Colour Television

Chassis

L01.2A
AB

Service
Service
Service

(SMALL SCREEN)
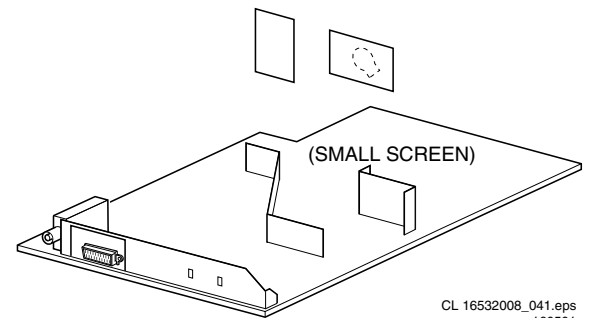
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Service Manual

Contents

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PHILIPS

1.   Technical Specifications, Connections and Chassis Overview

Index:
1. Technical Specifications.
2. Connections.
3. Chassis Overview.

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

1.1   Technical Specifications

1.1.1   Reception

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

1.2   Connections

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

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

1.1.2   Miscellaneous

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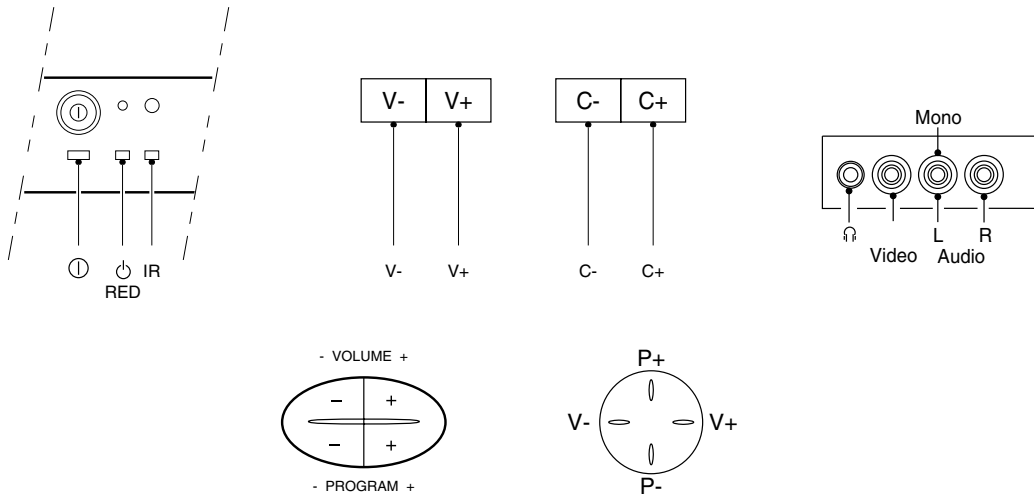
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Figure 1-1

A/V In (if present)

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

1.2.2 Rear Connections

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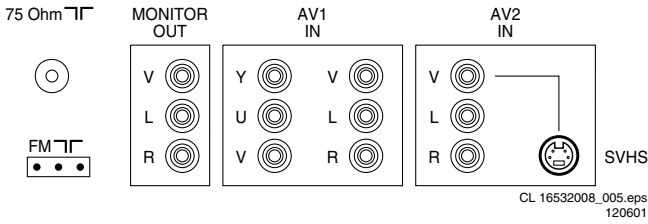
Figure 1-2

Monitor Out

1	- Video	CVBS (1 Vpp / 75 Ω)	$\ominus\!\!\rightarrow\!\odot$
2	- Audio	L (0.5 Vrms / 1 kΩ)	$\ominus\!\!\rightarrow\!\odot$
3	- Audio	R (0.5 Vrms / 1 kΩ)	$\ominus\!\!\rightarrow\!\odot$

YUV In (if present)

1	- Y	0.7 Vpp / 75 Ω	$\ominus\!\odot$
2	- U	0.7 Vpp / 75 Ω	$\ominus\!\odot$
3	- V	0.7 Vpp / 75 Ω	$\ominus\!\odot$

AV1 In

4	- Video	CVBS (1 Vpp / 75 Ω)	$\ominus\!\odot$
5	- Audio	L (0.5 Vrms / 10 kΩ)	$\ominus\!\odot$
6	- Audio	R (0.5 Vrms / 10 kΩ)	$\ominus\!\odot$

AV2 In

1	- Video	CVBS (1 Vpp / 75 Ω)	$\ominus\!\odot$
2	- Audio	L (0.5 Vrms / 10 kΩ)	$\ominus\!\odot$
3	- Audio	R (0.5 Vrms / 10 kΩ)	$\ominus\!\odot$

AV2 In (SVHS)

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

1.3 Chassis Overview
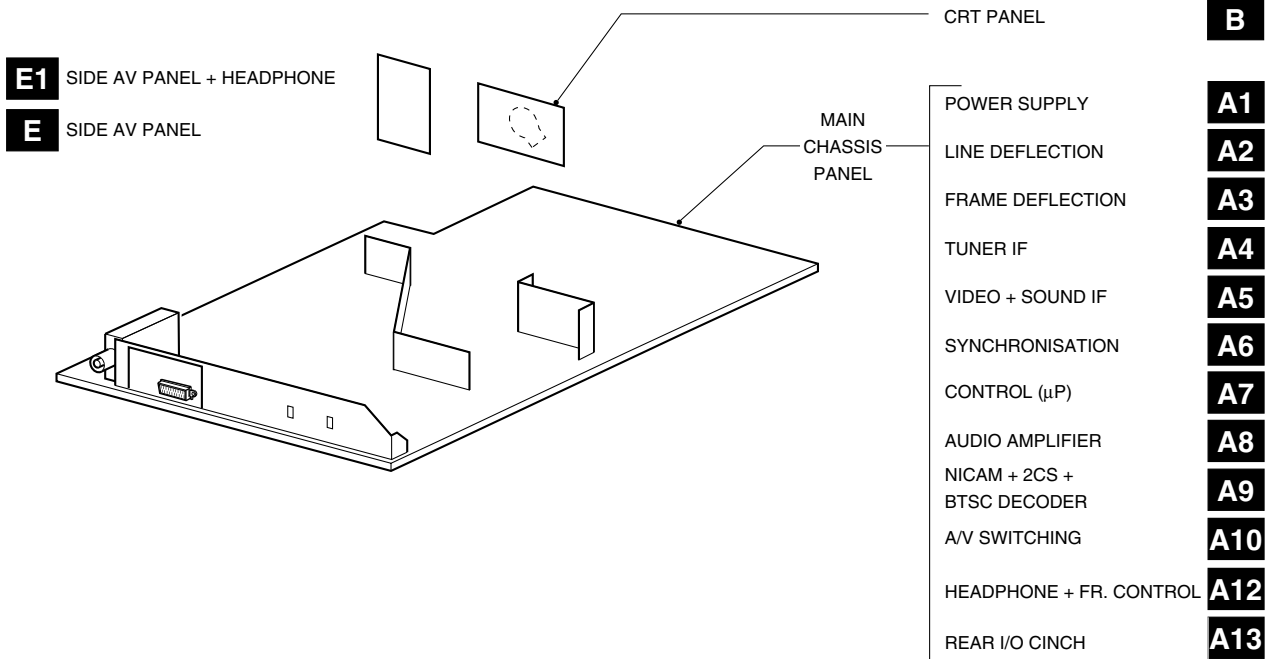
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Figure 1-3

2.　Safety & Maintenance Instructions, Warnings, and Notes

2.1　Safety Instructions For Repairs

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

Safety regulations require that after a repair, the set must be returned in its original condition. Pay particular attention to the following points:
- General repair instruction: as a strict precaution, we advise you to re-solder the solder connections through which the horizontal deflection current is flowing, in particular:
  - all pins of the line output transformer (LOT)
  - fly-back capacitor(s)
  - S-correction capacitor(s)
  - line output transistor
  - pins of the connector with wires to the deflection coil
  - other components through which the deflection current flows.

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

2.2　Maintenance Instructions

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

2.3　Warnings

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

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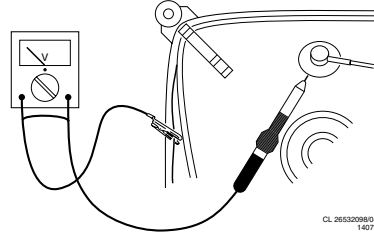
Figure 2-1

- 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 (①) 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.

PREPARATION
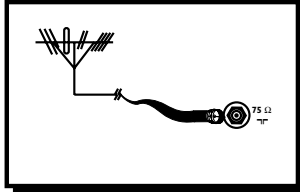
Antenna Connection

- Connect the aerial plug to the antenna socket ⊤ on the backcover.

- Insert the mains plug into the wall socket.

75 Ω
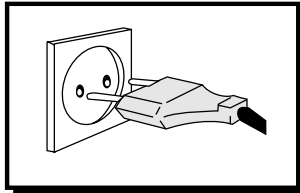
Mains Connection

- For correct mains voltage, refer to type sticker at the rear of the TV set

- Consult your dealer if mains supply is different. **Note** : This diagram is not representative of the actual plug and socket.
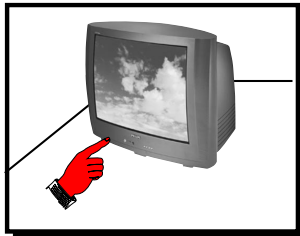
Switching on the Set

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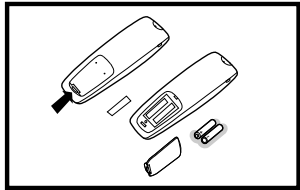
Using the Remote Control

- Insert the correct type of batteries into the compartment.

- Ensure the batteries are placed in the right direction.

CONNECTING THE AUDIO/VIDEO SOCKETS (PLAYBACK)

VIDEO

L

AUDIO

R

S-VIDEO

Monitor out   AV1 in   AV2 in

AV sockets on rear of TV

VCR (Equipped with Video and Audio Output sockets)
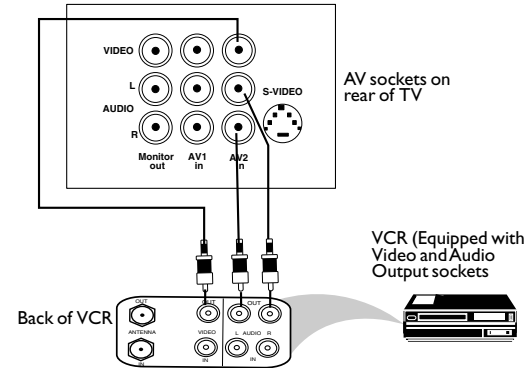
Back of VCR

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

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

VIDEO

L

AUDIO

R

S-VIDEO

Monitor out   AV1 in   AV2 in

AV sockets on rear of TV
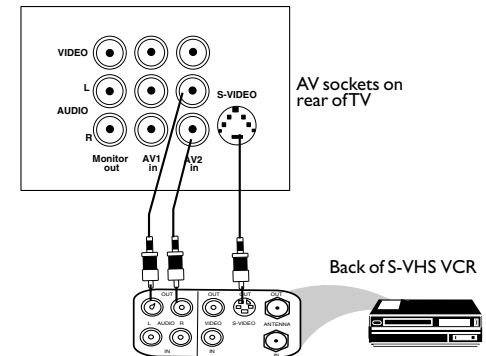
Back of S-VHS VCR

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

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

CONNECTING THE AUDIO/VIDEO SOCKETS (RECORDING)

Connection for recording from the TV channel

AV sockets on rear of TV

VIDEO
L
AUDIO
R
S-VIDEO
Monitor out   AV1 in   AV2 in

Back of VCR

VCR (Equipped with Video and Audio Input sockets)
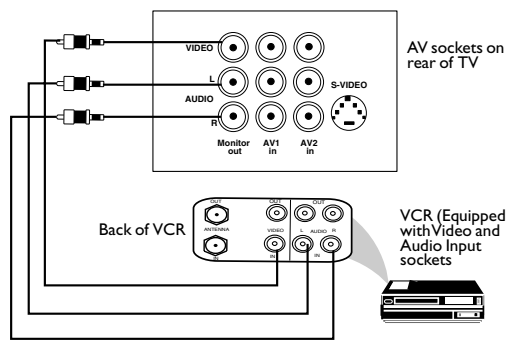
– Connect the corresponding **INPUT** sockets of the VCR to the **MONITOR OUTPUT** sockets on the rear of the TV.
– To enhance the sound of your TV, connect the **AUDIO L** and **R** sockets to an external audio system instead of the VCR. For mono equipment, connect only the **AUDIO L** socket.

Connection for recording from one VCR to another VCR

AV sockets on rear of TV

VIDEO
L
AUDIO
R
S-VIDEO
Monitor out   AV1 in   AV2 in

Back of VCR

VCR (Equipped with Video and Audio Input sockets)

VCR (Equipped with Video and Audio Output sockets)
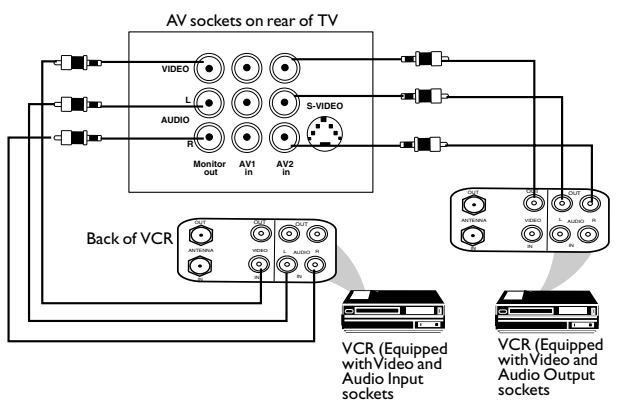
– Connect the sockets of the VCR which you wish to record from, to the corresponding sockets at either **AV1 or AV2**
– Connect the sockets of the receiving VCR to the **MONITOR OUTPUT** sockets on the rear of the TV.

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FUNCTIONS OF REMOTE CONTROL

❶ Power button
– Switch set off temporarily to standby mode. (The red light indicator lights up when the set is on standby mode).
– To switch on set from standby mode, press Channel +/– , Digit (0 -9) or Power button.

❷ Teletext Colour/Personal Zapping buttons
– In teletext mode, the colour buttons allow you to access directly an item or corresponding pages.
– As Personal Zapping buttons, you can surf up to 10 personal channels for each button. For detailed description of functions, refer to section on "Personal Zapping ".

❸ Teletext buttons
Allows you to access teletext information. For detailed description of functions, refer to section on "Using the Teletext"

❹ Smiley button
Allows to add and store your personal preference channels in your Personal Preference list. For detailed description of functions, refer to section on "Using your Personal Zapping feature".

❺ Timer Button
Allows you to set the clock to switch to another channel at a specified time while you are watching another channel or when the set is on standby mode.

❻ Smart Sound Button
Press the Smart Sound button repeatedly to access 4 different types of sound settings and choose your desired setting.

❼ Menu Button
Displays the main menu. Also exits menu from screen.

❽ Cursor Up Button
Allows you to select the next item on the menu.

❾ Cursor Left Button
Allows you to select the sub-menus and adjust the settings.

❿ Volume + / – Button
Increases or decreases volume.

⓫ I·II
Allows you to switch from Stereo to Mono sound during stereo transmission or to choose between language I or language II during dual sound transmission.

⓬ A/CH(Alternate channel) Button
Allows you to change between the current channel and the previous channel.

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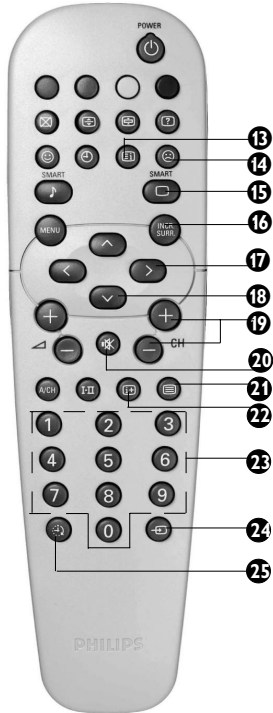
⑬ **Main Index Button**
In teletext mode, press button to return to the main index page.

⑭ **Frownie button**
Allows to delete stored personal preference channels in your Personal Preference list. For detailed description of functions, refer to section on "Personal Zapping ".

⑮ **Smart Picture Button**
Press the Smart Picture button repeatedly to access 5 different types of picture settings and choose your desired setting.

⑯ **Incredible Surround Button**
– Allows you to select Incredible Surround sound when transmission is in stereo mode.
– Allows you to select Spatial Sound when transmission is in mono mode.

⑰ **Cursor Right Button**
Allows you to access the sub-menus and adjust the settings.

⑱ **Cursor Down Button**
Allows you to select the next item on the menu.

⑲ **Channel + / – Buttons**
Allows you to select channels in ascending or descending order.

⑳ **Mute Button**
Mutes sound. To restore sound, press button again.

㉑ **Teletext Button**
Refer to section on "Using the Teletext"

㉒ **OSD button**
Allows you to display the current channel number. It also allows to exit menu from the screen after control adjustments.

㉓ **Digit (0 -9) Buttons**
Press to select a channel. For a 2-digit channel number, press the first digit and followed immediately by the second digit.

㉔ **A/V Button**
Allows you to select the AV channels.

㉕ **Sleeptimer Button**
Allows you to select a time period after which the set will switch to standby mode automatically.
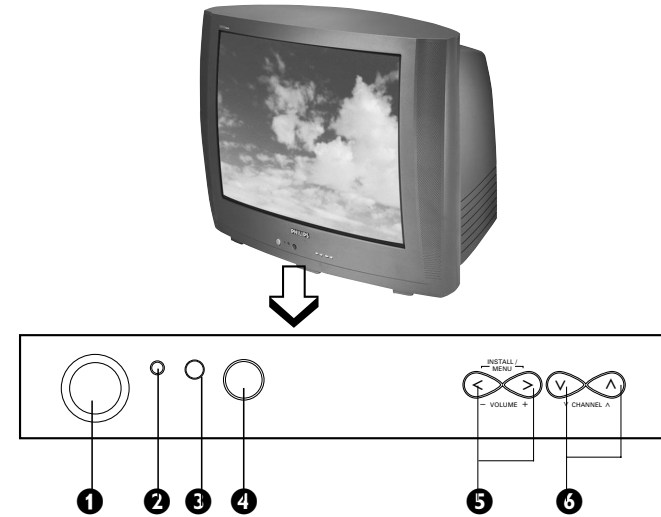
❶	Mains Power button	Switch mains power on or off.
❷	Standby light indicator	Indicate red light when standby mode is activated.
❸	Remote Sensor	Acts as a sensor for activating the controls of the TV when remote control handset is aimed at it.
❹	Headphone socket	Connect headphone jack to socket for personal listening.
❺	Volume </> buttons	Adjust sound volume softer/louder.
❻	Channel ∨ / ∧ buttons	Select channel in descending/ascending order.
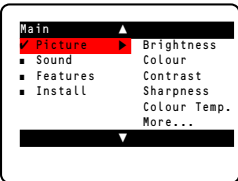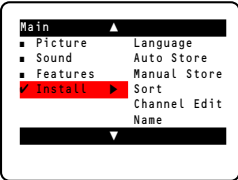
Note
• You can enter the main menu by pressing both the Volume < and > buttons at the same time.
• Press the ∨ or ∧ button to select the next item on the menu.
• Press Volume < or > button to access sub-menu and adjust the settings.

Directions for Use

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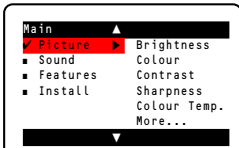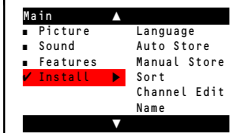
Operating instructions generally explains the operation of the TV set using the buttons on the remote control unless otherwise stated. Please read the following instructions carefully and follow the steps as shown to familiarise yourself with the installations and all features available in your set.

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

Step	Press button		Result on TV Screen
1	MENU	Enter main menu.	Main ▲ ✓ Picture ▶ Brightness ■ Sound Colour ■ Features Contrast ■ Install Sharpness Colour Temp. More... ▼
2	∨	Select **Install**.	Main ▲ ■ Picture Language ■ Sound Auto Store ■ Features Manual Store ✓ Install ▶ Sort Channel Edit Name ▼
3	>	Enter the Install menu.	Install ▲ ✓ Language English ▶ ■ Auto Store ■ Manual store ■ Sort ■ Channel Edit ■ Name ▼
4	>	Press button repeatedly to cycle through the language list and select the language of your choice.	
5	⊞	Exit menu from screen.	

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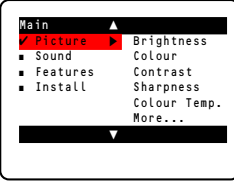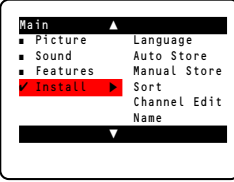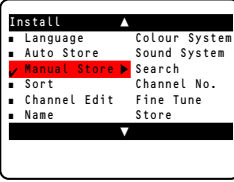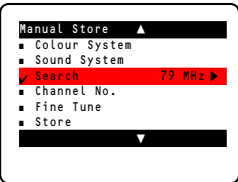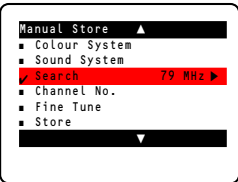
AUTOMATIC TUNING OF CHANNELS

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

Step	Press button		Result on TV Screen
1	MENU	Enter main menu.	Main ▲ ✓ Picture ▶ Brightness ■ Sound Colour ■ Features Contrast ■ Install Sharpness Colour Temp. More... ▼
2	∨	Press button repeatedly until **Install** is selected.	Main ▲ ■ Picture Language ■ Sound Auto Store ■ Features Manual Store ✓ Install ▶ Sort Channel Edit Name ▼
3	>	Enter install menu.	Install ▲ ✓ Language ▶ English ■ Auto Store ■ Manual store ■ Sort ■ Channel Edit ■ Name ▼
4	∨	Select **Auto Store**.	Install ▲ ■ Language ✓ Auto Store ▶ ■ Manual store ■ Sort ■ Channel Edit ■ Name ▼
5	>	Start automatic tuning of channels.	Auto Store ■ Channel 1 ■ TV 142 MHz ♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦▶♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦
6	⊞	When tuning is completed, exit menu from screen.	Install ▲ ■ Language ✓ Auto Store ▶ ■ Manual store ■ Sort ■ Channel Edit ■ Name ▼

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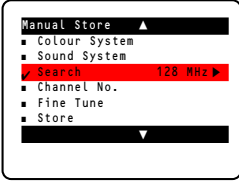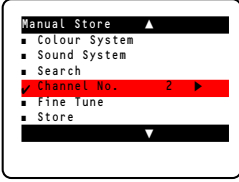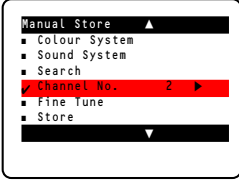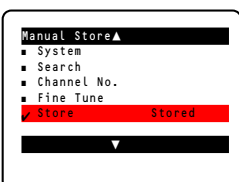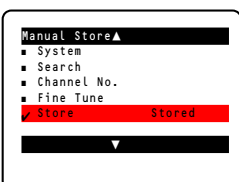
Manual tuning of channels allows you to select your preferred channel number for every available programme.

Step	Press button		Result on TV Screen
1	MENU	Enter main menu.	Main ▲ ✓ Picture ▶ Brightness ▪ Sound Colour ▪ Features Contrast ▪ Install Sharpness Colour Temp. More... ▼
2	∨	Press button repeatedly until **Install** is selected.	Main ▲ ▪ Picture Language ▪ Sound Auto Store ▪ Features Manual Store ✓ Install ▶ Sort Channel Edit Name ▼
3	>	Enter install menu.	Install ▲ ✓ Language ▶ English ▪ Auto Store ▪ Manual Store ▪ Sort ▪ Channel Edit ▪ Name ▼
4	∨	Press button repeatedly until **Manual Store** is selected.	Install ▲ ▪ Language Colour System ▪ Auto Store Sound System ✓ Manual Store ▶ Search ▪ Sort Channel No. ▪ Channel Edit Fine Tune ▪ Name Store ▼
5	>	Enter manual store menu.	Manual Store ▲ ▪ Colour System ▪ Sound System ✓ Search 79 MHz ▶ ▪ Channel No. ▪ Fine Tune ▪ Store ▼
6	∨	Press button repeatedly until **Search** is selected.	

Step	Press button		Result on TV Screen
7	>	Start manual searching. Searching stops once a transmitting signal is found.	Manual Store ▲ ▪ Colour System ▪ Sound System ✓ Search 128 MHz ▶ ▪ Channel No. ▪ Fine Tune ▪ Store ▼
8	∨	Select **Channel No.**	Manual Store ▲ ▪ Colour System ▪ Sound System ▪ Search ✓ Channel No. 2 ▶ ▪ Fine Tune ▪ Store ▼
9	1 2 3 4 5 6 7 8 9 0	Key in the channel number.	
10	∨	Press button repeatedly until **Store** is selected.	Manual Store ▲ ▪ System ▪ Search ▪ Channel No. ▪ Fine Tune ✓ Store Store? ▶ ▼
11	>	Store tuned channel. **Note** : If you want to continue searching for another transmitting channel, repeat steps 7 to 11.	Manual Store ▲ ▪ System ▪ Search ▪ Channel No. ▪ Fine Tune ✓ Store Stored ▼
12	⊞	Exit menu from screen.	

Directions for Use

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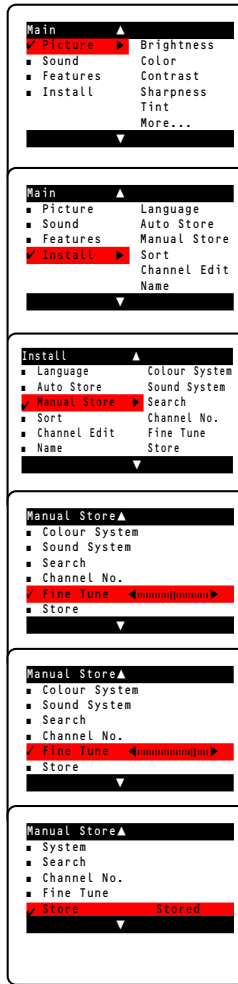
This feature allows you to select your desired **Colour** and **Sound** system. If **Auto** is selected, the respective colour and sound system will be automatically selected according to the transmission system. **Note** : Select your desired colour and sound system manually if reception is poor at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

Step	Press button	Result on TV Screen

Repeat s**tep 1** to **step 5** as in **"Manual Tuning of TV Channels"**

Colour System is selected.

```
Manual Store      ▲
✓ Colour System    Auto ▶
■ Sound System
■ Search
■ Channel No.
■ Fine Tune
■ Store
                  ▼
```

6   **<** or **>**

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

```
Manual Store      ▲
✓ Colour System    PAL ▶
■ Sound System
■ Search
■ Channel No.
■ Fine Tune
■ Store
                  ▼
```

7   **∨**

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

8   **>**

Store selected system.

```
Manual Store      ▲
■ Colour System
✓ Sound System
■ Search
■ Channel No.
■ Fine Tune
■ Store        Stored
                  ▼
```

9   **∨** or **∧**

Proceed to select **Sound System**.

```
Manual Store      ▲
■ Colour System
✓ Sound System    Auto ▶
■ Search
■ Channel No.
■ Fine Tune
■ Store
                  ▼
```

10 **<** or **>**

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

```
Manual Store      ▲
■ Colour System
✓ Sound System     DK ▶
■ Search
■ Channel No.
■ Fine Tune
■ Store
                  ▼
```

11 **∨**

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

12 **>**

Store selected system.

```
Manual Store      ▲
■ Colour System
✓ Sound System
■ Search
■ Channel No.
■ Fine Tune
■ Store        Stored
                  ▼
```

13 **⊞**

Exit menu from screen.

15

FINE TUNING OF CHANNELS

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

Step	Press button	Result on TV Screen

1   **MENU**

Enter main menu.

```
Main              ▲
✓ Picture    ▶ Brightness
■ Sound        Color
■ Features     Contrast
■ Install      Sharpness
               Tint
               More...
                  ▼
```

2   **∨**

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

```
Main              ▲
■ Picture      Language
■ Sound        Auto Store
■ Features     Manual Store
✓ Install  ▶   Sort
               Channel Edit
               Name
                  ▼
```

3   **>**

Enter install menu.

4   **∨**

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

```
Install           ▲
■ Language    Colour System
■ Auto Store  Sound System
■ Manual Store ▶ Search
■ Sort        Channel No.
■ Channel Edit Fine Tune
■ Name        Store
                  ▼
```

>

Enter manual store menu.

6   **∨**

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

```
Manual Store▲
■ Colour System
■ Sound System
■ Search
■ Channel No.
✓ Fine Tune  ◀▭▭▭▭▭▭▭▶
■ Store
                  ▼
```

7   **>** or **<**

Fine tune until the best reception is obtained.

```
Manual Store▲
■ Colour System
■ Sound System
■ Search
■ Channel No.
✓ Fine Tune  ◀▭▭▭▭▭▭▭▶
■ Store
                  ▼
```

8   **∨**

Select **Store**.

9   **>**

Store last fine-tuned status.

```
Manual Store▲
■ System
■ Search
■ Channel No.
■ Fine Tune
✓ Store        Stored
                  ▼
```

10 **⊞**

Exit menu from screen.

16

SORTING OF CHANNELS

This feature rearranges channel numbers.

Step	Press button		Result on TV Screen

1 — MENU — Enter main menu.

```
Main          ▲
■ Picture      Language
■ Sound        Auto Store
■ Features     Manual Store
✓ Install   ▶  Sort
               Channel Edit
               Name
              ▼
```

2 — ∨ — Press button repeatedly until **Install** is selected.

3 — ❯ — Enter install menu.

```
Install       ▲
■ Language     000
■ Auto Store   001
■ Manual Store 002
✓ Sort      ▶  003
■ Channel Edit 004
■ Name         005
              ▼
```

4 — ∨ — Press button repeatedly until **Sort** is selected.

5 — ❯ — Enter sort mode.

```
Install       ▲
■ Language     000
■ Auto Store   001
■ Manual Store 002 ▶
✓ Sort      ▶  003
■ Channel Edit 004
■ Name         005
              ▼
```

6 — ∨ or ∧ — Select the channel number you want to change from (e.g. 002).

```
Install       ▲
■ Language     000
■ Auto Store   001
■ Manual Store 002 ◀
✓ Sort      ▶  003
■ Channel Edit 004
■ Name         005
              ▼
```

7 — ❯ — Confirm selection.

```
Install       ▲
■ Language     000
■ Auto Store   001
■ Manual Store 002
✓ Sort      ▶  003
■ Channel Edit 004
■ Name         005 ◀
              ▼
```

8 — ∨ — Select the channel number you want to change to (e.g. 005).

9 — ❮ — Confirm selection.
The change is done.
Note : Channel numbers 5, 4 and 3 will move upwards accordingly. that is, Channel 5 will move up to Channel 4, Channel 4 to 3 and Channel 3 to 2.

```
Install       ▲
■ Language     000
■ Auto Store   001
■ Manual Store 002
✓ Sort      ▶  003
■ Channel Edit 004
■ Name         005 ▶
              ▼
```

10 — ⊞ — Exit menu from screen.

