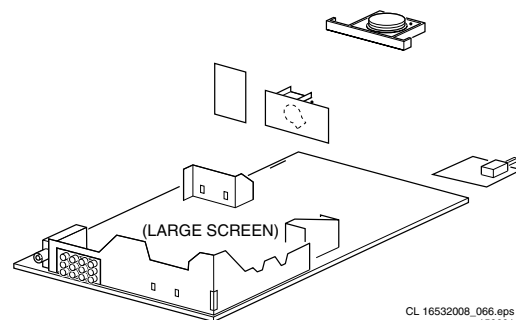


Service
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Service

Service Manual

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PHILIPS

1. Technical Specifications, Connections and Chassis Overview

Index:		
1. Technical Specifications.		: NICAM B/G, D, D/K, I
2. Connections.		: BI-NICAM B/G, D, D/K, I
3. Chassis Overview.		: NTSC 3.58, 4.43
	A/V connections	: PAL 60
	Channel selections	: 100 or 125 channels
	Aerial input	: UVSH or full cable
		: 75 Ω, IEC- or F-type

Note:

- Described specifications are valid for the *whole* product range (see Product Survey for *specific* models).
- Figures can deviate slightly from the actual situation, due to different set executions.

1.1 Technical Specifications

1.1.1 Reception

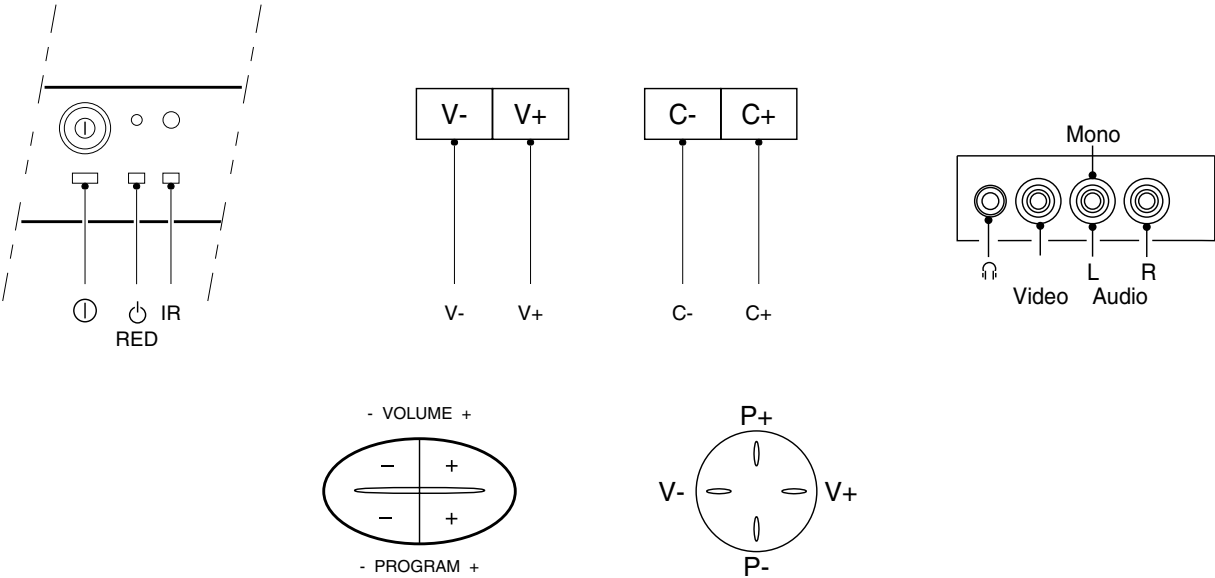
Tuning system	: PLL
Colour systems	: NTSC 3.58, 4.43
	: PAL B/G, B/H, D/K, I
	: SECAM B/G, D/K, K1
Sound systems	: FM-stereo
	: 2CS (B/G, China, Korea)
	: BTSC DBX

1.1.2 Miscellaneous

Audio output	: 2 x 5 W (with SAP)
	: 2 x 5 W + 10 W (subwoofer)
	: 2 x 5 W + 10 W + 2 x 3 W
Mains voltage	: 90 - 276 V or 150 - 276 V
Mains frequency	: 50 or 60 Hz
Ambient temperature	: + 5 to + 45 deg. C
Maximum humidity	: 90 %
Standby Power consumption	: < 3 W

1.2 Connections

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

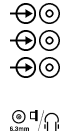


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220501

Figure 1-1

Audio / Video In

- 1 - Video CVBS (1 Vpp / 75 Ω)
- 2 - Audio L (0.2 Vrms / 10 k Ω)
- 3 - Audio R (0.2 Vrms / 10 k Ω)
- 4 - Headphone (3.5 mm) 8 - 600 Ω / 4 mW



- 3 - Audio R (0.5 Vrms / 1 k Ω)



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



1.2.2 Rear Connections

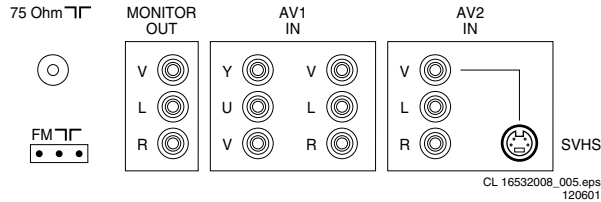


Figure 1-2 .eps

Monitor Out

- 1 - Video CVBS (1 Vpp / 75 Ω)
- 2 - Audio L (0.5 Vrms / 1 k Ω)



AV1 In

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



AV2 In

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

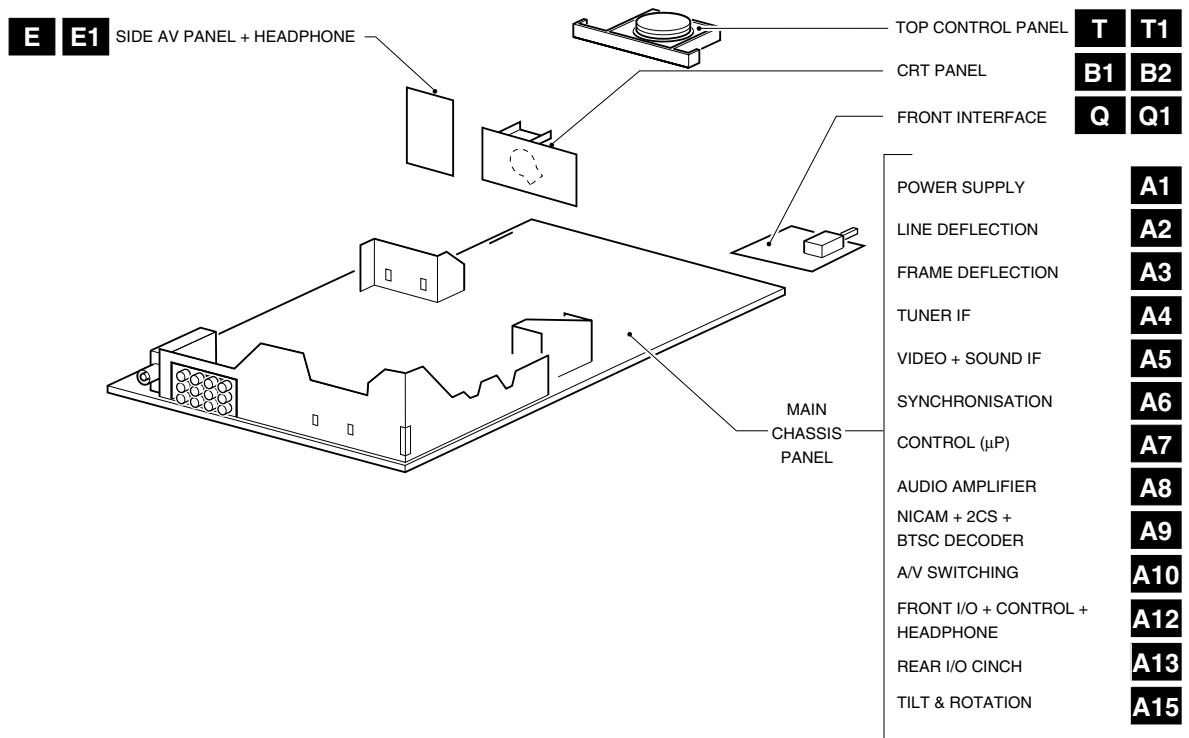


AV2 In (SVHS)

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



1.3 Chassis Overview




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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).

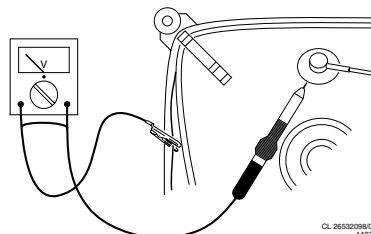









Figure 2-1

- 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 backcover.
- Insert the mains plug into the wall socket.

Mains Connection

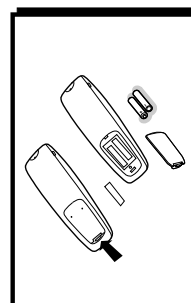
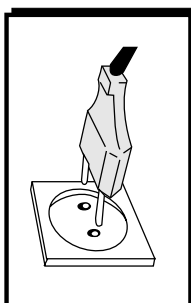
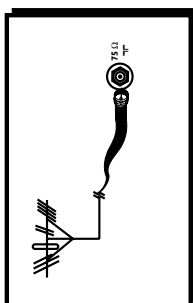
- For correct mains voltage, refer to type sticker at the rear of the TV set
 - Consult your dealer if mains supply is different.
- Note :** This diagram is not representative of the actual plug and socket.

Switching on the Set

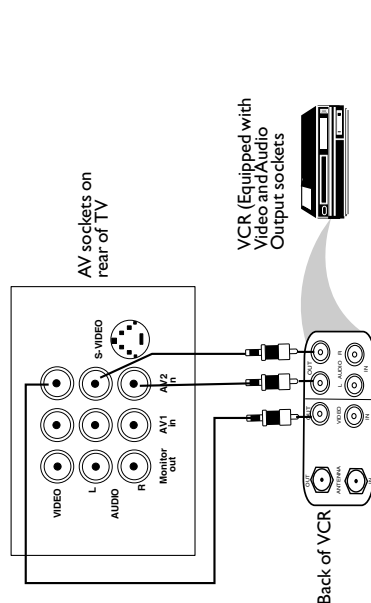
- Press the main power button to switch on/off the TV.
- If the set is on standby (indicator is red), press the **Power** button on the remote control to switch on set.

Using the Remote Control

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

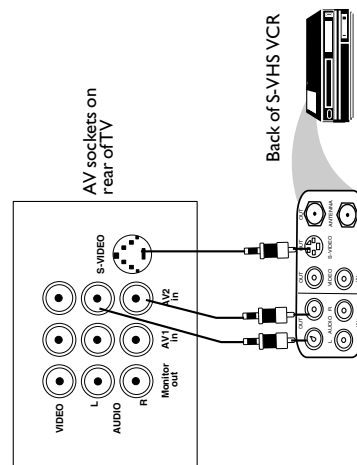


CONNECTING THE AUDIO/VIDEO SOCKETS (PLAYBACK)



You can view the playback of VCR tapes (Video Disc players, camcorders, etc.) by using the AUDIO and VIDEO INPUT sockets on the rear of the TV.

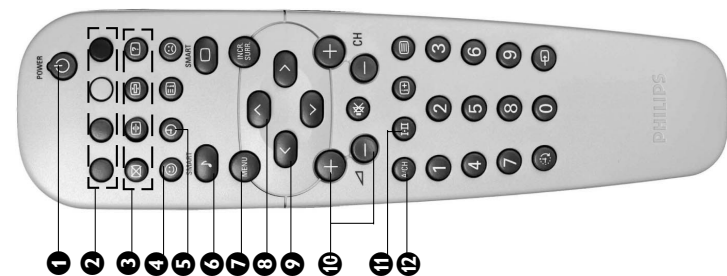
- Connect the **VIDEO** and **AUDIO IN** sockets on the rear of the TV to the **AUDIO** and **VIDEO OUT** sockets on the VCR.



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.

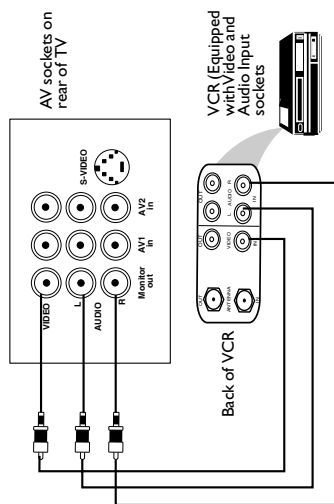
FUNCTIONS OF REMOTE CONTROL



- 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 on "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.

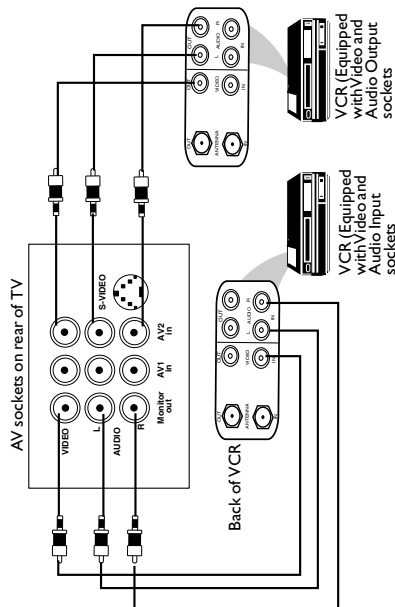
CONNECTING THE AUDIO/VIDEO SOCKETS (RECORDING)

Connection for recording from the TV channel



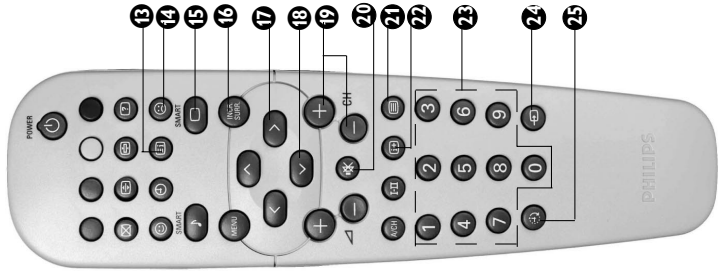
- Connect the corresponding **INPUT** sockets of the VCR to the **MONITOR OUTPUT** sockets on the rear of the TV.
- To enhance the sound of your TV, connect the **AUDIO L** and **R** sockets to an external audio system instead of the VCR. For mono equipment, connect only the **AUDIO L** socket.

