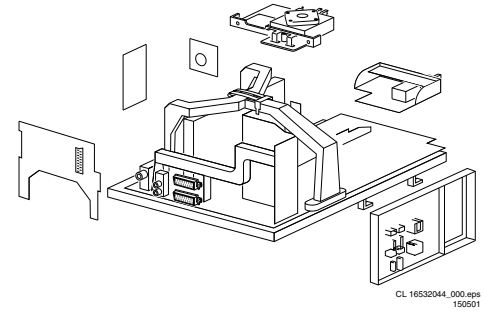


Service
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Service



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Service Manual

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1. Technical Specifications, Connection Facilities and Chassis Overview

1.1 Technical Specifications

1.1.1 Reception

Tuning system	: PLL
Colour systems	: PAL B/G, D/K, I : SECAM B/G, D/K, L/L'
Sound systems	: NTSC 4.43 (playback only) : FM-mono B/G : FM-mono D/K : FM-mono I : AM-mono L/L' : 2CS B/G : 2CS/Chez D/K : NICAM B/G : NICAM D/K : NICAM I : NICAM L
A/V connections	: PAL B/G, D/K, I : SECAM B/G, D/K, L/L' : NTSC 4.43 (playback only)
Channel selections	: 100 channels : VHF, UHF, S-Channels and Hyperband
Aerial input	: 75 Ω, Coax
VCR preselections	: 0 and 90 - 99

3 - Y	(1 Vpp / 75 Ω)	⊕
4 - C / 16:9	(0.3 Vpp / 75 Ω)	⊕
5 -	GND	⊥

1.2.2 Rear Connections

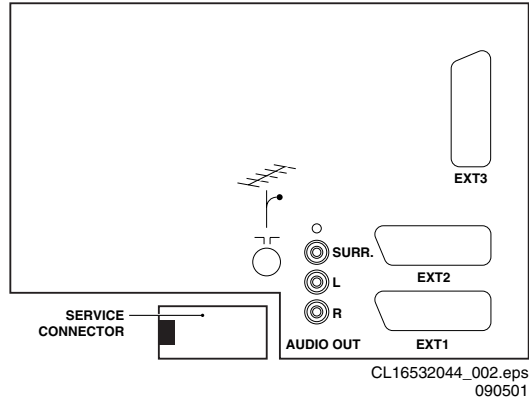


Figure 1-2

Audio Out

- - Audio	Surr. (0.5 Vrms / 1 kΩ)	⊕ ⊖
- - Audio	L (0.5 Vrms / 1 kΩ)	⊕ ⊖
- - Audio	R (0.5 Vrms / 1 kΩ)	⊕ ⊖

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

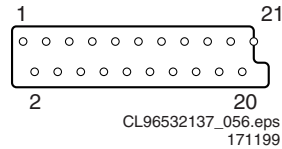


Figure 1-3

1 - Audio	R (0.5 Vrms / 1 kΩ)	⊕
2 - Audio	R (0.5 Vrms / 10 kΩ)	⊕
3 - Audio	L (0.5 Vrms / 1 kΩ)	⊕
4 -	GND	⊥
5 -	GND	⊥
6 - Audio	L (0.5 Vrms / 10 kΩ)	⊕
7 - Blue / U	(0.7 Vpp / 75 Ω)	⊕
8 - CVBS-status	0 - 1.3 V: INT 4.5 - 7 V: EXT 16:9 9.5 - 12 V: EXT 4:3	⊥
9 -	GND	⊥
10 -		⊥
11 - Green / Y	(0.7 Vpp / 75 Ω)	⊕
12 -		⊥
13 -	GND	⊥
14 -	GND	⊥
15 - Red / V	(0.7 Vpp / 75 Ω)	⊕
16 - RGB-status	0 - 0.4 V: INT 1 - 3 V: EXT / 75 Ω	⊥
17 -	GND	⊥
18 -	GND	⊥
19 - CVBS	(1 Vpp / 75 Ω)	⊕
20 - CVBS	(1 Vpp / 75 Ω)	⊕
21 - Earth	GND	⊥

1.1.2 Miscellaneous

Mains voltage	: 220 - 240 V (± 10 %)
Mains frequency	: 50 / 60 Hz (± 5 %)
Ambient temperature	: + 5 to + 45 deg. C
Maximum humidity	: 90 % R.H.
Standby Power consumption	: 1 W