17
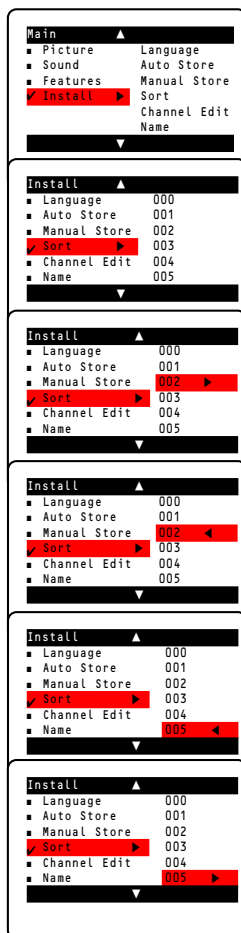
EDITING OF CHANNELS

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

Step	Press button		Result on TV Screen

1 — MENU — Enter main menu.

```
Main          ▲
■ Picture      Language
■ Sound        Auto Store
■ Features     Manual Store
✓ Install   ▶  Sort
               Channel Edit
               Name
              ▼
```

2 — ∨ — Press button repeatedly until **Install** is selected.

3 — ❯ — Enter install menu.

```
Install       ▲
■ Language      Channel No.
■ Auto Store    Skipped
■ Manual Store
■ Sort
✓ Channel Edit▶
■ Name
              ▼
```

4 — ∨ — Press button repeatedly until **Channel Edit** is selected.

5 — ❯ — Enter **Channel Edit** menu.

```
Channel Edit  ▲
✓ Channel No.    2   ▶
■ Skipped

              ▼
```

6 — 1 2 3 4 5 6 7 8 9 0 — Key in the channel number to be skipped.

7 — ∨ — Select **Skipped**.

8 — ❯ — Select **On** to skip channel.

```
Channel Edit  ▲
■ Channel No.
✓ Skipped        On

              ▼
```

9 — ⊞ — Exit menu from screen.
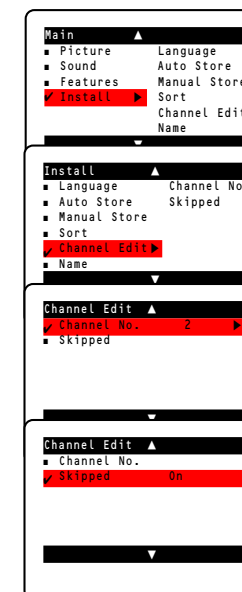
HOW TO RESTORE SKIPPED CHANNELS

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

```
Channel Edit  ▲
■ Channel No.
✓ Skipped        Off

              ▼
```

18
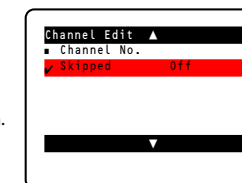
NAMING OF CHANNELS

This feature enables you to name or rename channels.

Step	Press button		Result on TV Screen

① MENU Enter main menu.

② ⌄ Press button repeatedly until **Install** is selected.

```
Main          ▲
■ Picture      Language
■ Sound        Auto Store
■ Features     Manual Store
✓ Install   ▶  Sort
               Channel Edit
               Name
              ▼
```

③ > Enter install menu.

④ ⌄ Press button repeatedly until **Name** is selected.

```
Install       ▲
■ Language      000
■ Auto Store    001
■ Manual Store  002
■ Sort          003
■ Channel Edit  004
✓ Name       ▶  005
              ▼
```

⑤ > Enter name mode.

⑥ ∧ or ⌄ Select the channel you want to name.

```
Install       ▲
■ Language      000
■ Auto Store    001
■ Manual Store  002
■ Sort        003▶
■ Channel Edit  004
✓ Name       ▶  005
              ▼
```

⑦ > Move to first character slot.

⑧ ∧ or ⌄ A cursor appears for you to start the input of characters. Select the character you want. Move to next character slot by the **Cursor Right** button and select the next character. You can enter up to a maximum of 5 characters.

```
Install       ▲
■ Language      000
■ Auto Store    001
■ Manual Store  002
■ Sort        003▶
■ Channel Edit  004
✓ Name       ▶  005
              ▼
```

⑨ ▣ Exit menu from screen.

ADJUSTING THE TV PICTURE

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

Step	Press button		Result on TV Screen

① MENU Display the main menu on screen.

```
Main          ▲
✓ Picture   ▶ Brightness
■ Sound        Colour
■ Features     Contrast
■ Install      Sharpness
               Colour Temp
               More...
```

② > Enter **Picture** menu.

③ ∧ or ⌄ Select item.

```
Picture       ▲
✓ Brightness ◀▯▯▯▯▯▯▯▯59▶
■ Colour
■ Contrast
■ Sharpness
■ Colour Temp
■ NR
```

④ < or > Adjust level or select desired setting.

```
Picture       ▲
✓ Colour     ◀▯▯▯▯▯▯▯▯59▶
■ Contrast
■ Sharpness
■ Colour Temp
■ NR
■ Contrast +
              ▼
```

⑤ ▣ Exit menu from screen.

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

ADJUSTING THE TV SOUND

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

Step	Press button		Result on TV Screen
1	MENU	Display the main menu on screen.	
2	∨	Select **Sound** menu.	
3	>	Enter **Sound** menu.	
4	∧ or ∨	Select item.	
5	< or >	Adjust level or select desired setting.	
6	(i+)	Exit menu from screen.	

```
Main              ▲
✓ Picture    ▶ Brightness
 ■ Sound        Colour
 ■ Features     Contrast
 ■ Install      Sharpness
                Colour Temp.
                More...
                  ▼
```

```
Main              ▲
 ■ Picture      Treble
✓ Sound    ▶  Bass
 ■ Features     Balance
 ■ Install      AVL
                Incr. Surround
                Ultra Bass
                  ▼
```

```
Sound             ▲
✓ Treble    ◀▭▭▭▭▮▭▭▭▭0▶
 ■ Bass
 ■ Balance
 ■ AVL
 ■ Incr. Surround
 ■ Ultra Bass
                  ▼
```

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

USING THE TIMER

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

Step	Press button		Result on TV Screen
1	MENU	Display the main menu on screen.	
2	∨	Select **Features**.	
3	>	Enter the Features menu.	
4	>	Enter Timer menu.	
5	1 2 3 / 4 5 6 / 7 8 9 / 0	Key in the current time starting from the hour follow by minute. This is the time where the "start time" and "stop time" will take reference from.	
6	∨	Select **Start Time**.	
7	1 2 3 / 4 5 6 / 7 8 9 / 0	Key in the time you want the programme to be switched on.	

```
Main              ▲
✓ Picture    ▶ Brightness
 ■ Sound        Colour
 ■ Features     Contrast
 ■ Install      Sharpness
                Colour Temp.
                More...
                  ▼
```

```
Main              ▲
 ■ Picture      Timer
 ■ Sound        Child Lock
✓ Features  ▶ Format
 ■ Install
                  ▼
```

```
Features          ▲
✓ Timer     ▶  Time
 ■ Child Lock   Start Time
 ■ Format       Stop Time
   Channel      Activate
                Display
                  ▼
```

```
Timer             ▲
✓ Time     ▶  08:30
 ■ Start Time
 ■ Stop Time
 ■ Channel
 ■ Activate
 ■ Display
                  ▼
```

```
Timer             ▲
 ■ Time
✓ Start Time▶ 10:30
 ■ Stop Time
 ■ Channel
 ■ Activate
 ■ Display
                  ▼
```

Directions for Use

L01.2A

3.

EN 13

USING THE TIMER

Step	Press button		Result on TV Screen

8 — ∨ — Select **Stop Time**.

```
Timer          ▲
  ▪ Time
  ▪ Start Time
  ✓ Stop Time  ▶ 12:30
  ▪ Channel
  ▪ Activate
  ▪ Display
               ▼
```

9 — 1 2 3 4 5 6 7 8 9 0 — Key in the time you want the programme to be switched off.

10 — ∨ — Select **Channel**.

```
Timer          ▲
  ▪ Time
  ▪ Start Time
  ▪ Stop Time
  ✓ Channel    ▶ 5
  ▪ Activate
  ▪ Display
               ▼
```

1 2 3 4 5 6 7 8 9 0 — Key in the channel you want to switch to.

11 — ∨ — Select **Activate**.

```
Timer          ▲
  ▪ Time
  ▪ Start Time
  ▪ Stop Time
  ▪ Channel
  ✓ Activate   ▶ Once
  ▪ Display
               ▼
```

12 — ∨ — Activate timer. You can select **Once**, **Daily** or **Off**.

13 — ∨ — Select **Display**.

```
Timer          ▲
  ▪ Time
  ▪ Start Time
  ▪ Stop Time
  ▪ Channel
  ▪ Activate
  ✓ Display    ▶ On
               ▼
```

14 — ∨ — Select **On** mode if you want to display the time on the TV screen.

15 — ⊞ — Exit menu from screen.

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

23

ACTIVATING THE CHILD LOCK (ACCESS CODE)

The Child Lock feature allows you to lock channels to prevent your children from watching programmes you deem undesirable.
Note : You can only have access to the locked channels via the remote control. Keep the remote control out of reach so as to prevent your children from having access to it.

Step	Press button		Result on TV Screen

1 — MENU — Display the main menu on screen.

2 — ∨ — Press button repeatedly until **Features** is selected.

```
Main            ▲
  ▪ Picture    Timer
  ▪ Sound      Child Lock
  ✓ Features ▶ Format
  ▪ Install
               ▼
```

3 — > — Enter the Features menu.

4 — ∨ — Select **Child Lock**.

```
Features       ▲
  ▪ Timer
  ✓ Child Lock ▶
  ▪ Format

               ▼
```

5 — > — Enter Child Lock mode.

6 — 1 2 3 4 5 6 7 8 9 0 — Key in the 4-digit access code. For the first time or if you have forgotten the access code, enter the universal access code 0711 twice. It will now prompt you to key in a **New Code**.

```
Features          ▲
  ▪ Timer       Access Code
  ✓ Child Lock ▶  xxxx
  ▪ Format      Correct

                  ▼
```

7 — 1 2 3 4 5 6 7 8 9 0 — Key in your preferred code (4-digit).

```
Features          ▲
  ▪ Timer       New Code
  ✓ Child Lock ▶  xxxx
  ▪ Format
```

8 — 1 2 3 4 5 6 7 8 9 0 — Key in the new code the second time to confirm code.

```
Features          ▲
  ▪ Timer       Confirm Code
  ✓ Child Lock ▶  xxxx
  ▪ Format      Confirmed
```

9 — ⊞ — The Child Lock menu will now appear. You can proceed to lock channel (refer to section on "Lock Channel"). If not, exit menu from screen.

```
Child Lock       ▲
  ▪ Lock Channel ▶ 002
  ▪ Change Code    003
  ▪ Clear All      004
  ▪ Lock All       005
                   006
                   007
                 ▼
```

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

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ACTIVATING THE CHILD LOCK (CHANGE CODE)

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

Step	Press button		Result on TV Screen
Repeat **Steps 1** to **8** as in **"ACTIVATING THE CHILD LOCK (ACCESS CODE)"**		The Child Lock menu will now appear. You can proceed to change code.	```Child Lock ▲
✓ Lock Channel ▶ 002
■ Change Code   003
■ Clear All   004
■ Lock All   005
006
007
▼```
⟨9⟩ ⟨10⟩	∨ ▷	Select **Change Code**. Enter change code mode.	```Child Lock ▲
■ Lock Channel New Code
✓ Change Code ▶ ----
■ Clear All
■ Lock All
▼```
⟨11⟩	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⓪	Key in your preferred code (4-digit).	```Child Lock ▲
■ Lock Channel New Code
✓ Change Code ▶ xxxx
■ Clear All
■ Lock All
▼```
⟨12⟩	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⓪	Key in the new code the second time to confirm code.	```Child Lock ▲
■ Lock Channel Confirm Code
✓ Change Code ▶ xxxx
■ Clear All   Confirmed
■ Lock All
▼```
⟨13⟩	⊞	Exit menu from screen.	

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ACTIVATING THE CHILD LOCK (LOCK CHANNEL)

Step	Press button	Result on TV Screen
Repeat **Steps 1** to **8** as in **"CHILD LOCK (ACCESS CODE)"**	The Child Lock menu will now appear. You can proceed to lock channel.	```Child Lock ▲
✓ Lock Channel ▶ 002
■ Change Code   003
■ Clear All   004
■ Lock All   005
006
007
▼```
⟨9⟩ ▷	Enter lock channel mode.	```Child Lock ▲
✓ Lock Channel ▶ 002
■ Change Code   003
■ Clear All   004
■ Lock All   005
006
007 ▶
▼```
⟨10⟩ ∧ or ∨	Select the channel you want to lock.	```Child Lock ▲
✓ Lock Channel ▶ 002
■ Change Code   003
■ Clear All   004
■ Lock All   005
006 ▶
007
▼```
⟨11⟩ ▷	Activate blocking of channel. A keylock symbol will appear beside the channel number indicating that it is locked. **Note** : To lock more than one channel, repeat Steps 10 to 11 before exiting menu from screen.	```Child Lock ▲
✓ Lock Channel ▶ 002
■ Change Code   003
■ Clear All   004
■ Lock All   005
006 ▶ 🔒
007
▼```
⟨12⟩ ⊞	Exit menu from screen.	

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ACTIVATING THE CHILD LOCK (LOCK ALL)

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

Step	Press button	Result on TV Screen

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

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

```
Child Lock      ▲
✓ Lock Channel ▶   002
■ Change Code       003
■ Clear All         004
■ Lock All          005
                    006
                    007
                ▼
```

⟨9⟩ ∨   Select **Lock All**.

⟨10⟩ ＞   Select the **On** option to lock all channels.

```
Child Lock      ▲
■ Lock Channel
■ Change Code
■ Clear All
■ Lock All      ▶    On
                ▼
```

⟨11⟩ ⊞   Exit menu from screen.

ACTIVATING THE CHILD LOCK (CLEAR ALL)

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

Step	Press button	Result on TV Screen

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

The Child Lock menu will now appear. You can proceed to clear all channels.

```
Child Lock      ▲
✓ Lock Channel ▶   002
■ Change Code       003
■ Clear All         004
■ Lock All          005
                    006
                    007
                ▼
```

⟨9⟩ ∨   Select **Clear All**.

⟨10⟩ ＞   Select the **Off** option to unlock all channels.

```
Child Lock      ▲
■ Lock Channel
■ Change Code
✓ Clear All     ▶    Off
■ Lock All
                ▼
```

⟨11⟩ ⊞   Exit menu from screen.

USING THE SCREEN FORMAT

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

Step	Press button	Result on TV Screen

⟨1⟩ MENU   Display the main menu on screen.

```
Main            ▲
■ Picture      Timer
■ Sound        Child Lock
✓ Features  ▶  Format
■ Install
                ▼
```

⟨2⟩ ∨   Press button repeatedly until **Features** is selected.

⟨3⟩ ＞   Enter the Features menu.

⟨4⟩ ∨   Press button repeatedly umtil **Format** is selected.

```
Features        ▲
■ Timer
■ Child Lock
✓ Format        4:3  ▶
                ▼
```

⟨5⟩ ＞   Press the button repeatedly to cycle through the different formats (**4:3** or **Expand 4:3)** or and select your desired format.

```
Features        ▲
■ Timer
■ Child Lock
✓ Format    4:3 Expand▶
                ▼
```

⟨6⟩ ⊞   Exit menu from screen.

When to use the Screen Formats

4:3 format

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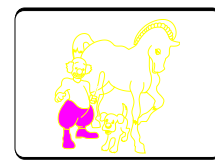
Expand 4:3 format

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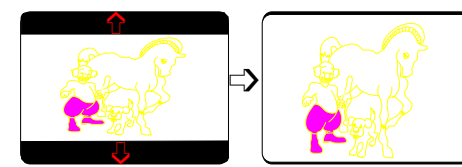
SMART PICTURE CONTROL

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

Step	Press button	
1	▭	Press botton repeatedly to cycle through the 5 settings namely, **DVD/VCD, Rich, Natural**, **Soft** and **Personal** and select your desired picture setting.
2	▣	Exit menu from screen.

Defintion of Picture Settings

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

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

Natural : Emphasize original colours.

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

Personal : Picture settings are set to your preference.

DVD/VCD

Rich

Natural

Soft

Personal

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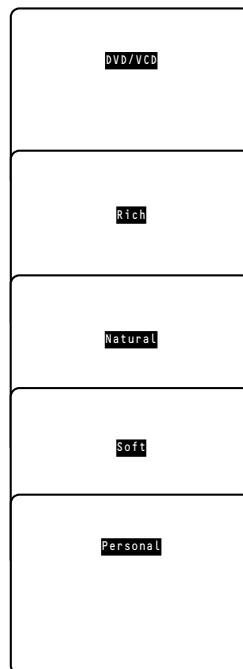
SMART SOUND CONTROL

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

Step	Press button	
1	♪	Press botton repeatedly to cycle through the 4 settings namely, **Personal**, **Voice**, **Music** and **Theatre** and select your desired sound setting.
2	▣	Exit menu from screen.

Definition of Sound Settings

Personal : Sound settings are set to your preference.

Voice : Emphasize high tone (treble boosted).

Music : Emphasize low tone (Bass boosted).

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

Personal

Voice

Music

Theatre

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SPECIFICATIONS

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

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

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Personal Notes:

4.   Mechanical Instructions

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

4.1   Rear Cover Removal

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

4.2   Service Position Main Panel

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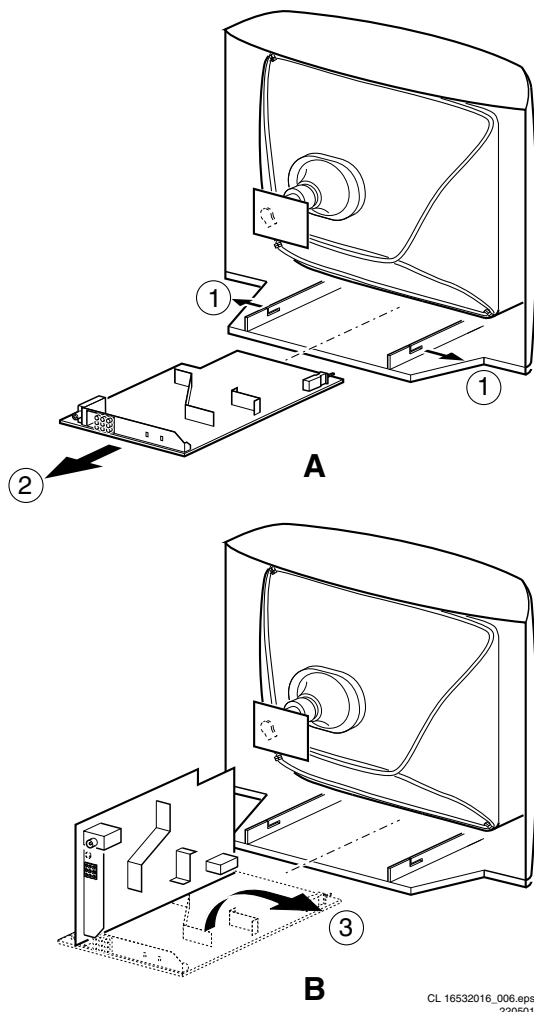
4.3   Side I/O Panel Removal

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

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030200
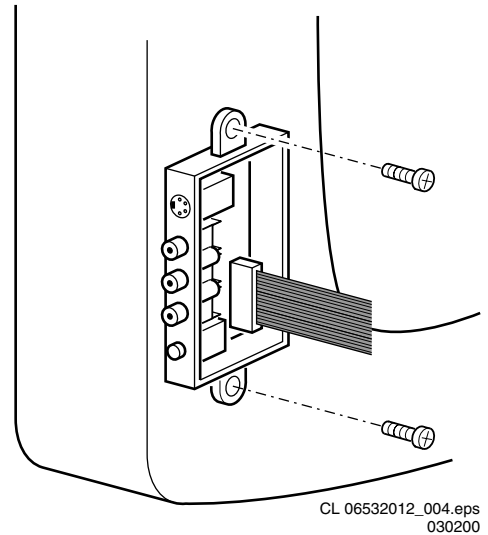
Figure 4-2

4.4   Rear Cover Mounting

Before you mount the rear cover, perform the following checks:
1. Check whether the mains cord is mounted correctly in its guiding brackets.
2. Replace the strain relief of the AC power cord into the cabinet.
3. Check whether all cables are replaced in their original position.

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Figure 4-1

5. Service Modes, Error Codes and Fault Finding

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

5.1 Test Points

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

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

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210501

Figure 5-1

The numbering is in a logical sequence for diagnostics. Always
start diagnosing within a functional block in the sequence of the
relevant test points for that block.
Perform measurements under the following conditions:
• Service Default Mode (when this mode is not present, set
all controls to 50%, set volume to 25% and select channel
3).
• Video: colour bar signal.
• Audio: 3 kHz left, 1 kHz right.

5.2 Service Modes

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

There is also the option of using ComPair, a hardware interface
between a computer (see requirements) and the TV chassis. It
offers the ability of structured trouble shooting, error code
reading and software version readout for all L01 chassis.
Minimum requirements: a 486 processor, Windows 3.1 and a
CD-ROM drive (see also paragraph 5.4).

| SOFTWARE VERSIONS (L01 AP SMALL SCREEN)			
SW cluster	SW name	UOC-type	Diversity
1AP1	L01AN1-x.y	TDA9580/1	AP, non TXT, China/AP
1AP2	L01AN2-x.y	TDA9581/2	AP, non TXT, Thailand/Vietnam
1AP3	L01AN3-x.y	TDA9580/1	AP, non TXT, India
1AP9	L01AN9-x.y	TDA9581	AP, non TXT, Middle East
3AP1	L01AT1-x.y	TDA9561/7	AP, 10 page TXT, Sgp/Aus/NZ
3AP2	L01AT2-x.y	TDA9567	AP, 10 page TXT, Middle East
4AP1	L01AC1-x.y	TDA9580	AP, NTSC, Thailand/Philippines
Abbreviations: A= Asia Pacific, C= NTSC, N= no TXT, T= TXT			

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

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

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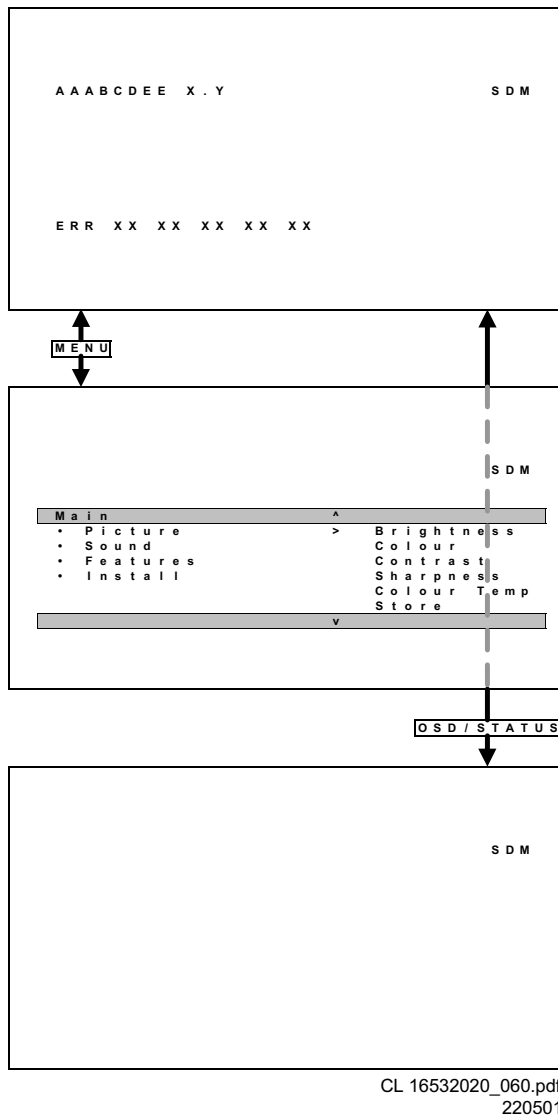the upper right side for recognition.

AAABCDEE X.Y   SDM

ERR XX XX XX XX XX

MENU

SDM

Main   ^
• Picture   >   Brightness
• Sound   Colour
• Features   Contrast
• Install   Sharpness
     Colour Temp
     Store
v

OSD / STATUS

SDM

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Figure 5-3

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

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

5.2.2 Service Alignment Mode (SAM)

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

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

How to enter
Use one of the following methods:
• Use a standard customer RC-transmitter and key in the code '062596' directly followed by the OSD / STATUS button or
• Via ComPair.

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

LLLL   AAABCD X.Y   SAM
ERR XX XX XX XX XX
XXX XXX XXX XXX XXX XXX XXX

CLEAR   CLEAR ?
OPTIONS   >
AKB   0 / 1
TUNER   >
WHITE TONE   >
GEOMETRY   >
AUDIO   >

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150401
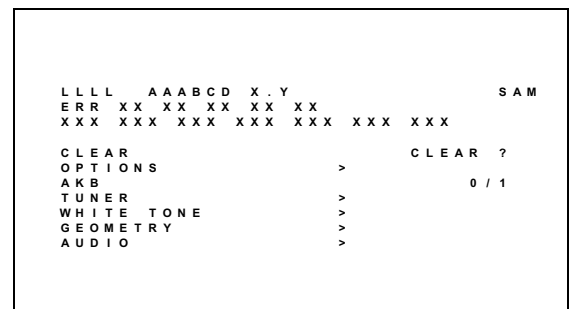
Figure 5-4

1. **LLLL** This is the operation hours counter. It counts the normal operation hours, not the standby hours.
2. **AAABCD-X.Y** This is the software identification of the main micro controller:
    • A = the project name (L01).
    • B = the region: E= Europe, A= Asia Pacific, U= NAFTA, L= LATAM.
    • C = the software diversity: C= NTSC, D= DVD, N= no TXT, T= TXT.
    • D = the language cluster number.
    • X = the main software version number.
    • Y = the sub software version number.
3. **SAM** Indication of the actual mode.
4. **Error buffer** Five errors possible.
5. **Option bytes** Seven codes possible.
6. **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.
7. **Options** To set the Option Bytes. See chapter 8.3.1 for a detailed description.
8. **AKB** Disable (0) or enable (1) the 'black current loop' (AKB = Auto Kine Bias).
9. **Tuner** To align the Tuner. See chapter 8.3.2 for a detailed description.
10. **White Tone** To align the White Tone. See chapter 8.3.3 for a detailed description.
11. **Geometry** To align the Geometry. See chapter 8.3.4 for a detailed description.
12. **Audio** To align the Audio. See chapter 8.3.5 for a detailed description.

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

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

How to exit

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

5.2.3 Customer Service Mode (CSM)

Purpose

When a customer is having problems with his TV-set, he can call his dealer. The service technician can than ask the customer to activate the CSM, in order to identify the status of the set. Now, the service technician can judge the severness of the complaint. In a lot of cases he can advise the customer how to solve the problem, or he can decide if it is necessary to visit the customer.
The CSM is a read only mode, therefore modifications in this mode are not possible.