Connection for recording from one VCR to another VCR



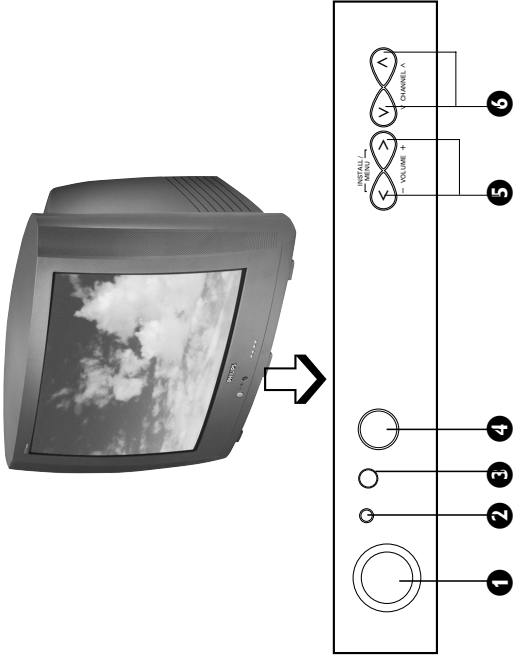
- Connect the sockets of the VCR which you wish to record from, to the corresponding sockets at either **AV1** or **AV2**
- Connect the sockets of the receiving VCR to the **MONITOR OUTPUT** sockets on the rear of the TV.

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 AV Button**
Allows you to select the AV channels.
- 25 Sleep timer 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 explains 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.

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.

Result on TV Screen

AUTOMATIC TUNING OF CHANNELS

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

Step

Press button

1

Enter main 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.

Result on TV Screen

MANUAL TUNING OF CHANNELS

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

Step

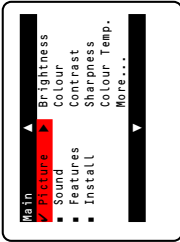


Press button

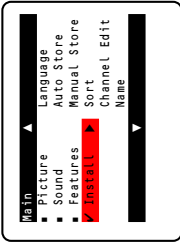


Enter main menu.

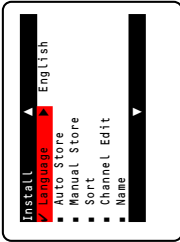
Result on TV Screen



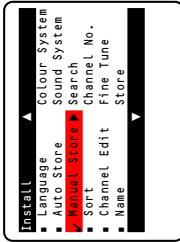
Press button repeatedly until **Install** is selected.



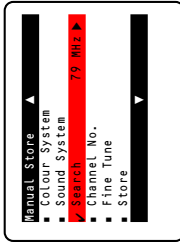
Enter install menu.



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



Enter manual store menu.



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



MANUAL TUNING OF CHANNELS

Step

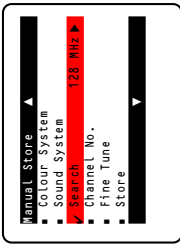


Press button



Start manual searching. Searching stops once a transmitting signal is found.

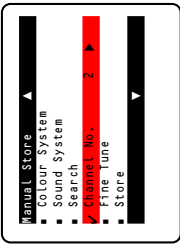
Result on TV Screen



Select **Channel No.**



Key in the channel number.

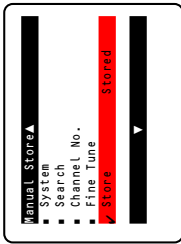


Press button repeatedly until **Store** is selected.



Store tuned channel.

Note : If you want to continue searching for another transmitting channel, repeat steps 7 to 11.



Exit menu from screen.



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
- Result on TV Screen

Colour System is selected.
- 6

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

< or >

Select the desired colour system (**Auto, PAL, NTSC 3.58, NTSC 4.43 or SECAM**).
- 7

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

>

Store selected system.
- 9

Proceed to select **Sound System**.

< or >

Select the desired sound system (**Auto, BG, I, DK or M**).
- 11

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

>

Store selected system.
- 13

Exit menu from screen.

EXIT

FINE TUNING OF CHANNELS

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

- Step

Press button
- Result on TV Screen

Enter main menu.
- 1

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.

> or <
- 8

Select **Store**.

>
- 9

Store last fine-tuned status.

>
- 10

Exit menu from screen.

EXIT

SORTING OF CHANNELS

This feature rearranges channel numbers.

Step

Press button

1

Enter main menu.

2

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

3

Enter install menu.

4

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

5

Enter sort mode.

6

Select the channel number you want to change from (e.g. 002).

7

Confirm selection.

8

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 menu from screen.

Result on TV Screen

Main

Language

Picture

Auto Store

Sound

Manual Store

Features

Sort

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

Install

Language

Auto Store

Manual Store

Sort

Channel Edit

Name

Install

Language

Auto Store

Manual Store

Sort

Channel Edit

Name

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 theCH (Channel) + or – button. You can only have access to the channel by the Digit (0 -9) buttons.

Step

Press button

1

Enter main menu.

2

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

3

Enter install menu.

4

Press button repeatedly until **Channel Edit** is selected.

5

Enter **Channel Edit** menu.

6

Key in the channel number to be skipped.

7

Select **Skipped**.

8

Select **On** to skip channel.

9

Exit menu from screen.

Result on TV Screen

Main

Language

Picture

Auto Store

Sound

Manual Store

Features

Sort

Channel Edit

Name

Install

Language

Auto Store

Manual Store

Sort

Channel Edit

Name

Channel Edit

Channel No.

Skipped

Channel Edit

Name

Channel Edit

Channel No.

Skipped

Channel Edit

Name

Channel Edit

Channel No.

Skipped

Channel Edit

Name

Channel Edit

Channel No.

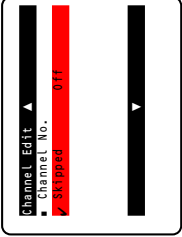
Skipped

Channel Edit

Name

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

Features

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

Brightness

Colour

Contrast

Sharpness

Colour Temp

NR

Picture

Brightness

Colour

Contrast

Sharpness

Colour Temp

NR

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

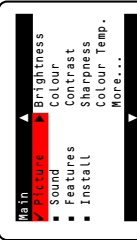
The sound menu allows you to make adjustments to the sound.

Step Press button

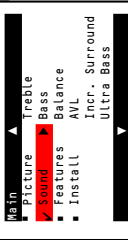


Display the main menu on screen.

Result on TV Screen



Select Sound menu.



Enter Sound menu.



Select item.



Adjust level or select desired setting.



Exit menu from screen.

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.

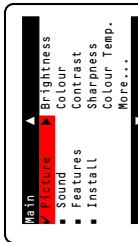
Step

Press button

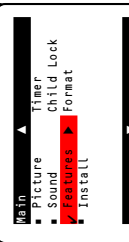


Display the main menu on screen.

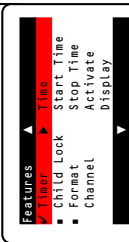
Result on TV Screen



Select Features.



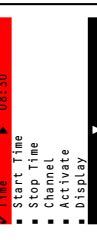
Enter the Features menu.



Enter Timer menu.



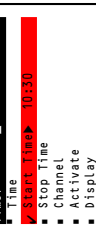
Key in the current time starting from the hour follow by minute. This is the time where the "start time" and "stop time" will take reference from.



Select Start Time.



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



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	V	Features menu: Timer, Child Lock, Format. Child Lock is highlighted.
3	>	Child Lock mode screen.
4	V	Child Lock mode screen.
5	>	Child Lock mode screen.
6	1 2 3 4 5 6 7 8 9 0	Enter 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	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	V	Timer menu: Time, Start Time, Stop Time, Channel, Activate, Display. Start Time is highlighted.
9	1 2 3 4 5 6 7 8 9 0	Key in the time you want the programme to be switched off.
10	V	Timer menu: Time, Start Time, Stop Time, Channel, Activate, Display. Channel is highlighted.
	1 2 3 4 5 6 7 8 9 0	Key in the channel you want to switch to.
11	V	Timer menu: Time, Start Time, Stop Time, Channel, Activate, Display. Activate is highlighted.
12	>	Activate timer: You can select Once , Daily or Off .
13	V	Timer menu: Time, Start Time, Stop Time, Channel, Activate, Display. Display is highlighted.
14	>	Select On mode if you want to display the time on the TV screen.
15	EXIT	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.

Child Lock

Lock Channel

Change Code

Clear All

Lock All

002

003

004

005

006

007

Select **Change Code**.

Enter change code mode.

11

1 2 3

4 5 6

7 8 9

0

Key in your preferred code (4-digit).

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

Exit menu from screen.

12

13

Child Lock

Lock Channel

Confirm Code

Change Code

Clear All

Lock All

xxxx

Confirmed

ACTIVATING THE CHILD LOCK (LOCK CHANNEL)

Step

Press button

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

9

10

11

12

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

Child Lock

Lock Channel

Change Code

Clear All

Lock All

002

003

004

005

006

007

Enter lock channel mode.

Child Lock

Lock Channel

Change Code

Clear All

Lock All

002

003

004

005

006

007

Select the channel you want to lock.

Child Lock

Lock Channel

Change Code

Clear All

Lock All

002

003

004

005

006

007

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.

Child Lock

Lock Channel

Change Code

Clear All

Lock All

002

003

004

005

006

007

Exit menu from screen.

Child Lock

Lock Channel

Change Code

Clear All

Lock All

002

003

004

005

006

007

26

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

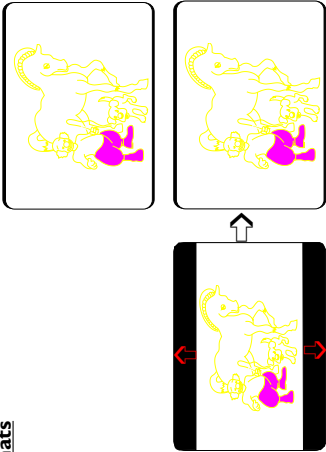
You can have a choice of two formats for your viewing pleasure, namely :- **4:3** mode and the **EXPAND 4:3** mode through the **FORMAT** menu.

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

When to use the Screen Formats

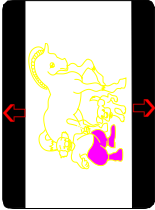
4:3 format

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.

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)

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:

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 to remove it.

4.2 Service Position Main Panel

There are two configurations. With and without panel bracket. Both have a different service position:

Main panel **without** bracket.

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. Turn the panel 90 degrees counter clockwise [3].
5. Flip the panel 90 degrees [4], with the components towards the CRT.
6. Turn the panel with the rear I/O towards the CRT [5].
7. Slide the metal heatsink (near the mains transformer 5520) underneath the right chassis bracket, so the panel is secured [6].

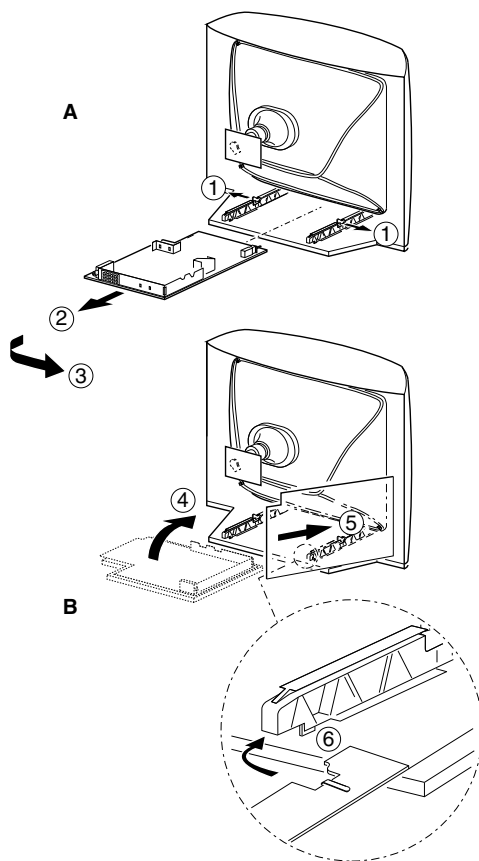


Figure 4-1

Main panel **with** bracket.

1. Disconnect the strain relief of the AC power cord.
2. Disconnect the degaussing coil by removing the cable from (red) connector 0201 [1].
3. Remove the panel bracket from the bottom tray, by pulling it backward [2].
4. Turn the chassis tray 90 degrees counter clockwise.
5. Move the panel somewhat to the left and flip it 90 degrees [3], with the components towards the CRT.
6. Turn the panel with the rear I/O towards the CRT.
7. Place the hook of the tray in the fixation hole of the cabinet bottom [4] and secure it.

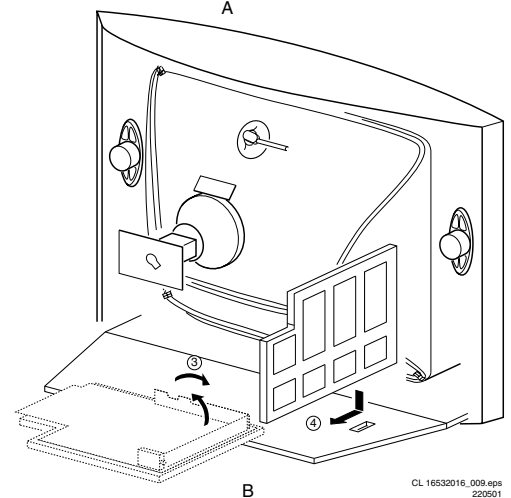
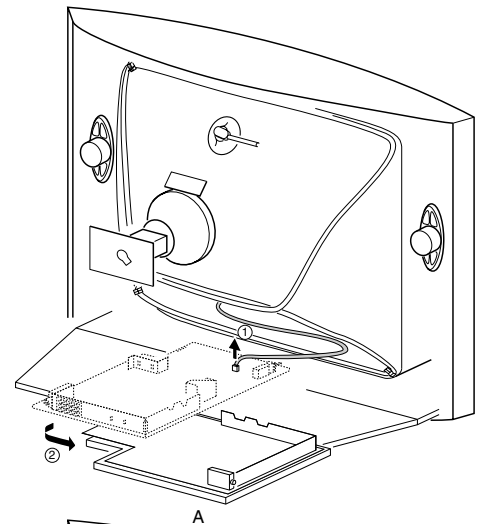


Figure 4-2

4.3 Side I/O Panel Removal

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

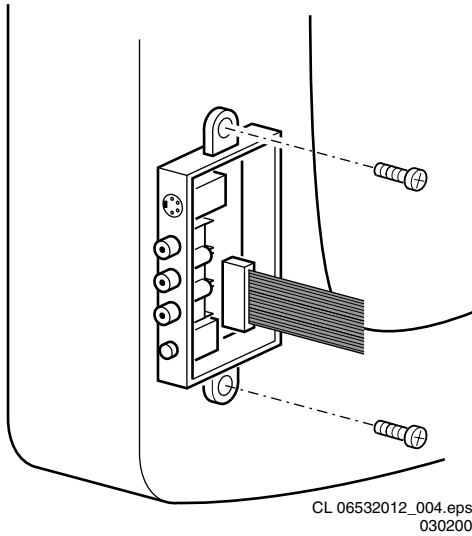


Figure 4-3

4.4 Rear Cover Mounting

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

1. Check whether the AC power 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.
- 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).

