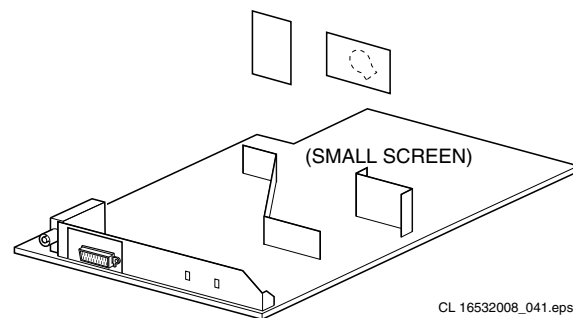


Service
Service
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Service Manual

Contents

	Page
1. Technical Specifications, Connections and Chassis Overview	2
2. Safety & Maintenance Instructions, Warnings and Notes	4
3. Directions for Use	5
4. Mechanical Instructions	9
5. Service Modes, Error Codes and Faultfinding	10
6. Block Diagram, Testpoints, I ² C And Supply Voltage Overview	
Block Diagram	17
Testpoint Overview	18
I ² C And Supply Voltage Overview	19
7. Electrical Diagrams and PWB's	
Power Supply (Diagram A1)	20 32-37
Line Deflection (Diagram A2)	21 32-37
Frame Deflection (Diagram A3)	22 32-37
Tuner IF (Diagram A4)	23 32-37
Video IF and Sound IF (Diagram A5)	24 32-37
Synchronization (Diagram A6)	25 32-37
Control (Diagram A7)	26 32-37
Audio Amplifier (Diagram A8)	27 32-37
BTSC (Stereo/SAP) Decoder (Diagram A9)	28 32-37
Audio/Video Source Switching (Diagram A10)	29 32-37
Front I/O + Control, Headphon (Diagram A12)	30 32-37
Rear I/O SCART (Diagram A14)	31 32-37
CRT Panel (Diagram B)	38 39
Side AV and Headphone Panel (Diagram C)	40 40
Side AV (Diagram E)	41 41
Side AV and Headphone Panel (Diagram E1)	42 42

Contents

	Page
8. Alignments	43
9. Circuit Description	50
List of Abbreviations	60
10. Spare Parts List	62

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PHILIPS

1. Technical Specifications, Connections and Chassis Overview

Note: Described specifications are valid for the *whole* product range.

1.1 Technical Specifications

1.1.1 Reception

Tuning system	: PLL
Colour systems	: PAL B/G, D/K, I
	: SECAM B/G, L/L'
Sound systems	: FM/AM mono
	: FM stereo (2CS)
	: NICAM
	: FM radio (10.7 MHz)
A/V connections	: PAL BG
	: SECAM L/L'
	: NTSC 3.58 (playback only)

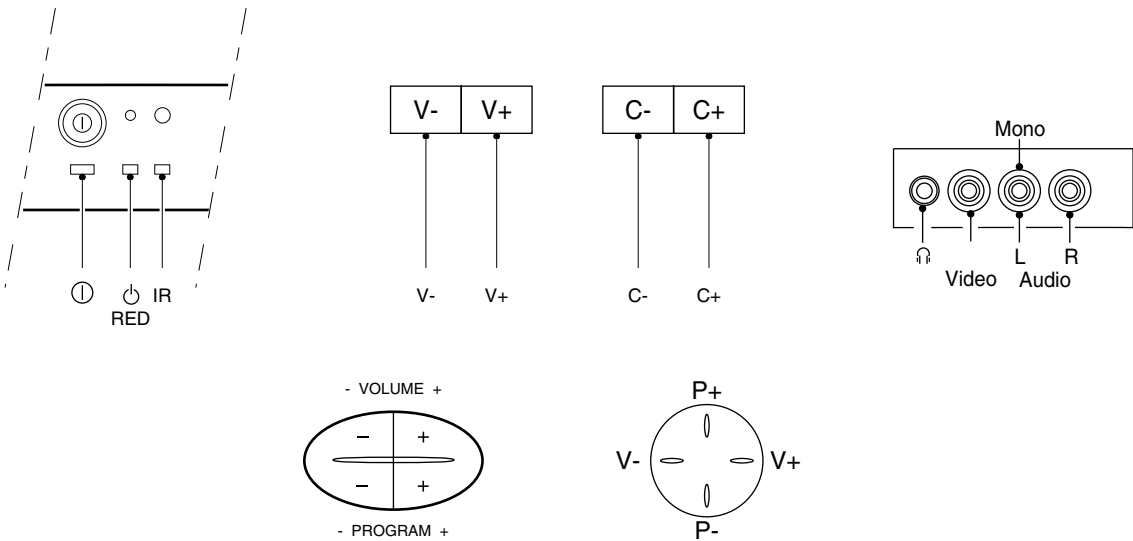
Channel selections	: NTSC 4.43 (playback only)
	: 100 channels
	: UVSH
IF frequency	: 38.9 MHz
Aerial input	: 75 Ω, Coax

1.1.2 Miscellaneous

Audio output (RMS)	: 1 W mono
	: 2 W mono
	: 4 W mono
	: 2 x 3 W stereo
Mains voltage	: 220 - 240 V (± 10 %)
Mains frequency	: 50 / 60 Hz (± 5 %)
Ambient temperature	: + 5 to + 45 deg. C
Maximum humidity	: 90 %
Power consumption	: 36 W (14") to 52 W (21")
Standby Power consumption	: < 3 W

1.2 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 - Headphone | 3.5 mm (8 - 600 Ω / 4 mW) |
| 2 - Video | CVBS (1 Vpp / 75 Ω) |
| 3 - Audio | Mono (0.5 Vrms / 10 kΩ) |



1.2.2 Rear Connections

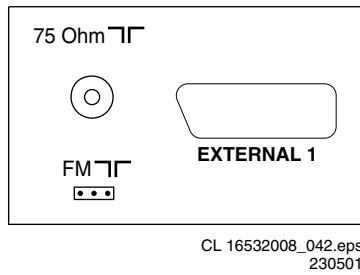


Figure 1-2 .eps

External 1: RGB/YUV in + CVBS in/out

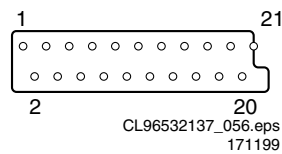


Figure 1-3

- | | |
|-----------|----------------------|
| 1 - Audio | R (0.5 Vrms / 1 kΩ) |
| 2 - Audio | R (0.5 Vrms / 10 kΩ) |
| 3 - Audio | L (0.5 Vrms / 1 kΩ) |
| 4 - | GND |



- | | | |
|-----------------|--|--|
| 5 - | GND | |
| 6 - Audio | L (0.5 Vrms / 10 kΩ) | |
| 7 - Blue / U | (0.7 Vpp / 75 Ω) | |
| 8 - CVBS-status | 0 - 2.0 V: INT
4.5 - 7 V: EXT 16:9
9.5 - 12 V: EXT 4:3 | |
| 9 - | GND | |
| 10 - | | |
| 11- Green / Y | (0.7 Vpp / 75 Ω) | |
| 12 - | | |
| 13 - | GND | |
| 14 - | GND | |
| 15- Red / V | (0.7 Vpp / 75 Ω) | |
| 16- RGB-status | 0 - 0.4 V: INT 1 - 3 V: EXT / 75 Ω | |
| 17 - | GND | |
| 18 - | GND | |
| 19- CVBS | (1 Vpp / 75 Ω) | |
| 20- CVBS | (1 Vpp / 75 Ω) | |
| 21- Earth | GND | |



TV Aerial In

Aerial input

: 75 Ω, coax (IEC-type)

FM Radio In

Aerial input

: via 'coax-to-3 pins' adapter
: 'cable' or 'wire' antenna

1.3 Chassis Overview

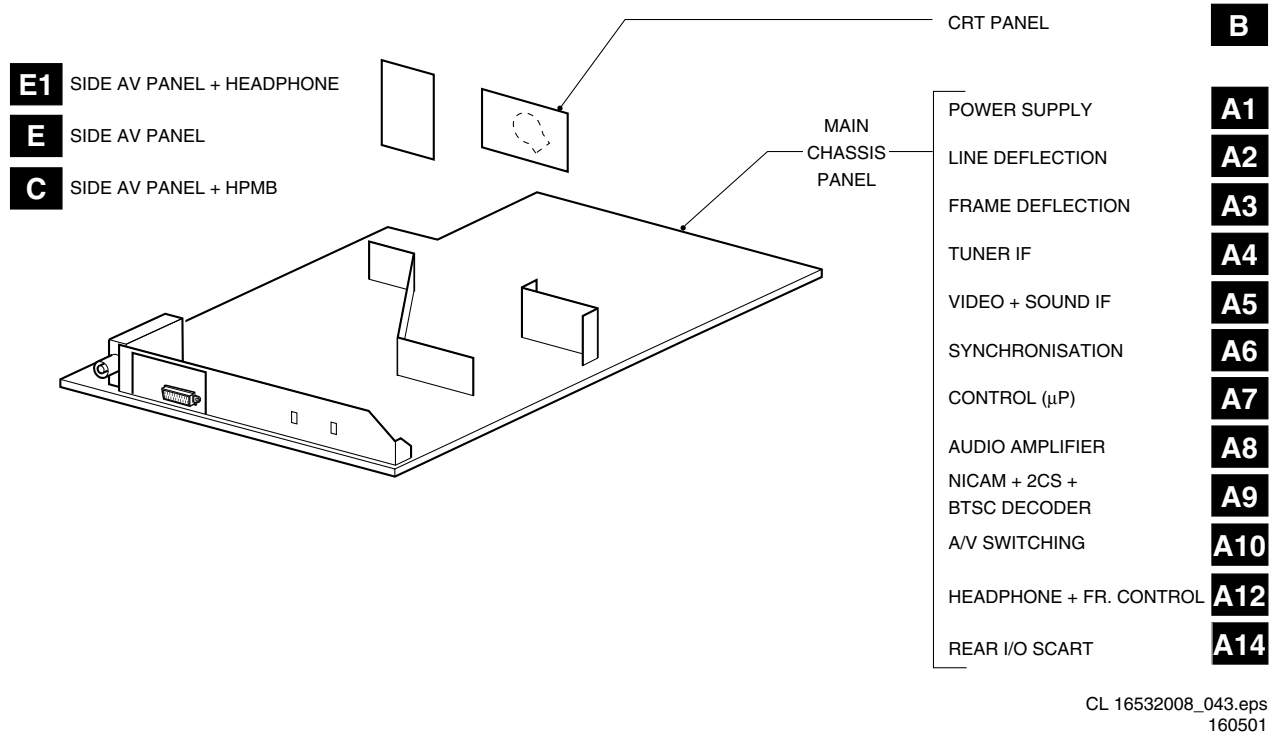


Figure 1-4

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).

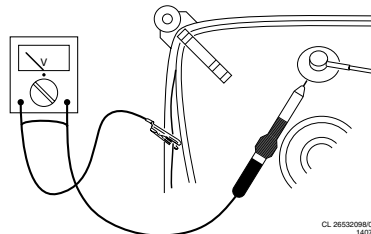


Figure 2-1

- 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.

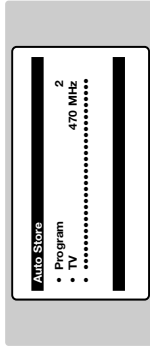
2.4 Notes

- 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.

Plug & Play

Quick installation

The first time you switch on the television, a menu appears on the screen and the tuning starts automatically.



If the menu is not displayed, press and hold down the Δ - and ∇ + keys on the TV set for 5 seconds to start the tuning.

All the available TV programs and radio stations * will be stored. This operation takes a few minutes. The display shows the progress of the

search and the number of programs found. At the end of the search, the menu disappears.

To exit or interrupt the search, press MENU . If no program is found, consult the possible solutions p. 12.

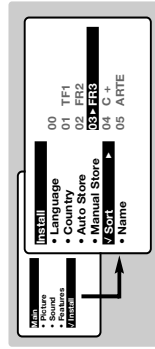
- 1 If the transmitter or cable network sends the automatic sort signal, the programs will be numbered correctly. In this case, the installation is complete.

- 2 If this is not the case, you need to use the **Sort** menu to number the programs correctly. Some transmitters or cable networks broadcast their own sort parameters (region, language, etc.). In this case, indicate your choice using the C and L keys and validate with ENTER .

* Only on versions equipped with a radio.

Program sort

- 1 Press key MENU . The Main menu is displayed on the screen.



- 2 With the cursor, select the **Install** menu followed by the **Sort** menu.
- 3 Select the programme you want to move using the C and L keys and press ENTER .
- 4 Then use the C and L keys to select the new number and validate with ENTER .
- 5 Repeat steps 3 and 4 for each program you wish to renumber.
- 6 To quit the menu, press MENU .

Program name

If required, you can give a name to the programmes and external connectors.

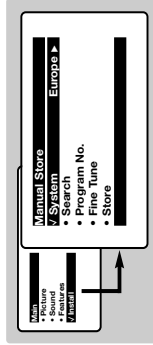
Note: on installation, the programs are named automatically when an identification signal is sent.

- 1 Press the MENU key.
- 2 With the cursor, select the **Install** menu, then **Name**.
- 3 Use the C and L keys to select the programme to name or rename.

Manual store

This menu is used to store the programmes one at a time.

- 1 Press the MENU key.
- 2 With the cursor, select the **Install** menu then **Manual store**:



- 3 **System**: select **Europe** (automatic detection*) or **Western Europe** (BG standard), **Eastern Europe** (DK standard), **United Kingdom** (I standard) or **France** (LL* standard).

* Except for France (LL* standard), you must select choice **France**.

- 4 **Search**: press ENTER . The search starts. Once a programme is found, the scanning stops and its name is displayed (when available). Go to the next step. If you know the frequency of the required programme, this can be entered directly using the C to 9 keys.

If no picture is found, consult the possible solutions (p. 10).

- 5 **Program No.**: enter the required number with the C and L keys.
- 6 **Fine Tune**: if the reception is not satisfactory, adjust using the C and L keys.
- 7 **Store**: press ENTER . The program is stored.
- 8 Repeat steps 4 to 7 for each programme to store.
- 9 To quit the menu, press MENU .

Other settings in the Install menu

- 1 Press the MENU key and select the **Install** menu:
- 2 **Language**: to change the display language for the menu.
- 3 **Country**: to select your country (GB for Great Britain).

This setting is used for the search, automatic programme sort and teletext display. If your country does not appear in the list, select "...".

- 4 **Auto Store**: to start automatic search for all programmes available in your region. If the transmitter or cable network sends the

automatic sort signal, the programmes will be numbered correctly. If this is not the case, you need to use the Sort menu to renumber the programmes (see p. 4).

Some transmitters or cable networks broadcast their own sort parameters (region, language, etc.). In this case, indicate your choice using the C and L keys and validate with ENTER . To quit or interrupt the search, press MENU . If no picture is found, consult the possible solutions (p. 10).

- 5 To quit the menu, press MENU .

Using the radio (only available on certain versions)

Choice of TV or radio mode

Press the MENU key on the remote control to switch the TV set to either TV or radio mode.

In radio mode, the number, station name (if available), frequency and sound mode are displayed on the screen. To enter the station names, use the **Name** menu (p. 4).

Program selection

Use the C and L or P and M keys to select the FM stations (from 1 to 40).

List of radio stations

Press the MENU key to display the list of radio stations radio. Use the C and L keys to change station and the MENU key to exit.

Using the radio menus

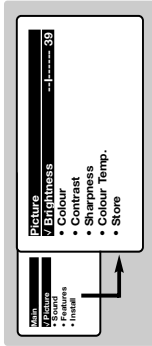
Use the MENU key to access the specific radio setting.

Search for radio stations

If you used the quick installation, all available FM stations have already been stored. To start a new search, use the **Install : Auto Store** menu (for a complete search) or **Manual Store** (for a station by station search). The **Sort** and **Name** menus let you sort or name the radio stations. Operation of these menus is the same as for the TV menus.

Picture settings

- 1 Press **Menu** then **Picture**. The Picture menu is displayed:



- 2 Use the **Left** and **Right** keys to select a setting and the **Up** and **Down** keys to adjust.
*Note: during the picture adjustment, only the selected line remains displayed. Press **Left** and **Right** to display the menu again.*

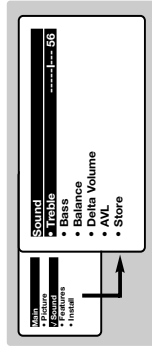
- 3 Once the adjustments have been made, select **Store** and press **Left** to store them. Press **Menu** to exit.

Description of the adjustments:

- **Brightness:** this changes picture brilliance.
- **Colour:** this changes the intensity of the colour.
- **Contrast:** this changes the difference between the light and dark tones.
- **Sharpness:** this changes the picture definition.
- **Colour Temp.:** this changes the colour rendering: Cold (bluer), Normal (balanced) or Warm (redder).
- **Store:** to store the picture adjustments and settings (as well as the settings for **Contrast +** and **NR** in the **Features** menu).

Sound adjustments

- 1 Press **Menu**, select **Sound** (**Left**) and press **Right**. The Sound menu is displayed:



- 2 Use the **Left** and **Right** keys to select a setting and the **Up** and **Down** keys to adjust.
- 3 Once the adjustments have been made, select **Store** and press **Left** to store these changes.
- 4 To quit the menu, press **Menu**.

Description of the settings:

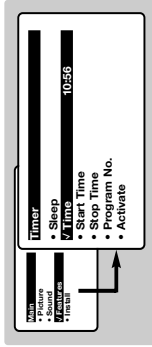
- **Treble:** this alters the high frequency sounds.
- **Bass:** this alters the low frequency sounds.
- **Balance:** this balances the sound on the left and right speakers.
- **Delta Volume**¹⁾: this is used to compensate any volume discrepancies between the different programs or EXT sockets. This setting is available for programs 0 to 40 and the EXT sockets.
- **AVL** * (Automatic Volume Leveller): this is used to limit increases in sound, especially on program change or advertising slots.
- **Store:** this is used to store the sound settings.
** Only available on certain versions.*

Feature settings

- 1 Press **Menu**, select **Features** (**Left**) and press **Right**. You can adjust:
- 2 **Timer**, **Child Lock** and **Parental Cont.:** see next page
- 3 **Contrast +:** automatic adjustment of the picture contrast which permanently sets the darkest part of the picture to black.
- 4 **NR:** attenuates picture noise (snow) in difficult reception conditions.
*Caution: to store the **Contrast +** and **NR** settings, use the **Store** choice in the **Picture** menu.*
- 5 To quit the menu, press **Menu**.

Timer function (only available on certain versions)

- 1 This menu lets you use the TV set as an alarm.
- 2 Press the **Menu** key.
- 3 With the cursor, select the **Options** menu then **Timer**:
- 4 **Sleep:** to select an automatic standby period.



*This setting is also available via the **Info** key on the remote control.*

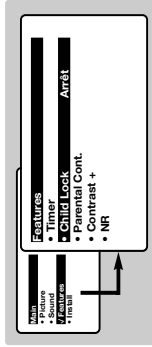
- 5 **Time:** enter the current time.
Note: the time is updated automatically each time the TV set is switched on via the teletext information on program no. 1. If this program does not have teletext, the update will not take place.
- 6 **Start Time:** enter the start time.
- 7 **Program No.:** enter the number of the programme for the wake-up alarm. For models equipped with a radio, you can select an FM station by using the **Left** and **Right** keys (the **Left** and **Right** keys are only used to select TV programs).
- 8 **Activate:** the settings include:
 - **Once** for a single alarm,
 - **Daily** for each day,
 - **Stop** to cancel.
- 9 Press **Left** to put the TV set in standby. It will automatically come on at the time programmed. If you leave the TV set on, it will just change programmes at the time entered (and will go to standby mode at the **Stop Time**).

TV lock (only available on certain versions)

You can block certain programs or inhibit use of the TV set completely by locking the keys.

Child lock

- 1 Press **Menu**.
- 2 With the cursor, select the **Options** menu and position **Child Lock** to **On**.
- 3 Turn off the TV set and hide the remote control. The TV set cannot be used (except via the remote control).
- 4 To cancel, position **Child Lock** to **Off**.



Parental control

- 1 Press the **Menu** key, select the **Features** menu then **Parental Cont.:**
- 2 You must enter your secret access code.

The first time you enter this, enter code 0711 twice and then enter your new code choice. The menu is displayed.

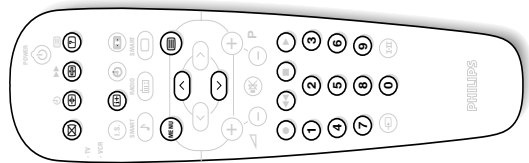
- 3 **Parental Cont.:** Use the **Left** and **Right** keys to select the TV programme required and validate with **Left**. The **Info** symbol will be displayed opposite the programmes or sockets that are locked. From now on, to view a locked programme, you must enter your secret code, otherwise the screen will stay blank.

*The access to the **Install** menu is also locked. Caution: for encrypted programs using an external decoder, you must lock the corresponding EXT socket.*

- 4 **Change code:** this allows you to enter a new 4 digit code. Confirm your new code by entering it a second time.
If you have forgotten your secret code, enter the universal code 0711 twice.
- 5 **Unlock all:** this is used to unlock all locked programmes.
- 6 **Lock All:** this is used to lock all the TV programmes and EXT connectors.
- 7 Press the **Menu** key to quit.