How to enter

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

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

```
1   A A A B C D   X . Y                          C S M
2   C O D E S     X X  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

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

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

How to exit
Use one of the following methods:
- After you press 'any' key of the remote control transmitter with exception of the CHANNEL and VOLUME keys.
- After you switch-off the TV set with the AC power switch.

5.3 Problems and Solving Tips (Related to CSM)

5.3.1 Picture Problems

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

No colours / noise in picture
Check CSM line 4. Wrong colour system installed. To change the setting:
1. Press the MENU button on the remote control.
2. Select the INSTALL sub menu.
3. Select the MANUAL STORE sub menu.
4. Select and change the SYSTEM setting until picture and sound are correct.
5. Select the STORE menu item.

Colours not correct / unstable picture
Check CSM line 4. Wrong colour system installed. To change the setting:
1. Press the MENU button on the remote control.
2. Select the INSTALL sub menu.
3. Select the MANUAL STORE sub menu.
4. Select and change the SYSTEM setting until picture and sound are correct.
5. Select the STORE menu item.

TV switches 'off' (or 'on') or changes the channel without any user action
(Sleep)timer switched the set 'off' or changed channel. To change the setting:
1. Press the MENU button on the remote control.
2. Select the FEATURES sub menu.
3. Select the TIMER sub menu.
4. Select and change the SLEEP or TIME setting.

Picture too dark or too bright
Increase / decrease the BRIGHTNESS and / or the CONTRAST value when:
- The picture improves after you have pressed the 'Smart Picture' button on the remote control.
- The picture improves after you have switched on the Customer Service Mode
The new 'Personal' preference value is automatically stored.

White line around picture elements and text
Decrease the SHARPNESS value when:
- The picture improves after you have pressed the 'Smart Picture' button on the remote control.
- The picture improves after you have switched on the Customer Service Mode
The new 'Personal' preference value is automatically stored.

Snowy picture
Check CSM line 5. If this line indicates 'Not Tuned', check the following:
- No or bad antenna signal. Connect a proper antenna signal.
- Antenna not connected. Connect the antenna.
- No channel / pre-set is stored at this program number. Go to the INSTALL menu and store a proper channel at this program number.

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

Snowy picture and/or unstable picture
- A scrambled or decoded signal is received.

Black and white picture
Increase the COLOR value when:
- The picture improves after you have pressed the 'Smart Picture' button on the remote control.
- The picture improves after you have switched on the Customer Service Mode

The new 'Personal' preference value is automatically stored.

Menu text not sharp enough
Decrease the CONTRAST value when:
- The picture improves after you have pressed the 'Smart Picture' button on the remote control.
- The picture improves after you have switched on the Customer Service Mode

The new 'Personal' preference value is automatically stored.

5.3.2   Sound Problems

No sound or sound too loud (after channel change / switching on)
Increase / decrease the VOLUME level when the volume is OK after you switched on the CSM. The new 'Personal' preference value is automatically stored.

5.4   ComPair

5.4.1   Introduction

ComPair (Computer Aided Repair) is a service tool for Philips Consumer Electronics products. ComPair is a further development on the European DST (service remote control), which allows faster and more accurate diagnostics. ComPair has three big advantages:
- ComPair helps you to quickly get an understanding on how to repair the chassis in a short time by guiding you systematically through the repair procedures.
- ComPair allows very detailed diagnostics (on I^{2}C level) and is therefore capable of accurately indicating problem areas. You do not have to know anything about I^{2}C 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 I^{2}C level. ComPair can access the I^{2}C bus of the television. ComPair can send and receive I^{2}C 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 I^{2}C busses of the TV-set.
- Manually (by asking questions to you): Automatic diagnosis is only possible if the micro controller of the television is working correctly and only to a certain extend. When this is not the case, ComPair will guide you through the faultfinding tree by asking you questions (e.g. Does the screen gives a picture? Click on the correct answer: YES / NO) and showing you examples (e.g. Measure test-point I7 and click on the correct oscillogram you see on the oscilloscope). You can answer by clicking on a link (e.g. text or a waveform picture) that will bring you to the next step in the faultfinding process.

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

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

5.4.3   How to Connect

1. First install the ComPair Browser software (see the Quick Reference Card for installation instructions).
2. Connect the RS232 interface cable between a free serial (COM) port of your PC and the PC connector (marked with 'PC') of the ComPair interface.
3. Connect the AC power adapter to the supply connector (marked with 'POWER 9V DC') on the ComPair interface.
4. Switch the ComPair interface OFF.
5. Switch the television set OFF (remove the AC power).
6. Connect the ComPair interface cable between the connector on the rear side of the ComPair interface (marked with 'I^{2}C') and the ComPair connector on the mono carrier (see figure 8-1 suffix D).
7. Plug the AC power adapter in the AC power outlet and switch on the interface. The green and red LEDs light up together. The red LED extinguishes after approx. 1 second while the green LED remains lit.
8. Start the ComPair program and read the 'introduction' chapter.

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050898
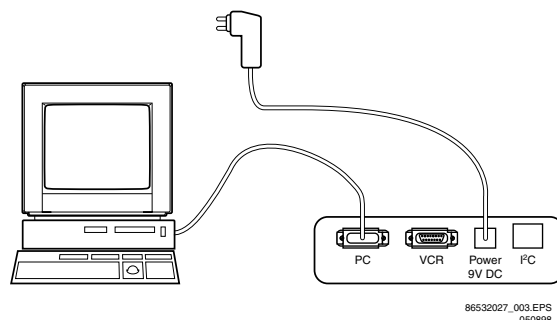
Figure 5-6

5.4.4   How to Order

ComPair order codes:

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

5.5 Error Buffer

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

5.5.1 How to Read the Error Buffer

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

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

5.5.2 How to Clear the Error Buffer

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

5.5.3 Error Codes

In case of non-intermittent faults, clear the error buffer before you begin the repair. These to ensure that old error codes are no longer present.
If possible, check the entire contents of the error buffer. In some situations, an error code is only the result of another error code and not the actual cause (e.g., a fault in the protection detection circuitry can also lead to a protection).

ERROR CODE TABLE				
Error	Device	Error description	Def. item	Diagram
0	Not applicable	No Error		
1	Not applicable	X-Ray/overvoltage protection (USA only)	2465, 7460	A2
2	Not applicable	Horizontal protection	7460, 7461, 7462, 7463, 6467	A2
	TDA8359/TDA9302	Vertical protection	7861, VlotAux+13V	A2, A3
3	Reserve			
4	MSP34X5 / TDA9853	MSP I²C identification error	7831 or 7861	A9 or A11
5	TDA95xx	POR 3V3 / +8V protection	7200, 7560, 7480	A5, A6, A7, A1, A2
6	I²C bus	General I²C 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 I²C identification error	7602, 3611, 3603/04	A7
10	Tuner	Tuner I²C identification error	1000, 7482	A4, A2
11	TDA6107/8	Black current loop protection	7330, RGB amps, CRT	B1, B2
12	M65669	PIP I²C 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 $\geq$ 10 are shown as follows:
– a long blink of 750 ms (which is an indication of the decimal digit),
– a pause of 1.5 s,
– n short blinks (n = 1 - 9),
– when all the error-codes are displayed, the sequence finishes with a LED blink of 3 s,
– the sequence starts again.

Example of error buffer: **12 9 6 0 0**
After entering SDM:
– 1 long blink of 750 ms followed by a pause of 1.5 s,
– 2 short blinks followed by a pause of 3 s,
– 9 short blinks followed by a pause of 3 s,
– 6 short blinks followed by a pause of 3 s,
– 1 long blink of 3 s to finish the sequence,
– the sequence starts again.

5.7 Protections

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

To get a quick diagnosis the chassis has three service modes implemented:
• The Customer Service Mode (CSM).
• The Service Default Mode (SDM). Start-up of the set in a predefined way.
• The Service Alignment Mode (SAM). Adjustment of the set via a menu and with the help of test patterns.

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

5.8 Repair Tips

Below some failure symptoms are given, followed by a repair tip.
• **Set is dead and makes hiccuping sound** 'MainSupply' is available. Hiccuping stops when de-soldering L5561, meaning that problem is in the 'MainSupply' line. No output voltages at LOT, no horizontal deflection. Reason: line transistor TS7460 is defective.
• **Set is dead, and makes no sound** Check power supply IC7520. Result: voltage at pins 1, 3, 4, 5 and 6 are about 180 V and pin 8 is 0 V. The reason why the voltage on these pins is so high is because the output driver (pin 6) has an open load. That is why MOSFET TS7521 is not able to switch. Reason: feedback resistor 3523 is defective. **Caution:** be careful measuring on the gate of TS7521; circuitry is very high ohmic and can easily be damaged! (first connect measuring equipment to ground, then to the gate).
• **Set is in hiccup mode and shuts down after 8 s.** Blinking LED (set in SDM mode) indicates error 5. As it is unlikely that 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 'Stdby_con' must be logic low under normal operation conditions and goes to high (3.3 V) under standby and fault conditions.
• **Set turns on, but without picture and sound** The screen shows snow, but OSD and other menus are okay. Blinking LED procedure indicates error 11, so problem is expected in the tuner (pos. 1000). Check presence of supply voltages. As 'Vlotaux+5V' at pin 5 and 7 are okay, 'VT_supply' at pin 9 is missing. Conclusion: resistor 3460 is defective.
• **Set turns on, but with a half screen at the bottom. Sound is okay** Blinking LED (set in SDM mode) indicates error 3. Check 'Vlotaux+13V' and '+50V'. If they are okay, problem is expected in the vertical amplifier IC7471. Measure with a scope the waveform on pin 17 of the UOC. Measure also at pin 1 of IC7471. If here the signal is missing, a defective resistor R3244 causes the problem.

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

Block Diagram

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230801

Testpoint Overview

Main Panel Copper Track Side

AUDIO OUTPUT
7901 OR 7902

TV-PROC.
7200
7200

NICAM + 2CS + BTSC
7831

SUPPLY
CONTROL
7520
7521
SUPPLY
7402
LINE

7471
FRAME

HOT GROUND

CRT Panel Copper Track Side

Testpoint index:

A1	B3	L2	E5
A2	B3	L3	E5
A3	A3	L4	D5
A4	A3	L6	C5
A5	C1	L8	C6
A6	B1	L9	D5
A7	B1	P1	E3
A8	C2	P2	E3
A9	B2	P3	D3
A10	B3	P4	C4
A11	C2	P5	C4
A12	B2	P6	D5
A13	C3	S1	A4
C1	B4	S2	A4
C2	B4	S3	A5
C3	B5	S4	A5
C4	B5	S5	A4
C5	B5	V1	B6
C6	E1	V2	B6
F1	D6	V3	B5
F2	D6	V4	B4
F3	C6	V5	B4
F4	C6	V6	B4
I1	A6	V7	B4
I2	A6	V8	B4
I3	A6	V9	A4
I4	A6	V10	A4
L1	C4		

L4 = +13V
L5 = +5V
L6 = +8V
L7 = -13V
L8 = +34V
L10 = +176V

P2 = +308V (317V)
P4 = +3V3
P5 = +12V4 (+3V9)
P6 = +95V

Oscilloscope waveform settings:

I4: 500mV / div DC, 250ns / div
S3: 500mV / div DC, 5ms / div
V12: 1V / div DC, 20us / div

L1: 500mV / div DC, 20us / div
S4: 500mV / div DC, 5ms / div
V13: 1V / div DC, 20us / div

L2: 2V / div DC, 20us / div
V4: 100mV / div DC, 20us / div
V14: 50V / div DC, 20us / div

V5: 1V / div DC, 20us / div
V15: 50V / div DC, 20us / div

L9: 2V / div DC, 20us / div
V6: 1V / div DC, 20us / div
V16: 50V / div DC, 20us / div

P1: 50V / div DC, 20us / div
V7: 1V / div DC, 20us / div

P3: 5V / div DC, 50ms / div
V8: 2V / div DC, 5ms / div

V9: 500mV / div DC, 10us / div

A1: 2V / div DC, 5us / div
A6: 2V / div DC, 200us / div
C1: 1V / div DC, 500us / div
C5: 2V / div DC, 200us / div
F3: 10V / div DC, 5ms / div
I1: 2V / div DC, 200us / div

A2: 2V / div DC, 500us / div
A7: 2V / div DC, 200us / div
C2: 1V / div DC, 500us / div
F1: 500mV / div DC, 5ms / div
F4: 1V / div DC, 5ms / div
I2: 2V / div DC, 200us / div
S1: 2V / div DC, 20us / div
V10: 1V / div DC, 500us / div

A3 - A4: 2V / div DC, 500us / div
A11: 1V / div DC, 500us / div
C4: 2V / div DC, 200us / div
F2: 500mV / div DC, 5ms / div
F5: 10V / div DC, 5ms / div
I3: 20mV / div DC, 1ms / div
S2: 500mV / div DC, 20us / div
V11: 1V / div DC, 20us / div

CL 16532008_033.eps
240801

I2C and Supply Voltage Diagram
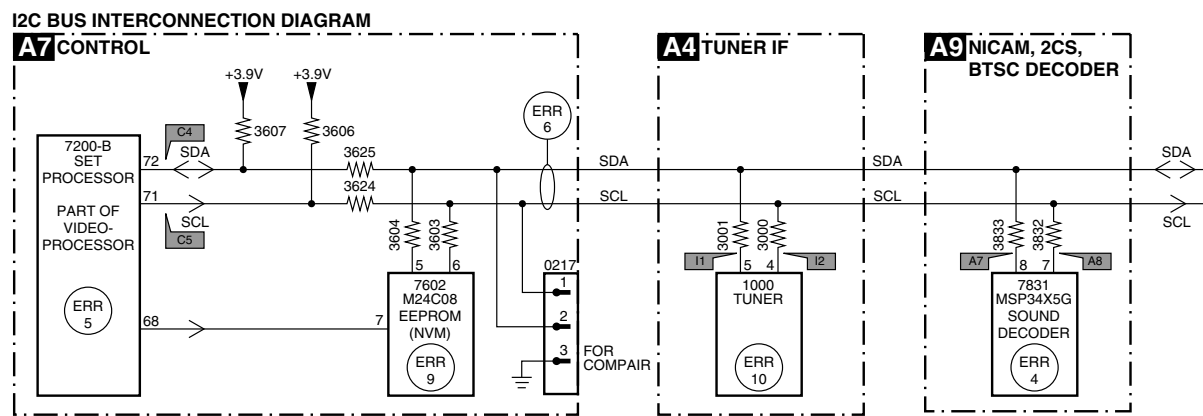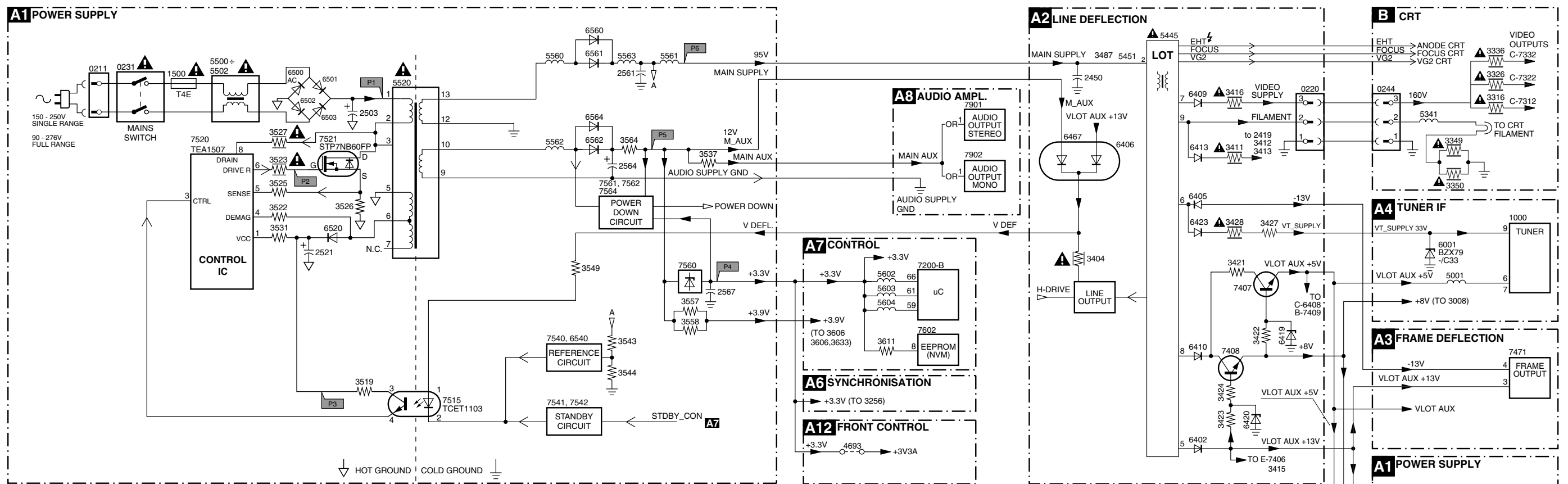
ERROR CODE LIST

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

CL 16532052_002.eps
230801
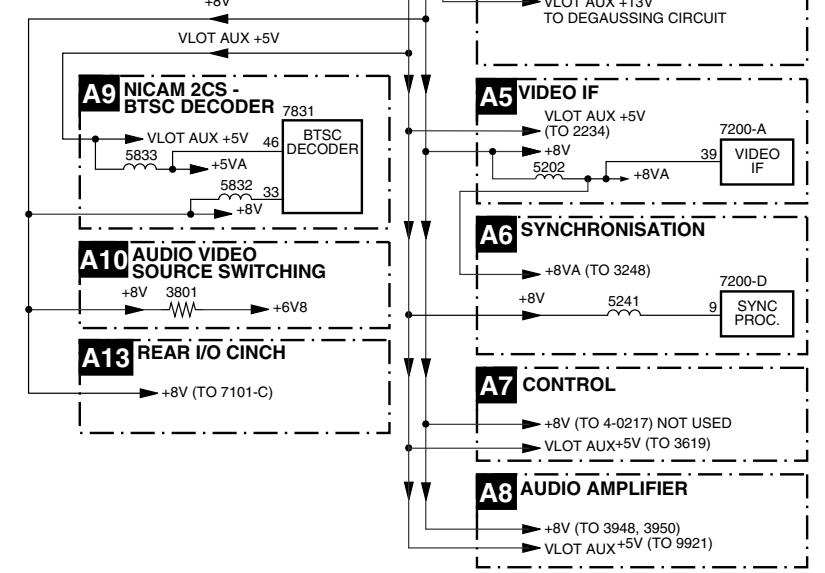
7. Schematics and PWB's

Large Signal Panel: Power Supply

A1 POWER SUPPLY
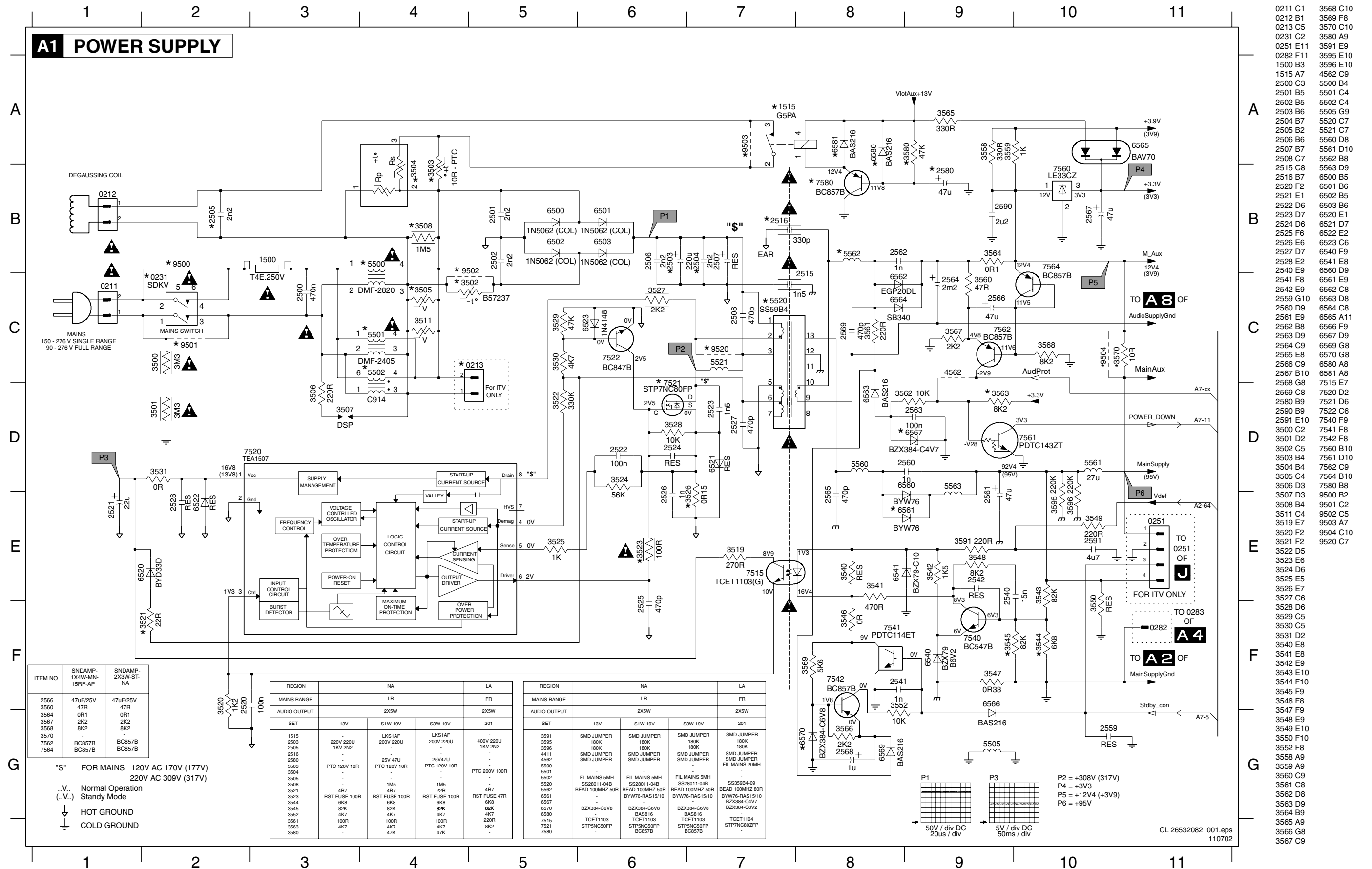
ITEM NO	SNDAMP-1X4W-MN-15RF-AP	SNDAMP-2X3W-ST-NA
2566	47uF/25V	47uF/25V
3560	47R	47R
3564	0R1	0R1
3567	2K2	2K2
3568	8K2	8K2
3570	-	-
7562	BC857B	BC857B
7564	BC857B	BC857B

"S" FOR MAINS 120V AC 170V (177V)
220V AC 309V (317V)

..V.. Normal Operation
(..V..) Standy Mode

HOT GROUND

COLD GROUND

REGION		NA		LA