SW cluster	SW name	UOC-type	Diversity
1AP1	L01AN1-x.y	TDA9583/6	AP non TXT, China/AP
1AP2	L01AN2-x.y	TDA9586	AP non TXT, Thailand/Vietnam
1AP3	L01AN3-x.y	TDA9583	AP non TXT, India
3AP1	L01AT1-x.y	TDA9565	AP 10 page TXT, Sgp/Aus/NZ
3AP2	L01AT2-x.y	TDA9565	AP 10 page TXT, Middle East
4AP1	L01AC1-x.y	TDA9588	AP NTSC, Thailand/Philippines

Abbreviations: A= Asia Pacific, C= NTSC, N= no TXT, T= TXT

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120601

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.

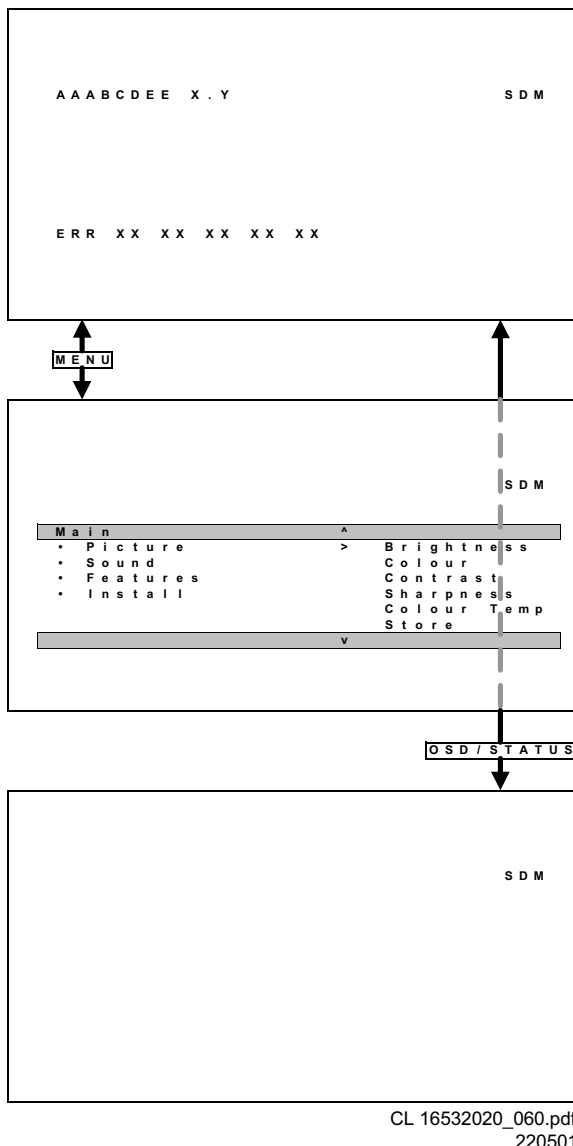


Figure 5-3

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.

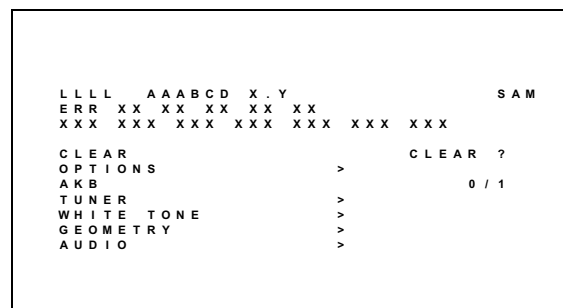


Figure 5-4

- 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

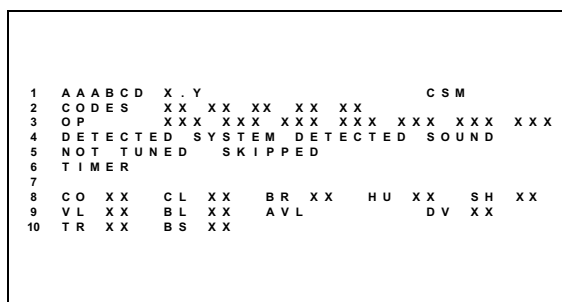
When a customer is having problems with his TV-set, he can call his dealer. The service technician can then ask the customer to activate the CSM, in order to identify the status of the set. Now, the service technician can judge the severeness of the complaint. In a lot of cases he can advise the customer 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

1. First install the ComPair Browser software (see the Quick Reference Card for installation instructions).
2. 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.
3. Connect the AC power adapter to the supply connector (marked with 'POWER 9V DC') on the ComPair interface.
4. Switch the ComPair interface OFF.
5. Switch the television set OFF (remove the AC power).
6. 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).
7. 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.
8. Start the ComPair program and read the 'introduction' chapter.

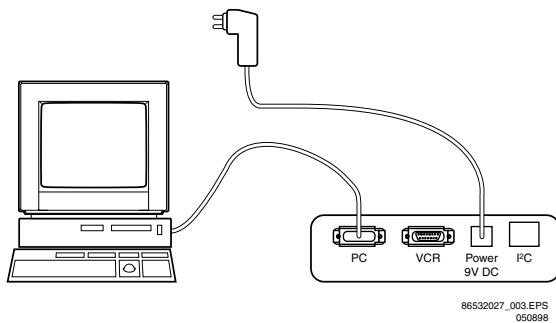


Figure 5-6

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	EW 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.

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 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 'Stdby_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.

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

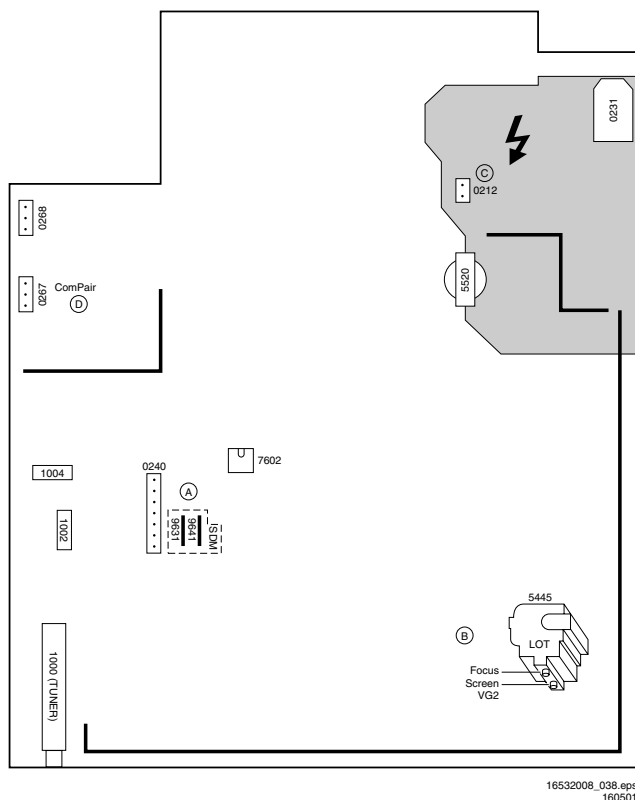


Figure 8-1

8.2.1 Vg2 Adjustment

1. Activate the SAM.
2. Go to the WHITE TONE sub menu.

3. Set the values of NORMAL RED, GREEN and BLUE to 40.
4. Go, via the MENU key, to the normal user menu and set
 - CONTRAST to zero.
 - BRIGHTNESS to minimum (OSD just visible in a dark room).
5. Return to the SAM via the MENU key.
6. Connect the RF output of a pattern generator to the antenna input. Test pattern is a 'black' picture (blank screen on CRT **without** any OSD info).
7. Set the channel of the oscilloscope to 50 V/div and the time base to 0.2 ms (external triggering on the vertical pulse).
8. Ground the scope at the CRT panel and connect a 10:1 probe to one of the cathodes of the picture tube socket (see diagram B).
9. Measure the cut off pulse during first full line after the frame blanking (see Fig. 8-2). You will see two pulses, one being the cut off pulse and the other being the white drive pulse. Choose the one with the lowest value, this is the cut off pulse.
10. Select the cathode with the highest V_{DC} value for the alignment. Adjust the V_{cutoff} of this gun with the SCREEN potentiometer (see Fig. 8-1) on the LOT to the correct value (see table below).
11. Restore BRIGHTNESS and CONTRAST to normal (= 31).

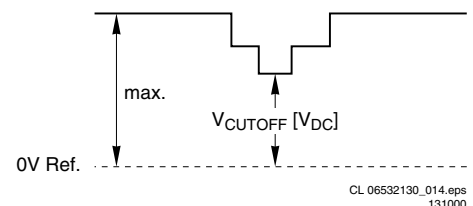


Figure 8-2

CUT-OFF VOLTAGE (L01 LARGE)	
Screen size	Cut-off [V]
21"	125 ± 4
24", 25", 27", 28", 29", 32", 35"	145 ± 10

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Figure 8-3

8.2.2 Focusing

1. Tune the set to a circle or crosshatch test pattern (use an external video pattern generator).
2. Choose picture mode NATURAL (or MOVIES) with the 'SMART PICTURE' button on the remote control transmitter.
3. Adjust the FOCUS potentiometer (see Fig. 8-1) until the vertical lines at 2/3 from east and west, at the height of the centreline, are of minimum width without visible haze.

8.3 Software Alignments and Settings

Enter the Service Alignment Mode (see chapter 5). The SAM menu will now appear on the screen.

Select one of the following alignments:

1. OPTIONS
2. TUNER
3. WHITE TONE
4. GEOMETRY

5. AUDIO

8.3.1 Options

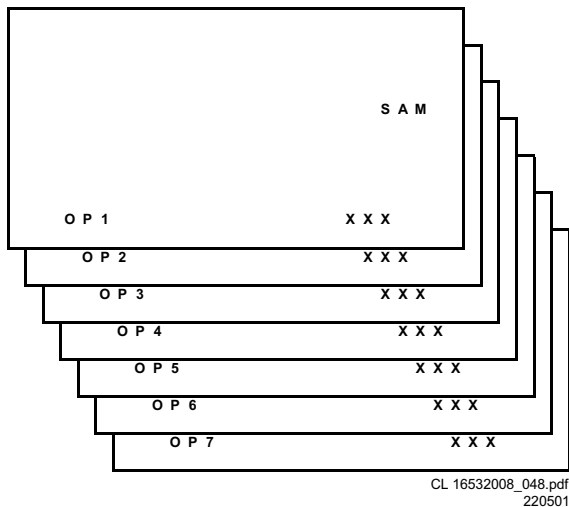


Figure 8-4

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
21PT2251/67R	160	215	193	164	242	144	44
21PT2251/71R	160	215	193	162	242	144	36
21PT2251/74R	160	215	193	164	242	144	44
21PT2251/97R	160	215	193	162	242	144	36
21PT2252/56A	160	247	193	164	242	144	44
21PT2252/57R	160	247	193	164	242	144	44
21PT2252/65R	160	247	193	164	242	144	44
21PT2252/68R	160	247	193	164	242	144	44
21PT2252/69R	160	247	193	164	242	144	44
21PT2252/73R	160	247	193	164	242	144	44
21PT2252/79R	160	247	193	164	242	144	44
21PT2301/67R	160	215	193	168	254	16	44
21PT2301/71R	160	215	193	162	254	144	36
21PT2301/74R	160	215	193	168	254	144	44
21PT2301/97R	160	215	193	162	254	144	36
21PT2302/56A	160	247	193	168	254	144	44
21PT2302/57R	160	247	193	168	254	144	44
21PT2302/65R	160	247	193	168	254	144	44
21PT2302/68R	160	247	193	168	254	144	44
21PT2302/69R	160	247	193	168	254	144	44
21PT2302/73R	160	247	193	168	254	144	44
21PT2302/79R	160	247	193	168	254	144	44
21PT2452/94R	160	215	193	164	246	144	32
21PT2465/94R	160	215	193	168	254	144	44
21PT2555/93R	161	215	193	164	242	144	43
21PT2565/93R	161	215	193	168	254	144	43
25PT2152/56A	0	247	193	168	244	212	12
25PT2152/65R	0	247	193	40	244	212	9
25PT2152/67R	0	215	193	168	244	212	11
25PT2152/68R	0	247	193	168	244	212	12
25PT2152/69R	0	247	193	168	244	212	12
25PT2152/71R	0	215	193	162	116	212	4
25PT2152/79R	0	247	193	168	244	212	12
25PT2252/56A	160	247	193	168	244	212	44
25PT2252/57R	160	247	193	168	244	212	44
25PT2252/67R	160	215	193	168	244	212	43
25PT2252/68R	160	247	193	168	244	212	44
25PT2252/69R	160	247	193	168	244	212	44
25PT2252/71R	160	215	193	162	116	212	36
25PT2252/79R	160	247	193	168	244	212	44
25PT2435/94R	160	215	225	164	244	212	32
25PT2455/94R	160	215	225	168	244	212	44
25PT2521/93R	1	215	193	168	246	212	12
25PT2511/93R	1	215	193	164	230	212	12
25PT2565/93R	161	215	193	168	246	212	44
29PT2152/56A	0	247	193	168	228	212	12
29PT2152/67R	0	215	193	168	228	212	11
29PT2152/69R	0	247	193	168	228	212	12
29PT2152/68R	0	247	193	168	228	212	12
29PT2152/71R	0	215	193	162	100	212	4
29PT2152/79R	0	247	193	168	228	212	12
29PT2252/57R	160	247	193	168	236	212	44
29PT2252/56A	160	247	193	168	236	212	44
29PT2252/67R	160	215	193	168	236	212	43
29PT2252/68R	160	247	193	168	236	212	44
29PT2252/69R	160	247	193	168	236	212	44
29PT2252/71R	160	215	193	162	108	212	36
29PT2252/79R	160	247	193	168	236	212	44
29PT2252/97R	160	215	193	162	108	212	36
29PT2465/94R	160	215	225	168	236	212	44
29PT2525/93R	1	215	193	168	246	212	12
29PT2535/93R	1	215	193	168	246	212	12
29PT2565/93R	161	223	193	168	230	212	44
29PT2566/93R	161	223	193	168	238	212	44
34PT2152/69R	0	247	193	168	244	212	12
34PT2152/79R	0	247	193	168	244	212	12

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: CHINA**

0 : Tuning is not for China set, or this option bit is not applicable,
 1 : Tuning is for China set,
 Default setting : 0.

OP11: VIRGIN_MODE

0 : 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_PNP

0 : 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: ACI

0 : ACI feature is disabled or not applicable,
 1 : ACI feature is enabled,
 Default setting : 0.

OP14: ATS

0 : 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: LNA

0 : Auto Picture Booster is not available or not applicable,
 1 : Auto Picture Booster is available,
 Default setting : 0.