1.2 Connection Facilities

1.2.1 Front Controls / Side Connections

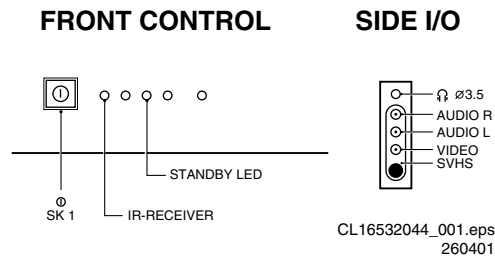


Figure 1-1

Audio / Video In

- - Video	CVBS (1 Vpp / 75 Ω)	⊕ ⊖
- - Audio	L (0.5 Vrms / 10 kΩ)	⊕ ⊖
- - Audio	R (0.5 Vrms / 10 kΩ)	⊕ ⊖
- - Headphone	(32 - 2000 Ω / 10 mW)	⊕ ⊖

SVHS (in)

1 -	GND	⊥
2 -	GND	⊥

External 2 (in/out): SVHS + CVBS (intended for VCR)

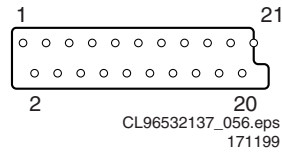


Figure 1-4

1 - Audio	R (0.5 Vrms / 1 kΩ)	⊕
2 - Audio	R (0.5 Vrms / 10 kΩ)	⊕
3 - Audio	L (0.5 Vrms / 1 kΩ)	⊕
4 -	GND	⊥
5 -	GND	⊥
6 - Audio	L (0.5 Vrms / 10 kΩ)	⊕
7 - C	(0.7 Vpp / 75 Ω)	⊕
8 - CVBS-status	0 - 1.3 V: INT 4.5 - 7 V: EXT 16:9 9.5 - 12 V: EXT 4:3	⊥
9 -	GND	⊥
10-	Easy link (P50)	
11-		
12-		
13-	GND	⊥
14-	GND	⊥
15- C	(0.7 Vpp / 75 Ω)	⊕
16-		
17-	GND	⊥
18-	GND	⊥
19- CVBS	(1 Vpp / 75 Ω)	⊕
20- Y / CVBS	(1 Vpp / 75 Ω)	⊕
21-	GND	⊥

External 3 (in): CVBS

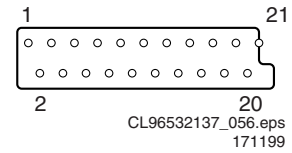


Figure 1-5

1 -		
2 - Audio	R (0.5 Vrms / 10 kΩ)	⊕
3 -		
4 -	GND	⊥
5 -	GND	⊥
6 - Audio	L (0.5 Vrms / 10 kΩ)	⊕
7 -		
8 - CVBS-status	0 - 1.3 V: INT 4.5 - 7 V: EXT 16:9 9.5 - 12 V: EXT 4:3	⊥
9 -	GND	⊥
10-		
11-		
12-		
13-	GND	⊥
14-	GND	⊥
15-		
16-		
17-	GND	⊥
18-	GND	⊥
19-		
20- CVBS	(1 Vpp / 75 Ω)	⊕
21-		