Teletext

Teletext is an information system broadcast by certain channels which can be consulted like a newspaper. It also offers access to subtitles for viewers with hearing problems or who are not familiar with the transmission language (cable networks, satellite channels, etc.).



Press :



Teletext call

You will obtain:

This is used to call teletext: change to transparent mode and then exit. The summary appears with a list of items that can be accessed. Each item has a corresponding 3 digit page number.

If the channel selected does not broadcast teletext, the indication 100 will be displayed and the screen will remain blank (in this case, exit teletext and select another channel).

Selecting a page



Enter the number of the page required using the 0 to 9 or P keys. Example: page 120, enter 1 2 0. The number is displayed top left, the counter turns and then the page is displayed. Repeat this operation to view another page.

If the counter continues to search, this means that the page is not transmitted. Select another number.

Direct access to the items



Coloured areas are displayed at the bottom of the screen. The 4 coloured keys are used to access the items or corresponding pages. The coloured areas flash when the item or the page is not yet available.

Contents



This returns you to the contents page (usually page 100).

Temporary stop



This is used to temporarily disable or activate the teletext display.

Enlarge a page



This allows you to display the top or bottom part of the page and then return to normal size.

Stop sub-page acquisition



Certain pages contain sub-pages which are automatically displayed successively. This key is used to stop or resume sub-page acquisition. The indication appears top left.

Hidden information



To display or hide the concealed information (games solutions).

Favourite pages



For teletext programs 0 to 40, you can store 4 favourite pages which can then be accessed directly using the coloured keys (red, green, yellow, blue).

1 Press the key to change to favourite pages mode.

2 Display the teletext page that you want to store.

3 Press the coloured key of your choice for 3 seconds. The page is now stored.

4 Repeat the operation with the other coloured keys.

5 You can now consult teletext and your favourite pages will appear in colour at the bottom of the screen. To retrieve the standard items, press.

To clear everything, press for 5 seconds.

Connecting peripheral equipment

Depending on the versions, the TV set will be equipped with 1 or 2 SCART connectors EXT1 and EXT2 located on the rear. The EXT1 socket has audio, CVBS/RGB inputs and audio, CVBS outputs. The EXT2 socket (if available) has audio, CVBS-S-VHS inputs and audio, CVBS outputs.

Video recorder

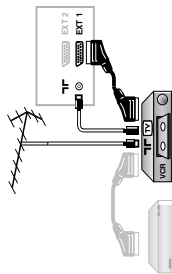
Carry out the connections shown opposite, using a good quality euroconnector cable.

If your video recorder does not have a euroconnector socket, the only connection possible is via the aerial cable. You will therefore need to tune in your video recorder's test signal and assign it programme number 0 (refer to manual store, p.6).

To reproduce the video recorder picture, press 0.

Video recorder with decoder

Connect the decoder to the second euroconnector socket of the video recorder. You will then be able to record scrambled transmissions.



Other equipment



Satellite receiver, decoder, CDV, games, etc.
For TV sets with 2 SCART connectors, preferably connect the equipment delivering RGB signals (digital decoders, DVD players, games consoles, etc.) to EXT1 and the equipment delivering S-VHS signals (S-VHS and Hi-8 VCRs) to EXT2.

Amplifier

(only available on certain versions)



To connect to a hi-fi system, use an audio connection cable and connect the "L" and "R" outputs on the TV set to the "AUDIO IN" "L" and "R" input on your hi-fi amplifier.

Front panel connectors

(only available on certain versions)



Depending on the versions, the connectors are located on the front (sometimes under a flap) or on the right-hand side of the TV set. Make the connections as shown opposite. With the key, select AV.

For a monophonic device, connect the audio signal to the AUDIO L input. Use the key to reproduce the sound on the left and right speakers of the TV set.

Headphones
When headphones are connected, the sound on the TV set will be cut. The P keys are used to adjust the volume level. The headphone impedance must be between 32 and 600 Ohms.

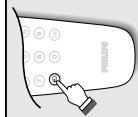
Headphones

When headphones are connected, the sound on the TV set will be cut. The P keys are used to adjust the volume level. The headphone impedance must be between 32 and 600 Ohms.

To select connected equipment

Press the key to select EXT1 and on the versions with 2 scarts, EXT2, S-VHS2 (S-VHS signals from the EXT2 socket) and AV for the side connections (if available).

Most equipment (decoder, video recorder) carries out the switching itself.



4. Mechanical Instructions

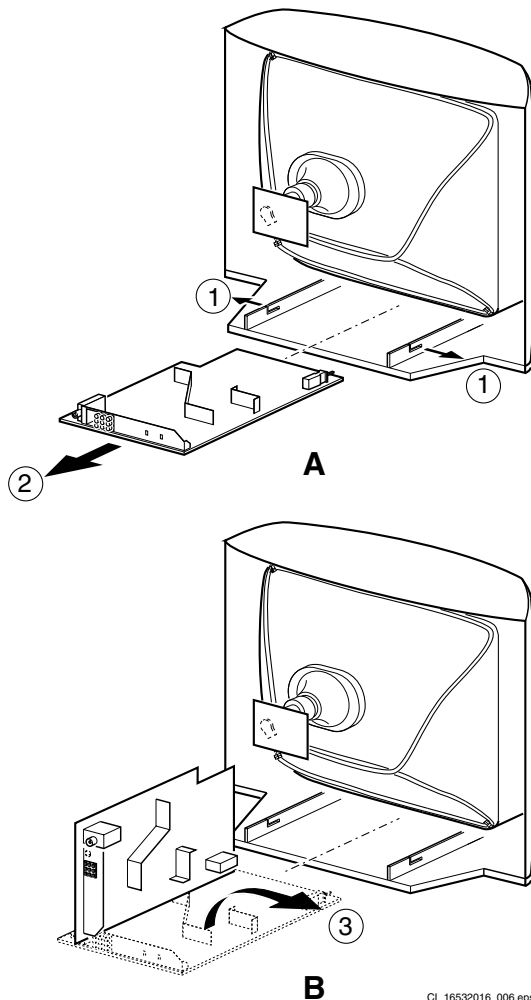
Note: Figures below can deviate slightly from the actual situation, due to the different set executions.

4.1 Rear Cover Removal

1. Remove all (seven) fixation screws of the rear cover: two at the top, two at each side and one near the mains cord holder.
2. Now pull the rear cover backward to remove it.

4.2 Service Position Main Panel

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

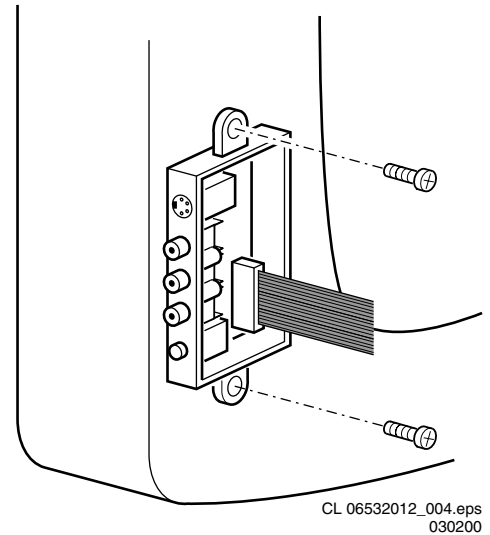


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Figure 4-1

4.3 Side I/O Panel Removal (if present)

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



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Figure 4-2

4.4 Rear Cover Mounting

Before you mount the rear cover:

1. Place the mains cord correctly in its guiding brackets (strain relief).
2. Place all cables in their original position.

5. Service Modes, Error Codes and Fault Finding

Index of this chapter:

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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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. A Pentium Processor and Windows 95/98 are also acceptable (see also paragraph 5.4).

SW cluster	SW name	UOC-type	Diversity	Remark
1EU0	L01EM0-x.y	TDA9570/71/72	E/W-Europe, Mono, non-TXT	All Service Modes
2EU0	L01ET0-x.y	TDA9550/52	West-Europe, 1 page TXT	All Service Modes
2EU9	L01ET9-x.y	TDA9551	East-Europe, 1 page TXT	All Service Modes
3EU1	L01EF1-x.y	TDA9567	West-Europe, 10 page TXT	All Service Modes
3EU2	L01EF2-x.y	TDA9561	East-Europe, 10 page TXT	All Service Modes

Abbreviations: E= Europe, F= Full TXT, M= mono, T= 1 page TXT

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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 (Europe and AP-PAL).
 - 61.25 MHz (channel 3) for NTSC-sets (AP-NTSC).
- Colour system:
 - SECAM L for France.
 - NTSC for NAFTA and AP-NTSC.
 - PAL-BG for Europe and AP-PAL.
- 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-favourite pre-sets/channels,
 - auto store of personal pre-sets,
 - 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 Mains voltage. 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.

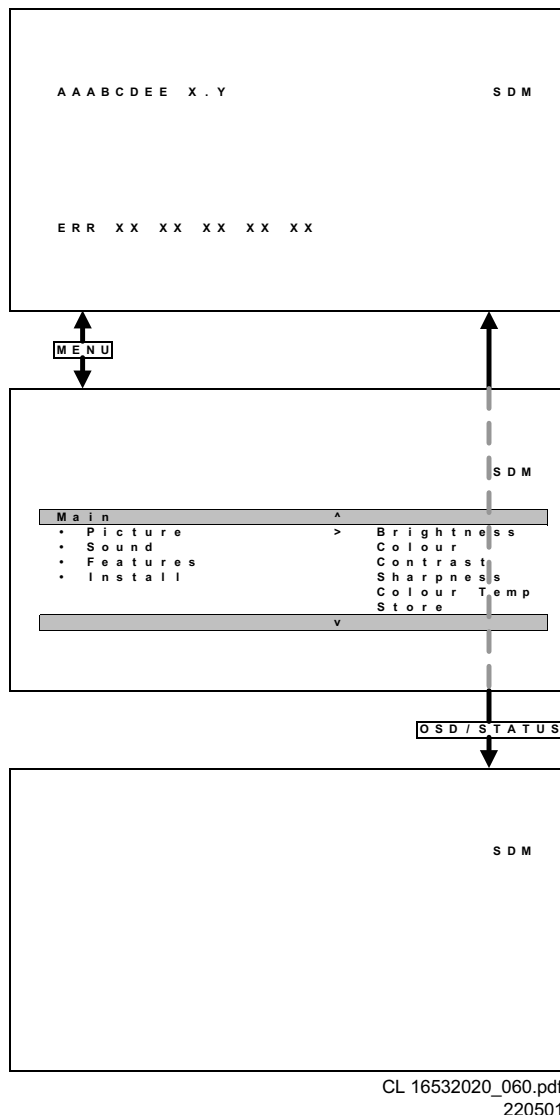


Figure 5-3

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 Mains voltage, the set will return in SDM when Mains voltage 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

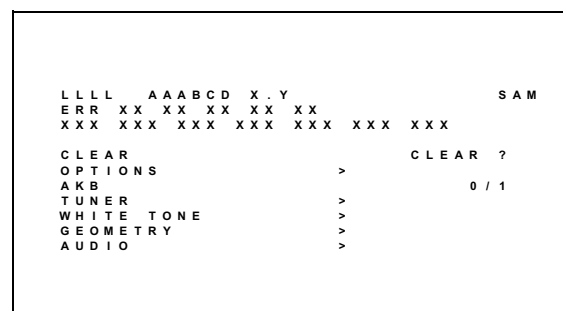
- Operation hours counter.
- Software version.
- Option settings.
- Error buffer reading and erasing.
- Software alignments.

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 [i+] or
- Via ComPair.

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



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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: D= DVD, F= full TXT, M= mono, T= 1 page 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 Mains voltage, the set will return in SAM when Mains voltage 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 many 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

```

1      A A B C D   X . Y                               C S M
2      C O D E S       X X   X X   X X   X X
3      O P             X X X   X X X   X X X   X X X   X X X   X X X
4      D E T E C T E D   S Y S T E M   D E T E C T E D   S O U N D
5      N O T   T U N E D           S K I P P E D
6      T I M E R
7
8      C O   X X       C L   X X       B R   X X       H U   X X       S H   X X
9      V L   X X       B L   X X       A V L               D V   X X
10     T R   X X       B S   X X

```

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Figure 5-5

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:

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 (OP) 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 colour 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. Not applicable for Europe.
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 Mains voltage 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 Mains voltage 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 Mains voltage).
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 Mains voltage adapter in the Mains voltage 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.

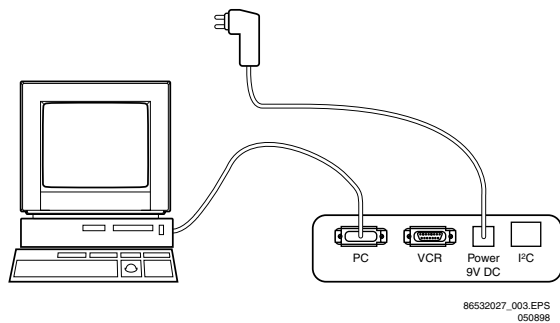


Figure 5-6

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** : No errors detected
 - ERROR: **6 0 0 0** : Error code 6 is the last and only detected error
 - ERROR: **9 6 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 Mains voltage, the error buffer is not reset).
- When you transmit the command DIAGNOSE-99-OK with ComPair.
- If the content of the error buffer has not changed for 50 hours, it resets automatically.

5.5.3 Error Codes

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

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

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

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Figure 5-7

5.6 The Blinking LED Procedure

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

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

Error-codes ≥ 10 are shown as follows:

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

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

After entering SDM:

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

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 7460 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 ground to measuring equipment, than 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 μP 'POR' and '+8V protection' happen at

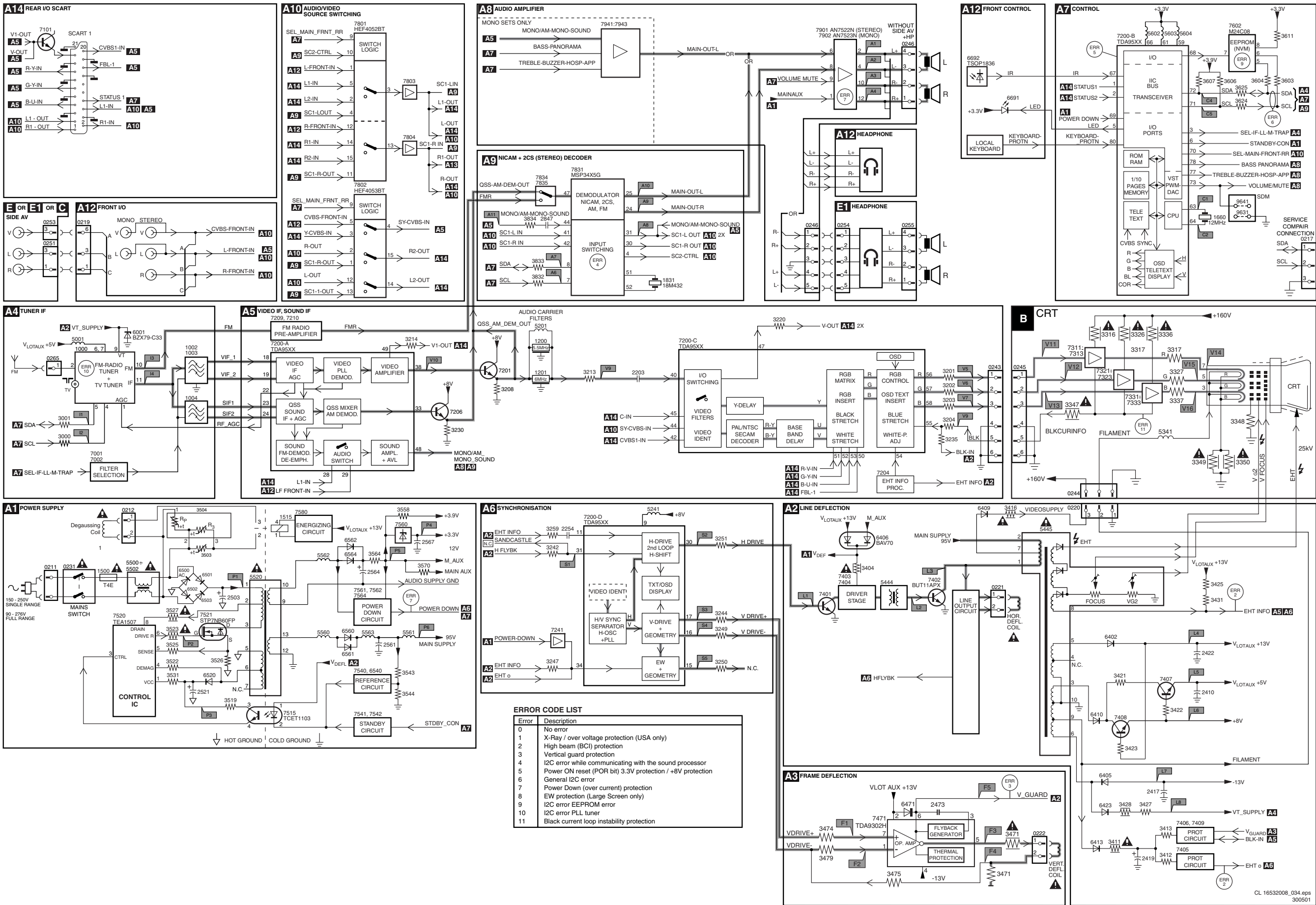
the same time, measure the '+8V'. If this voltage is missing, check transistor TS7480.

- **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 'Stdbby_con' must be logic low under normal operation conditions and goes to high (3.3 V) under standby and fault conditions.
- **Set turns on, but without picture and sound** The screen shows snow, but OSD and other menus are okay. Blinking LED procedure indicates error 11, so problem is expected in the tuner (pos. 1000). Check presence of supply voltages. As 'Vlotaux+5V' at pin 5 and 7 are okay, 'VT_supply' at pin 9 is missing. Conclusion: resistor 3460 is defective.
- **Set turns on, but with a half screen at the bottom. Sound is okay** Blinking LED (set in SDM mode) indicates error 3. Check 'Vlotaux+11V' 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.