OP16: FM_RADIO

0 : FM radio feature is disabled or not applicable,
 1 : FM radio feature is enabled,
 Default setting : 0.

OP17: PHILIPS_TUNER

0 : ALPS/MASCO compatible tuner is in use,
 1 : Philips compatible tuner is in use,
 Default setting : 0.

OP20: HUE

0 : Hue/Tint Level is disabled or not applicable,
 1 : Hue/Tint Level is enabled,
 Default setting : 0.

OP21: COLOR_TEMP

0 : Colour Temperature is disabled or not applicable,
 1 : Colour Temperature is enabled,
 Default setting : 0.

OP22: CONTRAST_PLUS

0 : Contrast+ is disabled or not applicable,
 1 : Contrast+ is enabled,
 Default setting : 0.

OP23: TILT

0 : Rotate Picture is disabled or not applicable,
 1 : Rotate Picture is enabled,
 Default setting : 0.

OP24: NOISE_REDUCTION

0 : Noise Reduction (NR) is disabled or not applicable,
 1 : Noise Reduction (NR) is enabled,
 Default setting : 0.

OP25: CHANNEL_NAMING

0 : 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_PICTURE

0 : Smart Picture is disabled or not applicable,
1 : Smart Picture is enabled,
Default setting : 1

OP27: SMART_SOUND

0 : Smart Sound is disabled or not applicable,
1 : Smart Sound is enabled,
Default setting : 1

AP30: AVL

0 : AVL is disabled or not applicable,
1 : AVL is enabled,
Default setting : 0.

OP31: WSSB

0 : 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_SCREEN

0 : Software is used for 4:3 set or not applicable,
1 : Software is used for 16:9 set,
Default setting : 0.

OP33: SHIFT_HEADER_SUBTITLE

0 : 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_ZOOM

0 : 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_9

0 : 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_3

0 : 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_FUNCTION

0 : 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_DBX

0 : For AP_NTSC, chip TDA 9853 is not present,
1 : For AP_NTSC, chip TDA 9853 is present,
Default setting : 0.

OP41: STEREO_DBX

0 : For AP_NTSC, chip MSP 3445 is not present,
1 : For AP_NTSC, chip MSP 3445 is present,
Default setting : 0.

OP42: STEREO_PB

0 : For AP_PAL, chip MSP3465 is not present,
1 : For AP_PAL, chip MSP3465 is present,

Default setting : 0.

OP43: STEREO_NICAM_2CS

0 : 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_VOLUME

0 : Delta Volume Level is disabled or not applicable,
1 : Delta Volume Level is enabled,
Default setting : 0.

OP45: ULTRA_BASS

0 : Ultra Bass is disabled or not applicable,
1 : Ultra Bass is enabled,
Default setting : 0.

OP46: VOLUME_LIMITER

0 : Volume Limiter Level is disabled or not applicable,
1 : Volume Limiter Level is enabled,
Default setting : 0.

OP47: INCR_SUR

0 : Incredible Surround feature is disabled,
1 : Incredible Surround feature is enabled,
Default setting : 1

OP50: PIP

0 : PIP is disabled or not applicable,
1 : PIP is enabled,
Default setting : 0.

OP51: HOTEL_MODE

0 : Hotel mode is disabled or not applicable,
1 : Hotel mode is enabled,
Default setting : 0.

OP52: SVHS

0 : SVHS source is not available,
1 : SVHS source is available,
Default setting : 0.
Note: This option bit is not applicable for EU.

OP53: CVI

0 : CVI source is not available,
1 : CVI source is available,
Default setting : 0.

OP54: AV3

0 : Side/Front AV3 source is not present,
1 : Side/Front AV3 source is present,
Default setting : 0.

OP55: AV2

0 : 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: AV1

0 : AV1 source is not present,
1 : AV1 source is present,
Default setting : 0.

OP57: NTSC_PLAYBACK

0 : NTSC playback feature is not available,
1 : NTSC playback feature is available,
Default setting : 0.

OP60: Reserved

Default setting : 0.

OP61: SMART_TEXT

0 : 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_LOCK

0 : 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: VCHIP

0 : VCHIP feature is disabled,

1 : VCHIP feature is enabled,
Default setting : 1.

OP64: WAKEUP_CLOCK

0 : Wake up clock feature is disabled or not applicable,

1 : Wake up clock feature is enabled,
Default setting : 1.

OP65: SMART_CLOCK

0 : 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_SURF

0 : Smart Surf feature is disabled or not applicable,

1 : Smart Surf feature is enabled,
Default setting : 0.

OP67: PERSONAL_ZAPPING

0 : Personal Zapping feature is disabled or not applicable,

1 : Personal Zapping feature is enabled,
Default setting : 0.

OP70: MULTI_STANDARD_EUR

0 : 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_EU

0 : 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_WIN2

00 : 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.

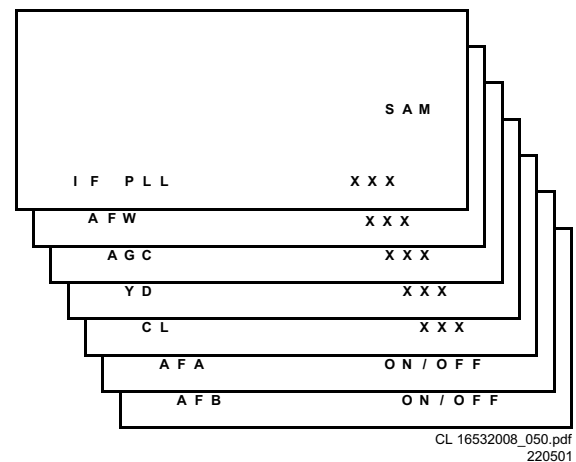


Figure 8-6

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 61.25 MHz (channel 3). 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.
5. Adjust the AGC-value (default value is 27) with the LEFT/RIGHT cursor keys until the voltage at pin 1 of the tuner lies between 3.8 and 2.3 V.
6. Select AFW with the UP/DOWN cursor keys and set to OFF.
7. 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

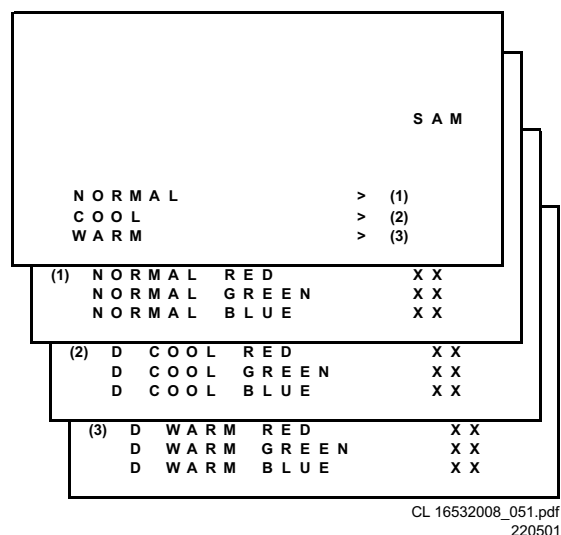


Figure 8-7

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.

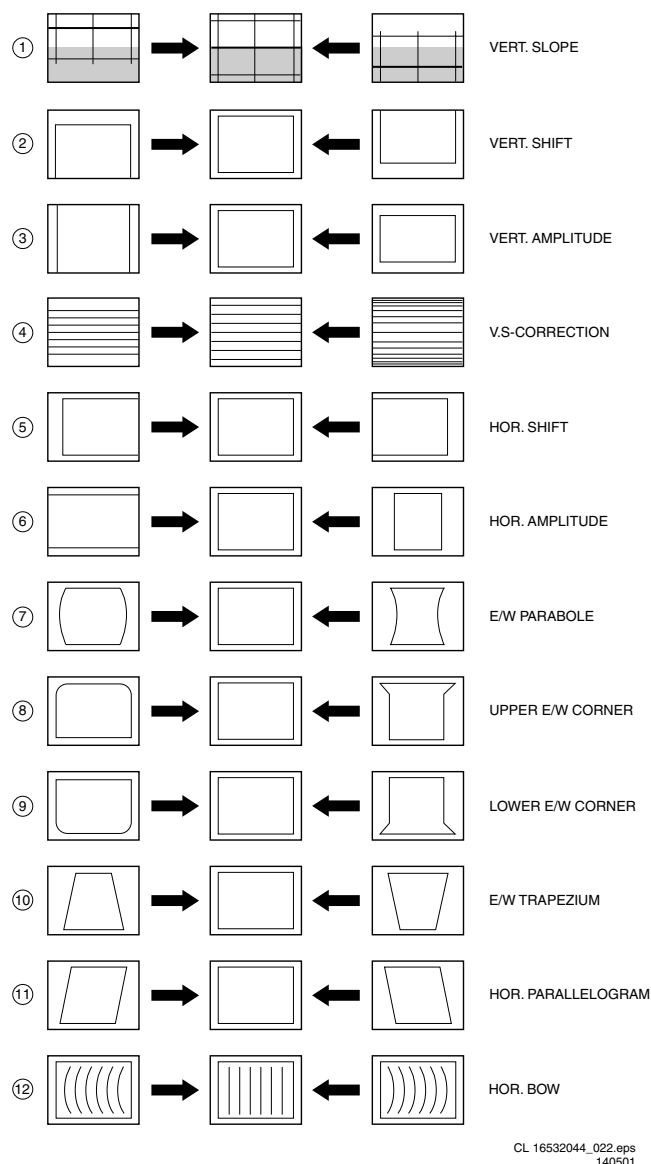


Figure 8-8

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 61.25 MHz (channel 3).

- 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.
- East West Width (EWW)** Align the picture width until the complete test pattern is visible.
- East West Parabola (EWP)** Align straight vertical lines at the sides of the screen.
- Upper Corner Parabola (UCP)** Align straight vertical lines in the upper corners of the screen.

- **Lower Corner Parabola (LCP)** Align straight vertical lines in the lower corners of the screen.
- **East West Trapezium (EWT)** Align straight vertical lines in the middle of the screen.

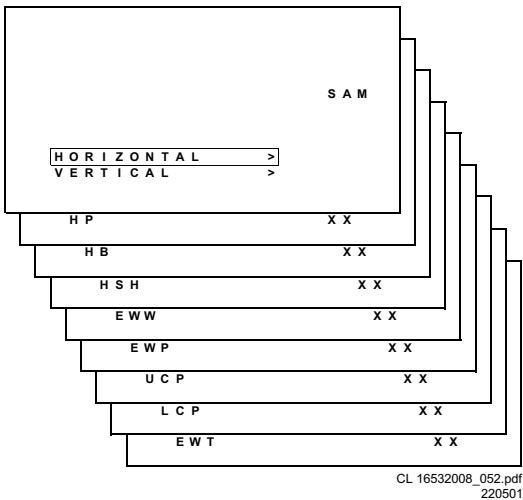


Figure 8-9

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.
- **Vertical Zoom (VX)** The vertical zoom is added for the purpose of development. It helps the designer to set a proper values for the movie expand or movie(16x9) compress. Default value is 25.
- **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).

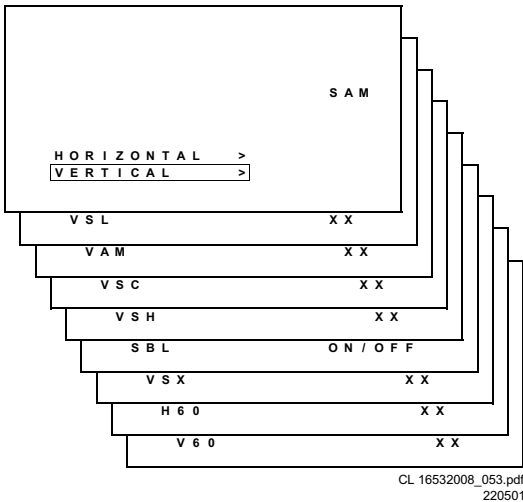


Figure 8-10

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

DEFAULT GEOMETRY VALUES (L01 Large Screen AP)					
Alignment	Description	21" 4:3	25" 4:3	29" 4:3	34" 4:3
HP	Hor. Parallelogram	35	22	31	31
HB	Hor. Bow	31	31	31	31
HSH	Hor. Shift	30	27	35	35
EWV	East West Width	37	36	34	34
EWV	East West Parabola	22	27	33	33
UCP	Upper Corner Parabola	43	43	35	35
LCP	Lower Corner Parabola	43	43	35	35
EWT	East West Trapezium	27	27	35	35
VSL	Vert. Slope	41	28	33	33
VAM	Vert. Amplitude	9	26	26	26
VSC	Vert. S-correction	32	23	23	23
VSH	Vert. Shift	28	35	31	31
VX	Vert. Zoom	25	25	25	25
H60	Hor. Shift offset (60 Hz)	9	9	9	9
V60	Vert. Shift offset (60 Hz)	32	32	32	32

CL 16532008_068.pdf
130601

Figure 8-11

8.3.5 Audio

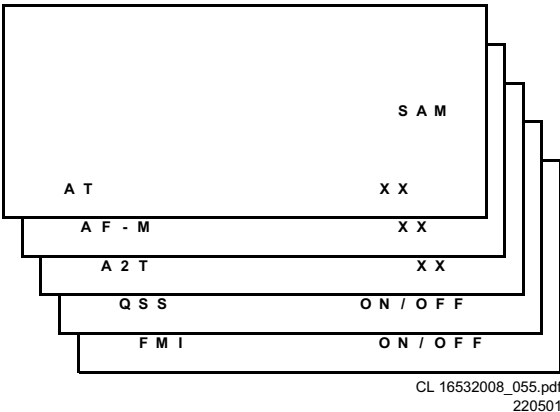


Figure 8-12

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 chassis is a global TV chassis for the model year 2001 and is used for TV sets with screen sizes from 14" to 21" (small screen) and 21" - 34" (large screen), in Super Flat and Real Flat executions.

The standard architecture consists of a Main panel, a Picture Tube panel, a Side I/O panel and a Top Control panel. In some executions, a Picture In Picture (PIP) panel is used. The Main panel consists primarily of conventional components with hardly any surface mounted devices.

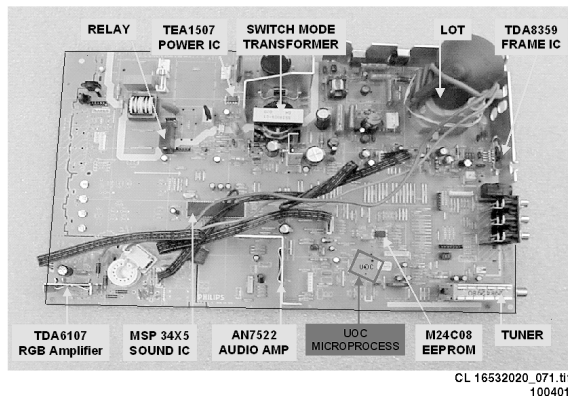


Figure 9-1

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 LSP.