1.3 Chassis Overview

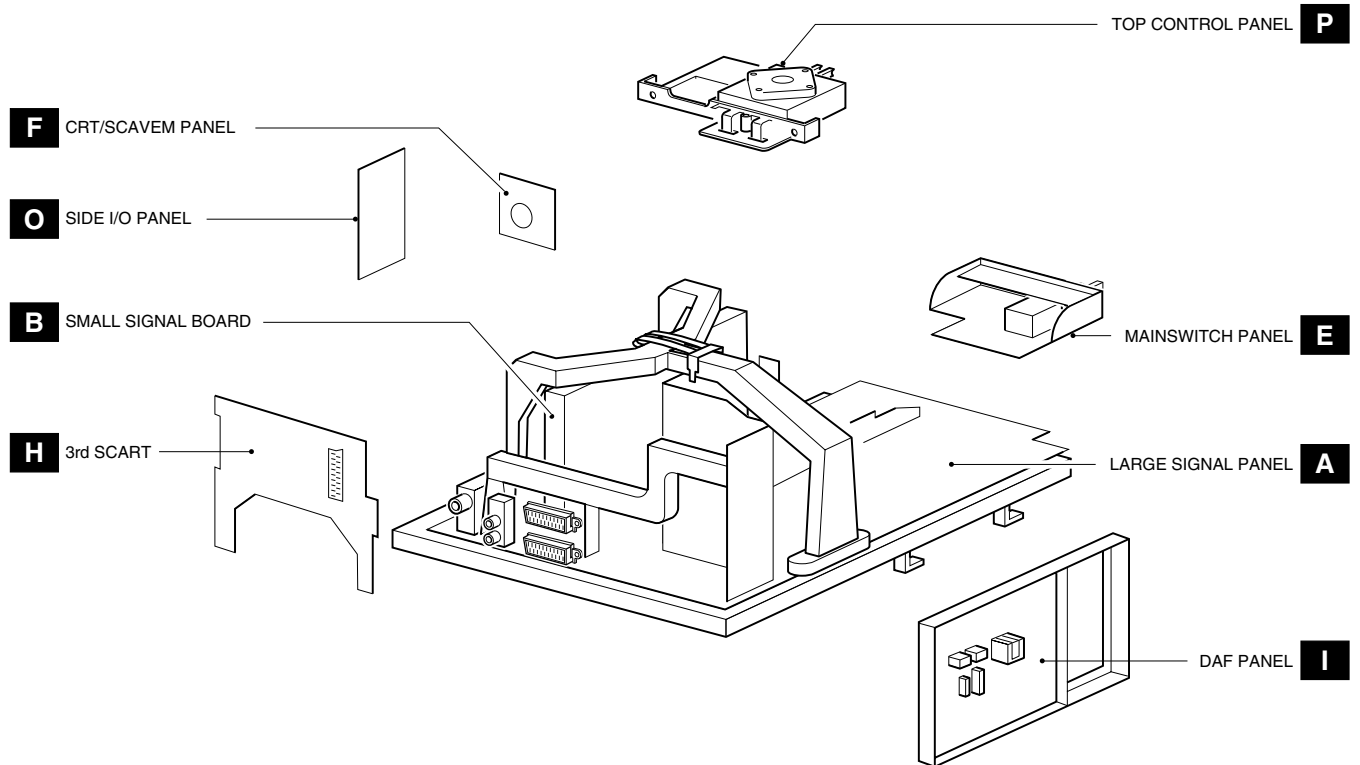
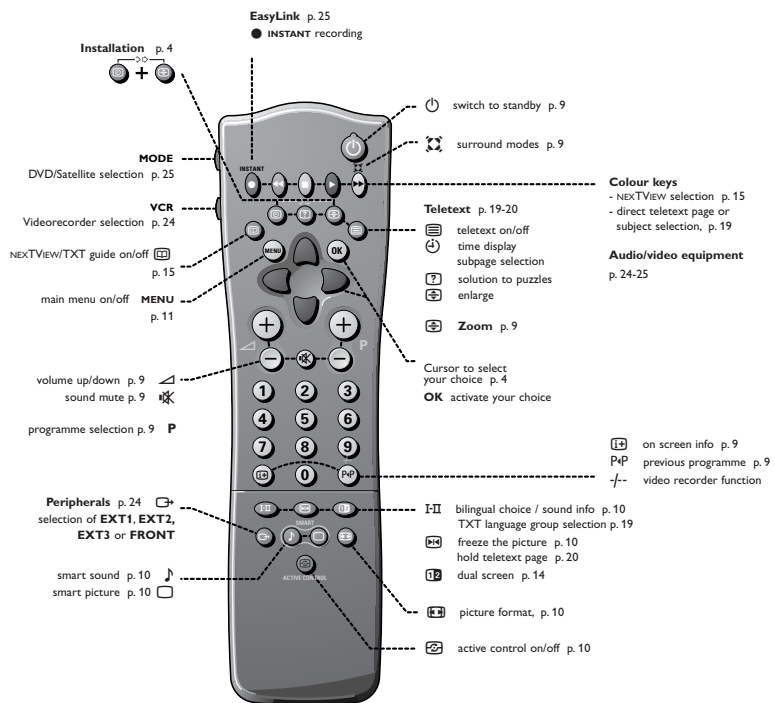


Figure 1-6

3. Directions for use

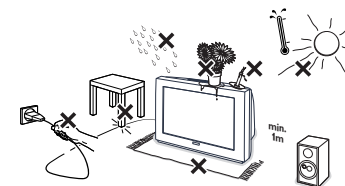
Preparation

Your remote control




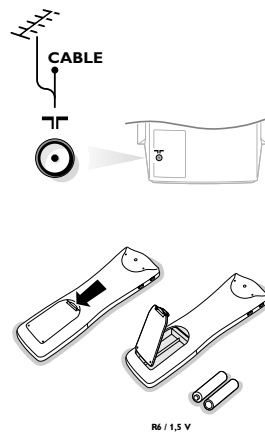
Preparation

- 1 Place the TV on a solid surface.