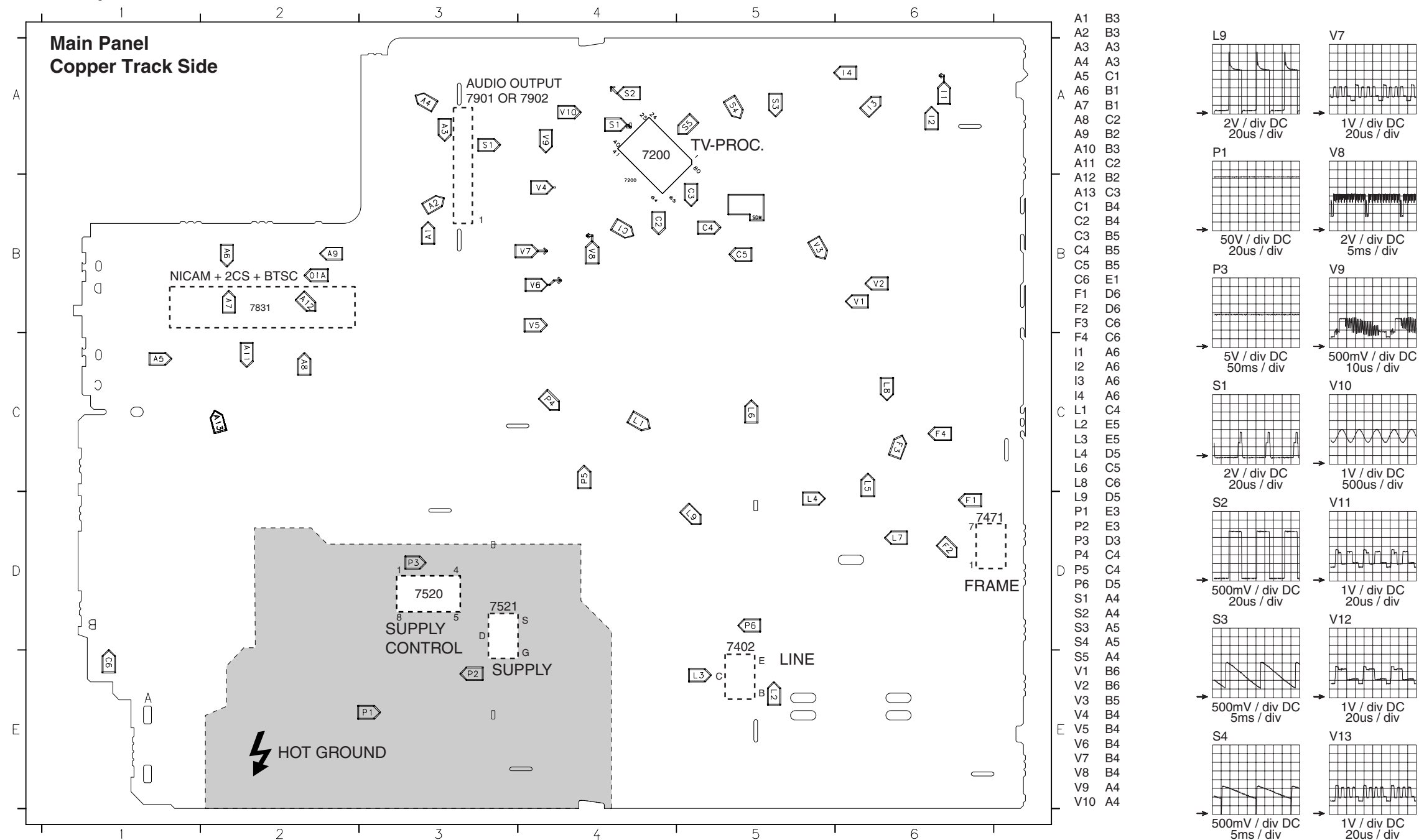
Personal Notes:

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

Block Diagram



Testpoint Overview



A7 CONTROL

7200-B SET PROCESSOR

PART OF VIDEO-PROCESSOR

ERR 5

72 SDA

71 SCL

68

7

7602 M24C08 EEPROM (NVM)

ERR 9

0217 FOR COMPAIR

A4 TUNER IF

1000 TUNER

ERR 10

A9 DECODER

NICAM + 2CS

7831 MSP34X5G NICAM+2CS DECODER

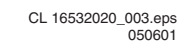
ERR 4

SDA

SCL

Error	Description
0	No error
1	X-Ray / over voltage protection
2	High beam (BCI) protection
3	Vertical guard protection
4	I2C error while communicating with the sound processor
5	Power ON reset (POR bit) 3.3V protection / +8V protection
6	General I2C error
7	Power Good (over current) protection
8	EW protection (Large Screen only)
9	I2C error EEPROM error
10	I2C error PLL tuner
11	Black current loop instability protection

A2 LINE DEFLECTION

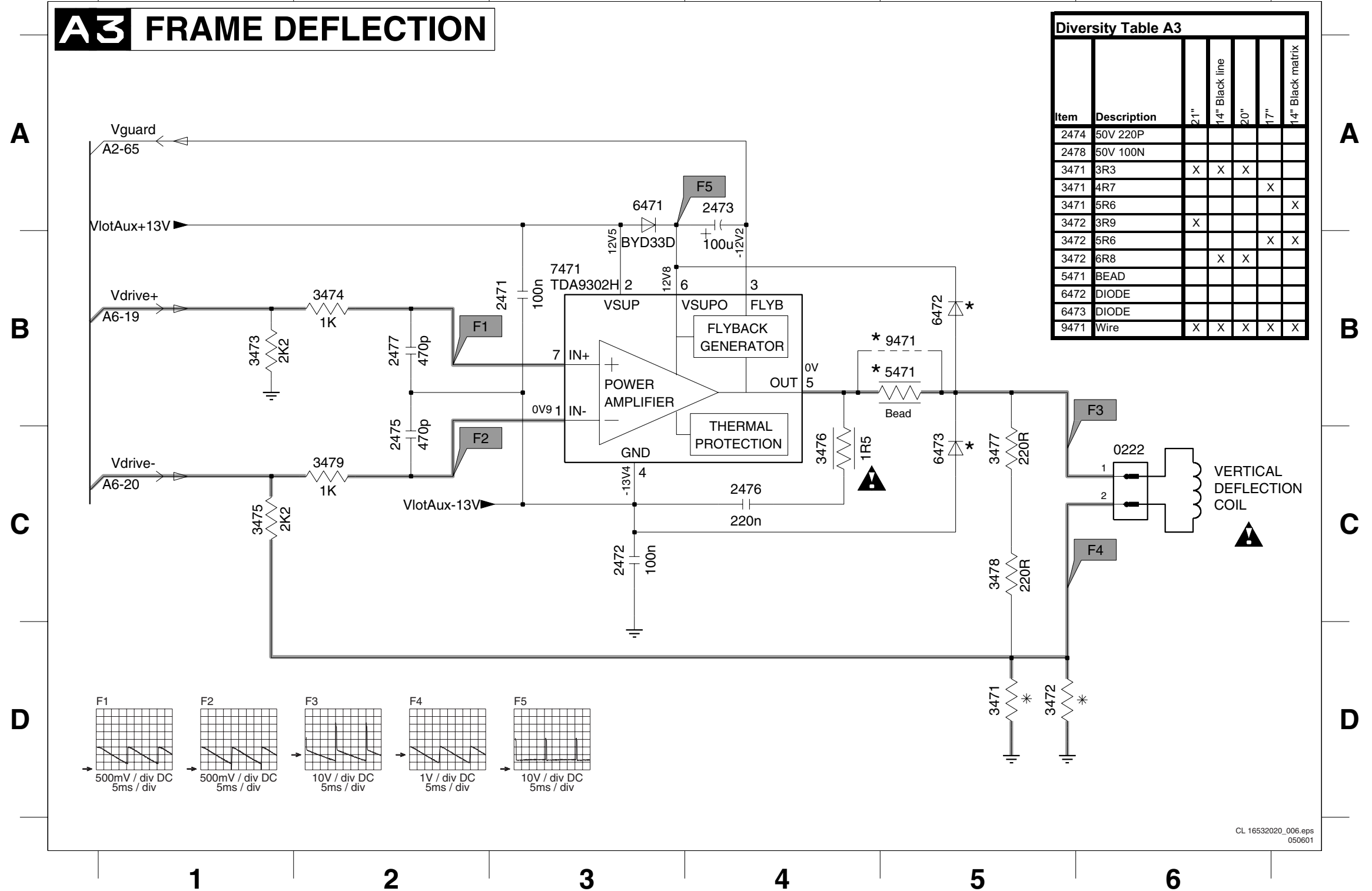


0220 F6	6416 F4
0221 A5	6419 D9
2400 F4	6420 E10
2403 D2	6423 F9
2404 A4	7401 E2
2405 D3	7402 D4
2406 D3	7403 D2
2407 D5	7404 D2
2408 B5	7405 A10
2409 C6	7406 B9
2410 D9	7407 D10
2411 D3	7408 E9
2412 C8	7409 B9
2413 A7	7435 E5
2414 D9	9401 F5
2415 D3	9402 D5
2416 D6	9403 A4
2417 F10	9404 B3
2418 B10	9408 B5
2419 A9	
2420 B8	
2421 B10	
2422 D10	
2423 F10	
2424 D5	
3401 C4	
3402 C4	
3403 B5	
3404 C2	
3406 D2	
3408 D2	
3410 B11	
3411 A8	
3412 A9	
3413 A8	
3414 A10	
3415 A10	
3416 A7	
3417 B10	
3418 A8	
3419 B8	
3420 B10	
3421 D9	
3422 D10	
3423 E10	
3424 E9	
3425 C9	
3426 B10	
3427 F10	
3428 F9	
3429 E4	
3430 E4	
3431 C9	
3432 D4	
3435 E6	
3436 E5	
5401 B3	
5403 B4	
5406 B3	
5408 B5	
5410 F5	
5444 D4	
5445 B6	
6402 C8	
6404 D5	
6405 E9	
6406 C2	
6407 D1	
6408 E3	
6409 A6	
6410 D8	
6411 D5	
6412 D5	
6413 A8	
6414 A10	
6415 A8	

0222 C6 2472 C3 2475 C2 2477 B2 3472 D5 3474 B2 3476 C4 3478 C5 5471 B5 6472 B5 7471 B3
2471 B3 2473 A4 2476 C4 3471 D5 3473 B1 3475 C1 3477 C5 3479 C2 6471 A3 6473 C5 9471 B5

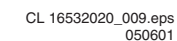
A3 FRAME DEFLECTION

Diversity Table A3						
Item	Description	21"	14" Black line	20"	17"	14" Black matrix
2474	50V 220P					
2478	50V 100N					
3471	3R3	X	X	X		
3471	4R7				X	
3471	5R6					X
3472	3R9	X				
3472	5R6				X	X
3472	6R8		X	X		
5471	BEAD					
6472	DIODE					
6473	DIODE					
9471	Wire	X	X	X	X	X



0265 A3	0285 B1	1002 D6	1004 E6	2002 C2	2004 B4	2006 B5	2008 C4	2010 A3	3001 C2	3003 B6	3005 C7	3007 D4	3009 D5	3011 D3	4001 C4	4003 E5	4005 D5	4007 B6	4012 F6	5002 C4	6001 A4	6003 C5	6005 D5	7002 E5
0283 B1	1000 A2	1003 E6	2001 C2	2003 D4	2005 A4	2007 B5	2009 C7	3000 C2	3002 C5	3004 C6	3006 D4	3008 D4	3010 D2	3012 A5	4002 E6	4004 E6	4006 D4	4011 F6	5001 A5	5003 F7	6002 B5	6004 D4	7001 E4	9001 D5

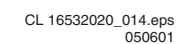


A5 VIDEO IF + SOUND IF

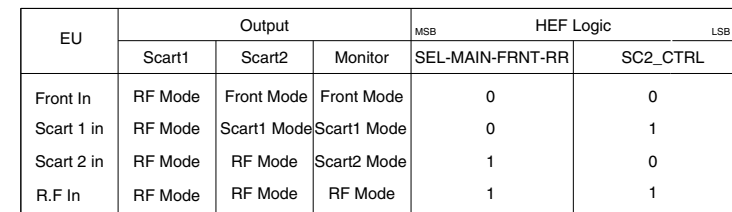
0243 C6	4216 F9
0248 C2	5201 D7
0249 B2	5202 A8
0266 E11	6201 F4
0276 C2	6202 F5
1200 E7	6206 G4
1201 E7	7200-A B9
1203 F8	7200-C C3
2201 D2	7201 D8
2202 C2	7204 F5
2203 D2	7206 B7
2204 D5	7209 F7
2205 B3	7210 F8
2206 D6	9200 D7
2207 D8	9618 A9
2208 B8	
2209 F4	
2210 G3	
2211 D8	
2213 E2	
2214 E2	
2215 F2	
2216 A8	
2217 A8	
2219 B4	
2220 F5	
2221 C2	
2222 F8	
2223 F9	
2225 C7	
2226 C8	
2227 D10	
2228 D11	
2229 C11	
2230 C11	
2233 E2	
2234 F6	
2235 E9	
2236 F7	
2237 G8	
2238 F6	
2239 G6	
2240 F7	
3200 B8	
3201 C5	
3202 C5	
3203 C5	
3204 E5	
3206 F5	
3207 C8	
3208 E8	
3209 D8	
3212 E6	
3213 D6	
3214 A9	
3217 G5	
3218 G4	
3219 G3	
3220 A4	
3223 E5	
3224 F3	
3225 F5	
3226 E5	
3227 C7	
3228 A7	
3229 C7	
3230 B7	
3231 A7	
3232 C10	
3233 F7	
3234 E10	
3235 E2	
3236 F7	
3237 F8	
3238 G7	
3239 G8	
3240 F6	
3261 F9	
3637 C1	
3638 D1	
4204 C8	
4205 F2	
4206 F2	
4207 E2	
4209 D9	
4210 B8	
4211 B8	
4212 B2	
4213 B2	
4214 D10	

[illegible]

A7 CONTROL



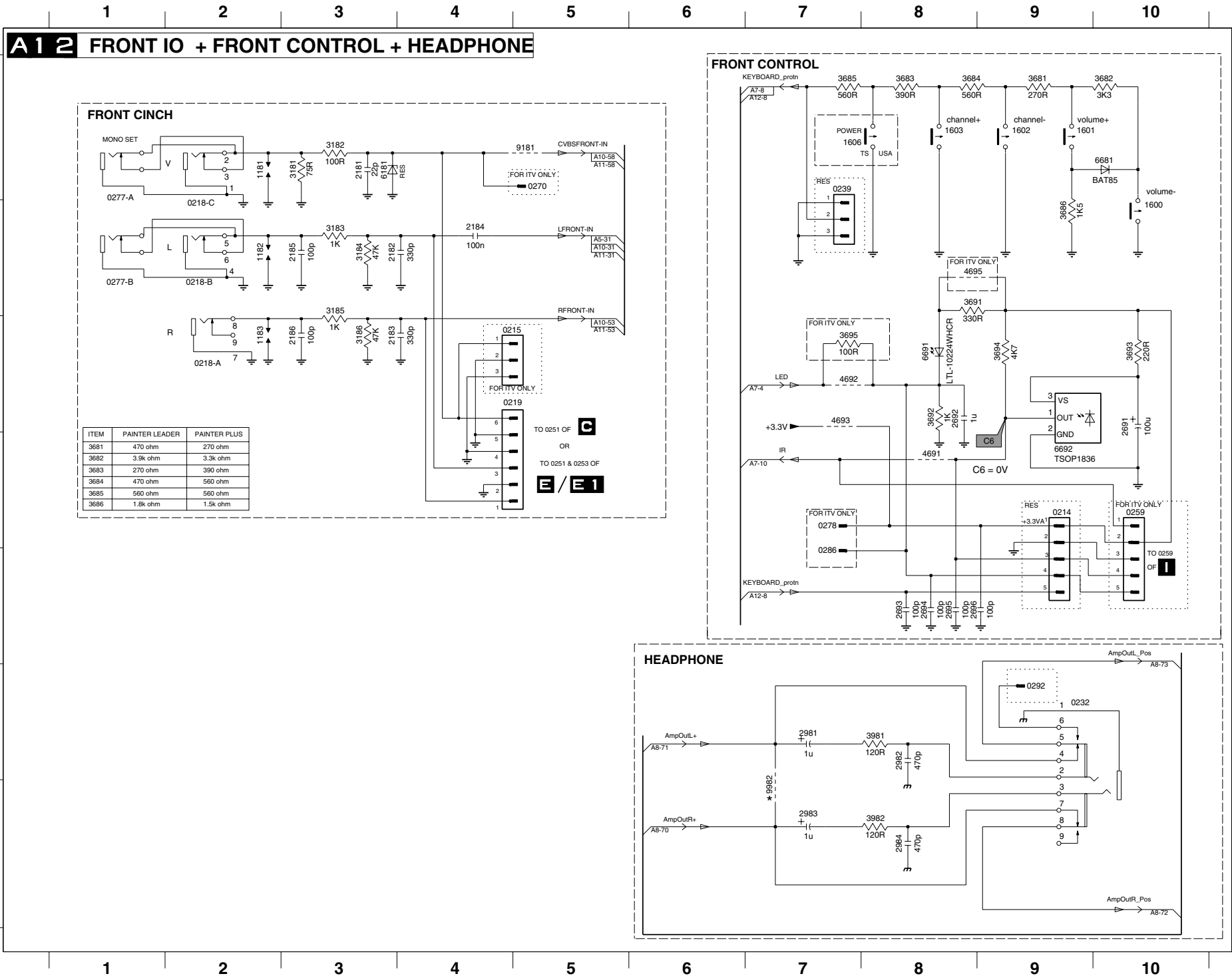
A 1 AUDIO/VIDEO SOURCE SWITCHING

[illegible]

2801 B4
2802 F4
2803 D2
2804 C5
2805 E5
3801 A2
3802 A2
3803 C4
3804 C4
3805 D5
3806 D4
3807 E4
3808 E5
3809 H2
4801 C6
4802 C6
4803 E6
4804 E6
4805 E2
4806 F2
4807 H3
4808 H3
4809 C2
7801 C3
7802-A F3
7802-B F3
7802-C G3
7803 C5
7804 D5
9801 F2

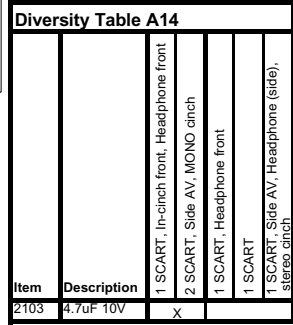
Large Signal Panel: Front I/O + Front Control + Headphone

0214 D90215 C40218-A C20218-B B20219 C40232 E50239 A70259 D100270 A50277-A A10278 D70286 E70292 E41181 A21182 B21183 C21600 B101601 A91602 A91603 A81606 A72181 A32182 B32183 C32184 B42185 B32186 C32691 C102692 C82693 E82694 E82695 E82696 E82981 E22982 F32983 F22984 F33181 A33182 B33183 B33184 B33185 B33186 C333681 A93682 A103683 A83684 A83685 A73686 B93691 B83692 C83693 C103694 C93695 C73981 E33982 F34691 D84692 C74693 C74694 G14695 B86181 A36691 C89181 A56692 D99181 A59982 F2



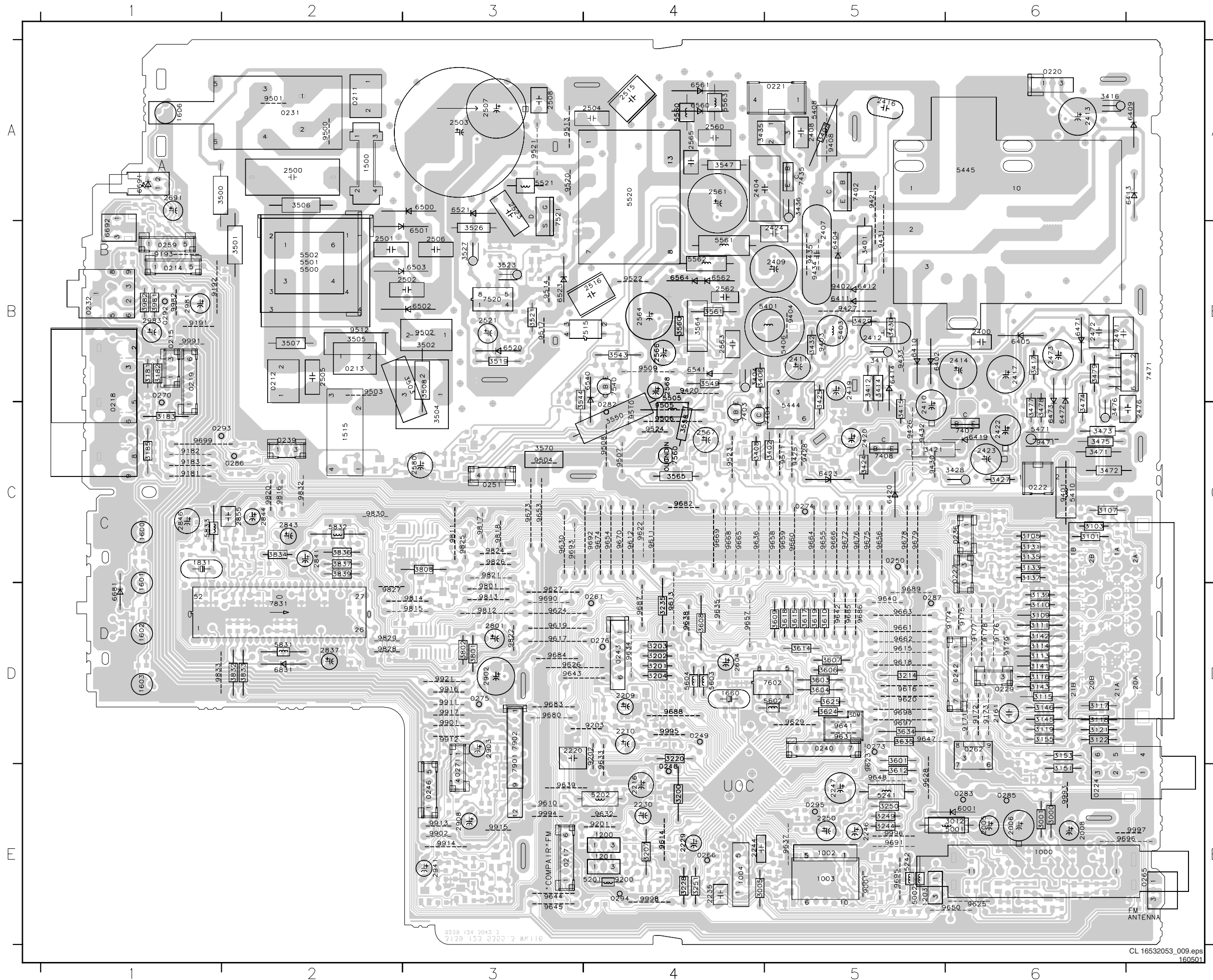
Diversity Table A12																					
Item	Description	14" Mono, 1&10 page txt, Headphone	17" Mono	21" Mono, 1&10 page txt, no side av	14" Mono, no txt, headphone	21" Mono, no txt, headphone	14" Stereo	21" Stereo, no side av	21" Mono, 10 page txt, side av	21" Stereo, side av	17" Mono, 1page txt	17" Mono, 1page txt	17" Mono, 1page txt, headphone	14" Mono, 1page txt, no headphone	20" Mono, 1page txt	21" Mono, 10 page txt, no headphone	14" Mono, 1page txt, no headphone	20" Mono, no txt, no headphone	21" Mono, no txt	17" Mono, no txt, no headphone	17" Mono, no txt
0215	CON 3P																				
0218	SOC CINCH H 2P F	X	X	X	X	X															
0218	SOC CINCH H 3P F							X	X												
0219	6P Male									X	X										
0232	SOC PHONE H 1P F	X	X	X	X	X	X	X	X		X	X	X	X							
0259	5P Male																				
1606	SWI TACT																				
2181	22pF 50V	X	X	X	X	X	X	X	X												
2182	390pF 50V	X	X	X	X	X	X	X	X												
2183	390pF 50V																				
2184	4.7uF 10V	X	X	X	X	X	X	X	X	X	X										
2185	390pF 50V	X	X	X	X	X	X	X	X												
2186	390pF 50V									X	X										
2981	10uF 50V	X	X	X	X	X	X	X	X		X	X	X	X	X						
2982	470pF 50V	X	X	X	X	X	X	X	X		X	X	X	X	X	X					
2983	10uF 50V	X	X	X	X	X	X	X	X		X	X	X	X							
2984	470pF 50V	X	X	X	X	X	X	X	X		X	X	X	X							
3181	75R	X	X	X	X	X	X	X	X												
3182	100R	X	X	X	X	X	X	X	X												
3183	150R	X	X	X	X	X	X	X	X												
3184	47K	X	X	X	X	X	X	X	X												
3185	150R									X	X										
3186	47K									X	X										
3681	390R	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X	X	X
3681	470R				X	X									X						
3682	3K3	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X	X	X
3682	3K9							X	X										X	X	X
3683	270R				X	X									X				X	X	X
3683	390R	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X	X	X
3684	470R				X	X									X				X	X	X
3684	560R	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X	X	X
3686	1K5	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X	X	X
3686	1K8				X	X													X	X	X
3692	1K	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3695	330R																				
3981	120R	X	X	X	X	X	X	X	X		X	X	X	X							
3982	120R	X	X	X	X	X	X	X	X		X	X	X	X							
4692	Jumper	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4693	Jumper	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
9181	Wire	X	X	X	X	X	X	X	X	X									X	X	X
9982	Wire	X	X	X	X	X			X		X	X	X	X							

