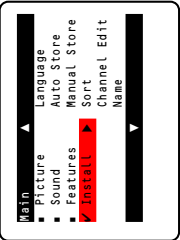

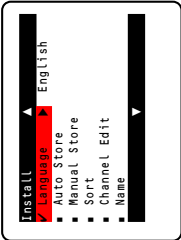

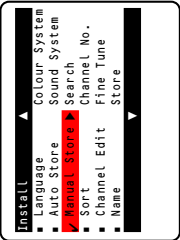

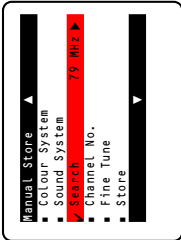

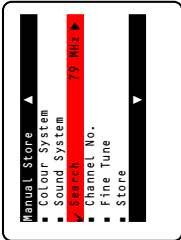
Sort

Channel Edit






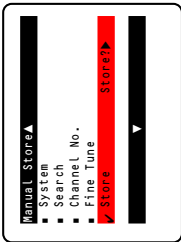

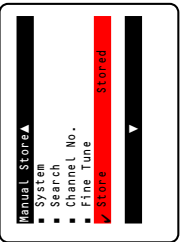

Name

MANUAL TUNING OF CHANNELS

Manual tuning of channels allows you to select your preferred channel number for every available programme.

Step	Press button	Result on TV Screen
1		
2		<p>Press button repeatedly until Install is selected.</p> 
3		<p>Enter install menu.</p> 
4		<p>Press button repeatedly until Manual Store is selected.</p> 
5		<p>Enter manual store menu.</p> 
6		<p>Press button repeatedly until Search is selected.</p> 

MANUAL TUNING OF CHANNELS

Step	Press button	Result on TV Screen
7		<p>Start manual searching. Searching stops once a transmitting signal is found.</p> 
8		<p>Select Channel No.</p>
9		<p>Key in the channel number.</p>
10		<p>Press button repeatedly until Store is selected.</p> 
11		<p>Store tuned channel.</p> <p>Note : If you want to continue searching for another transmitting channel, repeat steps 7 to 11.</p> 
12		<p>Exit menu from screen.</p>

SELECTING THE COLOUR/SOUND SYSTEM

This feature allows you to select your desired **Colour** and **Sound** system. If **Auto** is selected, the respective colour and sound system will be automatically selected according to the transmission system. **Note** : Select your desired colour and sound system manually if reception is poor at **Auto** mode.

- Step

Press button
- 6

Repeat step 1 to step 5 as in “Manual Tuning of TV Channels”
- 7

Colour System is selected.
- 8

Select the desired colour system (**Auto, PAL, NTSC 3.58, NTSC 4.43 or SECAM**).
- 9

Press button repeatedly until **STORE** is selected. Store selected system.
- 10

Proceed to select **Sound System**.
- 11

Select the desired sound system (**Auto, BG, I, DK or M**).
- 12

Press button repeatedly until **STORE** is selected. Store selected system.
- 13

Exit menu from screen.

FINE TUNING OF CHANNELS

This feature allows you to adjust picture reception in areas of weak reception.

- Step

Press button
- 1

Enter main menu.
- 2

Press button repeatedly until **Install** is selected.
- 3

Enter install menu.
- 4

Press button repeatedly until **Manual Store** is selected.
- 6

Enter manual store menu.
- 6

Press button repeatedly until **Fine Tune** is selected.
- 7

Fine tune until the best reception is obtained.
- 8

Select **Store**.
- 9

Store last fine-tuned status.
- 10

Exit menu from screen.

SORTING OF CHANNELS

This feature rearranges channel numbers.

Step	Press button	Result on TV Screen
1	MENU	Main Picture Sound Features Install Channel Edit Name
2	V	Press button repeatedly until Install is selected.
3	>	Enter install menu.
4	V	Press button repeatedly until Sort is selected.
5	>	Enter sort mode.
6	V or <	Select the channel number you want to change from (e.g. 002).
7	>	Confirm selection.
8	V	Select the channel number you want to change to (e.g. 005).
9	<	Confirm selection. The change is done. Note : Channel numbers 5, 4 and 3 will move upwards accordingly that is, Channel 5 will move up to Channel 4, Channel 4 to 3 and Channel 3 to 2.
10	EXIT	Exit menu from screen.

EDITING OF CHANNELS

This feature allows you to skip or edit channels which have bad or weak TV signal or channels that you do not watch often. **Note** : Once a channel is skipped, you cannot have access to it by the CH (Channel) + or - button. You can only have access to the channel by the Digit (0 - 9) buttons.

Step	Press button	Result on TV Screen
1	MENU	Main Picture Sound Features Install Channel Edit Name
2	V	Press button repeatedly until Install is selected.
3	>	Enter install menu.
4	V	Press button repeatedly until Channel Edit is selected.
5	>	Enter Channel Edit menu.
6	1 2 3 4 5 6 7 8 9 0	Key in the channel number to be skipped.
7	V	Select Skipped .
8	>	Select On to skip channel.
9	EXIT	Exit menu from screen.

HOW TO RESTORE SKIPPED CHANNELS

- Repeat **Steps 1 to 5** as in "Editing of Channels".
- Key in the channel number to be restored by the **Digit (0 - 9)** button.
- Select **Skipped** by the **Cursor Dow** button.
- Select **Off** to restore channel by the **Cursor Right** button.
- Exit menu from screen by the **OSD** button.

NAMING OF CHANNELS

This feature enables you to name or rename channels.

Step

Press button

1

Enter main menu.

2

Press button repeatedly until **Install** is selected.

3

Enter install menu.

4

Press button repeatedly until **Name** is selected.

5

Enter name mode.

6

Select the channel you want to name.

7

Move to first character slot.

8

A cursor appears for you to start the input of characters. Select the character you want. Move to next character slot by the **Cursor Right** button and select the next character. You can enter up to a maximum of 5 characters.

9

Exit menu from screen.

Result on TV Screen

Main

Language

Auto Store

Manual Store

Sort

Install

Channel Edit

Name

Install

Language

Auto Store

Manual Store

Sort

Channel Edit

Name

Install

Language

Auto Store

Manual Store

Sort

Channel Edit

Name

Install

Language

Auto Store

Manual Store

Sort

Channel Edit

Name

ADJUSTING THE TV PICTURE

The picture menu allows you to make adjustments to the picture.

Step

Press button

1

Display the main menu on screen.

2

Enter **Picture** menu.

3

Select item.

4

Adjust level or select desired setting.

5

Exit menu from screen.

Result on TV Screen

Main

Picture

Brightness

Colour

Contrast

Sharpness

Colour Temp

More...

Picture

Colour

Contrast

Sharpness

Colour Temp

NR

Picture

Contrast

Sharpness

Colour Temp

NR

Contrast +

Picture menu items	Activities
Brightness	Increase or decrease brightness level.
Colour	Increase or decrease color level.
Contrast	Increase or decrease contrast level.
Sharpness	Increase or decrease sharpness level to improve detail in picture.
Color temperature	Choose from 3 settings (Normal, Warm or Cool).
NR (Noise Reduction)	Select " On " to reduce "noisy" picture (little dots on picture) due to weak signal.
Contrast +	Select " On " to allow you to optimise the total contrast for improved picture quality.

ADJUSTING THE TV SOUND

The sound menu allows you to make adjustments to the sound.

Step

Press button

1

Display the main menu on screen.

2

Select **Sound** menu.

3

Enter **Sound** menu.

4

Select item.

5

Adjust level or select desired setting.

6

Exit menu from screen.

Result on TV Screen

Main
Picture
Sound
Features
Install
More...

Main
Picture
Sound
Features
Install

Sound
Treble
Bass
Balance
AVL
Incr. Surround
Ultra Bass

Sound menu items	Activities
Treble	Increase or decrease high frequency level.
Bass	Increase or decrease low frequency level.
Balance	Increase or decrease to adjust balance level.
AVL (Auto Volume Leveller)	Select On to enable volume to remain at a pre-determined level should there be a sudden change in volume during commercial breaks or channel switching.
Incredible Surround	Select On to boost the effect of stereo sound.
Ultra Bass	Select On to enjoy enhanced bass output.

USING THE TIMER

The Timer feature allows you to set the timer to switch to another channel at a specified time while you are watching another channel or when the TV is on standby mode.
Note : For the timer to function, the set must not be switched off. Once the set is switched off, the timer is disabled.

Step

Press button

1

Display the main menu on screen.

2

Select **Features**.

3

Enter the Features menu.

4

Enter Timer menu.

5

Key in the current time starting from the hour follow by minute. This is the time where the "start time" and "stop time" will take reference from.

6

Select **Start Time**.

7

Key in the time you want the programme to be switched on.

Result on TV Screen

Main
Picture
Sound
Features
Install
More...

Main
Picture
Sound
Features
Install

Features
Timer
Child Lock
Format

Features
Timer
Start Time
Stop Time
Format
Channel
Activate
Display

Timer
Start Time
Stop Time
Channel
Activate
Display

Timer
Start Time
Stop Time
Channel
Activate
Display

ACTIVATING THE CHILD LOCK (ACCESS CODE)

The Child Lock feature allows you to lock channels to prevent your children from watching programmes you deem undesirable.

Note : You can only have access to the locked channels via the remote control. Keep the remote control out of reach so as to prevent your children from having access to it.

Step	Press button	Result on TV Screen
1	MENU	Main menu: Timer, Picture, Sound, Child Lock, Features, Install. Features is highlighted.
2	Down Arrow	Features menu: Timer, Child Lock, Format. Child Lock is highlighted.
3	Right Arrow	Enter the Features menu.
4	Down Arrow	Select Child Lock .
5	Right Arrow	Enter Child Lock mode.
6	1 2 3 4 5 6 7 8 9 0	Key in the 4-digit access code. For the first time or if you have forgotten the access code, enter the universal access code 0711 twice. It will now prompt you to key in a New Code .
7	1 2 3 4 5 6 7 8 9 0	Key in your preferred code (4-digits).
8	1 2 3 4 5 6 7 8 9 0	Key in the new code the second time to confirm code.
9	Exit (Red Square)	The Child Lock menu will now appear. You can proceed to lock channel (refer to section on "Lock Channel"). If not, exit menu from screen.

Note : After you have exit menu from screen and you want to enter the child lock menu again, you need to key the new access code only once.

USING THE TIMER

Step	Press button	Result on TV Screen
8	Down Arrow	Select Stop Time .
9	1 2 3 4 5 6 7 8 9 0	Key in the time you want the programme to be switched off.
10	Down Arrow	Select Channel .
	1 2 3 4 5 6 7 8 9 0	Key in the channel you want to switch to.
11	Down Arrow	Select Activate .
12	Right Arrow	Activate timer: You can select Once , Daily or Off .
13	Down Arrow	Select Display .
14	Right Arrow	Select On mode if you want to display the time on the TV screen.
15	Exit (Red Square)	Exit menu from screen.

Note : After the Stop Time is activated, the TV will go on standby mode. To switch on set from standby mode, press **Channel +/-**, **Digit (0 -9)** or **Power** button.

ACTIVATING THE CHILD LOCK (CHANGE CODE)

Note : You need to key the access code only once.

Step

Press button

Repeat **Steps 1 to 8** as in “**ACTIVATING THE CHILD LOCK (ACCESS CODE)**”

9

10

The Child Lock menu will now appear. You can proceed to change code.

11

12

Child Lock

Lock Channel

New Code

Change Code

Clear All

Lock All

Select **Change Code**.
Enter change code mode.

11

12

Child Lock

Lock Channel

New Code

Change Code

Clear All

Lock All

Key in your preferred code (4-digit).

12

13

Child Lock

Lock Channel

Confirm Code

Change Code

Clear All

Lock All

Key in the new code the second time to confirm code.

13

Exit menu from screen.

Result on TV Screen

Child Lock

Lock Channel

New Code

Change Code

Clear All

Lock All

ACTIVATING THE CHILD LOCK (LOCK CHANNEL)

Step

Press button

Repeat **Steps 1 to 8** as in “**CHILD LOCK (ACCESS CODE)**”

9

10

The Child Lock menu will now appear. You can proceed to lock channel.

10

11

Child Lock

Lock Channel

002

Change Code

Clear All

Lock All

Enter lock channel mode.

10

11

Child Lock

Lock Channel

002

Change Code

Clear All

Lock All

Select the channel you want to lock.

11

12

Child Lock

Lock Channel

002

Change Code

Clear All

Lock All

Activate blocking of channel.
A keylock symbol will appear beside the channel number indicating that it is locked.
Note : To lock more than one channel, repeat Steps 10 to 11 before exiting menu from screen.

12

Exit menu from screen.

Result on TV Screen

Child Lock

Lock Channel

002

Change Code

Clear All

Lock All

ACTIVATING THE CHILD LOCK (LOCK ALL)

You can choose to lock all channels in the **LockAll** mode in the Child Lock menu.

Step	Press button	Result on TV Screen
Repeat Steps 1 to 8 as in “ CHILD Lock (Access Code) ”		
9		
10		
11		

ACTIVATING THE CHILD LOCK (CLEAR ALL)

To unlock channels that you have locked, enter the Child Lock menu and select the **Off** option **ClearAll** mode.

Step	Press button	Result on TV Screen
Repeat Steps 1 to 8 as in “ CHILD Lock (Access Code) ”		
9		
10		
11		

USING THE SCREEN FORMAT

You can have a choice of two formats for your viewing pleasure, namely :- **4:3** mode and the **EXPAND 4:3** mode through the **FORMAT** menu.

Step	Press button	Result on TV Screen
1		
2		
3		
4		
5		
6		

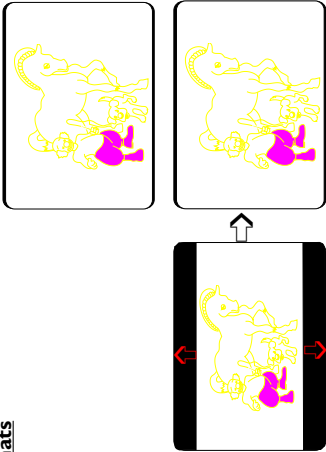
When to use the Screen Formats

4:3 format

Select the **4:3** format if you want to display the **4:3** picture using the full surface of the screen.

Expand 4:3 format

Select the **Expand 4:3** format if you want to expand movie images recorded in the letterbox format. When this format is selected, the black horizontal bars at the top and bottom are expanded thus filling up the entire TV screen.




SMART PICTURE CONTROL


Whether you are watching a movie or video game, your TV has automatic video control settings matched to your current program source or content. The Smart Picture feature quickly resets your TV's video controls of program for a number of different types of programs and viewing conditions you may have in your home. Each Smart Picture setting is preset at the factory to automatically adjust the TV's Brightness, Colour, Picture and Sharpness levels.

- Step

Press button
- 1



Press button repeatedly to cycle through the 5 settings namely, **DVD/VCD**, **Rich**, **Natural**, **Soft** and **Personal** and select your desired picture setting.
- 2



Exit menu from screen.

Definition of Picture Settings

DVD/VCD : For optimal picture setting, whenever the source is connected to DVD/VCD player, select DVD/VCD setting for AV mode.

Rich : Emphasize very vibrant colours. This setting is the optimal setting when you are viewing TV programmes in a brightly-lit room.

Natural : Emphasize original colours.

Soft : Emphasize "warm" colours. (Suitable for dimly-lit room condition and gives cinema-like effect when light is switched off).

Personal : Picture settings are set to your preference.


DVD/VCD
Rich
Natural
Soft
Personal

SMART SOUND CONTROL


Whether you are watching a movie or video game, your TV has automatic sound control settings matched to your current program source or content. The Smart Sound feature quickly resets your TV's sound controls of program for a number of different types of programs and viewing conditions you may have in your home. Each Smart Sound setting is preset at the factory to automatically adjust the TV's Treble and Bass levels.

- Step

Press button
- 1



Press button repeatedly to cycle through the 4 settings namely, **Personal**, **Voice**, **Music** and **Theatre** and select your desired sound setting.
- 2



Exit menu from screen.

Definition of Sound Settings

Personal : Sound settings are set to your preference.

Voice : Emphasize high tone (treble boosted).

Music : Emphasize low tone (Bass boosted).

Theatre : Emphasize sensation to action. (Bass and Treble boosted)

Personal
Voice
Music
Theatre

SPECIFICATIONS

	29PT2152
Picture tube screen size	72 cm
Picture tube visible area	68 cm
Audio Output : Speaker	2 x 5 W
TV System	NTSC M PAL B/G PAL D/K PAL I SECAM B/G SECAM D/K SECAM K1
Set Dimensions : Width Depth Height	75.9 cm 51 cm 57.5 cm
Net Weight of Set	approximate 35 kg

Note

For Operating Voltage, Frequency, Power Consumption and Version Number, refer to the type number at the rear of the set.

Personal Notes:

This image shows a full page of blank, lined paper. It features approximately 20 evenly spaced vertical blue lines running from the top to the bottom of the page. The lines are thin and consistent in color. There is no handwriting or other markings on the paper.

4. Mechanical Instructions

Index:

1. Rear Cover Removal
2. Service Position Main Panel
3. Side I/O Panel Removal
4. Rear Cover Mounting

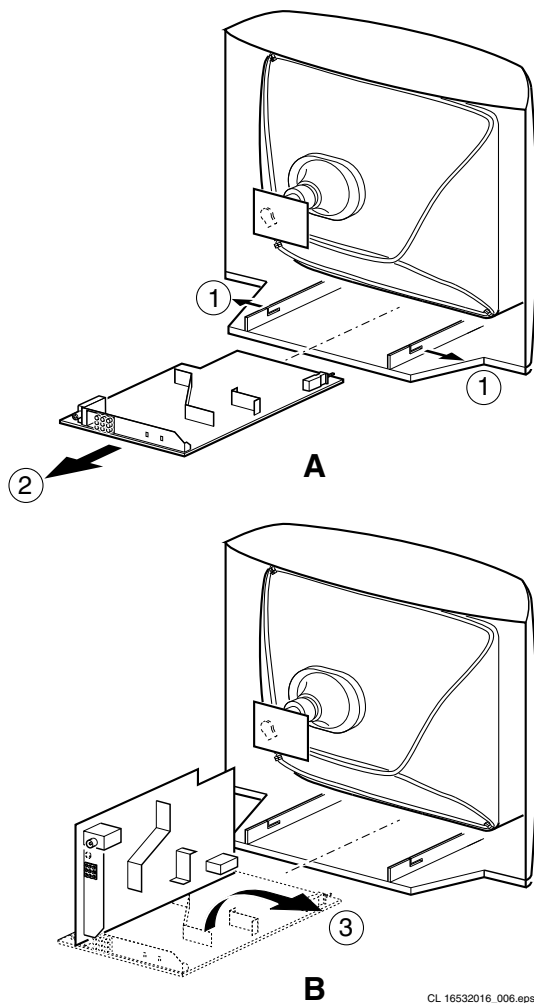
Note: Figures can deviate slightly from the actual situation, due to different set executions.

4.1 Rear Cover Removal

1. Remove all fixation screws of the rear cover.
2. Now pull the rear cover backward and remove it.

4.2 Service Position Main Panel

1. Disconnect the strain relief of the AC power cord.
2. Remove the main panel, by pushing the two center clips outward [1]. At the same time pull the panel away from the CRT [2].
3. Disconnect the degaussing coil by removing the cable from (red) connector 0201.
4. Move the panel somewhat to the left and flip it 90 degrees [3], with the components towards the CRT.

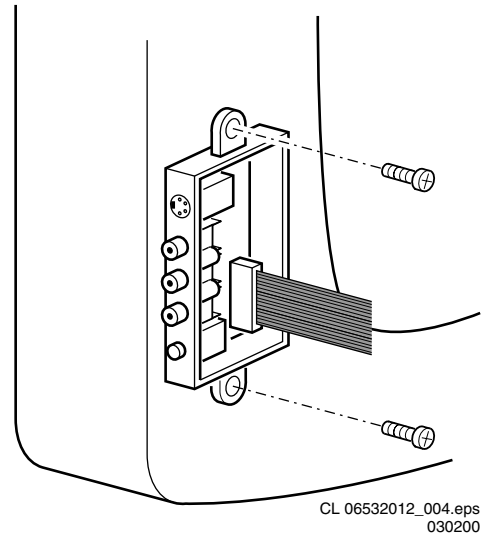


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220501

Figure 4-1

4.3 Side I/O Panel Removal

1. Remove the complete Side I/O assembly after unscrewing the 2 fixation screws [1].
2. Release the two fixation clamps [2] and lift the board out of the bracket.



CL 06532012_004.eps
030200

Figure 4-2

4.4 Rear Cover Mounting

Before you mount the rear cover, perform the following checks:

1. Check whether the mains cord is mounted correctly in its guiding brackets.
2. Replace the strain relief of the AC power cord into the cabinet.
3. Check whether all cables are replaced in their original position.

5. Service Modes, Error Codes and Fault Finding

Index:

1. Test points.
2. Service Modes.
3. Problems and Solving Tips (related to CSM).
4. ComPair.
5. Error Codes.
6. The Blinking LED Procedure.
7. Protections.
8. Repair Tips.

5.1 Test Points

The chassis is equipped with test points printed on the circuit board assemblies. These test points refer to the functional blocks:

TEST POINT OVERVIEW L01		
Test point	Circuit	Diagram
A1-A2-A3-.....	Audio processing	A8, A9 / A11
C1-C2-C3-.....	Control	A7
F1-F2-F3-.....	Frame drive	A3
I1-I2-I3-.....	Tuner & IF	A4
L1-L2-L3-....	Line drive	A2
P1-P2-P3-.....	Power supply	A1
S1-S2-S3-.....	Synchronisation	A6
V1-V2-V3-.....	Video processing	A5, B1

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210501

Figure 5-1

The numbering is in a logical sequence for diagnostics. Always start diagnosing within a functional block in the sequence of the relevant test points for that block.

Perform measurements under the following conditions:

- Service Default Mode (when this mode is not present, set all controls to 50%, set volume to 25% and select channel 3).
- Video: colour bar signal.
- Audio: 3 kHz left, 1 kHz right.

5.2 Service Modes

Service Default Mode (SDM) and Service Alignment Mode (SAM) offer several features for the service technician, while the Customer Service Menu (CSM) is used for communication between dealer and customer.

There is also the option of using ComPair, a hardware interface between a computer (see requirements) and the TV chassis. It offers the ability of structured trouble shooting, error code reading and software version readout for all L01 chassis.

Minimum requirements: a 486 processor, Windows 3.1 and a CD-ROM drive (see also paragraph 5.4).

SOFTWARE VERSIONS (L01 AP SMALL SCREEN)			
SW cluster	SW name	UOC-type	Diversity
1AP1	L01AN1-x.y	TDA9580/1	AP, non TXT, China/AP
1AP2	L01AN2-x.y	TDA9581/2	AP, non TXT, Thailand/Vietnam
1AP3	L01AN3-x.y	TDA9580/1	AP, non TXT, India
1AP9	L01AN9-x.y	TDA9581	AP, non TXT, Middle East
3AP1	L01AT1-x.y	TDA9561/7	AP, 10 page TXT, Sgp/Aus/NZ
3AP2	L01AT2-x.y	TDA9567	AP, 10 page TXT, Middle East
4AP1	L01AC1-x.y	TDA9580	AP, NTSC, Thailand/Philippines

Abbreviations: A= Asia Pacific, C= NTSC, N= no TXT, T= TXT
CL 16532008_070.pdf
220801

Figure 5-2

5.2.1 Service Default Mode (SDM)

Purpose

- To create a predefined setting to get the same measurement results as given in this manual.
- To override SW protections.
- To start the blinking LED procedure.

Specifications

- Tuning frequency:
 - 475.25 MHz for PAL/SECAM (AP-PAL).
 - 61.25 MHz (channel 3) for NTSC-sets (AP-NTSC).
- Colour system:
 - PAL-BG for AP-PAL.
 - NTSC for AP-NTSC.
- All picture settings at 50 % (brightness, colour contrast, hue).
- Bass, treble and balance at 50 %; volume at 25 %.
- All service-unfriendly modes (if present) are disabled, like:
 - (sleep) timer,
 - child/parental lock,
 - blue mute,
 - hotel/hospitality mode
 - auto switch-off (when no 'IDENT' video signal is received for 15 minutes),
 - skip / blank of non-favorite presets / channels,
 - auto store of personal presets,
 - auto user menu time-out.

How to enter SDM

Use one of the following methods:

- Use a standard customer RC-transmitter and key in the code '062596' directly followed by the MENU button or
- Short wires 9631 and 9641 on the mono carrier (see Fig. 8-1) and apply AC power. Then press the power button (remove the short after start-up). **Caution:** Entering SDM by shorten wires 9631 and 9641 will override the +8V-protection. Do this only for a short period. When doing this, the service-technician must know exactly what he is doing, as it could lead to damaging the set.
- Or via ComPair.

After entering SDM, the following screen is visible, with SDM at the upper right side for recognition.

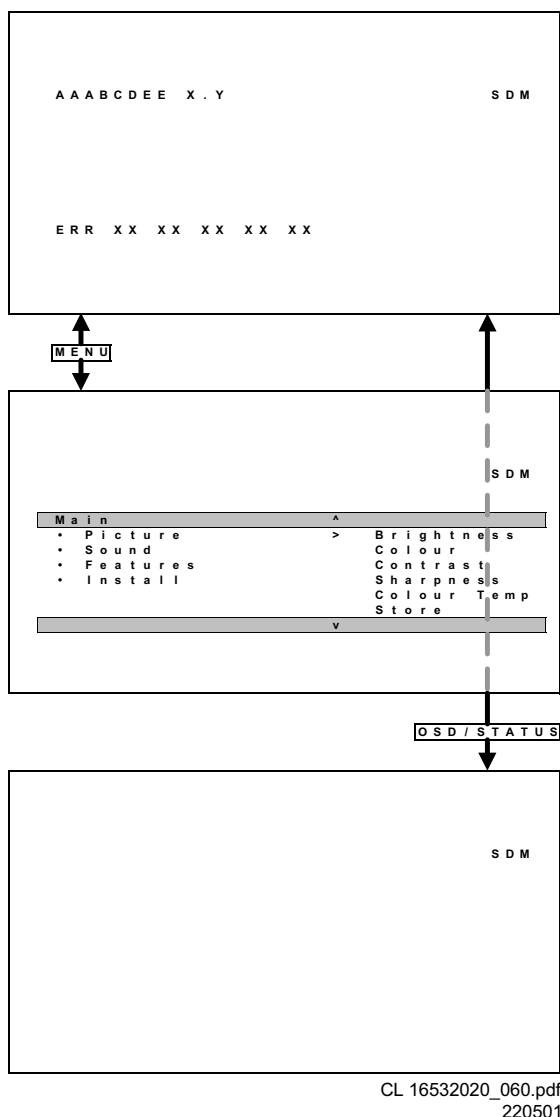


Figure 5-3

How to navigate

Use one of the following methods:

- When you press the MENU button on the remote control, the set will switch between the SDM and the normal user menu (with the SDM mode still active in the background). Return to the SDM screen with the OSD / STATUS button.
- When you press the OSD / STATUS button on the remote control, the menu will show or hide the error buffer. This feature is available to prevent interference during waveform measurements.
- On the TV, press and hold the 'VOLUME down' and press the 'CHANNEL down' for a few seconds, to switch from SDM to SAM and reverse.

How to exit

Switch the set to STANDBY by pressing the power button on the remote control transmitter (if you switch the set 'off' by removing the AC power, the set will return in SDM when AC power is re-applied). The error buffer is cleared.

5.2.2 Service Alignment Mode (SAM)**Purpose**

- To perform alignments.
- To change option settings.
- To display / clear the error code buffer.

Specifications

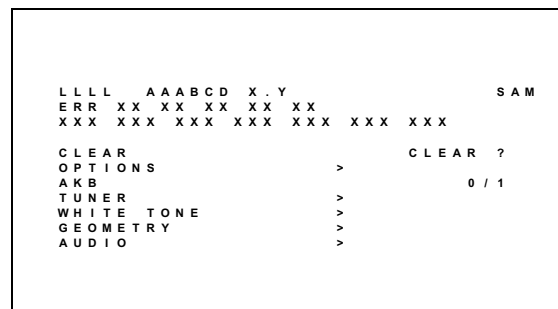
- Operation hours counter.
- Software version.
- Option settings.
- Error buffer reading and erasing.
- Software alignments.

How to enter

Use one of the following methods:

- Use a standard customer RC-transmitter and key in the code '062596' directly followed by the OSD / STATUS button or
- Via ComPair.

The following screen is visible, with SAM at the upper right side for recognition.



CL 16532020_061.eps
150401

Figure 5-4

- LLLL** This is the operation hours counter. It counts the normal operation hours, not the standby hours.
- AAABCD-X.Y** This is the software identification of the main micro controller:
 - A = the project name (L01).
 - B = the region: E= Europe, A= Asia Pacific, U= NAFTA, L= LATAM.
 - C = the software diversity: C= NTSC, D= DVD, N= no TXT, T= TXT.
 - D = the language cluster number.
 - X = the main software version number.
 - Y = the sub software version number.
- SAM** Indication of the actual mode.
- Error buffer** Five errors possible.
- Option bytes** Seven codes possible.
- Clear** Erase the contents of the error buffer. Select the CLEAR menu item and press the CURSOR RIGHT key. The content of the error buffer is cleared.
- Options** To set the Option Bytes. See chapter 8.3.1 for a detailed description.
- AKB** Disable (0) or enable (1) the 'black current loop' (AKB = Auto Kine Bias).
- Tuner** To align the Tuner. See chapter 8.3.2 for a detailed description.
- White Tone** To align the White Tone. See chapter 8.3.3 for a detailed description.
- Geometry** To align the Geometry. See chapter 8.3.4 for a detailed description.
- Audio** To align the Audio. See chapter 8.3.5 for a detailed description.

How to navigate

Use one of the following methods:

- In SAM, select menu items with the CURSOR UP/DOWN key on the remote control transmitter. The selected item will be highlighted. When not all menu items fit on the screen, move the CURSOR UP/DOWN key to display the next / previous menu items.
- With the CURSOR LEFT/RIGHT keys, it is possible to:
 - (De)activate the selected menu item.
 - Change the value of the selected menu item.

- Activate the selected submenu.
- When you press the MENU button twice, the set will switch to the normal user menus (with the SAM mode still active in the background). To return to the SAM menu press the OSD / STATUS button [i+].
- When you press the MENU key in a submenu, you will return to the previous menu.