For ventilation, leave at least 5 cm free all around the TV.
Do not place the TV on a carpet.
To prevent any unsafe situations, do not place any objects on top of the TV.
Avoid heat, direct sunlight and exposure to rain or water.

- 2 Insert the aerial plug firmly into the aerial socket  at the back of the TV.
- 3 Insert the mains plug in the wall socket having a mains voltage of 220V-240V. To prevent damaging the mains (AC) cord which could cause a fire or electric shock, do not place the TV on the cord.
- 4 Remote control: Remove the cover of the battery compartment. Insert the 2 batteries supplied (Type R6-1.5V).



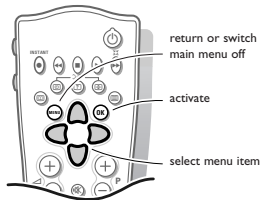
The batteries supplied do not contain the heavy metals mercury and cadmium. Nevertheless in many countries exhausted batteries may not be disposed of with your household waste. Please check on how to dispose of exhausted batteries according to local regulations.

Note: this remote control functions with TVs which use the RC6 signalling standard.

- 5 **Switch the TV on :** Press the power switch  on the front of your TV. A green indicator on the front of the TV lights up and the screen comes on. If the TV is in standby mode (see p. 9), press the **-P+** key on the remote control. The red lamp blinks every time you press a key on the remote control. When you switch on your set for the first time, the menu **LANGUAGE** automatically appears on the screen. The explanation appears in different languages one at a time. Choose your own language and press the **OK** key on the remote control.

Go on to page 4, Store TV channels.

Installation

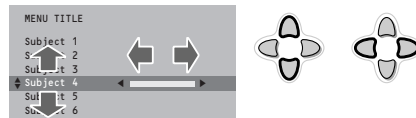


Select the INSTALLATION menu

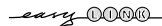
Press **OK** and **MENU** at the same time.

To use the menus

- 1 Use the cursor in the up/down, left/right directions to select a menu item.
- 2 Press the **OK** key to activate.
- 3 Use the **MENU** key to return or to switch the menu off.



Store TV channels



After the new or extra TV channels have been stored, the TV automatically transfers those TV channels to the video recorder if it is equipped with the EasyLink function. The message **EasyLink : downloading** appears on the screen. The programme list of the video recorder is now the same as the one of the TV. If the TV is connected to a video recorder which supports the NEXTV&VLink function, the TV also automatically transfers the language and country selections to the video recorder.

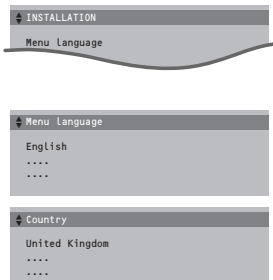
Select the menu language and country

First, select your language and country.

- 1 Select **Menu language** and press the **OK** key.
- 2 Select your language and press the **OK** key. Use the cursor up/down to scroll through the list and to bring up other languages which are not displayed on the screen at present.
- 3 Select **Country** and press the **OK** key.
- 4 Select the country where you are now located and press the **OK** key. Use the cursor up/down to scroll through the list and bring up other countries which are not displayed on the screen at present.

Select **Other** when none of the countries applies.

You can now search for and store the TV channels in two different ways: using **automatic installation** or **manual installation** (tuning-in channel by channel). Select your choice and press the **OK** key.



Automatic installation

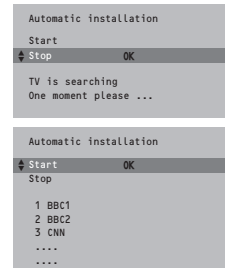
In the Automatic installation menu select **Start** and press the **OK** key to activate the searching. All TV channels are searched for and stored automatically.

If a cable system which broadcasts ACI (Automatic Channel Installation) or a TV channel transmitting a teletext page with the frequencies and programme names of all the TV channels which can be received, is detected, the search is stopped and a programme list appears. The programme list is automatically filled with all the programme numbers and names of the TV channels transmitted.