A 1 4 REAR I/O SCART



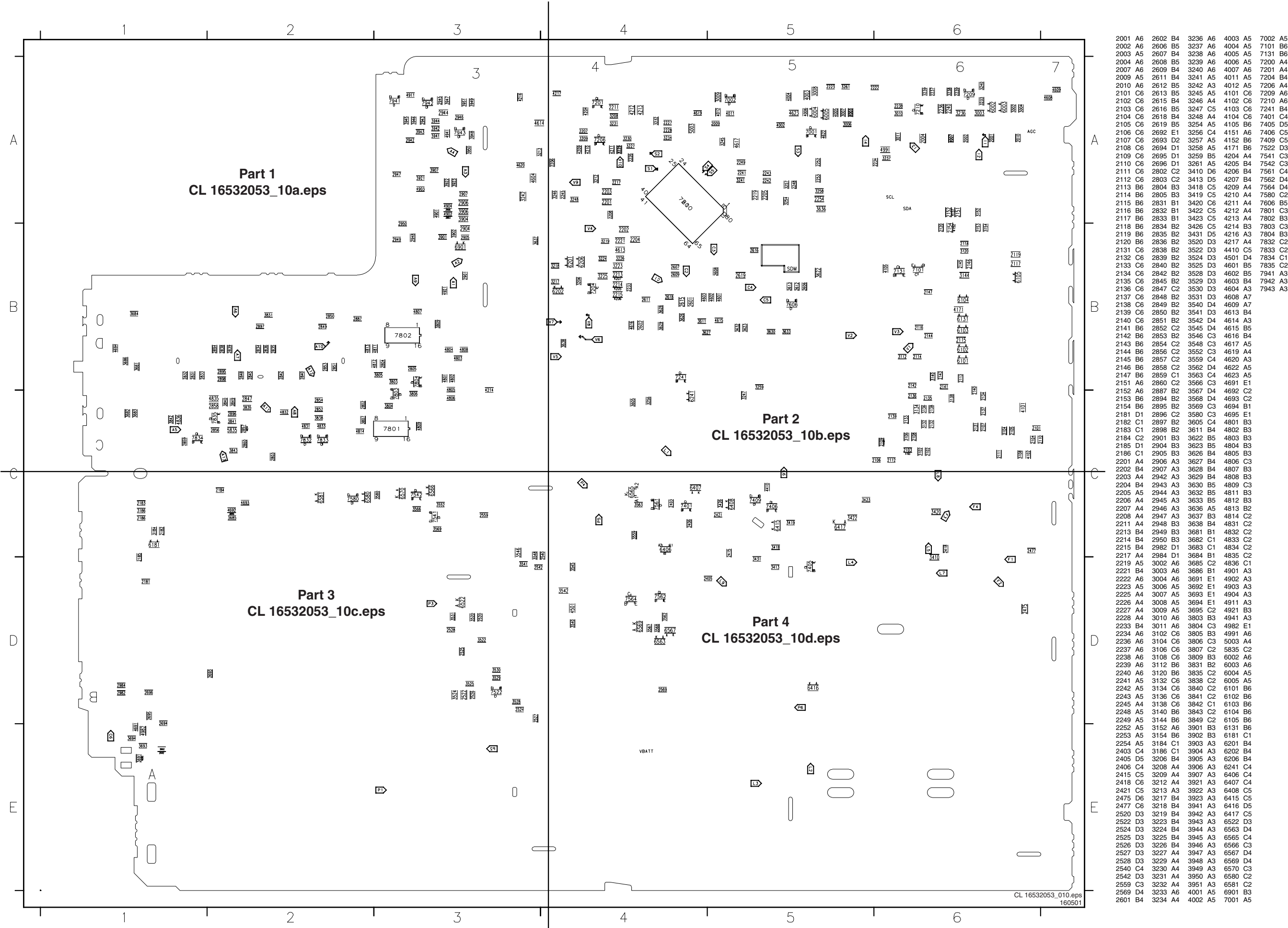
0222-A F11	3117 E4
0222-B F11	3118 E5
0227 A7	3119 F3
0229 E7	3120 F4
0235-A A1	3121 F3
0235-B A11	3122 F4
0236 A5	3131 A9
0242 F6	3132 A8
0262 G5	3133 B9
1101 A3	3134 B8
1102 B3	3135 B9
1103 B3	3136 B8
1104 C3	3137 C9
1105 C3	3138 C8
1106 D3	3139 C9
1107 C2	3140 C8
1108 D3	3141 D8
1109 C2	3142 D7
1110 E3	3143 D9
1111 E3	3144 D8
1112 F3	3145 E9
1113 F3	3146 E8
1131 A9	3151 E9
1132 B9	3152 F8
1133 B9	3153 F9
1134 C9	3154 F8
1135 B10	3155 G3
1136 C9	4101 A3
1137 C10	4102 B3
1138 C10	4103 A5
1139 D9	4104 B5
1140 C10	4105 E6
1141 D9	4151 E8
1142 E9	4152 F8
1151 F9	6101 C3
1152 F9	6102 D3
2101 A3	6103 D3
2102 A4	6104 C3
2103 A5	6105 C3
2104 B3	6131 D8
2105 B4	7101 E5
2106 B5	7131 D7
2107 B3	
2108 B4	
2109 B5	
2110 C3	
2111 C4	
2112 C5	
2113 C5	
2114 D5	
2115 D5	
2116 E5	
2117 E5	
2118 F4	
2119 F3	
2120 F4	
2131 A9	
2132 A8	
2133 A7	
2134 B9	
2135 B8	
2136 B7	
2137 B9	
2138 B8	
2139 B7	
2140 C9	
2141 C8	
2142 C7	
2143 C8	
2144 D7	
2145 D8	
2146 E9	
2147 E8	
2151 F9	
2152 E8	
2153 F9	
2154 F8	
2161 G3	
3101 A4	
3102 A4	
3103 B4	
3104 B4	
3105 B4	
3106 B4	
3107 C4	
3108 C4	
3109 C4	
3110 C5	
3111 D4	
3112 D4	
3113 D4	
3114 D5	
3115 E4	
3115 E5	

Layout Large Signal Panel (Top View)

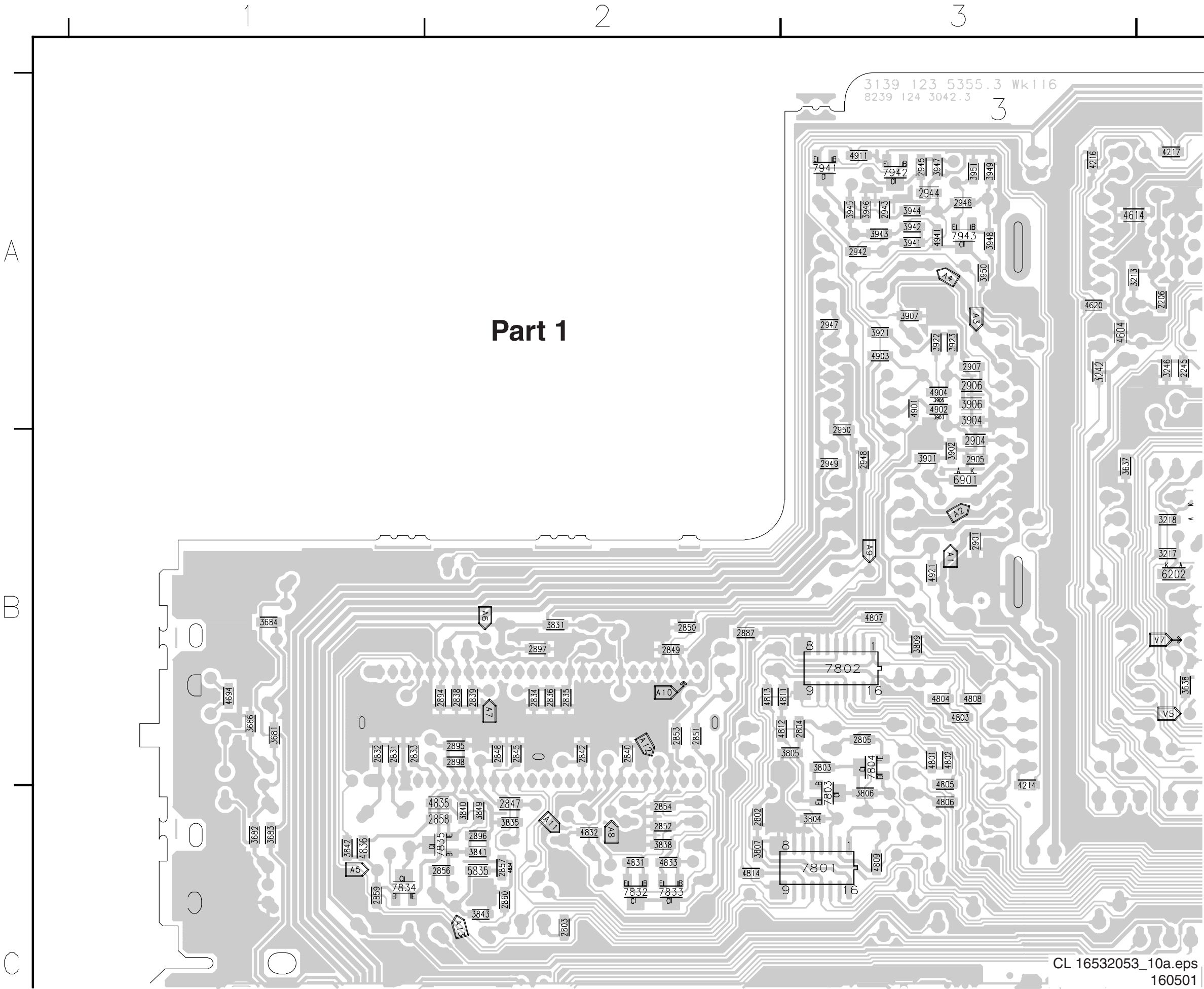


0211	A2	2903	D3	3832	D2	9508	C4
0212	B2	2908	E3	3833	D2	9509	B4
0213	B2	2941	E3	3834	C2	9510	C4
0214	B1	2981	B1	3836	C2	9511	C5
0215	B1	2983	B1	3837	C2	9512	B2
0217	E3	3000	E6	3839	C2	9513	A3
0218	C1	3001	E6	3981	B1	9514	B3
0219	B1	3005	E4	3982	B1	9517	B3
0220	A6	3012	E6	5001	E6	9520	A3
0221	A5	3101	C6	5002	E5	9521	A3
0222	C6	3103	C6	5201	E4	9522	B4
0224	E6	3105	C6	5202	E4	9523	C4
0227	C6	3107	C6	5241	E5	9524	C4
0229	D6	3109	D6	5242	E5	9510	E3
0231	A2	3110	D6	5401	B5	9511	C4
0232	B1	3111	D6	5403	B5	9512	C4
0235	D6	3113	D6	5408	B5	9513	D4
0238	C6	3114	D6	5408	A5	9514	E4
0239	C2	3115	D6	5410	C6	9515	D5
0240	D5	3116	D6	5444	C5	9516	D5
0242	D6	3117	D6	5445	A6	9517	D3
0243	D4	3118	D6	5471	C6	9518	D5
0246	E3	3119	D6	5500	B2	9519	D3
0248	E4	3121	D6	5501	B2	9520	D5
0249	D4	3122	D6	5502	B2	9522	C4
0250	C5	3131	C6	5505	B4	9523	D5
0251	C3	3133	C6	5520	A4	9524	D3
0259	B1	3135	C6	5521	A3	9525	E6
0261	D4	3137	C6	5560	A4	9526	D3
0262	D6	3139	D6	5561	B4	9527	D3
0265	E7	3141	D6	5562	B4	9528	E5
0266	E4	3142	D6	5563	A4	9529	D5
0270	B1	3143	D6	5602	D5	9530	C3
0271	E3	3145	D6	5603	D4	9531	D5
0273	D5	3146	D6	5604	D4	9532	E4
0274	C5	3151	E6	5831	D2	9533	D4
0275	D3	3153	D6	5832	C2	9534	D4
0278	D4	3155	D6	5833	C1	9535	D4
0277	B1	3181	B1	6001	E6	9536	C4
0282	C4	3182	B1	6402	B5	9537	E5
0283	E6	3183	C1	6404	B5	9538	D4
0285	E6	3185	C1	6405	B6	9539	E3
0286	C2	3200	E4	6409	B7	9540	D5
0287	D5	3201	D4	6410	B5	9541	D5
0292	B1	3202	D4	6411	B5	9542	D5
0293	C1	3203	D4	6412	B5	9543	D3
0294	E4	3204	D4	6413	A7	9544	E3
0295	E5	3207	E4	6414	B5	9545	E3
1000	E6	3214	D5	6419	C6	9547	D5
1002	E5	3220	D4	6420	C5	9548	E5
1003	E5	3228	E4	6423	C5	9550	E6
1004	E4	3235	D4	6471	B5	9553	C3
1200	E4	3244	E5	6472	C6	9554	C4
1201	E4	3249	E5	6473	C6	9555	C5
1203	E5	3250	E5	6500	A3	9556	C5
1500	A2	3251	E4	6501	B3	9557	D4
1515	C2	3401	B5	6502	B3	9558	C5
1600	C1	3402	C5	6503	B3	9559	C5
1601	C1	3403	A5	6520	B3	9560	C5
1602	D1	3404	B4	6521	A3	9561	D5
1603	D1	3406	B4	6523	B3	9562	D5
1606	A1	3408	C4	6540	B4	9563	D5
1660	D4	3411	B5	6541	B4	9564	C5
1831	C1	3412	B5	6560	A4	9565	C4
2005	E6	3414	B5	6561	A4	9566	C5
2006	E6	3415	C5	6562	B4	9568	C4
2008	E6	3416	A6	6564	B4	9569	C4
2161	D6	3417	B6	6681	D1	9570	C4
2209	D4	3421	C5	6691	A1	9572	C5
2210	D4	3424	C5	6692	B1	9573	C3
2216	E4	3425	B5	6831	D3	9574	C4
2220	D3	3427	C6	7402	A5	9575	C5
2229	E4	3428	C6	7403	C4	9576	C5
2230	E4	3429	B5	7404	C5	9578	C5
2235	E4	3430	B5	7407	C6	9579	C5
2244	E4	3432	B5	7408	C5	9580	D3
2246	E5	3435	A4	7435	A5	9582	C4
2247	E5	3436	A5	7471	B7	9583	D3
2250	E5	3471	C6	7515	B4	9584	D3
2400	B6	3472	C6	7520	B3	9585	D5
2404	A4	3473	C6	7521	A3	9586	D5
2407	B5	3474	C6	7540	B4	9587	D4
2408	A5	3475	C6	7560	C4	9588	D4
2409	B5	3476	C6	7602	D5	9589	D5
2410	C5	3477	C6	7631	D2	9590	D3
2411	B5	3478	C6	7901	D3	9591	E5
2412	B5	3479	B6	7902	D3	9592	C4
2413	A6	3500	A1	9001	E5	9593	C3
2414	B6	3501	B2	9171	D6	9595	E5
2416	A5	3502	B3	9172	D6	9596	E6
2417	B6	3503	B3	9173	D6	9597	D5
2419	B5	3504	C3	9174	D6	9598	D5
2420	C5	3505	B2	9175	D6	9599	C1
2422	C6	3506	A2	9176	D6	9601	D3
2423	C6	3507	B2	9177	D6	9611	C3
2424	B5	3508	B3	9178	D6	9612	D3
2471	B6	3519	B3	9179	D6	9613	D3
2472	B6	3521	B3	9181	C1	9614	D3
2473	B6	3523	B3	9182	C1	9615	D3
2476	C7	3526	B3	9183	C1	9616	C2
2500	A2	3527	B3	9191	B1	9617	C3
2501	B2	3543	B4	9192	B1	9618	C3
2502	B3	3544	B3	9193	B1	9620	C2
2503	A3	3547	A4	9200	E4	9621	C3
2504	A4	3549	B4	9201	E4	9622	D3
2505	B2	3550	C4	9202	D4	9624	C3
2506	B3	3558	C4	9203	D4	9625	C3
2507	A3	3560	B4	9401	C6	9626	C3
2508	A3	3561	B4	9402	B5	9627	D2
2515	A4	3564	B4	9403	B5	9628	D2
2516	B4	3565	C4	9408	B5	9629	D2
2521	B3	3570	C3	9408	A5	9630	C2
2523	A3	3601	D5	9420	B4	9632	C2
2560	A4	3603	D5	9421	A5	9633	D1
2561	A4	3604	D5	9425	C5	9601	D3
2562	B4	3606	D5	9426	C5	9602	E3
2563	B4	3607	D5	9427	B5	9611	D3
2564	B4	3608	D4	9428	C5	9612	D3
2565	A4	3609	D5	9430	C3	9613	E3
2566	B4	3610	D5	9431	B5	9614	E3
2567	C4	3612	E5	9432	C5	9615	E3
2568	B4	3614	D5	9433	B5	9616	D3
2580	C3	3615	D5	9434	B5	9617	D3
2604	D4	3617	D5	9435	B5	9621	D3
2691	A1	3618	D5	9471	C6	9982	E1
2801	D3	3619	D5	9500	A2	9991	B1
2837	D2	3624	D5	9501	A2	9993	E6
2841	C2	3625	D5	9502	B3	9994	E3
2843	C2	3634	D5	9503	B2	9995	D4
2844	C2	3635	D5	9504	C3	9996	E5
2846	C1	3601	D3	9505	C4	9997	E7
2855	C2	3802	D3	9506	C4	9998	E4
2902	D3	3808	C3	9507	C4	9999	E5

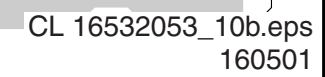
Layout Large Signal Panel (Overview Bottom View)



Layout Large Signal Panel (Part 1 Bottom View)