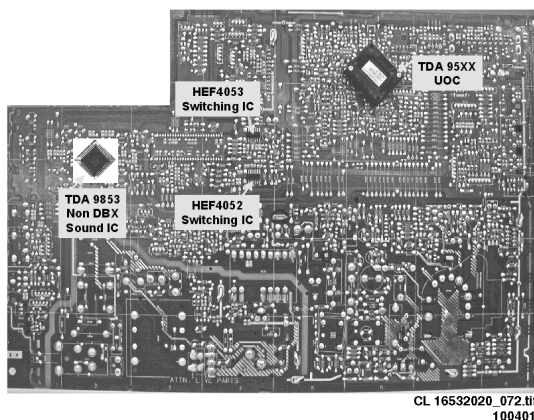


Figure 9-2

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 (or 125) 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 Inter-carrier demodulation), to the audio demodulator part of the UOC IC7200. The stereo audio output on pin 33 goes, via TS7201, 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 from 7901 is then sent to the speaker/headphone output panel.

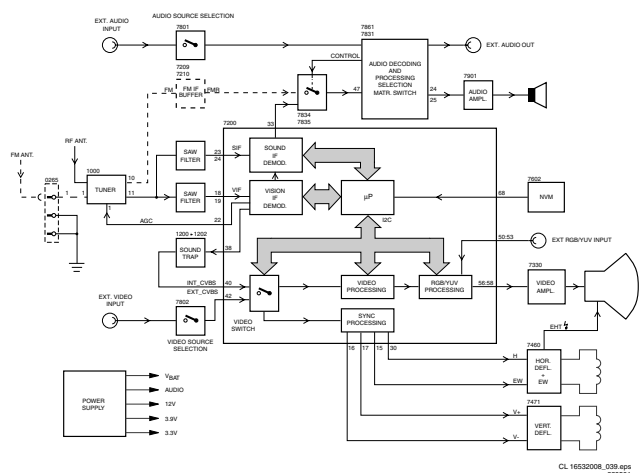


Figure 9-3

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 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 from IC7902 is then sent to the speaker/headphone output panel.

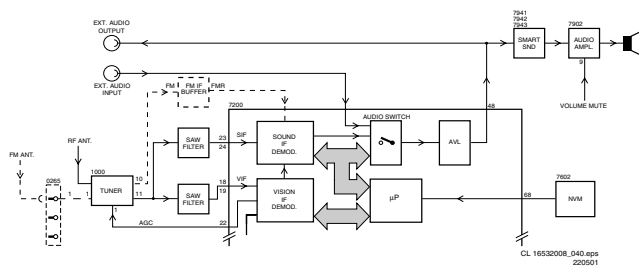


Figure 9-4 .eps

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 exit 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

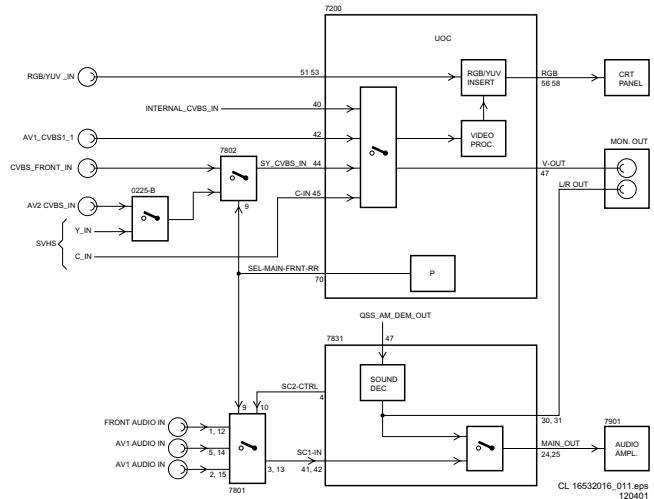


Figure 9-5

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 μ A are generated to adjust the cut off voltage. During the second frame, three pulses with a current of 20 μ A 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 integrated output amplifier (7330) on the CRT panel. Via the outputs 7, 8 and 9 the picture tube cathodes are driven.

The supply voltage for the amplifier is +200 V and is derived from the line output stage.

9.3.8 SCAVEM (if present)

The SCAN VELOCITY Modulation (SCAVEM) circuitry is implemented in the layout of the picture tube panel. It is thus not an extra module. This circuit influences the horizontal deflection as a function of the picture content. In an ideal square wave, the sides are limited in slope due to a limited bandwidth (5 MHz).

SCAVEM will improve the slope as follows:

At a positive slope, a SCAVEM current is generated which supports the deflection current. At the first half of the slope, the spot is accelerated and the picture is darker. At the second half of the slope, the spot is delayed and the slope becomes steeper.

At the end of the slope, the SCAVEM-current decays to zero and the spot is at the original position. An overshoot occurs which improves the impression of sharpness.

At the negative slope, the SCAVEM-current counteracts the deflection. During the first half of the slope, the spot is delayed and the slope becomes steeper. During the second half the spot accelerates, the SCAVEM-current is zero at the end of the slope.

Via the three resistors R3371, R3379 and R3386, Red, Green and Blue are added together, buffered and offered to the emitter of TS7363. On the collector of this transistor, configured in a common base, the sum of these 3 signals is obtained. Via the emitter follower formed with TS7360, this signal is conveyed to the differentiator C2376 and R3392. Only the high frequencies are differentiated (small RC-time). The positive and negative pulses of this signal drive respectively TS7365 and TS7362 into conductivity. The DC setting of the output stage is set by R3363, R3374, R3378 and R3384. The working voltage of the transistors is settled at half the supply voltage.

At the positive section of the pulse, the current flows through TS7365 and the SCAVEM coil. At the negative section of the pulse, the current flows through TS7362 and the SCAVEM coil.

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 TS7462 cannot switch 'on' during the flyback time.

The 'EWdrive' signal for the E/W circuit (if present) is available on pin 15, where it drives transistor 7400 to make linearity corrections in the horizontal drive.

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 6447 and fed to the emitter of transistor TS7443. If this voltage goes above 6.8 V, TS7443 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 TS7462, the horizontal driver transistor. The signal is amplified and coupled to the base circuit of TS7460, 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.

During the insertion of RGB signals, the maximum vertical frequency is increased to 72 Hz so that the circuit can also synchronise on signals with a higher vertical frequency like VGA.

To avoid damage of the picture tube when the vertical deflection fails, the 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 1 and 2 of IC7471 (full bridge vertical deflection amplifier). These are voltage driven differential inputs. As the

driver device (IC7200) delivers output currents, R3474 and R3475 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 pins 4 and 7 where they drive the vertical deflection coil (connector 0222) in phase opposition.

IC7471 is supplied by +13 V. The vertical flyback voltage is determined by an external supply voltage at pin 6 (VlotAux+50V). This voltage is almost totally available as flyback voltage across the coil, this being possible due to the absence of a coupling capacitor (which is not necessary, due to the 'bridge' configuration).

9.5.3 Deflection Corrections

The Linearity Correction

A constant voltage on the horizontal deflection coil should result in a sawtooth current. This however is not the case as the resistance of the coil is not negligible. In order to compensate for this resistance, a pre-magnetised coil L5457 is used. R3485 and C2459 ensure that L5457 does not excite, because of its own parasite capacitance. This L5457 is called the 'linearity coil'.

The Mannheim Effect

When clear white lines are displayed, the high-voltage circuit is heavily loaded. During the first half of the flyback, the high voltage capacitors are considerably charged. At that point in time, the deflection coil excites through C2465. This current peak, through the high-voltage capacitor, distorts the flyback pulse. This causes synchronisation errors, causing an oscillation under the white line.

During $t_3 - t_5$, C2490//2458 is charged via R3459. At the moment of the flyback, C2490//2458 is subjected to the negative voltage pulses of the parabola as a result of which D6465 and D6466 are conducting and C2490//2458 is switched in parallel with C2456//2457. This is the moment the high-voltage diodes are conducting. Now extra energy is available for excitation through C2465 and the line deflection. As a consequence, the flyback pulse is less distorted.

The S-Correction

Since the sides of the picture are further away from the point of deflection than from the centre, a linear sawtooth current would result in a non-linear image being scanned (the centre would be scanned slower than the sides). For the centre-horizontal line, the difference in relation of the distances is larger than those for the top and bottom lines. An S-shaped current will have to be superimposed onto the sawtooth current. This correction is called finger-length correction or S-correction.

C2456//2457 is relatively small, as a result of which the sawtooth current will generate a parabolic voltage with negative voltage peaks. Left and right, the voltage across the deflection coil decreases, and the deflection will slow down; in the centre, the voltage increases and deflection is faster. The larger the picture width, the higher the deflection current through C2456//2457. The current also results in a parabolic voltage across C2484//2469, resulting in the finger length correction proportionally increasing with the picture width. The east/west drive signal will ensure the largest picture width in the centre of the frame. Here the largest correction is applied.

East/West Correction

In the L01, there are three types of CRTs, namely the 100°, 110° and wide screen CRTs. The 100° CRT is raster-correction-free and does not need East/West correction. The 110° 4:3 CRT comes with East/West correction and East/West protection.

The wide screen TV sets have all the correction of the 110° 4:3 CRT and also have additional picture format like the 4:3

format, 16:9, 14:9, 16:9 zoom, subtitle zoom and the Super-Wide picture format

A line, written at the upper- or lower side of the screen, will be larger at the screen centre when a fixed deflection current is used. Therefore, the amplitude of the deflection current must be increased when the spot approaches the centre of the screen. This is called the East/West or pincushion correction.

The 'Ewdrive' signal from pin 15 of IC7200 takes care for the correct correction. It drives FET TS7400. It also corrects breathing of the picture, due to beam current variations (the EHT varies dependent of the beam current). This correction is derived from the 'EHTinformation' line.

Two protections are built-in for the E/W circuit: over-current and over-voltage protection. See paragraph Power Supply.

Panorama (if present)

The panorama function is only used in 16:9 sets. This is a function to enable the 4:3 and Super-Wide feature. It drives the 'Bass_panorama' line, to activate relay 1400. When this relay is switched on, the capacitors 2453//2454 are added in parallel to the default S-correction capacitors 2456//2457. This results in an increased capacitance, a lower resonance frequency of the line deflection coil and the S-correction capacitors and therefore a less steep S-corrected line deflection current.

9.5.4 Rotation (if present)

To cope with the different earth magnetism situations in the world, a rotation coil is added. This coil is controlled by the rotation circuitry (see diagram A15).

The amount of frame rotation is user controlled via the the PWM output (pin 77) of the UOC.

With the tilt setting at '-10', the PWM duty cycle is 0.1 (leftmost tuning).

With the setting at '+10', the duty cycle is 0.9 (rightmost tuning).

The output of amplifier IC7171 is a DC-voltage in the range from 0 (user setting = -10), via 6 V (user setting = 0) to 12 V (user setting = +10).

9.6 Power Supply

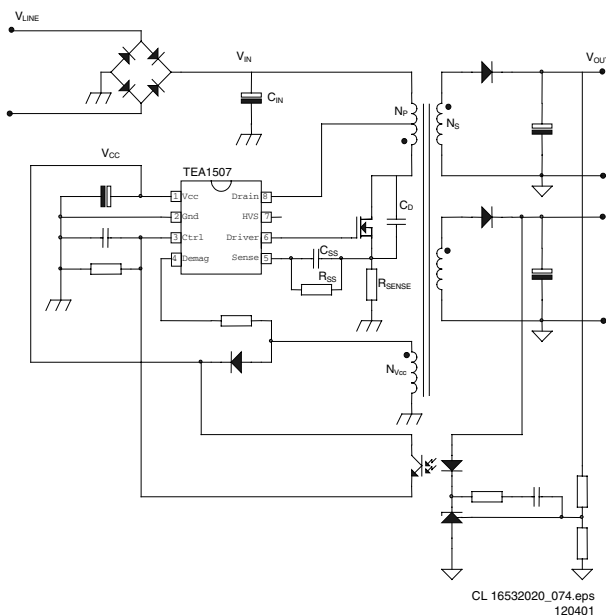


Figure 9-6

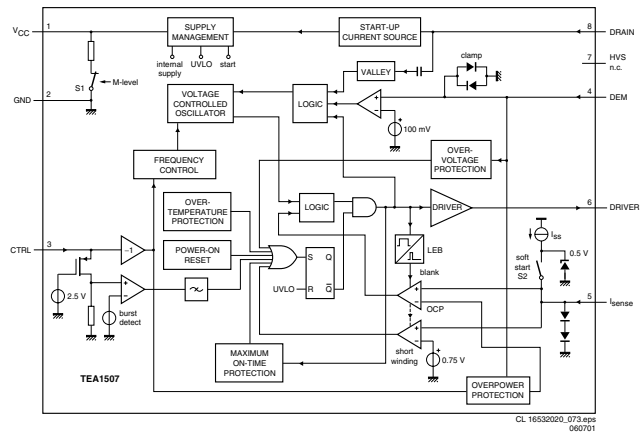


Figure 9-7

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 IC7520 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 IC7200 on pins 11 and 34.

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

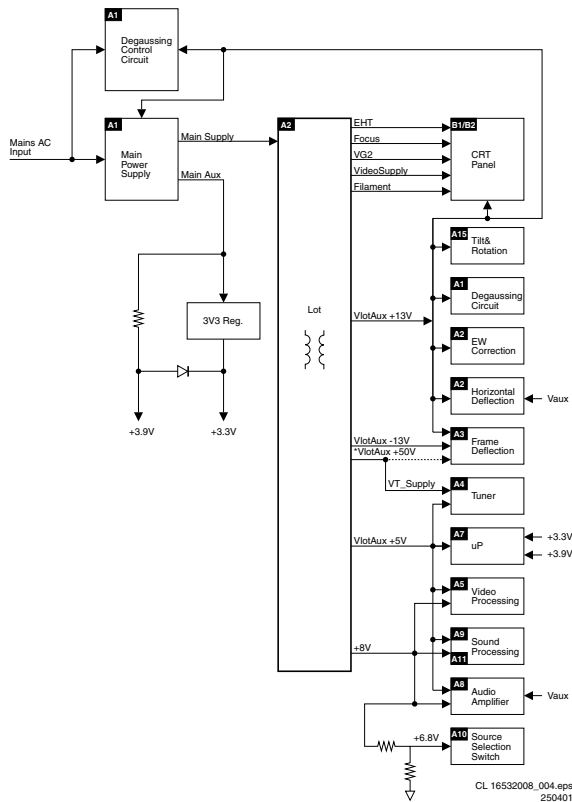


Figure 9-8

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

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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).