*It is possible that the cable company or the TV channel displays a broadcast selection menu. Layout and items are defined by the cable company or the TV channel. Make your choice with the cursor and press the **OK** key.*

To exit from the menu press the **MENU** key on the remote control.

Go on to page 6.



Manual installation

Searching for and storing TV channels is done channel by channel. You must go through every step of the Manual installation menu.

Selection mode is only present and lights up if the country selected also offers the channel option (C-channels for aerial channels, S-channels for cable channels).

You can choose either channel or frequency mode.

- 1 Select the TV system
Select the country or part of the world from where you want to receive the TV channel.
If you are connected to a cable system, select your country or part of the world where you are now located.
- 2 Press the cursor down and enter the programme number with the digit keys.
- 3 Search for a TV channel
Press the cursor left/right.
The frequency or the channel number increases until a TV channel is found.

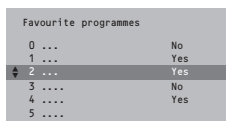
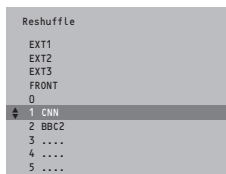
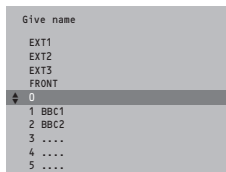
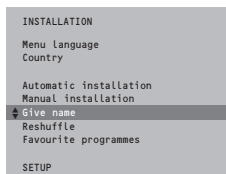
Direct selection of a TV channel

If you know the frequency, the C- or S-channel number, enter it directly with the digit keys 0 to 9.
Ask for a list from your cable company or dealer; alternatively consult the Table of frequencies on the inside backcover of this handbook.

- 4 Fine tune
In case of poor reception, you can improve the reception by adjusting the frequency with the cursor left/right.
- 5 To store your TV channel, select **Store** and press the **OK** key.

Repeat steps **1** to **5** to store another TV channel.

- 6 To exit from the menu press the **MENU** key on the remote control.



Give name

It is possible to change the name stored in the memory or to assign a name to a TV channel which has not yet been entered. A name with up to 5 letters or numbers can be given to the programme numbers 0 to 99. For example SUPER, BBC1, ... Between 99 and 0 you can also name any peripherals that are connected to a euroconnector.

- 1 Select **Give name** in the **INSTALLATION** menu and press the **OK** key.
- 2 Select the programme number.
- 3 Press the **OK** key.
- 4 Select the character with the cursor up/down.
- 5 Select the following position with the cursor right.
- 6 Select the following character.
- 7 Press the **OK** key when finished.
- 8 Press the **MENU** key to return to the **INSTALLATION** menu.

Space, numbers and other special characters are located between Z and A.

Reshuffle the programme list

According to your preference you can change the order of the stored TV channels.

- 1 Select **Reshuffle** in the **INSTALLATION** menu and press the **OK** key.
- 2 Select the programme number you want to exchange.
- 3 Press the **OK** key.
- 4 Select the new number you want to exchange it with.
- 5 Press the **OK** key.
Repeat the operation until all TV channels are allocated as you like.
- 6 Press the **MENU** key to return to the **INSTALLATION** menu.

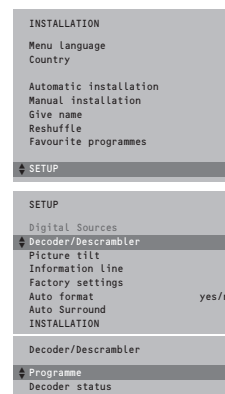
Select Favourite TV channels

After leaving the installation you can browse through the TV channels by pressing the **- P +** key. Only those TV channels which are in the favourite list will be displayed. Non-favourite TV channels can still be selected with the digit keys. By default all stored channels are added to the favourite list.

- 1 Select **Favourite programmes** in the **INSTALLATION** menu and press the **OK** key.
- 2 Select your favourite programme number.
- 3 Select **Yes** or **No** with the cursor left/right.
- 4 Repeat for every TV channel you want to make a favourite or a non-favourite TV channel.
- 5 Press the **MENU** key to return to the **INSTALLATION** menu.



In order for **NEXTVIEW** to function properly, the first TV channel from the favourite list should also broadcast the correct local date and time via teletext.



Install TV Setup

The Setup menu allows you to adjust initial settings, i.e. those which are not related to the installation of the TV channels. The Setup menu contains items that control the settings of the TV's functions, features, services and peripherals you may have connected.