Part 2

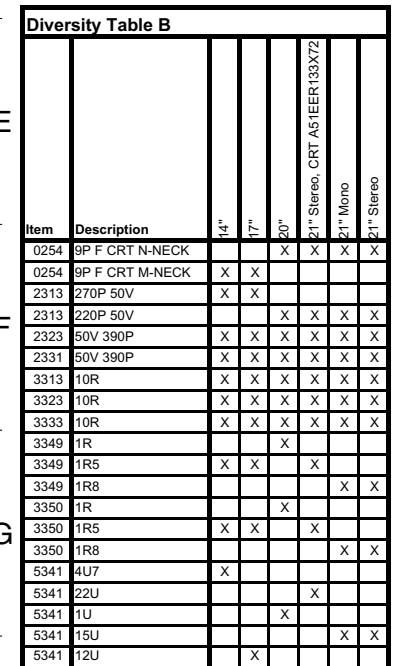


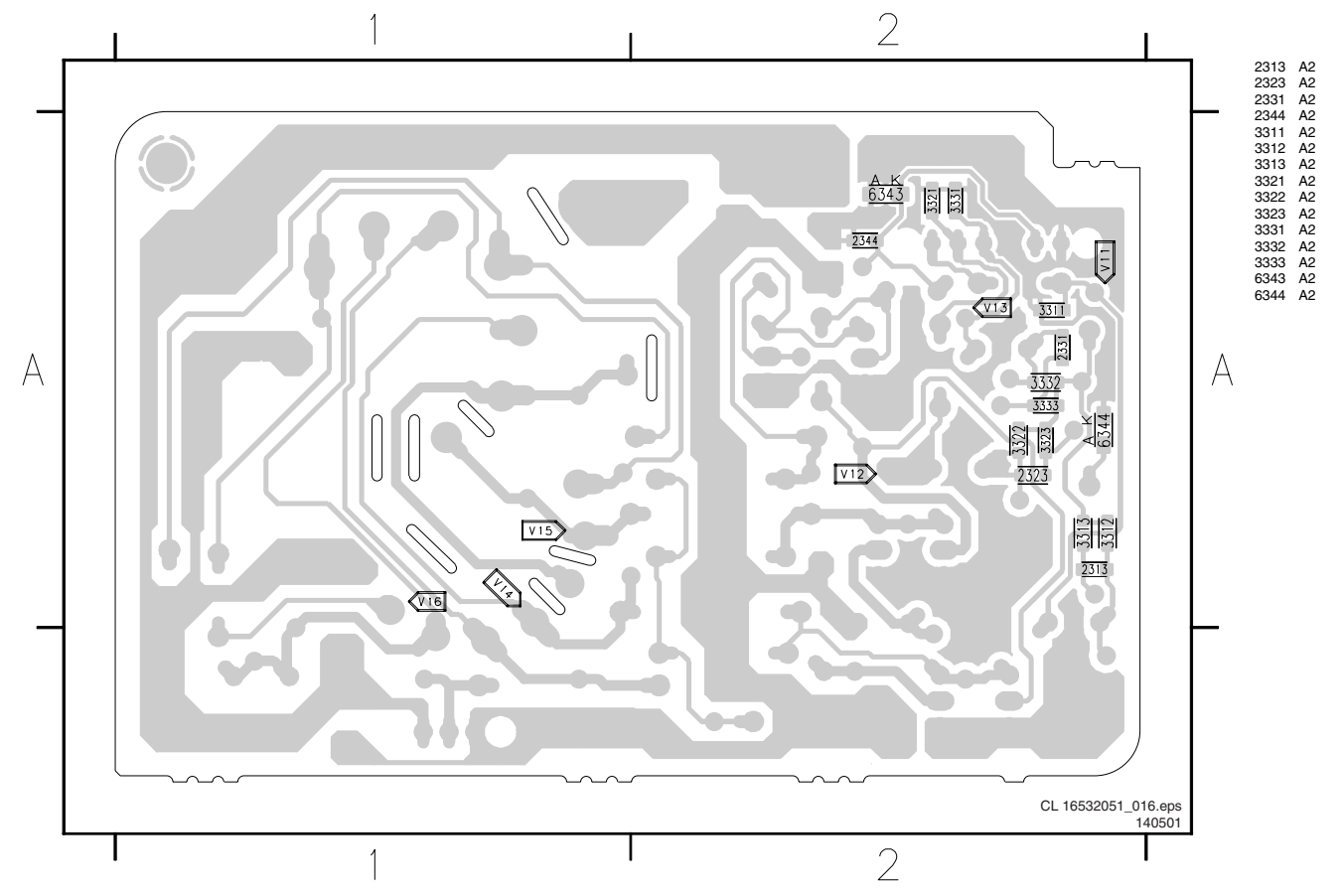
F

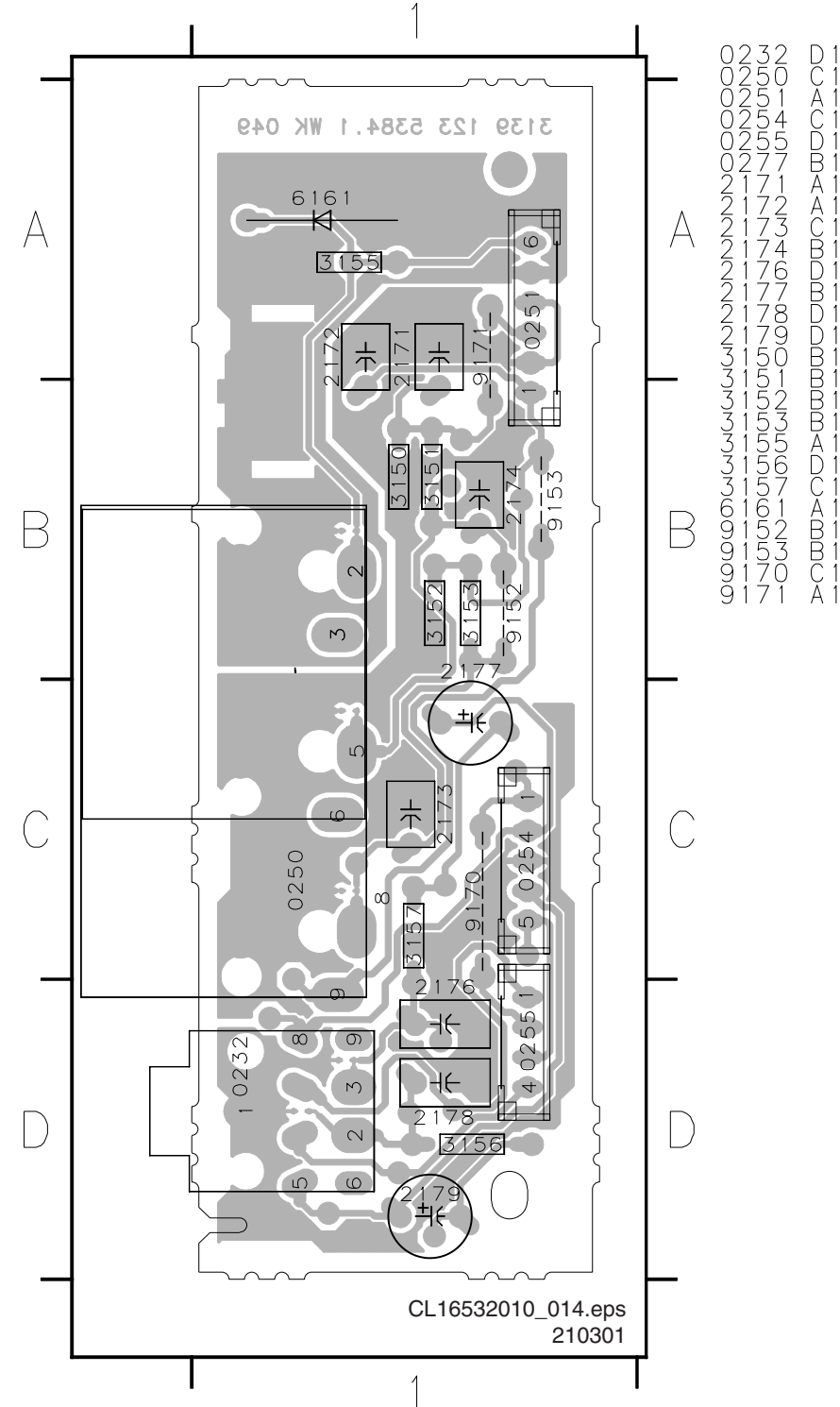


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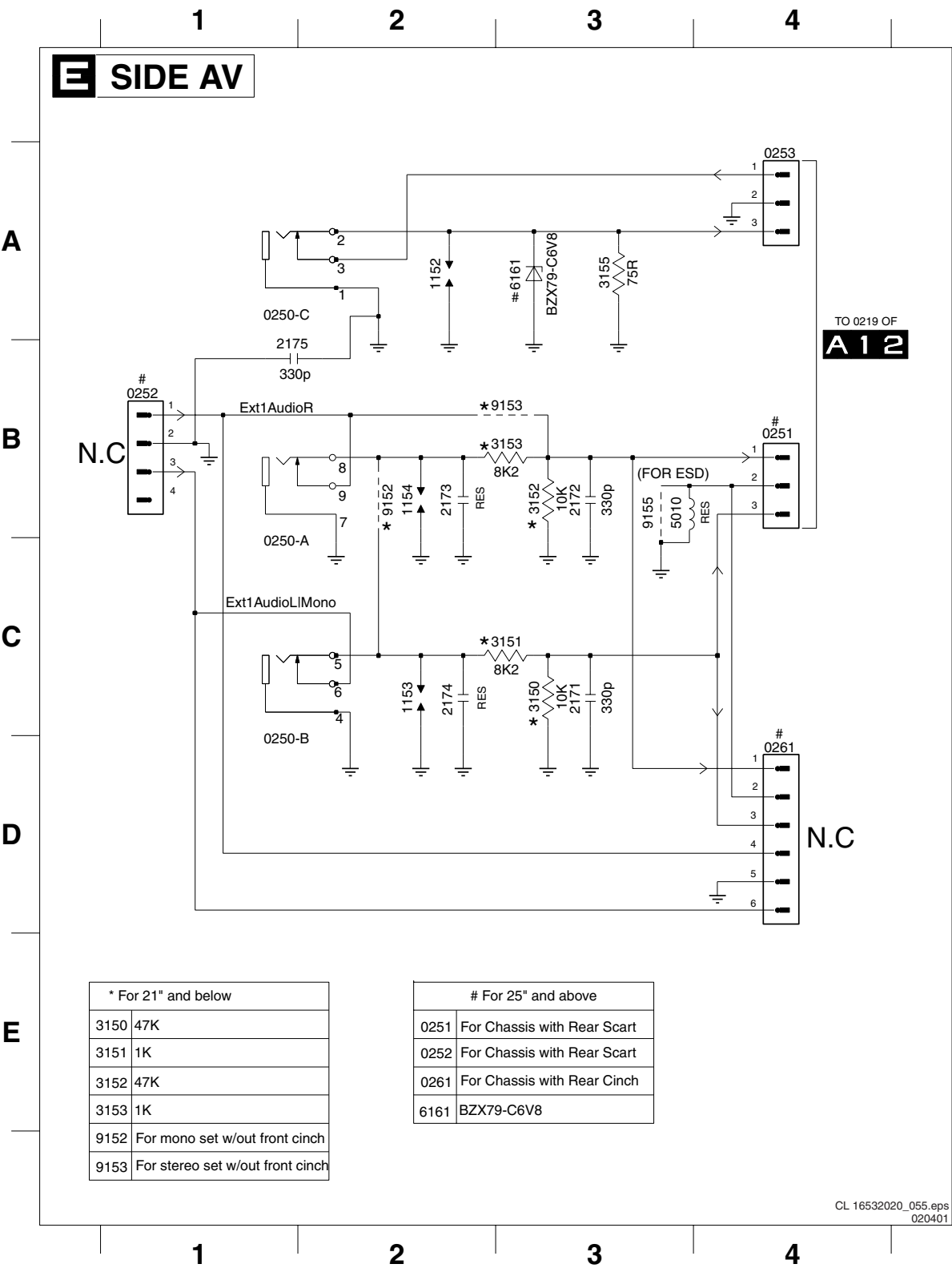
VG12 F9	0244 G2	0254-A D7	2313 E3	2331 B3	2342 G2	3311 F2	3313 F3	3316 D4	3321 D2	3323 D3	3326 B4	3331 B2	3333 B3	3336 A4	3341 E5	3348 D5	3350 E6	5342 G2	6321 C4	6341 A4	6343 G4	7312 D4	7321 C3	7323 C4	7332 A4	9300 F3
0165 A7	0245 C1	1300-1 B7	2323 D3	2341 F5	2343 G2	3312 F2	3314 E3	3317 C5	3322 D2	3324 C3	3327 C5	3332 B2	3334 A3	3337 B5	3347 F4	3349 E6	5341 G2	6311 D4	6331 A4	6342 F3	7311 E3	7313 E4	7322 C4	7331 B3	7333 A4	



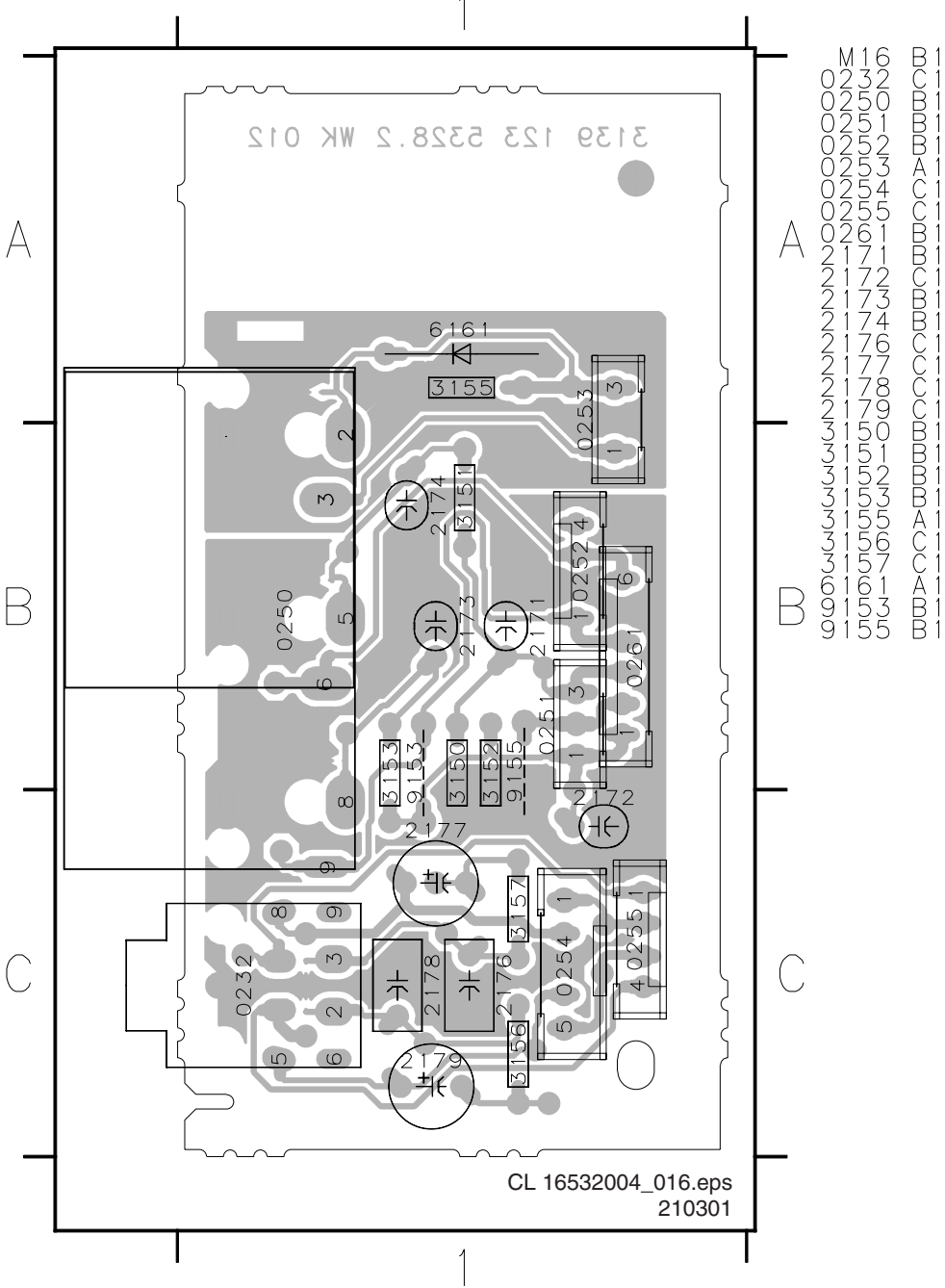




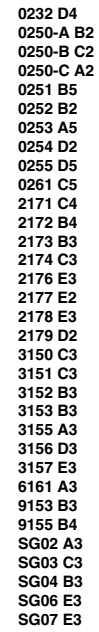
Side AV Panel



Layout Side AV Panel (Top View)



E 1 SIDE AV PANEL & HEADPHONE



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0	M	16	C	2
0	25	1	C	2
0	25	1	A	3
0	25	2	A	2
0	25	3	A	1
0	26	1	A	2
2	17	1	B	2
2	17	2	A	3
2	17	3	B	2
2	17	4	B	2
2	17	5	B	1
3	15	0	B	3
3	15	1	B	2
3	15	2	B	3
3	15	3	B	3
3	15	5	B	1
5	0	0	B	3
6	16	1	B	1
9	15	2	B	2
9	15	3	B	3
9	15	5	B	3

8. Alignments

Index of this chapter:

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.

8.1 General Alignment Conditions

Perform all electrical adjustments under the following conditions:

- Mains voltage and frequency: according to country's standard.
- Connect the set to the Mains 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

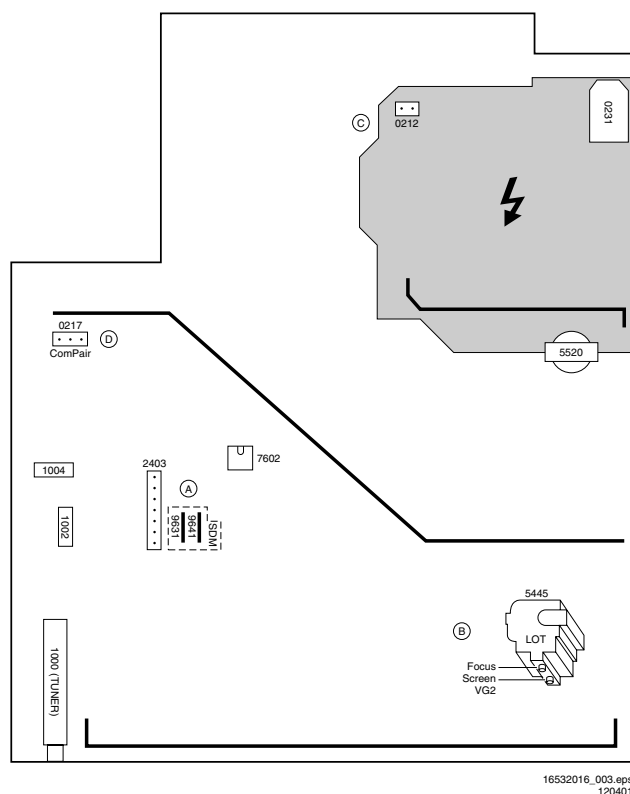


Figure 8-1

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).

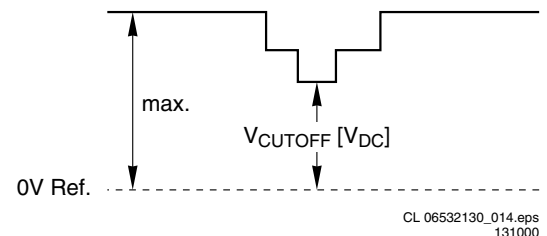


Figure 8-2

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

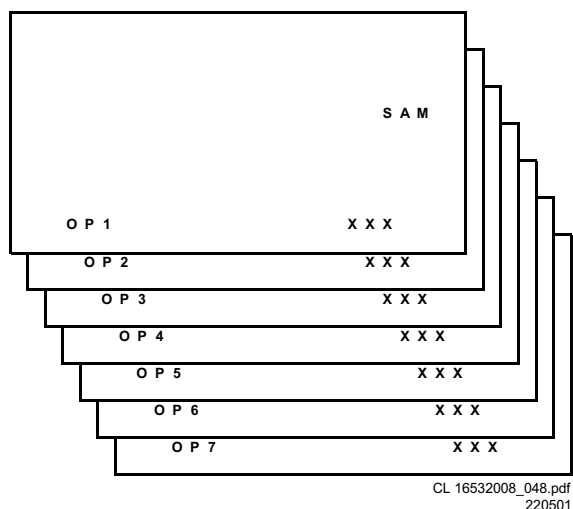


Figure 8-4

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 Mains 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 numbers 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
14PT1346/05	4	196	0	0	64	0	66
14PT1346/58	4	196	0	0	64	0	65
14PT1356/00	4	196	0	0	208	0	66
14PT1356/01	4	196	0	0	208	0	67
14PT1356/05	4	196	0	0	208	0	66
14PT1356/58	4	196	0	0	208	0	65
14PT1556/00	4	196	0	0	208	0	66
14PT1546/58	4	196	0	0	64	0	65
14PT1546/05	4	196	0	0	64	0	66
14PT1556/01	4	196	0	0	208	0	67
14PT1556/05	4	196	0	0	208	0	66
14PT1556/21	4	196	0	0	208	0	67
14PT1666/01	220	246	65	16	208	54	67
14PT1666/58	220	246	65	16	208	54	65
14PT1686/01C	220	246	65	16	208	54	67
14PT1686/01B	220	246	65	16	208	54	67
14PT1686/01L	220	246	65	16	208	54	67
14PT1686/01M	220	246	65	16	208	54	67
14PT1686/01V	220	246	65	16	208	54	67
14PT1686/01Y	220	246	65	16	208	54	67
14PT1686/05B	220	246	65	16	208	54	66
14PT1686/05C	220	246	65	16	208	54	66
14PT1686/05L	220	246	65	16	208	54	66
14PT1686/05M	220	246	65	16	208	54	66
14PT1686/05V	220	246	65	16	208	54	66
14PT1686/05Y	220	246	65	16	208	54	66
14PT1686/58B	220	246	65	16	208	54	65
14PT1686/58C	220	246	65	16	208	54	65
14PT1686/58L	220	246	65	16	208	54	65
14PT1686/58M	220	246	65	16	208	54	65
14PT1686/58V	220	246	65	16	208	54	65
14PT1686/58Y	220	246	65	16	208	54	65
14PT2666/01	220	246	65	184	208	54	67
14PT2666/05	220	246	65	184	208	54	66
14PT2666/58	220	246	65	184	208	54	65
17PT1666/00	220	246	65	16	208	54	66
17PT1666/01	220	246	65	16	208	54	67
17PT1666/05	220	246	65	16	208	54	66
17PT1666/58	220	246	65	16	208	54	65
20PT1346/00	4	196	0	0	192	0	67
20PT1346/01	4	196	0	0	192	0	67
20PT1346/58	4	196	0	0	192	0	65
20PT1546/00	4	196	0	0	192	0	67
20PT1546/01	4	196	0	0	192	0	67
20PT1546/58	4	196	0	0	192	0	65
21PT1346/58	4	196	0	0	64	0	65
21PT1356/00	4	196	0	0	208	0	66
21PT1356/01	4	196	0	0	208	0	67
21PT1356/58	4	196	0	0	208	0	65
21PT1546/58	4	196	0	0	64	0	65
21PT1556/00	4	196	0	0	208	0	66
21PT1556/05	4	196	0	0	208	0	66
21PT1556/58	4	196	0	0	208	0	65
21PT1666/01	220	246	65	16	208	54	67
21PT1666/05	220	246	65	16	208	54	66
21PT1666/58	220	246	65	16	208	54	65
21PT4406/01	4	196	64	40	240	0	67
21PT4406/05	4	196	64	40	240	0	67
21PT4406/21	4	196	64	40	240	0	67
21PT4406/58	4	196	64	40	240	0	65
21PT4456/01	220	246	65	56	240	2	67
21PT4456/05	220	246	65	56	240	2	67
21PT4456/58	220	246	65	56	240	2	65
37TA1266/18	4	20	0	0	64	0	67
37TA1266/58	4	20	0	0	64	0	65
37TA1276/03	4	4	0	0	64	0	66
37TA1276/08	4	4	0	0	64	0	66
37TA1276/11	4	4	0	0	64	0	67
37TA1276/16	4	4	0	0	64	0	66
37TA1476/18	4	4	0	0	64	0	67
37TA1476/16	4	4	0	0	64	0	66
37TA1476/03	4	4	0	0	64	0	66
37TB1256/19	4	20	0	0	64	0	67
51TA1266/18	4	4	0	0	64	0	67
51TA1476/11	4	4	0	0	64	0	67
51TA1476/03	4	4	0	0	64	0	66
51TA1476/16	4	4	0	0	64	0	66
51TB1256/19	4	4	0	0	64	0	67
52TA1466/18	4	4	0	0	64	0	67
52TA1476/03	4	4	0	0	64	0	66
52TA1476/11	4	4	0	0	64	0	67
52TA1476/16	4	4	0	0	64	0	66
52TB1456/19	4	4	0	0	64	0	67