How to exit

Switch the set to STANDBY by pressing the power button on the remote control (if you switch the set 'off' by removing the AC power, the set will return in SAM when AC power is re-applied). The error buffer is **not** cleared.

5.2.3 Customer Service Mode (CSM)

Purpose

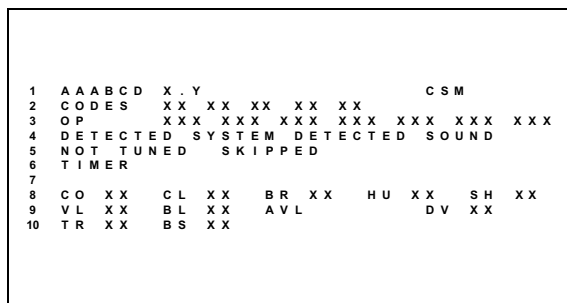
When a customer is having problems with his TV-set, he can call his dealer. The service technician can then ask the customer to activate the CSM, in order to identify the status of the set. Now, the service technician can judge the severness of the complaint. In a lot of cases he can advise the customer how to solve the problem, or he can decide if it is necessary to visit the customer.

The CSM is a read only mode, therefore modifications in this mode are not possible.

How to enter

The CSM will be turned on after pressing the MUTE key on the remote control transmitter and any of the control buttons on the TV for at least 4 seconds **simultaneously**. This activation only works if there is no menu on the screen.

After switching ON the Customer Service Mode, the following screen will appear:



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220501

Figure 5-5

1. Software identification of the main micro controller (see paragraph 5.2.2 for an explanation).
2. Error code buffer (see paragraph 5.5 for more details). Displays the last seven errors of the error code buffer.
3. In this line, the Option Bytes (OB) are visible. Each Option Byte is displayed as a decimal number between 0 and 255. The set may not work correctly when an incorrect option code is set. See chapter 8.3.1 for more information on the option settings.
4. Indicates which color and sound system is installed for the selected pre-set.
5. Indicates if the set is not receiving an 'IDENT' signal on the selected source. It will display 'Not Tuned'.
6. Indicates if the sleep timer is enabled.
7. Indicates if the V-chip feature is enabled.
8. Value indicates parameter levels at CSM entry. CO= CONTRAST, CL= COLOR, BR= BRIGHTNESS, HU= HUE, SH= SHARPNESS
9. Value indicates parameter levels at CSM entry. VL= VOLUME LEVEL, BL= BALANCE LEVEL, AVL= AUTO VOLUME LEVEL LIMITER, DV= DELTA VOLUME

10. Value indicates parameter levels at CSM entry (only for stereo sets). TR= TREBLE, BS= BASS

How to exit

Use one of the following methods:

- After you press 'any' key of the remote control transmitter with exception of the CHANNEL and VOLUME keys.
- After you switch-off the TV set with the AC power switch.

5.3 Problems and Solving Tips (Related to CSM)

5.3.1 Picture Problems

Note: Below described problems are all related to the TV settings. The procedures to change the value (or status) of the different settings are described.

No colours / noise in picture

Check CSM line 4. Wrong colour system installed. To change the setting:

1. Press the MENU button on the remote control.
2. Select the INSTALL sub menu.
3. Select the MANUAL STORE sub menu.
4. Select and change the SYSTEM setting until picture and sound are correct.
5. Select the STORE menu item.

Colours not correct / unstable picture

Check CSM line 4. Wrong colour system installed. To change the setting:

1. Press the MENU button on the remote control.
2. Select the INSTALL sub menu.
3. Select the MANUAL STORE sub menu.
4. Select and change the SYSTEM setting until picture and sound are correct.
5. Select the STORE menu item.

TV switches 'off' (or 'on') or changes the channel without any user action

(Sleep)timer switched the set 'off' or changed channel. To change the setting:

1. Press the MENU button on the remote control.
2. Select the FEATURES sub menu.
3. Select the TIMER sub menu.
4. Select and change the SLEEP or TIME setting.

Picture too dark or too bright

Increase / decrease the BRIGHTNESS and / or the CONTRAST value when:

- The picture improves after you have pressed the 'Smart Picture' button on the remote control.
- The picture improves after you have switched on the Customer Service Mode

The new 'Personal' preference value is automatically stored.

White line around picture elements and text

Decrease the SHARPNESS value when:

- The picture improves after you have pressed the 'Smart Picture' button on the remote control.
- The picture improves after you have switched on the Customer Service Mode

The new 'Personal' preference value is automatically stored.

Snowy picture

Check CSM line 5. If this line indicates 'Not Tuned', check the following:

- No or bad antenna signal. Connect a proper antenna signal.
- Antenna not connected. Connect the antenna.
- No channel / pre-set is stored at this program number. Go to the INSTALL menu and store a proper channel at this program number.

- The tuner is faulty (in this case the CODES line will contain error number 10). Check the tuner and replace / repair if necessary.

Snowy picture and/or unstable picture

- A scrambled or decoded signal is received.

Black and white picture

Increase the COLOR value when:

- The picture improves after you have pressed the 'Smart Picture' button on the remote control.
- The picture improves after you have switched on the Customer Service Mode

The new 'Personal' preference value is automatically stored.

Menu text not sharp enough

Decrease the CONTRAST value when:

- The picture improves after you have pressed the 'Smart Picture' button on the remote control.
- The picture improves after you have switched on the Customer Service Mode

The new 'Personal' preference value is automatically stored.

5.3.2 Sound Problems

No sound or sound too loud (after channel change / switching on)

Increase / decrease the VOLUME level when the volume is OK after you switched on the CSM. The new 'Personal' preference value is automatically stored.

5.4 ComPair

5.4.1 Introduction

ComPair (Computer Aided Repair) is a service tool for Philips Consumer Electronics products. ComPair is a further development on the European DST (service remote control), which allows faster and more accurate diagnostics. ComPair has three big advantages:

- ComPair helps you to quickly get an understanding on how to repair the chassis in a short time by guiding you systematically through the repair procedures.
- ComPair allows very detailed diagnostics (on I²C level) and is therefore capable of accurately indicating problem areas. You do not have to know anything about I²C commands yourself because ComPair takes care of this.
- ComPair speeds up the repair time since it can automatically communicate with the chassis (when the microprocessor is working) and all repair information is directly available. When ComPair is installed together with the SearchMan electronic manual of the defective chassis, schematics and PWBs are only a mouse click away.

5.4.2 Specifications

ComPair consists of a Windows based faultfinding program and an interface box between PC and the (defective) product. The ComPair interface box is connected to the PC via a serial or RS232 cable.

In case of the L01 chassis, the ComPair interface box and the TV communicate via a bi-directional service cable via the service connector (located on the Main panel, see also figure 8-1 suffix D).

The ComPair faultfinding program is able to determine the problem of the defective television. ComPair can gather diagnostic information in two ways:

- Automatic (by communication with the television): ComPair can automatically read out the contents of the entire error buffer. Diagnosis is done on I²C level. ComPair can access the I²C bus of the television. ComPair can send and

receive I²C commands to the micro controller of the television. In this way, it is possible for ComPair to communicate (read and write) to devices on the I²C busses of the TV-set.

- Manually (by asking questions to you): Automatic diagnosis is only possible if the micro controller of the television is working correctly and only to a certain extend. When this is not the case, ComPair will guide you through the faultfinding tree by asking you questions (e.g. Does the screen gives a picture? Click on the correct answer: YES / NO) and showing you examples (e.g. Measure test-point I7 and click on the correct oscillogram you see on the oscilloscope). You can answer by clicking on a link (e.g. text or a waveform picture) that will bring you to the next step in the faultfinding process.

By a combination of automatic diagnostics and an interactive question / answer procedure, ComPair will enable you to find most problems in a fast and effective way.

Beside fault finding, ComPair provides some **additional features** like:

- Up- or downloading of pre-sets.
- Managing of pre-set lists.
- Emulation of the (European) Dealer Service Tool (DST).
- If both ComPair and SearchMan (Electronic Service Manual) are installed, all the schematics and the PWBs of the set are available by clicking on the appropriate hyperlink. Example: *Measure the DC-voltage on capacitor C2568 (Schematic/Panel) at the Monocarrier.* Click on the 'Panel' hyperlink to automatically show the PWB with a highlighted capacitor C2568. Click on the 'Schematic' hyperlink to automatically show the position of the highlighted capacitor.

5.4.3 How to Connect

- First install the ComPair Browser software (see the Quick Reference Card for installation instructions).
- Connect the RS232 interface cable between a free serial (COM) port of your PC and the PC connector (marked with 'PC') of the ComPair interface.
- Connect the AC power adapter to the supply connector (marked with 'POWER 9V DC') on the ComPair interface.
- Switch the ComPair interface OFF.
- Switch the television set OFF (remove the AC power).
- Connect the ComPair interface cable between the connector on the rear side of the ComPair interface (marked with 'I²C') and the ComPair connector on the mono carrier (see figure 8-1 suffix D).
- Plug the AC power adapter in the AC power outlet and switch on the interface. The green and red LEDs light up together. The red LED extinguishes after approx. 1 second while the green LED remains lit.
- Start the ComPair program and read the 'introduction' chapter.

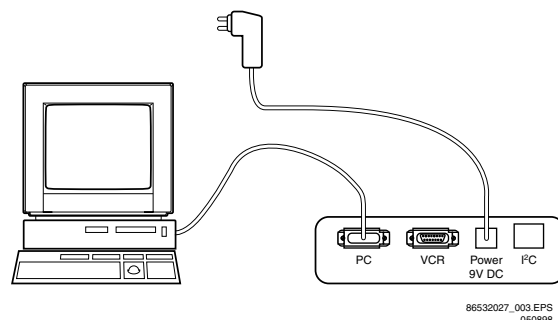


Figure 5-6

5.4.4 How to Order

ComPair order codes:

- Starter kit ComPair + SearchMan software + ComPair interface (excluding transformer): 4822 727 21629
- ComPair interface (excluding transformer): 4822 727 21631
- Starter kit ComPair software (registration version): 4822 727 21634
- Starter kit SearchMan software: 4822 727 21635
- ComPair CD (update): 4822 727 21637
- SearchMan CD (update): 4822 727 21638
- ComPair interface cable: 3122 785 90004

5.5 Error Buffer

The error code buffer contains all detected errors since the last time the buffer was erased. The buffer is written from left to right. When an error occurs that is not yet in the error code buffer, it is written at the left side and all other errors shift one position to the right.

5.5.1 How to Read the Error Buffer

Use one of the following methods:

- On screen via the SAM (only if you have a picture).
Examples:
 - ERROR: **0 0 0 0 0** : No errors detected
 - ERROR: **6 0 0 0 0** : Error code 6 is the last and only detected error

- ERROR: **9 6 0 0 0** : Error code 6 was first detected and error code 9 is the last detected (newest) error
- Via the blinking LED procedure (when you have no picture). See next paragraph.
- Via ComPair.

5.5.2 How to Clear the Error Buffer

The error code buffer is cleared in the following cases:

- By activation of the CLEAR command in the SAM menu:
- When you exit SDM / SAM with the STANDBY command on the remote control (when leaving SDM / SAM, by disconnecting the set from AC power, the error buffer is not reset).
- When you transmit the command DIAGNOSE-99-OK with ComPair.
- If the content of the error buffer has not changed for 50 hours, it resets automatically.

5.5.3 Error Codes

In case of non-intermittent faults, clear the error buffer before you begin the repair. These to ensure that old error codes are no longer present.

If possible, check the entire contents of the error buffer. In some situations, an error code is only the result of another error code and not the actual cause (e.g., a fault in the protection detection circuitry can also lead to a protection).

ERROR CODE TABLE				
Error	Device	Error description	Def. item	Diagram
0	Not applicable	No Error		
1	Not applicable	X-Ray/overvoltage protection (USA only)	2465, 7460	A2
2	Not applicable	Horizontal protection	7460, 7461, 7462, 7463, 6467	A2
	TDA8359/TDA9302	Vertical protection	7861, VlotAux+13V	A2, A3
3	Reserve			
4	MSP34X5 / TDA9853	MSP I ² C identification error	7831 or 7861	A9 or A11
5	TDA95xx	POR 3V3 / +8V protection	7200, 7560, 7480	A5, A6, A7, A1, A2
6	I ² C bus	General I ² C bus error	7200, 3624, 3625	A7
7	AN7522/3	Power down (over current) protection	7901 / 7902, 7561	A8, A1
8	Not applicable	E/W protection (Large Screen)	7400, 3405, 3406, 3400	A2
9	M24C08	NVM I ² C identification error	7602, 3611, 3603/04	A7
10	Tuner	Tuner I ² C identification error	1000, 7482	A4, A2
11	TDA6107/8	Black current loop protection	7330, RGB amps, CRT	B1, B2
12	M65669	PIP I ² C identification error	7803	P

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Figure 5-7

5.6 The Blinking LED Procedure

Via this procedure, you can make the contents of the error buffer visible via the front LED. This is especially useful when there is no picture.

When the SDM is entered, the LED will blink the contents of the error-buffer.

Error-codes ≥ 10 are shown as follows:

- a long blink of 750 ms (which is an indication of the decimal digit),
- a pause of 1.5 s,
- n short blinks (n = 1 - 9),
- when all the error-codes are displayed, the sequence finishes with a LED blink of 3 s,
- the sequence starts again.

Example of error buffer: **12 9 6 0 0**

After entering SDM:

- 1 long blink of 750 ms followed by a pause of 1.5 s,
- 2 short blinks followed by a pause of 3 s,
- 9 short blinks followed by a pause of 3 s,
- 6 short blinks followed by a pause of 3 s,
- 1 long blink of 3 s to finish the sequence,
- the sequence starts again.

time, measure the '+8V'. If this voltage is missing, check transistor TS7480.

- **Set is non-stop in hiccup mode** Set is in over current mode; check the secondary sensing (opto coupler 7515) and the 'MainSupply' voltage. Signal 'Stdbby_con' must be logic low under normal operation conditions and goes to high (3.3 V) under standby and fault conditions.
- **Set turns on, but without picture and sound** The screen shows snow, but OSD and other menus are okay. Blinking LED procedure indicates error 11, so problem is expected in the tuner (pos. 1000). Check presence of supply voltages. As 'Vlotaux+5V' at pin 5 and 7 are okay, 'VT_supply' at pin 9 is missing. Conclusion: resistor 3460 is defective.
- **Set turns on, but with a half screen at the bottom. Sound is okay** Blinking LED (set in SDM mode) indicates error 3. Check 'Vlotaux+13V' and '+50V'. If they are okay, problem is expected in the vertical amplifier IC7471. Measure with a scope the waveform on pin 17 of the UOC. Measure also at pin 1 of IC7471. If here the signal is missing, a defective resistor R3244 causes the problem.

5.7 Protections

If a fault situation is detected an error code will be generated and if necessary, the set will be put in the protection mode. Blinking of the red LED at a frequency of 3 Hz indicates the protection mode. In some error cases, the microprocessor does not put the set in the protection mode. The error codes of the error buffer can be read via the service menu (SAM), the blinking LED procedure or via ComPair. The DST diagnose functionality will force the set into the Service-standby, which is similar to the usual standby mode, however the microprocessor has to remain in normal operation completely.

To get a quick diagnosis the chassis has three service modes implemented:

- The Customer Service Mode (CSM).
- The Service Default Mode (SDM). Start-up of the set in a predefined way.
- The Service Alignment Mode (SAM). Adjustment of the set via a menu and with the help of test patterns.

See for a detailed description Chapter 9 paragraphs Deflection and Power Supply.

5.8 Repair Tips

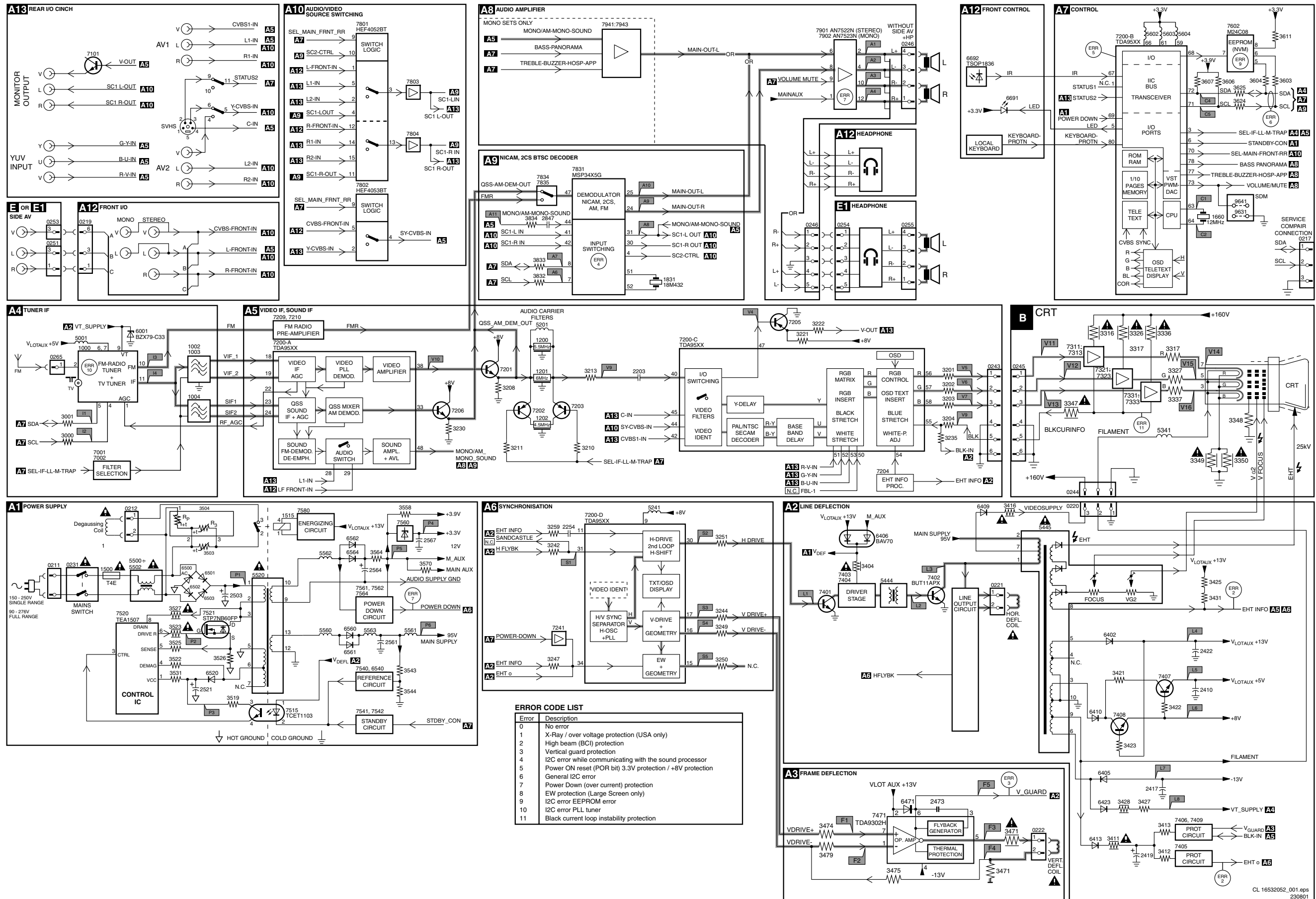
Below some failure symptoms are given, followed by a repair tip.

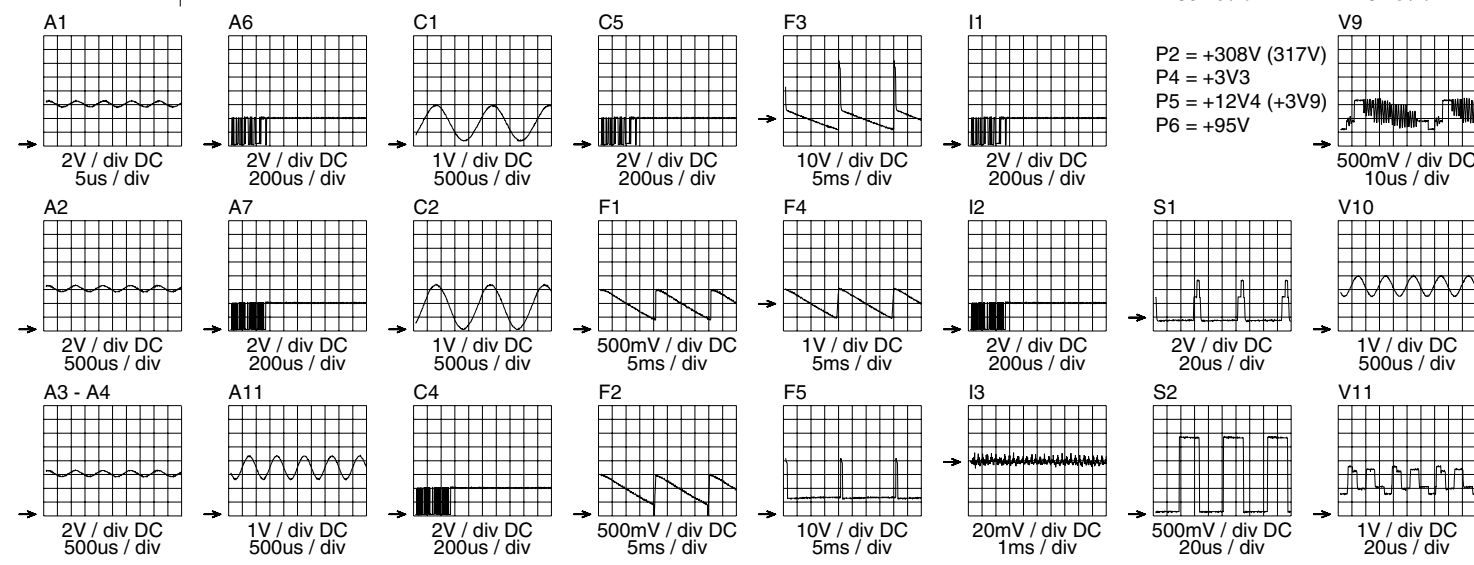
- **Set is dead and makes hiccuping sound** 'MainSupply' is available. Hiccuping stops when de-soldering L5561, meaning that problem is in the 'MainSupply' line. No output voltages at LOT, no horizontal deflection. Reason: line transistor TS7460 is defective.
- **Set is dead, and makes no sound** Check power supply IC7520. Result: voltage at pins 1, 3, 4, 5 and 6 are about 180 V and pin 8 is 0 V. The reason why the voltage on these pins is so high is because the output driver (pin 6) has an open load. That is why MOSFET TS7521 is not able to switch. Reason: feedback resistor 3523 is defective.
Caution: be careful measuring on the gate of TS7521; circuitry is very high ohmic and can easily be damaged! (first connect measuring equipment to ground, then to the gate).
- **Set is in hiccup mode and shuts down after 8 s.** Blinking LED (set in SDM mode) indicates error 5. As it is unlikely that μ P 'POR' and '+8V protection' happen at the same

Personal Notes:

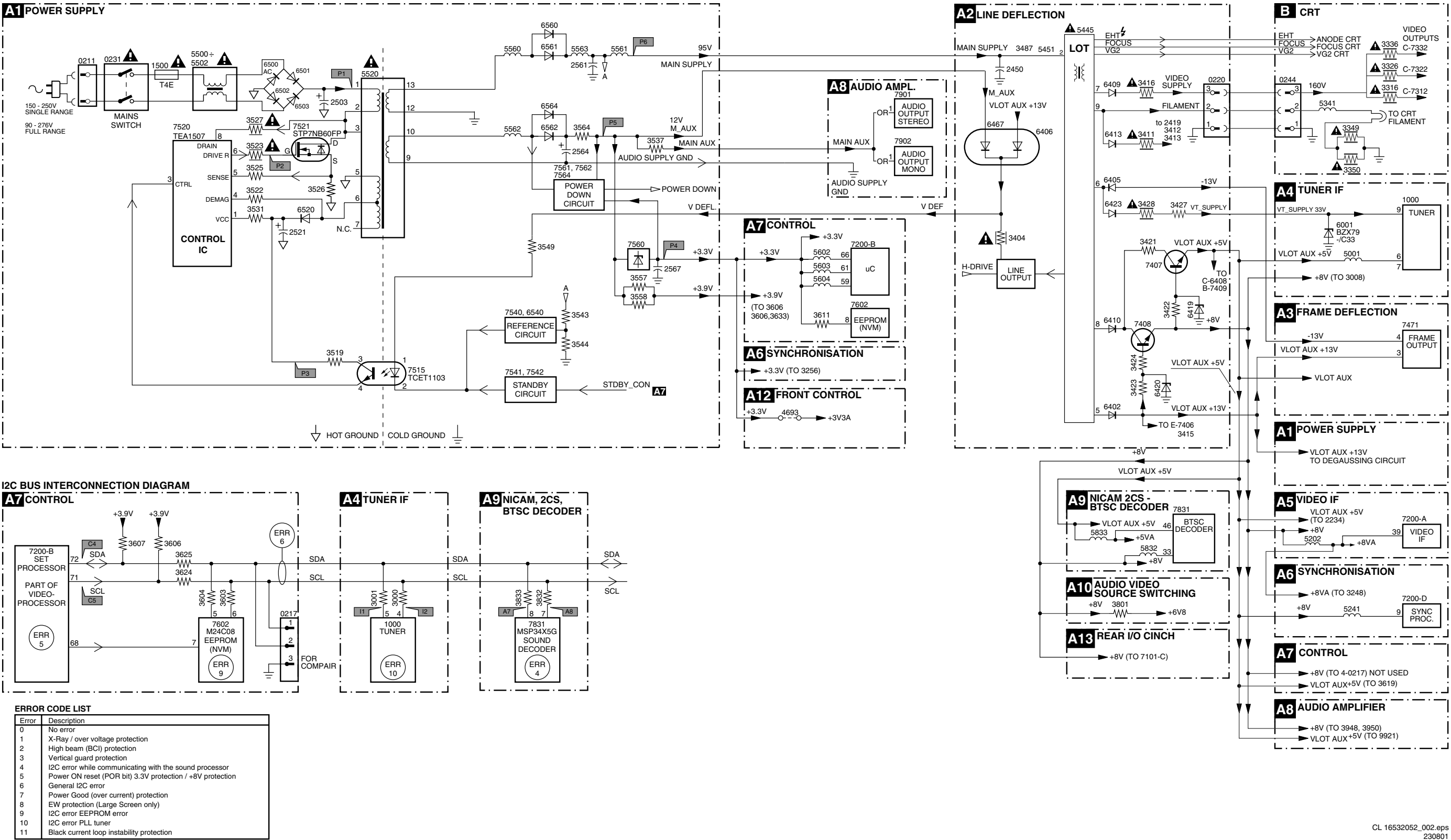
6. Block Diagram, Testpoints, I²C and Supply Voltage Overview