MAINS RANGE		LR		FR
AUDIO OUTPUT		2X5W		2X5W
SET	13V	S1W-19V	S3W-19V	201
1515		LKS1AF	LKS1AF	
2503	220V 220U	200V 220U	200V 220U	400V 220U
2505	1KV 2N2			1KV 2N2
2516		25V 47U	25V47U	
3503	PTC 120V 10R	PTC 120V 10R	PTC 120V 10R	PTC 200V 100R
3504	-	-	-	-
3505	-	1M5	1M5	-
3508	4R7	4R7	22R	4R7
3521	RST FUSE 100R	RST FUSE 100R	RST FUSE 100R	RST FUSE 47R
3523	6K8	6K8	6K8	6K8
3544	82K	82K	82K	82K
3545	4K7	4K7	4K7	4K7
3552	100R	100R	100R	220R
3561	4K7	4K7	4K7	8K2
3563	-	-	-	-
3580	-	47K	47K	-

REGION		NA		LA
MAINS RANGE		LR		FR
AUDIO OUTPUT		2X5W		2X5W
SET	13V	S1W-19V	S3W-19V	201
3591	SMD JUMPER	SMD JUMPER	SMD JUMPER	SMD JUMPER
3595	180K	180K	180K	180K
3596	180K	180K	180K	180K
4411	SMD JUMPER	SMD JUMPER	SMD JUMPER	SMD JUMPER
4562	SMD JUMPER	SMD JUMPER	SMD JUMPER	FIL MAINS 20MH
5500	-	-	-	-
5501	-	-	-	-
5502	FIL MAINS 5MH	FIL MAINS 5MH	FIL MAINS 5MH	SS359B4-09
5520	SS28011-04B	SS28011-04B	SS28011-04B	
5562	BEAD 100MHZ 50R	BEAD 100MHZ 50R	BEAD 100MHZ 50R	BEAD 100MHZ 80R
6561	BYW76-RAS15/10	BYW76-RAS15/10	BYW76-RAS15/10	BYW76-RAS15/10
6567	-	-	-	BZX384-C4V7
6570	BZX384-C6V8	BZX384-C6V8	BZX384-C6V8	BZX384-C6V2
6580	BAS816	BAS816	BAS816	BAS816
7515	TCET1103	TCET1103	TCET1103	TCET1104
7521	STP5NC50FP	STP5NC50FP	STP5NC50FP	STP7NC80ZFP
7580	STP5NC50FP	BC857B	BC857B	

P1

P3

P2 = +308V (317V)
P4 = +3V3
P5 = +12V4 (+3V9)
P6 = +95V

50V / div DC
20us / div

5V / div DC
50ms / div

CL 26532082_001.eps
110702

DEGAUSSING COIL

MAINS
150 - 276 V SINGLE RANGE
90 - 276 V FULL RANGE

MAINS SWITCH

7520
TEA1507

SUPPLY MANAGEMENT
FREQUENCY CONTROL
VOLTAGE CONTROLLED OSCILLATOR
OVER TEMPERATURE PROTECTION
LOGIC CONTROL CIRCUIT
POWER-ON RESET
INPUT CONTROL CIRCUIT
BURST DETECTOR
MAXIMUM ON-TIME PROTECTION
OVER POWER PROTECTION
CURRENT SENSING
OUTPUT DRIVER
START-UP CURRENT SOURCE
VALLEY
START-UP CURRENT SOURCE

Large Signal Panel: Line Deflection

A2 LINE DEFLECTION

Right-side reference index:
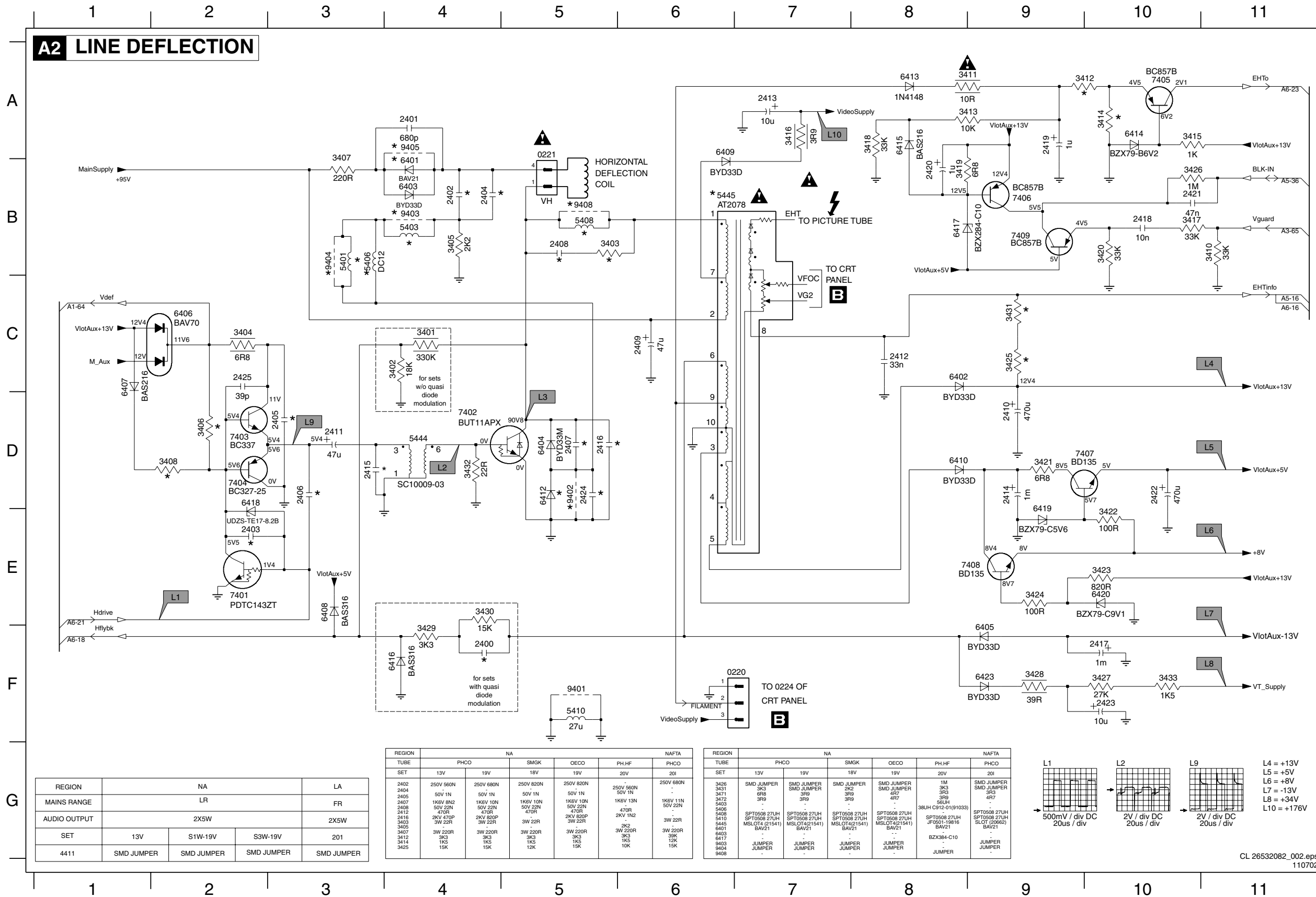
0220 F6, 0221 A5, 2400 F4, 2401 A4, 2402 B4, 2403 E2, 2404 B4, 2405 D3, 2406 D3, 2407 D5, 2408 B5, 2409 C6, 2410 D9, 2411 D3, 2412 C8, 2413 A7, 2414 D9, 2415 D3, 2416 D5, 2417 F10, 2418 B10, 2419 A9, 2420 B8, 2421 B10, 2422 D10, 2423 F10, 2424 D5, 2425 C2, 3401 C4, 3402 C4, 3403 B5, 3404 C2, 3405 B4, 3406 D2, 3407 B3, 3408 D2, 3410 B11, 3411 A9, 3412 A10, 3413 A9, 3414 A10, 3415 A10, 3416 A7, 3417 B10, 3418 A8, 3419 B8, 3420 B10, 3421 D9, 3422 E10, 3423 E10, 3424 E9, 3425 C9, 3426 B10, 3427 F10, 3428 F9, 3429 F4, 3430 E4, 3431 C9, 3432 D4, 3433 F10, 5401 B3, 5403 B4, 5406 B3, 5408 B5, 5410 F5, 5444 D4, 5445 B6, 6401 B4, 6402 C8, 6403 B4, 6404 D5, 6405 F9, 6406 C2, 6407 C1, 6408 E3, 6409 A6, 6410 D8, 6412 D5, 6413 A8, 6414 A10, 6415 A8, 6416 F4, 6417 B8, 6418 D2, 6419 E9, 6420 E10, 6423 F9

7401 E2, 7402 D4, 7403 D2, 7404 D2, 7405 A10, 7406 B9, 7407 D10, 7408 E9, 7409 B9, 9401 F5, 9402 D5, 9403 B4, 9404 B3, 9405 A4, 9408 B5

Key components: 6413 1N4148, 3411 10R, 3412, BC857B 7405, EHTo A6-23, 2413 10u, VideoSupply, 3416 3R9 L10, 3413 10K, VlotAux+13V, 3418 33K, 6415 BAS216, 2420, 3419 6R8, 2419 1u, 3414, 6414 BZX79-B6V2, 3415 1K, VlotAux+13V, 3407 220R, 6401 680p 9405, BAV21 6403, BYD33D 9403, 5403, 3405 2K2, 2402, 2404, 0221 VH, HORIZONTAL DEFLECTION COIL, 5408, 2408 3403, 6409 BYD33D, 5445 AT2078, EHT TO PICTURE TUBE, 12V4 BC857B 7406, 6417, BZX284-C10, 7409 BC857B, VlotAux+5V, 3420 33K, 3426 1M 2421, BLK-IN A5-36, 2418 10n, 3417 33K, 3410 33K, Vguard A3-65, EHTinfo A5-16, A6-16, 9404 5401 DC12, 5406, 3402 18K, 3401 330K, 2409 47u, 2412 33n, VFOC VG2, TO CRT PANEL B, 3431, 3425, 12V4, 6402 BYD33D, VlotAux+13V L4, 2410 470u, MainSupply +95V, Vdef A1-64, VlotAux+13V 12V4, M_Aux 12V, 6406 BAV70, 11V6, 6407 BAS216, 3404 6R8, 2425 39p, 7403 BC337, 11V, 5V4, 2405, L9 2411 47u, 5V4, 5444, 7402 BUT11APX, 90V8, L3, 6404 BYD33M 2407, 2416, 6410 BYD33D, 3421 6R8, 7407 BD135, VlotAux+5V L5, 2414 1m, 6419 BZX79-C5V6, 3422 100R, 2422 470u, L6, 3406, 3408, 7404 BC327-25, 6418 UDZS-TE17-8.2B, 2403, 5V5, 2406, 7401 PDTC143ZT, 1V4, VlotAux+5V, 6408 BAS316, 2415, 3432 22R, SC10009-03, 6412 9402 2424, 7408 BD135, 8V, 8V4, 8V7, 3423 820R 6420 BZX79-C9V1, 3424 100R, VlotAux+13V, +8V L6, L7 VlotAux-13V, Hdrive A6-21, Hflybk A6-18, L1, 6416 BAS316, 3429 3K3, 3430 15K 2400, for sets with quasi diode modulation, 6405 BYD33D, 2417 1m, 9401 5410 27u, 0220 FILAMENT, VideoSupply, TO 0224 OF CRT PANEL B, 6423 BYD33D, 3428 39R, 3427 27K 2423 10u, 3433 1K5, VT_Supply L8

REGION	NA					LA
MAINS RANGE	LR					FR
AUDIO OUTPUT	2X5W					2X5W
SET	13V	S1W-19V	S3W-19V	201		
4411	SMD JUMPER	SMD JUMPER	SMD JUMPER	SMD JUMPER		

REGION	NA					NAFTA
TUBE	PHCO		SMGK	OECO	PH.HF	PHCO
SET	13V	19V	18V	19V	20V	20I
2402	250V 560N	250V 680N	250V 820N	250V 820N	250V 560N	250V 680N
2404						
2405	50V 1N	50V 1N	50V 1N	50V 1N	50V 1N	
2407	1K6V 8N2	1K6V 10N	1K6V 10N	1K6V 10N	1K6V 13N	1K6V 11N
2408	50V 22N	50V 22N	50V 22N	50V 22N		50V 22N
2412	470R	470R	470R	470R	470R	
2416	2KV 470P	2KV 820P	2KV 820P		2KV 1N2	
3405	3W 22R	3W 22R	3W 22R	3W 22R	3W 22R	3W 22R
3407					2K2	3W 220R
3412	3W 220R	3W 220R	3W 220R	3W 220R	3K3	39K
3414	3K3	3K3	3K3	3K3	1K5	12K
3425	1K5	1K5	1K5	1K5	15K	15K
	15K	15K	15K	12K	10K	

REGION	NA					NAFTA
TUBE	PHCO		SMGK	OECO	PH.HF	PHCO
SET	13V	19V	18V	19V	20V	20I
3426	SMD JUMPER	SMD JUMPER	SMD JUMPER	SMD JUMPER	1M	SMD JUMPER
3431	3K3	6R8	2K2	SMD JUMPER	3K3	SMD JUMPER
3471	3R9	3R9	3R9	4R7	3R9	3R3
3472	3R9	3R9	3R9	4R7	3R9	4R7
5403					56uH	
5406					38uH C912-01(91033)	
5408	SPT0508 27UH	SPT0508 27UH	SPT0508 27UH	SPT0508 27UH	SPT0508 27UH	SPT0508 27UH
5410	SPT0508 27UH	SPT0508 27UH	SPT0508 27UH	SPT0508 27UH	JF0501-19816	SPT0508 27UH
5445	MSLOT4 (21541)	MSLOT4(21541)	MSLOT4(21541)	MSLOT4(21541)		SLOT (20662)
6401	BAV21	BAV21	BAV21	BAV21	BAV21	BAV21
6403						
6417					BZX384-C10	
9403	JUMPER	JUMPER	JUMPER	JUMPER		JUMPER
9404	JUMPER	JUMPER	JUMPER	JUMPER	JUMPER	JUMPER
9408						

L1 500mV / div DC 20us / div, L2 2V / div DC 20us / div, L9 2V / div DC 20us / div

L4 = +13V, L5 = +5V, L6 = +8V, L7 = -13V, L8 = +34V, L10 = +176V

CL 26532082_002.eps
110702
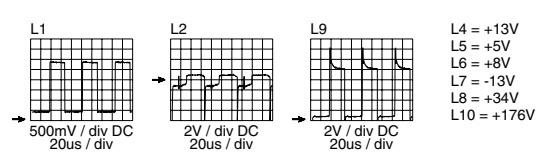
Large Signal Panel: Frame Deflection

A3 FRAME DEFLECTION (LATAM / NAFTA / AP)
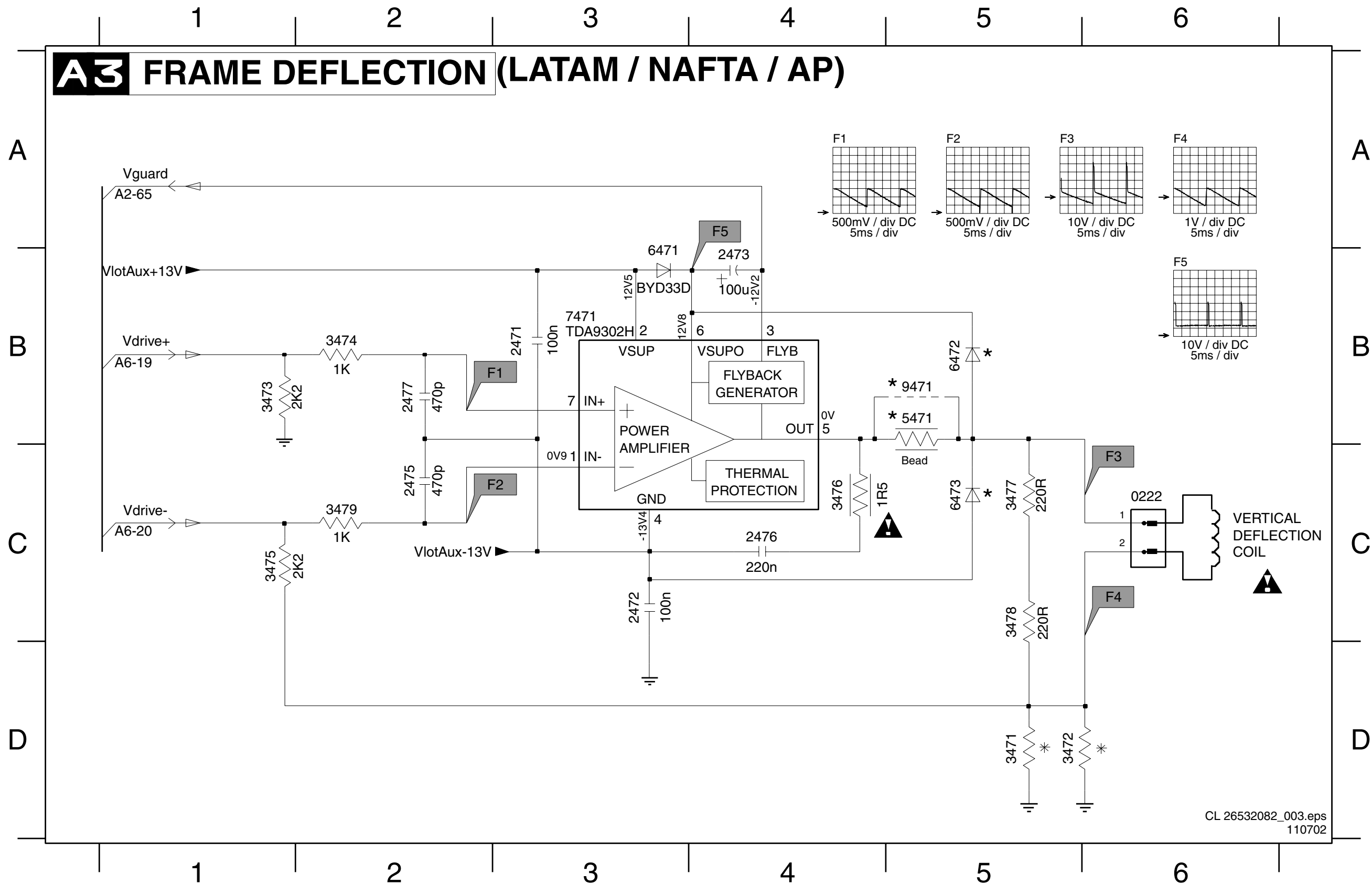
0222 C6
2471 B3
2472 C3
2473 B4
2475 C2
2476 C4
2477 B2
3471 D5
3472 D5
3473 B1
3474 B2
3475 C1
3476 C4
3477 C5
3478 C5
3479 C2
5471 B5
6471 A3
6472 B5
6473 C5
7471 B3
9471 B5

Vguard
A2-65

VlotAux+13V

Vdrive+
A6-19

Vdrive-
A6-20

VlotAux-13V

F5
6471   2473
BYD33D   100u2
-12V2
12V5

7471
TDA9302H
VSUP   VSUPO   FLYB
FLYBACK GENERATOR
IN+
POWER AMPLIFIER
OUT
IN-
THERMAL PROTECTION
GND

3474   1K
3473   2K2
2471   100n
2477   470p
F1

3479   1K
3475   2K2
2475   470p
F2

2472   100n

2476   220n

3476   1R5

6472   *
* 9471
* 5471
Bead
6473   *

3477   220R
3478   220R

F3
F4

0222
1
2

VERTICAL DEFLECTION COIL

3471   *   3472   *

F1
500mV / div DC
5ms / div

F2
500mV / div DC
5ms / div

F3
10V / div DC
5ms / div

F4
1V / div DC
5ms / div

F5
10V / div DC
5ms / div

CL 26532082_003.eps
110702

Large Signal Panel: Tuner IF

A4 TUNER IF

FM-RADIO ANTENNA
0265

VT_Supply
VlotAux+5V

2010 1n
2005 10u
6001 BZX79-C33
5001 5u6

1000

AGC
FM-ANT
+5V
VT
FM
IF
ADC

TUNER

MT

AS SCL SDA +5V
3 4.3V 5 7V 8

FOR ITV ONLY
0285

FOR EMC ONLY
0283

TO 0282
OF
A1

12
13
14
15

2004 47n

3003 4K7
2006 470u
2007 100n

6002 BAS216
6003 BAS216
3002 10K

3004 22K
2009 22n

3005 680R RF_AGC A5-25

SCL A7-13 3000 100R
SDA A7-14 3001 100R
FM A5-24 3010 100R

I2 I1 I3 I4

2001 RES
2002 RES
3011 RES

5002 820n
2008 100u

2003 10n *4001
*8V

3007 6k8
3008 2k2
3009 2k2

3006 2K2
*4006 *6004 BA792
*4005 *6005 BA792

*9001

*1002 OFWG1984M
1 4
2 5
3 0309

VIF_1 A5-27
VIF_2 A5-26

*1003 OFWK6272K
10 SWI O1 4
1 IN
2 ING GND O2 5
3 8

*4003
*4004
*4002

SEL-IF-LL_M-TRAP
A7-3

5V
5V 7001 PDTC124ET
0V

7002 PDTC124ET

*4011
*4012

*1004 OFWG1984M
1 4
2 5
3

5003 2u7

SIF_1 A5-28
SIF_2 A5-29

Item	AP-multi-Inter	AP-Multi-QSS	AP-PAL	CHINA-PAL	NA/LA/AP-NTSC
1002	K7260	K7257	K2960	K2978	F072 M1971
1004	---	K9362	---	---	---
2003	10n	10n	---	---	---
3006	2K2	2K2	---	---	---
3007	6K8	6K8	---	---	---
3008	2K2	2K2	---	---	---
4001	---	---	JMP	JMP	JMP
4002	---	---	JMP	JMP	JMP
4003	---	JMP	---	---	---
4004	JMP	JMP	---	---	---
4012	---	JMP	---	---	---
6004	1SS356	ISS356	---	---	---
7001	PDTC124	PDTC124	---	---	---

Tuner

ITEM	LNA (AP)	AP	NA	LA/AP-NTSC
1000	UV1356A	TEDE9-228B	ENV56D98G3 TEDH9-200A	RTEDH9-200A UV1336
5001	47u	47u	27u	5u6
5002	820n	---	820n	820n

I1 2V / div DC 200us / div
I2 2V / div DC 200us / div
I3 20mV / div DC 1ms / div
I4 500mV / div DC 250ns / div

CL 265320082_004.eps
110702
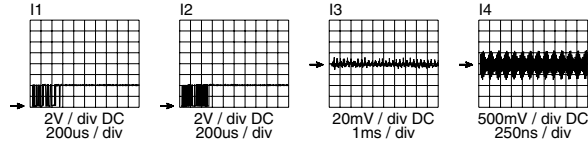
0265 A4
0283 B2
0285 B2
0309 D8
1000 A3
1002 D7
1003 E7
1004 E7
2001 C3
2002 C4
2003 C5
2004 B5
2005 A5
2006 B6
2007 B6
2008 C5
2009 C8
2010 A4
3000 C3
3001 C3
3002 C6
3003 B7
3004 C7
3005 B7
3006 D5
3007 D5
3008 D5
3009 D6
3010 D3
3011 D4
4001 C5
4002 E7
4003 E6
4004 E7
4005 D6
4006 D5
4011 F7
4012 F7
5001 A6
5002 C5
5003 F8
6001 A5
6002 B6
6003 C6
6004 D5
6005 D6
7001 E5
7002 E6
9001 D6

Large Signal Panel: Video IF + Sound IF

A5 VIDEO IF + SOUND IF

VIF

ITEM	AP-multi-Inter	AP-Multi-QSS	AP-PAL	CHINA-PAL	NA/LA/AP-NTSC
1200	TP02	6M	TP04	6M	4.5M
1201	---	---	---	---	---
1202	4.5M	---	---	---	---
3208	150R	390R	220R	390R	---
3209	82R	100R	82R	82R	68R
3210	4K7	---	---	---	---
3211	4K7	---	---	---	---
3213	470R	560R	470R	560R	560R
5201	4u7	4u7	4u7	4u7	6u8
7202	C857B	---	---	---	---
7203	C857B	---	---	---	---
9694	JMP	---	---	---	---

Component reference list:
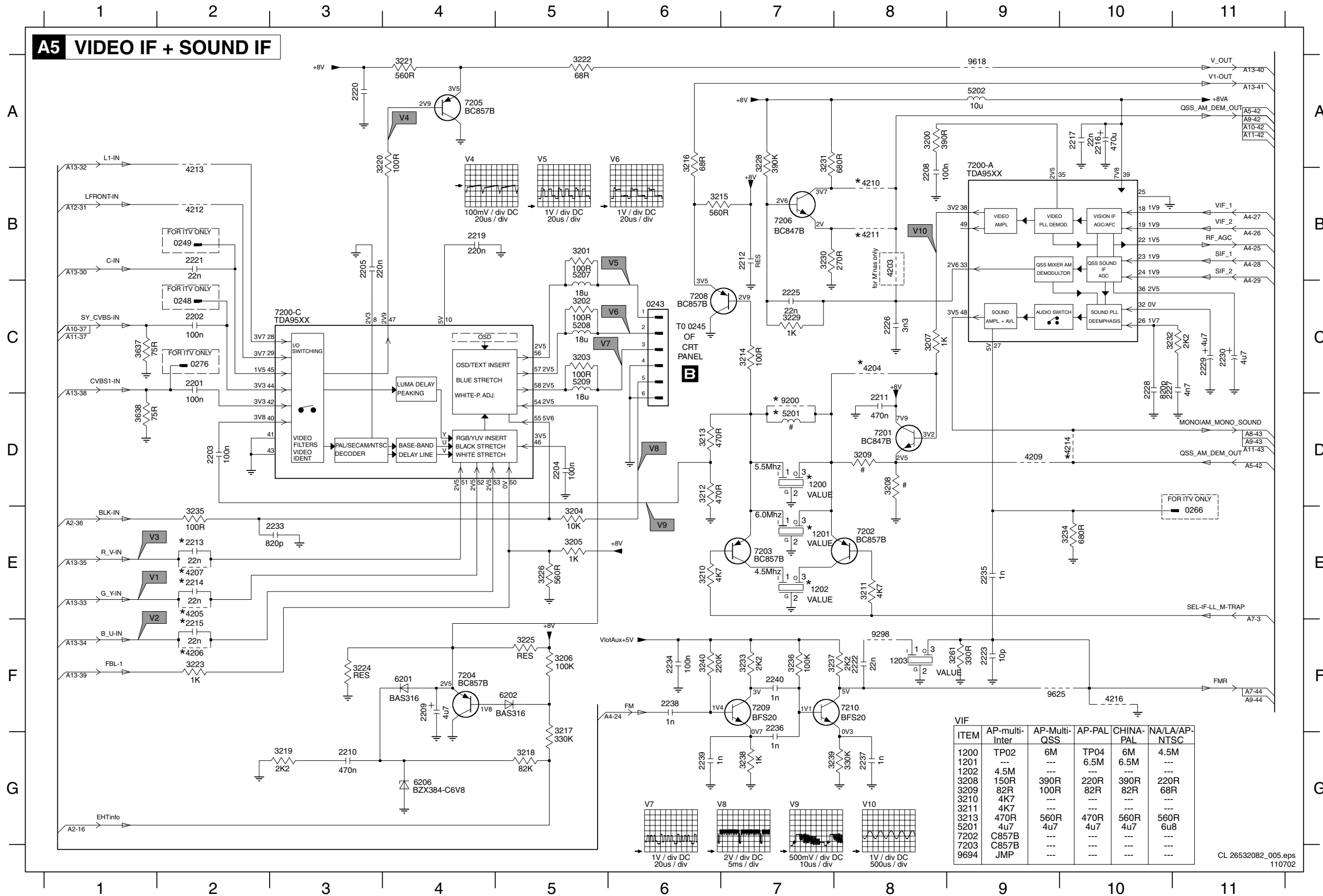
0243 C6, 0248 C2, 0249 B2, 0266 E11, 0276 C2, 1200 D7, 1201 E7, 1202 E7, 1203 F8, 2201 C2, 2202 C2, 2203 D2, 2204 D5, 2205 B3, 2208 B8, 2209 F4, 2210 G3, 2211 D8, 2212 B7, 2213 E2, 2214 E2, 2215 F2, 2216 A10, 2217 A10, 2219 B4, 2220 A3, 2221 B2, 2222 F8, 2223 F9, 2225 C7, 2226 C8, 2227 C10, 2228 C10, 2229 C11, 2230 C11, 2233 E3, 2234 F6, 2235 E9, 2236 F7, 2237 G8, 2238 F6, 2239 G6, 2240 F7, 3200 A8, 3201 B5, 3202 C5, 3203 C5, 3204 E5, 3205 E5, 3206 F5, 3207 C8, 3208 D8, 3209 D8, 3210 E6, 3211 E8, 3212 D6, 3213 D6, 3214 C7, 3215 B6, 3216 A6, 3217 F5, 3218 G5, 3219 G3, 3220 A3, 3221 A4, 3222 A5, 3223 F2, 3224 F3, 3225 F5, 3226 E5, 3228 A7, 3229 C7, 3230 B7, 3231 A7, 3232 C11, 3233 F7, 3234 E10, 3235 E2, 3236 F7, 3237 F8, 3238 G7, 3239 G8, 3240 F6, 3261 F9, 3637 C1, 3638 D1, 4203 B8, 4204 C8, 4205 E2, 4206 F2, 4207 E2, 4209 D9, 4210 B8, 4211 B8, 4212 B2, 4213 B2, 4214 D10, 4216 F10, 5201 D7, 5202 A9, 5207 B5, 5208 C5, 5209 C5, 6201 F4, 6202 F5, 6206 G4, 7200-A B9, 7200-C C3, 7201 D8, 7202 E8, 7203 E7, 7204 F4, 7205 A4, 7206 B7, 7208 C6, 7209 F7, 7210 F8, 9200 D7, 9298 F8, 9618 A9, 9625 F9

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110702

Large Signal Panel: Synchronisation

1   2   3   4   5   6   7

A6 SYNCHRONISATION

A

5241
10u
+8V

EHTinfo
A2-16
A6-16
3259
470K
3258
330K
2254
100p
3257
10M
2243
2n2
3254
1M
2247
470u
2248
22n

B

SANDCASTLE
A7-17

S1

S2
3251
100R
5242
10u
Hdrive
A2-21
1K
3256
+3.3V

2255
15p
3242
12K
2250
2u2
2249
22n

7200-D
TDA95XX

4V 14 0V9 31 2V9 11   7V9 9

VIDEO IDENT

H-DRIVE
2nd LOOP
H-SHIFT

30 1V2

S3
3244
820R
2252
1n
Vdrive+
A3-19

Hflybk
A2-18

C

H/V SYNC SEP.

H-OSC. + PLL

H

TELETEXT/ODS
DISPLAY

S4
3249
820R
2253
1n
Vdrive-
A3-20

V

V-DRIVE
+
GEOMETRY

17 1V3
16 1V2

S5

EW
GEOMATRY

15 0V
13

3250
100R
2246
4u7

EWdrivelEWD_dyn
N.C
(FOR E/W ONLY)

S1   S2

2V / div DC   500mV / div DC
20us / div   20us / div

3V9 12

3V8 21 3V9 20 2V1 34

D

S3   S4

500mV / div DC   500mV / div DC
5ms / div   5ms / div

2242
1u
3241
22K
2241
1n5
2244 100n
3245 39K
3246
10K
2245
1n

3248
27K
+8VA

+8V

E

POWER_DOWN
A7-11
6241
BZX384-C6V8
7241
PDTA114ET
3247
560K
EHTinfo
A6-16
EHTo
A2-23

CL 265320082_006.eps
110702

2241 D3
2242 D3
2243 B4
2244 E4
2245 D4
2246 D6
2247 B5
2248 B6
2249 C3
2250 C2
2252 C6
2253 C6
2254 A3
2255 C2
3241 D3
3242 C2
3244 C6
3245 E4
3246 D4
3247 E6
3248 D6
3249 C6
3250 D6
3251 B6
3254 A4
3256 C6
3257 A3
3258 B2
3259 A2
5241 A6
5242 B6
6241 E4
7200-D C3
7241 E5

Large Signal Panel: Control

A7 CONTROL

0240 FOR ITV ONLY
1 POR
2 DATA-OUT
3 DATA-IN
4 CLOCK
5 GND
6 TREBLE-BUZZ
7 Bass_panorama

TO 0240 OF J

FOR ITV ONLY 0250
FOR ITV ONLY 0273
FOR ITV ONLY 0274
FOR ITV ONLY 0261

2616 47n   FOR ITV ONLY

+3.3V
5602 5u6
5603 5u6
5604 5u6
2608 100n
2618 10n
2611 100n

2601 220n
2615 1n

7602
EEPROM M24C08
3V3 8
3V3 7
*4601 3
*4602 2
*4603
6 3V7
5 3V7
1

3604 100R
3603 100R
3611 100R   +3.3V
+3.9V
SDA
SCL

3606 2K2
3607 2K2
3625 100R
3624 100R
2613 22p
2612 22p

A4-14 A7-14 A9-14 A11-14
A4-13 A7-13 A9-13 A11-13

VlotAux+5V
STATUS2   3635 100R   A13-2
ITV_MSG   FOR ITV ONLY 9647   A13-75
SEL-IF-LL_M-TRAP   3636 100R   A4-3 A5-3
3601 8K2
3612 8K2

LED   A12-4
+3.3V Stdby_con   3605 2K2   A1-5
3619 8K2   3610 8K2

SEL-MAIN-FRNT-RR   A10-12
Bass_panorama   3609 1K   A8-7
3617 4K7

FOR INDIA ONLY 0317   +3.3V
Volume/Mute   A8-15
3623 4K7   3639 6K8   FOR INDIA ONLY 0316
3618 10K

3640 1K
2604 10u
6601 BAS216
SDM 9641
2 9631 1

POWER_DOWN

Treble_Buzzer_Hosp-app   A8-6
3615 10K
3614 4K7   +3.3V

* 7200-B TDA95XX
3V3 66 3V2 61 3V2 59 3V3

C5   3V7 71 SCL
C4   3V7 72 SDA

IIC-BUS TRANSCEIVER
I/O PORTS
VST PWM-DAC

1 0V
2 0V
67 3V3
68 0V
69 3V2
80 3V3
5V 70
0V 78
79
0V 73
0V 74
0V 75
0V 76
0V 77
60 0V
62 0V
63 1V5
64 0V
65 0V

3634 100R   STATUS1   +3.3V
3626 4K7   +3.3V
3622   POWER_DOWN   A1-11
3608 100R   IR   A12-10

3629 4K7   +3.3V
3627 4K7   N.C. (FOR E/W ONLY)

ENHANCED 80C51 CPU

C3
C1
C2

3628 10K
2607 33p
1660 12MHZ
2609 33p

2619 1u   2602 100p

3633 *1R   +3.9V
3630   3632 1R   +3.3V
KEYBOARD_protn   A12-8

1n 2606

7606 PDTC143ZT