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Figure 8-6

Option Bit Assignment

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

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

Option bit definition**OP10: 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

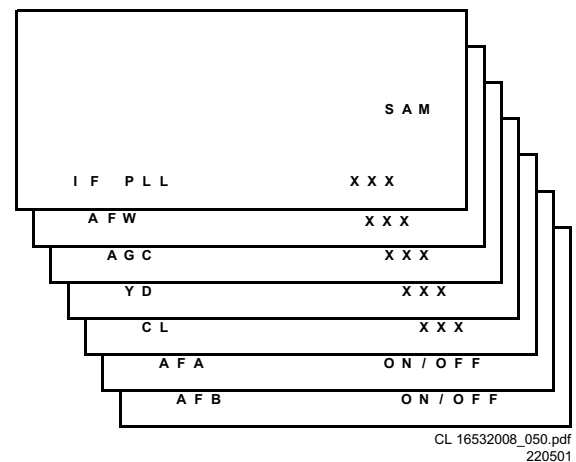
11 : not in use

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.



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220501

Figure 8-7

IFPLL

This adjustment is auto-aligned. Therefore, no action is required (default= 30).

AFW (AFC window)

Select the lowest value.

AGC (AGC take over point)

Set the external pattern generator to a colour bar video signal and connect the RF output to aerial input.

Set amplitude to 10 mV and set frequency to 475.25 MHz (PAL/SECAM) or 61.25 MHz (NTSC).

Connect a DC multi-meter 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.

Default value is 28.

YD (Y-delay adjustment)
Fixed value is 7.

CL (Cathode drive level)
Fixed value is 5.

AFA
Read only bit, for monitoring purpose only.

AFB
Read only bit, for monitoring purpose only.

8.3.3 White Tone

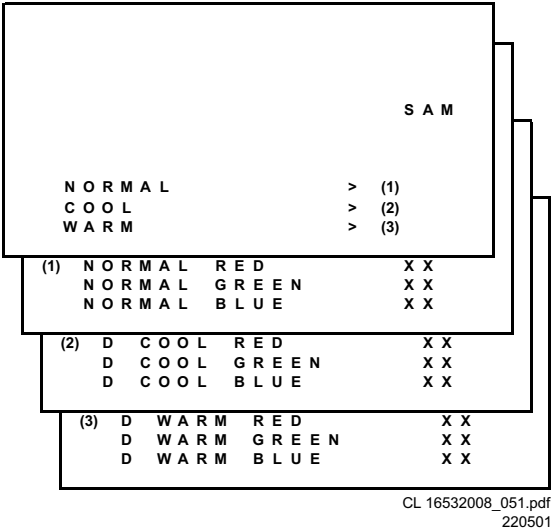


Figure 8-8

In the WHITE TONE sub menu, the values of the black cut off level can be adjusted. Normally, no alignment is needed for the WHITE TONE. You can use the given default values. The colour temperature mode (NORMAL, COOL and WARM) and the colour (R, G, and B) can be selected with the UP/DOWN RIGHT/LEFT cursor keys. The value can be changed with the LEFT/RIGHT cursor keys. First, select the values for the NORMAL colour temperature. Then select the values for the COOL and WARM mode. After alignment, switch the set to standby, in order to store the alignments.

Default settings:

- NORMAL** (colour temperature = 8500 K):
 - NORMAL R = 26
 - NORMAL G = 32
 - NORMAL B = 27
- COOL** (colour temperature = 11500 K):
 - DELTA COOL R = -3
 - DELTA COOL G = 0
 - DELTA COOL B = 5
- WARM** (colour temperature = 7000 K):
 - DELTA WARM R = 2
 - DELTA WARM G = 0
 - DELTA WARM B = -6

8.3.4 Geometry

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

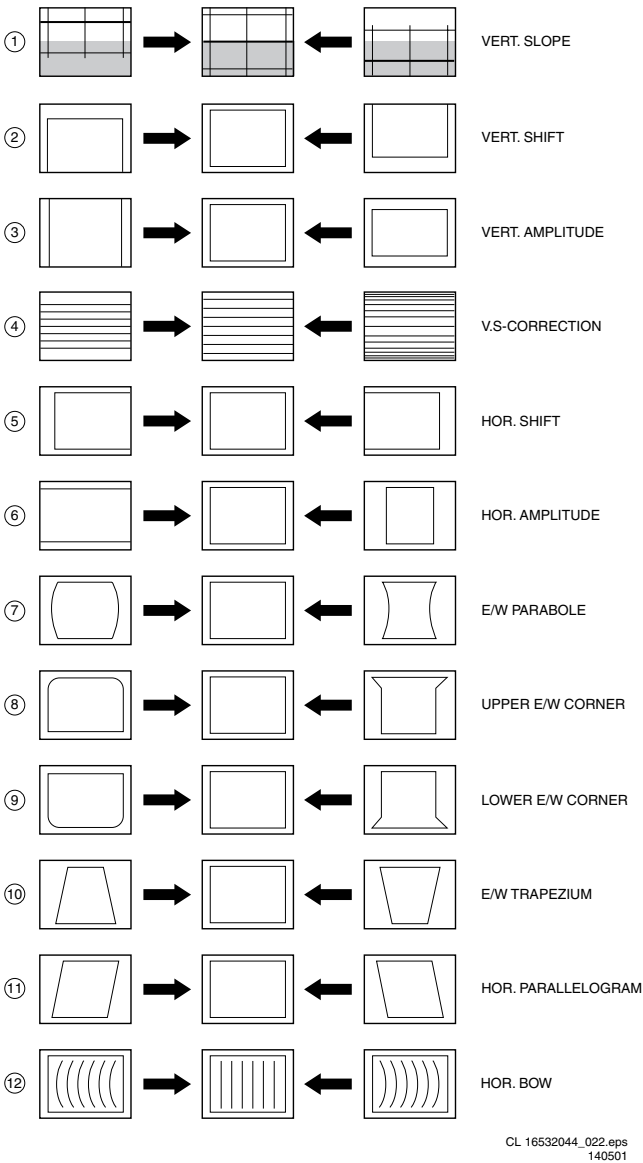


Figure 8-9

- How to align**
- Connect an external video pattern generator to the aerial input of the TV-set and input a crosshatch test pattern. Set amplitude to at least 1 mV and set frequency to 475.25 MHz (PAL/SECAM) or 61.25 MHz (NTSC).
- Set 'Smart Picture' to NATURAL (or MOVIES).
 - Activate the SAM menu (see chapter 5).
 - Go to the GEOMETRY sub menu.
 - Choose HORIZONTAL or VERTICAL alignment
- Now you can perform the following alignments:

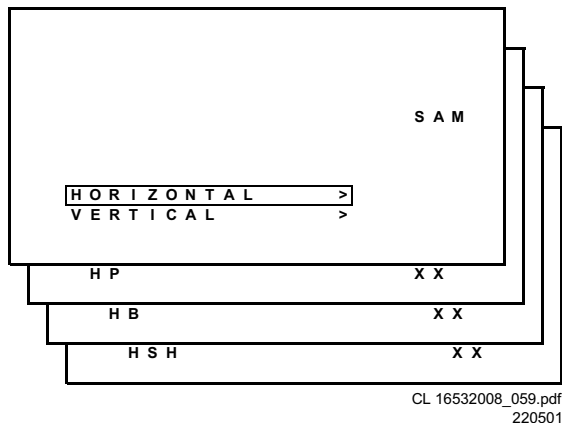


Figure 8-10

Horizontal alignment

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

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

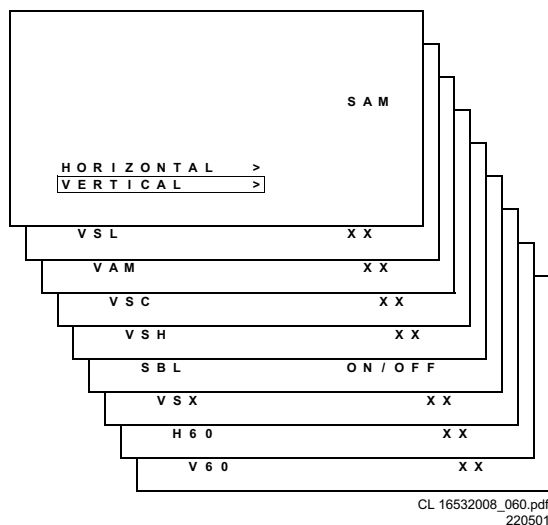


Figure 8-11

Vertical alignment

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

- **V60.** Align straight vertical lines if NTSC input (60 Hz) is used i.s.o. PAL (50 Hz).

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

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

DEFAULT GEOMETRY VALUES (L01 SMALL SCREEN)					
Alignment	Description	14"	14" Real Flat	17"	20"
HP	Hor. Parallelogram	31	31	31	31
HB	Hor. Bow	31	31	31	31
HSH	Hor. Shift	25	25	25	25
VSL	Vert. Slope	33	33	33	33
VAM	Vert. Amplitude	26	30	26	30
VSC	Vert. S-correction	23	23	23	23
VSH	Vert. Shift	35	35	35	35
VX	Vert. Zoom	25	25	25	25
H60	Hor. Shift offset (60 Hz)	9	9	9	9
V60	Vert. Shift offset (60 Hz)	4	4	4	4

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Figure 8-12

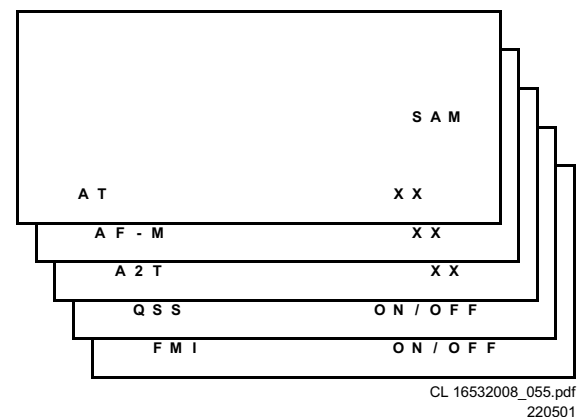
8.3.5 Audio

Figure 8-13

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

AT (Attack Time)

Default value is 0 (**exception:** for the 14PT26xx and 21PT44xx the default value is 8).

AF-M

Default value is 0 (**exception:** for the 14PT26xx and 21PT44xx the default value is 301).

A2T

Default value is 0 (**exception:** for the 14PT26xx and 21PT44xx the 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 of this chapter:

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

Notes:

- 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" - 21" (small screen) to 21" - 32" (large screen).

The standard architecture consists of a Main panel, a Picture Tube panel, a Side I/O panel (not all executions) and a Top Control panel.

The Main panel consists primarily of conventional components with hardly any surface mounted devices.

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 video 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.

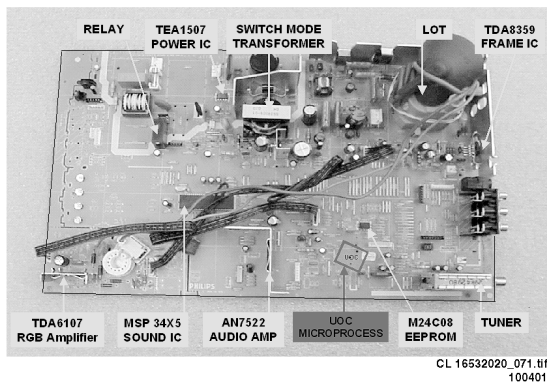


Figure 9-1

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

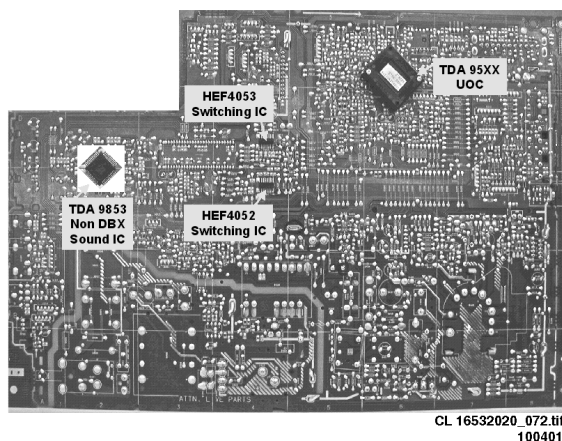


Figure 9-2

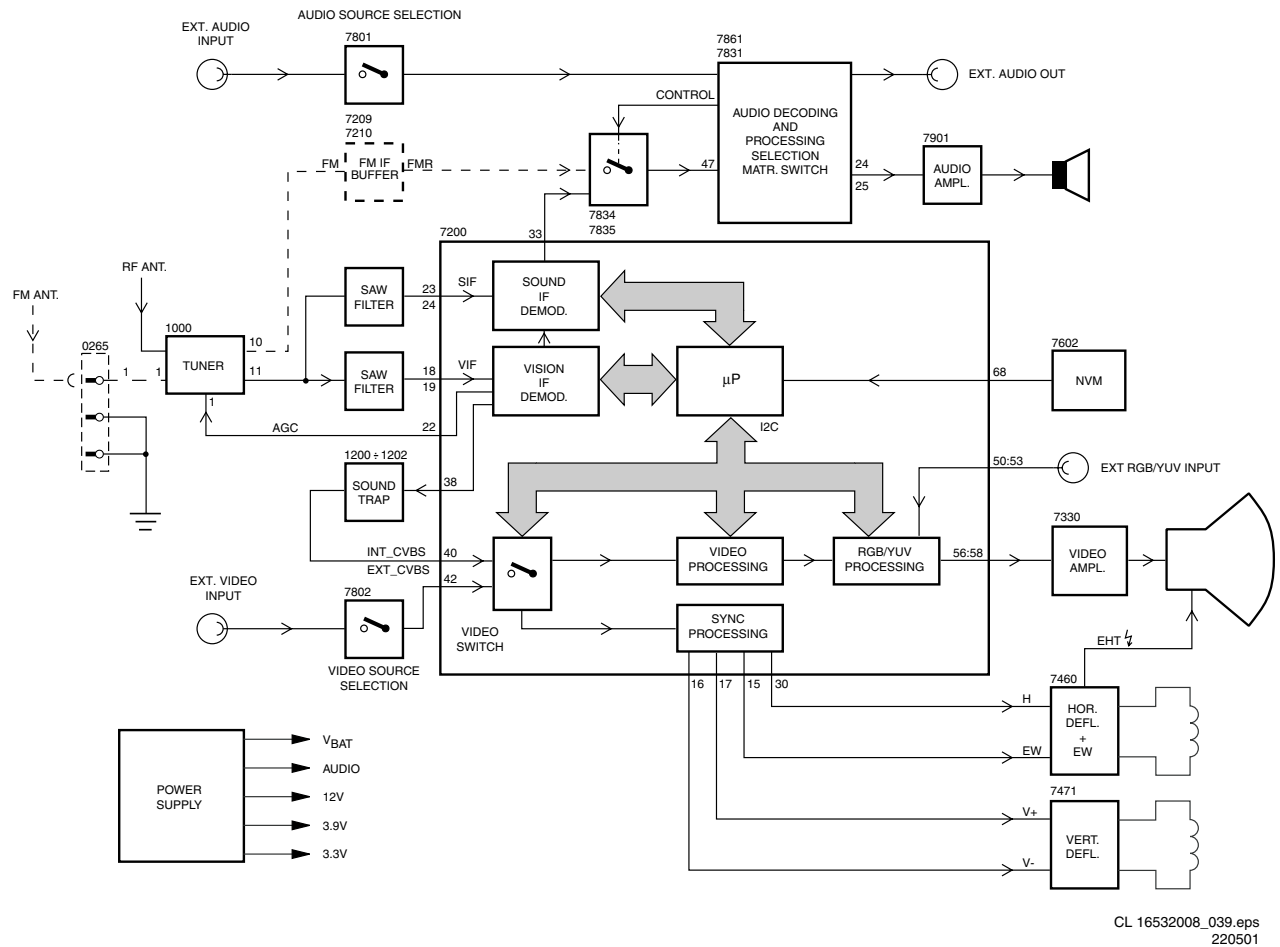


Figure 9-3

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.

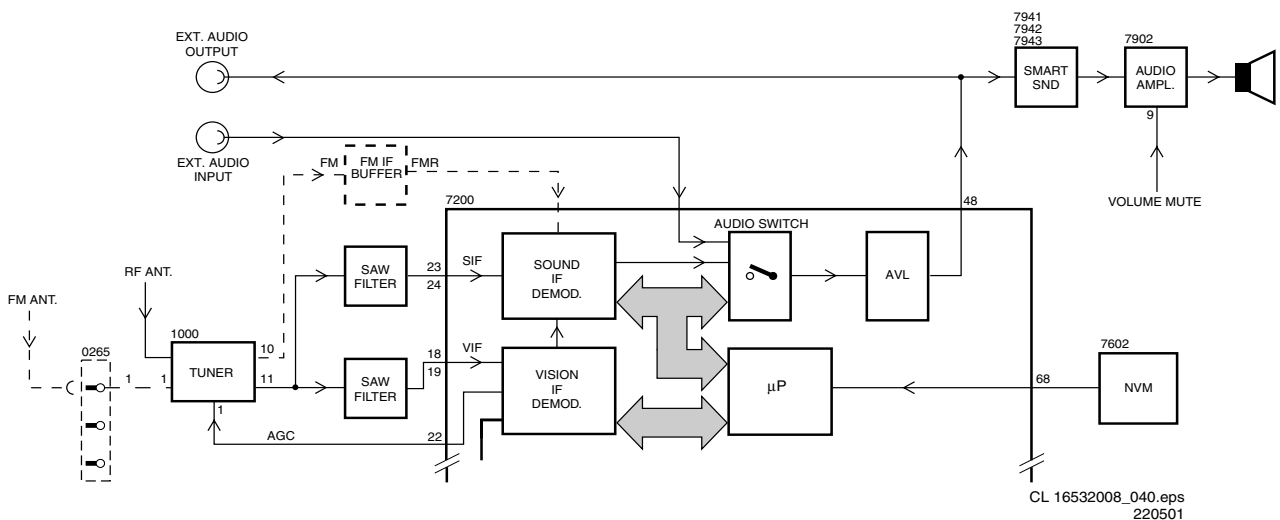


Figure 9-4

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 38.9 MHz IF signal is developed and amplified. The IF signals then exits the tuner from pin 11 to pass through the SAW filter (position 1002 in case of QSS demodulation and 1003 in case of Intercarrier 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 and 1201) 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

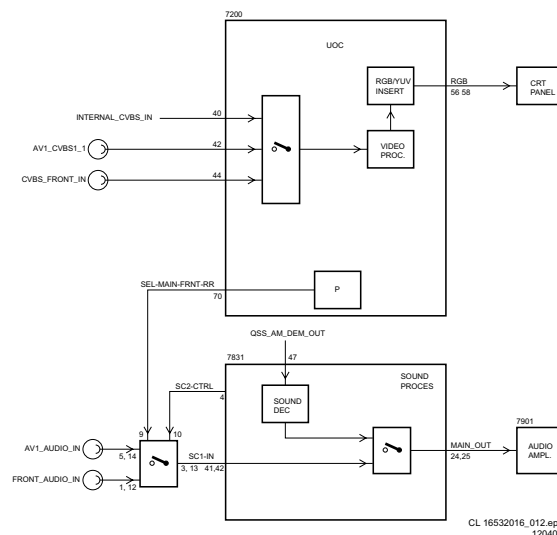


Figure 9-5

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 processing or the cloche filter for SECAM processing is switched on. The selected luminance (Y) signal is supplied to the horizontal and vertical synchronisation processing circuit and to the luminance processing circuit. In the luminance-processing block, the luminance signal goes to the chroma trap filter. This trap is switched 'on' or 'off', depending on the colour burst detection of the chroma calibration circuit.