Block Diagram

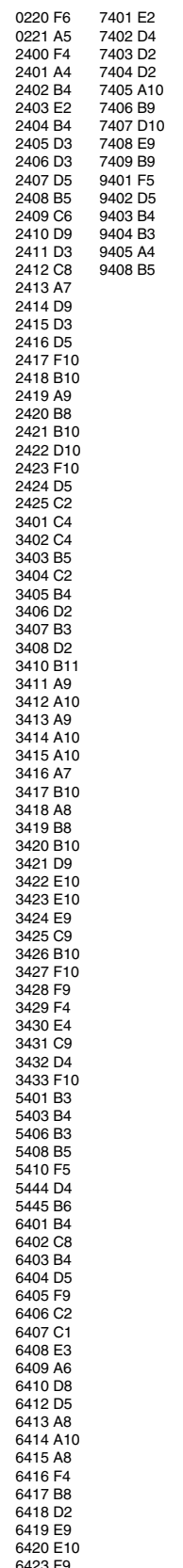




I2C and Supply Voltage Diagram

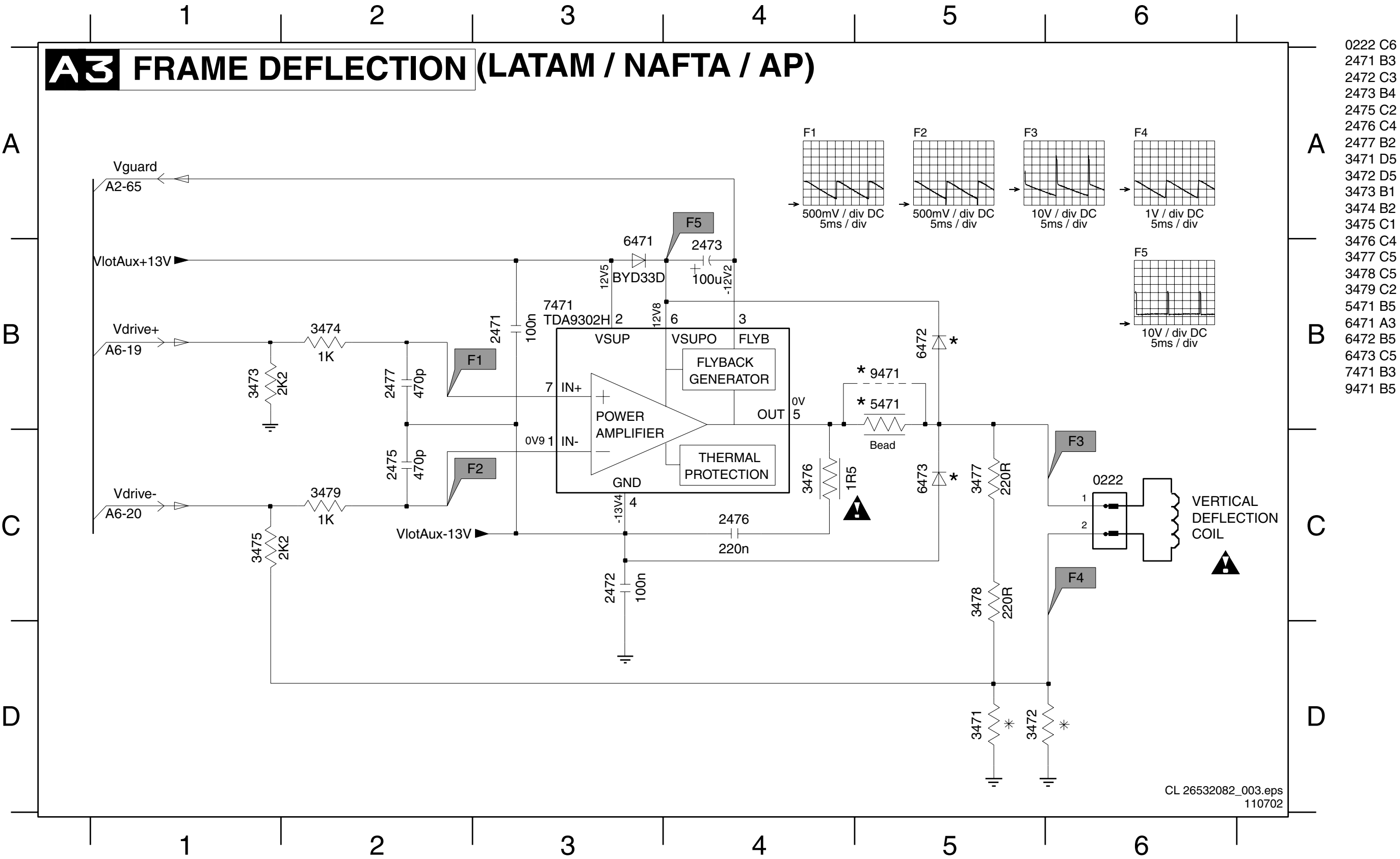


A2 LINE DEFLECTION

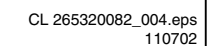


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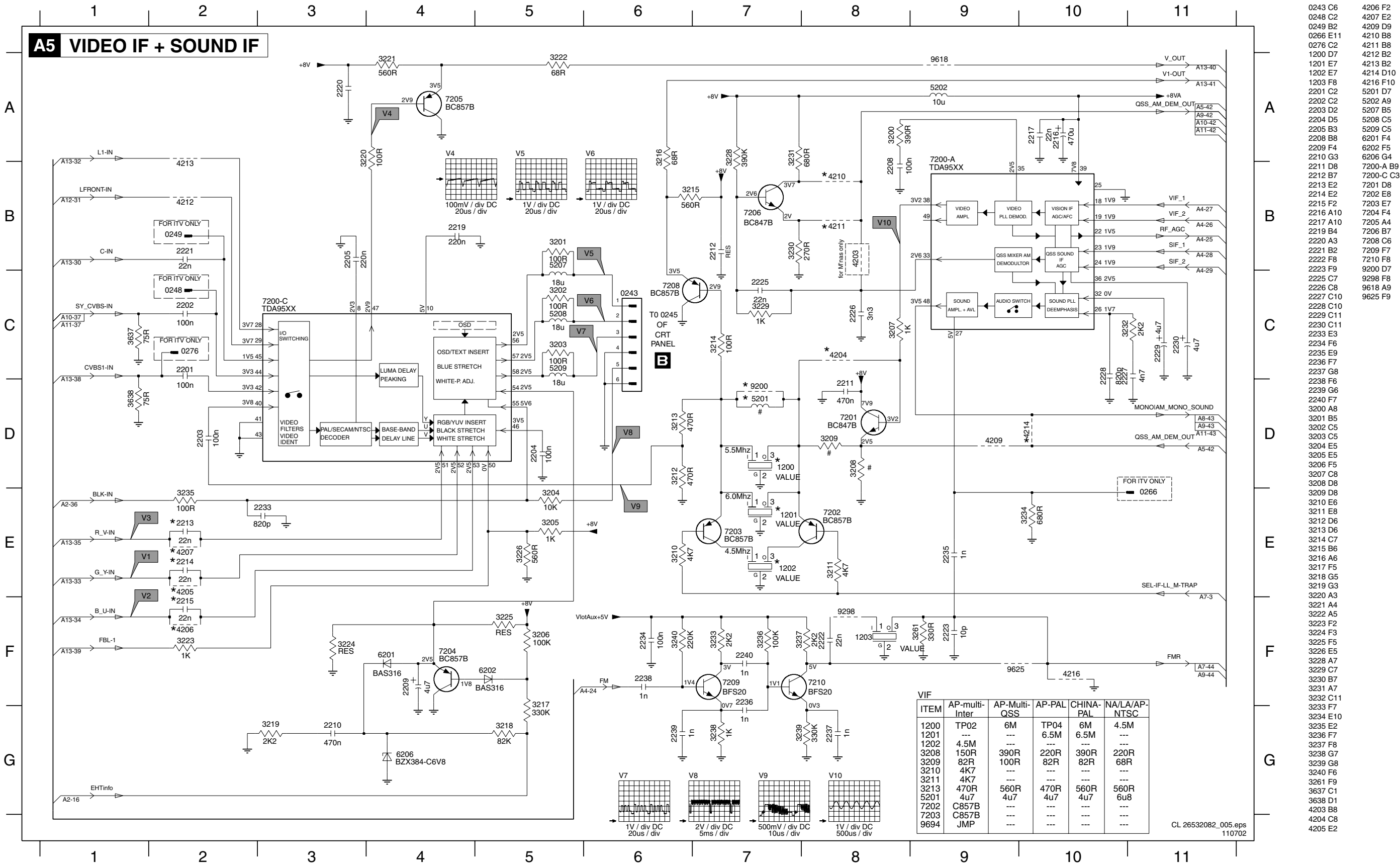
Large Signal Panel: Frame Deflection



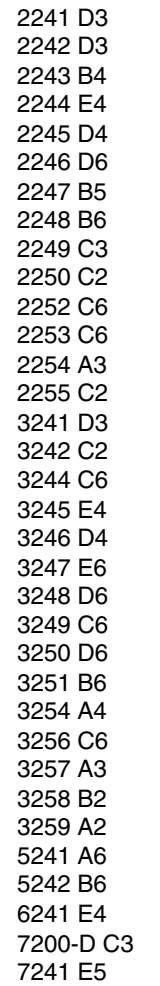
A4 TUNER IF



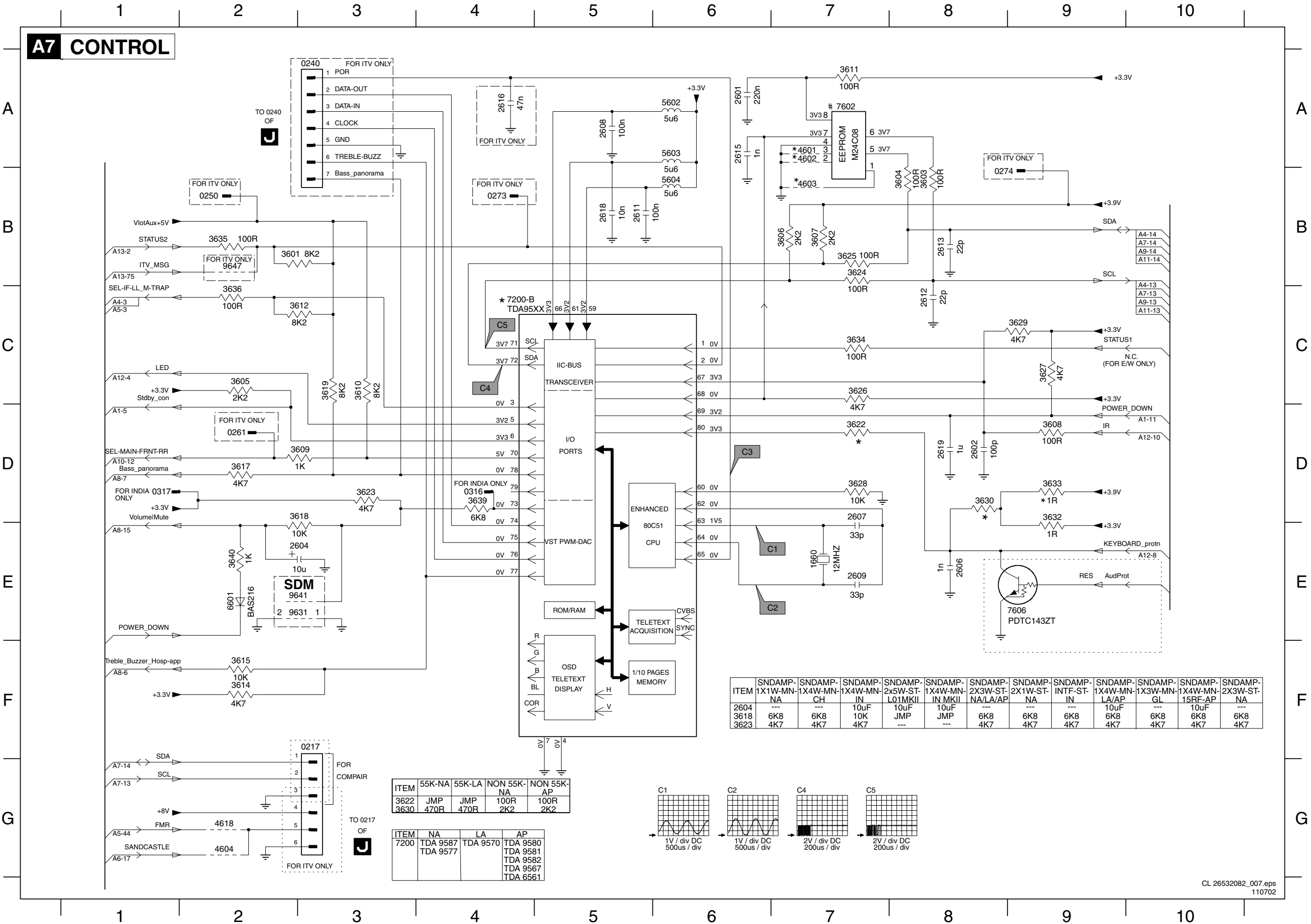
Large Signal Panel: Video IF + Sound IF



A6 SYNCHRONISATION

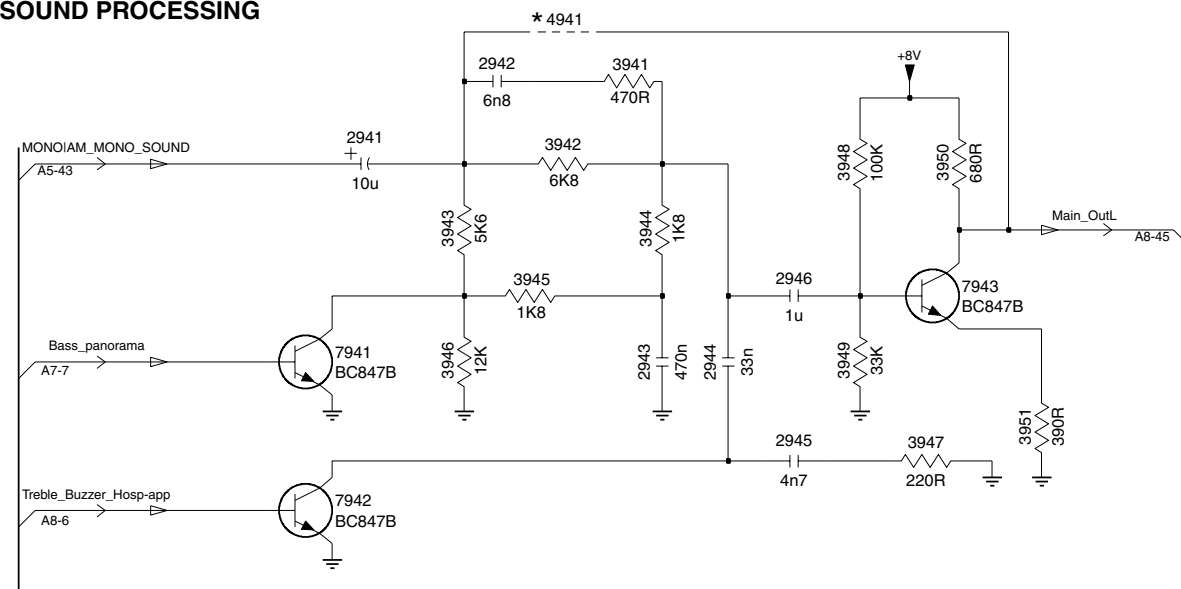
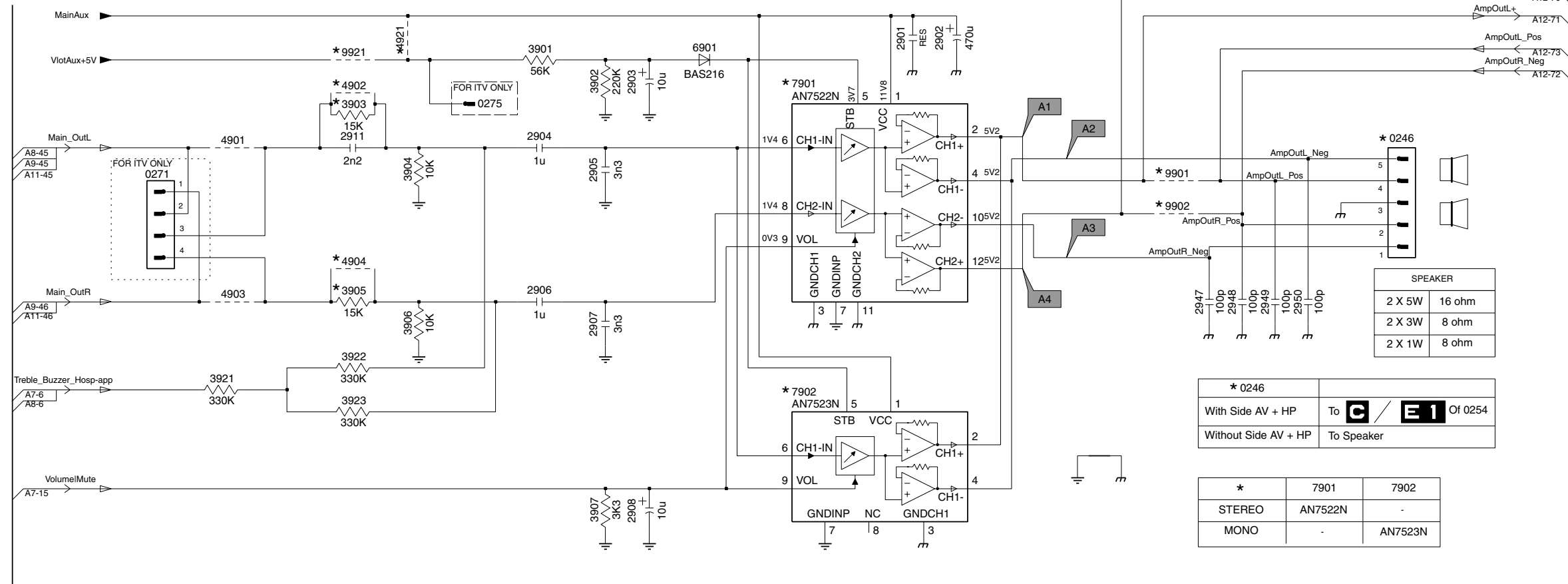


Large Signal Panel: Control



0217 F3
0240 A3
0250 B2
0261 D2
0273 B4
0274 B9
0316 D4
0317 D1
1660 E7
2601 A6
2602 D8
2604 E3
2606 E8
2607 D7
2608 A5
2609 E7
2611 B5
2612 C8
2613 B8
2615 A6
2616 A4
2618 B5
2619 D8
3601 B2
3603 B8
3604 B8
3605 C2
3606 B7
3607 B7
3608 D9
3609 D3
3610 C3
3611 A7
3612 C3
3614 F2
3615 F2
3617 D2
3618 D3
3619 C3
3622 D7
3623 D3
3624 B7
3625 B7
3626 C7
3627 C9
3628 D7
3629 C9
3630 D8
3632 D9
3633 D9
3634 C7
3635 B2
3636 C2
3639 D4
3640 E2
4601 A7
4602 A7
4603 B7
4604 G2
4618 G2
5602 A6
5603 A6
5604 B6
6601 E2
7200-B C4
7602 A7
7606 E9
9631 E3
9641 E3
9647 B2

A8 AUDIO_AMPLIFIER + MONO_SOUND_PROCESSING



(Mono sets only)

ITEM	WITH STEREO	WITHOUT STEREO	SMARTPHONE 15RF-AP
2941	1uF	10uF	1uF
2942	33nF	---	33nF
2943	100nF	---	100nF
2944	47nF	---	39nF
2945	10nF	---	4n7
2946	1uF	---	1uF
3941	100R	---	100R
3942	3K9	---	4K7
3943	2K7	---	2K7
3944	2K7	---	2K7
3945	1K	---	1K
3946	18K	---	8K2
3947	330R	---	10K
3948	47K	---	47K
3949	15K	---	15K
3950	560R	---	560R
3951	390R	---	390R
4903	JUMPER	---	---
4941	---	JUMPER	---
7941	BC847B	---	BC847B
7942	BC847B	---	BC847B
7943	BC847B	---	BC847B
9913	JUMPER	---	---
9914	JUMPER	---	---

ITEM	SNDAMP-1X4W-MN-15RF-AP	SNDAMP-2X3W-S-AP
2904	1uF	33nF
2906	---	33nF
3903	10K	3K3
3905	---	3K3
3906	---	10K
7901	YES	YES
7902	---	---

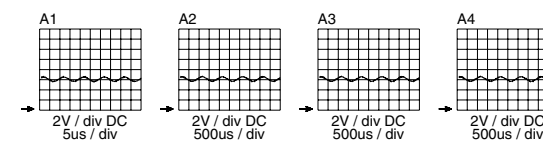
ITEM	1X1 OR 2X1W-NA	1X1W-MN	OTHERS
2902	220uF/50V	470uF/25V	1000uF/16V

ITEM	IC-AN7522N	IC-AN7523N
2907	1nF	---

ITEM	SNDAMP-1X4W-MN-15RE-AP	OTHERS
2911	2n2	---

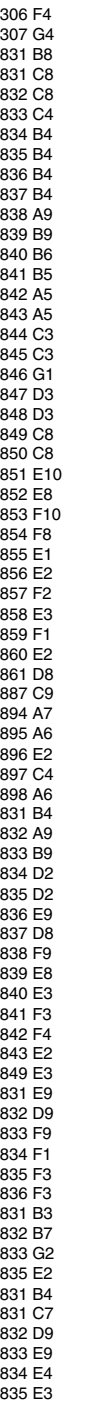
ITEM	SNDAMP-1X1W-MN-NA	SNDAMP-1X4W-MN-CH	SNDAMP-1X4W-MN-IN	SNDAMP-2X5W-ST-L01MKII	SNDAMP-1X4W-MN-IN MKII	SNDAMP-2X3W-ST-NA/LA/AP
2908	10uF	10uF	---	---	---	10uF

ITEM	SNDAMP- 2X1W-ST- NA	SNDAMP- INTF-ST- IN	SNDAMP- 1X4W-MN- LA/AP	SNDAMP- 1X3W-MN- GL	SNDAMP- 1X4W-MN- 15RF-AP	SNDAMP- 2X3W-ST- NA
2908	10uF	10uF	---	10uF	---	10uF

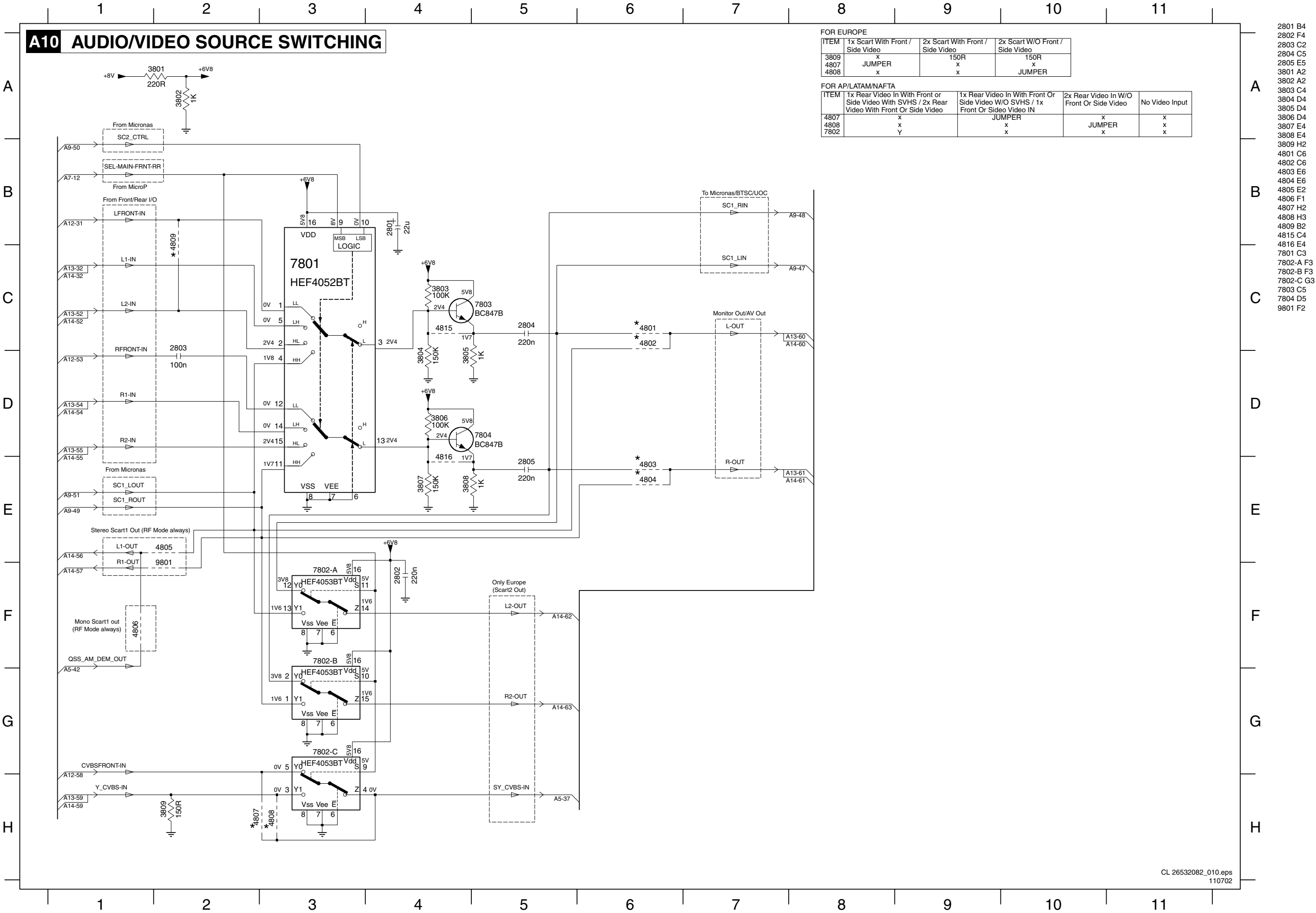
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0246 B10
0271 B2
0275 B4
2901 A7
2902 A7
2903 A5
2904 B5
2905 B5
2906 C5
2907 C5
2908 D5
2911 B3
2941 F3
2942 E3
2943 G4
2944 G4
2945 G4
2946 F4
2947 C9
2948 C9
2949 C9
2950 C10
3901 A5
3902 A5
3903 B3
3904 B4
3905 C3
3906 C4
3907 D5
3921 C2
3922 C3
3923 D3
3941 E4
3942 F3
3943 F3
3944 F4
3945 F3
3946 G3
3947 G5
3948 F5
3949 G5
3950 F5
3951 G6
4901 B3
4902 A3
4903 C3
4904 C3
4921 A4
4941 E3
6901 A6
7901 A6
7902 C6
7941 G2
7942 G2
7943 F5
9901 B9
9902 B9
9921 A3

A9 NICAM + 2CS + BTSC (STEREO/SAP) DECODER

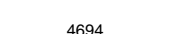


Large Signal Panel: Audio / Video Source Switching



10

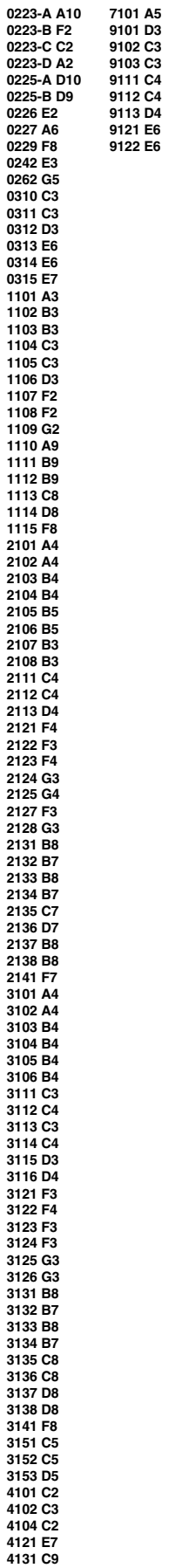
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0214 D9

G

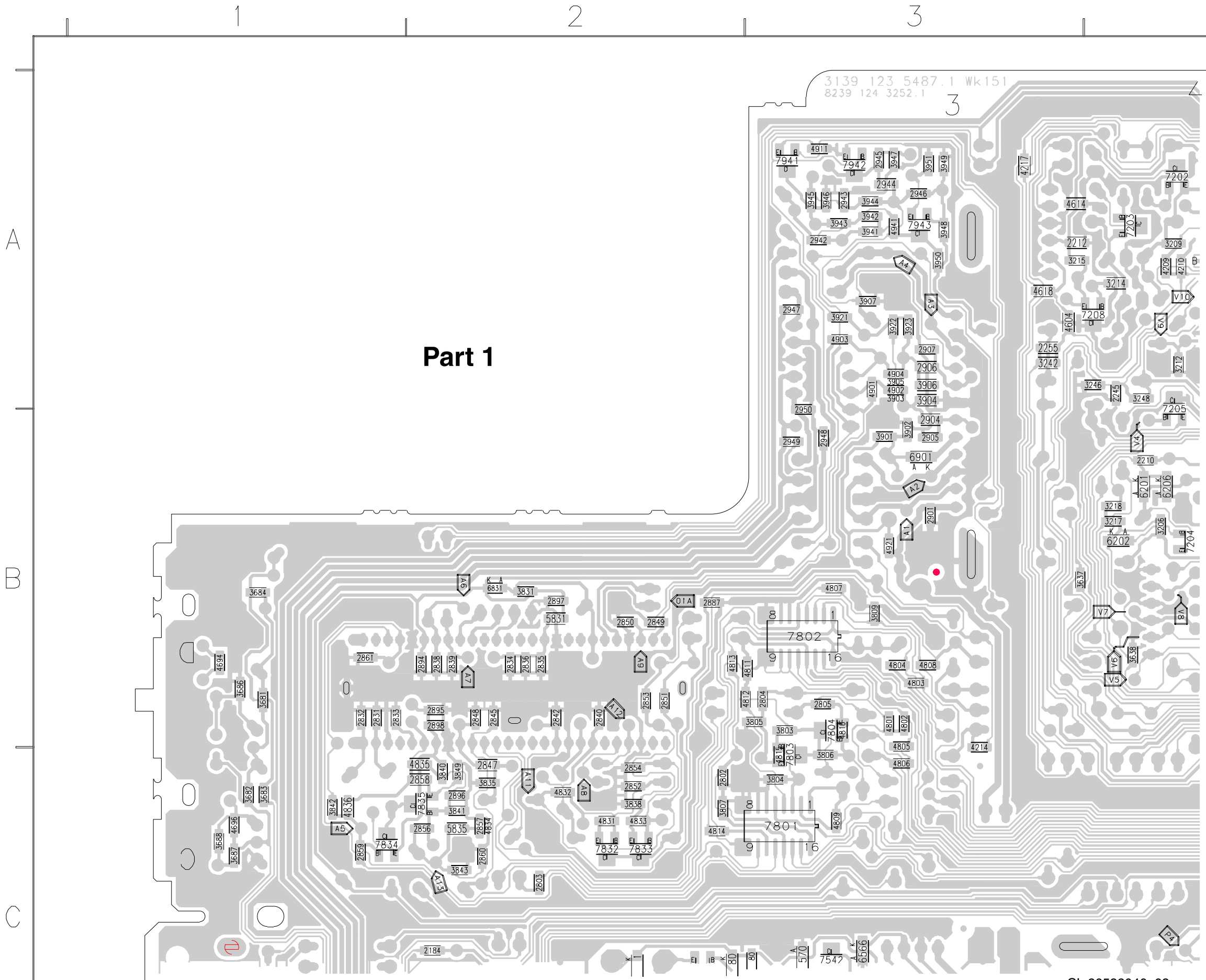
A13 REAR I/O CINCH



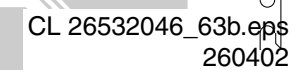
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F001	A6	1002	A6	1507	D3
F002	B5	1003	A5	1508	D3
F003	A5	1006	A6	1509	D3
F004	A5	1005	A5	1510	D3
F005	A6	1007	B5	1511	D3
F006	B5	1012	A5	1512	D3
F007	A6	1009	A5	1513	D3
F008	A6	1010	A5	1514	E3
F009	A5	1011	A6	1515	D3
F010	A6	1013	A4	1516	D3
F011	B6	1014	A4	1517	D4
F012	A5	1015	B18	1518	D4
F103	A6	1018	A4	1519	D4
F104	B6	1101	B6	1520	D4
F105	B6	1102	B6	1521	D4
F106	B7	1103	C5	1522	D4
F107	B6	1104	B6	1523	D3
F108	B7	1105	B6	1524	D3
F109	B7	1106	B6	1525	C4
F110	C6	1107	B6	1527	D3
F111	B6	1108	B6	1528	E2
F112	C6	1109	B6	1529	E2
F113	C6	1110	B6	1530	C2
F114	B7	1111	B6	1531	D3
F115	C5	1112	C6	1532	D3
F116	A6	1113	B6	1533	E3
F117	B5	1114	C6	1534	D4
F181	D1	1115	B6	1535	D4
F182	D1	1116	B6	1536	E3
F183	D1	1117	B6	1537	B6
F201	B4	1222	B6	1538	E4
F202	B4	1181	D1	1539	E4
F203	B4	1182	C2	1540	D4
F204	B3	1183	D1	1541	E4
F205	A4	1185	D1	1543	C4
F206	B4	1201	B4	1544	D4
F207	A4	1202	B3	1545	D4
F208	B4	1203	A3	1546	D3
F209	A6	1204	A4	1547	E2
F241	B3	1205	A4	1548	D3
F401	E4	1206	B4	1549	D4
F402	E4	1207	B4	1550	D4
F404	E5	1209	B4	1602	B5
F405	E5	1210	A4	1603	B5
F406	D5	1211	A4	1604	B5
F407	D5	1213	A5	1605	B5
F408	D5	1214	A4	1606	B6
F409	A4	1215	B4	1607	B5
F410	D5	1216	B4	1608	B5
F411	D5	1217	B4	1609	B4
F412	D6	1218	A4	1610	A4
F413	C5	1219	A5	1612	B5
F414	C5	1220	A4	1613	B5
F415	D5	1221	B4	1614	B4
F416	C6	1222	A4	1615	A5
F417	D5	1223	A4	1616	B5
F418	C6	1224	A6	1617	A5
F419	D5	1225	A4	1618	B1
F471	D6	1226	A6	1682	B1
F472	D6	1227	A6	1683	B1
F473	D6	1228	A6	1684	C1
F474	C6	1229	A4	1685	B1
F475	C6	1231	A4	1686	C1
F476	C6	1232	A4	1687	C1
F477	C6	1233	A4	1691	E1
F478	C6	1234	A4	1693	D1
F479	D6	1235	A5	1801	C2
F501	D2	1236	A5	1803	C3
F502	D2	1241	A5	1804	C3
F503	D2	1242	A5	1805	C3
F504	E2	1243	A5	1806	C3
F505	E2	1244	A5	1807	C3
F506	E2	1245	A5	1808	C3
F507	E3	1246	A5	1809	C3
F508	E3	1247	A5	1810	C3
F509	E3	1248	A5	1811	C3
F510	D3	1249	A5	1814	B3
F511	C4	1250	A5	1815	C3
F512	D4	1251	B3	1816	B3
F513	E4	1252	A5	1831	B2
F514	E3	1253	A5	1832	B2
F515	E3	1254	A5	1833	B2
F516	E4	1401	E5	1834	B2
F517	C3	1402	D5	1835	C2
F518	C3	1403	D5	1836	B2
F519	D4	1404	D5	1837	C2
F520	D5	1405	E5	1838	C2
F521	D5	1406	E5	1839	C2
F522	C4	1407	D5	1840	B2
F523	C4	1408	D5	1841	B2
F524	C2	1411	C5	1842	C2
F525	C2	1412	C5	1843	C2
F526	D4	1413	D6	1844	C4
F603	B4	1414	D6	1845	C2
F604	B4	1415	D6	1847	C2
F604	B4	1424	E5	1848	C1
F605	B5	1425	E5	1850	C1
F606	C4	1430	D5	1851	B2
F607	C4	1431	D5	1852	B2
F608	B4	1432	D6	1853	B2
F609	A5	1433	E7	1854	C1
F610	A6	1434	E7	1855	C2
F611	A6	1435	D6	1901	B3
F612	A6	1440	D5	1903	B3
F613	B4	1441	D4	1904	B3
F614	B5	1445	C4	1905	B3
F682	D1	1446	D4	1906	B3
F683	C1	1447	E6	1907	A3
F684	C2	1448	C5	1908	A3
F691	D1	1449	C5	1909	A3
F692	D1	1450	C5	1910	A3
F693	E1	1451	C5	1911	A3
F694	B1	1452	D5	1941	A3
F695	B1	1453	D5	1942	A3
F696	C2	1454	C6	1943	A3
F801	B2	1455	C5	1944	A3
F802	B2	1456	C5	1945	A3
F803	C2	1457	C5	1946	A3
F805	C2	1459	C6	1947	A3
F831	B1	1472	D6	1948	A3
F832	B2	1473	D6	1949	A3
F901	A3	1474	D6	1981	D1
F902	A3	1475	D6	1982	D1
F903	A3	1476	D6	1983	D1
F904	A3	1477	D6	1984	D1
F905	B3	1501	E2	1985	D1
F906	B3	1502	E2	1986	D1
F907	A3	1503	C2		
F908	A3	1504	C2		
F909	B3	1505	D3		
F910	A6	1506	D3		