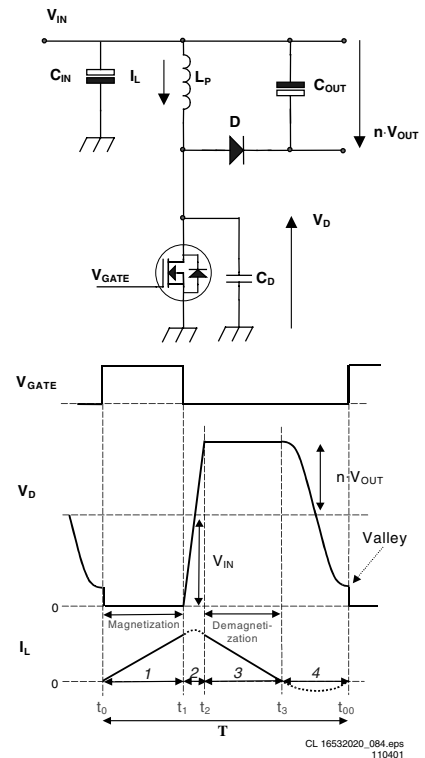


Figure 9-10

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.

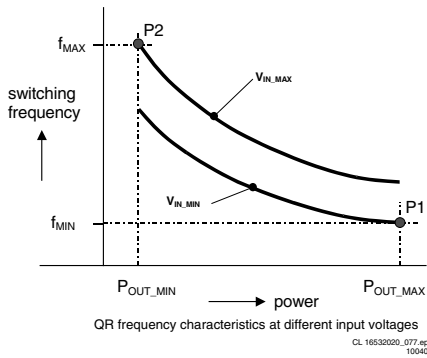


Figure 9-11

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.

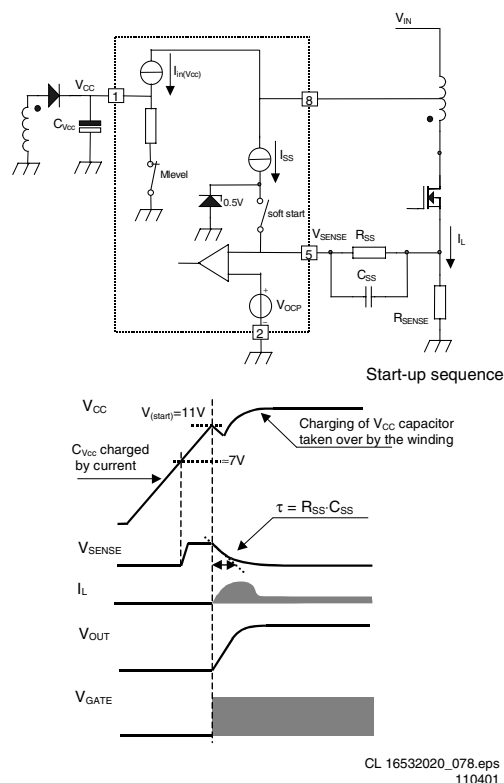


Figure 9-12

The moment that the voltage on pin 1 drops below the 'under voltage lock out' level ($UVLO = \pm 9 \text{ V}$), 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 < 1.425V, the oscillator will run on maximum frequency $f_{\text{osch}} = 175 \text{ kHz}$ 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.

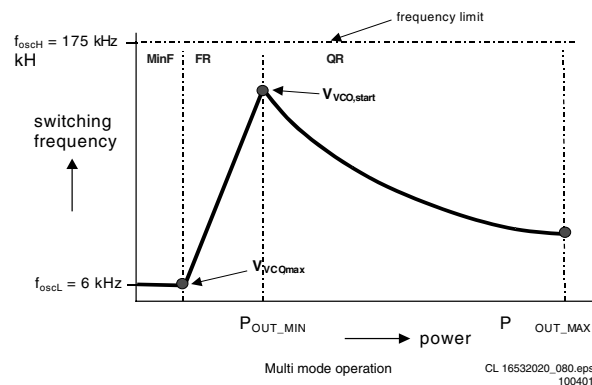


Figure 9-13

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.

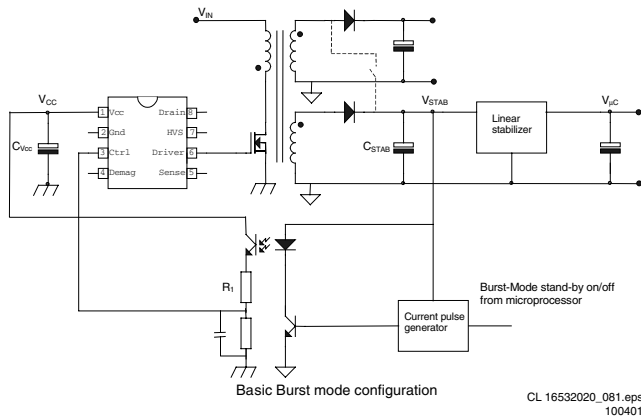


Figure 9-14

The system enters burst mode standby when the microprocessor activates the 'Stdby_con' line. When this line is pulled high, the base of TS7541 is allowed to go high. This is triggered by the current from collector TS7542. When TS7541 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 'Stdby_con' signal low again. The base of TS7541 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 should 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.

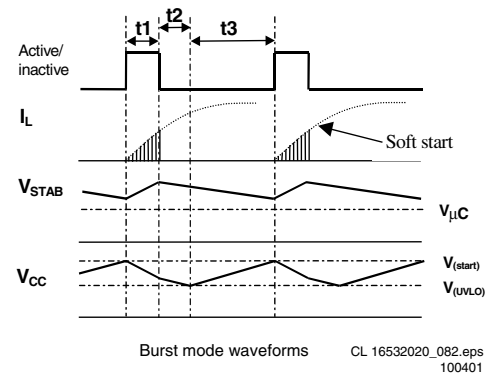


Figure 9-15

9.6.3 Protection Events

The SMPS IC7520 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 (V_{demag}) 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.

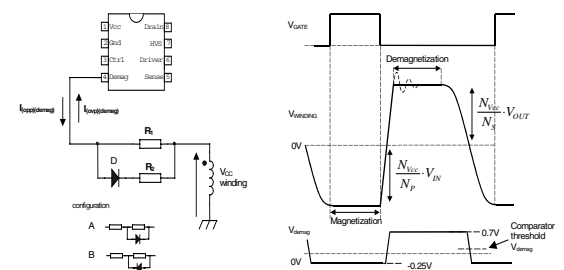


Figure 9-16

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 ($UVLO = \pm 9$ 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 I_{SENSE} .

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

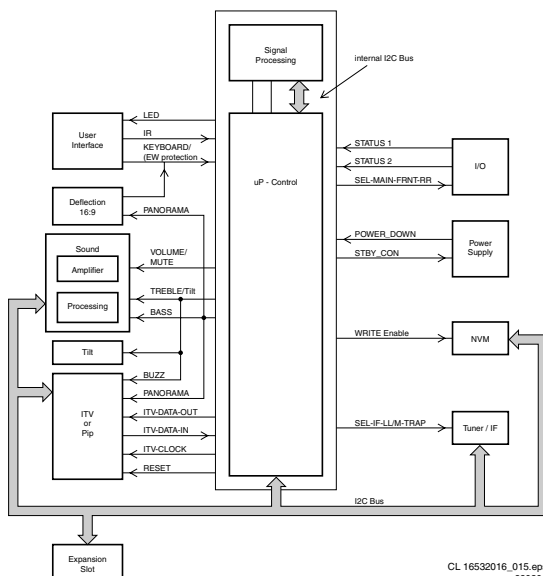


Figure 9-17

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 μP . 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 'KEYBOARD_protn' line, also serves to detect faults in the E/W circuit, which would require the μP to shut down the set (by forcing the power supply in standby mode).

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. For other set executions (e.g. stereo, widescreen), they have another functionality:

- The 'Bass_panorama' line is used to switch the panorama mode in widescreen sets (to fit 4:3 pictures into a 16:9 display, it is possible to apply a panoramic horizontal distortion, to make a screen-fitting picture without black sidebars or lost video).
- The 'Treble_Buzzer_Hosp_app' is used in ITV applications for other features, and in widescreen sets to enable the 'Tilt' feature (via R3172 on diagram A8) in the deflection part.

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

10. Spare Parts List

[A] Monocarrier (LSP)

Various

0127▲	4822 265 11253	FUSE HOLDER 2P
0129	3139 120 10151	NTC HOLDER
0136	4822 492 70788	FIX IC
0137	4822 492 70289	
0138	4822 492 70788	FIX IC
0211	2422 025 16268	CON H 2P
0211	4822 265 20723	B2P3-VH
0212	2422 025 16268	CON H 2P
0212	4822 267 10774	CON 2P MALE (red)
0214	2422 025 06353	CON H 5P
0214	4822 267 10734	CON B5B-EH-A
0219	2422 025 12482	CON V 6P
0220	4822 265 30735	CON 5P
0221	4822 267 10966	CON 2P
0222	2422 025 10646	CON V 2
0223	2422 026 05186	CINCH 9P
0223	2422 026 05236	CINCH YUV 9P
0225	2422 026 04926	Sck MDIN 4P
0231▲	2422 128 02972	powerwitch
0232▲	4822 267 31014	HPocket
0243	2422 025 04854	CON V 6P
0254	2422 025 06353	CON H 5P
0255	4822 267 10567	CON 4P
0267	4822 267 10735	CON B3B-EH-A
0269	2422 026 05182	CINCH 3P
0280	4822 267 10565	CON 4P
1000▲	2422 542 90111	Tuner IEC BGDK
1000▲	3139 147 16481	Tuner UV1356A/AIG-3
1002	2422 549 44722	Saw fit 38MHz9
		OFWK7257M
1004	2422 549 44719	Saw fit 38MHz9
		OFWK9362M
1200	4822 242 81572	TPS6,0MB-TF21
1500▲	2422 086 10914	Fuse ET 4A
1515▲	2422 132 07444	Relay
1600	4822 276 13775	Switch
1601	4822 276 13775	Switch
1602	4822 276 13775	Switch
1603	4822 276 13775	Switch
1660	2422 543 01203	Res X-tal 12MHz
1831	4822 242 10769	18.432MHz

-II-

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	63V 22nF
2101	4822 126 13482	470nF 20% 16V
2102	5322 122 32658	22pF 5% 50V
2103	5322 122 31863	63V 330pF
2104	5322 122 31863	63V 330pF
2105	4822 124 40248	10µF 20% 63V
2106	4822 124 40248	10µF 20% 63V
2111	5322 122 32658	22pF 5% 50V
2112	5322 122 32658	22pF 5% 50V
2113	5322 122 32658	22pF 5% 50V
2121	5322 122 32658	22pF 5% 50V
2122	5322 122 31863	63V 330pF
2123	4822 126 14491	2.2µF 10V
2124	5322 122 31863	63V 330pF
2125	4822 126 14491	2.2µF 10V
2131	5322 122 31863	63V 330pF
2132	4822 126 14491	2.2µF 10V
2133	5322 122 31863	63V 330pF
2134	4822 126 14491	2.2µF 10V
2135	5322 122 32658	22pF 5% 50V
2136	5322 122 32658	22pF 5% 50V
2141	5322 122 31863	63V 330pF
2142	4822 124 41407	0.47µF 20% 63V
2176	5322 122 32311	470pF 10% 100V
2177	4822 124 40207	100µF 20% 25V
2178	5322 122 32311	470pF 10% 100V
2179	4822 124 40207	100µF 20% 25V
2181	5322 122 32658	22pF 5% 50V
2184	4822 126 14491	2.2µF 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	220nF 25V.

2208	4822 126 14585	100nF 10% 50V
2209	4822 124 40769	4.7µF 20% 100V
2210	4822 124 21913	1µF 20% 63V
2211	4822 126 13482	470nF 16V
2213	5322 122 32654	63V 22nF
2214	5322 122 32654	63V 22nF
2215	5322 122 32654	63V 22nF
2216	4822 124 81144	1000µF 16V
2217	5322 122 32654	63V 22nF
2219	4822 126 14076	220nF 25V.
2220	4822 121 51252	470nF 5% 63V
2221	5322 122 32654	63V 22nF
2230	4822 124 40769	4.7µF 20% 100V
2241	4822 126 13344	1.5nF 5% 63V
2242	4822 126 14043	1µF 20% 16V
2243	4822 122 33127	2.2nF 10% 63V
2244	5322 121 42386	100nF 5% 63V
2245	4822 126 14076	220nF 25V.
2247	4822 124 81144	1000µF 16V
2248	5322 122 32654	63V 22nF
2249	5322 122 32654	63V 22nF
2250	4822 124 22652	2.2µF 20% 50V
2252	5322 126 10511	1nF 5% 50V
2253	5322 126 10511	1nF 5% 50V
2254	4822 051 20008	jumper
2401	5322 124 41379	2.2µF 20% 50V
2402▲	4822 122 31177	470pF 10% 500V
2404	4822 124 41751	47µF 20% 50V
2405	5322 126 10511	1nF 5% 50V
2441	4822 124 21913	1µF 20% 63V
2443	4822 126 13751	47nF 10% 63V
2444	4822 124 21913	1µF 20% 63V
2450	4822 124 11575	47µF 20% 160V
2455	4822 124 40433	47µF 20% 25V
2457▲	4822 121 10518	250V 390nF 5%
2457▲	4822 121 43888	360nF 5% 250V
2458	4822 124 12438	2.2µF 20% 100V
2459▲	4822 126 13185	680pF 10% 500V
2460	5322 122 32531	100pF 5% 50V
2463▲	4822 126 11503	820pF 10% 2KV
2463▲	4822 126 13451	2.2nF 10% 2KV
2463▲	4822 126 13862	1.5nF 10% 2KV
2464	4822 121 10739	2.2µF 5% 160V
2465▲	2222 375 24153	1KV 15nF
2465▲	2222 375 90157	1K6V 13nF
2467	2222 347 90219	400V 15nF
2467	4822 121 40488	22nF 10% 400V
2467	5322 121 44151	33nF 10% 400V
2468	2222 347 90219	POL 347 400V 15nF
2468	5322 121 42532	18nF 10% 400V
2471	5322 121 42386	100nF 5% 63V
2472	4822 121 41854	150nF 5% 63V
2473	5322 121 42386	100nF 5% 63V
2474	4822 122 33127	2.2nF 10% 63V
2475	4822 122 33127	2.2nF 10% 63V
2476	5322 126 10223	4.7nF 10% 63V
2480	5322 121 10472	47µF
2481▲	4822 122 31177	470pF 10% 500V
2482	2222 479 90051	250V 120nF
2482	4822 121 40482	68nF 10% 250V
2485	4822 124 12265	4.7µF 20% 250V
2486	2020 021 91577	16V 470µF
2487	4822 124 80604	47µF 20% 50V
2488	4822 124 81145	16V 1000µF
2489	2020 021 91577	16V 470µF A
2491	4822 122 31175	1nF 10% 500V
2500▲	4822 126 13589	470pF 275V
2501▲	4822 126 14153	2.2nF 10%B 1KV
2502▲	4822 126 14153	2.2nF 10%B 1KV
2503	4822 124 12415	220µF 20% 400V
2503	4822 124 42159	330µF 20% 400V
2505▲	4822 126 14153	2.2nF 10%B 1KV
2507	5322 122 34099	470pF 10% 63V
2508	4822 122 50116	470pF 10% 1KV
2509	4822 121 10711	100nF 20% 275V
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	4822 126 13482	470nF 16V
2527	4822 122 33127	2.2nF 10% 63V
2528	5322 122 31647	1nF 10% 63V
2540	4822 122 33177	10nF 20% 50V
2560	4822 126 14152	680pF 10% 1KV
2561	2020 021 91496	160V100µF
2562	5322 122 32331	1nF 10% 100V