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

9.3.4 Video Demodulation

The colour decoder circuit detects whether the signal is a PAL, NTSC or SECAM signal. The result is made known to the auto system manager. The PAL/NTSC decoder has an internal clock generator, which is stabilised to the required frequency by using the 12 MHz clock signal from the reference oscillator of the microcontroller/teletext decoder. The base-band delay line is used to obtain a good suppression of cross colour effects.

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

9.3.5 Luminance/Chrominance Signal Processing

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

- **Black stretch** This function corrects the black level of incoming signals, which have a difference between the black level and the blanking level. The amount of extension depends upon the difference between actual black level and the darkest part of the incoming video signal level. It is detected by means of an internal capacitor.

- **White stretch** This function adapts the transfer characteristic of the luminance amplifier in a non-linear way depending on the average picture content of the luminance signal. It operates in such a way that maximum stretching is obtained when signals with a low video level are received. For bright pictures, stretching is not active.
- **Dynamic skin tone correction** This circuit corrects (instantaneously and locally) the hue of those colours which are located in the area in the UV plane that matches the skin tone. The correction is dependent on the luminance, saturation and distance to the preferred axis.

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

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

9.3.6 RGB Control

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

The following additional controls are used:

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

the vertical deflection is placed in an over-scan position, so that the discharge is not visible on the screen.

9.3.7 RGB Amplifier

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

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

9.3.8 SCAVEM (only present in large screen sets)

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 6413 and fed to the emitter of transistor 7405. If this voltage goes above 6.8 V, transistor 7405 will conduct, making the 'EHTO' 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 7401, the horizontal driver transistor. The signal is amplified and coupled to the base circuit of 7402, 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.

9.5.3 Rotation (only present in widescreen sets)

To cope with the different earth magnetism situations in the world, a rotation coil is added in widescreen sets. 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

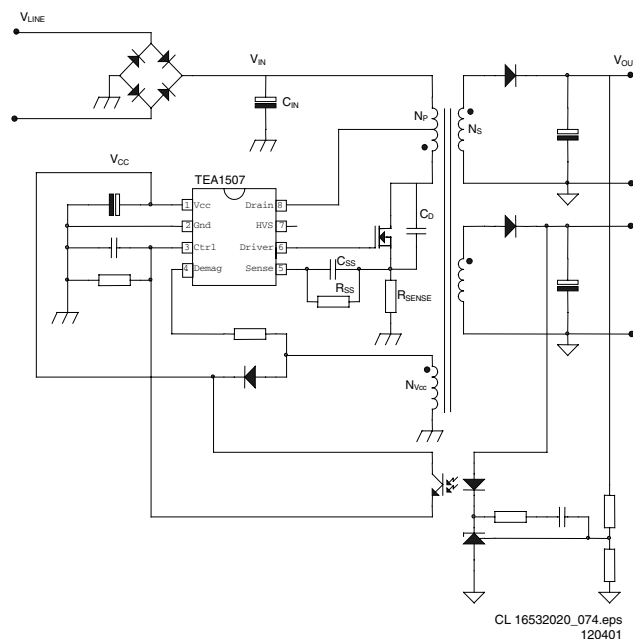


Figure 9-6

9.5.2 Vertical Drive

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

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

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

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

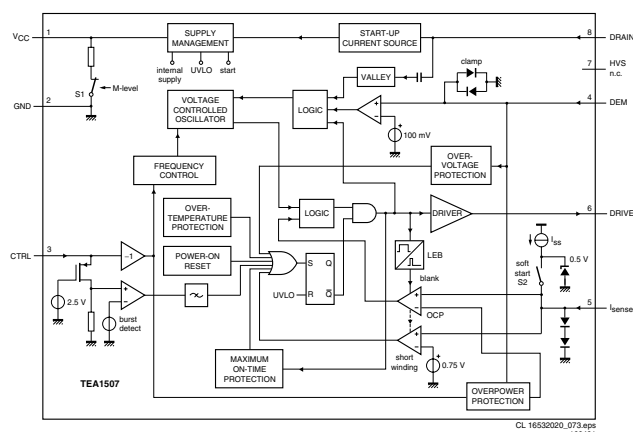


Figure 9-7

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.

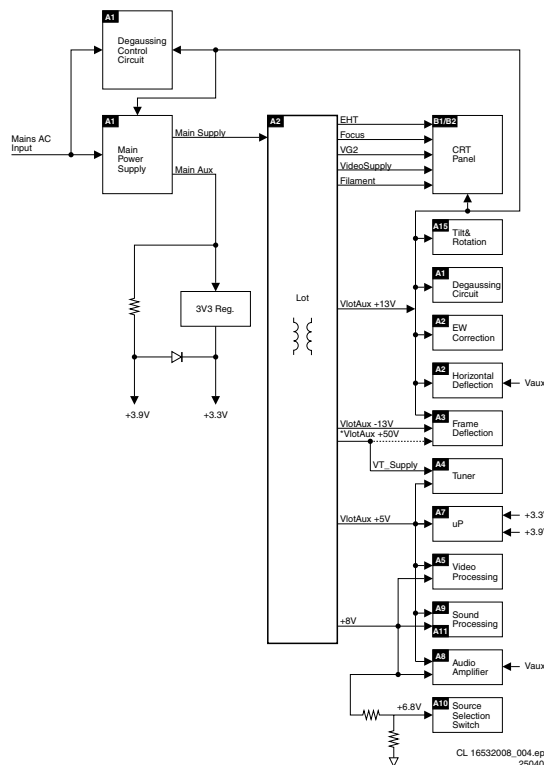


Figure 9-8

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
			10 V	Stereo 2x1 W and Mono 1x1 W
All others	MainSupply	P6 (C2561)	130 V	21/25/29RF and 25/27/32/35V
			143 V	25/28/29SF, 25/28BLD, 25/28BLS, 28/32WS, 24/28BLDWS & BLSWS
	MainAux	P5 (C2564)	12 V	Stereo 2x1 W, 3 W, 5 W
			10 V	Mono 1x1 W

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230501

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).

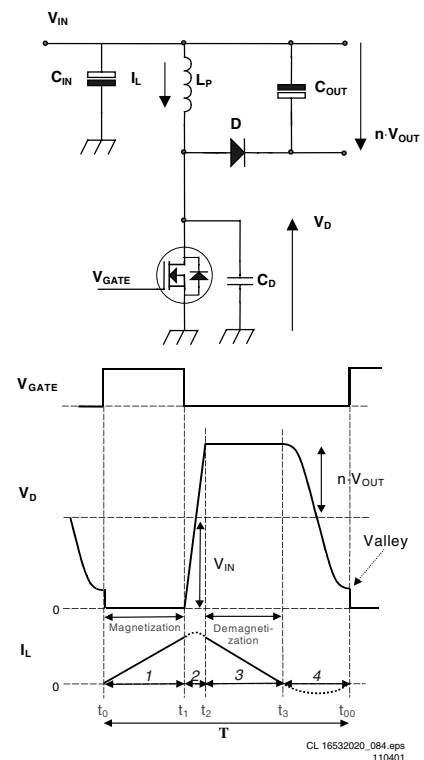


Figure 9-10

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.

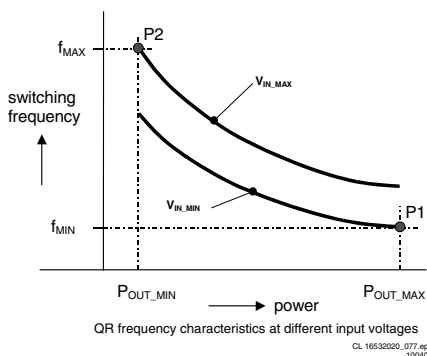


Figure 9-11

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 $V_{CC-start}$ (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.

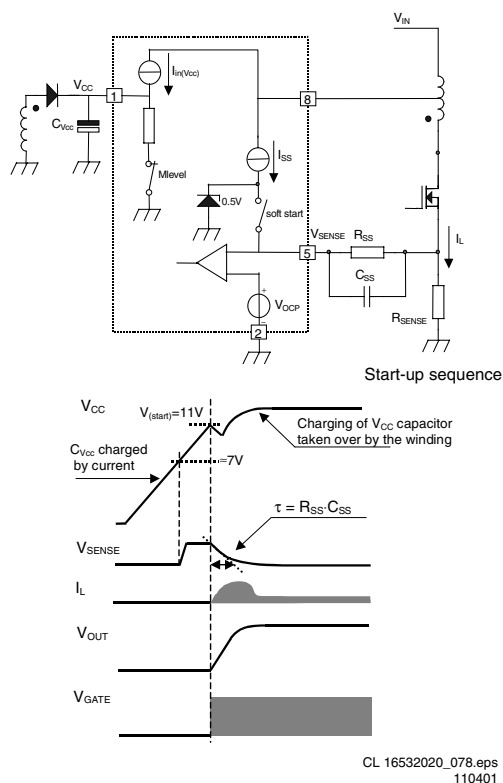


Figure 9-12

The moment that the voltage on pin 1 drops below the 'under voltage lock out' level ($UVLO = \pm 9$ 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 $V_{VCO,start}$. 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 $f_{OSCH} = 175$ kHz typically). At 50 mV ($V_{VCO,max}$) 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.

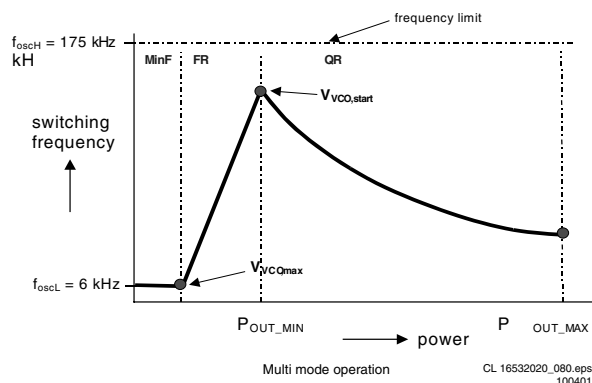


Figure 9-13

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:

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 ($I_{(restart)(VCC)}$) 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:

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.

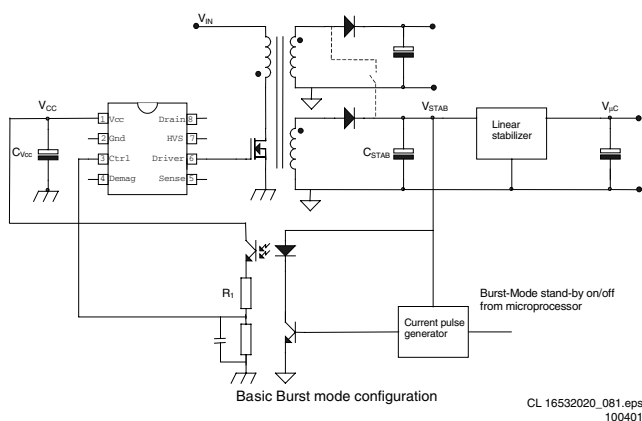


Figure 9-14

The system enters burst mode standby when the microprocessor activates the 'Stdbby_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 'Stdbby_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:

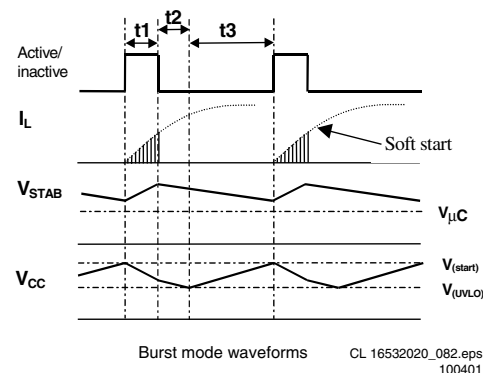


Figure 9-15

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:

The demag(netisation) sense is realised by an internal circuit that guards the voltage (Vdemag) at pin 4 that is connected

to V_{CC} winding by resistor R_1 (R3522). The Figure below shows the circuit and the idealised waveforms across this winding.

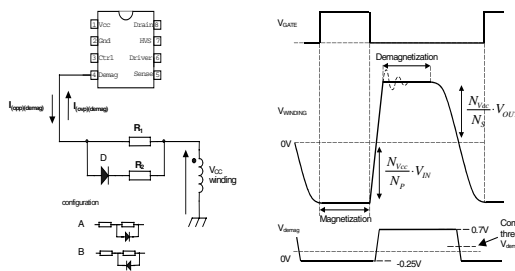


Figure 9-16

Over Voltage Protection

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

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

Next, the controller waits until the 'under voltage lock out' level ($UVLO = \pm 9\text{ V}$) 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

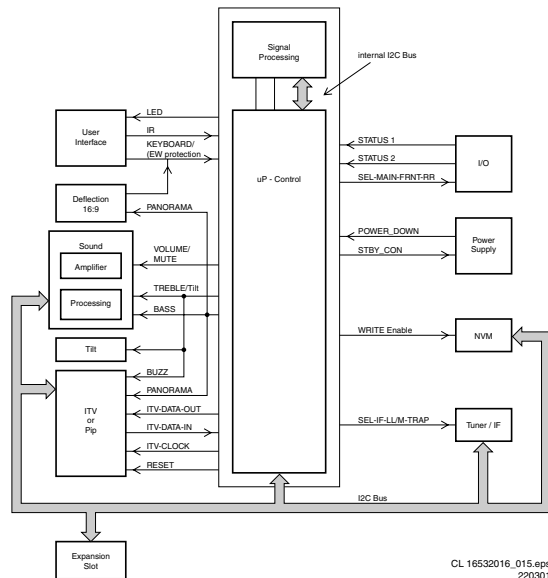


Figure 9-17

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 plop). 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.
 - 0 to 2 V: INTERNAL 4:3
 - 4.5 to 7 V: EXTERNAL 16:9
 - 9.5 to 12 V: EXTERNAL 4:3
- **STATUS2** This signal provides information to the microprocessor on whether a video signal is available on the SCART2 AV input and output port (signal is low). For sets with an SVHS input, it provides the additional information if a Y/C or CVBS source is present (signal is high). The presence of an external Y/C source makes this line 'high' while a CVBS source makes the line 'low'.
 - 0 to 2 V: INTERNAL 4:3
 - 4.5 to 7 V: EXTERNAL 16:9
 - 9.5 to 12 V: EXTERNAL 4:3
- **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

Note: For West Europe, two separate SAW filters (1002 and 1004) are used for video and audio (Quasi Split Sound demodulation). For East Europe, one SAW filter (1003) is used for both (Intercarrier demodulation).

9.7.8 Protection Events

Several protection events are controlled by the UOC:

- **BC protection**, to protect the picture tube from a too high beam current. The UOC has the capability of measuring the normal back level current during the vertical flyback. So if for some reason the CRT circuit is malfunctioning (i.e. high beam current), the normal black current will be out of the 75 μ A range, and the UOC will trigger the power supply to shut down. However, this is a high beam-current situation, the TV screen will be bright white before the set is shut down.
- **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	HA	Horizontal Acquisition: horizontal sync pulse coming out of the HIP
ACI	Automatic Channel Installation: algorithm that installs TV sets directly from cable network by means of a predefined TXT page	HFB	Horizontal Flyback Pulse: horizontal sync pulse from large signal deflection
ADC	Analogue to Digital Converter	HP	Headphone
AFC	Automatic Frequency Control: control signal used to tune to the correct frequency	Hue	Colour phase control for NTSC (not the same as 'Tint')
AFT	Automatic Fine Tuning	I	Monochrome TV system. Sound carrier distance is 6.0 MHz
AGC	Automatic Gain Control: algorithm that controls the video input of the featurebox	I2C	Integrated IC bus
AM	Amplitude Modulation	IF	Intermediate Frequency
AP	Asia Pacific	IIC	Integrated IC bus
AR	Aspect Ratio: 4 by 3 or 16 by 9	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.
ATS	Automatic Tuning System	ITV	Institutional TV
AV	External Audio Video	LATAM	Latin America
AVL	Automatic Volume Level	LED	Light Emitting Diode
BC-PROT	Beam Current Protection	L/L'	Monochrome TV system. Sound carrier distance is 6.5 MHz. L' is Band I, L is all bands except for Band I
BCL	Beam Current Limitation	LNA	Low Noise Amplifier
B/G	Monochrome TV system. Sound carrier distance is 5.5 MHz	LS	Large Screen
BLC-		LS	Loudspeaker
INFORMATION	Black current informationrmation	LSP	Large signal panel
BTSC	Broadcast Television Standard Committee. Multiplex FM stereo sound system, originating from the USA and used e.g. in LATAM and AP-NTSC countries	M/N	Monochrome TV system. Sound carrier distance is 4.5 MHz
B-TXT	Blue teletext	MSP	Multistandard Sound Processor: ITT sound decoder
CC	Closed Caption	MUTE	Mute-Line
ComPair	Computer aided rePair	NC	Not Connected
CRT	Cathode Ray Tube or picture tube	NICAM	Near Instantaneous Compounded Audio Multiplexing. This is a digital sound system, mainly used in Europe.
CSM	Customer Service Mode	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)
CTI	Colour Transient Improvement: manipulates steepness of chroma transients	NVM	Non Volatile Memory: IC containing TV related data e.g. alignments
CVBS	Composite Video Blanking and Synchronisation	OB	Option Byte
DAC	Digital to Analogue Converter	OC	Open Circuit
DBE	Dynamic Bass Enhancement: extra low frequency amplification	OSD	On Screen Display
DBX	Dynamic Bass Expander	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)
D/K	Monochrome TV system. Sound carrier distance is 6.5 MHz	PCB	Printed Circuit board
DFU	Direction For Use: description for the end user	PIP	Picture In Picture
DNR	Dynamic Noise Reduction	PLL	Phase Locked Loop. Used for e.g. FST tuning systems. The customer can give directly the desired frequency
DSP	Digital Signal Processing	POR	Power-On Reset
DST	Dealer Service Tool: special remote control designed for dealers to enter e.g. service mode	Progressive Scan	Scan mode where all scan lines are displayed in one frame at the same time, creating a double vertical resolution.
DVD	Digital Versatile Disc	PTP	Picture Tube Panel (or CRT-panel)
EEPROM	Electrically Erasable and Programmable Read Only Memory	RAM	Random Access Memory
EHT	Extra High Tension	RC	Remote Control handset
EHT-		RC5	Remote Control system 5, signal from the remote control receiver
INFORMATION	Extra High Tension informationrmation	RGB	Red Green Blue
EU	Europe	ROM	Read Only Memory
EW	East West, related to horizontal deflection of the set		
EXT	External (source), entering the set via SCART or Cinch		
FBL	Fast Blanking: DC signal accompanying RGB signals		
FILAMENT	Filament of CRT		
FLASH	Flash memory		
FM	Field Memory		
FM	Frequency Modulation		

SAM	Service Alignment Mode
SAP	Second Audio Program
SC	Sandcastle: pulse derived from sync signals
S/C	Short Circuit
SCAVEM	Scan Velocity Modulation
SCL	Serial Clock
SDA	Serial Data
SDM	Service Default Mode
SECAM	SEquence Couleur Avec Memoire. Colour system mainly used in France and East Europe. Colour carriers = 4.406250 MHz and 4.250000 MHz
SIF	Sound Intermediate Frequency
SS	Small Screen
STBY	Standby
SVHS	Super Video Home System
SW	Software
THD	Total Harmonic Distortion
TXT	Teletext
μP	Microprocessor
UOC	Ultimate One Chip
VA	Vertical Acquisition
VBAT	Main supply voltage for the deflection stage (mostly 141 V)
V-chip	Violence Chip
VCR	Video Cassette Recorder
WYSIWYR	What You See Is What You Record: record selection that follows main picture and sound
XTAL	Quartz crystal
YC	Luminance (Y) and Chrominance (C) signal

10. Spare Parts list

Mono Carrier [A]