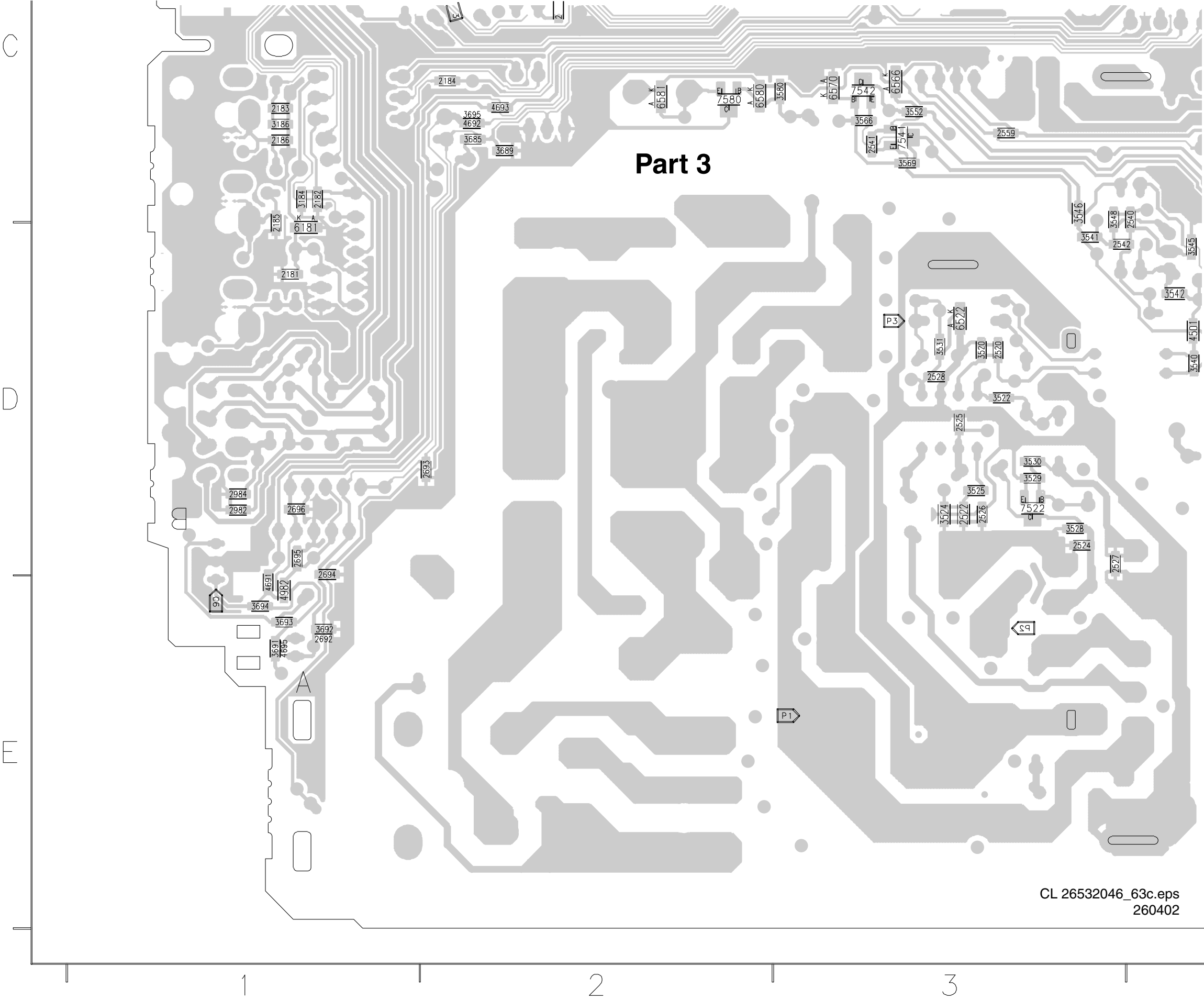
Layout Mono Carrier (Part 1 Bottom Side)



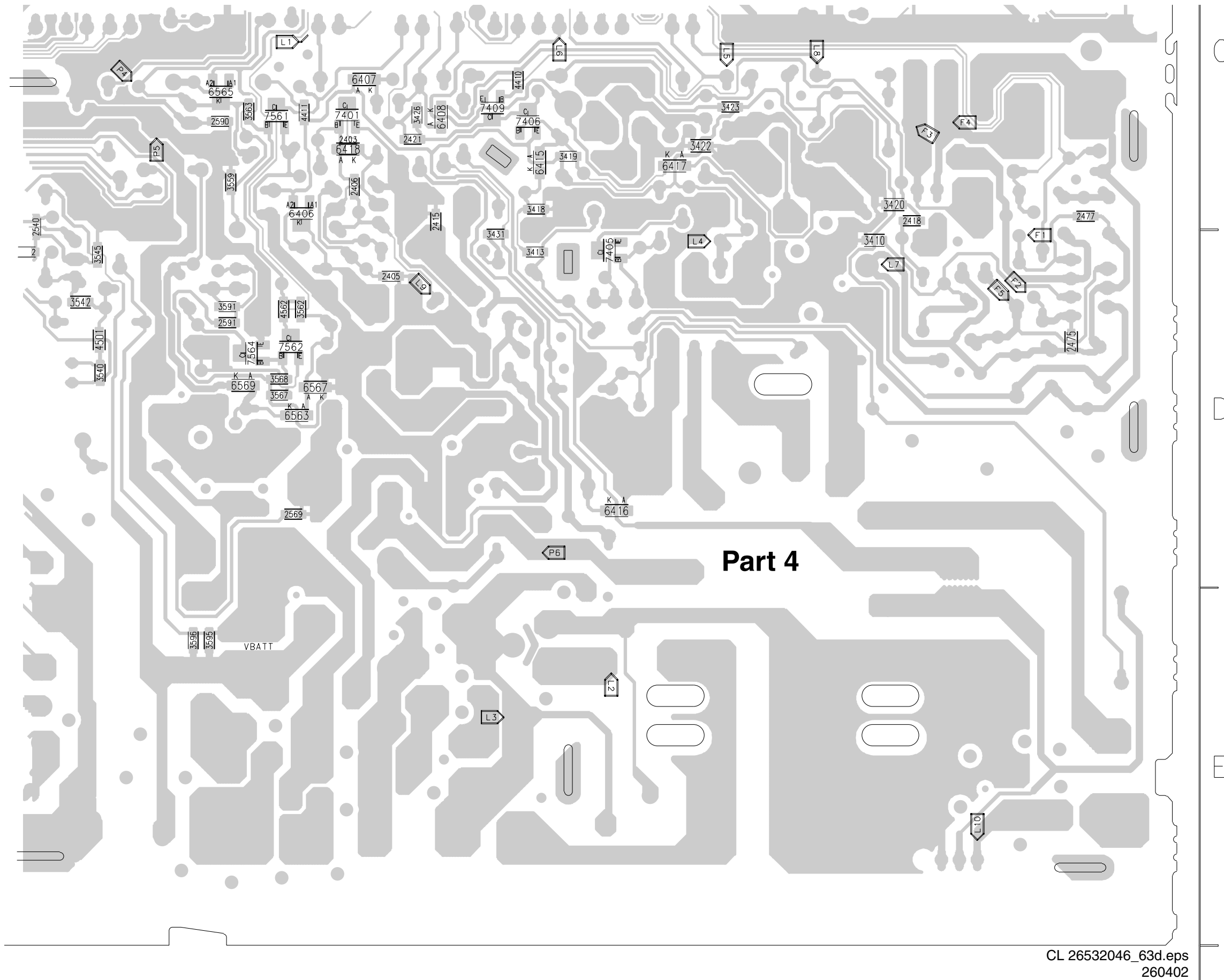
Part 2



Layout Mono Carrier (Part 3 Bottom Side)



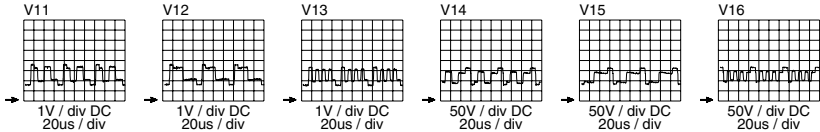
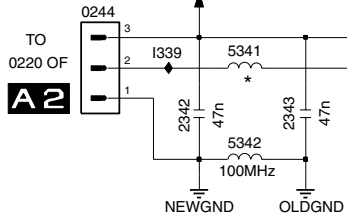
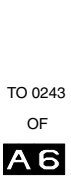
Layout Mono Carrier (Part 4 Bottom Side)



CRT Panel

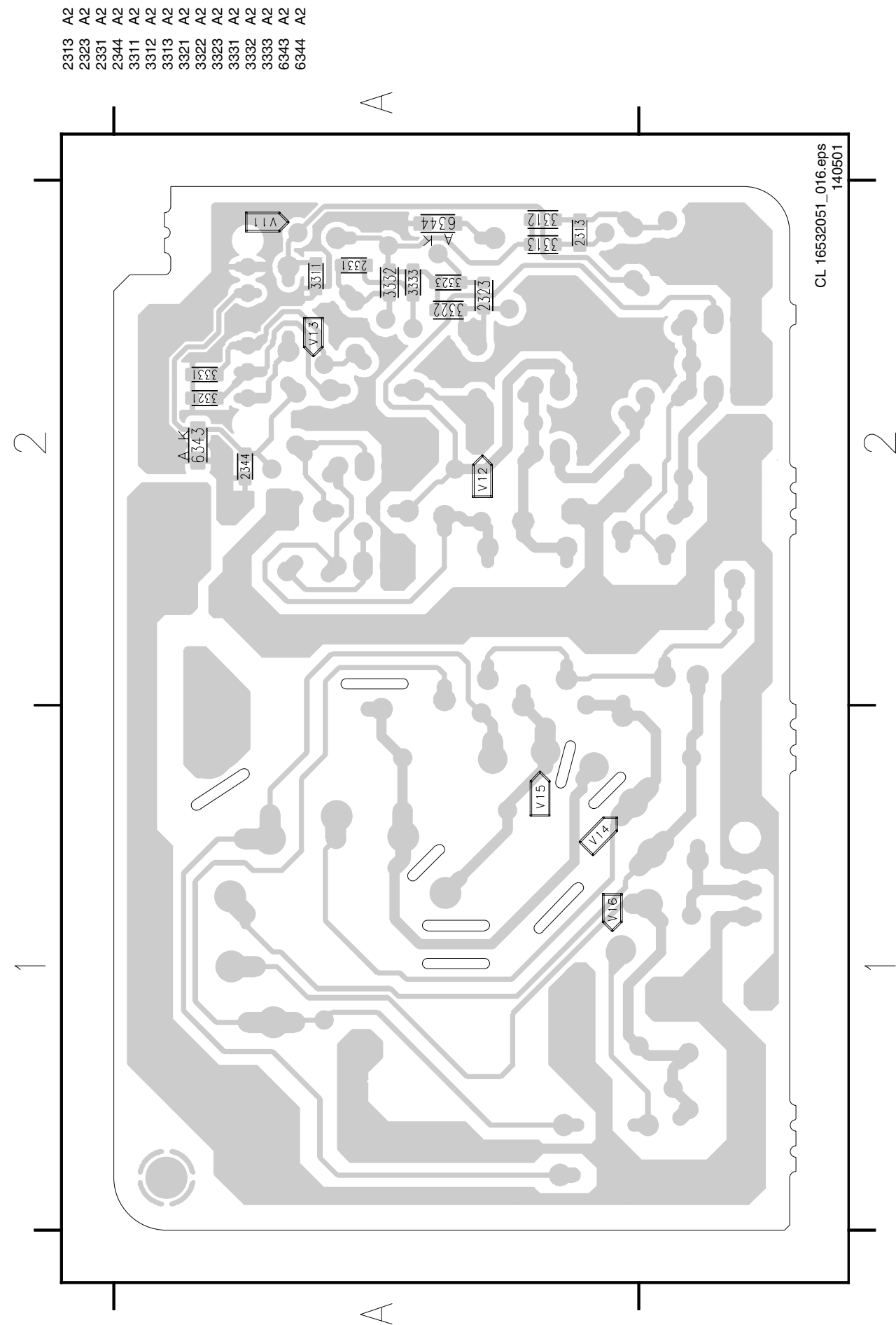
B CRT PANEL

AP / CH	14"	17"	20"	21"	21" CHINA
3349	2R2	3K9	1R2	1R2	1R2
3350	2R2	1R0	1R2	1R2	1R2
5341	spt0508 27u	spt0508 12u	spt0508 2u2	fxdind 1u5	spt0508 27u



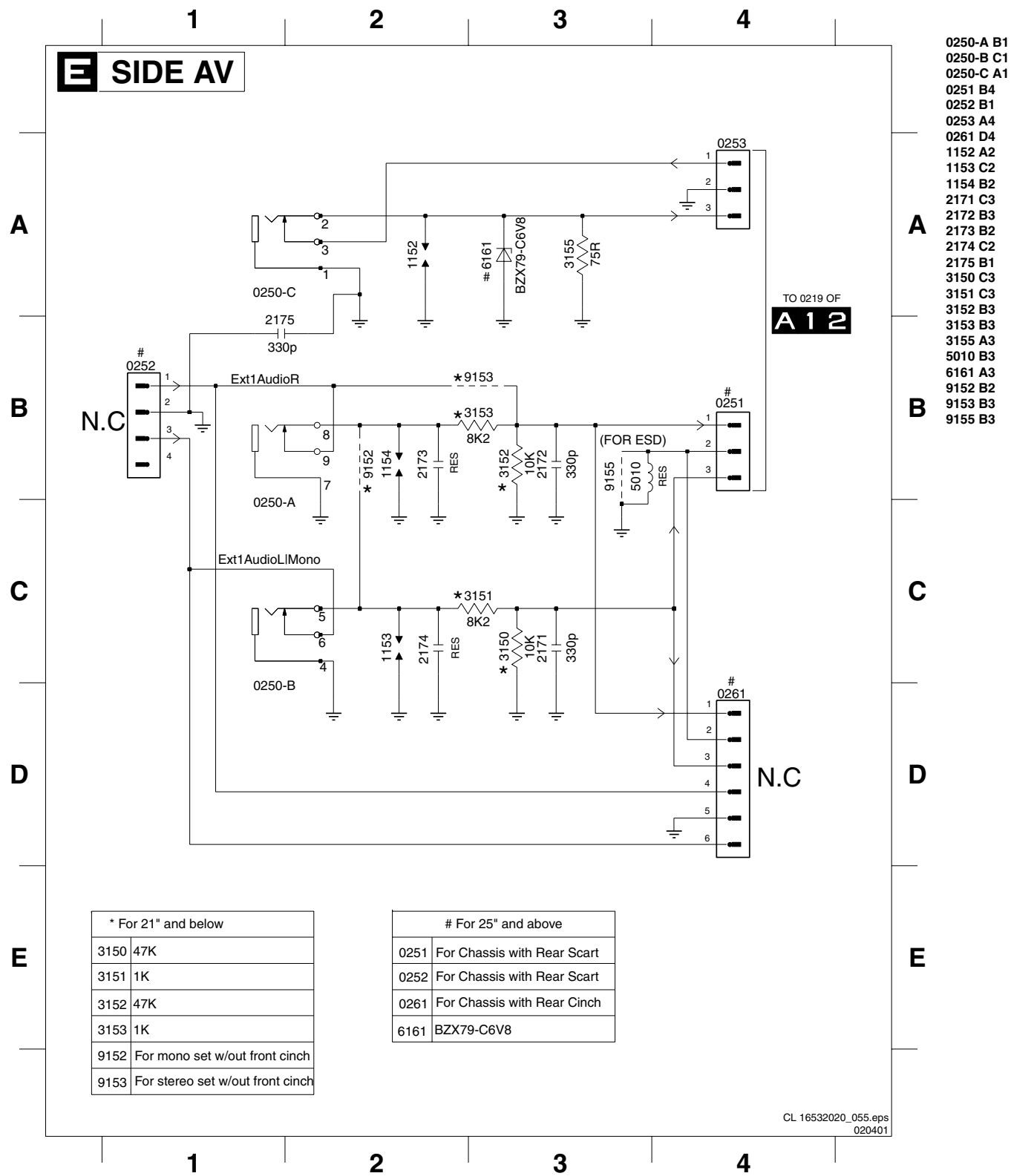
- VG2 F10
- 0165 B8
- 0244 G2
- 0245 C2
- 0254-A D7
- 1300-1 B7
- 2313 F3
- 2323 D3
- 2331 B3
- 2341 F6
- 2342 H3
- 2343 H3
- 2344 G5
- 3311 F3
- 3312 F3
- 3313 F3
- 3314 E4
- 3316 D4
- 3317 C6
- 3321 D3
- 3322 D3
- 3323 E3
- 3324 C4
- 3326 C4
- 3327 C6
- 3331 C3
- 3332 C3
- 3333 C3
- 3334 B4
- 3336 A4
- 3337 C6
- 3341 F6
- 3347 F5
- 3348 E6
- 3349 F6
- 3350 F6
- 5341 G3
- 5342 H3
- 6311 E5
- 6321 C5
- 6331 A5
- 6341 A5
- 6342 G4
- 6343 G5
- 6344 F4
- 7311 E3
- 7312 E4
- 7313 E4
- 7321 D3
- 7322 C4
- 7323 D4
- 7331 B3
- 7332 B4
- 7333 B4
- 9300 F4
- F301 D2
- F302 D2
- F303 D2
- F304 C3
- F305 G5
- F306 E6
- F307 E6
- F308 E5
- F309 G4
- F310 C6
- F311 C6
- F312 C6
- I310 A5
- I311 E5
- I312 F3
- I313 F3
- I314 E4
- I316 E4
- I318 D6
- I320 F6
- I321 D5
- I322 D3
- I323 D3
- I324 D4
- I326 C4
- I329 G3
- I331 B5
- I332 B3
- I333 C3
- I334 B4
- I335 B5
- I336 A4
- I337 E7
- I338 F6
- I339 G3
- I341 E6
- I343 G4

Layout CRT Panel (Bottom View)

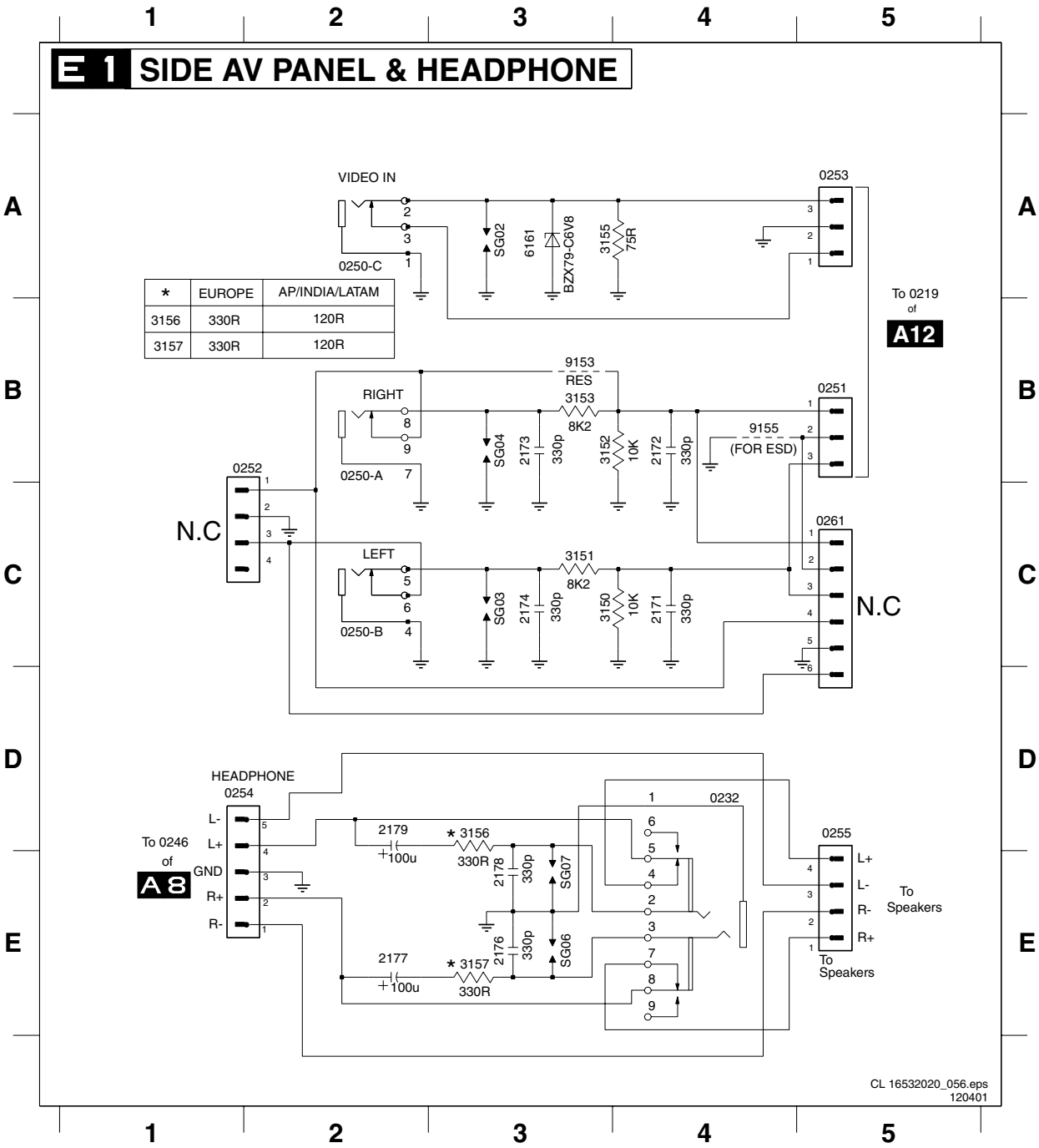


0	2	5	0	C	2
0	2	5	1	C	2
0	2	5	2	A	3
0	2	5	3	A	2
0	2	6	1	A	1
2	1	7	1	A	2
2	1	7	2	B	2
2	1	7	3	A	3
2	1	7	4	B	2
2	1	7	5	B	2
3	1	5	0	B	1
3	1	5	1	B	3
3	1	5	2	B	3
3	1	5	3	B	3
3	1	5	5	B	3
5	0	1	0	B	1
6	1	6	1	B	3
9	1	5	2	B	1
9	1	5	3	B	2
9	1	5	5	B	3
				B	3

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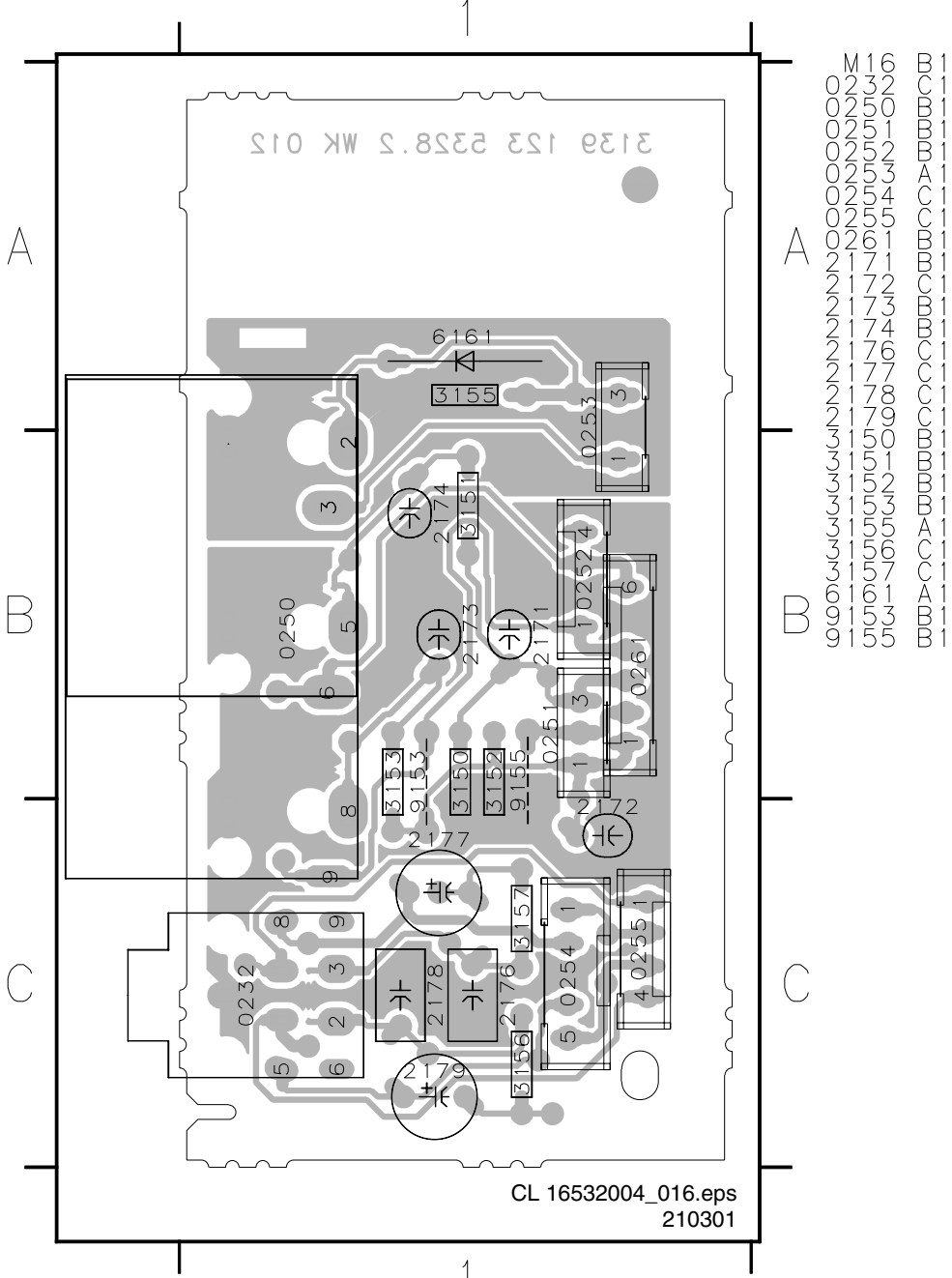


Side AV Panel + Headphone



- 0232 D4
- 0250-A B2
- 0250-B C2
- 0250-C A2
- 0251 B5
- 0252 B2
- 0253 A5
- 0254 D2
- 0255 D5
- 0261 C5
- 2171 C4
- 2172 B4
- 2173 B3
- 2174 C3
- 2176 E3
- 2177 E2
- 2178 E3
- 2179 D2
- 3150 C3
- 3151 C3
- 3152 B3
- 3153 B3
- 3155 A3
- 3156 D3
- 3157 E3
- 6161 A3
- 9153 B3
- 9155 B4
- SG02 A3
- SG03 C3
- SG04 B3
- SG06 E3
- SG07 E3

Layout Side AV Panel + Headphone (Top View)



[illegible]

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

8. Alignments

Index:

1. General Alignment Conditions
2. Hardware Alignments
3. Software Alignments and Settings

Note:

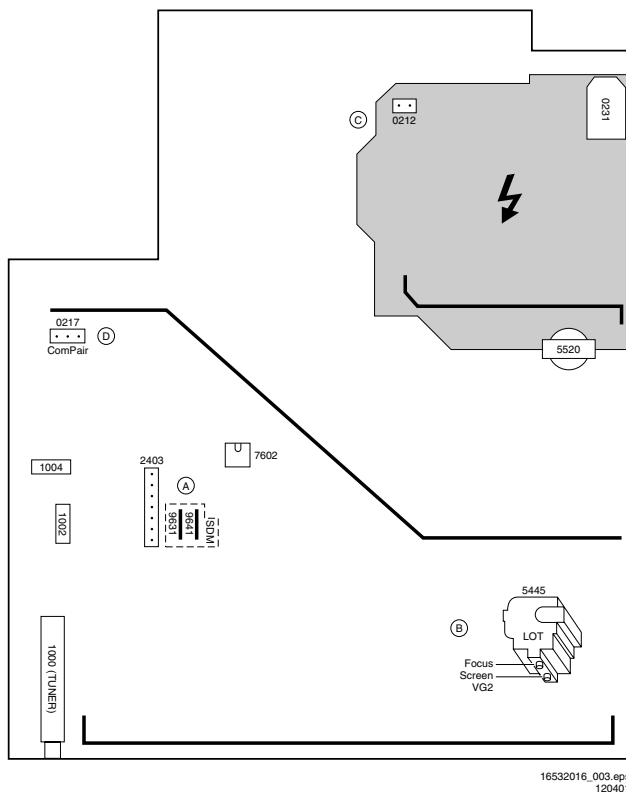
- The Service Default Mode (SDM) and Service Alignment Mode (SAM) are described in chapter 5.
- Menu navigation is done with the 'CURSOR UP, DOWN, LEFT or RIGHT' keys of the remote control transmitter.
- Figures can deviate slightly from the actual situation, due to different set executions or software versions.