- 1 Use the cursor in the up/down, left/right directions to select the menu item.
- 2 Use the **OK** key to activate.
- 3 Use the **MENU** key to return or switch menu off.

Digital sources *(for future use)*

Define Decoder/Descrambler programme numbers
If a decoder or a descrambler is connected, see p. 22 you can define one or more programme numbers as decoder programme numbers.

Press the cursor left/right to select the input used to connect to your decoder **Off**, **EXT1** or **EXT2**.
Select **Off** if you do not want the selected programme number being activated as a decoder programme number.

Select **EXT2** when the decoder is connected to your EasyLink video recorder. When selecting the decoder, the message **EasyLink: downloading presets....** appears on the screen.

Picture tilt

Select **Picture tilt** with the cursor up/down.
Keep the cursor left/right pressed to adjust the rotation of the picture.

Information line

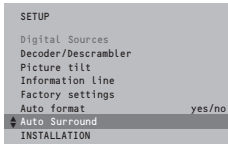
Select **On** and after the selection of a TV programme or after pressing the **[I]** key on the remote control, a TV channel which broadcasts teletext may transmit the name of the TV channel, the programme name or another message. This is displayed on screen next to information about sound and picture format.
When selected **Off**, only sound and picture format information is displayed after the selection of a TV channel or after pressing the **[I]** key.

Factory settings

Select **Factory settings** and press the **OK** key to restore picture and sound settings, predefined in the factory.

Auto format

Selecting **Yes** causes the screen to automatically fill as much of the picture as possible when TV programmes are not carrying special signals detecting the correct screen format.
With the **[P]** key on the remote control you can still select other picture formats. See p. 10.




Auto Surround

Sometimes the broadcaster transmits special signals for Surround Sound encoded programmes. In that case, the TV automatically switches to the best Surround Sound mode when Auto Surround is switched on. Virtual Dolby® Surround will be reproduced, see p. 9. Overruling this surround mode remains possible.

Installation


Select **Installation** and press the **OK** key to return immediately to the **INSTALLATION** menu.


- 4 To exit from the menu press the **MENU** key repeatedly.


*Dolby® 'Pro Logic' and the double-D symbol  are trademarks of Dolby Laboratories Licensing Corporation. Manufactured under license from Dolby Laboratories Licensing Corporation.

Operation

Use of the remote control

Instant record
 If your video recorder has the EasyLink function the **INSTANT**  key for record can be operated in the TV mode.

Video recorder see p. 24


NEXTVIEW/TXT guide on/off see p. 15


MENU Main menu on/off see p. 11
OK Press this key to activate your choice, when in the menus.

Volume
 Press + or - to adjust the volume.

Mute
 Temporarily interrupt the sound or restore it.

P Programme selection
 To browse through the TV channels activated in the Favourite Programme menu.

i+ Screen information
 Press for 5 seconds to activate/de-activate the extended or reduced display of TV channel and programme information on the screen.
 Press briefly to display information about the selected TV channel and programme, the sound reception, picture settings and the remaining time set with the sleep timer.



0/9 Digit keys
 To select a TV channel.
 For a two digit programme number, enter the second digit within 2 seconds.
 To switch immediately to a selected one digit TV channel, keep the digit key pressed a bit longer.

P4P Previous programme
 The previously selected TV channel is displayed.
 The **-/-** indication is only video recorder.

Standby
 The set is switched off. To switch the TV on again, press **- P +** or the digit keys.
 If your EasyLink video recorder has the system standby function and you press the standby key for 3 seconds, both the TV and video recorder are switched to standby. Your TV consumes energy in the standby mode. Energy consumption contributes to air and water pollution. We advise to switch off your TV overnight instead of leaving it on standby. You save energy.

Surround modes
Incredible Surround
 With stereo transmission, and when **Incredible Surround** is selected, it seems as though the loudspeakers are spread further apart from one another.
Virtual Dolby Surround
(optimal with Dolby Surround signals)
 Virtual Dolby Surround enables you to experience the effect of Dolby Surround Pro Logic, reproducing a rear sound effect. See Sound menu, Virtual Dolby effect, p. 12.