RES   AudProt
A12-8

ROM/RAM
TELETEXT ACQUISITION   CVBS SYNC
1/10 PAGES MEMORY

OSD TELETEXT DISPLAY
R G B BL COR   H V

0V 7 4 0V

ITEM	SNDAMP-1X1W-MN-NA	SNDAMP-1X4W-MN-CH	SNDAMP-1X4W-MN-IN	SNDAMP-2x5W-ST-L01MKII	SNDAMP-1X4W-MN-IN MKII	SNDAMP-2X3W-ST-NA/LA/AP	SNDAMP-2X1W-ST-NA	SNDAMP-INTF-ST-IN	SNDAMP-1X4W-MN-LA/AP	SNDAMP-1X3W-MN-GL	SNDAMP-1X4W-MN-15RF-AP	SNDAMP-2X3W-ST-NA
2604	---	---	10uF	10uF	10uF	---	---	---	10uF	---	10uF	---
3618	6K8	6K8	10K	JMP	JMP	6K8	6K8	6K8	6K8	6K8	6K8	6K8
3623	4K7	4K7	4K7	---	---	4K7	4K7	4K7	4K7	4K7	4K7	4K7

0217
SDA   A7-14   1
SCL   A7-13   2
3
+8V   4
FMR   4618   A5-44   5
SANDCASTLE   4604   A6-17   6
FOR ITV ONLY
FOR COMPAIR
TO 0217 OF J

ITEM	55K-NA	55K-LA	NON 55K-NA	NON 55K-AP
3622	JMP	JMP	100R	100R
3630	470R	470R	2K2	2K2

ITEM	NA	LA	AP
7200	TDA 9587	TDA 9570	TDA 9580
	TDA 9577		TDA 9581
			TDA 9582
			TDA 9567
			TDA 6561

C1   1V / div DC   500us / div
C2   1V / div DC   500us / div
C4   2V / div DC   200us / div
C5   2V / div DC   200us / div

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

Large Signal Panel: Audio Amplifier + Mono Sound Processing

A8 AUDIO_AMPLIFIER + MONO_SOUND_PROCESSING

AUDIO AMPLIFIER

MainAux

VlotAux+5V

Main_OutL
A8-45
A9-45
A11-45

Main_OutR
A9-46
A11-46

Treble_Buzzer_Hosp-app
A7-6
A8-6

VolumeIMute
A7-15

FOR ITV ONLY 0271

* 9921
* 4921

FOR ITV ONLY 0275

3901 56K
3902 220K
2903
10u
6901 BAS216

2901 RES
2902 470u

* 7901 AN7522N

* 4902
* 3903 15K
2911 2n2
4901
2904 1u
3904 10K
2905 3n3

1V4 6 CH1-IN STB VCC 5 11V8 1
2 5V2 CH1+
4 5V2 CH1-

1V4 8 CH2-IN
0V3 9 VOL
10 5V2 CH2-
12 5V2 CH2+

GNDCH1 GNDINP GNDCH2
3 7 11

* 4904
* 3905 15K
4903
2906 1u
3906 10K
2907 3n3

3921 330K
3922 330K
3923 330K

* 7902 AN7523N
6 CH1-IN STB VCC 5 1
2 CH1+
9 VOL 4 CH1-

GNDINP NC GNDCH1
7 8 3

3907 3K3
2908 10u

A1 A2 A3 A4

AmpOutR+ → A12-70
AmpOutL+ → A12-71
AmpOutL_Pos → A12-73
AmpOutR_Neg → A12-72

* 0246
AmpOutL_Neg 5
AmpOutL_Pos 4
3
* 9901
* 9902
AmpOutR_Pos 2
AmpOutR_Neg 1

2947 100p
2948 100p
2949 100p
2950 100p

SPEAKER

2 X 5W	16 ohm
2 X 3W	8 ohm
2 X 1W	8 ohm

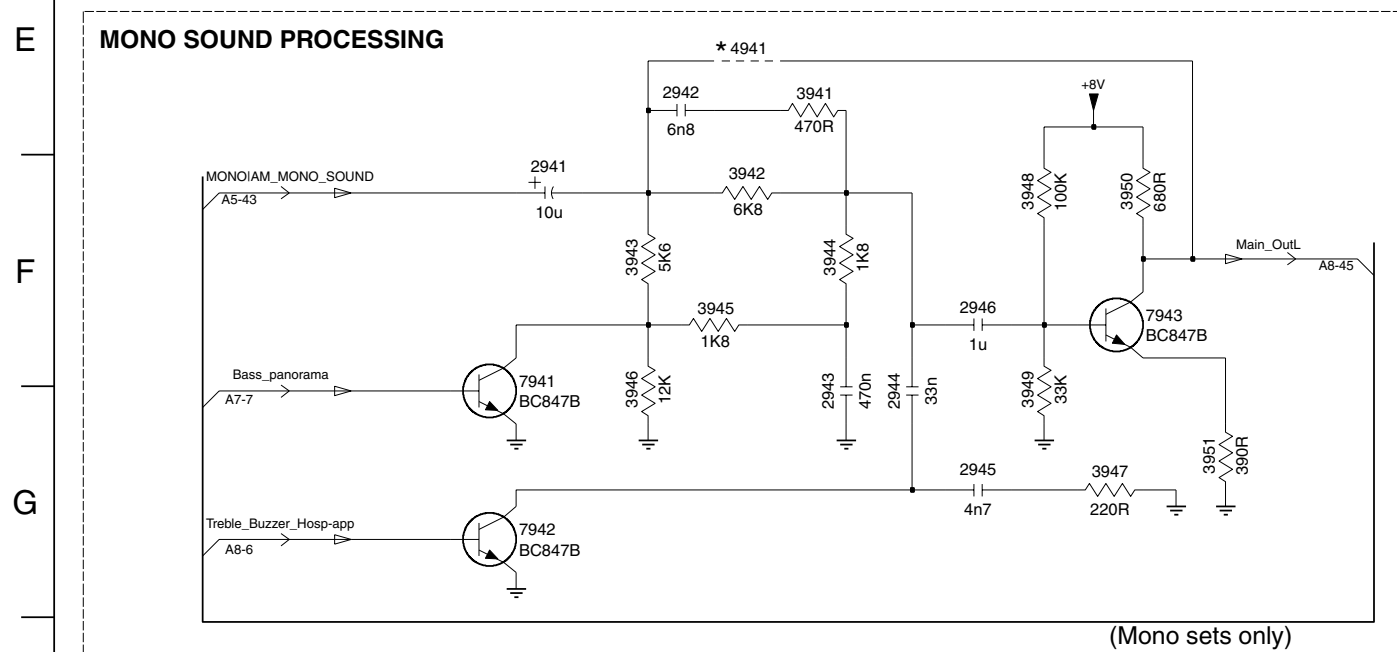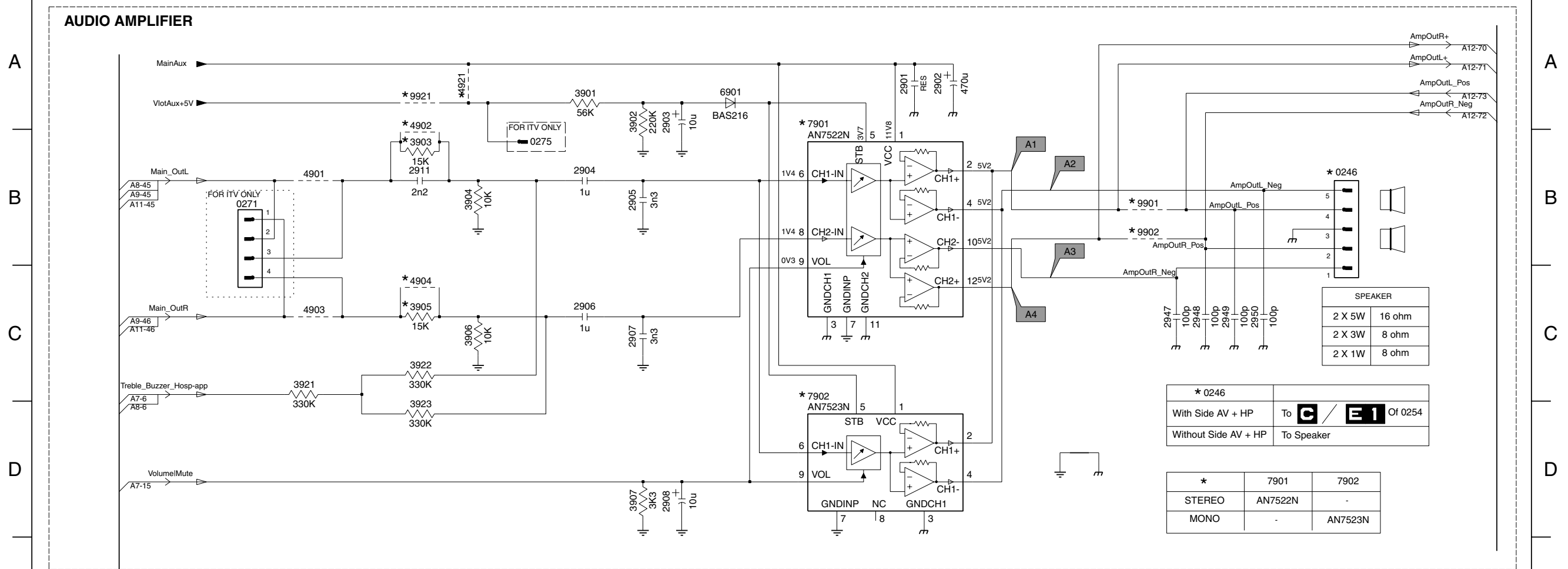| * 0246		
With Side AV + HP	To C / E1	Of 0254
Without Side AV + HP	To Speaker	

*	7901	7902
STEREO	AN7522N	-
MONO	-	AN7523N

MONO SOUND PROCESSING

MONOIAM_MONO_SOUND
A5-43

Bass_panorama
A7-7

Treble_Buzzer_Hosp-app
A8-6

* 4941

2942 6n8
3941 470R
3942 6K8

2941 10u

3943 5K6
3944 1K8

3945 1K8

7941 BC847B

3946 12K
2943 470n
2944 33n

3948 100K
3950 680R
+8V

3949 33K
2946 1u
7943 BC847B
Main_OutL → A8-45

7942 BC847B

2945 4n7
3947 220R
3951 390R

(Mono sets only)

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

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

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

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

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

ITEM	SNDAMP-1X1W-MN-NA	SNDAMP-1X4W-MN-CH	SNDAMP-1X4W-MN-IN	SNDAMP-2x5W-ST-L01MKII	SNDAMP-1X4W-MN-IN MKII	SNDAMP-2X3W-ST-NA/LA/AP
2908	10uF	10uF	---	---	---	10uF

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

A1 2V / div DC 5us / div
A2 2V / div DC 500us / div
A3 2V / div DC 500us / div
A4 2V / div DC 500us / div

CL 265320082_008.eps
110702
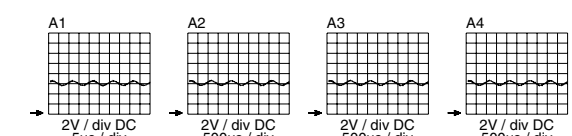
0246 B10
0271 B2
0275 B4
2901 A7
2902 A7
2903 A5
2904 B5
2905 B5
2906 C5
2907 C5
2908 D5
2911 B3
2941 F3
2942 E3
2943 G4
2944 G4
2945 G4
2946 F4
2947 C9
2948 C9
2949 C9
2950 C10
3901 A5
3902 A5
3903 B3
3904 B4
3905 C3
3906 C4
3907 D5
3921 C2
3922 C3
3923 D3
3941 E4
3942 F3
3943 F3
3944 F4
3945 F3
3946 G3
3947 G5
3948 F5
3949 G5
3950 F5
3951 G6
4901 B3
4902 A3
4903 C3
4904 C3
4921 A4
4941 E3
6901 A6
7901 A6
7902 C6
7941 G2
7942 G2
7943 F5
9901 B9
9902 B9
9921 A3

Large Signal Panel: NICAM + 2CS + BTSC (Stereo / SAP Decoder)

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

2843
10u
2842
100n

+5VA

VIotAux+5V

A6

2895
560p

2894
220p

2838
RES
3832
100R
2839

SCL
A7-13

5831
6u8
2834
470p
2835
220p
2836
1n5

2898
10n

A7

RES
3833
100R

SDA
A7-14

6831
BAS216

VIotAux+5V

3831
47K

2837
2841 10u
10u

2840
100n

5832
6u8

+8V

1831
18M432
HC-49/U

2897
330p

7831
MSP34X5G

AUDIO PLL

2832
1p5
2831
1p5

2887
10n

A10

2844
10u
2845
100n

2V6 43
VREFTOP
SOUND IF
1V5 47
ANA_IN1+
2833 1V5 48
ANA_IN1-
47p

DEMODULATOR
& NICAM
DECODER

FM1/AM
FM2
NICAM A
NICAM B

D/A

DACM-L
25 1V8

LOUDSPEAKER L

LOUDSPEAKER
DACM-R
24 1V8

2849
1n

Main_OutL
A8-45

A9

Main_OutR
A8-46

2850
1n

A11

MONOIAM_MONO_SOUND
A9-43

3834
680R
3835
100R

2847
330n
2848
1n

3V8 44
MONO
MONO-IN

IDENT

DSP

3 0V

SC2_CTRL
A10-50

SC1_LIN
A10-47

SC1_RIN
A10-48

3V8 41
SC1-IN-L

3V8 42
SCART 1
SC1-IN-R

39
SC2-IN-L

A/D

A/D

SCART-L

SCART-R

4 0V

2861
10n

MONOIAM_MONO_SOUND
A5-43
A9-43

+5VA

38 40
4K7
7835
BC847B 4V9

7834
BC847B

4V9

SCART 2
40 SC2-IN-R

SCART-L

SCART-R

D/A

D/A

TP

9

11

13

4832

3837
100R

7832
BC847B

+8V

4831

SC1_LOUT
A10-51

A13

A5-42
QSS_AM_DEM_OUT

2855
39p

2856
12p

4V8

4V8

5835
15u

3843
RES
2860

2896
12p

3841
33K
4835

4V1

4V1

4V1

3849
470R

2858
1n

14

15

26
SC1-OUT-L
31 3V

SCART
SC1-OUT-R
30 3V

A8

A12

2852
1n

3836
1K

SC

SCART Switching Facilities

NC

4834
RES

2857
220p

4833

SC1_ROUT
A10-49

3839
100R

7833
BC847B

2854
1n

3838
1K

2853
220n

+8V

4836

A5

FMR
A5-44

2859
1n

3842
22K

12 18 19 21 22 27 28 32 37 38 49 1

VIotAux+5V

5833
3u3

+5VA

2846
100u

TO L01-DVD CONN.

0306
1
2
3
4

TO 0308 OF
REAR IO SCART

A14

0307
1 R_OUT
2 L_OUT

A6   A7   A11

2V / div DC   2V / div DC   1V / div DC
200us / div   200us / div   500us / div

CL 26532082_009.eps
110702

0306 F4
0307 G4
1831 B8
2831 C8
2832 C8
2833 C4
2834 B4
2835 B4
2836 B4
2837 B4
2838 A9
2839 B9
2840 B6
2841 B5
2842 A5
2843 A5
2844 C3
2845 C3
2846 G1
2847 D3
2848 D3
2849 C8
2850 C8
2851 E10
2852 E8
2853 F10
2854 F8
2855 E1
2856 E2
2857 F2
2858 E3
2859 F1
2860 E2
2861 D8
2887 C9
2894 A7
2895 A6
2896 E2
2897 C4
2898 A6
3831 B4
3832 A9
3833 B9
3834 D2
3835 D2
3836 E9
3837 D8
3838 F9
3839 E8
3840 E3
3841 F3
3842 F4
3843 E2
3849 E3
4831 E9
4832 D9
4833 F9
4834 F1
4835 F3
4836 F3
5831 B3
5832 B7
5833 G2
5835 E2
6831 B4
7831 C7
7832 D9
7833 E9
7834 E4
7835 E3

Large Signal Panel: Audio / Video Source Switching

A10 AUDIO/VIDEO SOURCE SWITCHING
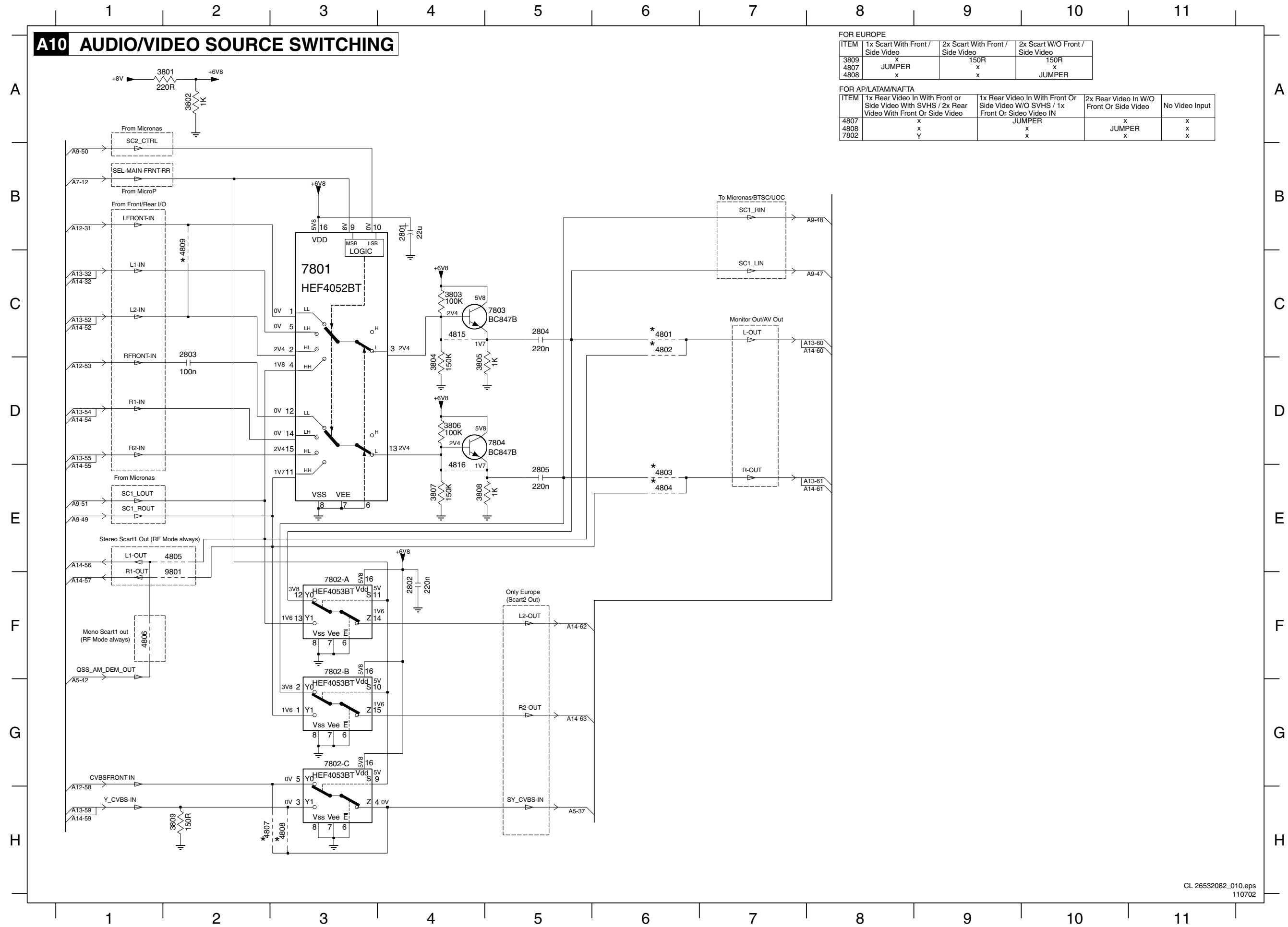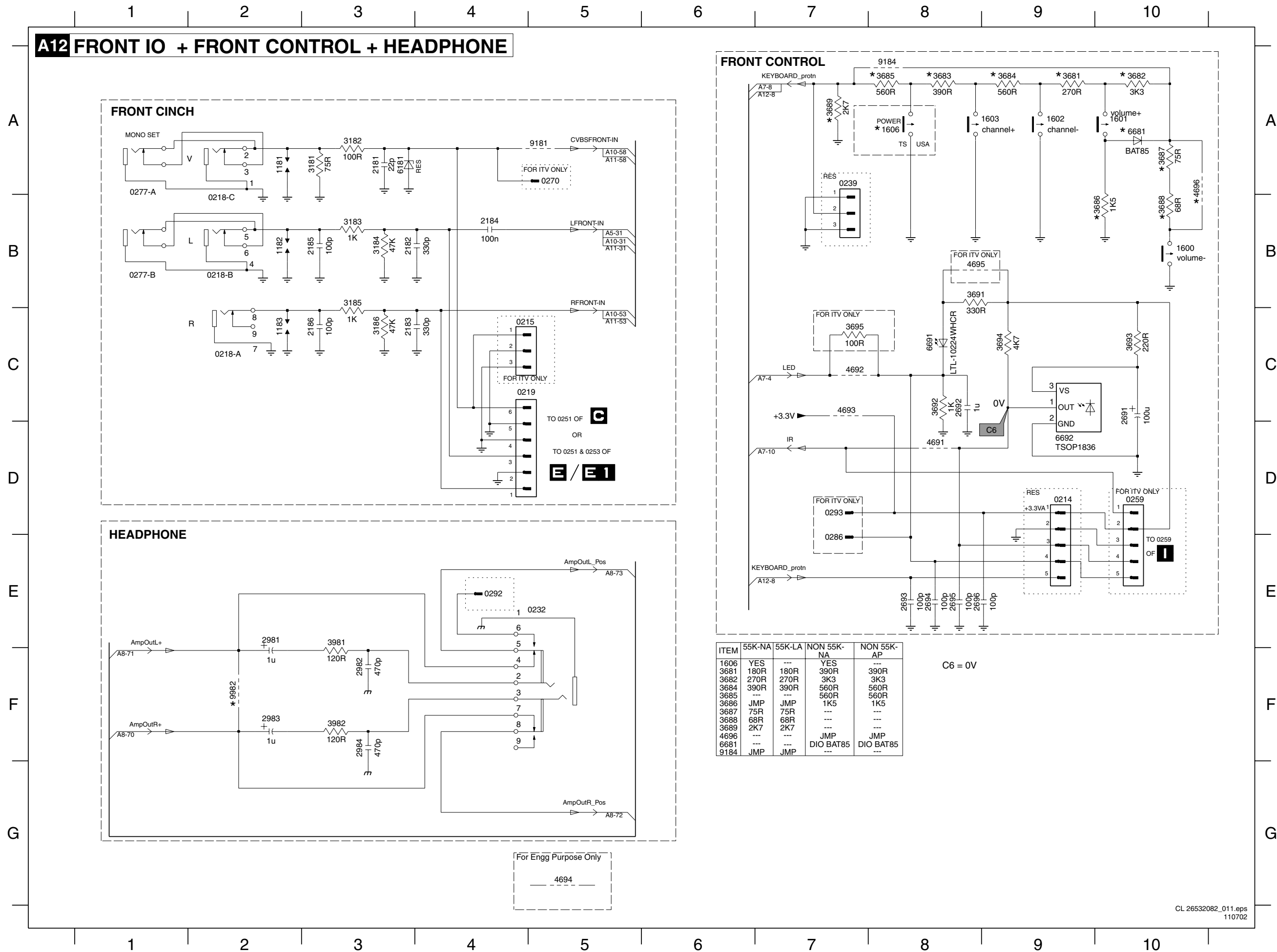
FOR EUROPE

ITEM	1x Scart With Front / Side Video	2x Scart With Front / Side Video	2x Scart W/O Front / Side Video
3809	x	150R	150R
4807	JUMPER	x	x
4808	x	x	JUMPER

FOR AP/LATAM/NAFTA

ITEM	1x Rear Video In With Front or Side Video With SVHS / 2x Rear Video With Front or Side Video	1x Rear Video In With Front Or Side Video W/O SVHS / 1x Front Or Sideo Video IN	2x Rear Video In W/O Front Or Side Video	No Video Input
4807		JUMPER	x	x
4808	x	x	JUMPER	x
7802	Y	x	x	x

+8V 3801 220R +6V8
3802 1K

From Micronas
SC2_CTRL
A9-50

SEL-MAIN-FRNT-RR
A7-12
From MicroP

From Front/Rear I/O
LFRONT-IN
A12-31

+6V8

*4809

L1-IN
A13-32
A14-32

L2-IN
A13-52
A14-52

RFRONT-IN 2803 100n
A12-53

R1-IN
A13-54
A14-54

R2-IN
A13-55
A14-55

From Micronas
SC1_LOUT
A9-51
SC1_ROUT
A9-49

5V8 16 8V 9 0V 10
VDD
MSB LSB
LOGIC
7801
HEF4052BT

2801 22u

0V 1 LL
0V 5 LH
2V4 2 HL 3 2V4
1V8 4 HH

0V 12 LL
0V 14 LH
2V4 15 HL 13 2V4
1V7 11 HH

VSS VEE
8 7 6

+6V8
3803 100K 5V8
2V4 7803 BC847B
4815 1V7
3804 150K 3805 1K

+6V8
3806 100K 5V8
2V4 7804 BC847B
4816 1V7
3807 150K 3808 1K

2804 220n
*4801
*4802

2805 220n
*4803
*4804

To Micronas/BTSC/UOC
SC1_RIN
A9-48

SC1_LIN
A9-47

Monitor Out/AV Out
L-OUT
A13-60
A14-60

R-OUT
A13-61
A14-61

Stereo Scart1 Out (RF Mode always)
L1-OUT 4805
A14-56
R1-OUT 9801
A14-57

Mono Scart1 out (RF Mode always)
4806

QSS_AM_DEM_OUT
A5-42

+6V8
2802 220n
7802-A 5V8 16
3V8 12 Y0 HEF4053BT Vdd 5V 11 S
1V6 13 Y1 Z 14 1V6
Vss Vee E
8 7 6

Only Europe (Scart2 Out)
L2-OUT
A14-62

7802-B 5V8 16
3V8 2 Y0 HEF4053BT Vdd 5V 10 S
1V6 1 Y1 Z 15 1V6
Vss Vee E
8 7 6

R2-OUT
A14-63

CVBSFRONT-IN
A12-58

Y_CVBS-IN
A13-59
A14-59

3809 150R

*4807 *4808

7802-C 5V8 16
0V 5 Y0 HEF4053BT Vdd 5V 9 S
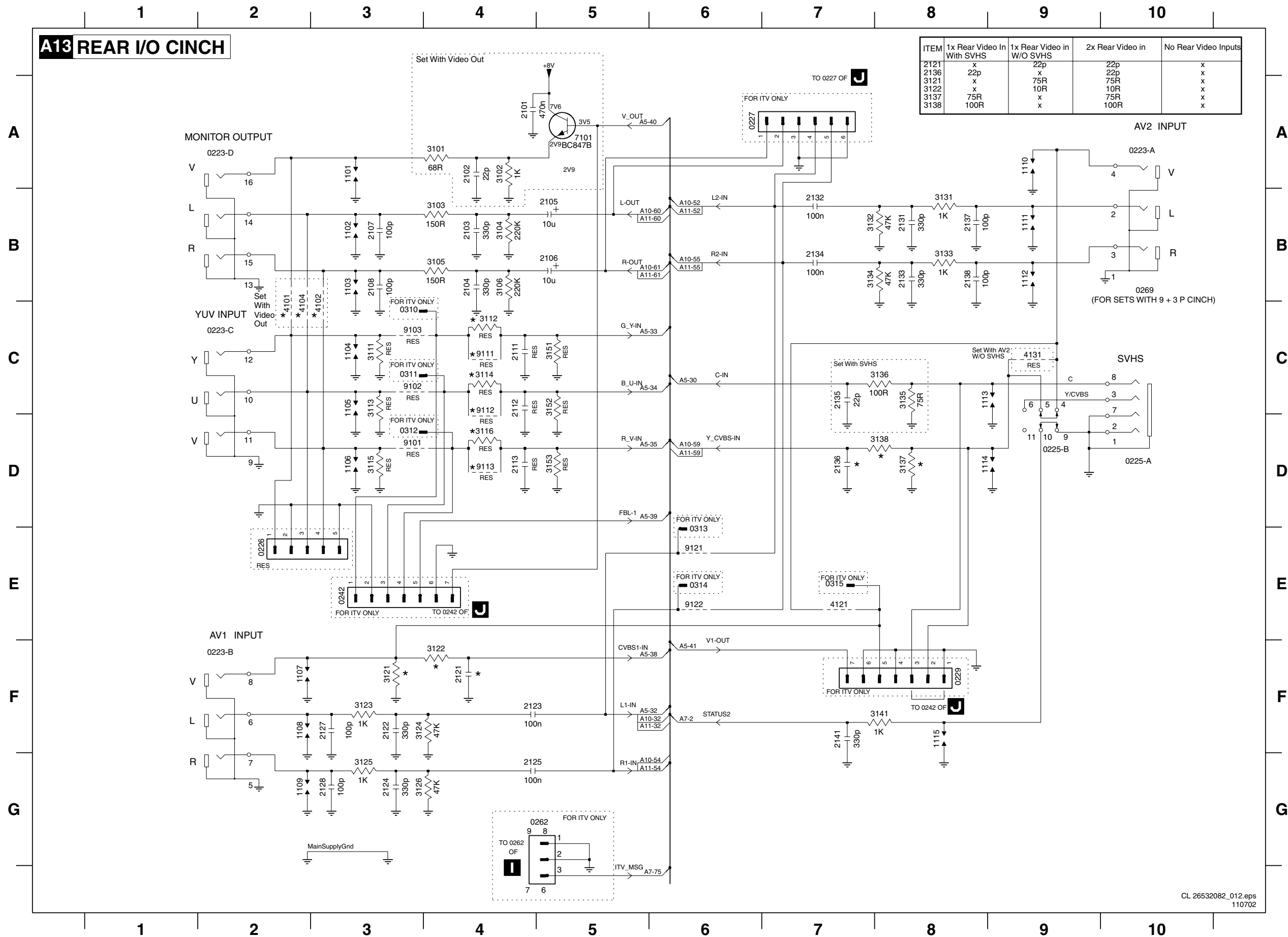0V 3 Y1 Z 4 0V
Vss Vee E
8 7 6

SY_CVBS-IN
A5-37

CL 26532082_010.eps
110702

2801 B4
2802 F4
2803 C2
2804 C5
2805 E5
3801 A2
3802 A2
3803 C4
3804 D4
3805 D4
3806 D4
3807 E4
3808 E4
3809 H2
4801 C6
4802 C6
4803 E6
4804 E6
4805 E2
4806 F1
4807 H2
4808 H3
4809 B2
4815 C4
4816 E4
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

A12 FRONT IO + FRONT CONTROL + HEADPHONE

FRONT CINCH

MONO SET

V
0277-A 0218-C

9181 CVBSFRONT-IN
A10-58
A11-58

3182 100R
2181 22p
6181 RES
3181 75R
1181

FOR ITV ONLY
0270

L
0277-B 0218-B

3183 1K
3184 47K
2182 330p
2185 100p
1182

2184 100n
LFRONT-IN
A5-31
A10-31
A11-31

R
0218-A

3185 1K
3186 47K
2183 330p
2186 100p
1183

RFRONT-IN
A10-53
A11-53

0215
1
2
3
FOR ITV ONLY

0219
6
5
4
3
2
1
TO 0251 OF **C**
OR
TO 0251 & 0253 OF **E** / **E1**

HEADPHONE

AmpOutL_Pos
A8-73

0292
0232
1
6
5
4
2
3
7
8
9

AmpOutL+
A8-71
2981 1u
3981 120R
2982 470p

* 9982

AmpOutR+
A8-70
2983 1u
3982 120R
2984 470p

AmpOutR_Pos
A8-72

For Engg Purpose Only
4694

FRONT CONTROL

9184
KEYBOARD_protn
A7-8
A12-8

* 3685 560R
* 3683 390R
* 3684 560R
* 3681 270R
* 3682 3K3

* 3689 2K7

POWER
* 1606
TS USA

1603
channel+

1602
channel-

volume+
1601
* 6681
BAT85
* 3687 75R

* 3686 1K5
* 3688 68R
4696

RES
0239
1
2
3

1600
volume-

FOR ITV ONLY
4695

3691 330R

FOR ITV ONLY
3695 100R

LED
A7-4
4692

6691
LTL-10224WHCR

3692 1K 2692
1u

0V

3694 4K7

3693 220R

3
VS
1
OUT
2
GND
6692
TSOP1836

2691 100u

+3.3V
4693

IR
A7-10
4691

C6

FOR ITV ONLY
0293
0286

RES
0214
+3.3VA 1
2
3
4
5

FOR ITV ONLY
0259
1
2
3
4
5
TO 0259
OF **I**

KEYBOARD_protn
A12-8

2693 100p
2694 100p
2695 100p
2696 100p

C6 = 0V

ITEM	55K-NA	55K-LA	NON 55K-NA	NON 55K-AP
1606	YES	---	YES	---
3681	180R	180R	390R	390R
3682	270R	270R	3K3	3K3
3684	390R	390R	560R	560R
3685	---	---	560R	560R
3686	JMP	JMP	1K5	1K5
3687	75R	75R	---	---
3688	68R	68R	---	---
3689	2K7	2K7	---	---
4696	---	---	JMP	JMP
6681	---	---	DIO BAT85	DIO BAT85
9184	JMP	JMP	---	---

CL 26532082_011.eps
110702

Large Signal Panel: Rear I/O CINCH

A13 **REAR I/O CINCH**

Set With Video Out

MONITOR OUTPUT

0223-D

V 16

L 14

R 15

13

Set With Video Out

YUV INPUT

0223-C

Y 12

U 10

V 11

9

AV1 INPUT

0223-B

V 8

L 6

R 7

5

MainSupplyGnd

ITEM	1x Rear Video In With SVHS	1x Rear Video in W/O SVHS	2x Rear Video in	No Rear Video Inputs
2121	x	22p	22p	x
2136	22p	x	22p	x
3121	x	75R	75R	x
3122	x	10R	10R	x
3137	75R	x	75R	x
3138	100R	x	100R	x

AV2 INPUT

0223-A

V 4

L 2

R 3

1

0269
(FOR SETS WITH 9 + 3 P CINCH)

SVHS

Y/CVBS

0225-B

0225-A

Set With SVHS

Set With AV2 W/O SVHS

FOR ITV ONLY 0227 TO 0227 OF

FOR ITV ONLY 0310

FOR ITV ONLY 0311

FOR ITV ONLY 0312

FOR ITV ONLY 0313

FOR ITV ONLY 0314

FOR ITV ONLY 0315

0226 RES

0242 FOR ITV ONLY TO 0242 OF

0229 FOR ITV ONLY TO 0242 OF

0262 FOR ITV ONLY TO 0262 OF

V_OUT A5-40
L-OUT A10-52 A11-52 L2-IN A10-52 A11-52
R-OUT A10-55 A11-55 R2-IN A10-55 A11-55
G_Y-IN A5-33
B_U-IN A5-34 C-IN A5-30
R_V-IN A5-35 Y_CVBS-IN A10-59 A11-59
FBL-1 A5-39
CVBS1-IN A5-38 V1-OUT A5-41
L1-IN A5-32 A10-32 A11-32 STATUS2 A7-2
R1-IN A10-54 A11-54
ITV_MSG A7-75

+8V
2101 470n 7V6
7101 3V5
2V9 BC847B 2V9

7101 A5
9101 D3
9102 C3
9103 C3
9111 C4
9112 C4
9113 D4
9121 E6
9122 E6

0223-A A10
0223-B F2
0223-C C2
0223-D A2
0225-A D10
0225-B D9
0226 E2
0227 A6
0229 F8
0242 E3
0262 G5
0310 C3
0311 C3
0312 D3
0313 E6
0314 E6
0315 E7
1101 A3
1102 B3
1103 B3
1104 C3
1105 C3
1106 D3
1107 F2
1108 F2
1109 G2
1110 A9
1111 B9
1112 B9
1113 C8
1114 D8
1115 F8
2101 A4
2102 A4
2103 B4
2104 B4
2105 B5
2106 B5
2107 B3
2108 B3
2111 C4
2112 C4
2113 D4
2121 F4
2122 F3
2123 F4
2124 G3
2125 G4
2127 F3
2128 G3
2131 B8
2132 B7
2133 B8
2134 B7
2135 C7
2136 D7
2137 B8
2138 B8
2141 F7
3101 A4
3102 A4
3103 B4
3104 B4
3105 B4
3106 B4
3111 C3
3112 C4
3113 C3
3114 C4
3115 D3
3116 D4
3121 F3
3122 F4
3123 F3
3124 F3
3125 G3
3126 G3
3131 B8
3132 B7
3133 B8
3134 B7
3135 C8
3136 C8
3137 D8
3138 D8
3141 F8
3151 C5
3152 C5
3153 D5
4101 C2
4102 C3
4104 C2
4121 E7
4131 C9

CL 26532082_012.eps
110702

Layout Mono Carrier (Top Side)

CL 26532046_062.eps
250402

CL 26532046_62m.eps
250402

Layout Mono Carrier (Overview Bottom Side)
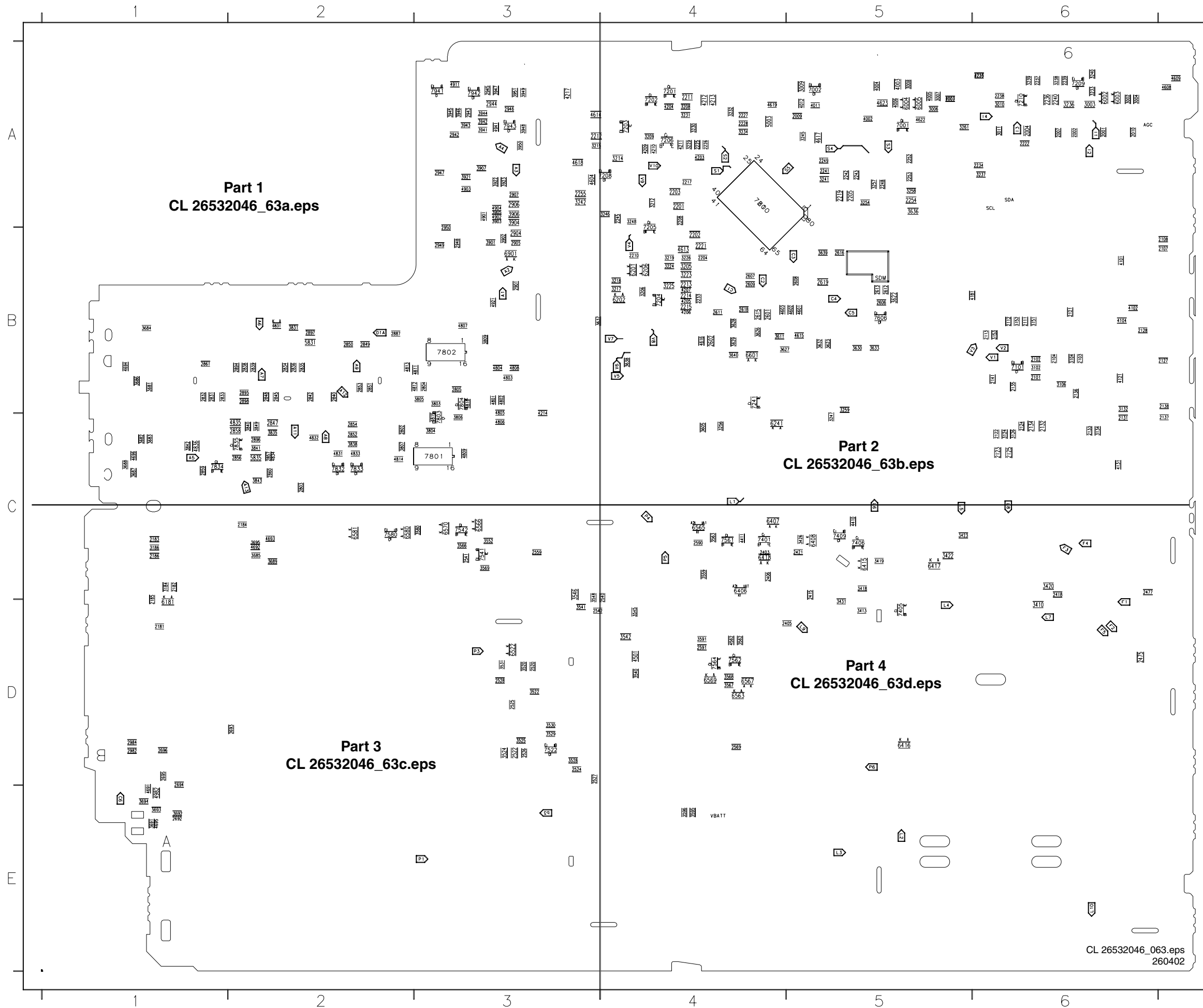
Part 1
CL 26532046_63a.eps

Part 2
CL 26532046_63b.eps

Part 3
CL 26532046_63c.eps

Part 4
CL 26532046_63d.eps

7802

7801

7800

CL 26532046_063.eps
260402

Layout Mono Carrier (Part 1 Bottom Side)

1   2   3

3139 123 5487.1 Wk151
8239 124 3252.1

3

A

Part 1

B

C

CL 26532046_63a.eps
260402
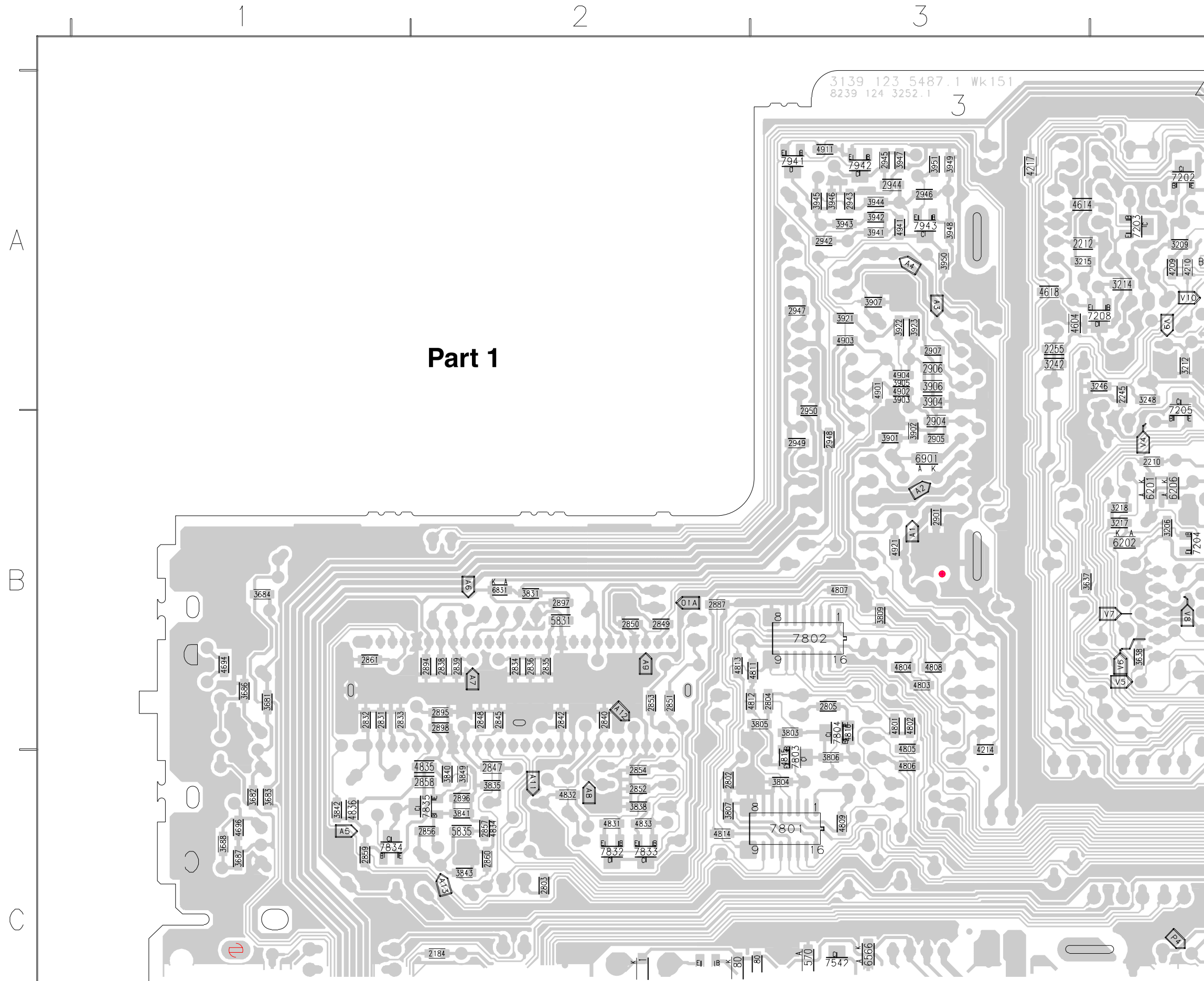
Layout Mono Carrier (Part 2 Bottom Side)

Part 2

CL 26532046_63b.eps
260402

Layout Mono Carrier (Part 3 Bottom Side)

C

2184

2183
3186
4692
2186

3695
4693
3685
3689

6581
A Y

7580
F B
0

6580
A K

3580

6570
K A
B

7542
F
E

6566
A K

3552

2559

3566

2541

7541
D B
L
E

Part 3

3569

3546

3548
2540

3541

2542

3545

3542

3181
2182

2185

6181
K A

2181

P3

6522
A K

4501

3531

3520
2520

3540

2528

3522

2525

3530
3529

2693

3525

2984
2982

2696

3524
2522
2526

7522
F B
E
0

3528
2524

2695

2527

2694

4691
4962

96

3694

3693

P2

3692
2692

3691
4695

A

P1

D

E

1   2   3

Layout Mono Carrier (Part 4 Bottom Side)

L1
L8
9
G
P4
A2 A1
6565
KI
6407
A   K
4410
2590   3563   7561   4411   7401   6408   7409   3423   F4
C   BI IE   C   A   K   EI IB   7406   A3
BI IE   3426   2421   C   K
3419   3422   6417
P5   2403   6415   3420
A   K   2418
3559   6418   2477
2540   6406   3418   F1
A2 A1   2415
2   3545   KI   3431   3410   F5 F2
3542   2405   3413   7405   L4   L7