8.1 General Alignment Conditions

Perform all electrical adjustments under the following conditions:

- AC voltage and frequency: according to country's standard.
- Connect the set to the AC power via an isolation transformer.
- Allow the set to warm up for approximately 20 minutes.
- Measure the voltages and waveforms in relation to chassis ground (with the exception of the voltages on the primary side of the power supply). Never use the cooling fins / plates as ground.
- Test probe: $R_i > 10 \text{ M}\Omega$; $C_i < 2.5 \text{ pF}$.
- Use an **isolated** trimmer / screwdriver to perform the alignments.

8.2 Hardware Alignments



4. GEOMETRY
5. AUDIO

8.3.1 Options

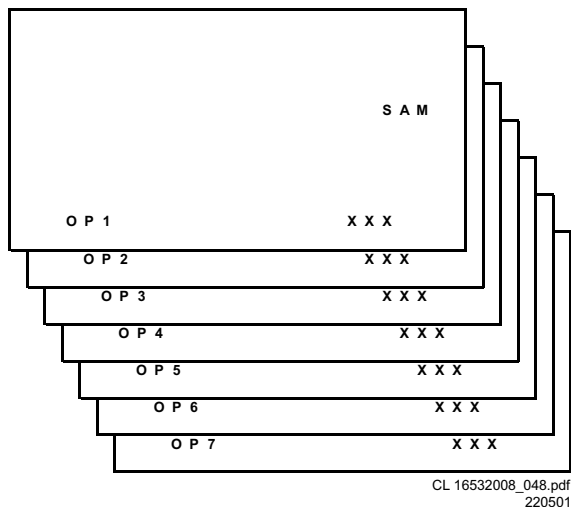


Figure 8-4

Options are used to control the presence / absence of certain features and hardware.

How to change an Option Byte

An Option Byte represents a number of different options. Changing these bytes directly makes it possible to set all options very fast. All options are controlled via seven option bytes. Select the option byte (OB1.. OB7) with the MENU UP/ DOWN keys, and enter the new value.

Leaving the OPTION submenu saves changes in the Option Byte settings. Some changes will only take effect after the set has been switched OFF and ON with the AC power switch (cold start).

How to calculate the value of an Option Byte

Calculate an Option Byte value (OB1 .. OB7) in the following way:

1. Check the status of the single option bits (OP): are they enabled (1) or disabled (0).
2. When an option bit is enabled (1) it represents a certain value (see first column 'value between brackets' in first table below). When an option bit is disabled, its value is 0.
3. The total value of an Option Byte is formed by the sum of its eight option bits. See second table below for the correct Option Bytes per typenumber.

Bit (value)	OB1	OB2	OB3	OB4	OB5	OB6	OB7
0 (1)	OP10	OP20	OP30	OP40	OP50	OP60	OP70
1 (2)	OP11	OP21	OP31	OP41	OP51	OP61	OP71
2 (4)	OP12	OP22	OP32	OP42	OP52	OP62	OP72
3 (8)	OP13	OP23	OP33	OP43	OP53	OP63	OP73
4 (16)	OP14	OP24	OP34	OP44	OP54	OP64	OP74
5 (32)	OP15	OP25	OP35	OP45	OP55	OP65	OP75
6 (64)	OP16	OP26	OP36	OP46	OP56	OP66	OP76
7 (128)	OP17	OP27	OP37	OP47	OP57	OP67	OP77
Total:	Sum	Sum	Sum	Sum	Sum	Sum	Sum

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Figure 8-5

Typenumber	OB1	OB2	OB3	OB4	OB5	OB6	OB7
14PT2001/59A	0	215	65	0	194	80	9
14PT2001/59B	0	215	65	0	194	80	9
14PT2001/59C	0	215	65	0	194	80	9
14PT2001/65R	0	215	65	0	194	80	9
14PT2001/67R	0	215	65	0	194	80	9
14PT2001/71R	0	215	65	0	194	80	4
14PT2001/79R	0	215	65	0	194	80	11
14PT2011/71R	0	215	65	0	210	80	4
14PT2011/74R	0	215	65	0	210	80	9
14PT2012/59A	0	247	65	0	210	80	9
14PT2012/59B	0	247	65	0	210	80	9
14PT2012/59C	0	247	65	0	210	80	9
14PT2012/65R	0	247	65	0	210	80	9
14PT2401/94R	192	215	65	0	194	80	0
14PT2411/94R	192	215	65	0	194	80	0
15PT2301/67R	160	215	65	168	246	144	44
15PT2301/71R	160	215	65	162	246	144	36
15PT2301/74R	160	215	65	168	246	144	44
15PT2302/56A	160	247	65	168	246	144	44
15PT2302/57R	160	247	65	168	246	144	44
15PT2302/65R	160	247	65	168	246	144	44
15PT2302/68R	160	247	65	168	246	144	44
15PT2302/69R	160	247	65	168	246	144	44
15PT2302/79R	160	247	65	168	246	144	44
15PT2441/94R	192	215	65	164	246	144	12
20PT2001/59A	0	215	65	0	194	80	9
20PT2001/59B	0	215	65	0	194	80	9
20PT2001/59C	0	215	65	0	194	80	9
20PT2001/59S	0	215	65	0	194	80	9
20PT2001/65R	0	215	65	0	194	80	9
20PT2001/67R	0	215	65	0	194	80	9
20PT2001/71R	0	215	65	0	194	80	4
20PT2001/79R	0	215	65	0	194	80	11
20PT2011/67R	160	215	65	0	210	80	41
20PT2011/71R	160	215	65	0	210	80	36
20PT2011/74R	160	215	65	0	210	80	41
20PT2012/59A	160	247	65	0	210	80	41
20PT2012/59B	160	247	65	0	210	80	41
20PT2012/59C	160	247	65	0	210	80	41
20PT2012/59S	160	247	65	0	210	80	41
20PT2012/65R	160	247	65	0	210	80	41
20PT2151/67R	160	215	65	164	242	80	44
20PT2151/71R	160	215	65	162	242	80	36
20PT2151/74R	160	215	65	164	242	80	44
20PT2152/65R	160	247	65	164	242	80	44
20PT2152/68R	160	247	65	164	242	80	44
20PT2152/69R	160	247	65	164	242	80	44
20PT2401/94R	0	215	65	0	194	80	0
20PT2411/94R	192	215	65	0	194	80	0
20PT2421/94R	160	215	65	164	210	80	32
21PT2001/59B	0	215	65	0	194	80	9
21PT2001/67R	0	215	65	0	194	80	9
21PT2001/71R	0	215	65	0	194	80	4
21PT2001/79R	0	215	65	0	194	80	11
21PT2011/67R	160	215	65	0	194	80	41
21PT2011/71R	160	215	65	0	194	80	36
21PT2011/74R	160	215	65	0	194	80	41
21PT2012/59A	0	247	65	0	194	80	9
21PT2012/59B	160	247	65	0	194	80	41
21PT2012/59C	0	247	65	0	194	80	9
21PT2012/65R	160	247	65	0	194	80	41
21PT2012/79R	160	247	65	0	194	80	43
21PT2411/94R	0	215	65	0	210	80	0
21PT2421/94R	192	215	65	164	226	80	0
21PT2425/94R	192	215	65	164	242	144	0
21PT2426/94R	192	215	65	164	242	144	0
21PT2501/93R	1	215	65	0	194	16	3
21PT2502/93R	1	215	65	0	194	16	3
21PT2521/93R	1	215	65	164	226	16	3

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Figure 8-6

Option Bit Assignment

Following are the option bit assignments for all L01 software clusters.

- **Option Byte 1 (OB1)**
 - OP10: CHINA
 - OP11: VIRGIN_MODE
 - OP12: UK_PNP
 - OP13: ACI
 - OP14: ATS
 - OP15: LNA
 - OP16: FM_RADIO
 - OP17: PHILIPS_TUNER
- **Option Byte 2 (OB2)**
 - OP20: HUE
 - OP21: COLOR_TEMP
 - OP22: CONTRAST_PLUS
 - OP23: TILT
 - OP24: NOISE_REDUCTION
 - OP25: CHANNEL_NAMING
 - OP26: SMART_PICTURE
 - OP27: SMART_SOUND
- **Option Byte 3 (OB3)**
 - OP30: AVL
 - OP31: WSSB
 - OP32: WIDE_SCREEN
 - OP33: SHIFT_HEADER_SUBTITLE
 - OP34: CONTINUOUS_ZOOM
 - OP35: COMPRESS_16_9
 - OP36: EXPAND_4_3
 - OP37: EW_FUNCTION
- **Option Byte 4 (OB4)**
 - OP40: STEREO_NON_DBX
 - OP41: STEREO_DBX
 - OP42: STEREO_PB
 - OP43: STEREO_NICAM_2CS
 - OP44: DELTA_VOLUME
 - OP45: ULTRA_BASS
 - OP46: VOLUME_LIMITER
 - OP47: INCR_SUR
- **Option Byte 5 (OB5)**
 - OP50: PIP
 - OP51: HOTEL_MODE
 - OP52: SVHS
 - OP53: CVI
 - OP54: AV3
 - OP55: AV2
 - OP56: AV1
 - OP57: NTSC_PLAYBACK
- **Option Byte 6 (OB6)**
 - OP60: Reserved (value = 0)
 - OP61: SMART_TEXT
 - OP62: SMART_LOCK
 - OP63: VCHIP
 - OP64: WAKEUP_CLOCK
 - OP65: SMART_CLOCK
 - OP66: SMART_SURF
 - OP67: PERSONAL_ZAPPING
- **Option Byte 7 (OB7)**
 - OP70: SOUND_SYSTEM_AP_3 / MULTI_STANDARD_EUR / SYSTEM_LT_2
 - OP71: SOUND_SYSTEM_AP_2 / WEST_EU / SYSTEM_LT_1
 - OP72: SOUND_SYSTEM_AP_1
 - OP73: COLOR_SYSTEM_AP
 - OP74: Reserved (value = 0)
 - OP75: Reserved (value = 0)
 - OP76: TIME_WIN2
 - OP77: TIME_WIN1

Option bit definition

- **OP10: CHINA0** : Tuning is not for China set, or this option bit is not applicable, 1 : Tuning is for China set, Default setting : 0.
- **OP11: VIRGIN_MODE0** : Virgin mode is disabled or not applicable, 1 : Virgin mode is enabled. Plug and Play menu

item will be displayed to perform installation at the initial start-up of the TV when VIRGIN_MODE is set to 1. After installation is finished, this option bit will be automatically set to 0, Default setting : 0.

- **OP12: UK_PNP0** : UK's default Plug and Play setting is not available or not applicable, 1 : UK's default Plug and Play setting is available. When UK_PNP and VIRGIN_MODE are set to 1 at the initial set-up, LANGUAGE = ENGLISH, COUNTRY = GREAT BRITAIN and after exiting from menu, VIRGIN_MODE will be set automatically to 0 while UK_PNP remains 1, Default setting : 0.
- **OP13: ACIO** : ACI feature is disabled or not applicable, 1 : ACI feature is enabled, Default setting : 0.
- **OP14: ATS0** : ATS feature is disabled or not applicable, 1 : ATS feature is enabled. When ATS is enabled, it sorts the program in an ascending order starting from program 1, Default setting : 0.
- **OP15: LNA0** : Auto Picture Booster is not available or not applicable, 1 : Auto Picture Booster is available, Default setting : 0.
- **OP16: FM_RADIO0** : FM radio feature is disabled or not applicable, 1 : FM radio feature is enabled, Default setting : 0.
- **OP17: PHILIPS_TUNER0** : ALPS / MASCO compatible tuner is in use, 1 : Philips compatible tuner is in use, Default setting : 0.
- **OP20: HUE0** : Hue/Tint Level is disabled or not applicable, 1 : Hue/Tint Level is enabled, Default setting : 0.
- **OP21: COLOR_TEMPO** : Colour Temperature is disabled or not applicable, 1 : Colour Temperature is enabled, Default setting : 0.
- **OP22: CONTRAST_PLUS0** : Contrast+ is disabled or not applicable, 1 : Contrast+ is enabled, Default setting : 0.
- **OP23: TILT0** : Rotate Picture is disabled or not applicable, 1 : Rotate Picture is enabled, Default setting : 0.
- **OP24: NOISE_REDUCTION0** : Noise Reduction (NR) is disabled or not applicable, 1 : Noise Reduction (NR) is enabled, Default setting : 0.
- **OP25: CHANNEL_NAMING0** : Name FM Channel is disabled or not applicable, 1 : Name FM Channel is enabled, Default setting : 0. Note : Name FM channel can be enabled only when FM_RADIO = 1.
- **OP26: SMART_PICTURE0** : Smart Picture is disabled or not applicable, 1 : Smart Picture is enabled, Default setting : 1
- **OP27: SMART_SOUND0** : Smart Sound is disabled or not applicable, 1 : Smart Sound is enabled, Default setting : 1
- **AP30: AVL0** : AVL is disabled or not applicable, 1 : AVL is enabled, Default setting : 0.
- **OP31: WSSB0** : WSSB is disabled or not applicable, 1 : WSSB is enabled, Default setting : 0. Note : This option bit can be set to 1 only when WIDE_SCREEN = 1.
- **OP32: WIDE_SCREEN0** : Software is used for 4:3 set or not applicable, 1 : Software is used for 16:9 set, Default setting : 0.
- **OP33: SHIFT_HEADER_SUBTITLE0** : Shift Header / Subtitle is disabled or not applicable, 1 : Shift Header / Subtitle is enabled, Default setting : 0. Note : This option bit can be set to 1 only when WIDE_SCREEN = 1.
- **OP34: CONTINUOUS_ZOOM0** : Continuous Zoom is disabled or not applicable, 1 : Continuous Zoom is enabled, Default setting : 0. Note : This option bit can be set to 1 only when WIDE_SCREEN = 1.
- **OP35: COMPRESS_16_90** : COMPRESS 16:9 selection is not applicable. Item should not be in the FORMAT menu list, 1 : COMPRESS 16:9 selection is applicable. Item should not be in the FORMAT menu list, Default setting : 0.
- **OP36: EXPAND_4_30** : Expand 4:3 selection is not applicable. Item should not be in the FORMAT menu list, 1 : Expand 4:3 selection is applicable. Item should be in the FORMAT menu list, Default setting : 0.
- **OP37: EW_FUNCTION0** : EW function is disabled. In this case, only Expand 4:3 is allowed, Compress 16:9 is not applicable. 1 : EW function is enabled. In this case, both

Expand 4:3 and Compress 16:9 are applicable. Default setting : 0.

- **OP40: STEREO_NON_DBX0** : For AP_NTSC, chip TDA 9853 is not present, 1 : For AP_NTSC, chip TDA 9853 is present, Default setting : 0.
- **OP41: STEREO_DBX0** : For AP_NTSC, chip MSP 3445 is not present, 1 : For AP_NTSC, chip MSP 3445 is present, Default setting : 0.
- **OP42: STEREO_PB0** : For AP_PAL, chip MSP3465 is not present, 1 : For AP_PAL, chip MSP3465 is present, Default setting : 0.
- **OP43: STEREO_NICAM_2CS0** : For EU and AP_PAL, chip MSP 3415 is not present, 1 : For EU and AP_PAL, chip MSP 3415 is present, Default setting : 0.
- **OP44: DELTA_VOLUME0** : Delta Volume Level is disabled or not applicable, 1 : Delta Volume Level is enabled, Default setting : 0.
- **OP45: ULTRA_BASS0** : Ultra Bass is disabled or not applicable, 1 : Ultra Bass is enabled, Default setting : 0.
- **OP46: VOLUME_LIMITER0** : Volume Limiter Level is disabled or not applicable, 1 : Volume Limiter Level is enabled, Default setting : 0.
- **OP47: INCR_SUR0** : Incredible Surround feature is disabled, 1 : Incredible Surround feature is enabled, Default setting : 1
- **OP50: PIP0** : PIP is disabled or not applicable, 1 : PIP is enabled, Default setting : 0.
- **OP51: HOTEL_MODE0** : Hotel mode is disabled or not applicable, 1 : Hotel mode is enabled, Default setting : 0.
- **OP52: SVHS0** : SVHS source is not available, 1 : SVHS source is available, Default setting : 0. Note : This option bit is not applicable for EU.
- **OP53: CVI0** : CVI source is not available, 1 : CVI source is available, Default setting : 0.
- **OP54: AV30** : Side/Front AV3 source is not present, 1 : Side/Front AV3 source is present, Default setting : 0.
- **OP55: AV20** : AV2 source is not present, 1 : AV2 source is present, Default setting : 0. Note : For EU, when AV2=1, both EXT2 and SVHS2 should be included in the OSD loop.
- **OP56: AV10** : AV1 source is not present, 1 : AV1 source is present, Default setting : 0.
- **OP57: NTSC_PLAYBACK0** : NTSC playback feature is not available, 1 : NTSC playback feature is available, Default setting : 0.
- **OP60: Reserved Default setting : 0.**
- **OP61: SMART_TEXT0** : Smart Text Mode and Favourite Page are disabled or not applicable, 1 : Smart Text Mode and Favourite Page are enabled, Default setting : 1.
- **OP62: SMART_LOCK0** : Child Lock and Lock Channel are disabled or not applicable for EU, 1 : Child Lock and Lock Channel are enabled for EU, Default setting : 1.
- **OP63: VCHIP0** : VCHIP feature is disabled, 1 : VCHIP feature is enabled, Default setting : 1.
- **OP64: WAKEUP_CLOCK0** : Wake up clock feature is disabled or not applicable, 1 : Wake up clock feature is enabled, Default setting : 1.
- **OP65: SMART_CLOCK0** : Smart Clock Using Teletext and Smart Clock Using PBS is disabled or not applicable, 1 : Smart Clock Using Teletext and Smart Clock Using PBS is enabled. For NAFTA, menu item AUTOCHRON is present in the INSTALL submenu, Default setting : 0.
- **OP66: SMART_SURF0** : Smart Surf feature is disabled or not applicable, 1 : Smart Surf feature is enabled, Default setting : 0.
- **OP67: PERSONAL_ZAPPING0** : Personal Zapping feature is disabled or not applicable, 1 : Personal Zapping feature is enabled, Default setting : 0.
- **OP70: MULTI_STANDARD_EUR0** : Not for Europe multi standard set, or this option bit is not applicable, 1 : For Europe multi standard set. Default setting : 0. Note : This option bit is used to control the SYSTEM selection in Manual Store : If MULTI_STANDARD_EUR = 1 then SYSTEM = Europe, West Europe, East Europe, UK, France otherwise SYSTEM = 'Europe, West Europe, UK

for West Europe' (WEST_EU=1) or SYSTEM = 'Europe, West Europe, East Europe for East Europe' (WEST_EU=0)

- **OP71: WEST_EU0** : For East Europe set, or this option bit is not applicable, 1 : For West Europe set, Default setting : 0.
- **OP71 and 70: SYSTEM_LT_1, SYSTEM_LT_2** These two option bits are allocated for LATAM system selection. 00 : NTSC-M 01 : NTSC-M, PAL-M 10 : NTSC-M, PAL-M, PAL-N 11 : NTSC-M, PAL-M, PAL-N, PAL-BG Default setting : 00
- **OP70, 71 and 72: SOUND_SYSTEM_AP_1, SOUND_SYSTEM_AP_2, SOUND_SYSTEM_AP_3** These three option bits are allocated for AP_PAL sound system selection. 000 : BG 001 : BG / DK 010 : I / DK 011 : BG / I / DK 100 : BG / I / DK / M Default setting : 00
- **OP73: COLOR_SYSTEM_AP** This option bit is allocated for AP-PAL colour system selection. 0 : Auto, PAL 4.43, NTSC 4.43, NTSC 3.58 1 : Auto, PAL 4.43, NTSC 4.43, NTSC 3.58, SECAM Default setting : 0
- **OP74: Reserved Default setting : 0.**
- **OP75: Reserved Default setting : 0.**
- **OP77 and 76: TIME_WIN1, TIME_WIN200** : The time window is set to 1.2s 01 : The time window is set to 2s 10 : The time window is set to 5s 11 : not in use Default setting : 01 Note : The time-out for all digit entries depend on this setting.

8.3.2 Tuner

Note: Described alignments are only necessary when the NVM (item 7602) is replaced.

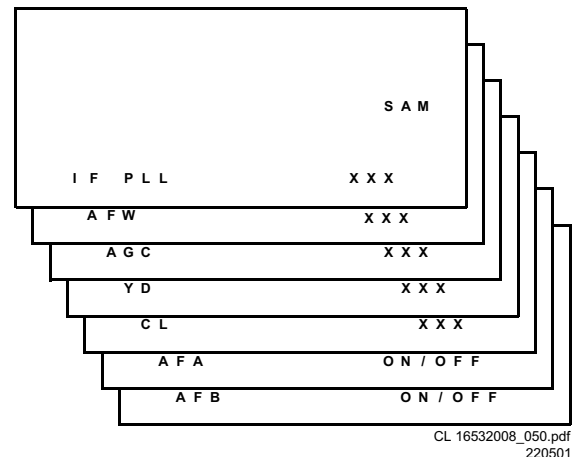


Figure 8-7

IF PLL

This adjustment is auto-aligned. Therefore, no action is required.

AFW (AFC window)

Fixed value is OFF.

AGC (AGC take over point)

Set the external pattern generator to a colour bar video signal and connect the RF output to aerial input. Set amplitude to 10 mV and set frequency to 475.25 MHz (PAL/SECAM) or 61.25 MHz (NTSC).

Connect a DC multimeter to pin 1 of the tuner (item 1000 on the main panel).

1. Activate the SAM.
2. Go to the TUNER sub menu.
3. Select AFW with the UP/DOWN cursor keys and set to ON.
4. Select AGC with the UP/DOWN cursor keys.

- Adjust the AGC-value (default value is 28) with the LEFT/RIGHT cursor keys until the voltage at pin 1 of the tuner lies between 3.8 and 2.3 V.
- Select AFW with the UP/DOWN cursor keys and set to OFF.
- Switch the set to STANDBY.

YD (Y-delay)

Always set to 8.

CL (cathode drive level)

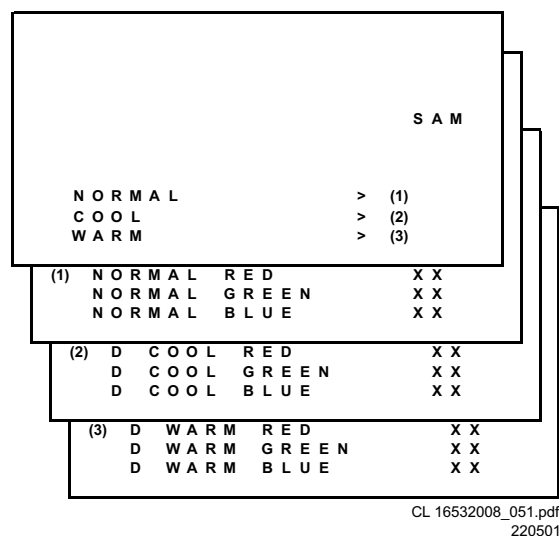
Always set to 7.

AFA

Read only bit, for monitoring purpose only.

AFB

Read only bit, for monitoring purpose only.

8.3.3 White Tone**Figure 8-8**

In the WHITE TONE sub menu, the values of the black cut off level can be adjusted. Normally, no alignment is needed for the WHITE TONE. You can use the given default values.

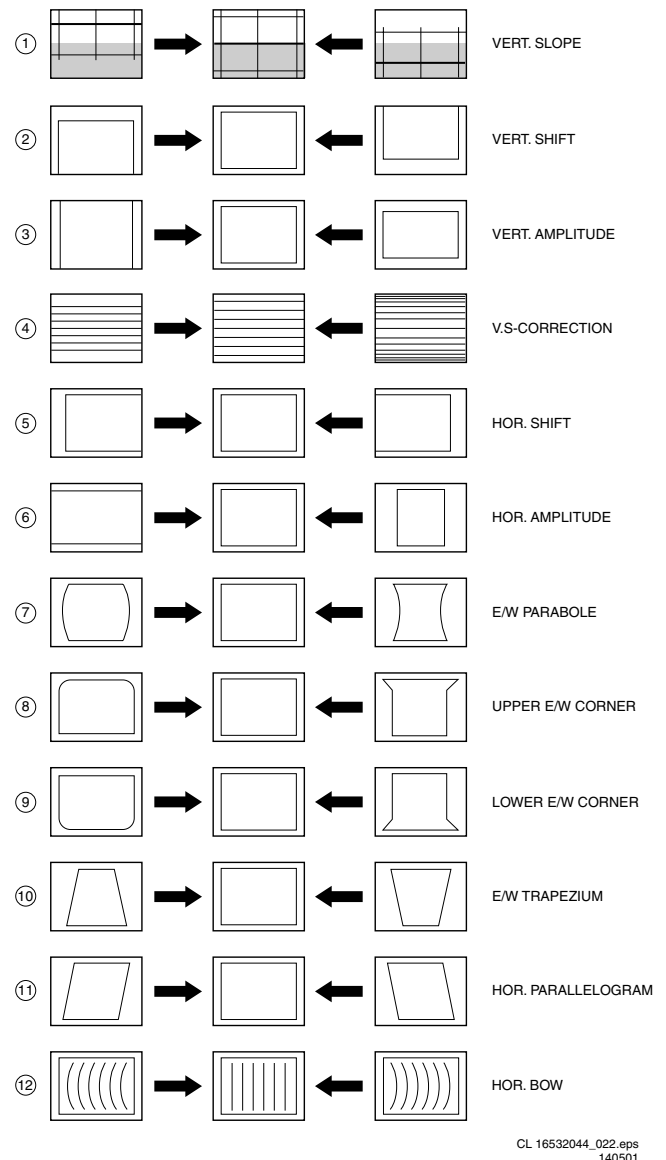
The colour temperature mode (NORMAL, COOL and WARM) and the colour (R, G, and B) can be selected with the UP/DOWN RIGHT/LEFT cursor keys. The value can be changed with the LEFT/RIGHT cursor keys. First, select the values for the NORMAL colour temperature. Then select the values for the COOL and WARM mode. After alignment, switch the set to standby, in order to store the alignments.

Default settings:

- NORMAL** (colour temperature = 11500 K):
 - NORMAL R = 32
 - NORMAL G = 35
 - NORMAL B = 30
- COOL** (colour temperature = 14000 K):
 - DELTA COOL R = 0
 - DELTA COOL G = -5
 - DELTA COOL B = 5
- WARM** (colour temperature = 8200 K):
 - DELTA WARM R = 8
 - DELTA WARM G = -3
 - DELTA WARM B = 2

8.3.4 Geometry

The geometry alignments menu contains several items to align the set, in order to obtain correct picture geometry.

**Figure 8-9**

Connect an external video pattern generator to the aerial input of the TV-set and input a crosshatch test pattern. Set the generator amplitude to at least 1 mV and set frequency to 475.25 MHz (PAL/SECAM) or 61.25 MHz (NTSC).

- Set 'Smart Picture' to NATURAL (or MOVIES).
 - Activate the SAM menu (see chapter 5).
 - Go to the GEOMETRY sub menu.
 - Choose HORIZONTAL or VERTICAL alignment
- Now you can perform the following alignments:

Horizontal:

- Horizontal Parallelogram (HP)** Align straight vertical lines in the top and the bottom; vertical rotation around the centre.
- Horizontal Bow (HB)** Align straight horizontal lines in the top and the bottom; horizontal rotation around the centre.
- Horizontal Shift (HSH)** Align the horizontal centre of the picture to the horizontal centre of the CRT.

See also Figure 8-9 numbers 11, 12 and 5.

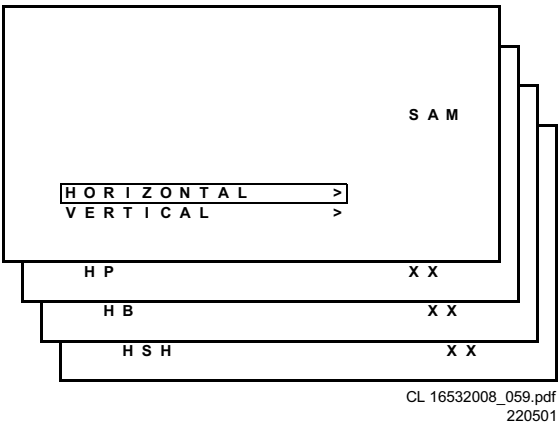


Figure 8-10

Vertical:

- **Vertical slope (VSL)** Align the vertical centre of the picture to the vertical centre of the CRT. This is the first of the vertical alignments to perform. For an easy alignment, set SBL to ON.
- **Vertical Amplitude (VAM)** Align the vertical amplitude so that the complete test pattern is visible.
- **Vertical S-Correction (VSC)** Align the vertical linearity, meaning that vertical intervals of a grid pattern must be equal over the entire screen height.
- **Vertical Shift (VSH)** Align the vertical centring so that the test pattern is located vertically in the middle. Repeat the 'vertical amplitude' alignment if necessary.
- **Service blanking (SBL)** Switch the blanking of the lower half of the screen ON or OFF (to be used in combination with the vertical slope alignment).
- **H60** Align straight horizontal lines if NTSC input (60 Hz) is used i.s.o. PAL (50 Hz).
- **V60** Align straight vertical lines if NTSC input (60 Hz) is used i.s.o. PAL (50 Hz).