Teletext on/off see p. 19
Teletext functions see p. 20

Zoom
 Press the **ZOOM**  key repeatedly to select one of the zoom magnifications (x1, x4, x9, x16). Additionally you can shift the selected zoom window over the screen with the cursor.
 Press  to activate/de-activate the continuous display of the zoom magnification. The zoom window is reset after: selecting another TV channel, another picture format or when another picture format is selected automatically.
Zooming is disabled in Dual screen mode.

Time display
 The time, downloaded from the TV channel (with teletext) stored on programme number 1 or the lowest favourite programme number, is displayed on the screen.
This function is not available when continuous subtitles have been switched on.

Select peripherals
Press this key repeatedly to select **EXT1**, **EXT2**, **EXT3** or **FRONT**, according to where you connected the peripherals (p. 24).

Smart Keys
To select predefined picture and sound settings.

Smart Sound
Each time it is pressed, a different sound setting is selected, corresponding with specific factory settings of the equalizer.

Smart Picture
Each time it is pressed, a different picture setting is selected, corresponding with specific factory settings of Contrast, Colour, Sharpness and Dynamic Contrast.

Personal refers to the personal preference settings of picture and sound selected in the picture and sound menu.
Remark: the moment you are in a predefined smart sound or picture setting and you modify a setting in the picture or sound menu, all values of the menu will overwrite the previously made settings.

I-II Bilingual choice and sound mode selection
Press this key

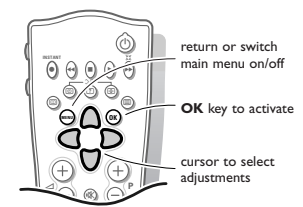
- to switch from **Stereo** to **Mono** sound, in case of stereo transmission, or from **Nicam Stereo** to **Nicam** available, in case of digital transmission;
- to choose between language **I (Dual I)** or language **II (Dual II)**, in case of bilingual transmission. The setting is separately stored for each TV channel.

Freeze
To activate/de-activate the frozen picture or to hold a teletext page.

Dual screen, see p. 14

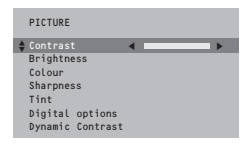
Picture format
Press this key repeatedly to select another picture format: 4:3, Movie Expand 14:9, Movie Expand 16:9 with or without subtitling, Wide Screen, Super Zoom or Automatic (when Auto format is set to Yes in the **SETUP** menu).
Automatic makes the picture to fill the screen as much as possible.
Sometimes also video recorder programmes carry special signals which will automatically switch the TV to the correct screen format.
Auto format is disabled when in Dual screen.
When in Movie Expand 14:9 or 16:9 or Super Zoom picture format you can make subtitles visible with the cursor up/down.

Active control
Active control is a pro-active and automatic system. The TV continuously measures and corrects all incoming signals in order to provide the best picture possible.
Press the **Active Control** key to select the Active Control values Off or On.
Off Sharpness and Dynamic Contrast are controlled automatically
On Sharpness, Dynamic Contrast and Noise Reduction are controlled automatically.
Press the cursor in the up/down directions while the selected Active Control setting information is on top of the screen.
The Active Control menu appears.
The picture settings are being adapted continuously and automatically.
The menu items cannot be selected.
Press the cursor in the up/down directions again to switch off the menu.



Use of the menus

- 1 Press the **MENU** key to display/cancel the **MAIN MENU**.
- 2 Use the cursor in the up/down directions to select the **PICTURE**, **SOUND** or **FEATURES** menu or to select the **PROGRAMMES**.
- 3 Press the cursor right to activate the selected menu.
- 4 Use the cursor in the up/down, left/right directions to select the menu item.
- 5 Use the **OK** key to activate.
- 6 Press the **MENU** key repeatedly to return or to switch the menu off.



Picture menu

If an NTSC peripheral is connected to one of the euroconnectors, the option **Hue** also appears.

Tint

Select the colour temperature: **Normal**, **Warm** or **Cool**.

Digital options

Although **Natural Motion** is the most ideal setting, it may be preferable to switch back to **Digital Scan** and/or **100 Hz**.
To make all the 3 digital options available at the same time and selectable, first select a 4:3 picture format.

- **100 Hz** = 100 Hz only (Field flicker reduction)
- **Dig. Scan** = 100 Hz + Dig. Scan (Field and line flicker reduction)
- **Natural Motion** = 100 Hz + Dig. Scan + Natural Motion (Field and line flicker reduction and smooth movement reproduction)
- **Double lines** = provides for a doubling of vertical resolution which adds astonishing sharpness and a total absence of visible picture lines.
Motion compensation reduces jitter and offers smooth, yet sharp motion reproduction.