2563	5322 121 42386	100nF 5% 63V
2564	2020 012 93057	16V 2200µF
2566	4822 124 23432	100µF 20% 10V
2567	4822 124 40433	47µF 20% 25V
2568	4822 124 21913	1µF 20% 63V
2580	4822 124 81286	47µF 20% 16V
2581	4822 124 81151	22µF 50V
2601	4822 126 14076	220nF 25V.
2602	5322 122 32531	100pF 5% 50V
2606	5322 126 10511	1nF 5% 50V
2607	5322 122 32659	33pF 5% 50V
2608	4822 126 14043	1µF 20% 16V
2609	5322 122 32659	33pF 5% 50V
2611	4822 126 14043	1µF 20% 16V
2612	4822 126 13694	68pF 1% 63V
2613	4822 126 13694	68pF 1% 63V
2615	5322 126 10511	1nF 5% 50V
2618	4822 126 14043	1µF 20% 16V
2619	4822 126 14043	1µF 20% 16V
2691	4822 124 40248	10µF 20% 63V
2698	5322 121 42386	100nF 5% 63V
2801	4822 124 81151	22µF 50V
2802	4822 126 14076	220nF 25V.
2803	4822 126 14491	2.2µF 10V
2804	4822 126 14491	2.2µF 10V
2805	4822 126 14491	2.2µF 10V
2831	5322 122 32447	1pF 5% 63V
2832	5322 122 32447	1pF 5% 63V
2833	4822 126 13692	47pF 1% 63V
2834	5322 122 32268	63V 470P
2835	4822 122 33575	220pF 5% 63V
2836	4822 126 13344	1.5nF 5% 63V
2837	4822 124 40769	4.7µF 20% 100V
2840	4822 126 14585	100nF 10% 50V
2841	4822 124 40248	10µF 20% 63V
2842	4822 126 14585	100nF 10% 50V
2843	4822 124 40248	10µF 20% 63V
2844	4822 124 40248	10µF 20% 63V
2845	4822 126 14585	100nF 10% 50V
2846	4822 124 40207	100µF 20% 25V
2849	5322 126 10511	1nF 5% 50V
2850	5322 126 10511	1nF 5% 50V
2851	2020 552 96305	4U7 20% 10V
2852	5322 126 10511	1nF 5% 50V
2853	2020 552 96305	4U7 20% 10V
2854	5322 126 10511	1nF 5% 50V
2855	4822 122 30045	27pF 2% 100V
2856	4822 126 13486	15pF 2% 63V
2857	5322 122 33538	150pF 2% 63V
2860	4822 126 13693	56pF 1% 63V
2894	4822 122 33575	220pF 5% 63V
2895	5322 116 80853	560pF 5% 63V
2897	4822 122 33172	390pF 5% 50V
2898	4822 122 33177	10nF 20% 50V
2902	4822 124 11767	470µF 20% 25V
2903	4822 124 21913	1µF 20% 63V
2904	4822 126 13482	470nF 16V
2905	5322 122 31647	1nF 10% 63V
2906	4822 126 13482	470nF 16V
2907	5322 122 31647	1nF 10% 63V
2908	4822 124 40248	10µF 20% 63V
2910	4822 122 33891	3.3nF 10% 63V
2911	4822 122 33891	3.3nF 10% 63V
2981	4822 124 40248	10µF 20% 63V
2982	5322 122 32268	63V 470P
2983	4822 124 40248	10µF 20% 63V
2984	5322 122 32268	63V 470P

□

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	1k5 1% 0.1W
3004	4822 051 20822	8k2 5% 0.1W
3005	4822 116 52175	100Ω 5% 0.5W
3006	4822 117 11449	2k2 5% 0.1W
3007	4822 117 11507	6k8 1% 0.1W
3008	4822 117 11449	2k2 5% 0.1W
3101	4822 116 52199	68Ω 5% 0.5W
3102	4822 051 10102	1k 2% 0.25W
3103	4822 116 83868	150Ω 5% 0.5W
3104	3198 021 52240	220k
3105	4822 116 83868	150Ω 5% 0.5W
3106	3198 021 52240	220k
3111	4822 116 52201	75Ω 5% 0.5W
3112	4822 116 52175	100Ω 5% 0.5W
3113	4822 116 52201	75Ω 5% 0.5W
3114	4822 116 52175	100Ω 5% 0.5W

3115	4822 116 52201	75Ω 5% 0.5W	3465	4822 050 22703	27k 1% 0.6W	3627	4822 051 20472	4k7 5% 0.1W
3116	4822 116 52175	100Ω 5% 0.5W	3468	4822 116 52175	100Ω 5% 0.5W	3628	4822 117 10833	10k 1% 0.1W
3121	4822 116 52201	75Ω 5% 0.5W	3468	4822 116 52213	180Ω 5% 0.5W	3630	4822 117 11449	2k2 5% 0.1W
3122	4822 116 52175	100Ω 5% 0.5W	3469	4822 116 52269	3k3 5% 0.5W	3632	4822 051 20008	jumper (0805)
3123	4822 116 83868	150Ω 5% 0.5W	3470	4822 051 20334	330k 5% 0.1W	3634	4822 116 52175	100Ω 5% 0.5W
3124	4822 117 10834	47k 1% 0.1W	3470	4822 051 20474	470k 5% 0.1W	3635	4822 116 52175	100Ω 5% 0.5W
3125	4822 116 83868	150Ω 5% 0.5W	3471	4822 050 23308	3Q3 1% 0.6W	3636	4822 117 11373	100Ω 1%
3126	4822 117 10834	47k 1% 0.1W	3471	4822 050 23908	3Q9 1% 0.6W	3681	4822 051 20391	390Ω 5% 0.1W
3131	4822 116 83868	150Ω 5% 0.5W	3472	4822 050 23308	3Q3 1% 0.6W	3681	4822 116 83881	390Ω 5% 0.5W
3132	4822 117 10834	47k 1% 0.1W	3472	4822 050 23908	3Q9 1% 0.6W	3682	4822 051 20332	3k3 5% 0.1W
3133	4822 116 83868	150Ω 5% 0.5W	3473	4822 050 22208	2Q2 1% 0.6W	3682	4822 116 52269	3k3 5% 0.5W
3134	4822 117 10834	47k 1% 0.1W	3473	4822 050 23308	3Q3 1% 0.6W	3683	4822 051 20391	390Ω 5% 0.1W
3135	4822 116 52201	75Ω 5% 0.5W	3474	4822 050 22202	2k2 1% 0.6W	3683	4822 116 83881	390Ω 5% 0.5W
3136	4822 116 52175	100Ω 5% 0.5W	3475	4822 050 22202	2k2 1% 0.6W	3684	4822 051 20561	560Ω 5% 0.1W
3137	4822 116 52201	75Ω 5% 0.5W	3477	4822 116 83868	150Ω 5% 0.5W	3684	4822 116 52226	560Ω 5% 0.5W
3138	4822 116 52175	100Ω 5% 0.5W	3478	4822 116 83868	150Ω 5% 0.5W	3685	4822 051 20561	560Ω 5% 0.1W
3141	4822 050 11002	1k 1% 0.4W	3479	4822 117 12955	2k7 1% 0.1W	3685	4822 116 52226	560Ω 5% 0.5W
3154	4822 116 52289	5k6 5% 0.5W	3480	4822 116 80676	1Q5 5% 0.5W	3686	4822 116 52243	1k5 5% 0.5W
3156	4822 050 21003	10k 1% 0.6W	3481▲	4822 050 21003	10k 1% 0.6W	3686	4822 117 11139	1k5 1% 0.1W
3156	4822 116 52206	120Ω 5% 0.5W	3481▲	4822 050 21203	12k 1% 0.6W	3691	4822 116 52219	330Ω 5% 0.5W
3157	4822 051 10102	1k 2% 0.25W	3481▲	4822 050 21503	15k 1% 0.6W	3691	4822 117 13577	330Ω 1% 1.25W
3157	4822 116 52206	120Ω 5% 0.5W	3482▲	4822 050 21503	15k 1% 0.6W	3693	4822 116 83872	220Ω 5% 0.5W
3159	2120 108 92616	6Ω 1k2	3482▲	4822 050 28202	8k2 1% 0.6W	3693	4822 117 11503	220Ω 1% 0.1W
3200	4822 116 83881	390Ω 5% 0.5W	3484	4822 116 52276	3k9 5% 0.5W	3694	4822 051 20472	4k7 5% 0.1W
3201	4822 116 52175	100Ω 5% 0.5W	3488▲	4822 052 11478	4Q7 5% 0.5W	3801	4822 116 83872	220Ω 5% 0.5W
3202	4822 116 52175	100Ω 5% 0.5W	3490	4822 116 52303	8k2 5% 0.5W	3802	4822 050 11002	1k 1% 0.4W
3203	4822 116 52175	100Ω 5% 0.5W	3491	4822 050 21003	10k 1% 0.6W	3803	4822 117 10837	100k 1% 0.1W
3204	4822 050 21003	10k 1% 0.6W	3492	4822 050 11002	1k 1% 0.4W	3804	4822 117 11149	82k 1% 0.1W
3205	4822 051 10102	1k 2% 0.25W	3492	4822 116 83883	470Ω 5% 0.5W	3805	4822 051 10102	1k 2% 0.25W
3206	4822 051 20333	33k 5% 0.1W	3493▲	4822 052 10688	6Q8 5% 0.33W	3806	4822 117 10837	100k 1% 0.1W
3207	4822 050 11002	1k 1% 0.4W	3494▲	4822 052 11478	4Q7 5% 0.5W	3807	4822 117 11149	82k 1% 0.1W
3208	4822 051 20391	390Ω 5% 0.1W	3495	4822 051 20223	22k 5% 0.1W	3808	4822 050 11002	1k 1% 0.4W
3209	4822 117 11373	100Ω 1%	3496	4822 117 10837	100k 1% 0.1W	3831	4822 117 10834	47k 1% 0.1W
3212	4822 051 20471	470Ω 5% 0.1W	3497	4822 117 10837	100k 1% 0.1W	3832	4822 116 52175	100Ω 5% 0.5W
3213	4822 116 52226	560Ω 5% 0.5W	3498	4822 117 11383	12k 1% 0.1W	3833	4822 116 52175	100Ω 5% 0.5W
3217	4822 051 20334	330k 5% 0.1W	3500▲	4822 053 21335	3M3 5% 0.5W	3836	4822 050 11002	1k 1% 0.4W
3218	4822 117 11149	82k 1% 0.1W	3501▲	4822 053 21335	3M3 5% 0.5W	3837	4822 116 52175	100Ω 5% 0.5W
3219	4822 117 11449	2k2 5% 0.1W	3504▲	4822 116 10105	9Ω 220V PTC	3838	4822 051 10102	1k 2% 0.25W
3220	4822 116 52175	100Ω 5% 0.5W	3506▲	4822 053 21155	1M5 5% 0.5W	3839	4822 116 52175	100Ω 5% 0.5W
3221	4822 116 52226	560Ω 5% 0.5W	3507	4822 252 11215	DSP301N-A21F	3901	4822 051 10102	1k 2% 0.25W
3222	4822 116 52175	100Ω 5% 0.5W	3508	4822 116 83872	220Ω 5% 0.5W	3902	4822 051 20332	3k3 5% 0.1W
3226	4822 051 20561	560Ω 5% 0.1W	3510	4822 117 12765	4Q7 20% 3W1	3903	4822 051 20332	3k3 5% 0.1W
3229	4822 117 11454	820Ω 1% 0.1W	3519	4822 116 83876	270Ω 5% 0.5W	3904	4822 117 10833	10k 1% 0.1W
3230	4822 117 11504	270Ω 1% 0.1W	3520	4822 051 20122	1k2 5% 0.1W	3905	4822 051 20332	3k3 5% 0.1W
3231	4822 051 20561	560Ω 5% 0.1W	3521	4822 116 52186	22Ω 5% 0.5W	3906	4822 117 10833	10k 1% 0.1W
3235	4822 116 52175	100Ω 5% 0.5W	3522	4822 051 20394	390k 5% 0.1W	3907	4822 051 20822	8k2 5% 0.1W
3241	4822 051 20223	22k 5% 0.1W	3523	4822 052 10479	47Ω 5% 0.33W	3981	4822 116 52206	120Ω 5% 0.5W
3242	4822 051 20273	27k 5% 0.1W	3524	4822 117 11148	56k 1% 0.1W	3982	4822 116 52206	120Ω 5% 0.5W
3244	4822 116 52231	820Ω 5% 0.5W	3525	4822 051 10102	1k 2% 0.25W	4xxx	4822 051 10008	jumper (1206)
3245	4822 051 20393	39k 5% 0.1W	3526	3198 012 11570	1W 0Ω15	4xxx	4822 051 20008	jumper (0805)
3246	4822 117 10833	10k 1% 0.1W	3527	4822 117 11744	0Ω22 5% 1W			
3247	4822 051 20684	680k 5% 0.1W	3528	4822 051 20109	10Ω 5% 0.1W			
3248	4822 051 20333	33k 5% 0.1W	3529	4822 117 10834	47k 1% 0.1W			
3249	4822 116 52231	820Ω 5% 0.5W	3530	4822 117 10833	10k 1% 0.1W			
3250	4822 116 52283	4k7 5% 0.5W	3531	4822 051 20472	4k7 5% 0.1W	5001	4822 156 20966	47 μH
3250	4822 116 52303	8k2 5% 0.5W	3532	4822 052 10222	2k2 5% 0.33W	5002	3198 018 18270	Fxd 02 820N
3251	4822 116 52175	100Ω 5% 0.5W	3541	4822 051 20471	470Ω 5% 0.1W	5003	4822 157 11866	1.8μH 10%
3256	4822 051 10102	1k 2% 0.25W	3542	4822 117 11139	1k5 1% 0.1W	5201	4822 157 11835	4.7μH 5%
3257	4822 051 20106	10M 5% 0.1W	3543▲	4822 050 28203	82k 1% 0.6W	5202	4822 157 51462	10μH 10%
3258	4822 117 10837	100k 1% 0.1W	3544▲	2120 108 92624	4k7	5204	4822 157 11411	100mH
3259	4822 051 20474	470k 5% 0.1W	3545	4822 051 20274	270k 5% 0.1W	5205	4822 157 11411	100mH
3400	4822 116 52219	330Ω 5% 0.5W	3545	4822 051 20393	39k 5% 0.1W	5206	4822 157 11411	100mH
3401	4822 050 23303	33k 1% 0.6W	3548	4822 116 83933	15k 1% 0.1W	5241	4822 157 51462	10μH 10%
3401	4822 116 83874	220k 5% 0.5W	3549	4822 116 83883	470Ω 5% 0.5W	5242	4822 157 11706	10μH 5%
3403	4822 116 52234	100k 5% 0.5W	3552	4822 117 10833	10k 1% 0.1W	5401	4822 157 11885	1000μH 5%
3403	4822 116 52304	82k 5% 0.5W	3557	4822 051 10102	1k 2% 0.25W	5445▲	2422 531 02471	LOT 25"RF
3404	4822 050 11002	1k 1% 0.4W	3560	4822 116 52195	47Ω 5% 0.5W	5445▲	2422 531 02468	LOT 29"FS
3405	4822 050 24708	4Q7 1% 0.6W	3561	4822 116 83872	220Ω 5% 0.5W	5445▲	2422 531 02472	LOT 29"RF
3405	4822 116 52176	10Ω 5% 0.5W	3562	4822 117 11383	12k 1% 0.1W	5450	2422 535 95427	100mH
3406	4822 050 24708	4Q7 1% 0.6W	3563	4822 051 20822	8k2 5% 0.1W	5452	4822 157 11411	100mH
3406	4822 116 52176	10Ω 5% 0.5W	3564	3198 012 21070	Pwr 2W 0Ω	5457▲	4822 157 11712	Lin. coil 25"RF
3408	4822 116 52175	100Ω 5% 0.5W	3565	4822 053 10331	330Ω 5% 1W	5457▲	4822 157 11883	Lin. coil 29"FS
3410	4822 050 21003	10k 1% 0.6W	3566	4822 117 11449	2k2 5% 0.1W	5457▲	4822 157 11854	Lin. coil 29"RF
3411▲	4822 052 10478	4Q7 5% 0.33W	3567	4822 051 20182	1k8 5% 0.1W	5461	2422 531 02465	dr. C10015-00
3441	4822 117 11373	100Ω 1%	3568	4822 051 20822	8k2 5% 0.1W	5463	4822 157 11711	Choke coil
3442	4822 117 11507	6k8 1% 0.1W	3569	4822 051 20562	5k6 5% 0.1W	5471	2422 535 94638	6U8
3443	4822 051 20105	1M 5% 0.1W	3580	4822 117 10834	47k 1% 0.1W	5471	3198 018 73380	3U3
3445	4822 116 52244	15k 5% 0.5W	3601	4822 116 52303	8k2 5% 0.5W	5472	4822 157 51157	3.3μH
3446	4822 116 52289	5k6 5% 0.5W	3603	4822 116 52175	100Ω 5% 0.5W	5472	4822 158 10604	6.8 μH
3447	4822 116 52213	180Ω 5% 0.5W	3604	4822 116 52175	100Ω 5% 0.5W	5480	4822 156 20966	47 μH 29FS
3448	4822 116 52231	820Ω 5% 0.5W	3605	4822 051 20472	4k7 5% 0.1W	5480	4822 157 63788	18μH 10% 29RF
3449	4822 116 52199	68Ω 5% 0.5W	3606	4822 116 52256	2k2 5% 0.5W	5480	5322 157 51687	coil 25RF
3450	4822 116 52191	33Ω 5% 0.5W	3607	4822 116 52256	2k2 5% 0.5W	5500▲	4822 157 10476	DMF-2820H
3451▲	4822 052 10109	10Ω 5% 0.33W	3608	4822 116 52175	100Ω 5% 0.5W	5500	4822 157 11538	10mH
3452▲	4822 050 24703	47k 1% 0.6W	3609	4822 050 11002	1k 1% 0.4W	5501▲	4822 157 11523	5mH /2A
3453▲	4822 050 11002	1k 1% 0.4W	3610	4822 116 52303	8k2 5% 0.5W	5520▲	2422 531 02462	tr 42025-03 25/29RF
3454▲	4822 050 21503	15k 1% 0.6W	3611	4822 117 11373	100Ω 1%	5520▲	2422 531 02463	tr 42026-03 29FS
3455	4822 053 11688	6Q8 5% 2W	3612	4822 116 52303	8k2 5% 0.5W	5521	4822 526 10704	100mH
3456	4822 051 20008	0Ω jumper . (0805)	3618	4822 116 83961	6k8 5%	5560	4822 526 10704	100mH
3457	4822 051 20008	0Ω jumper . (0805)	3622	4822 117 11373	100Ω 1%	5561	4822 157 52392	27μH
3458	4822 050 11002	1k 1% 0.4W	3623	4822 051 20472	4k7 5% 0.1W	5562	4822 526 10704	100mH
3459	4822 053 1							