See also Figure 8-9 numbers 1, 3, 4 and 2.

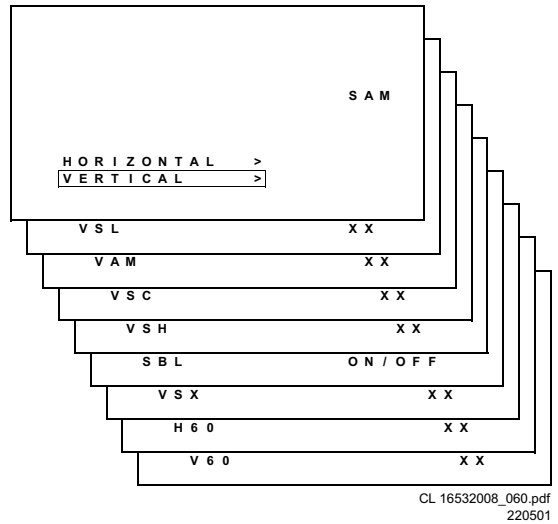


Figure 8-11

In the table below, you will find the GEOMETRY default values for the different sets.

DEFAULT GEOMETRY VALUES (L01 SMALL SCREEN)									
Alignment	Description	13V	14	14RF	15RF	17	19V	20	21
HP	Hor. Parallelogram	31	31	31	31	31	31	31	31
HB	Hor. Bow	31	31	31	31	31	31	31	31
HSH	Hor. Shift	23	35	23	35	35	23	35	35
EWV	East West Width	-	-	-	-	-	-	-	-
EWP	East West Parabola	-	-	-	-	-	-	-	-
UCP	Upper Corner Parabola	-	-	-	-	-	-	-	-
LCP	Lower Corner Parabola	-	-	-	-	-	-	-	-
EWT	East West Trapezium	-	-	-	-	-	-	-	-
VSL	Vert. Slope	31	33	31	33	33	31	33	33
VAM	Vert. Amplitude	26	26	26	26	26	26	26	26
VSC	Vert. S-correction	23	23	23	23	23	23	23	23
VSH	Vert. Shift	30	35	30	35	35	30	35	35
VX	Vert. Zoom	-	-	-	-	-	-	-	-
H60	Hor. Shift offset (60 Hz)	0	9	0	9	9	0	9	9
V60	Vert. Shift offset (60 Hz)	0	-2	0	-2	-2	0	-2	-2
Abbreviations: V= visual, RF= Real Flat									

Figure 8-12

8.3.5 Audio

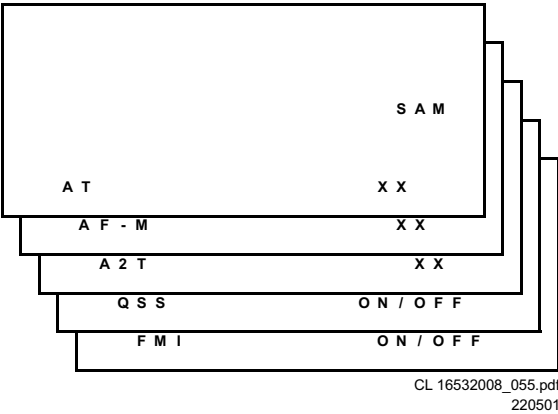


Figure 8-13

No alignments are needed for the audio sub menu. Use the given default values.

AT

Default value is 8.

AF-M

Default value is 44.

A2T

Default value is 250.

QSS

OFF for mono sets, ON for stereo sets.

FMI

OFF for mono sets, ON for stereo sets.

9. Circuit Description

Index:

1. Introduction
2. Audio Signal Processing
3. Video Signal Processing
4. Synchronisation
5. Deflection
6. Power Supply
7. Control
8. Abbreviations

Note:

- Figures can deviate slightly from the actual situation, due to different set executions.
- For a good understanding of the following circuit descriptions, please use the block diagram in chapter 6, or the electrical diagrams in chapter 7. Where necessary, you will find a separate drawing for clarification.

9.1 Introduction

The L01 (small screen) chassis is a global TV chassis for the model year 2001 and is used for TV sets with screen sizes from 14" - 21". The standard architecture consists of a Main panel, a Picture Tube panel, a Side (or Front) I/O panel and a Front Control panel. The Main panel consists primarily of conventional components with hardly any surface mounted devices.

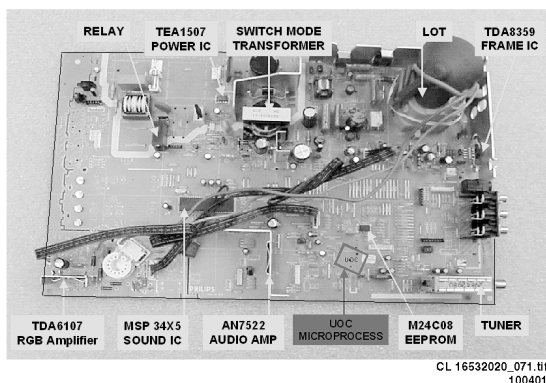


Figure 9-1

The functions for video processing, microprocessor (μ P) and teletext (TXT) decoder are combined in one IC (TDA958xH), the so-called Ultimate One Chip (UOC). This chip is (surface) mounted on the copper side of the main panel.

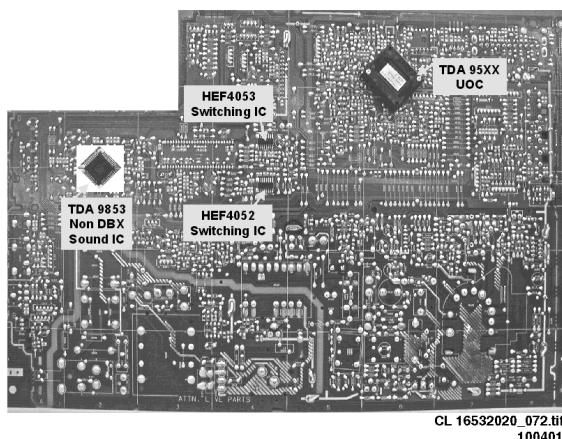


Figure 9-2

The L01 is divided into 2 basic systems, i.e. mono and stereo sound. While the audio processing for the mono sound is done in the audio block of the UOC, an external audio processing IC is used for stereo sets.

The tuning system features 100 channels with on-screen display. The main tuning system uses a tuner, a microcomputer, and a memory IC mounted on the main panel. Also, in some type numbers, an FM radio is implemented with 40 pre-set channels.

The microcomputer communicates with the memory IC, the customer keyboard, remote receiver, tuner, signal processor IC and the audio output IC via the I²C bus. The memory IC retains the settings for favourite stations, customer-preferred settings, and service/factory data.

The on-screen graphics and closed caption decoding are done within the microprocessor, and then sent to the signal processor IC to be added to the main signal.

The chassis uses a Switching Mode Power Supply (SMPS) for the main voltage source. The chassis has a 'hot' ground reference on the primary side and a cold ground reference on the secondary side of the power supply and the rest of the chassis.

9.2 Audio Signal Processing

9.2.1 Stereo

In stereo sets, the signal goes via the SAW filter (position 1004 in case of QSS demodulation and 1003 in case of Intercarrier demodulation), to the audio demodulator part of the UOC IC7200. The stereo audio output on pin 33 (or 38 for QSS) goes, via TS7206 or (TS7201 for QSS), to the stereo decoder 7831.

The switch inside the stereo decoder 7831 selects (via I²C) either the internal decoder or an external source.

The NICAM + 2CS AM/FM stereo decoder is an ITT MSP34X5. The output is fed to the audio amplifier (AN7522 at position 7901). The volume level is controlled at this IC (pin 9) by a control line (VolumeMute) from the microprocessor. The audio signal is then sent to the speaker/headphone output panel.

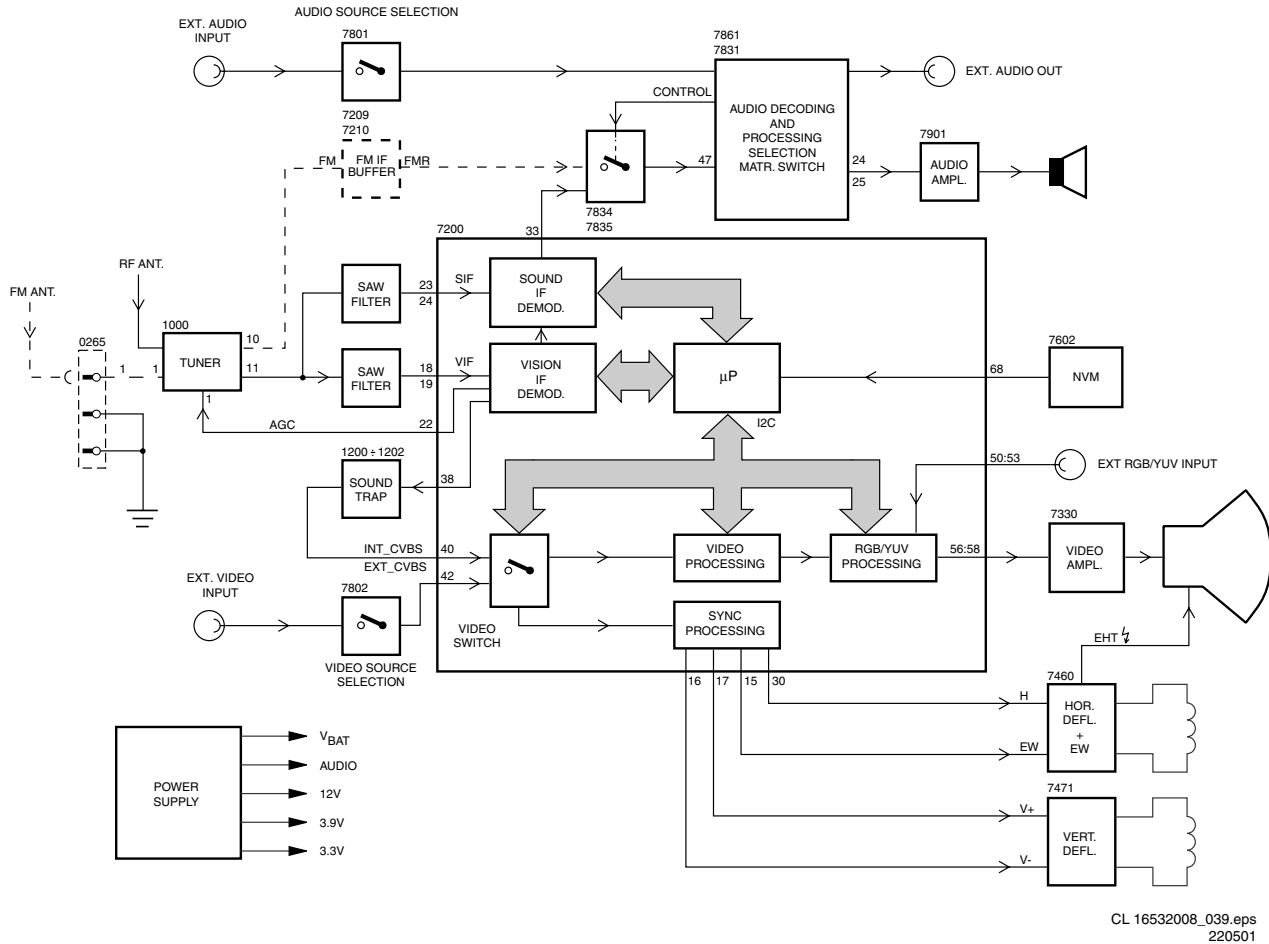


Figure 9-3

9.2.2 Mono

In mono sets, the signal goes via the SAW filter (position 1004 in case of QSS demodulation and 1003 in case of Inter-carrier demodulation), to the audio demodulator part of the UOC IC7200. The mono audio output on pin 48 goes directly, via the

smart sound circuit (7941 for Bass and 7942 for Treble) and buffer (7943), to the audio amplifier (AN7523 at position 7902). The volume level is controlled at this IC (pin 9) by a 'VolumeMute' control line from the microprocessor. The audio signal is then sent to the speaker/headphone output panel.

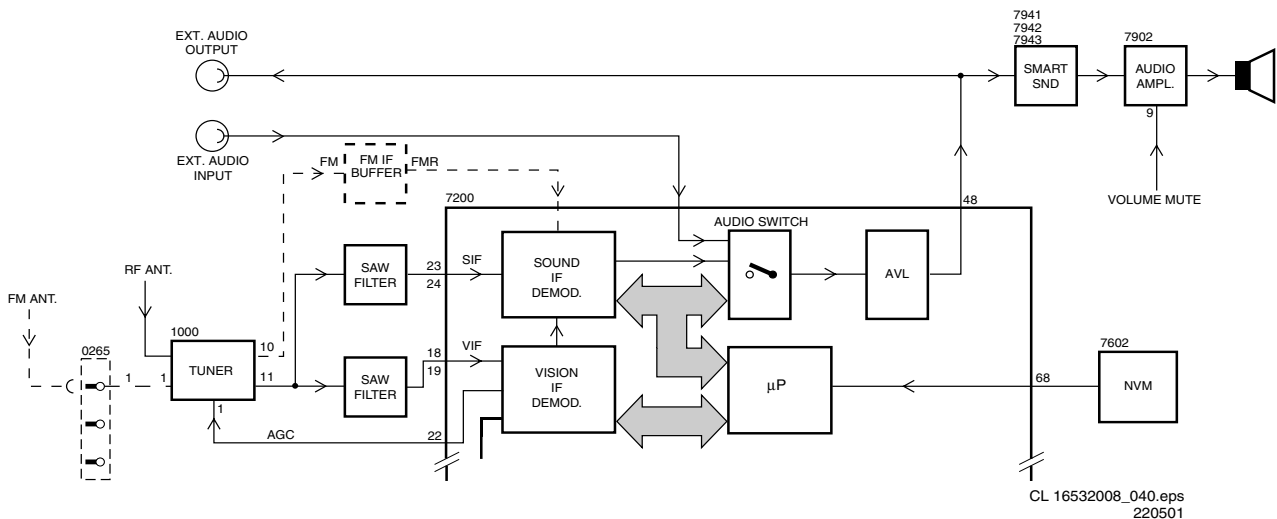


Figure 9-4

9.2.3 FM radio (if present)

The FM radio uses the 10.7 MHz concept. This SIF frequency is available at pin 10 of the tuner. Via a pre-amplifier (TS7209 and TS7210), the signal is fed for demodulation to either the UOC (for mono FM radio) or by the Micronas MSP34X5 (for stereo FM radio).

9.3 Video Signal Processing

9.3.1 Introduction

The video signal-processing path consists of the following parts:

- RF signal processing.
- Video source selection.
- Video demodulation.
- Luminance/Chrominance signal processing.
- RGB control.
- RGB amplifier

The processing circuits listed above are all integrated in the UOC TV processor. The surrounding components are for the adaptation of the selected application. The I²C bus is for defining and controlling the signals.

9.3.2 RF Signal Processing

The incoming RF signal goes to the tuner (pos. 1000), where the IF signal is developed and amplified. The IF signals then exits the tuner from pin 11 to pass through the SAW filter (position 1002 in case of QSS demodulation and 1003 in case of Inter-carrier demodulation). The shaped signal is then applied to the IF processor part of the UOC (pos. 7200).

Tuner AGC (Automatic Gain Control) will reduce the tuner gain and thus the tuner output voltage when receiving strong RF signals. Adjust the AGC take-over point via the Service Alignment Mode (SAM). The tuner AGC starts working when the video-IF input reaches a certain input level and will adjust this level via the I²C bus. The tuner AGC signal goes to the tuner (pin 1) via the open collector output (pin 22) of the UOC. The IC also generates an Automatic Frequency Control (AFC) signal that goes to the tuning system via the I²C bus, to provide frequency correction when needed.

The demodulated composite video signal is available at pin 38 and then buffered by transistor 7201.

9.3.3 Video Source Selection

The Composite Video Blanking Signal (CVBS) from buffer 7201 goes to the audio carrier trap filters (1200, 1201, or 1202 depending on the system used) to remove the audio signal. The signal then goes to pin 40 of IC7200. The internal input switch selects the following input signals:

- Pin 40: terrestrial CVBS input
- Pin 42: external AV1 CVBS input
- Pin 44: external Side I/O CVBS or AV2 Luminance (Y) input
- Pin 45: external AV2 Chrominance (C) input

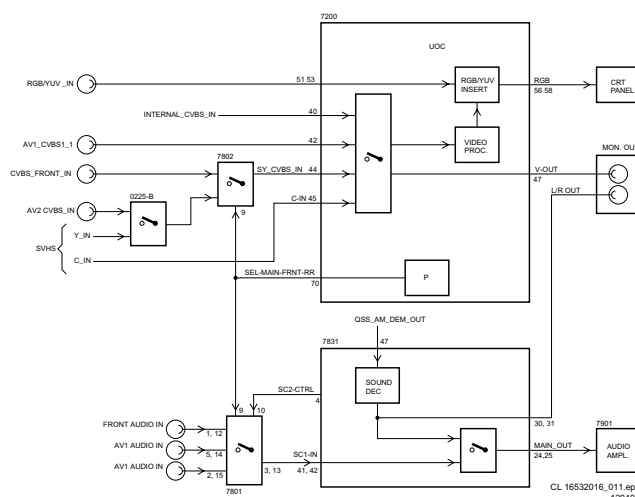


Figure 9-5

Once the signal source is selected, a chroma filter calibration is performed. The received colour burst sub-carrier frequency is used for this. Correspondingly, the chroma band pass filter for PAL/NTSC processing or the cloche filter for SECAM processing is switched on. The selected luminance (Y) signal is supplied to the horizontal and vertical synchronisation processing circuit and to the luminance processing circuit. In the luminance-processing block, the luminance signal goes to the chroma trap filter. This trap is switched 'on' or 'off' depending on the colour burst detection of the chroma calibration circuit.

The group delay correction part can be switched between the BG and a flat group delay characteristic. This has the advantage that in multi-standard receivers no compromise has to be made for the choice of the SAW filter.

9.3.4 Video Demodulation

The colour decoder circuit detects whether the signal is a PAL, NTSC or SECAM signal. The result is made known to the auto system manager. The PAL/NTSC decoder has an internal clock generator, which is stabilised to the required frequency by using the 12 MHz clock signal from the reference oscillator of the microcontroller/teletext decoder.

The base-band delay line is used to obtain a good suppression of cross colour effects.

The Y signal and the delay line outputs U and V are applied to the luminance/chroma signal processing part of the TV processor.

9.3.5 Luminance/Chrominance signal Processing

The output of the YUV separator is fed to the internal YUV switch, which switches between the output of the YUV separator or the external YUV (for DVD or PIP) on pins 51-53. Pin 50 is the input for the insertion control signal called 'FBL-1'. When this signal level becomes higher than 0.9 V (but less than 3 V), the RGB signals at pins 51, 52 and 53 are inserted into the picture by using the internal switches.

Also some picture improvement features are implemented in this part:

- **Black stretch.** This function corrects the black level of incoming signals, which have a difference between the black level and the blanking level. The amount of extension depends upon the difference between actual black level and the darkest part of the incoming video signal level. It is detected by means of an internal capacitor.
- **White stretch.** This function adapts the transfer characteristic of the luminance amplifier in a non-linear way depending on the average picture content of the luminance

signal. It operates in such a way that maximum stretching is obtained when signals with a low video level are received. For bright pictures, stretching is not active.

- **Dynamic skin tone correction.** This circuit corrects (instantaneously and locally) the hue of those colours which are located in the area in the UV plane that matches the skin tone. The correction is dependent on the luminance, saturation and distance to the preferred axis.

The YUV signal is then fed to the colour matrix circuit, which converts it to R, G and B signals.

The OSD/TXT signal from the microprocessor is mixed with the main signal at this point, before being output to the CRT board (pins 56, 57 and 58).

9.3.6 RGB Control

The RGB control circuit enables the picture parameters contrast, brightness and saturation to be adjusted, by using a combination of the user menus and the remote control. Additionally automatic gain control for the RGB signals via cut-off stabilisation is achieved in this functional block to obtain an accurate biasing of the picture tube. Therefore this block inserts the cut-off point measuring pulses into the RGB signals during the vertical retrace period.

The following additional controls are used:

- **Black current calibration loop.** Because of the 2-point black current stabilisation circuit, both the black level and the amplitude of the RGB output signals depend on the drive characteristics of the picture tube. The system checks whether the returning measuring currents meet the requirements, and adapt the output level and gain of the circuit when necessary. After stabilisation of the loop, the RGB drive signals are switched on. The 2-point black level system adapts the drive voltage for each cathode in such a way that the two measuring currents have the right value. This is done with the measurement pulses during the frame flyback. During the first frame, three pulses with a current of 8 μA are generated to adjust the cut off voltage. During the second frame, three pulses with a current of 20 μA are generated to adjust the 'white drive'. This has as a consequence, that a change in the gain of the output stage will be compensated by a gain change of the RGB control circuit. Pin 55 (BLKIN) of the UOC is used as the feedback input from the CRT base panel.
- **Blue stretch.** This function increases the colour temperature of the bright scenes (amplitudes which exceed a value of 80% of the nominal amplitude). This effect is obtained by decreasing the small signal gain of the red and green channel signals, which exceed this 80% level.
- **Beam current limiting.** A beam current limiting circuit inside the UOC handles the contrast and brightness control for the RGB signals. This prevents the CRT from being overdriven, which could otherwise cause serious damage in the line output stage. The reference used for this purpose is the DC voltage on pin 54 (BLCIN) of the TV processor. Contrast and brightness reduction of the RGB output signals is therefore proportional to the voltage present on this pin. Contrast reduction starts when the voltage on pin 54 is lower than 2.8 V. Brightness reduction starts when the voltage on pin 54 is less than 1.7 V. The voltage on pin 54 is normally 3.3 V (limiter not active). During set switch-off, the black current control circuit generates a fixed beam current of 1 mA. This current ensures that the picture tube capacitance is discharged. During the switch-off period, the vertical deflection is placed in an over-scan position, so that the discharge is not visible on the screen.

9.3.7 RGB Amplifier

From outputs 56, 57 and 58 of IC7200, the RGB signals are applied to the analogue output amplifiers on the CRT panel. The R-signal is amplified by a circuit built around transistors TS7311, 7312 and 7313, which drives the picture tube cathodes. For the other two signals see the blockdiagram in chapter 6.

The supply voltage for the amplifier is +160 V and is derived from the line output stage.

9.4 Synchronisation

Inside IC7200 (part D), the vertical and horizontal sync-pulses are separated. These 'H' and 'V' signals are synchronised with the incoming CVBS signal. They are then fed to the H- and V-drive circuits and to the OSD/TXT circuit for synchronisation of the On Screen Display and Teletext (or Closed Caption) information.

9.5 Deflection

9.5.1 Horizontal Drive

The horizontal drive signal is obtained from an internal VCO, which is running at twice the line frequency. This frequency is divided by two, to lock the first control loop to the incoming signal.

When the IC is switched 'on', the 'Hdrive' signal is suppressed until the frequency is correct.

The 'Hdrive' signal is available at pin 30. The 'Hflybk' signal is fed to pin 31 to phase lock the horizontal oscillator, so that TS7401 cannot switch 'on' during the flyback time.

When the set is switched on, the '+8V' voltage goes to pin 9 of IC7200. The horizontal drive starts up in a soft start mode. It starts with a very short T_{ON} time of the horizontal output transistor. The T_{OFF} of the transistor is identical to the time in normal operation. The starting frequency during switch on is therefore about 2 times higher than the normal value. The 'on' time is slowly increased to the nominal value in 1175 ms. When the nominal value is reached, the PLL is closed in such a way that only very small phase corrections are necessary.

The 'EHTinformation' line on pin 11 is intended to be used as a 'X-ray' protection. When this protection is activated (when the voltage exceeds 6 V), the horizontal drive (pin 30) is switched 'off' immediately. If the 'H-drive' is stopped, pin 11 will become low again. Now the horizontal drive is again switched on via the slow start procedure.

The 'EHTinformation' line (Aquadag) is also fed back to the UOC IC7200 pin 54, to adjust the picture level in order to compensate for changes in the beam current.

The filament voltage is monitored for 'no' or 'excessive' voltage. This voltage is rectified by diode 6413 and fed to the emitter of transistor TS7405. If this voltage goes above 6.8 V, TS7405 will conduct, making the 'EHT0' line 'high'. This will immediately switch off the horizontal drive (pin 30) via the slow stop procedure.

The horizontal drive signal exits IC7200 at pin 30 and goes to TS7401, the horizontal driver transistor. The signal is amplified and coupled to the base circuit of TS7402, the horizontal output transistor. This will drive the line output transformer (LOT) and associated circuit. The LOT provides the extra high voltage (EHT), the VG2 voltage and the focus and filament voltages for the CRT, while the line output circuit drives the horizontal deflection coil.

9.5.2 Vertical Drive

A divider circuit performs the vertical synchronisation. The vertical ramp generator needs an external resistor (R3245, pin 20) and capacitor (C2244, pin 21). A differential output is available at pins 16 and 17, which are DC-coupled with the vertical output stage.

To avoid damage of the picture tube when the vertical deflection fails, the 'V_GUARD' output is fed to the beam current limiting input. When a failure is detected, the RGB-outputs are blanked. When no vertical deflection output stage is connected, this guard circuit will also blank the output signals.

These 'V_DRIVE+' and 'V_DRIVE-' signals are applied to the input pins 7 and 1 of IC7471 (vertical deflection amplifier). These are voltage driven differential inputs. As the driver device (IC7200) delivers output currents, R3474 and R3479 convert them to voltage. The differential input voltage is compared with the voltage across measuring resistor R3471 that provides internal feedback information. The voltage across this measuring resistor is proportional to the output current, which is available at pin 5 where it drives the vertical deflection coil (connector 0222).

IC7471 is supplied by +/-13 V. The vertical flyback voltage is generated at pin 3.

9.6 Power Supply

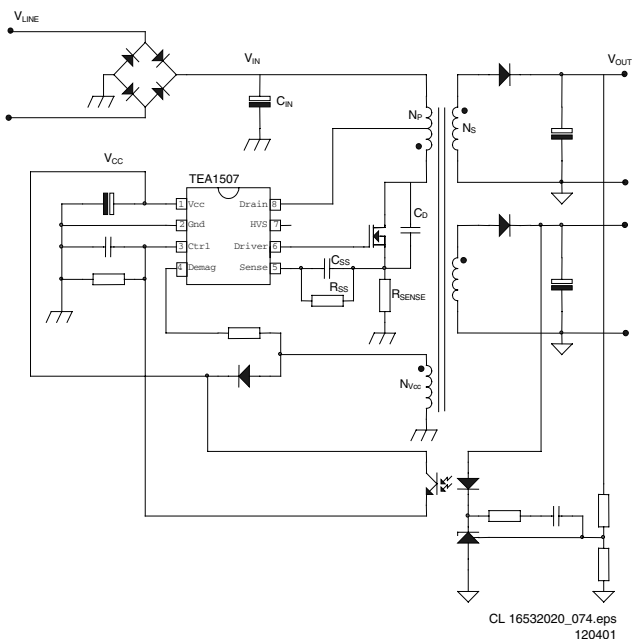


Figure 9-6

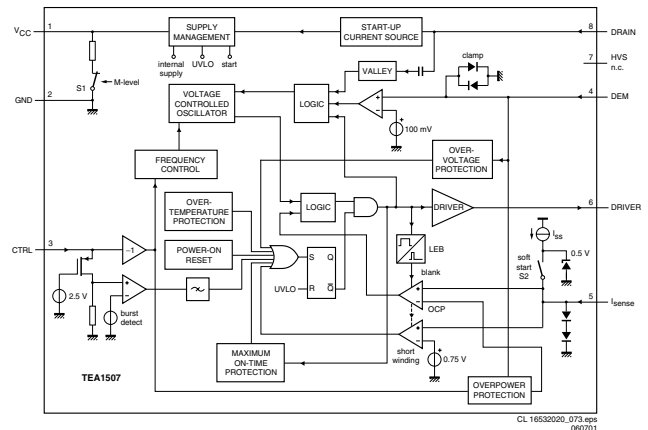


Figure 9-7

9.6.1 Introduction

The supply is a Switching Mode Power Supply (SMPS). The frequency of operation varies with the circuit load. This 'Quasi-Resonant Flyback' behaviour has some important benefits compared to a 'hard switching' fixed frequency Flyback converter. The efficiency can be improved up to 90%, which results in lower power consumption. Moreover the supply runs cooler and safety is enhanced.

The power supply starts operating when a DC voltage goes from the rectifier bridge via T5520, R3532 to pin 8. The operating voltage for the driver circuit is also taken from the 'hot' side of this transformer.

The switching regulator IC 7520 starts switching the FET 'on' and 'off', to control the current flow through the primary winding of transformer 5520. The energy stored in the primary winding during the 'on' time is delivered to the secondary windings during the 'off' time.

The 'MainSupply' line is the reference voltage for the power supply. It is sampled by resistors 3543 and 3544 and fed to the input of the regulator 7540 / 6540. This regulator drives the feedback optocoupler 7515 to set the feedback control voltage on pin 3 of 7520.

The power supply in the set is 'on' any time AC power goes to the set.

Derived Voltages

The voltages supplied by the secondary windings of T5520 are:

- 'MainAux' for the audio circuit (voltage depends on set execution, see table below),
- 3.3 V and 3.9 V for the microprocessor and
- 'MainSupply' for the horizontal output (voltage depends on set execution, see table below).

Other supply voltages are provided by the LOT. It supplies +50 V (only for large screen sets), +13 V, +8 V, +5 V and a +200 V source for the video drive. The secondary voltages of the LOT are monitored by the 'EHTinformation' lines. These lines are fed to the video processor part of the UOC IC 7200 on pins 11 and 34.

This circuit will shut 'off' the horizontal drive in case of over-voltage or excessive beam current.