Various

0040	3139 124 23601	Cinch housing
0040	3139 124 25551	3P cinch cover
0127▲	4822 265 11253	Fuse holder
0136	4822 492 70788	Fix IC
0138	4822 492 70788	Fix IC
0153▲	3104 301 09441	Cable 3P 400mm
0211▲	4822 265 20723	2P
0212▲	4822 267 10774	2P male (red)
0217	4822 267 10735	6P
0218	2422 026 04742	Soc cinch 3P
0218	4822 265 10481	Cinch 2P
0220	2422 025 04851	3P
0221▲	4822 267 10966	2P
0222▲	2422 025 10646	2P male
0231▲	2422 128 02972	Switch
0232▲	4822 267 31014	Headphone socket
0235	4822 267 60385	21P
0243	2422 025 04854	6P female
0246	2422 025 15848	5P male
0246	2422 025 16382	3P male
0265▲	4822 267 10748	3P
1000▲	3139 147 17401	Tuner UR1316R/A I -3
1002	4822 242 81436	Filter OFWK3953M
1003	4822 242 11055	Filter OFWK6289K
1004	2422 549 44341	Filter OFWK9656M
1200	4822 242 81712	TPWA04B
1201	4822 242 10315	TPT02B-TF21
1201	4822 242 81572	TPS6,0MB-TF21
1203	4822 242 70665	SFE10,7MS3-A
1500▲	2422 086 10914	Fuse 4A 250V
1600	4822 276 13775	Switch
1601	4822 276 13775	Switch
1602	4822 276 13775	Switch
1603	4822 276 13775	Switch
1660	2422 543 01203	Chrystal 12MHz
1831	4822 242 10769	Chrystal 18.432MHz

—II—

2001	5322 122 32658	22pF 5% 50V
2002	5322 122 32658	22pF 5% 50V
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 20% 16V
2007	4822 126 14585	100nF 10% 50V
2008	4822 124 40207	100μF 20% 25V
2009	5322 122 32654	22nF 10% 63V
2010	5322 126 10511	1nF 5% 50V
2101	4822 122 33172	390pF 5% 50V
2102	4822 122 33172	390pF 5% 50V
2103	2020 552 96305	4U7 20% 10V
2104	4822 122 33172	390pF 5% 50V
2105	4822 122 33172	390pF 5% 50V
2106	2020 552 96305	4U7 20% 10V
2107	4822 122 33172	390pF 5% 50V
2108	4822 122 33172	390pF 5% 50V
2109	2020 552 96305	4U7 20% 10V
2110	4822 122 33172	390pF 5% 50V
2111	4822 122 33172	390pF 5% 50V
2112	2020 552 96305	4U7 20% 10V
2113	5322 122 32658	22pF 5% 50V
2114	5322 122 32658	22pF 5% 50V
2115	5322 122 32658	22pF 5% 50V
2116	5322 122 32658	22pF 5% 50V
2117	5322 122 32658	22pF 5% 50V
2118	5322 122 32658	22pF 5% 50V
2120	5322 122 32658	22pF 5% 50V
2161	4822 124 12392	47μF 20% 16V
2181	5322 122 32658	22pF 5% 50V
2182	4822 122 33172	390pF 5% 50V
2183	4822 122 33172	390pF 5% 50V
2184	2020 552 96305	4U7 20% 10V
2185	4822 122 33172	390pF 5% 50V
2186	4822 122 33172	390pF 5% 50V
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
2206	5322 122 32531	100pF 5% 50V
2207	4822 126 13694	68pF 1% 63V
2208	4822 126 14585	100nF 10% 50V
2209	4822 124 40769	4.7μF 20% 100V

2210	4822 124 41407	0.47μF 20% 63V
2211	4822 126 13482	470nF 80/20% 16V
2213	5322 122 32654	22nF 10% 63V
2214	5322 122 32654	22nF 10% 63V
2215	5322 122 32654	22nF 10% 63V
2216	4822 124 40207	100μF 20% 25V
2217	5322 122 32654	22nF 10% 63V
2219	4822 126 14076	220nF 25V
2222	4822 122 33177	10nF 20% 50V
2223	5322 122 32448	10pF 5% 63V
2225	4822 126 14076	220nF 25V
2226	5322 126 10465	3.9nF 10% 50V
2227	5322 126 10223	4.7nF 10% 63V
2228	5322 126 10184	820P 5% 50V 3
2229	4822 124 40248	10μF 20% 63V
2230	4822 124 40769	4.7μF 20% 100V
2234	4822 126 14585	100nF 10% 50V
2235	5322 122 32331	1nF 10% 100V
2238	5322 126 10511	1nF 5% 50V
2239	5322 126 10511	1nF 5% 50V
2240	5322 126 10511	1nF 5% 50V
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
2246	4822 124 40769	4.7μF 20% 100V
2247	4822 124 40207	100μF 20% 25V
2248	5322 122 32654	22nF 10% 63V
2249	5322 122 32654	22nF 10% 63V
2250	4822 124 22652	2.2μF 20% 50V
2252	5322 126 10511	1nF 5% 50V
2253	5322 126 10511	1nF 5% 50V
2254	5322 122 32531	100pF 5% 50V
2400	4822 121 43901	4.7nF 5% 50V
2404▲	4822 121 10781	470nF 5% 250V
2405	5322 126 10511	1nF 5% 50V
2407▲	4822 121 70649	9.1nF 5% 1.6kV
2408	4822 122 30103	22nF 80% 63V
2409	4822 124 11575	47μF 20% 160V
2410	2020 021 91577	470μF 16V
2411	5322 121 10472	47μF /25
2412	2222 347 90236	33nF 10% 100V
2413	4822 124 11565	10μF 20% 250V
2414	4822 124 81145	1000μF 20% 16V
2416▲	4822 126 12263	220pF 10% 2kV
2417	4822 124 81145	1000μF 20% 16V
2418	4822 122 33177	10nF 20% 50V
2419	4822 124 22776	1μF 50V
2420	4822 124 21913	1μF 20% 63V
2421	4822 126 13751	47nF 10% 63V
2422	2020 021 91577	470μF 16V
2423	4822 124 42127	100V 20% 10μF
2424	4822 121 43526	47nF 5% 250V
2471	5322 121 42386	100nF 5% 63V
2472	5322 121 42386	100nF 5% 63V
2473	4822 124 40255	100μF 20% 63V
2475	5322 122 32268	470pF 5% 63V
2476	4822 121 42408	220nF 5% 63V
2477	5322 122 32268	470pF 5% 63V
2500▲	4822 126 13589	470nF 275V
2501▲	4822 126 14153	2.2nF 10% 1kV
2502▲	4822 126 14153	2.2nF 10% 1kV
2503	4822 124 12439	100μF 20% 400V
2505▲	4822 126 14153	2.2nF 10% 1kV
2506▲	4822 126 14153	2.2nF 10% 1kV
2508▲	4822 122 50116	470pF 10% 1kV
2515▲	4822 126 14049	1.5nF 20% 250V
2516▲	4822 126 13867	330P 20% 250V
2520	4822 126 14585	100nF 10% 50V
2521	4822 124 81151	22μF 50V
2522	4822 126 14585	100nF 10% 50V
2523▲	4822 126 13862	1.5nF 10% 2kV
2525	5322 122 34099	470pF 10% 63V
2526	5322 122 31647	1nF 10% 63V
2527	5322 122 34099	470pF 10% 63V
2540	4822 126 13188	15nF 5% 63V
2560▲	4822 126 11382	1nF 10% 1kV
2561	4822 124 42336	47μF 20% 160V
2562	5322 122 32331	1nF 10% 100V
2563	5322 121 42386	100nF 5% 63V
2564	2020 012 93057	2200μF 20% 16V
2565▲	4822 122 50116	470pF 10% 1kV
2566	4822 124 40433	47μF 20% 25V
2567	4822 124 40433	47μF 20% 25V
2568	4822 124 21913	1μF 20% 63V
2569	5322 122 34099	470pF 10% 63V
2601	4822 126 14076	220nF 25V
2602	5322 122 32531	100pF 5% 50V

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 40207	100μF 20% 25V
2801	4822 124 81151	22μF 50V
2803	2020 552 96305	4U7 20% 10V
2804	2020 552 96305	4U7 20% 10V
2805	2020 552 96305	4U7 20% 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	470pF 5% 63V
2835	4822 122 33575	220pF 5% 63V
2836	4822 126 13344	1.5nF 5% 63V
2837	4822 124 40769	4.7μF 20% 100V
2838	4822 126 13692	47pF 1% 63V
2839	4822 126 13692	47pF 1% 63V
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
2858	5322 126 10511	1nF 5% 50V
2859	5322 126 10511	1nF 5% 50V
2860	4822 126 13693	56pF 1% 63V
2860	4822 126 13695	82pF 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 80/20% 16V
2904	4822 126 14043	1μF 20% 16V
2905	5322 126 10511	1nF 5% 50V
2906	4822 126 13482	470nF 80/20% 16V
2907	5322 126 10511	1nF 5% 50V
2908	4822 124 40248	10μF 20% 63V
2941	4822 124 21913	1μF 20% 63V
2942	4822 126 12105	50V 33nF 5%
2943	4822 126 14585	100nF 10% 50V
2944	4822 126 13751	47nF 10% 63V
2945	4822 122 33177	10nF 20% 50V
2946	4822 126 14043	1μF 20% 16V
2981	4822 124 40248	10μF 20% 63V
2982	5322 122 32268	470pF 5% 63V
2983	4822 124 40248	10μF 20% 63V
2984	5322 122 32268	470pF 5% 63V

□

3000	4822 116 52175	100Ω 5% 0.5W
3001	4822 116 52175	100Ω 5% 0.5W
3002	4822 051 20008	Jumper
3002	4822 117 10833	10k 1% 0.1W
3003	4822 117 11139	1k5 1% 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
3010	4822 051 20008	Jumper
3010	4822 117 13577	330Ω 1% 1.25W
3011	4822 117 13577	330Ω 1% 1.25W
3101	4822 116 83868	150Ω 5% 0.5W
3102	4822 117 13579	220k 1% 0.1W
3103	4822 116 83868	150Ω 5% 0.5W
3104	4822 117 10834	47k 1% 0.1W
3105	4822 116 83868	150Ω 5% 0.5W
3106	4822 117 13579	220k 1% 0.1W
3107	4822 116 83868	150Ω 5% 0.5W
3108	4822 117 10834	47k 1% 0.1W

3109	4822 116 52201	75Ω 5% 0.5W	3425▲	4822 116 52238	12k 5% 0.1W	3692	4822 051 10102	1k 2% 0.25W
3110	4822 116 52175	100Ω 5% 0.5W	3426	4822 051 20105	1M 5% 0.1W	3693	4822 117 11503	220Ω 1% 0.1W
3111	4822 116 52264	27k 5% 0.5W	3427	4822 116 52238	12k 5% 0.5W	3694	4822 051 20472	4k7 5% 0.1W
3112	4822 117 11507	6k8 1% 0.1W	3428▲	4822 052 11399	39Ω 5% 0.5W	3801	4822 116 83872	220Ω 5% 0.5W
3113	4822 116 52201	75Ω 5% 0.5W	3429	4822 116 52269	3k3 5% 0.5W	3802	4822 050 11002	1k 1% 0.4W
3114	4822 116 52175	100Ω 5% 0.5W	3430	4822 116 52244	15k 5% 0.5W	3803	4822 117 10837	100k 1% 0.1W
3115	4822 116 52201	75Ω 5% 0.5W	3431▲	4822 051 20472	4k7 5% 0.1W	3804	4822 117 11149	82k 1% 0.1W
3116	4822 116 52175	100Ω 5% 0.5W	3431▲	4822 051 20562	5k6 5% 0.1W	3805	4822 051 10102	1k 2% 0.25W
3117	4822 116 52201	75Ω 5% 0.5W	3432	4822 116 52186	22Ω 5% 0.5W	3806	4822 117 10837	100k 1% 0.1W
3118	4822 116 52175	100Ω 5% 0.5W	3435	4822 100 12159	100k 30%	3807	4822 117 11149	82k 1% 0.1W
3119	4822 116 52199	68Ω 5% 0.5W	3436▲	4822 052 10478	4Ω7 5% 0.33W	3808	4822 050 11002	1k 1% 0.4W
3120	4822 051 10102	1k 2% 0.25W	3471	4822 050 23908	3Ω9 1% 0.6W	3831	4822 117 10834	47k 1% 0.1W
3121	4822 116 52201	75Ω 5% 0.5W	3471	4822 050 25608	50k 1% 0.6W	3832	4822 116 52175	100Ω 5% 0.5W
3122	4822 116 52176	10Ω 5% 0.5W	3472	4822 050 25608	50k 1% 0.6W	3833	4822 116 52175	100Ω 5% 0.5W
3140	4822 117 11507	6k8 1% 0.1W	3472	4822 050 26808	6Ω8 1% 0.6W	3836	4822 050 11002	1k 1% 0.4W
3155	4822 116 52195	47Ω 5% 0.5W	3473	4822 050 22202	2k2 1% 0.6W	3837	4822 116 52175	100Ω 5% 0.5W
3181	4822 116 52201	75Ω 5% 0.5W	3474	4822 050 11002	1k 1% 0.4W	3838	4822 051 10102	1k 2% 0.25W
3182	4822 116 52175	100Ω 5% 0.5W	3475	4822 050 22202	2k2 1% 0.6W	3839	4822 116 52175	100Ω 5% 0.5W
3183	4822 116 83868	150Ω 5% 0.5W	3476▲	4822 052 10158	1Ω5 5% 0.33W	3840	4822 051 20472	4k7 5% 0.1W
3184	4822 117 10834	47k 1% 0.1W	3477	4822 116 83872	220Ω 5% 0.5W	3841	4822 051 20822	8k2 5% 0.1W
3185	4822 116 83868	47Ω 5% 0.5W	3478	4822 116 83872	220Ω 5% 0.5W	3842	4822 051 10102	1k 2% 0.25W
3186	4822 117 10834	150k 1% 0.1W	3479	4822 050 11002	1k 1% 0.4W	3843	4822 117 11449	2k2 5% 0.1W
3200	4822 116 83881	390Ω 5% 0.5W	3500▲	4822 053 21335	3M3 5% 0.5W	3849	4822 051 20471	470Ω 5% 0.1W
3201	4822 116 52175	100Ω 5% 0.5W	3501▲	4822 053 21335	3M3 5% 0.5W	3901	4822 051 10102	1k 2% 0.25W
3202	4822 116 52175	100Ω 5% 0.5W	3504▲	2120 660 90043	PTC 9Ω 200V	3902	4822 051 20332	3k3 5% 0.1W
3203	4822 116 52175	100Ω 5% 0.5W	3506▲	4822 116 83872	220Ω 5% 0.5W	3903	4822 051 20332	3k3 5% 0.1W
3204	4822 050 21003	10k 1% 0.6W	3507	4822 252 11215	Spark gap	3903	4822 051 20822	8k2 5% 0.1W
3206	4822 117 10837	100k 1% 0.1W	3519	4822 116 83876	270Ω 5% 0.5W	3904	4822 117 10833	10k 1% 0.1W
3207	4822 050 11002	1k 1% 0.4W	3520	4822 051 20122	1k2 5% 0.1W	3905	4822 051 20332	3k3 5% 0.1W
3208	4822 051 20391	390Ω 5% 0.1W	3521	4822 116 52186	22Ω 5% 0.5W	3906	4822 117 10833	10k 1% 0.1W

6409	4822 130 42488	BYD33D
6410	4822 130 42488	BYD33D
6411	4822 130 42488	BYD33D
6412	4822 130 42488	BYD33D
6413	4822 130 30621	1N4148
6414▲	4822 130 34167	BZX79-B6V2
6415	4822 130 11397	BAS316
6416	4822 130 11397	BAS316
6419	4822 130 34173	BZX79-B5V6
6420	4822 130 30862	BZX79-B9V1
6423	4822 130 42488	BYD33D
6471	4822 130 42488	BYD33D
6500	4822 130 31083	BYW55
6501	4822 130 31083	BYW55
6502	4822 130 31083	BYW55
6503	4822 130 31083	BYW55
6520	4822 130 42488	BYD33D
6523	4822 130 30621	1N4148
6540	4822 130 34167	BZX79-B6V2
6541	4822 130 61219	BZX79-B10
6560	9322 127 32682	BYW76-RAS15/10
6562	9322 164 42682	EGP20DL-5100
6563	4822 130 11397	BAS316
6565	5322 130 34331	BAV70
6566	4822 130 11397	BAS316
6567	4822 130 11148	UDZ4.7B
6569	4822 130 11397	BAS316
6570	4822 130 11378	BZX284-C6V2
6681	4822 130 31983	BAT85
6691	9322 050 99682	LTL-10224WHCR
6692	9322 127 54667	TSOP1836UH1
6831	4822 130 30621	1N4148
6901	4822 130 11397	BAS316



7001	4822 130 63732	MMUN2212
7101	4822 130 60511	BC847B
7200	9352 683 55557	TDA9567H/N1/5Y
7200	9352 684 10557	TDA9561H/N1/5Y
7201	4822 130 60511	BC847B
7204	4822 130 60373	BC856B
7206	5322 130 42755	BC847C
7209	5322 130 42718	BFS20
7210	5322 130 42718	BFS20
7241	3198 010 44010	PDTA114ETR
7401	9340 547 00215	PDTC143ZTR
7402	9340 563 21127	BUT11APX-1200L
7403	4822 130 40981	BC337-25
7404	4822 130 44283	BC636
7405▲	4822 130 60373	BC856B
7406	4822 130 60373	BC856B
7407	4822 130 41109	BD135-16
7408	4822 130 41109	BD135-16
7409	4822 130 60373	BC856B
7435	4822 130 41109	BD135-16
7471	4822 209 13176	TDA9302H
7515▲	8238 274 02070	TCET1103G
7520	9352 673 56112	TEA1507P/N1L
7521▲	9322 164 04687	STP4NC80ZFPL
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	PDTC143ZTR
7562	4822 130 60373	BC856B
7564	4822 130 60373	BC856B
7602	9322 147 25682	M24C16-WBN6L
7801	5322 209 11102	HEF4052BT
7803	4822 130 60511	BC847B
7804	4822 130 60511	BC847B
7831	9322 160 79682	MSP3415G-PO-B8 FM
7832	4822 130 60511	BC847B
7833	4822 130 60511	BC847B
7834	4822 130 60511	BC847B
7835	4822 130 60511	BC847B
7901	9322 158 65667	AN7522N
7941	4822 130 60511	BC847B
7942	4822 130 60511	BC847B
7943	4822 130 60511	BC847B

CRT panel [B]

Various

0244	2422 025 04851	3P
0245	2422 025 04854	6P female
0254▲	2422 500 80068	9P female

—II—

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



3311	4822 051 20392	3k9 5% 0.1W
3312	4822 117 13577	330Ω 1% 1.25W
3313	4822 051 20109	10Ω 5% 0.1W
3314	4822 053 12183	18k 5% 3W
3316▲	4822 052 10689	68Ω 5% 0.33W
3317	3198 013 01520	1k5 2% 0.5W
3321	4822 051 20392	3k9 5% 0.1W
3322	4822 117 13577	330Ω 1% 1.25W
3323	4822 051 20109	10Ω 5% 0.1W
3324	4822 053 12183	18k 5% 3W
3326▲	4822 052 10689	68Ω 5% 0.33W
3327	3198 013 01520	1k5 2% 0.5W
3331	4822 051 20392	3k9 5% 0.1W
3332	4822 117 13577	330Ω 1% 1.25W
3333	4822 051 20109	10Ω 5% 0.1W
3334	4822 053 12183	18k 5% 3W
3336▲	4822 052 10689	68Ω 5% 0.33W
3337	3198 013 01520	1k5 2% 0.5W
3341	3198 013 01520	1k5 2% 0.5W
3347▲	4822 052 10221	220Ω 5% 0.33W
3348	3198 013 01520	1k5 2% 0.5W
3349▲	4822 052 10158	1Ω5 5% 0.33W
3350▲	4822 052 10158	1Ω5 5% 0.33W



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



6311	4822 130 30842	BAV21
6321	4822 130 30842	BAV21
6331	4822 130 30842	BAV21
6341	4822 130 30842	BAV21
6342	4822 130 33697	1SS135
6343	4822 130 10837	UDZS8.2B



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

Side AV panel + HP panel [C]

Various

0232▲	4822 267 31014	Headphone socket
0254	4822 267 10734	5P
0255	4822 267 10565	4P

—II—

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



3156	4822 116 52206	120Ω 5% 0.5W
3157	4822 116 52206	120Ω 5% 0.5W

Side AV [E]

Various

0250	4822 265 10481	2P
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0252	4822 267 10565	4P
0253	4822 267 10735	6P

—II—

2172	4822 126 13512	330pF 10% 50V
2173	4822 126 13512	330pF 10% 50V
2175	4822 126 13512	330pF 10% 50V



3152	4822 116 83884	47k 5% 0.5W
3153	4822 050 11002	1k 1% 0.4W



6161	4822 130 34278	BZX79-B6V8
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Side AV panel + HP panel [E1]

Various

0163	3139 131 01551	Cable 6P 560mm
0186	3139 110 38861	Cable 5P 680mm
0232▲	4822 267 31014	Headphone socket
0250	4822 265 11606	3P
0251	4822 267 10735	6P
0253	2422 025 16382	3P male
0253	4822 267 10735	6P
0254	4822 267 10734	5P
0255	4822 267 10565	4P
0261	2422 025 12482	6P male
0261	2422 025 15849	6P male

—II—

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



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



6161	4822 130 34278	BZX79-B6V8
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