9   BI IE   L6
4501   3591   4562 3562   247B
2591
3540   7564   7562
C IE   C
6569   3568   6567   BI IE
K   A   3567   A K
6563
K A   K A
6416
2569
P6   **Part 4**

VBATT
3596 359B

L2

L3

L10

CL 26532046_63d.eps
260402

C
D
E
4   5   6

CRT Panel

B CRT PANEL

AP / CH	14"	17"	20"	21"	21" CHINA
3349	2R2	3K9	1R2	1R2	1R2
3350	2R2	1R0	1R2	1R2	1R2
5341	spt0508 27u	spt0508 12u	spt0508 2u2	fxdind 1u5	spt0508 27u
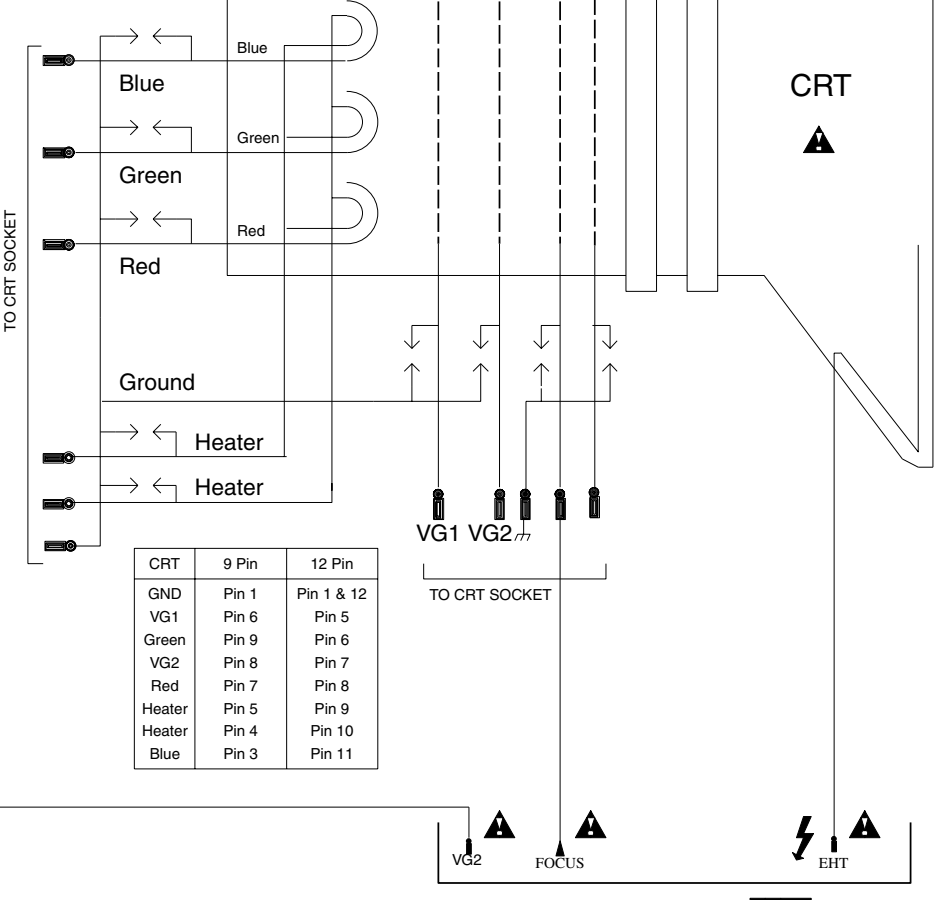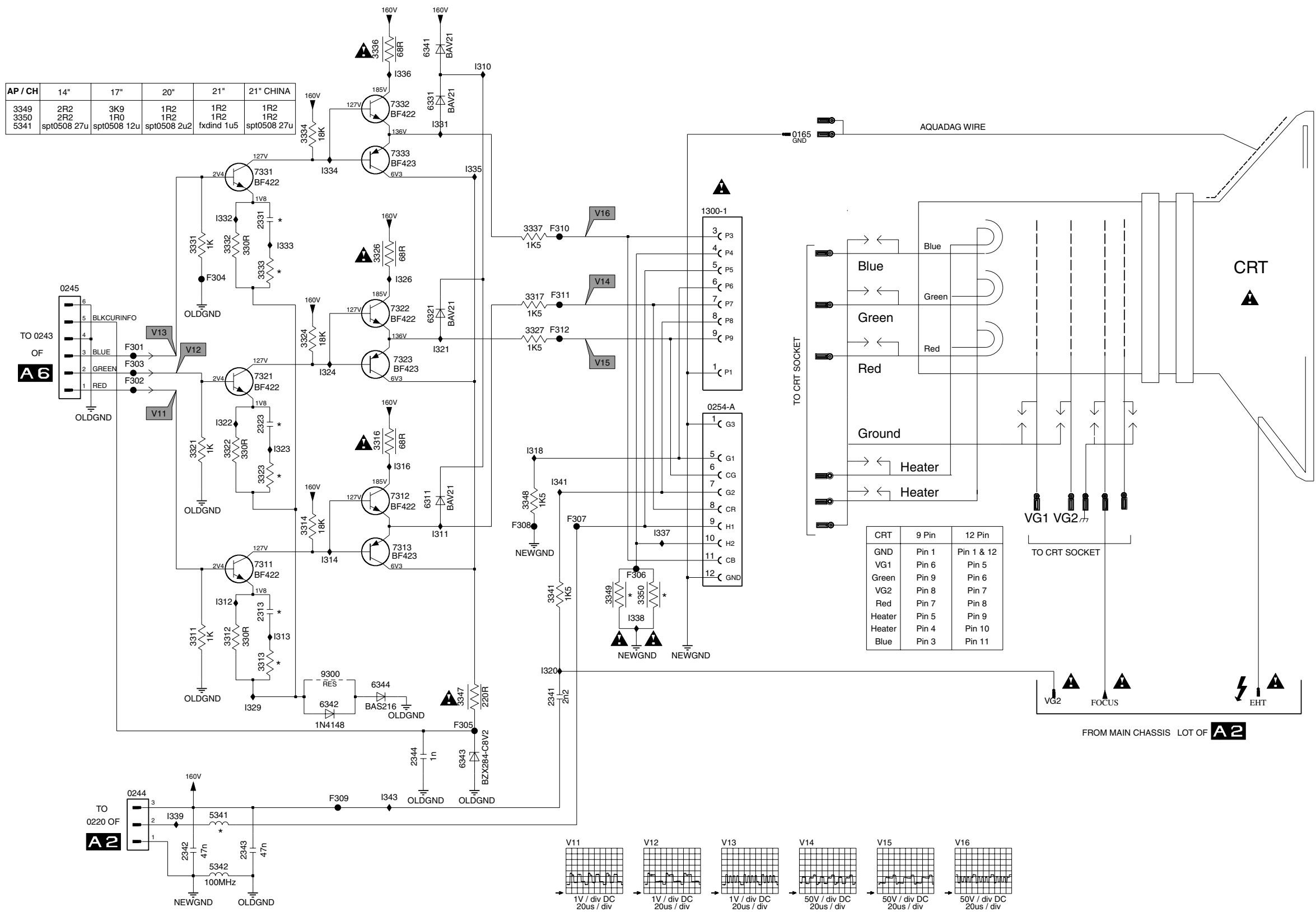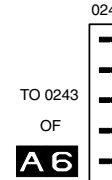
CRT	9 Pin	12 Pin
GND	Pin 1	Pin 1 & 12
VG1	Pin 6	Pin 5
Green	Pin 9	Pin 6
VG2	Pin 8	Pin 7
Red	Pin 7	Pin 8
Heater	Pin 5	Pin 9
Heater	Pin 4	Pin 10
Blue	Pin 3	Pin 11

AQUADAG WIRE

CRT

Blue

Green

Red

Ground

Heater

Heater

TO CRT SOCKET

VG1 VG2

TO CRT SOCKET

VG2   FOCUS   EHT

FROM MAIN CHASSIS LOT OF A2

TO 0243 OF A6

BLKCURINFO

BLUE

GREEN

RED

OLDGND

TO 0220 OF A2

1300-1

0254-A

V11 V12 V13 V14 V15 V16

1V / div DC 20us / div

1V / div DC 20us / div

1V / div DC 20us / div

50V / div DC 20us / div

50V / div DC 20us / div

50V / div DC 20us / div

CL 16532101_037.eps
230801
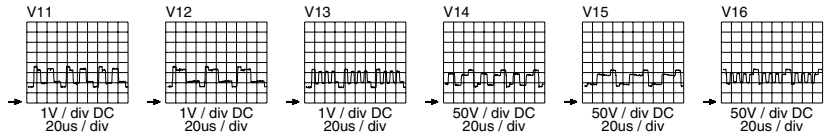
VG2 F10
0165 B8
0244 G2
0245 C2
0254-A D7
1300-1 B7
2313 F3
2323 D3
2331 B3
2341 F6
2342 H3
2343 H3
2344 G5
3311 F3
3312 F3
3313 F3
3314 E4
3316 D4
3317 C6
3321 D3
3322 D3
3323 E3
3324 C4
3326 C4
3327 C6
3331 C3
3332 C3
3333 C3
3334 B4
3336 A4
3337 C6
3341 F6
3347 F5
3348 E6
3349 F6
3350 F6
5341 G3
5342 H3
6311 E5
6321 C5
6331 A5
6341 A5
6342 G4
6343 G5
6344 F4
7311 E3
7312 E4
7313 E4
7321 D3
7322 C4
7323 D4
7331 B3
7332 B4
7333 B4
9300 F4
F301 D2
F302 D2
F303 D2
F304 C3
F305 G5
F306 E6
F307 E6
F308 E5
F309 G4
F310 C6
F311 C6
F312 C6
I310 A5
I311 E5
I312 F3
I313 F3
I314 E4
I316 E4
I318 D6
I320 F6
I321 D5
I322 D3
I323 D3
I324 D4
I326 C4
I329 G3
I331 B5
I332 B3
I333 C3
I334 B4
I335 B5
I336 A4
I337 E7
I338 F6
I339 G3
I341 E6
I343 G4

Layout CRT Panel (Top View)

Layout CRT Panel (Bottom View)
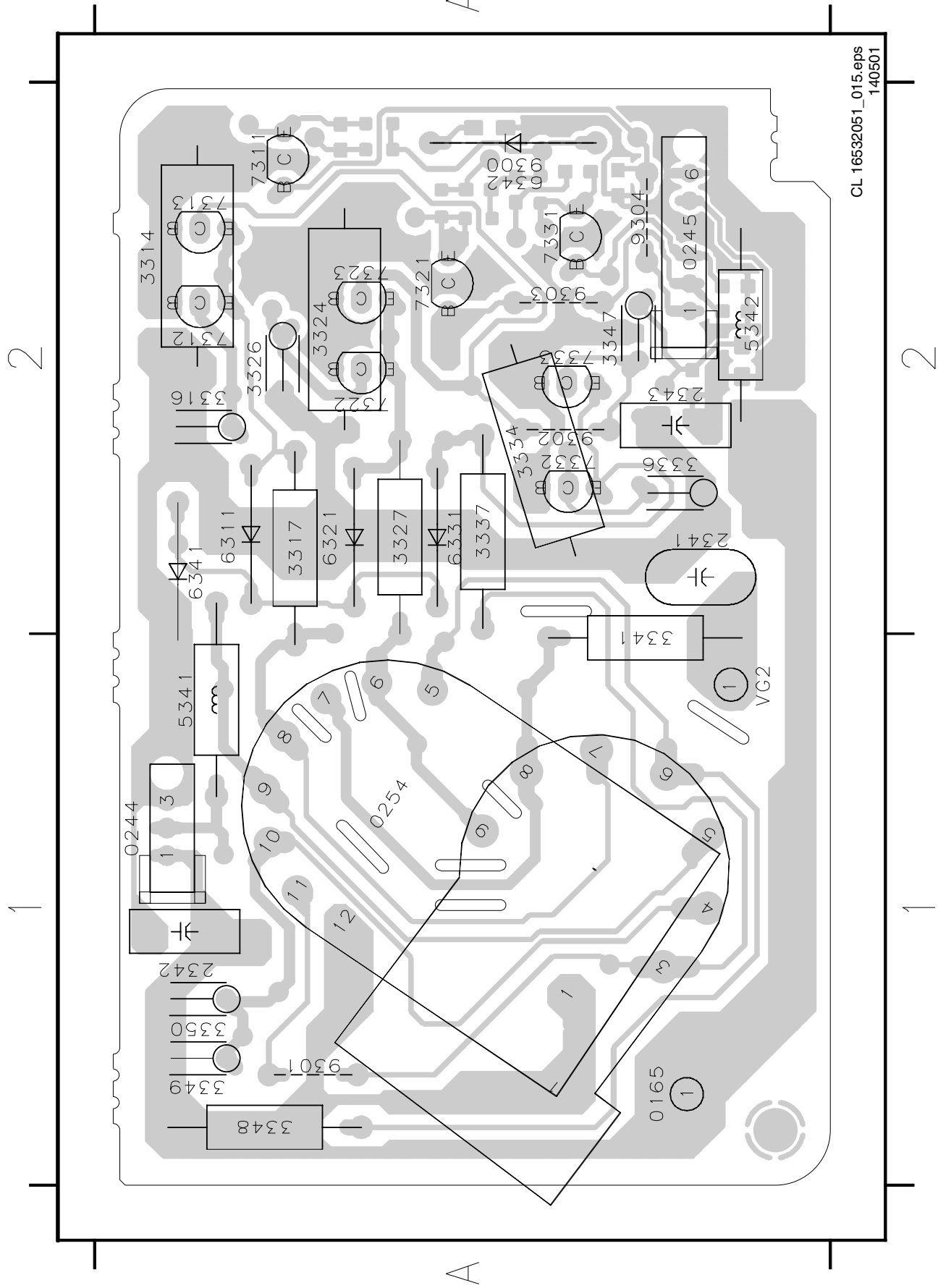
CL 16532051_015.eps
140501
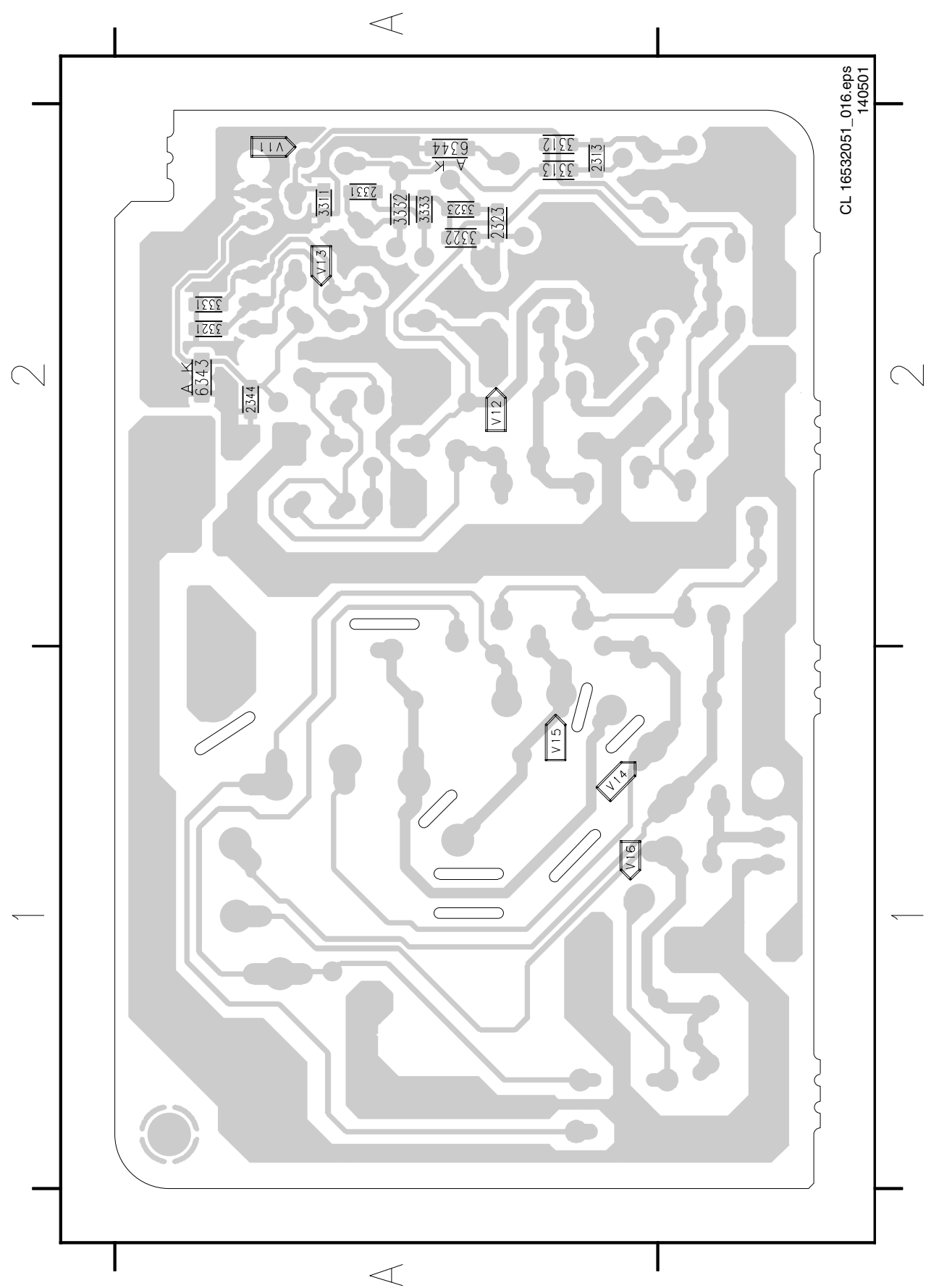
CL 16532051_016.eps
140501

Side AV Panel

E **SIDE AV**

TO 0219 OF
A12

0250-C

2175
330p

0252
N.C

Ext1AudioR

★9153

★3153
8K2

9152
1154
2173
RES

★3152
10K
2172

330p

9155
5010
RES

(FOR ESD)

0250-A

0251

Ext1AudioL|Mono

★3151
8K2

1153
2174
RES

★3150
10K
2171

330p

0250-B

0261
N.C

1152
6161
BZX79-C6V8
3155
75R

0253

* For 21" and below	
3150	47K
3151	1K
3152	47K
3153	1K
9152	For mono set w/out front cinch
9153	For stereo set w/out front cinch

# For 25" and above	
0251	For Chassis with Rear Scart
0252	For Chassis with Rear Scart
0261	For Chassis with Rear Cinch
6161	BZX79-C6V8

CL 16532020_055.eps
020401

0250-A	B1
0250-B	C1
0250-C	A1
0251	B4
0252	B1
0253	A4
0261	D4
1152	A2
1153	C2
1154	B2
2171	C3
2172	B3
2173	B2
2174	C2
2175	B1
3150	C3
3151	C3
3152	B3
3153	B3
3155	A3
5010	B3
6161	A3
9152	B2
9153	B3
9155	B3

Layout Side AV Panel (Top View)

CL 16532004_017.eps
210301

M16	C2
0250	C2
0251	A3
0252	A2
0253	A1
0261	A2
2171	B2
2172	A3
2173	B2
2174	B2
2175	B1
3150	B3
3151	B2
3152	B3
3153	B3
3155	B1
5010	B3
6161	B1
9152	B2
9153	B3
9155	B3

Side AV Panel + Headphone

E 1 SIDE AV PANEL & HEADPHONE

1 2 3 4 5

VIDEO IN

0253

SG02
6161
BZX79-C6V8
3155
75R

0250-C

★	EUROPE	AP/INDIA/LATAM
3156	330R	120R
3157	330R	120R

To 0219
of
A12

9153
RES

RIGHT
3153
8K2
SG04 2173 330p 3152 10K 2172 330p

9155
(FOR ESD)

0251

0250-A 7

0252
N.C

LEFT
3151
8K2
SG03 2174 330p 3150 10K 2171 330p

0261
N.C

0250-B 4

HEADPHONE
0254

To 0246
of
A8

L- 5
L+ 4
GND 3
R+ 2
R- 1

2179
+100u
★ 3156
330R
2178
330p
SG07

0232

2177
+100u
★ 3157
330R
2176
330p
SG06

0255
L+
L-
R-
R+

To
Speakers

To
Speakers

CL 16532020_056.eps
120401

1 2 3 4 5

Layout Side AV Panel + Headphone (Top View)

3139 123 5328.2 WK 012

6161
3155
0253

0250
2174
3151
0252
2171
0261

3153
9153
3150
3152
9155
0251
2172

2177

0232
2178
2176
3157
0254
0255
2179
3156

CL 16532004_016.eps
210301

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

M16 B1
0232 C1
0250 C1
0251 B1
0252 B1
0253 A1
0254 C1
0255 C1
0261 B1
2171 B1
2172 C1
2173 B1
2174 B1
2176 C1
2177 C1
2178 C1
2179 B1
3150 B1
3151 B1
3152 B1
3153 A1
3155 C1
3156 C1
3157 C1
6161 A1
9153 B1
9155 B1

8. Alignments

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

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

8.1   General Alignment Conditions

Perform all electrical adjustments under the following conditions:
*   AC voltage and frequency: according to country's standard.
*   Connect the set to the AC power via an isolation transformer.
*   Allow the set to warm up for approximately 20 minutes.
*   Measure the voltages and waveforms in relation to chassis ground (with the exception of the voltages on the primary side of the power supply). Never use the cooling fins / plates as ground.
*   Test probe: Ri > 10 MΩ; Ci < 2.5 pF.
*   Use an **isolated** trimmer / screwdriver to perform the alignments.

8.2   Hardware Alignments

16532016_003.eps
120401
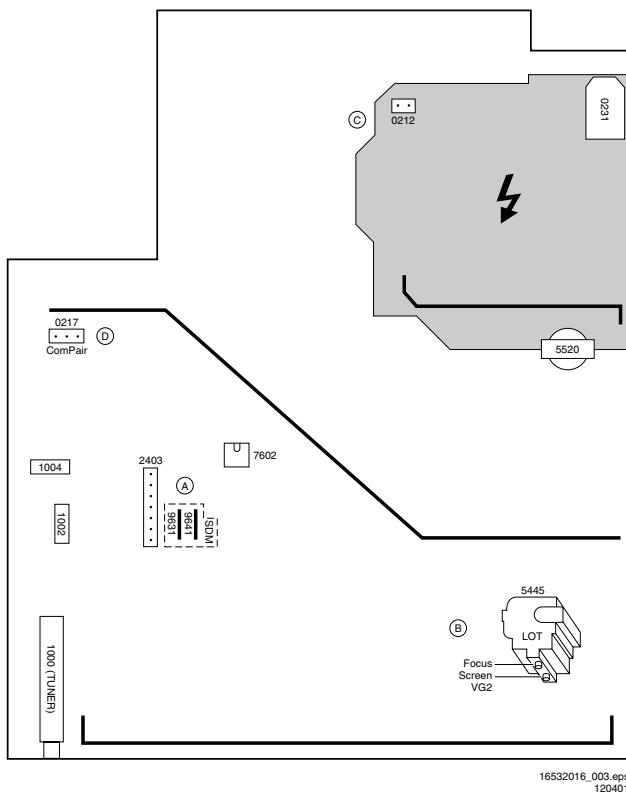
Figure 8-1

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).
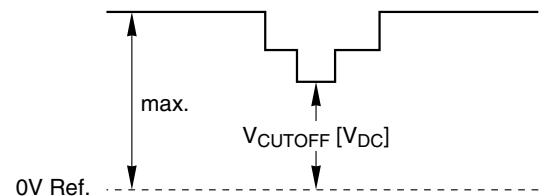
CL 06532130_014.eps
131000

Figure 8-2

CUT-OFF VOLTAGE	
Screen size	Cut-off [V]
13V, 14 , 14RF, 15RF, 17 , 19V, 20	140 ± 4
21 (L01S)	150 ± 4
21 (L01L), 20RF, 21RF, 24WS, 25BLD, 25HF, 28 BLD, 28WS	125 ± 4
25V, 25BLS, 25RF, 27V, 28BLS, 29 , 29RF, 32V, 33 , 32WS, 35V	145 ± 10

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220801

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

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220501
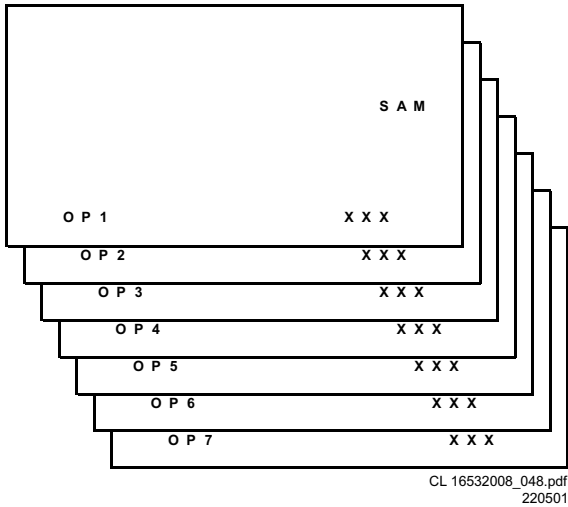
Figure 8-4

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

How to change an Option Byte

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

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

How to calculate the value of an Option Byte

Calculate an Option Byte value (OB1 .. OB7) in the following way:
1. Check the status of the single option bits (OP): are they enabled (1) or disabled (0).
2. When an option bit is enabled (1) it represents a certain value (see first column 'value between brackets' in first table below). When an option bit is disabled, its value is 0.
3. The total value of an Option Byte is formed by the sum of its eight option bits. See second table below for the correct Option Bytes per typenumber.

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

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210501

Figure 8-5

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

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Figure 8-6

Option Bit Assignment

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

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

Option bit definition

- **OP10: 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.

CL 16532008_050.pdf
220501
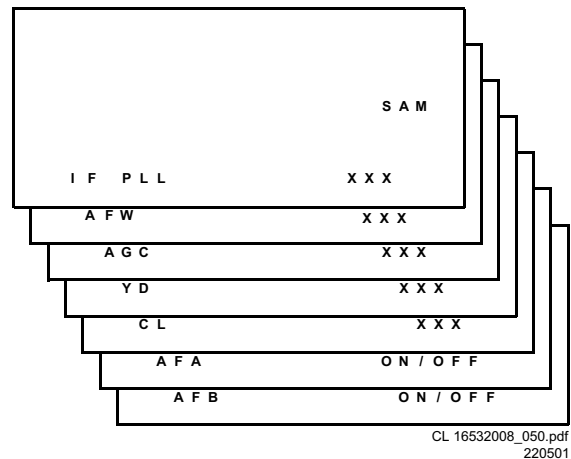
Figure 8-7

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

AFW (AFC window)
Fixed value is OFF.

AGC (AGC take over point)
Set the external pattern generator to a colour bar video signal and connect the RF output to aerial input. Set amplitude to 10 mV and set frequency to 475.25 MHz (PAL/SECAM) or 61.25 MHz (NTSC).
Connect a DC multimeter to pin 1 of the tuner (item 1000 on the main panel).
1. Activate the SAM.
2. Go to the TUNER sub menu.
3. Select AFW with the UP/DOWN cursor keys and set to ON.
4. Select AGC with the UP/DOWN cursor keys.

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

YD (Y-delay)
Always set to 8.

CL (cathode drive level)
Always set to 7.

AFA
Read only bit, for monitoring purpose only.

AFB
Read only bit, for monitoring purpose only.

8.3.3   White Tone

CL 16532008_051.pdf
220501
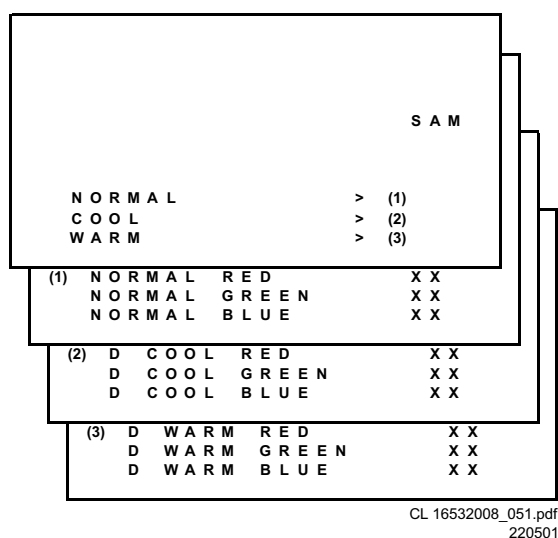
Figure 8-8

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

8.3.4   Geometry

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

CL 16532044_022.eps
140501
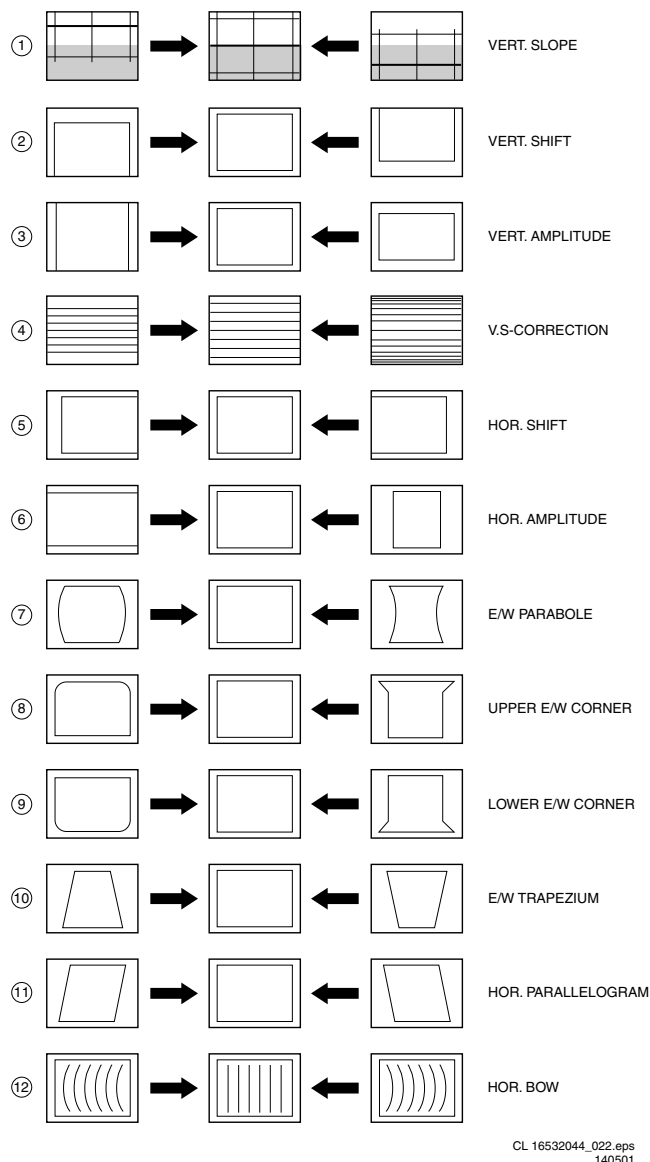
Figure 8-9

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

Horizontal:
• **Horizontal Parallelogram (HP)** Align straight vertical lines in the top and the bottom; vertical rotation around the centre.
• **Horizontal Bow (HB)** Align straight horizontal lines in the top and the bottom; horizontal rotation around the centre.
• **Horizontal Shift (HSH)** Align the horizontal centre of the picture to the horizontal centre of the CRT.
See also Figure 8-9 numbers 11, 12 and 5.

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Figure 8-10

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

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

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Figure 8-11

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

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

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Figure 8-12

8.3.5 Audio

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Figure 8-13

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

AT
Default value is 8.

AF-M
Default value is 44.

A2T
Default value is 250.

QSS
OFF for mono sets, ON for stereo sets.

FMI
OFF for mono sets, ON for stereo sets.

9. Circuit Description

Index:

Note:

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

9.1 Introduction

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

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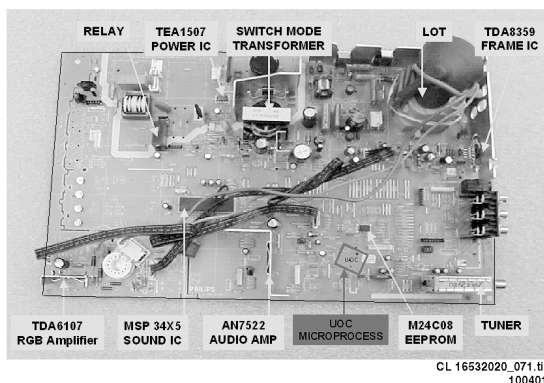
Figure 9-1

The functions for video processing, microprocessor (μP) 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.

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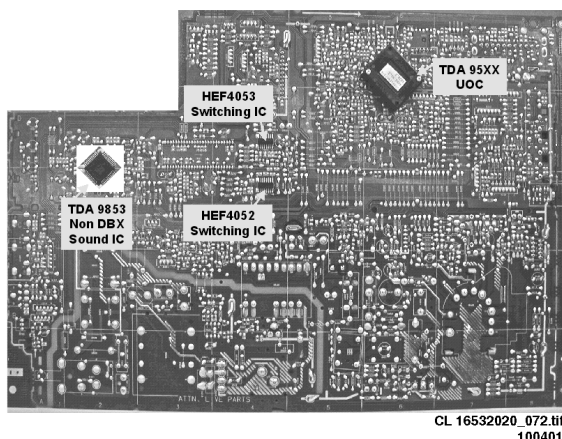
Figure 9-2

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

The tuning system features 100 channels with on-screen display. The main tuning system uses a tuner, a microcomputer, and a memory IC mounted on the main panel. Also, in some type numbers, an FM radio is implemented with 40 pre-set channels.
The microcomputer communicates with the memory IC, the customer keyboard, remote receiver, tuner, signal processor IC and the audio output IC via the I²C bus. The memory IC retains the settings for favourite stations, customer-preferred settings, and service/factory data.
The on-screen graphics and closed caption decoding are done within the microprocessor, and then sent to the signal processor IC to be added to the main signal.

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

9.2 Audio Signal Processing

9.2.1 Stereo

In stereo sets, the signal goes via the SAW filter (position 1004 in case of QSS demodulation and 1003 in case of Intercarrier demodulation), to the audio demodulator part of the UOC IC7200. The stereo audio output on pin 33 (or 38 for QSS) goes, via TS7206 or (TS7201 for QSS), to the stereo decoder 7831.
The switch inside the stereo decoder 7831 selects (via I²C) either the internal decoder or an external source.
The NICAM + 2CS AM/FM stereo decoder is an ITT MSP34X5. The output is fed to the to the audio amplifier (AN7522 at position 7901). The volume level is controlled at this IC (pin 9) by a control line (VolumeMute) from the microprocessor. The audio signal is then sent to the speaker/headphone output panel.
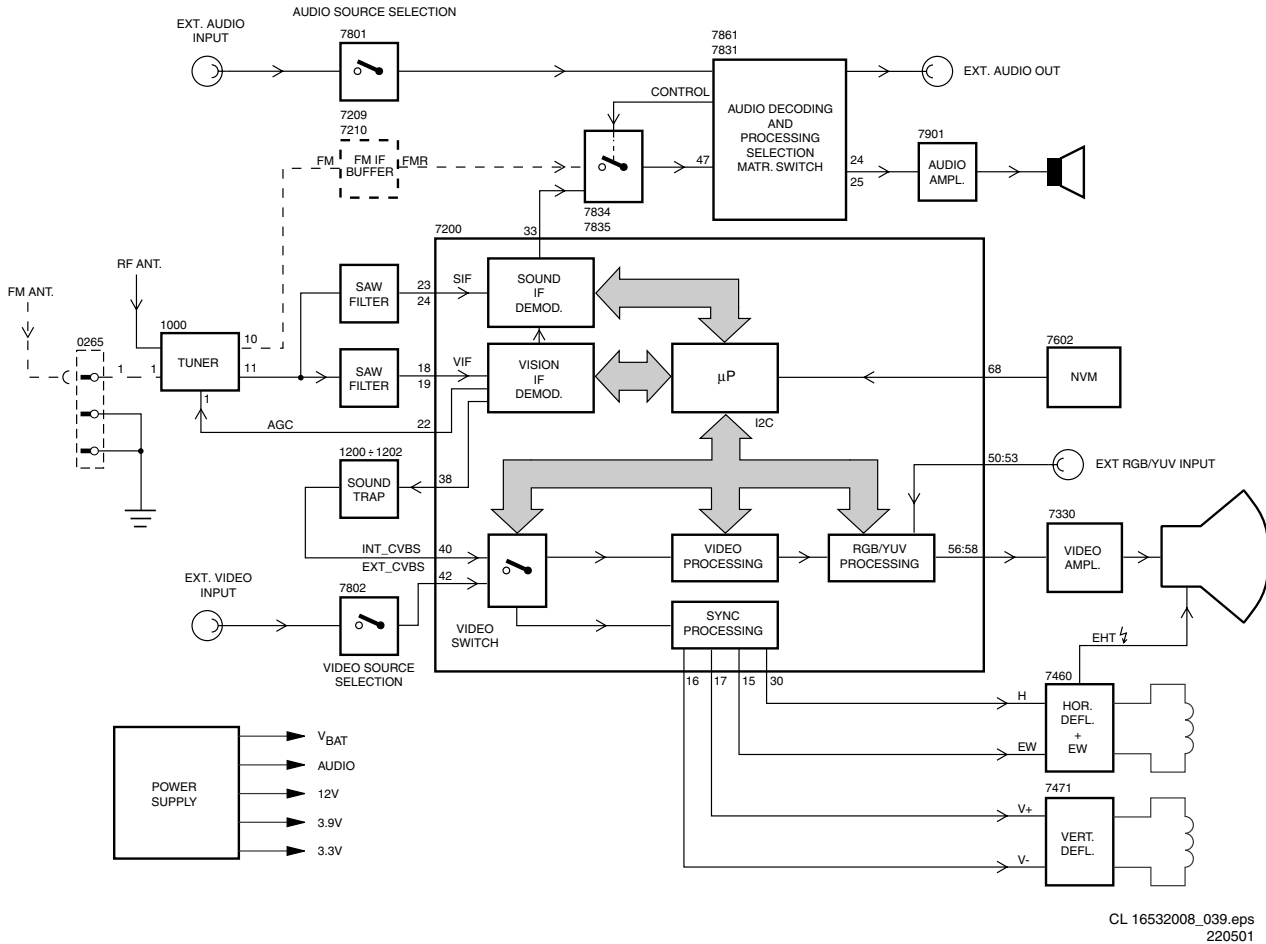
Figure 9-3

9.2.2 Mono

In mono sets, the signal goes via the SAW filter (position 1004 in case of QSS demodulation and 1003 in case of Intercarrier demodulation), to the audio demodulator part of the UOC IC7200. The mono audio output on pin 48 goes directly, via the smart sound circuit (7941 for Bass and 7942 for Treble) and buffer (7943), to the audio amplifier (AN7523 at position 7902). The volume level is controlled at this IC (pin 9) by a 'VolumeMute' control line from the microprocessor.
The audio signal is then sent to the speaker/headphone output panel.
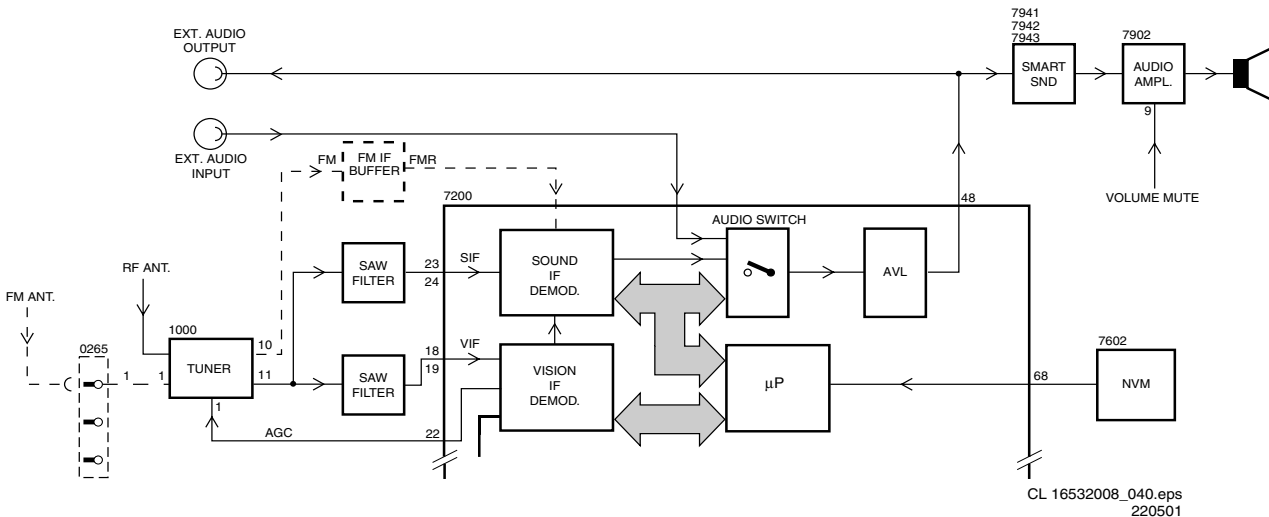
Figure 9-4

9.2.3 FM radio (if present)

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

9.3 Video Signal Processing

9.3.1 Introduction

The video signal-processing path consists of the following parts:
- RF signal processing.
- Video source selection.
- Video demodulation.
- Luminance/Chrominance signal processing.
- RGB control.
- RGB amplifier

The processing circuits listed above are all integrated in the UOC TV processor. The surrounding components are for the adaptation of the selected application. The I^{2}C bus is for defining and controlling the signals.

9.3.2 RF Signal Processing

The incoming RF signal goes to the tuner (pos. 1000), where the IF signal is developed and amplified. The IF signals then exits the tuner from pin 11 to pass through the SAW filter (position 1002 in case of QSS demodulation and 1003 in case of 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 I^{2}C 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 I^{2}C bus, to provide frequency correction when needed.

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

9.3.3 Video Source Selection

The Composite Video Blanking Signal (CVBS) from buffer 7201 goes to the audio carrier trap filters (1200, 1201, or 1202 depending on the system used) to remove the audio signal. The signal then goes to pin 40 of IC7200. The internal input switch selects the following input signals:
- Pin 40: terrestrial CVBS input
- Pin 42: external AV1 CVBS input
- Pin 44: external Side I/O CVBS or AV2 Luminance (Y) input
- Pin 45: external AV2 Chrominance (C) input
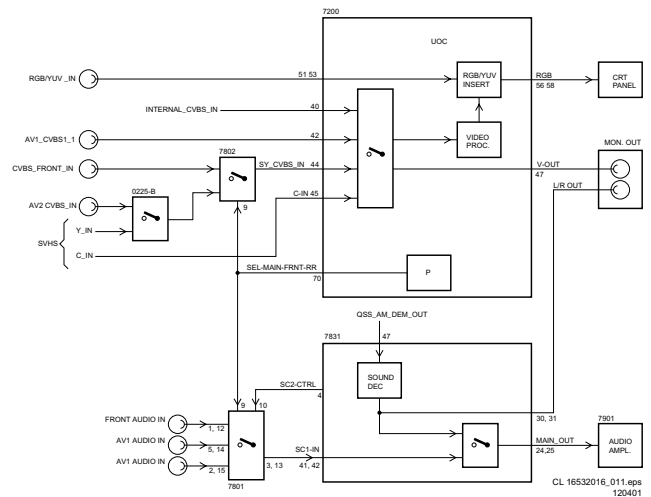
Figure 9-5

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