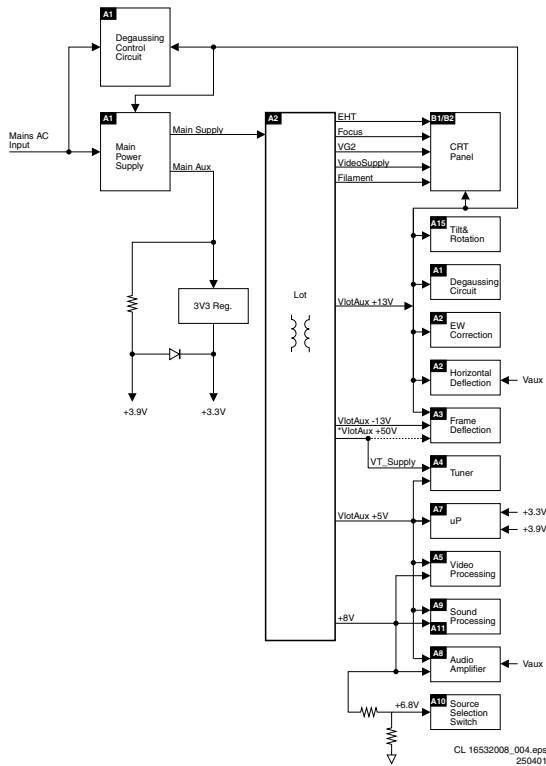


Figure 9-8

Power supply voltages L01				
Screen Size	Voltage name	Meas. point	Value	Remark
14", 17", 20", 21"	MainSupply	P6 (C2561)	95 V	Stereo 2x3 W and Mono 1x2 W, 3 W, 4 W
	MainAux	P5 (C2564)	11 V	
			10 V	Stereo 2x1 W and Mono 1x1 W
			10 V	
All others	MainSupply	P6 (C2561)	130 V	21/25/29RF and 25/27/32/35V
			143 V	25/28/29SF, 25/28BLD, 25/28BLS, 28/32WS, 24/28BLDWS & BLSWS
	MainAux	P5 (C2564)	12 V	Stereo 2x1 W, 3 W, 5 W
			10 V	Mono 1x1 W

Figure 9-9

Degaussing

When the set is switched on, the degaussing relay 1515 is immediately activated as transistor 7580 is conducting. Due to the RC-time of R3580 and C2580, it will last about 3 to 4 seconds before transistor 7580 is switched off.

9.6.2 Basic IC Functionality

For a clear understanding of the Quasi-Resonant behaviour, it is possible to explain it by a simplified circuit diagram (see Figure below). In this circuit diagram, the secondary side is transferred to the primary side and the transformer is replaced by an inductance L_P . C_D is the total drain capacitance including the resonance capacitor C_R , parasitic output capacitor C_{OSS} of the MOSFET and the winding capacitance C_W of the transformer. The turns ratio of the transformer is represented by n (N_P/N_S).

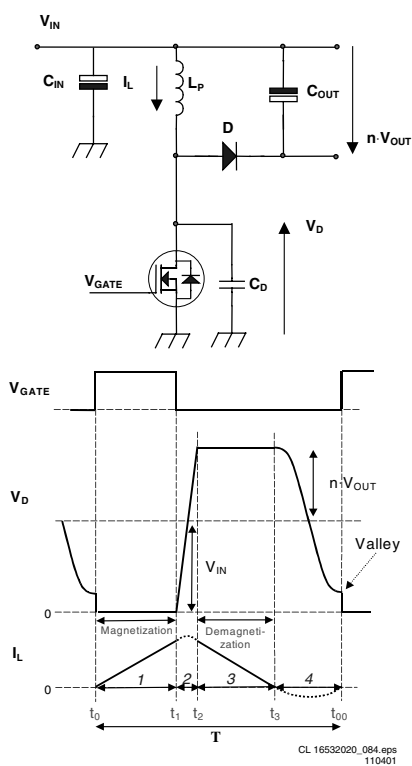


Figure 9-10

In the Quasi-Resonant mode each period can be divided into four different time intervals, in chronological order:

- Interval 1: $t_0 < t < t_1$ primary stroke At the beginning of the first interval, the MOSFET is switched 'on' and energy is stored in the primary inductance (magnetisation). At the end, the MOSFET is switched 'off' and the second interval starts.
- Interval 2: $t_1 < t < t_2$ commutation time In the second interval, the drain voltage will rise from almost zero to $V_{IN} + n \cdot (V_{OUT} + V_F)$. V_F is the forward voltage drop of diode that will be omitted from the equations from now on. The current will change its positive derivative, corresponding to V_{IN}/L_P , to a negative derivative, corresponding to $-n \cdot V_{OUT}/L_P$.
- Interval 3: $t_2 < t < t_3$ secondary stroke In the third interval, the stored energy is transferred to the output, so the diode starts to conduct and the inductive current I_L will decrease. In other words, the transformer will be demagnetised. When the inductive current has become zero the next interval begins.
- Interval 4: $t_3 < t < t_{00}$ resonance time In the fourth interval, the energy stored in the drain capacitor C_D will start to resonate with the inductance L_P . The voltage and current waveforms are sinusoidal waveforms. The drain voltage will drop from $V_{IN} + n \cdot V_{OUT}$ to $V_{IN} - n \cdot V_{OUT}$.

Frequency Behaviour

The frequency in the QR-mode is determined by the power stage and is not influenced by the controller (important parameters are L_P and C_D). The frequency varies with the input voltage V_{IN} and the output power P_{OUT} . If the required output power increases, more energy has to be stored in the transformer. This leads to longer magnetising t_{PRIM} and demagnetising t_{SEC} times, which will decrease the frequency. See the frequency versus output power characteristics below. The frequency characteristic is not only output power-, but also input voltage dependent. The higher the input voltage, the smaller t_{PRIM} , so the higher the frequency will be.

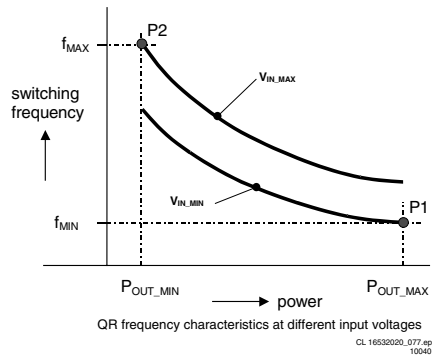


Figure 9-11

Point P1 is the minimum frequency f_{MIN} that occurs at the specified minimum input voltage and maximum output power required by the application. Of course the minimum frequency has to be chosen above the audible limit (>20 kHz).

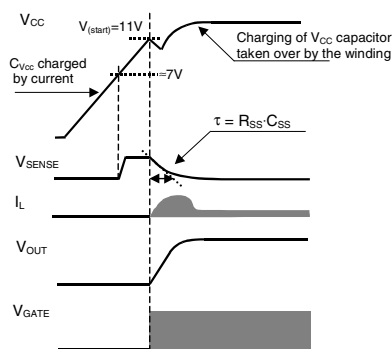
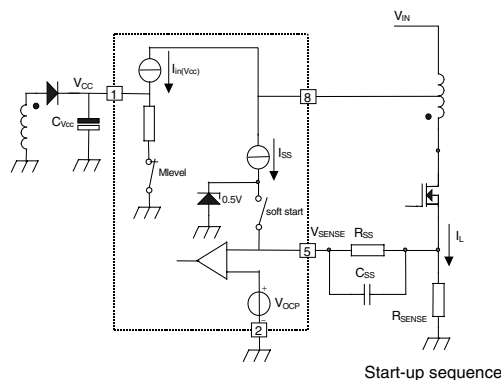
Start-Up Sequence

When the rectified AC voltage V_{IN} (via the centre tap connected to pin 8) reaches the Mains dependent operation level (Mlevel: between 60 and 100 V), the internal 'Mlevel switch' will be opened and the start-up current source is enabled to charge capacitor C2521 at the V_{CC} pin as shown below.

The 'soft start' switch is closed when the V_{CC} reaches a level of 7 V and the 'soft start' capacitor C_{SS} (C2522, between pin 5 and the sense resistor R3526), is charged to 0.5 V.

Once the V_{CC} capacitor is charged to the start-up voltage $V_{\text{CC-start}}$ (11 V), the IC starts driving the MOSFET. Both internal current sources are switched 'off' after reaching this start-up voltage. Resistor R_{SS} (3524) will discharge the 'soft start' capacitor, such that the peak current will slowly increase. This to prevent 'transformer rattle'.

During start-up, the V_{CC} capacitor will be discharged until the moment that the primary auxiliary winding takes over this voltage.



CL 16532020_078.eps
110401

Figure 9-12

The moment that the voltage on pin 1 drops below the 'under voltage lock out' level ($\text{UVLO} = \pm 9$ V), the IC will stop switching and will enter a safe restart from the rectified mains voltage.

Operation

The supply can run in three different modes depending on the output power:

- **Quasi-Resonant mode (QR)** The QR mode, described above, is used during normal operation. This will give a high efficiency.
- **Frequency Reduction mode (FR)** The FR mode (also called VCO mode) is implemented to decrease the switching losses at low output loads. In this way the efficiency at low output powers is increased, which enables power consumption smaller than 3 W during stand-by. The voltage at the pin 3 (Ctrl) determines where the frequency reduction starts. An external Ctrl voltage of 1.425 V corresponds with an internal VCO level of 75 mV. This fixed VCO level is called $V_{\text{VCO,start}}$. The frequency will be reduced in relation to the VCO voltage between 75 mV and 50 mV (at levels larger than 75 mV, Ctrl voltage < 1.425 V, the oscillator will run on maximum frequency $f_{\text{oscH}} = 175$ kHz typically). At 50 mV ($V_{\text{VCO,max}}$) the frequency is reduced to the minimum level of 6 kHz. Valley switching is still active in this mode.
- **Minimum Frequency mode (MinF)** At VCO levels below 50 mV, the minimum frequency will remain on 6 kHz, which is called the MinF mode. Because of this low frequency, it is possible to run at very low loads without having any output regulation problems.

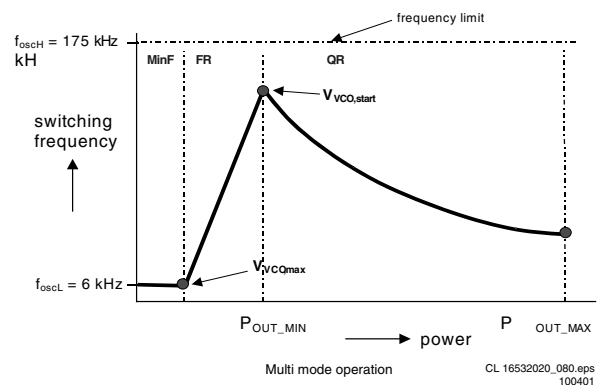


Figure 9-13

Safe-Restart Mode

This mode is introduced to prevent the components from being destroyed during eventual system fault conditions. It is also used for the Burst mode. The Safe-Restart mode will be entered if it is triggered by one of the following functions:

- Over voltage protection,
- Short winding protection,
- Maximum 'on time' protection,
- V_{CC} reaching UVLO level (fold back during overload),
- Detecting a pulse for Burst mode,
- Over temperature protection.

When entering the Safe-Restart mode, the output driver is immediately disabled and latched. The V_{CC} winding will not charge the V_{CC} capacitor anymore and the V_{CC} voltage will drop until UVLO is reached. To recharge the V_{CC} capacitor, the internal current source ($I_{\text{(restart)}}(V_{\text{CC}})$) will be switched 'on' to initiate a new start-up sequence as described before. This Safe-Restart mode will persist until the controller detects no faults or burst triggers.

Standby

The set goes to Standby in the following cases:

- After pressing the 'standby' key on the remote control.
- When the set is in protection mode.

In Standby, the power supply works in 'burst mode'. Burst mode can be used to reduce the power consumption below 1 W at stand-by. During this mode, the controller is active (generating gate pulses) for only a short time and for a longer time inactive waiting for the next burst cycle. In the active period the energy is transferred to the secondary and stored in the buffer capacitor C_{STAB} in front of the linear stabiliser (see Figure below). During the inactive period, the load (e.g. microprocessor) discharges this capacitor. In this mode, the controller makes use of the Safe-Restart mode.

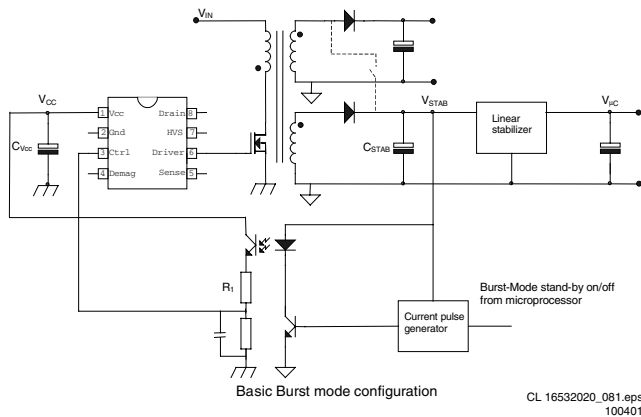


Figure 9-14

The system enters burst mode standby when the microprocessor activates the 'Stdb_by_con' line. When this line is pulled high, the base of Q7541 is allowed to go high. This is triggered by the current from collector Q7542. When Q7541 turns 'on', the opto-coupler (7515) is activated, sending a large current signal to pin 3 (Ctrl). In response to this signal, the IC stops switching and enters a 'hiccup' mode. This burst activation signal should be present for longer than the 'burst blank' period (typically 30 μ s): the blanking time prevents false burst triggering due to spikes.

Burst mode standby operation continues until the microcontroller pulls the 'Sdbystby_con' signal low again. The base of Q7541 is unable to go high, thus cannot turn 'on'. This will disable the burst mode. The system then enters the start-up sequence and begins normal switching behaviour.

For a more detailed description of one burst cycle, three time intervals are defined:

- t1: Discharge of V_{CC} when gate drive is active During the first interval, energy is transferred, which result in a ramp-up of the output voltage (V_{STAB}) in front of the stabiliser. When enough energy is stored in the capacitor, the IC will be switched 'off' by a current pulse generated at the secondary side. This pulse is transferred to the primary side via the opto coupler. The controller will disable the output driver (safe restart mode) when the current pulse reaches a threshold level of 16 mA into the Ctrl pin. A resistor R_1 (R3519) is placed in series with the opto coupler, to limit the current going into the Ctrl pin. Meanwhile the V_{CC} capacitor is discharged but has to stay above V_{UVLO} .
- t2: Discharge of V_{CC} when gate drive is inactive During the second interval, the V_{CC} is discharged to V_{UVLO} . The output voltage will decrease depending on the load.
- t3: Charge of V_{CC} when gate drive is inactive The third interval starts when the UVLO is reached. The internal current source charges the V_{CC} capacitor (also the soft start capacitor is recharged). Once the V_{CC} capacitor is charged to the start-up voltage, the driver is activated and a new burst cycle is started.

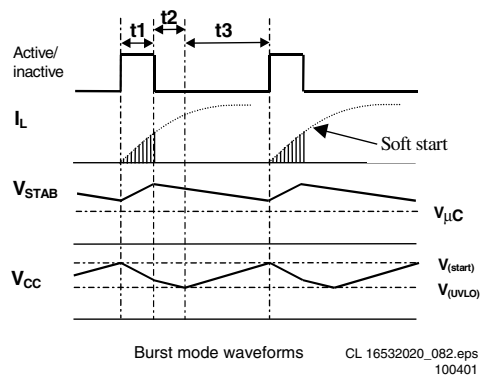


Figure 9-15

9.6.3 Protection Events

The SMPS IC 7520 has the following protection features:

Demagnetisation sense

This feature guarantees discontinuous conduction mode operation in every situation. The oscillator will not start a new primary stroke until the secondary stroke has ended. This is to ensure that FET 7521 will not turn on until the demagnetisation of transformer 5520 is completed. The function is an additional protection feature against:

- saturation of the transformer,
- damage of the components during initial start-up,
- an overload of the output.

The demag(netisation) sense is realised by an internal circuit that guards the voltage (Vdemag) at pin 4 that is connected to V_{CC} winding by resistor R_1 (R3522). The Figure below shows the circuit and the idealised waveforms across this winding.

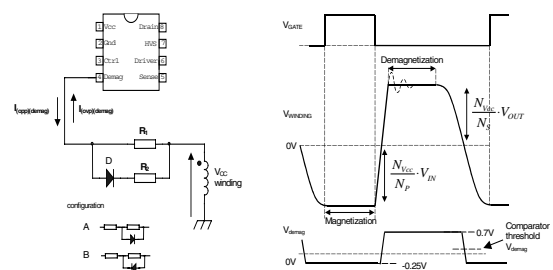


Figure 9-16

Over Voltage Protection

The Over Voltage Protection ensures that the output voltage will remain below an adjustable level. This works by sensing the auxiliary voltage via the current flowing into pin 4 (DEM) during the secondary stroke. This voltage is a well-defined replica of the output voltage. Any voltage spikes are averaged by an internal filter.

If the output voltage exceeds the OVP trip level, the OVP circuit switches the power MOSFET 'off'.

Next, the controller waits until the 'under voltage lock out' level (UVLO = ± 9 V) is reached on pin 1 (V_{CC}). This is followed by a safe restart cycle, after which switching starts again. This process is repeated as long as the OVP condition exists. The output voltage at which the OVP function trips, is set by the demagnetisation resistor R3522.

Over Current Protection

The internal OCP protection circuit limits the 'sense' voltage on pin 5 to an internal level.

Over Power Protection

During the primary stroke, the rectified AC input voltage is measured by sensing the current drawn from pin 4 (DEM). This current is dependent on the voltage on pin 9 of transformer 5520 and the value of R3522. The current information is used to adjust the peak drain current, which is measured via pin 1SENSE.

Short Winding Protection

If the 'sense' voltage on pin 5 exceeds the short winding protection voltage (0.75 V), the converter will stop switching. Once V_{CC} drops below the UVLO level, capacitor C2521 will be recharged and the supply will start again. This cycle will be repeated until the short circuit is removed (safe restart mode). The short winding protection will also protect in case of a secondary diode short circuit.

This protection circuit is activated after the leading edge blanking time (LEB).

LEB time

The LEB (Leading Edge Blanking) time is an internally fixed delay, preventing false triggering of the comparator due to current spikes. This delay determines the minimum 'on' time of the controller.

Over Temperature protection

When the junction temperature exceeds the thermal shutdown temperature (typ. 140° C), the IC will disable the driver. When the V_{CC} voltage drops to UVLO, the V_{CC} capacitor will be recharged to the $V_{(start)}$ level. If the temperature is still too high, the V_{CC} voltage will drop again to the UVLO level (Safe-Restart mode). This mode will persist until the junction temperature drops 8 degrees typically below the shutdown temperature.

Mains dependent operation enabling level

To prevent the supply from starting at a low input voltage, which could cause audible noise, a mains detection is implemented (Mlevel). This detection is provided via pin 8, that detects the minimum start-up voltage between 60 and 100 V. As previous mentioned, the controller is enabled between 60 and 100 V. An additional advantage of this function is the protection against a disconnected buffer capacitor (C_{IN}). In this case, the supply will not be able to start-up because the V_{CC} capacitor will not be charged to the start-up voltage.

9.7 Control

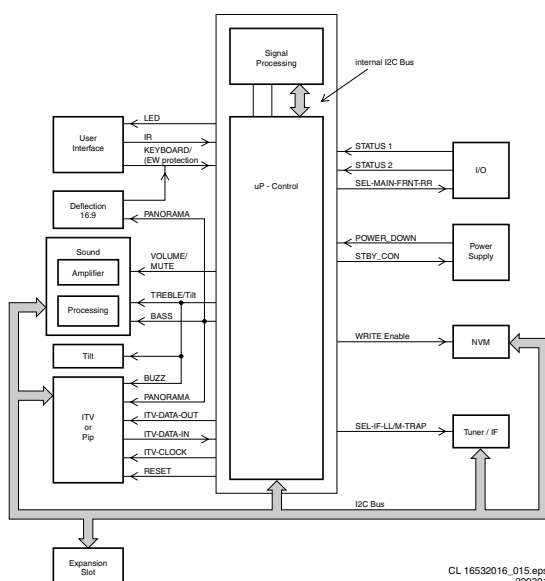


Figure 9-17

9.7.1 Introduction

The microprocessor part of the UOC, has the complete control and teletext on board. User menu, Service Default Mode, Service Alignment Mode and Customer Service Mode are generated by the μ P. Communication to other ICs is done via the I²C-bus.

9.7.2 I²C-Bus

The main control system, which consists of the microprocessor part of the UOC (7200), is linked to the external devices (tuner, NVM, MSP, etc) by means of the I²C-bus. An internal I²C-bus is used to control other signal processing functions, like video processing, sound IF, vision IF, synchronisation, etc.

9.7.3 User Interface

There are two control signals, called 'KEYBOARD_protn' and 'IR'. Users can interact either through the Remote Control transmitter, or by activation of the appropriate keyboard buttons.

The L01 uses a remote control with RC5 protocol. The incoming signal is connected to pin 67 of the UOC.

The 'Top Control' keyboard, connected to UOC pin 80, can also control the set. Button recognition is done via a voltage divider.

The front LED (6691) is connected to an output control line of the microprocessor (pin 5). It is activated to provide the user information about whether or not the set is working correctly (e.g., responding to the remote control or fault condition)

9.7.4 Sound Interface

There are three control signals, called 'Volume_Mute', 'Treble_Buzzer_Hosp_app' and 'Bass_panorama'.

The 'Volume_Mute' line controls the sound level output of the audio amplifier or to mute it in case of no video identification or from user command. This line also controls the volume level during set switch 'on' and 'off' (to prevent audio pop).

The 'Treble' and 'Bass' lines are used (in mono 4:3 sets) to switch between different smart sound modes.

9.7.5 In- and Output Selection

For the control of the input and output selections, there are three lines:

- **STATUS1** This signal provides information to the microprocessor on whether a video signal is available on the SCART1 AV input and output port (only for Europe). This signal is not connected in NAFTA sets.
- **STATUS2** This signal provides information to the microprocessor on whether a video signal is available on the SCART2 AV input and output port (only for Europe). For sets with an SVHS input it provides the additional information if a Y/C or CVBS source is present. The presence of an external Y/C source makes this line 'high' while a CVBS source makes the line 'low'.
- **SEL-MAIN-FRNT-RR** This is the source select control signal from the microprocessor. This control line is under user control or can be activated by the other two control lines.

9.7.6 Power Supply Control

The microprocessor part is supplied with 3.3 V and 3.9 V both derived from the 'MainAux' voltage via a 3V3 stabiliser (7560) and a diode.

Two signals are used to control the power supply:

- **Stdbby_con** This signal is generated by the microprocessor when over-current takes place at the 'MainAux' line. This is

done to enable the power supply into standby burst mode, and to enable this mode during a protection. This signal is 'low' under normal operation conditions and goes to 'high' (3.3 V) under 'standby' and 'fault' conditions.

- **POWER_DOWN** This signal is generated by the power supply. Under normal operating conditions this signal is 'high' (3.3 V). During 'standby' mode, this signal is a pulse train of approx. 10 Hz and a 'high' duration of 5 ms. It is used to give information to the UOC about the fault condition in the Audio amplifier supply circuit. This information is generated by sensing the current on the 'MainAux' line (using voltage drop across R3564 to trigger TS7562). This signal goes 'low' when the DC-current on the 'MainAux' line exceeds 1.6 - 2.0 A. It is also used to give an early warning to the UOC about a power failure. Then the information is used to mute the sound amplifier to prevent a switch off noise and to solve the switch-off spot.

9.7.7 Tuner IF

Pin 3 of the UOC (SEL-IF-LL'_M-TRAP), is an output pin to switch the SAW-filter to the appropriate system.

- If UOC pin 3 is 'low', the selected system is:
 - West Europe: PAL B/G, I, SECAM L/L'
 - East Europe: PAL B/G
 - Asia Pacific: NTSC M
- If UOC pin 3 is 'high', the selected system is:
 - West Europe: SECAM L', L'-NICAM
 - East Europe: PAL D/K
 - Asia Pacific: PAL B/G, D/K, I

9.7.8 Protection Events

Several protection events are controlled by the UOC:

- **BC protection**, to protect the picture tube from a too high beam current. The UOC has the capability of measuring the normal back level current during the vertical flyback. So if for some reason the CRT circuit is malfunctioning (i.e. high beam current), the normal black current will be out of the 75 μ A range, and the UOC will trigger the power supply to shut down. However, this is a high beam-current situation, the TV screen will be bright white before the set is shut down.
- **E/W protection**, two protection mechanisms are built in, over-current and over-voltage.
 - In case of over-current due to defective parts in the line deflection output stage, a high current will flow through resistors 3405//3406. If this current is large enough to create a voltage drop of 0.7 V across 3405//3406, transistor TS7606 (in A7 diagram) will conduct and pin 80 of the UOC will be pulled down. Thereafter, the UOC will shut down the power supply. In case of further current increase, the fused resistor 3411 is built-in for double protection.
 - In case of a high voltage appearing across capacitor 2401 (dependent of the tube size), which is high enough to trigger zener diode 6401 into conduction, transistor TS7606 (in A7 diagram) will conduct and UOC is triggered to shut down the power supply.
- **I²C protection**, to check whether all I²C IC's are functioning.

In case one of these protections is activated, the set will go into 'standby'.

The 'on' and 'standby' LEDs are controlled via the UOC.

9.8 Abbreviation list

2CS	2 Carrier (or Channel) Stereo
ACI	Automatic Channel Installation: algorithm that installs TV sets directly from cable network by means of a predefined TXT page
ADC	Analogue to Digital Converter
AFC	Automatic Frequency Control: control signal used to tune to the correct frequency
AFT	Automatic Fine Tuning
AGC	Automatic Gain Control: algorithm that controls the video input of the feature box
AM	Amplitude Modulation
AP	Asia Pacific
AR	Aspect Ratio: 4 by 3 or 16 by 9
ATS	Automatic Tuning System
AV	External Audio Video
AVL	Automatic Volume Level
BC-PROT	Beam Current Protection
BCL	Beam Current Limitation
B/G	Monochrome TV system. Sound carrier distance is 5.5 MHz
BLC-INFORMATION	Black current information
BTSC	Broadcast Television Standard Committee. Multiplex FM stereo sound system, originating from the USA and used e.g. in LATAM and AP-NTSC countries
B-TXT	Blue teletext
CC	Closed Caption
ComPair	Computer aided rePair
CRT	Cathode Ray Tube or picture tube
CSM	Customer Service Mode
CTI	Colour Transient Improvement: manipulates steepness of chroma transients
CVBS	Composite Video Blanking and Synchronisation
DAC	Digital to Analogue Converter
DBE	Dynamic Bass Enhancement: extra low frequency amplification
DBX	Dynamic Bass Expander
D/K	Monochrome TV system. Sound carrier distance is 6.5 MHz
DFU	Direction For Use: description for the end user
DNR	Dynamic Noise Reduction
DSP	Digital Signal Processing
DST	Dealer Service Tool: special remote control designed for dealers to enter e.g. service mode
DVD	Digital Versatile Disc
EEPROM	Electrically Erasable and Programmable Read Only Memory
EHT	Extra High Tension
EHT-INFORMATION	Extra High Tension information
EU	Europe
EW	East West, related to horizontal deflection of the set
EXT	External (source), entering the set via SCART or Cinch
FBL	Fast Blanking: DC signal accompanying RGB signals
FILAMENT	Filament of CRT
FLASH	Flash memory
FM	Field Memory
FM	Frequency Modulation
HA	Horizontal Acquisition: horizontal sync pulse coming out of the HIP
HFB	Horizontal Flyback Pulse: horizontal sync pulse from large signal deflection

HP	Headphone	SDM	Service Default Mode
Hue	Colour phase control for NTSC (not the same as 'Tint')	SECAM	SEquence Couleur Avec Memoire. Colour system mainly used in France and East Europe. Colour carriers = 4.406250 MHz and 4.250000 MHz
I	Monochrome TV system. Sound carrier distance is 6.0 MHz		Sound Intermediate Frequency
I2C	Integrated IC bus	SIF	Small Screen
IF	Intermediate Frequency	SS	Standby
IIC	Integrated IC bus	STBY	Super Video Home System
Interlaced	Scan mode where two fields are used to form one frame. Each field contains half the number of the total amount of lines. The fields are written in "pairs", causing line flicker.	SVHS	Software
	Institutional TV	SW	Total Harmonic Distortion
ITV	Latin America	THD	Teletext
LATAM	Light Emitting Diode	TXT	Microprocessor
LED	Monochrome TV system. Sound carrier distance is 6.5 MHz. L' is Band I, L is all bands except for Band I	μ P	Ultimate One Chip
L/L'	Low Noise Amplifier	UOC	Vertical Acquisition
LNA	Large Screen	VA	Main supply voltage for the deflection stage (mostly 141 V)
LS	Loudspeaker	VBAT	Violence Chip
LS	Large signal panel	VCR	Video Cassette Recorder
LSP	Monochrome TV system. Sound carrier distance is 4.5 MHz	WYSIWYR	What You See Is What You Record: record selection that follows main picture and sound
M/N	Multi-standard Sound Processor: ITT sound decoder		Quartz crystal
MSP	Mute-Line	XTAL	Luminance (Y) and Chrominance (C) signal
MUTE	Not Connected	YC	
NC	Near Instantaneous Compounded Audio Multiplexing. This is a digital sound system, mainly used in Europe.		
NICAM	National Television Standard Committee. Colour system mainly used in North America and Japan. Colour carrier NTSC M/N = 3.579545 MHz, NTSC 4.43 = 4.433619 MHz (this is a VCR norm, it is not transmitted off-air)		
NTSC	Non Volatile Memory: IC containing TV related data e.g. alignments		
NVM	Option Byte		
OB	Open Circuit		
OC	On Screen Display		
OSD	Phase Alternating Line. Colour system mainly used in West Europe (colour carrier = 4.433619 MHz) and South America (colour carrier PAL M = 3.575612 MHz and PAL N = 3.582056 MHz)		
PAL	Printed Circuit board		
PCB	Picture In Picture		
PIP	Phase Locked Loop. Used for e.g. FST tuning systems. The customer can give directly the desired frequency		
PLL	Power-On Reset		
POR	Scan mode where all scan lines are displayed in one frame at the same time, creating a double vertical resolution.		
Progressive Scan	Picture Tube Panel (or CRT-panel)		
PTP	Random Access Memory		
RAM	Remote Control handset		
RC	Remote Control system 5, signal from the remote control receiver		
RC5	Red Green Blue		
RGB	Read Only Memory		
ROM	Service Alignment Mode		
SAM	Second Audio Program		
SAP	Sandcastle: pulse derived from sync signals		
SC	Short Circuit		
S/C	Scan Velocity Modulation		
SCAVEM	Serial Clock		
SCL	Serial Data		
SDA			