5604	4822 157 11867	5.6μH 5%
5831	4822 157 11139	6.8μH 5%
5832	4822 157 11139	6.8μH 5%
5833	4822 157 11139	6.8μH 5%
5835	3198 018 31290	12U



6001	4822 130 34142	BZX79-B33
6004	4822 130 10414	BA792
6201	4822 130 11397	BAS316
6202	4822 130 11397	BAS316
6206	4822 130 11416	PDZ6.8B
6400	4822 050 21002	1K00 1% 0.6W
6401	4822 130 34145	BZX79-B39
6401	4822 130 34383	BZX79-B47
6444	4822 130 30621	1N4148
6445	3198 020 51090	BZX384-C10
6447▲	4822 130 30621	1N4148
6448▲	4822 130 34167	BZX79-B6V2
6449	5322 130 34337	BAV99
6453	4822 130 11416	PDZ6.8B
6460	9340 559 50112	BY228/24
6461	4822 130 80572	RGP30J
6462	4822 130 61219	BZX79-B10
6465	4822 130 30842	BAV21
6466	4822 130 30842	BAV21
6467	5322 130 34331	BAV70
6468	4822 130 11397	BAS316
6470	5322 130 34337	BAV99
6476	4822 130 34281	BZX79-B15
6481	4822 130 34173	BZX79-B5V6
6482	4822 130 30862	BZX79-B9V1
6483	4822 130 34142	BZX79-B33
6485	4822 130 42606	BYD33J
6486	9322 164 42682	EGP20DL-5100
6487	4822 130 42488	BYD33D
6488	9322 164 42682	EGP20DL-5100
6500	4822 130 10741	GBU6J 25/29RF
6500	9322 132 55667	GBU4JL 29"FS
6520	4822 130 42488	BYD33D
6522	4822 130 11152	UDZ18B
6523	4822 130 30621	1N4148
6525	4822 130 31083	BYW55
6540	4822 130 34167	BZX79-B6V2
6541	4822 130 11413	PDZ10B
6560	3139 120 52021	BYV29X-500
6561	4822 130 32715	SB340
6563	4822 130 11397	BAS316
6565	5322 130 34331	BAV70
6566	4822 130 30621	1N4148
6567	4822 130 11148	UDZ4.7B
6569	4822 130 11397	BAS316
6570	4822 130 11378	BZX284-C6V2
6580	4822 130 11397	BAS316
6581	4822 130 11397	BAS316
6681	4822 130 31983	BAT85
6691▲	9322 050 99682	Led
6692	9322 127 54667	IR rec.
6831	4822 130 30621	1N4148
6901	4822 130 11397	BAS316



7001	4822 130 63732	MMUN2212
7101	4822 130 60511	BC847B
7102	4822 130 60511	BC847B
7103	4822 130 60511	BC847B
7200	xxxx xxx xxxxx	UOC; see product survey
7201	4822 130 60511	BC847B
7204	4822 130 60373	BC856B
7205	4822 130 60373	BC856B
7206	5322 130 42755	BC847C
7400	9322 157 37687	FET TP3NC60FP
7441	4822 130 60373	BC856B
7443▲	4822 130 44568	BC557B
7450	3198 010 44010	PDTA114ET
7460	9340 550 92127	BU4508DX
7461	4822 130 40981	BC337-25
7462	9340 547 00215	PDTC143ZT
7463	4822 130 41246	BC327-25
7471	9352 635 76112	TDA8359J
7480	4822 130 41109	BD135-16
7482	4822 130 41109	BD135-16
7515▲	8238 274 02070	TCET1103G
7520	9352 673 56112	TEA1507P/N1L
7521	3139 120 52031	FET TU9NC80ZI 25/29RF
7521▲	9322 160 63687	FET TP7NC80ZFP 29FS
7522	4822 130 60511	BC847B
7540	4822 130 40959	BC547B
7541	4822 130 11155	PDTC114ET
7542	4822 130 60373	BC856B

7560	4822 209 15576	LE33CZ
7561	9340 547 00215	PDTC143ZT
7562	4822 130 60373	BC856B
7564	4822 130 60373	BC856B
7580	4822 130 60373	BC856B
7602	9322 147 25682	M24C16-WBN6
7606	9340 547 00215	PDTC143ZT
7801	5322 209 11102	HEF4052BT
7802	5322 209 14481	HEF4053BT
7803	4822 130 60511	BC847B
7804	4822 130 60511	BC847B
7831	9322 160 79682	MSP3415G-PO-B8 FM
7901	9322 158 65667	AN7522NL

[B] CRT panel

Various

1018▲	3139 127 24631	CRT pnl 29RF
1018▲	3139 127 29321	CRT pnl 25RF
1018▲	3139 178 67421	CRT pnl 29FS
0141	4822 492 70788	FIX IC
0244	4822 265 30735	CON 5P
0245	2422 025 04854	CON V 6P F
0254	2422 500 80053	CON CRT 9P F DAF
0254▲	2422 500 80067	CON CRT V 9P F N-NECK B
0278	4822 267 10735	CON B3B-EH-A



2330	4822 121 51473	470nF 20% 63V
2340	4822 124 11565	10μF 20% 250V
2341▲	4822 126 13599	3.3nF 10% 500V
2342▲	5322 122 31647	1nF 10% 63V
2343▲	4822 126 12278	3300pF 10%) 2KV
2344	4822 126 14585	100nF 10% 50V
2345▲	4822 122 31175	1nF 10% 500V
2346▲	4822 126 13435	1.2nF 10% 2KV
2360	4822 124 40764	22μF 100 V
2361	4822 124 40207	100μF 20% 25V
2365	4822 121 40516	22nF 10% 250V
2366	4822 121 40334	100nF 10% 100V
2367	4822 126 13692	47pF 1% 63V
2368	5322 122 32654	63V 22nF R
2372	5322 122 32967	5.6pF 10% 63V



3331	4822 116 52175	100Ω 5% 0.5W
3332	3198 013 01020	1/2W A 1K
3333	4822 116 52175	100Ω 5% 0.5W
3334	3198 013 01020	1/2W A 1K
3335	4822 116 52175	100Ω 5% 0.5W
3336	3198 013 01020	1/2W A 1K
3340▲	4822 052 11109	10Ω 5% 0.5W
3341▲	4822 052 10108	1Ω 5% 0.33W
3342▲	4822 052 10108	1Ω 5% 0.33W
3343	3198 013 01520	1/2W A 1K5
3344	4822 116 52186	22Ω 5% 0.5W
3345	4822 117 13016	1M A/50V MAX 115V
3346	4822 116 52186	22Ω 5% 0.5W
3347	4822 051 20008	jumper (0805)
3350	4822 051 20008	jumper (0805)
3353	4822 051 20008	jumper (0805)
3360	4822 117 13424	8k2 5% 5W
3362▲	4822 052 10109	10Ω 5% 0.33W
3363	4822 116 52231	820Ω 5% 0.5W
3364	4822 116 81039	1Ω8 5% 0.5W
3368	4822 117 12955	2k7 1% 0.1W
3369	4822 117 10833	10k 1% 0.1W
3370	4822 117 13577	330Ω 1% 1.25W
3371	4822 051 20472	4k7 5% 0.1W
3374	4822 116 52291	56k 5% 0.5W
3375	4822 116 83883	470Ω 5% 0.5W
3376	4822 051 20008	jumper (0805)
3378	4822 117 11148	56k 1% 0.1W
3379	4822 051 20472	4k7 5% 0.1W
3382	4822 117 11139	1k5 1% 0.1W
3383	4822 051 20471	470Ω 5% 0.1W
3384	4822 117 11454	820Ω 1% 0.1W
3385	4822 116 81039	1Ω8 5% 0.5W
3386	4822 051 20472	4k7 5% 0.1W
3387	4822 051 20471	470Ω 5% 0.1W
3388	4822 116 83872	220Ω 5% 0.5W
3389	4822 116 83872	220Ω 5% 0.5W
3390	4822 051 20109	10Ω 5% 0.1W
3391	4822 051 20109	10Ω 5% 0.1W

5342	4822 156 21125	3.9μH 10%
5342	4822 157 50961	22μH
5360	4822 157 51216	5.6μH



6331	4822 130 30842	BAV21
6332	4822 130 11397	BAS316
6333	4822 130 30842	BAV21
6335	4822 130 30842	BAV21



7330	9352 576 50112	TDA6107Q/N2
7360	4822 130 42589	BF370
7362	9322 166 55682	2SA1358
7363	4822 130 44154	BF199
7365	9322 166 56682	2SC3421
7367	4822 130 44568	BC557B

[E] Side AV (& HP [E1])

Various

0232▲	4822 267 31014	HP socket
0246	4822 267 10734	CON B5B-EH-A
0250	4822 265 11606	3P YKC21-5599
0251	4822 267 10735	CON B3B-EH-A
0253	2422 025 16382	CON V 3P M
0254	4822 267 10734	CON B5B-EH-A
0255	4822 267 10565	CON 4P



2171	5322 122 32311	470pF 10% 100V
2172	5322 122 32311	470pF 10% 100V
2173	5322 122 32311	470pF 10% 100V
2174	5322 122 32311	470pF 10% 100V
2176	5322 122 32311	470pF 10% 100V
2177	4822 124 40248	10μF 20% 63V
2178	5322 122 32311	470pF 10% 100V
2179	4822 124 40248	10μF 20% 63V



3150	4822 116 83884	47k 5% 0.5W
3151	4822 116 83868	150Ω 5% 0.5W
3152	4822 116 83884	47k 5% 0.5W
3153	4822 116 83868	150Ω 5% 0.5W
3155	4822 116 52201	75Ω 5% 0.5W
3156	4822 116 52206	120Ω 5% 0.5W
3157	4822 116 52206	120Ω 5% 0.5W



6161	4822 130 34278	BZX79-B6V8
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