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

9.3.4 Video Demodulation

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

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

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

9.3.5 Luminance/Chrominance signal Processing

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

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

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

The YUV signal is then fed to the colour matrix circuit, which converts it to R, G and B signals.
The OSD/TXT signal from the microprocessor is mixed with the main signal at this point, before being output to the CRT board (pins 56, 57 and 58).

9.3.6 RGB Control

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

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

9.3.7 RGB Amplifier

From outputs 56, 57 and 58 of IC7200, the RGB signals are applied to the analogue output amplifiers on the CRT panel. The R-signal is amplified by a circuit built around transistors TS7311, 7312 and 7313, which drives the picture tube cathodes. For the other two signals see the blockdiagram in chapter 6.
The supply voltage for the amplifier is +160 V and is derived from the line output stage.

9.4 Synchronisation

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

9.5 Deflection

9.5.1 Horizontal Drive

The horizontal drive signal is obtained from an internal VCO, which is running at twice the line frequency. This frequency is divided by two, to lock the first control loop to the incoming signal.
When the IC is switched 'on', the 'Hdrive' signal is suppressed until the frequency is correct.
The 'Hdrive' signal is available at pin 30. The 'Hflybk' signal is fed to pin 31 to phase lock the horizontal oscillator, so that TS7401 cannot switch 'on' during the flyback time.
When the set is switched on, the '+8V' voltage goes to pin 9 of IC7200. The horizontal drive starts up in a soft start mode. It starts with a very short T_{ON} time of the horizontal output transistor. The T_{OFF} of the transistor is identical to the time in normal operation. The starting frequency during switch on is therefore about 2 times higher than the normal value. The 'on' time is slowly increased to the nominal value in 1175 ms. When the nominal value is reached, the PLL is closed in such a way that only very small phase corrections are necessary.

The 'EHTinformation' line on pin 11 is intended to be used as a 'X-ray' protection. When this protection is activated (when the voltage exceeds 6 V), the horizontal drive (pin 30) is switched 'off' immediately. If the 'H-drive' is stopped, pin 11 will become low again. Now the horizontal drive is again switched on via the slow start procedure.
The 'EHTinformation' line (Aquadag) is also fed back to the UOC IC7200 pin 54, to adjust the picture level in order to compensate for changes in the beam current.

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

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

9.5.2   Vertical Drive

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

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

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

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

9.6   Power Supply
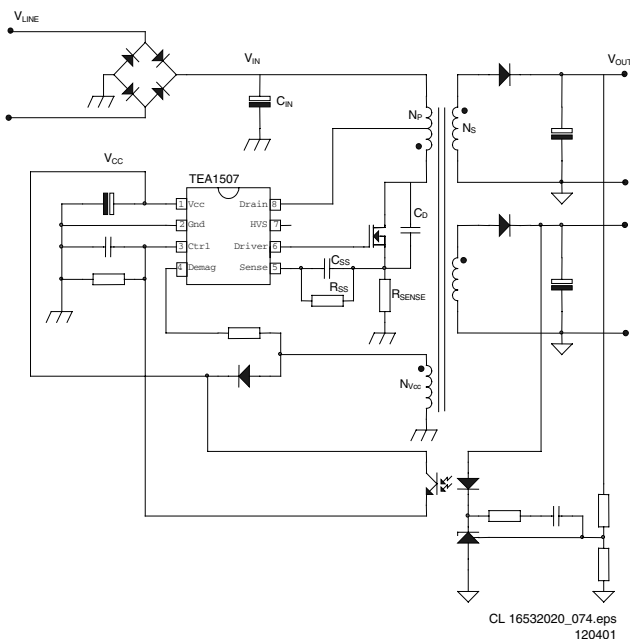
Figure 9-6
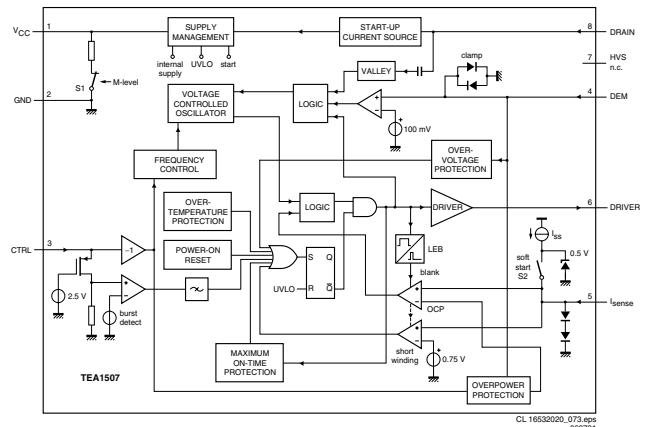
Figure 9-7

9.6.1   Introduction

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

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

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

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

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

Derived Voltages

The voltages supplied by the secondary windings of T5520 are:
- 'MainAux' for the audio circuit (voltage depends on set execution, see table below),
- 3.3 V and 3.9 V for the microprocessor and
- 'MainSupply' for the horizontal output (voltage depends on set execution, see table below).

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

This circuit will shut 'off' the horizontal drive in case of over-voltage or excessive beam current.
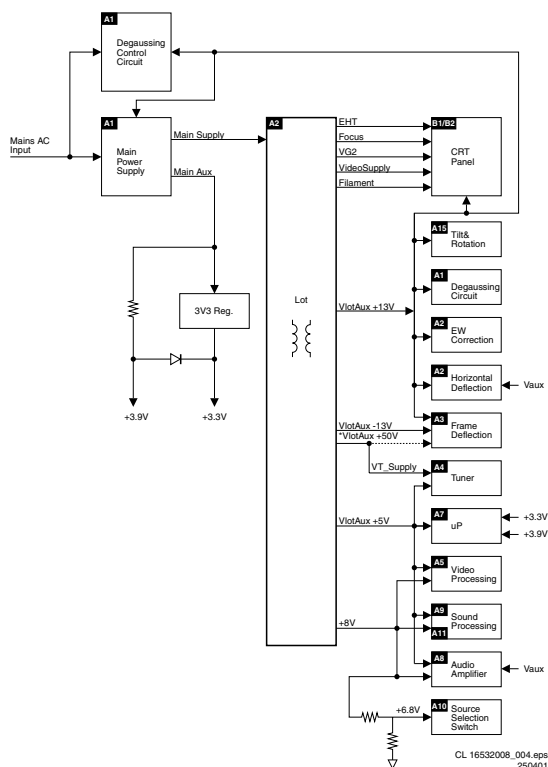
Figure 9-8
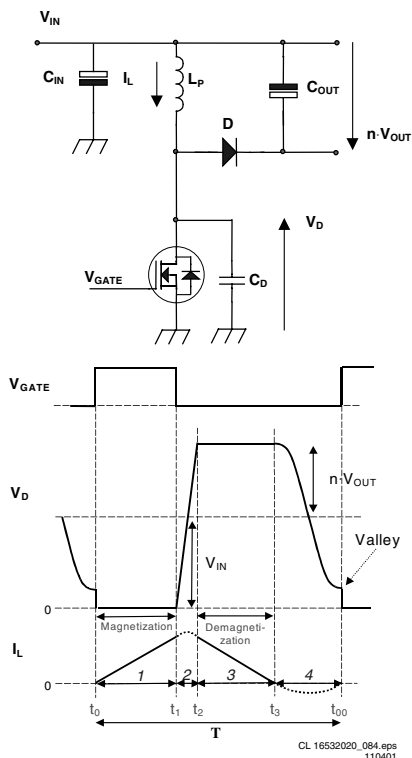
Figure 9-9

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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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: t0 < t < t1 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: t1 < t < t2 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 de 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: t2 < t < t3 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: t3 < t < t00 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.

QR frequency characteristics at different input voltages

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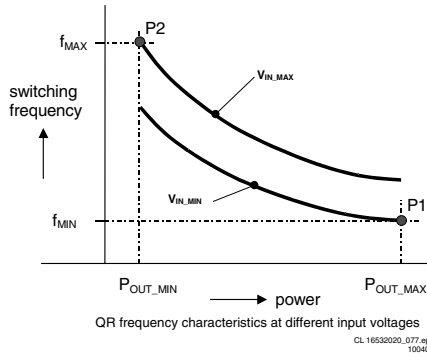
Figure 9-11

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 $V_{CC\text{-}start}$ (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.

Start-up sequence

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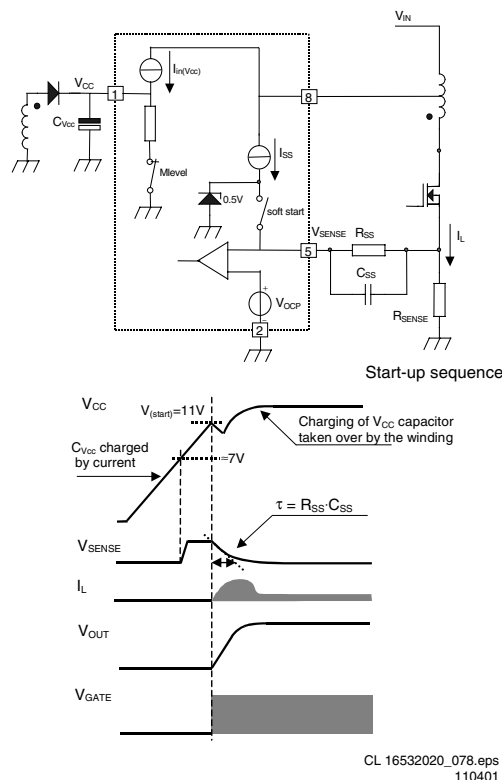
Figure 9-12

The moment that the voltage on pin 1 drops below the 'under voltage lock out' level (UVLO = ± 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.

Multi mode operation

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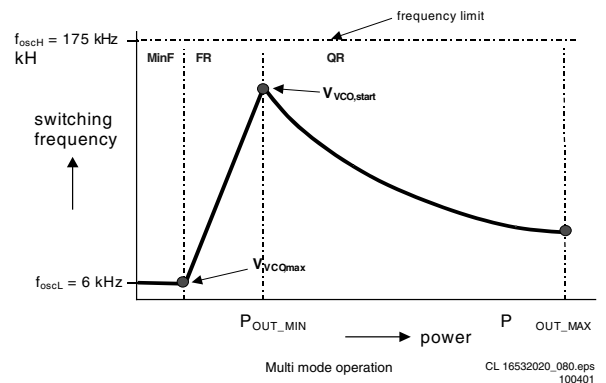
Figure 9-13

Safe-Restart Mode

This mode is introduced to prevent the components from being destroyed during eventual system fault conditions. It is also used for the Burst mode. The Safe-Restart mode will be entered if it is triggered by one of the following functions:
- Over voltage protection,
- Short winding protection,
- Maximum 'on time' protection,
- V_{CC} reaching UVLO level (fold back during overload),
- Detecting a pulse for Burst mode,
- Over temperature protection.

When entering the Safe-Restart mode, the output driver is immediately disabled and latched. The V_{CC} winding will not charge the V_{CC} capacitor anymore and the V_{CC} voltage will drop until UVLO is reached. To recharge the V_{CC} capacitor, the internal current source ($I_{(restart)(VCC)}$) 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:
- After pressing the 'standby' key on the remote control.
- When the set is in protection mode.

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

Basic Burst mode configuration   CL 16532020_081.eps
100401
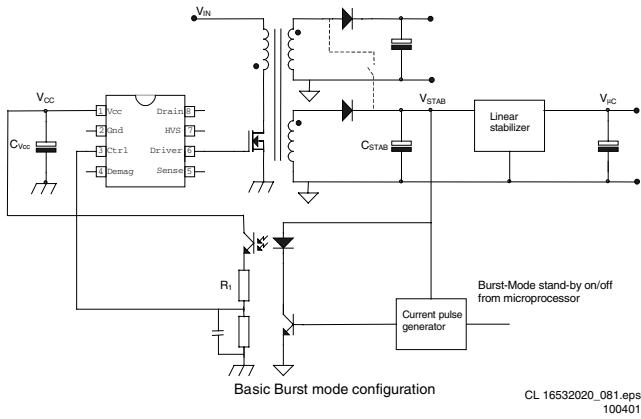
Figure 9-14

The system enters burst mode standby when the
microprocessor activates the 'Stdby_con' line. When this line is
pulled high, the base of Q7541 is allowed to go high. This is
triggered by the current from collector Q7542. When Q7541
turns 'on', the opto-coupler (7515) is activated, sending a large
current signal to pin 3 (Ctrl). In response to this signal, the IC
stops switching and enters a 'hiccup' mode. This burst
activation signal should be present for longer than the 'burst
blank' period (typically 30 μs): the blanking time prevents false
burst triggering due to spikes.
Burst mode standby operation continues until the
microcontroller pulls the 'Stdby_con' signal low again. The
base of Q7541 is unable to go high, thus cannot turn 'on'. This
will disable the burst mode. The system then enters the start-
up sequence and begins normal switching behaviour.

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

Burst mode waveforms   CL 16532020_082.eps
100401
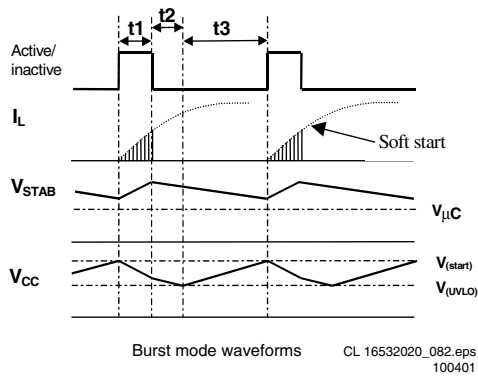
Figure 9-15

9.6.3   Protection Events

The SMPS IC 7520 has the following protection features:

Demagnetisation sense
This feature guarantees discontinuous conduction mode
operation in every situation. The oscillator will not start a new
primary stroke until the secondary stroke has ended. This is to
ensure that FET 7521 will not turn on until the demagnetisation
of transformer 5520 is completed. The function is an additional
protection feature against:
*   saturation of the transformer,
*   damage of the components during initial start-up,
*   an overload of the output.
The demag(netisation) sense is realised by an internal circuit
that guards the voltage (Vdemag) at pin 4 that is connected to
V_{CC} winding by resistor R_1 (R3522). The Figure below shows
the circuit and the idealised waveforms across this winding.
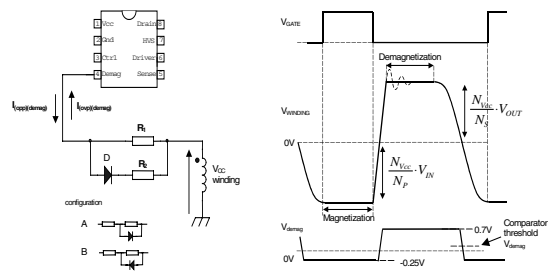
Figure 9-16

Over Voltage Protection
The Over Voltage Protection ensures that the output voltage
will remain below an adjustable level. This works by sensing
the auxiliary voltage via the current flowing into pin 4 (DEM)
during the secondary stroke. This voltage is a well-defined
replica of the output voltage. Any voltage spikes are averaged
by an internal filter.
If the output voltage exceeds the OVP trip level, the OVP circuit
switches the power MOSFET 'off'.
Next, the controller waits until the 'under voltage lock out' level
(UVLO = ± 9 V) is reached on pin 1 (V_{CC}). This is followed by a
safe restart cycle, after which switching starts again. This
process is repeated as long as the OVP condition exists. The
output voltage at which the OVP function trips, is set by the
demagnetisation resistor R3522.

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

Over Power Protection

During the primary stroke, the rectified AC input voltage is measured by sensing the current drawn from pin 4 (DEM). This current is dependent on the voltage on pin 9 of transformer 5520 and the value of R3522. The current information is used to adjust the peak drain current, which is measured via pin 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. 140º 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
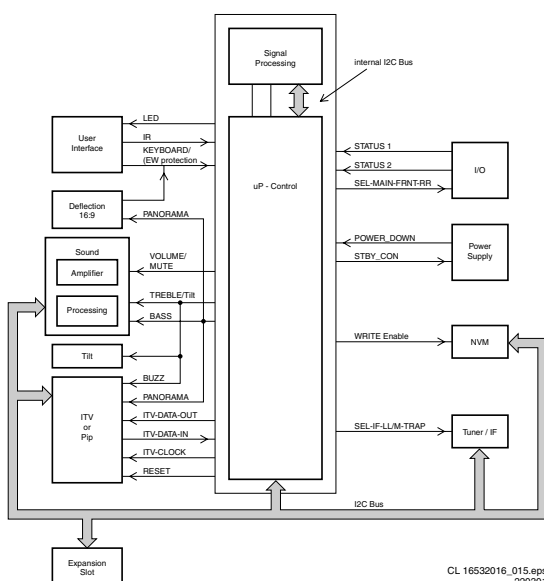
Figure 9-17

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 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.

9.7.5   In- and Output Selection

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

9.7.6   Power Supply Control

The microprocessor part is supplied with 3.3 V and 3.9 V both derived from the 'MainAux' voltage via a 3V3 stabiliser (7560) and a diode.
Two signals are used to control the power supply:
- **Stdby_con** This signal is generated by the microprocessor when over-current takes place at the 'MainAux' line. This is

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

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

9.7.7   Tuner IF

Pin 3 of the UOC (SEL-IF-LL'_M-TRAP), is an output pin to switch the SAW-filter to the appropriate system.
- If UOC pin 3 is 'low', the selected system is:
  – West Europe: PAL B/G, I, SECAM L/L'
  – East Europe: PAL B/G
  – Asia Pacific: NTSC M
- If UOC pin 3 is 'high', the selected system is:
  – West Europe: SECAM L', L'-NICAM
  – East Europe: PAL D/K
  – Asia Pacific: PAL B/G, D/K, I

9.7.8   Protection Events

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

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

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

9.8   Abbreviation list

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

HP	Headphone
Hue	Colour phase control for NTSC (not the same as 'Tint')
I	Monochrome TV system. Sound carrier distance is 6.0 MHz
I2C	Integrated IC bus
IF	Intermediate Frequency
IIC	Integrated IC bus
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.
ITV	Institutional TV
LATAM	Latin America
LED	Light Emitting Diode
L/L'	Monochrome TV system. Sound carrier distance is 6.5 MHz. L' is Band I, L is all bands except for Band I
LNA	Low Noise Amplifier
LS	Large Screen
LS	Loudspeaker
LSP	Large signal panel
M/N	Monochrome TV system. Sound carrier distance is 4.5 MHz
MSP	Multi-standard Sound Processor: ITT sound decoder
MUTE	Mute-Line
NC	Not Connected
NICAM	Near Instantaneous Compounded Audio Multiplexing. This is a digital sound system, mainly used in Europe.
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)
NVM	Non Volatile Memory: IC containing TV related data e.g. alignments
OB	Option Byte
OC	Open Circuit
OSD	On Screen Display
PAL	Phase Alternating Line. Colour system mainly used in West Europe (colour carrier = 4.433619 MHz) and South America (colour carrier PAL M = 3.575612 MHz and PAL N = 3.582056 MHz)
PCB	Printed Circuit board
PIP	Picture In Picture
PLL	Phase Locked Loop. Used for e.g. FST tuning systems. The customer can give directly the desired frequency
POR	Power-On Reset
Progressive Scan	Scan mode where all scan lines are displayed in one frame at the same time, creating a double vertical resolution.
PTP	Picture Tube Panel (or CRT-panel)
RAM	Random Access Memory
RC	Remote Control handset
RC5	Remote Control system 5, signal from the remote control receiver
RGB	Red Green Blue
ROM	Read Only Memory
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	SEequence 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
0127▲	4822 265 11253	Fuse holder
0136	4822 492 70788	Fix IC
0137	4822 492 70289	IC spring
0138	4822 492 70788	Fix IC
0139	3122 121 24785	Spring for bracket
0152	3139 121 08841	Dipmate cable
0211▲	4822 265 20723	2p
0212▲	4822 267 10774	2p male (red)
0217	4822 267 10735	3p
0218	4822 265 10481	Cinch 2p
0220	2422 025 04851	3p
0221▲	4822 267 10966	2p
0222▲	2422 025 10646	2p male
0223	2422 026 05185	Cinch socket 4p female
0231▲	2422 128 02972	Power switch
0232▲	4822 267 31014	Headphone socket
0243	2422 025 04854	6p female
0244	2422 025 04851	3p
0245	2422 025 04854	6p female
0246	2422 025 16382	3p male
0254▲	2422 500 80067	CRT 9p female
1000	3139 147 16481	UV1356A/AIG-3
1002	4822 242 10357	OFWK2960M