10. Spare Parts List

Mono carrier [A]

Various

0040

3139 124 23601

Cinch housing

0127▲

4822 265 11253

Fuse holder

0136

4822 492 70788

Fix IC

0137

4822 492 70289

IC spring

0138

4822 492 70788

Fix IC

0139

3122 121 24785

Spring for bracket

0152

3139 121 08841

Dipmate cable

0211▲

4822 265 20723

2p

0212▲

4822 267 10774

2p male (red)

0217

4822 267 10735

3p

0218

4822 265 10481

Cinch 2p

0220

2422 025 04851

3p

0221▲

4822 267 10966

2p

0222▲

2422 025 10646

2p male

0223

2422 026 05185

Cinch socket 4p female

0231▲

2422 128 02972

Power switch

0232▲

4822 267 31014

Headphone socket

0243

2422 025 04854

6p female

0244

2422 025 04851

3p

0245

2422 025 04854

6p female

0246

2422 025 16382

3p male

0254▲

2422 500 80067

CRT 9p female

1000

3139 147 16481

UV1356A/AIG-3

1002

4822 242 10357

OFWK2960M

1002

2422 549 44223

OFWK7260M

1200

4822 242 10315

TP702B-TF21

1200

4822 242 81712

TPWA04B

1201

4822 242 81572

TPS6,0MB-TF21

1201

4822 242 81301

TPS6,5MB-TF21

1202

4822 242 81978

TPS4,5MB-TF21

1500▲

2422 086 10914

Fuse 4A 250V

1600

4822 276 13775

Switch

1601

4822 276 13775

Switch

1602

4822 276 13775

Switch

1603

4822 276 13775

Switch

1660

2422 543 01203

Crystal 12.00MHz

—|—

2003

4822 122 33177

10nF 20% 50V

2004

4822 126 13751

47nF 10% 63V

2005

4822 124 40248

10µF 20% 63V

2006

4822 124 80791

470µF 16V 20%

2007

4822 126 14585

100nF 10% 50V

2008

4822 124 40207

100µF 20% 25V

2009

5322 122 32654

330pF 5% 63V

2101

4822 126 13482

470nF 80/20% 16V

2102

5322 122 32658

22pF 5% 50V

2103

5322 122 31863

33nF 5% 50V

2105

4822 124 40248

10µF 20% 63V

2121

5322 122 32658

22pF 5% 50V

2122

5322 122 31863

1.2nF 10% 63V

2123

5322 126 14103

2.2µF 20-80% 10V

2141

4822 051 20008

Jumper

2181

5322 122 32658

22pF 5% 50V

2182

5322 122 31863

22nF 10% 63V

2184

5322 126 14103

2.2µF 20-80% 10V

2201

4822 126 14585

100nF 10% 50V

2202

4822 126 14585

100nF 10% 50V

2203

4822 126 14585

100nF 10% 50V

2204

4822 126 14585

100nF 10% 50V

2205

4822 126 14076

220F 25V

2208

4822 126 14585

100nF 10% 50V

2209

4822 124 40769

4.7µF 20% 100V

2210

4822 126 13482

470nF 80/20% 16V

2211

4822 126 13482

470nF 80/20% 16V

2216

4822 124 80791

470µF 16V 20%

2217

5322 122 32654

330pF 5% 63V

2219

4822 126 14076

220F 25V

2220

4822 121 51252

470nF 5% 63V

2226

5322 126 10465

3.9nF 10% 50V

2227

4822 122 32614

330pF 5% 63V

2228

5322 122 31863

22nF 10% 63V

2229

4822 124 40248

10µF 20% 63V

2233

5322 126 10184

820pF 5% 50V

2241

4822 126 13344

1.5nF 5% 63V

2242

4822 126 14043

1µF 20-80% 16V

2243

4822 122 33127

2.2nF 10% 63V

2244

5322 121 42386

100nF 5% 63V

2245

4822 126 14076

220nF 25V

2246

4822 124 40769

4.7µF 20% 100V

2247

4822 124 80791

470µF 16V 20%

2248

5322 122 32654

470pF 5% 63V

2249

5322 122 32654

470pF 5% 63V

2250

4822 124 22652

2.2µF 20% 50V

2252

5322 126 10511

1nF 5% 50V

2253

5322 126 10511

1nF 5% 50V

2254

5322 122 32531

100pF 5% 50V

2313

4822 122 33216

270pF 5% 50V

2323

4822 122 33172

390pF 5% 50V

2331

4822 122 33172

390pF 5% 50V

2341▲

2020 558 90571

2.2nF 10% 1kV

2342

4822 121 70386

47nF 10% 250V

2343

4822 121 70386

47nF 10% 250V

2401

4822 126 13461

680pF 10% 50V

2404▲

4822 121 43888

360nF 5% 250V

2406

5322 122 31863

22nF 10% 63V

2407▲

4822 121 70618

12nF 5% 1600V

2409

4822 124 11575

47µF 20% 160V

2410

2020 021 91577

470µF 20% 16V

2411

5322 121 10472

47µF /25

2412

2222 347 90236

33nF 10% 100V

2413

4822 124 11565

10µF 20% 250V

2414

4822 124 81145

1000µF 20% 16V

2416▲

4822 126 11503

820pF 10% 2kV

2417

4822 124 81145

16V S 1000µF

2418

4822 122 33177

10nF 20% 50V

2419

4822 124 22776

1µF 50V

2420

4822 124 21913

1µF 20% 63V

2421

4822 126 13751

47nF 10% 63V

2422

2020 021 91577

470µF 20% 16V

2423

4822 124 42127

100µF 20% 100V

2471

5322 121 42386

100nF 5% 63V

2472

5322 121 42386

100nF 5% 63V

2473

4822 124 40255

100µF 20% 63V

2475

5322 122 32268

330pF 5% 63V

2476

4822 121 42408

220nF 5% 63V

2477

5322 122 32268

330pF 5% 63V

2500▲

4822 126 13589

470nF 275V

2501▲

4822 126 14153

2.2nF 10% 1kV

2502▲

4822 126 14153

2.2nF 10% 1kV

2503

4822 124 12415

220µF 20% 400V

2505▲

4822 126 14153

2.2nF 10% 1kV

2506▲

4822 126 14153

2.2nF 10% 1kV

2508▲

4822 122 50116

470pF 10% 1kV

2515▲

4822 126 14049

1.5nF 20% 250V

2516▲

4822 126 13867

330P 20% 250V

2520

4822 126 14585

100nF 10% 50V

2521

4822 124 81151

22µF 50V

2522

4822 126 14585

100nF 10% 50V

2523▲

4822 126 13862

1.5nF 10% 2kV

2525

5322 122 34099

470pF 10% 63V

2526

5322 122 31647

1nF 10% 63V

2527

5322 122 34099

470pF 10% 63V

2540

4822 126 13188

15nF 5% 63V

2541

4822 122 33177

10nF 20% 50V

2560▲

4822 126 13449

1nF 10% 2kV

2561

4822 124 42336

47µF 20% 160V

2562

5322 122 32331

1nF 10% 100V

2563

5322 121 42386

100nF 5% 63V

2564

2020 012 93057

2200µF 20% 16V

2565▲

4822 122 50116

470pF 10% 1kV

2567

4822 124 40433

47µF 20% 25V

2568

4822 124 21913

1µF 20% 63V

2569

5322 122 34099

470pF 10% 63V

2601

4822 126 14076

220nF 25V

2602

5322 122 32531

100pF 5% 50V

2604

4822 124 40248

10µF 20% 63V

2606

5322 122 31647

1nF 10% 63V

2607

2238 861 18339

33P 1% 50V

2608

4822 126 14043

1µF 20-80% 16V

2609

2238 861 18339

33P 1% 50V

2611

4822 126 14043

1µF 20-80% 16V

2612

4822 126 13694

68pF 1% 63V

2613

4822 126 13694

68pF 1% 63V

2615

5322 122 31647

1nF 10% 63V

2618

4822 126 14043

1µF 20-80% 16V

2619

4822 126 14043

1µF 20-80% 16V

2691

4822 124 40207

100µF 20% 25V

2851

2020 552 96305

4.7µF 20-80% 10V

2902

4822 124 81144

1000µF 16V

2903

4822 124 21913

1µF 20% 63V

2904

4822 126 14043

1µF 20-80% 16V

2905

5322 126 10511

1nF 5% 50V

2907

5322 126 10511

1nF 5% 50V

2911

4822 122 33127

2.2nF 10% 63V

2941

4822 124 21913

1µF 20% 63V

2942

4822 126 12105

330pF 5% 63V

2943

4822 126 14585

100nF 10% 50V

2944

4822 126 14127

39nF 10% 50V

2945

5322 126 10223

4.7nF 10% 63V

2946

4822 126 14043

1µF 20-80% 16V

2950

5322 122 31863

22nF 10% 63V

2981

4822 124 40248

10µF 20% 63V

2982

5322 122 34099

470pF 10% 63V

2983

4822 124 40248

10µF 20% 63V

2984

5322 122 34099

470pF 10% 63V

□

3000

4822 116 52175

100Ω 5% 0.5W

3001

4822 116 52175

100Ω 5% 0.5W

3002

4822 051 20008

Jumper (0805)

3003

4822 117 11139

1.5kΩ 1% 0.1W

3004

4822 051 20822

8.2kΩ 5% 0.1W

3005

4822 116 52175

100Ω 5% 0.5W

3006

4822 117 11449

2.2kΩ 5% 0.1W

3007

4822 117 11507

6.8kΩ 1% 0.1W

3008

4822 117 11449

2.2kΩ 5% 0.1W

3101

4822 116 52199

68Ω 5% 0.5W

3102

4822 051 10102

1kΩ 2% 0.25W

3103

4822 116 83868

150Ω 5% 0.5W

3104

3198 021 52240

220kΩ 5%

3121

4822 116 52201

75Ω 5% 0.5W

3122

4822 116 52176

10Ω 5% 0.5W

3123

4822 116 83868

150Ω 5% 0.5W

3124

4822 117 10834

47kΩ 1% 0.1W

3181

4822 116 52201

75Ω 5% 0.5W

3182

4822 116 52175

100Ω 5% 0.5W

3183

4822 116 83868

150Ω 5% 0.5W

3184

4822 117 10834

47kΩ 1% 0.1W

3200

4822 116 83881

390Ω 5% 0.5W

3201

4822 116 52175

100Ω 5% 0.5W

3202

4822 116 52175

100Ω 5% 0.5W

3203

4822 116 52175

100Ω 5% 0.5W

3204

4822 050 21003

10kΩ 1% 0.6W

3206

4822 117 10837

100kΩ 1% 0.1W

3207

4822 050 11002

1kΩ 1% 0.4W

3208

4822 117 10353

150Ω 1% 0.1W

3208

4822 117 11503

220Ω 1% 0.1W

3209

4822 051 20829

82Ω 5% 0.1W

3210

4822 116 52283

4.7kΩ 5% 0.5W

3211

4822 116 52283

4.7kΩ 5% 0.5W

3212

4822 051 20471

470Ω 5% 0.1W

3213

4822 116 83883

470Ω 5% 0.5W

3217

4822 051 20334

330kΩ 5% 0.1W

3218

4822 117 11149

82kΩ 1% 0.1W

3219

4822 117 11449

2.2kΩ 5% 0.1W

3220

4822 116 52175

100Ω 5% 0.5W

3221

4822 116 52226

560Ω 5% 0.5W

3222

4822 116 52175

100Ω 5% 0.5W

3226

4822 051 20561

560Ω 5% 0.1W

3226

4822 051 20392

3.9kΩ 5% 0.1W

3235

4822 116 52175

100Ω 5% 0.5W

3241

4822 051 20223

22kΩ 5% 0.1W

3242

4822 117 11383

12kΩ 1% 0.1W

3244

4822 116 52231

820Ω 5% 0.5W

3245

4822 051 20393

39kΩ 5% 0.1W

3246

4822 117 10833

10kΩ 1% 0.1W

3247

3198 021 52240

220kΩ 5%

3248

4822 051 20273

27kΩ 5% 0.1W

3249

4822 116 52231

820Ω 5% 0.5W

3251

4822 116 52175

100Ω 5% 0.5W

3256

4822 051 10102

1kΩ 2% 0.25W

3257

4822 051 20106

10M Ω 5% 0.1W

3258

4822 051 20334

330kΩ 5% 0.1W

3259

4822 051 20474

470kΩ 5% 0.1W

3311

4822 051 20392

3.9kΩ 5% 0.1W

3312

4822 117 13577

330Ω 1% 1.25W

3313

4822 051 20109

10Ω 5% 0.1W

3314

4822 053 12183

18kΩ 5% 3W

3316▲

4822 052 10689

68Ω 5% 0.33W

3317

3198 013 01520

1.5kΩ 20% 0.5W

3321

4822 051 20392

3.9kΩ 5% 0.1W

3322

4822 117 13577

330Ω 1% 1.25W

3323

4822 051 20109

10Ω 5% 0.1W

3324

4822 053 12183

18kΩ 5% 3W

3326▲

4822 052 10689

68Ω 5% 0.33W

3327

3198 013 01520

1.5kΩ 20% 0.5W

3331

4822 051 20392

3.9kΩ 5% 0.1W

3332

4822 117 13577

330Ω 1% 1.25W

3333

4822 051 20109

10Ω 5% 0.1W

3334

4822 053 12183

18kΩ 5% 3W

3336▲

4822 052 10689

68Ω 5% 0.33W

3337

3198 013 01520

1.5kΩ 20% 0.5W

3341

3198 013 01520

1.5kΩ 20% 0.5W

3347▲

4822 052 10221

220Ω 5% 0.33W

3348

3198 013 01520

1.5kΩ 20% 0.5W

3349▲

4822 052 10108

1Ω 5% 0.33W

3350▲

4822 052 10108

1Ω 5% 0.33W

3401

4822 053 21334

330kΩ 5% 0.5W

3402

4822 116 52251

18kΩ 5% 0.5W

3404▲	4822 052 10688	6.8kΩ 5% 0.33W
3405	4822 116 52256	2.2kΩ 5% 0.5W
3406	4822 050 21003	10kΩ 1% 0.6W
3407	4822 053 12331	330Ω 5% 3W
3408	4822 050 11002	1kΩ 1% 0.4W
3410	4822 051 20333	33kΩ 5% 0.1W
3411▲	4822 052 10109	10Ω 5% 0.33W
3412▲	4822 050 23903	39kΩ 1% 0.6W
3413	4822 117 10833	10kΩ 1% 0.1W
3414▲	4822 050 21203	12kΩ 1% 0.6W
3415▲	4822 050 11002	1kΩ 1% 0.4W
3416▲	4822 052 11398	3.9Ω 5% 0.5W
3417	4822 050 23303	33kΩ 1% 0.6W
3418	4822 051 20333	33kΩ 5% 0.1W
3419	4822 117 11507	6.8kΩ 1% 0.1W
3420	4822 051 20333	33kΩ 5% 0.1W
3421	4822 053 11688	6.8kΩ 5% 2W
3422	4822 117 11373	100Ω 1%
3423	4822 117 11454	12kΩ 1% 0.1W
3424	4822 116 52175	100Ω 5% 0.5W
3425	4822 116 52238	12kΩ 5% 0.5W
3426	4822 051 20105	1M Ω 5% 0.1W
3427	4822 116 52238	12kΩ 5% 0.5W
3428▲	4822 052 11399	39Ω 5% 0.5W
3431▲	4822 117 12955	2.7kΩ 1% 0.1W
3432	4822 116 52186	22Ω 5% 0.5W
3471	4822 050 23308	3.3Ω 1% 0.6W
3472	4822 050 23908	3.3Ω 1% 0.6W
3473	4822 050 22202	2.2kΩ 1% 0.6W
3474	4822 050 11002	1kΩ 1% 0.4W
3475	4822 050 22202	2.2kΩ 1% 0.6W
3476▲	4822 052 10158	1.5Ω 5% 0.33W
3477	4822 116 83872	220Ω 5% 0.5W
3478	4822 116 83872	220Ω 5% 0.5W
3479	4822 050 11002	1kΩ 1% 0.4W
3500▲	4822 053 21335	3.3M Ω 5% 0.5W
3501▲	4822 053 21335	3.3M Ω 5% 0.5W
3502	2122 612 00055	NTC 4.7Ω 20%
3504▲	2120 660 90043	PTC 9Ω/100Ω 200V
3506▲	4822 116 83872	220Ω 5% 0.5W
3507	4822 252 11215	DSP301N-A21F
3519	4822 116 83876	270Ω 5% 0.5W
3520	4822 051 20122	1.2kΩ 5% 0.1W
3521	4822 050 24708	4.7Ω 1% 0.6W
3522	4822 051 20334	330kΩ 5% 0.1W
3523▲	4822 052 10479	47Ω 5% 0.33W
3524	4822 117 11148	56kΩ 1% 0.1W
3525	4822 051 10102	1kΩ 2% 0.25W
3526	3198 012 11570	0.15Ω 5% 1W
3527▲	4822 052 10222	2.2kΩ 5% 0.33W
3528	4822 117 10833	10kΩ 1% 0.1W
3529	4822 117 10834	47kΩ 1% 0.1W
3530	4822 051 20472	4.7kΩ 5% 0.1W
3531	4822 051 20008	Jumper (0805)
3541	4822 051 20471	470Ω 5% 0.1W
3542	4822 117 11139	1.5kΩ 1% 0.1W
3543▲	4822 050 28203	82kΩ 1% 0.6W
3544▲	4822 050 26802	6.8kΩ 1% 0.6W
3545▲	4822 117 11149	82kΩ 1% 0.1W
3546	4822 051 20008	Jumper (0805)
3547	4822 117 11342	0.33Ω 5% 2W
3548	4822 051 20822	8.2kΩ 5% 0.1W
3549	4822 116 83872	220Ω 5% 0.5W
3552	4822 051 20472	4.7kΩ 5% 0.1W
3559	4822 051 10102	1kΩ 2% 0.25W
3561	4822 116 83872	220Ω 5% 0.5W
3562	4822 117 10833	10kΩ 1% 0.1W
3563	4822 051 20822	8.2kΩ 5% 0.1W
3564	2120 106 90565	0.1Ω 5% 2W
3565	4822 053 10331	330Ω 5% 1W
3566	4822 117 11449	2.2kΩ 5% 0.1W
3569	4822 051 20562	5kΩ 5% 0.1W
3591	4822 051 20008	Jumper (0805)
3595	2120 108 92641	ERJ6EN180k
3596	2120 108 92641	ERJ6EN180k
3603	4822 116 52175	100Ω 5% 0.5W
3604	4822 116 52175	100Ω 5% 0.5W
3605	4822 051 20472	4.7kΩ 5% 0.1W
3606	4822 116 52256	2.2kΩ 5% 0.5W
3607	4822 116 52256	2.2kΩ 5% 0.5W
3608	4822 116 52175	100Ω 5% 0.5W
3611	4822 117 11373	100Ω 1%
3612	4822 116 52303	8.2kΩ 5% 0.5W
3614	4822 116 52283	4.7kΩ 5% 0.5W
3615	4822 050 21003	10kΩ 1% 0.6W
3617	4822 116 52283	4.7kΩ 5% 0.5W
3618	4822 116 83961	6.8kΩ 5%
3619	4822 116 52303	8.2kΩ 5% 0.5W
3622	4822 117 11373	100Ω 1%
3623	4822 051 20472	4.7kΩ 5% 0.1W
3624	4822 116 52175	100Ω 5% 0.5W
3625	4822 116 52175	100Ω 5% 0.5W
3626	4822 051 20472	4.7kΩ 5% 0.1W
3627	4822 051 20472	4.7kΩ 5% 0.1W

3628	4822 117 10833	10kΩ 1% 0.1W
3630	4822 117 11449	2.2kΩ 5% 0.1W
3632	4822 051 20008	Jumper (0805)
3636	4822 117 11373	100Ω 1%
3639	4822 051 20008	Jumper (0805)
3681	4822 051 20391	390Ω 5% 0.1W
3682	4822 051 20332	3.3kΩ 5% 0.1W
3683	4822 051 20391	390Ω 5% 0.1W
3684	4822 051 20561	560Ω 5% 0.1W
3685	4822 051 20561	560Ω 5% 0.1W
3686	4822 117 11139	1.5kΩ 1% 0.1W
3691	4822 117 13577	330Ω 1% 1.25W
3693	4822 117 11503	220Ω 1% 0.1W
3694	4822 051 20472	4.7kΩ 5% 0.1W
3901	4822 051 10102	1kΩ 2% 0.25W
3902	4822 051 20332	3.3kΩ 5% 0.1W
3903	4822 117 10833	10kΩ 1% 0.1W
3904	4822 117 10833	10kΩ 1% 0.1W
3907	4822 051 20822	8.2kΩ 5% 0.1W
3941	4822 117 11373	100Ω 1%
3942	4822 051 20472	4.7kΩ 5% 0.1W
3943	4822 117 12955	2.7kΩ 1% 0.1W
3944	4822 117 12955	2.7kΩ 1% 0.1W
3945	4822 051 10102	1kΩ 2% 0.25W
3946	4822 051 20822	8.2kΩ 5% 0.1W
3947	4822 117 10833	10kΩ 1% 0.1W
3948	4822 117 10834	47kΩ 1% 0.1W
3949	4822 116 83933	15kΩ 1% 0.1W
3950	4822 051 20561	560Ω 5% 0.1W
3951	4822 051 20391	390Ω 5% 0.1W
3981	4822 116 52206	120Ω 5% 0.5W
3982	4822 116 52206	120Ω 5% 0.5W
4xxx	4822 051 10008	Jumper (1206)
4xxx	4822 051 20008	Jumper (0805)



5001	4822 157 51216	5.6μH
5002	3198 018 18270	820nH 10%
5201	4822 157 11835	4.7μH 5%
5202	4822 157 51462	10μH 10%
5241	4822 157 51462	10μH 10%
5242	4822 157 11706	10μH 5%
5341	4822 157 11441	22μH 5%
5342	4822 526 10704	Bead 100MHz
5403	4822 157 11891	27μH 10%
5406	3128 138 56801	Linearity coil drum DC12
5444	2422 531 02446	Transformer driver SC10009-03
5445▲	2422 531 02475	LOT JF0501-19163A
5500▲	4822 157 10476	DMF-2820H
5520▲	2422 531 02456	Transformer S359B4-09 B
5521	4822 526 10704	Bead 100MHz
5560	4822 526 10704	Bead 100MHz
5561	4822 157 52392	27μH
5562	4822 157 11411	Bead 100MHz
5563	4822 526 10704	Bead 100MHz
5602	4822 157 11867	5.6μH 5%
5603	4822 157 11867	5.6μH 5%
5604	4822 157 11867	5.6μH 5%



6001	4822 130 34142	BZX79-B33
6004	4822 130 11525	1SS356
6201	4822 130 11397	BAS316
6202	4822 130 11397	BAS316
6206	4822 130 11416	PDZ6.8B
6241	4822 130 11416	PDZ6.8B
6311	4822 130 30842	BAV21
6321	4822 130 30842	BAV21
6331	4822 130 30842	BAV21
6341	4822 130 30842	BAV21
6342	9337 587 20673	BA282
6343	4822 130 10837	UDZS8.2B
6344	4822 051 20008	Jumper (0805)
6402	4822 130 10871	SBYV27-200
6403	4822 130 42488	BYD33D
6404	4822 130 32896	BYD33M
6405	4822 130 42488	BYD33D
6406	5322 130 34331	BAV70
6407	4822 130 11397	BAS316
6408	4822 130 11397	BAS316
6409	4822 130 42488	BYD33D
6410	4822 130 42488	BYD33D
6413	4822 130 30621	1N4148
6414▲	4822 130 34167	BZX79-B6V2
6415	4822 130 11397	BAS316
6417	4822 130 11551	UDZS10B
6419	4822 130 34173	BZX79-B5V6
6420	4822 130 30862	BZX79-B9V1
6423	4822 130 42488	BYD33D

6471	4822 130 42488	BYD33D
6500	4822 130 31083	BYW55
6501	4822 130 31083	BYW55
6502	4822 130 31083	BYW55
6503	4822 130 31083	BYW55
6520	4822 130 42488	BYD33D
6523	4822 130 30621	1N4148
6540	4822 130 34167	BZX79-B6V2
6541	4822 130 61219	BZX79-B10
6560	9322 127 32682	BYW76-RAS15/10
6561	9322 127 32682	BYW76-RAS15/10
6562	9322 164 42682	EGP20DL-5100
6563	4822 130 11397	BAS316
6565	5322 130 34331	BAV70
6566	4822 130 11397	BAS316
6567	4822 130 11148	UDZ4.7B
6569	4822 130 11397	BAS316
6570	9322 163 91685	BZX384-C6V2
6681	4822 130 31983	BAT85
6691	9322 050 99682	LTL-10224WHCR
6692	9322 127 54667	IR receiver TSOP1836UH1
6901	4822 051 20008	Jumper (0805)



7001	4822 130 63732	MMUN2212
7101	5322 130 60159	BC846B
7200	9352 707 37557	TDA9561H/N1/4/0630
7201	5322 130 60159	BC846B
7202	4822 130 60373	BC856B
7203	4822 130 60373	BC856B
7204	4822 130 60373	BC856B
7205	4822 130 60373	BC856B
7241	3198 010 44010	PDTA114ET
7311	4822 130 41782	BF422
7312	4822 130 41782	BF422
7313	4822 130 41646	BF423
7321	4822 130 41782	BF422
7322	4822 130 41782	BF422
7323	4822 130 41646	BF423
7331	4822 130 41782	BF422
7332	4822 130 41782	BF422
7333	4822 130 41646	BF423
7401	9340 547 00215	PDTCT143ZT
7402	9340 563 21127	BUT11APX-1200
7403	4822 130 40981	BC337-25
7404	4822 130 41246	BC327-25
7405▲	4822 130 60373	BC856B
7406	4822 130 60373	BC856B
7407	4822 130 40823	BD139
7408	4822 130 40823	BD139
7409	4822 130 60373	BC856B
7471	4822 209 13176	TDA9302H
7515	9322 175 72667	TCET1104(G)
7520	9352 673 56112	TEA1507P/N1
7521	9322 160 63687	STP7NC80ZFP
7522	5322 130 60159	BC846B
7540	4822 130 40959	BC547B
7541	4822 130 11155	PDTCT114ET
7542	4822 130 60373	BC856B
7560	4822 209 16978	LF33CV
7561	9340 547 00215	PDTCT143ZT
7602	9322 147 25682	M24C16-WBN6
7901	9322 158 65667	AN7522N
7941	5322 130 60159	BC846B
7942	5322 130 60159	BC846B
7943	5322 130 60159	BC846B

Picture tube panel [B]

Various

0244	2422 025 04851	3P
0245	2422 025 04854	6P female
0254	2422 500 80067	6P female



2313	4822 122 33216	270pF 5% 50V
2323	4822 122 33172	390pF 5% 50V
2331	4822 122 33172	390pF 5% 50V
2341▲	4822 126 14588	2.2nF 10% 1kV
2342	4822 121 70386	47nF 10% 250V
2343	4822 121 70386	47nF 10% 250V

3314	4822 053 12183	18k 5% 3W
3316▲	4822 052 10689	68Ω 5% 0.33W
3317	3198 013 01520	1k5 2% 0.5W
3321	4822 117 11139	1k5 1% 0.1W
3322	4822 117 13577	330Ω 1% 1.25W
3323	4822 051 20109	10Ω 5% 0.1W
3324	4822 053 12183	18k 5% 3W
3326▲	4822 052 10689	68Ω 5% 0.33W
3327	3198 013 01520	1k5 2% 0.5W
3331	4822 117 11139	1k5 1% 0.1W
3332	4822 117 13577	330Ω 1% 1.25W
3333	4822 051 20109	10Ω 5% 0.1W
3334	4822 053 12183	18k 5% 3W
3336▲	4822 052 10689	68Ω 5% 0.33W
3337	3198 013 01520	1k5 2% 0.5W
3341	3198 013 01520	1k5 2% 0.5W
3347▲	4822 052 10221	220Ω 5% 0.33W
3348	3198 013 01520	1k5 2% 0.5W



5341	2422 535 94213	SPT0508A
5342	4822 526 10704	Bead 100MHz



6311	4822 130 30842	BAV21
6321	4822 130 30842	BAV21
6331	4822 130 30842	BAV21
6341	4822 130 30842	BAV21
6342	4822 130 33697	1SS135
6343	4822 130 10837	UDZS8.2B
6344	4822 051 20008	Jumper 0805



7311	4822 130 41782	BF422
7312	4822 130 41782	BF422
7313	4822 130 41646	BF423
7321	4822 130 41782	BF422
7322	4822 130 41782	BF422
7323	4822 130 41646	BF423
7331	4822 130 41782	BF422
7332	4822 130 41782	BF422
7333	4822 130 41646	BF423

Side AV panel [E][E1]

Various

0232▲	4822 267 31014	Headphone socket
0250	2422 026 04742	Socket 3 x cinch



2171	4822 126 13512	330pF 10% 50V
2172	5322 122 32311	470pF 10% 100V
2172	4822 126 13512	330pF 10% 50V
2173	5322 122 32311	470pF 10% 100V
2173	4822 126 13512	330pF 10% 50V
2174	5322 122 32311	470pF 10% 100V
2174	4822 126 13512	330pF 10% 50V
2176	4822 126 13512	330pF 10% 50V
2176	5322 122 32311	470pF 10% 100V
2177	4822 124 40207	100μF 20% 25V
2177	4822 124 40248	10μF 20% 63V
2178	4822 126 13512	330pF 10% 50V
2178	5322 122 32311	470pF 10% 100V
2179	4822 124 40207	100μF 20% 25V
2179	4822 124 40248	10μF 20% 63V



3150	4822 050 21003	10k 1% 0.6W
3150	4822 116 83884	47k 5% 0.5W
3151	4822 116 52303	8k2 5% 0.5W
3151	4822 116 83868	150Ω 5% 0.5W
3152	4822 050 21003	10k 1% 0.6W
3152	4822 116 83884	47k 5% 0.5W
3153	4822 116 52303	8k2 5% 0.5W
3153	4822 116 83868	150Ω 5% 0.5W
3155	4822 116 52201	75Ω 5% 0.5W
3156	4822 116 52219	330Ω 5% 0.5W
3157	4822 116 52219	330Ω 5% 0.5W



6161	4822 130 34278	BZX79-B6V8P
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