1002	2422 549 44223	OFWK7260M
1200	4822 242 10315	TPT02B-TF21
1200	4822 242 81712	TPWA04B
1201	4822 242 81572	TPS6,0MB-TF21
1201	4822 242 81301	TPS6,5MB-TF21
1202	4822 242 81978	TPS4,5MB-TF21
1500▲	2422 086 10914	Fuse 4A 250V
1600	4822 276 13775	Switch
1601	4822 276 13775	Switch
1602	4822 276 13775	Switch
1603	4822 276 13775	Switch
1660	2422 543 01203	Crystal 12.00MHz

⊣⊢

2003	4822 122 33177	10nF 20% 50V
2004	4822 126 13751	47nF 10% 63V
2005	4822 124 40248	10μF 20% 63V
2006	4822 124 80791	470μF 16V 20%
2007	4822 126 14585	100nF 10% 50V
2008	4822 124 40207	100μF 20% 25V
2009	5322 122 32654	330pF 5% 63V
2101	4822 126 13482	470nF 80/20% 16V
2102	5322 122 32658	22pF 5% 50V
2103	5322 122 31863	33nF 5% 50V
2105	4822 124 40248	10μF 20% 63V
2121	5322 122 32658	22pF 5% 50V
2122	5322 122 31863	1.2nF 10% 63V
2123	5322 126 14103	2.2μF 20-80% 10V
2141	4822 051 20008	Jumper
2181	5322 122 32658	22pF 5% 50V
2182	5322 122 31863	22nF 10% 63V
2184	5322 126 14103	2.2μF 20-80% 10V
2201	4822 126 14585	100nF 10% 50V
2202	4822 126 14585	100nF 10% 50V
2203	4822 126 14585	100nF 10% 50V
2204	4822 126 14585	100nF 10% 50V
2205	4822 126 14076	220nF 25V
2208	4822 126 14585	100nF 10% 50V
2209	4822 124 40769	4.7μF 20% 100V
2210	4822 126 13482	470nF 80/20% 16V
2211	4822 126 13482	470nF 80/20% 16V
2216	4822 124 80791	470μF 16V 20%
2217	5322 122 32654	330pF 5% 63V
2219	4822 126 14076	220nF 25V
2220	4822 121 51252	470nF 5% 63V
2226	5322 126 10465	3.9nF 10% 50V
2227	5322 122 32614	330pF 5% 63V
2228	5322 122 31863	22nF 10% 63V
2229	4822 124 40248	10μF 20% 63V
2233	5322 126 10184	820pF 5% 50V
2241	4822 126 13344	1.5nF 5% 63V
2242	4822 126 14043	1μF 20-80% 16V
2243	4822 122 33127	2.2nF 10% 63V
2244	5322 121 42386	100nF 5% 63V
2245	4822 126 14076	220nF 25V
2246	4822 124 40769	4.7μF 20% 100V
2247	4822 124 80791	470μF 16V 20%
2248	5322 122 32654	470pF 5% 63V
2249	5322 122 32654	470pF 5% 63V

2250	4822 124 22652	2.2μF 20% 50V
2252	5322 126 10511	1nF 5% 50V
2253	5322 126 10511	1nF 5% 50V
2254	5322 122 32531	100pF 5% 50V
2313	4822 122 33216	270pF 5% 50V
2323	4822 122 33172	390pF 5% 50V
2331	4822 122 33172	390pF 5% 50V
2341▲	2020 558 90571	2.2nF 10% 1kV
2342	4822 121 70386	47nF 10% 250V
2343	4822 121 70386	47nF 10% 250V
2401	4822 126 13461	680pF 10% 50V
2404▲	4822 121 43888	360nF 5% 250V
2406	5322 122 31863	22nF 10% 63V
2407▲	4822 121 70618	12nF 5% 1600V
2409	4822 124 11575	47μF 20% 160V
2410	2020 021 91577	470μF 20% 16V
2411	5322 121 10472	47μF /25
2412	2222 347 90236	33nF 10% 100V
2413	4822 124 11565	10μF 20% 250V
2414	4822 124 81145	1000μF 20% 16V
2416▲	4822 126 11503	820pF 10% 2kV
2417	4822 124 81145	16V S 1000μF
2418	4822 122 33177	10nF 20% 50V
2419	4822 124 22776	1μF 50V
2420	4822 124 21913	1μF 20% 63V
2421	4822 126 13751	47nF 10% 63V
2422	2020 021 91577	470μF 20% 16V
2423	4822 124 42127	10μF 20% 100V
2471	5322 121 42386	100nF 5% 63V
2472	5322 121 42386	100nF 5% 63V
2473	4822 124 40255	100μF 20% 63V
2475	5322 122 32268	330pF 5% 63V
2476	4822 121 42408	220nF 5% 63V
2477	5322 122 32268	330pF 5% 63V
2500▲	4822 126 13589	470nF 275V
2501▲	4822 126 14153	2.2nF 10% 1kV
2502▲	4822 126 14153	2.2nF 10% 1kV
2503	4822 124 12415	220μF 20% 400V
2505▲	4822 126 14153	2.2nF 10% 1kV
2506▲	4822 126 14153	2.2nF 10% 1kV
2508▲	4822 122 50116	470pF 10% 1kV
2515▲	4822 126 14049	1.5nF 20% 250V
2516▲	4822 126 13867	330P 20% 250V
2520	4822 126 14585	100nF 10% 50V
2521	4822 124 81151	22μF 50V
2522	4822 126 14585	100nF 10% 50V
2523▲	4822 126 13862	1.5nF 10% 2kV
2525	5322 122 34099	470pF 10% 63V
2526	5322 122 31647	1nF 10% 63V
2527	5322 122 34099	470pF 10% 63V
2540	4822 126 13188	15nF 5% 63V
2541	4822 122 33177	10nF 20% 50V
2560▲	4822 126 13449	1nF 10% 2kV
2561	4822 124 42336	47μF 20% 160V
2562	5322 122 32331	1nF 10% 100V
2563	5322 121 42386	100nF 5% 63V
2564	2020 012 93057	2200μF 20% 16V
2565▲	4822 122 50116	470pF 10% 1kV
2567	4822 124 40433	47μF 20% 25V
2568	4822 124 21913	1μF 20% 63V
2569	5322 122 34099	470pF 10% 63V
2601	4822 126 14076	220nF 25V
2602	5322 122 32531	100pF 5% 50V
2604	4822 124 40248	10μF 20% 63V
2606	5322 122 31647	1nF 10% 63V
2607	2238 861 18339	33P 1% 50V
2608	4822 126 14043	1μF 20-80% 16V
2609	2238 861 18339	33P 1% 50V
2611	4822 126 14043	1μF 20-80% 16V
2612	4822 126 13694	68pF 1% 63V
2613	4822 126 13694	68pF 1% 63V
2615	5322 122 31647	1nF 10% 63V
2618	4822 126 14043	1μF 20-80% 16V
2619	4822 126 14043	1μF 20-80% 16V
2691	4822 124 40207	100μF 20% 25V
2851	2020 552 96305	4.7μF 20-80% 10V
2902	4822 124 81144	1000μF 16V
2903	4822 124 21913	1μF 20% 63V
2904	4822 126 14043	1μF 20-80% 16V
2905	5322 126 10511	1nF 5% 50V
2907	5322 126 10511	1nF 5% 50V
2911	4822 122 33127	2.2nF 10% 63V
2941	4822 124 21913	1μF 20% 63V
2942	4822 126 12105	330pF 5% 63V
2943	4822 126 14585	100nF 10% 50V
2944	4822 126 14127	39nF 10% 50V
2945	5322 126 10223	4.7nF 10% 63V
2946	4822 126 14043	1μF 20-80% 16V
2950	5322 122 31863	22nF 10% 63V

2981	4822 124 40248	10μF 20% 63V
2982	5322 122 34099	470pF 10% 63V
2983	4822 124 40248	10μF 20% 63V
2984	5322 122 34099	470pF 10% 63V

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3000	4822 116 52175	100Ω 5% 0.5W
3001	4822 116 52175	100Ω 5% 0.5W
3002	4822 051 20008	Jumper (0805)
3003	4822 117 11139	1.5kΩ 1% 0.1W
3004	4822 051 20822	8.2kΩ 5% 0.1W
3005	4822 116 52175	100Ω 5% 0.5W
3006	4822 117 11449	2.2kΩ 5% 0.1W
3007	4822 117 11507	6.8kΩ 1% 0.1W
3008	4822 117 11449	2.2kΩ 5% 0.1W
3101	4822 116 52199	68Ω 5% 0.5W
3102	4822 051 10102	1kΩ 2% 0.25W
3103	4822 116 83868	150Ω 5% 0.5W
3104	3198 021 52240	220kΩ 5%
3121	4822 116 52201	75Ω 5% 0.5W
3122	4822 116 52176	10Ω 5% 0.5W
3123	4822 116 83868	150Ω 5% 0.5W
3124	4822 117 10834	47kΩ 1% 0.1W
3181	4822 116 52201	75Ω 5% 0.5W
3182	4822 116 52175	100Ω 5% 0.5W
3183	4822 116 83868	150Ω 5% 0.5W
3184	4822 117 10834	47kΩ 1% 0.1W
3200	4822 116 83881	390Ω 5% 0.5W
3201	4822 116 52175	100Ω 5% 0.5W
3202	4822 116 52175	100Ω 5% 0.5W
3203	4822 116 52175	100Ω 5% 0.5W
3204	4822 050 21003	10kΩ 1% 0.6W
3206	4822 117 10837	100kΩ 1% 0.1W
3207	4822 050 11002	1kΩ 1% 0.4W
3208	4822 117 10353	150Ω 1% 0.1W
3208	4822 117 11503	220Ω 1% 0.1W
3209	4822 051 20829	82Ω 5% 0.1W
3210	4822 116 52283	4.7kΩ 5% 0.5W
3211	4822 116 52283	4.7kΩ 5% 0.5W
3212	4822 051 20471	470Ω 5% 0.1W
3213	4822 116 83883	470Ω 5% 0.5W
3217	4822 051 20334	330kΩ 5% 0.1W
3218	4822 117 11149	82kΩ 1% 0.1W
3219	4822 117 11449	2.2kΩ 5% 0.1W
3220	4822 116 52175	100Ω 5% 0.5W
3221	4822 116 52226	560Ω 5% 0.5W
3222	4822 116 52175	100Ω 5% 0.5W
3226	4822 051 20561	560Ω 5% 0.1W
3232	4822 051 20392	3.9kΩ 5% 0.1W
3235	4822 116 52175	100Ω 5% 0.5W
3241	4822 051 20223	22kΩ 5% 0.1W
3242	4822 117 11383	12kΩ 1% 0.1W
3244	4822 116 52231	820Ω 5% 0.5W
3245	4822 051 20393	39kΩ 5% 0.1W
3246	4822 117 10833	10kΩ 1% 0.1W
3247	3198 021 52240	220kΩ 5%
3248	4822 051 20273	27kΩ 5% 0.1W
3249	4822 116 52231	820Ω 5% 0.5W
3251	4822 116 52175	100Ω 5% 0.5W
3256	4822 051 10102	1kΩ 2% 0.25W
3257	4822 051 20106	10M Ω 5% 0.1W
3258	4822 051 20334	330kΩ 5% 0.1W
3259	4822 051 20474	470kΩ 5% 0.1W
3311	4822 051 20392	3.9kΩ 5% 0.1W
3312	4822 117 13577	330Ω 1% 1.25W
3313	4822 051 20109	10Ω 5% 0.1W
3314	4822 053 12183	18kΩ 5% 3W
3316▲	4822 052 10689	68Ω 5% 0.33W
3317	3198 013 01520	1.5kΩ 20% 0.5W
3321	4822 051 20392	3.9kΩ 5% 0.1W
3322	4822 117 13577	330Ω 1% 1.25W
3323	4822 051 20109	10Ω 5% 0.1W
3324	4822 053 12183	18kΩ 5% 3W
3326▲	4822 052 10689	68Ω 5% 0.33W
3327	3198 013 01520	1.5kΩ 20% 0.5W
3331	4822 051 20392	3.9kΩ 5% 0.1W
3332	4822 117 13577	330Ω 1% 1.25W
3333	4822 051 20109	10Ω 5% 0.1W
3334	4822 053 12183	18kΩ 5% 3W
3336▲	4822 052 10689	68Ω 5% 0.33W
3337	3198 013 01520	1.5kΩ 20% 0.5W
3341	3198 013 01520	1.5kΩ 20% 0.5W
3347▲	4822 052 10221	220Ω 5% 0.33W
3348	3198 013 01520	1.5kΩ 20% 0.5W
3349▲	4822 052 10108	1Ω 5% 0.33W
3350▲	4822 052 10108	1Ω 5% 0.33W
3401	4822 053 21334	330kΩ 5% 0.5W
3402	4822 116 52251	18kΩ 5% 0.5W

3404▲	4822 052 10688	6.8kΩ 5% 0.33W
3405	4822 116 52256	2.2kΩ 5% 0.5W
3406	4822 050 21003	10kΩ 1% 0.6W
3407	4822 053 12331	330Ω 5% 3W
3408	4822 050 11002	1kΩ 1% 0.4W
3410	4822 051 20333	33kΩ 5% 0.1W
3411▲	4822 052 10109	10Ω 5% 0.33W
3412▲	4822 050 23903	39kΩ 1% 0.6W
3413	4822 117 10833	10kΩ 1% 0.1W
3414▲	4822 050 21203	12kΩ 1% 0.6W
3415▲	4822 050 11002	1kΩ 1% 0.4W
3416▲	4822 052 11398	3.9Ω 5% 0.5W
3417	4822 050 23303	33kΩ 1% 0.6W
3418	4822 051 20333	33kΩ 5% 0.1W
3419	4822 117 11507	6.8kΩ 1% 0.1W
3420	4822 051 20333	33kΩ 5% 0.1W
3421	4822 053 11688	6.8kΩ 5% 2W
3422	4822 117 11373	100Ω 1%
3423	4822 117 11454	820Ω 1% 0.1W
3424	4822 116 52175	100Ω 5% 0.5W
3425	4822 116 52238	12kΩ 5% 0.5W
3426	4822 051 20105	1M Ω 5% 0.1W
3427	4822 116 52238	12kΩ 5% 0.5W
3428▲	4822 052 11399	39Ω 5% 0.5W
3431▲	4822 117 12955	2.7kΩ 1% 0.1W
3432	4822 116 52186	22Ω 5% 0.5W
3471	4822 050 23308	3.3Ω 1% 0.6W
3472	4822 050 23908	3.3Ω 1% 0.6W
3473	4822 050 22202	2.2kΩ 1% 0.6W
3474	4822 050 11002	1kΩ 1% 0.4W
3475	4822 050 22202	2.2kΩ 1% 0.6W
3476▲	4822 052 10158	1.5Ω 5% 0.33W
3477	4822 116 83872	220Ω 5% 0.5W
3478	4822 116 83872	220Ω 5% 0.5W
3479	4822 050 11002	1kΩ 1% 0.4W
3500▲	4822 053 21335	3.3M Ω 5% 0.5W
3501▲	4822 053 21335	3.3M Ω 5% 0.5W
3502	2122 612 00055	NTC 4.7Ω 20%
3504▲	2120 660 90043	PTC 9Ω/100Ω 200V
3506▲	4822 116 83872	220Ω 5% 0.5W
3507	4822 252 11215	DSP301N-A21F
3519	4822 116 83876	270Ω 5% 0.5W
3520	4822 051 20122	1.2kΩ 5% 0.1W
3521	4822 050 24708	4.7Ω 1% 0.6W
3522	4822 051 20334	330kΩ 5% 0.1W
3523▲	4822 052 10479	47Ω 5% 0.33W
3524	4822 117 11148	56kΩ 1% 0.1W
3525	4822 051 10102	1kΩ 2% 0.25W
3526	3198 012 11570	0.15Ω 5% 1W
3527▲	4822 052 10222	2.2kΩ 5% 0.33W
3528	4822 117 10833	10kΩ 1% 0.1W
3529	4822 117 10834	47kΩ 1% 0.1W
3530	4822 051 20472	4.7kΩ 5% 0.1W
3531	4822 051 20008	Jumper (0805)
3541	4822 051 20471	470Ω 5% 0.1W
3542	4822 117 11139	1.5kΩ 1% 0.1W
3543▲	4822 050 28203	82kΩ 1% 0.6W
3544▲	4822 050 26802	6.8kΩ 1% 0.6W
3545▲	4822 117 11149	82kΩ 1% 0.1W
3546	4822 051 20008	Jumper (0805)
3547	4822 117 11342	0.33Ω 5% 2W
3548	4822 051 20822	8.2kΩ 5% 0.1W
3549	4822 116 83872	220Ω 5% 0.5W
3552	4822 051 20472	4.7kΩ 5% 0.1W
3559	4822 051 10102	1kΩ 2% 0.25W
3561	4822 116 83872	220Ω 5% 0.5W
3562	4822 117 10833	10kΩ 1% 0.1W
3563	4822 051 20822	8.2kΩ 5% 0.1W
3564	2120 106 90565	0.1Ω 5% 2W
3565	4822 053 10331	330Ω 5% 1W
3566	4822 117 11449	2.2kΩ 5% 0.1W
3569	4822 051 20562	5kΩ6 5% 0.1W
3591	4822 051 20008	Jumper (0805)
3595	2120 108 92641	ERJ6ΕN180k
3596	2120 108 92641	ERJ6ΕN180k
3603	4822 116 52175	100Ω 5% 0.5W
3604	4822 116 52175	100Ω 5% 0.5W
3605	4822 051 20472	4.7kΩ 5% 0.1W
3606	4822 116 52256	2.2kΩ 5% 0.5W
3607	4822 116 52256	2.2kΩ 5% 0.5W
3608	4822 116 52175	100Ω 5% 0.5W
3611	4822 117 11373	100Ω 1%
3612	4822 116 52303	8.2kΩ 5% 0.5W
3614	4822 116 52283	4.7kΩ 5% 0.5W
3615	4822 050 21003	10kΩ 1% 0.6W
3617	4822 116 52283	4.7kΩ 5% 0.5W
3618	4822 116 83961	6.8kΩ 5%
3619	4822 116 52303	8.2kΩ 5% 0.5W
3622	4822 117 11373	100Ω 1%
3623	4822 051 20472	4.7kΩ 5% 0.1W
3624	4822 116 52175	100Ω 5% 0.5W
3625	4822 116 52175	100Ω 5% 0.5W
3626	4822 051 20472	4.7kΩ 5% 0.1W
3627	4822 051 20472	4.7kΩ 5% 0.1W

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

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

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

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

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7001	4822 130 63732	MMUN2212
7101	5322 130 60159	BC846B
7200	9352 707 37557	TDA9561H/N1/4/0630
7201	5322 130 60159	BC846B
7202	4822 130 60373	BC856B
7203	4822 130 60373	BC856B
7204	4822 130 60373	BC856B
7205	4822 130 60373	BC856B
7241	3198 010 44010	PDTA114ET
7311	4822 130 41782	BF422
7312	4822 130 41782	BF422
7313	4822 130 41646	BF423
7321	4822 130 41782	BF422
7322	4822 130 41782	BF422
7323	4822 130 41646	BF423
7331	4822 130 41782	BF422
7332	4822 130 41782	BF422
7333	4822 130 41646	BF423
7401	9340 547 00215	PDTC143ZT
7402	9340 563 21127	BUT11APX-1200
7403	4822 130 40981	BC337-25
7404	4822 130 41246	BC327-25
7405▲	4822 130 60373	BC856B
7406	4822 130 60373	BC856B
7407	4822 130 40823	BD139
7408	4822 130 40823	BD139
7409	4822 130 60373	BC856B
7471	4822 209 13176	TDA9302H
7515	9322 175 72667	TCET1104(G)
7520	9352 673 56112	TEA1507P/N1
7521	9322 160 63687	STP7NC80ZFP
7522	5322 130 60159	BC846B
7540	4822 130 40959	BC547B
7541	4822 130 11155	PDTC114ET
7542	4822 130 60373	BC856B
7560	4822 209 16978	LF33CV
7561	9340 547 00215	PDTC143ZT
7602	9322 147 25682	M24C16-WBN6
7901	9322 158 65667	AN7522N
7941	5322 130 60159	BC846B
7942	5322 130 60159	BC846B
7943	5322 130 60159	BC846B

Picture tube panel [B]

Various

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

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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

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3311	4822 117 11139	1k5 1% 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 117 11139	1k5 1% 0.1W
3322	4822 117 13577	330Ω 1% 1.25W
3323	4822 051 20109	10Ω 5% 0.1W
3324	4822 053 12183	18k 5% 3W
3326▲	4822 052 10689	68Ω 5% 0.33W
3327	3198 013 01520	1k5 2% 0.5W
3331	4822 117 11139	1k5 1% 0.1W
3332	4822 117 13577	330Ω 1% 1.25W
3333	4822 051 20109	10Ω 5% 0.1W
3334	4822 053 12183	18k 5% 3W
3336▲	4822 052 10689	68Ω 5% 0.33W
3337	3198 013 01520	1k5 2% 0.5W
3341	3198 013 01520	1k5 2% 0.5W
3347▲	4822 052 10221	220Ω 5% 0.33W
3348	3198 013 01520	1k5 2% 0.5W

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

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

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

Side AV panel [E][E1]

Various

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

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

⊏▭⊐

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

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6161	4822 130 34278	BZX79-B6V8P