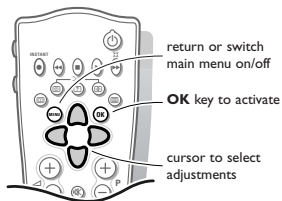
*Note: if the menu item Digital options is not present, first select a 4:3 picture format with the **Picture format** key.*

Dynamic Contrast

To make the contrast in the darker and the brighter picture areas more noticeable, select the **Med** setting.
In certain circumstances it may be preferred to select **Min**, **Max** or **Off**.

The modified adjustments for Contrast, Brightness, Colour, Sharpness, Tint, Digital Scan and Dynamic Contrast are automatically stored for all TV channels.

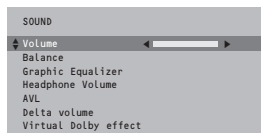
Select **Factory settings** in the Setup menu to restore the predefined factory settings, see p. 7.



Sound menu

- 1 Press the **MENU** key to display/cancel the **MAIN MENU**.
- 2 Use the cursor in the up/down directions to select the **SOUND** menu.
- 3 Use the cursor in the up/down, left/right directions to select the menu item.
- 4 Use the **OK** key to activate.
- 5 Press the **MENU** key repeatedly to return or to switch the menu off.

The modified adjustments for Volume, Balance, and Graphic equalizer are automatically stored for all TV channels. Select **Factory settings** in the Setup menu to restore the predefined factory settings, see p. 7.



Graphic Equalizer

Here you can select the preferred sound setting which corresponds with the personal sound settings.

Headphone volume

See **Connect Peripheral Equipment**, p. 23, for the connection of the headphone.

AVL (Automatic Volume Leveller)

AVL automatically controls the volume level to avoid too large level differences, especially when switching to another programme or during commercial breaks.

AVL will reduce the dynamics of the sound. To maintain original dynamics, use the Delta volume feature.

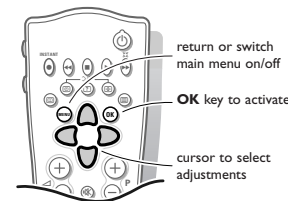
Delta volume

Here you may adjust the volume differences of each selected TV channel or external device separately. This can compensate volume differences between different broadcasters.

Use the **- P +** keys to compare to the volume of other TV channels or externals.

Virtual Dolby effect

Virtual Dolby enables you to experience the effect of Dolby Surround Pro Logic without the need of having rear speakers connected or activated. Select the level of **Virtual Dolby effect** with the cursor left/right.



Features menu

- 1 Press the **MENU** key to display/cancel the **MAIN MENU**.
- 2 Use the cursor in the up/down directions to select the **FEATURES** menu.
- 3 Use the cursor in the up/down, left/right directions to select the menu item.
- 4 Use the **OK** key to activate.
- 5 Press the **MENU** key repeatedly to return or to switch the menu off.



Sleeptimer

With the sleeptimer you can set a time period after which the TV should switch itself to standby.

The counter runs from **Off** up to **180 min**.

One minute before the TV is set to go to standby, the remaining seconds appear on screen. Not visible in dual screen mode. You can always switch off your set earlier or change the set time.

Child lock

If the child lock is on, the TV can only be switched on with the remote control. The **P -** and **+** keys on top of the TV cannot be used to select a TV channel. In this way you can prevent unauthorised use of your TV.

If the message **Child lock On** appears, the child lock must be switched off before you can use the **P -** and **+** keys on top of the TV to select a TV channel.

Subtitle

TV channels with teletext often transmit certain programmes with subtitling. See **Teletext, Continuous Subtitles**, p. 21 how to select the proper subtitle page from the teletext index.

Select **Subtitle On** or **Off**.

Press the **MENU** key to switch off the Features menu.

Programme list

- 1 Press the **MENU** key to display/cancel the **MAIN MENU**.
- 2 Select **PROGRAMMES** with the cursor up/down.
- 3 Press the cursor right to display an overview of all the TV channels installed.
- 4 Press the cursor up/down to run through the list and press **OK** to select the desired TV channel.
- 5 Press the **MENU** key to switch off the Programme list.

NEXTVIEW / Teletext Guide

Today, most broadcasters in Europe, are offering teletext pages containing their programme schedule of today. These pages can be requested by switching the TV to **Teletext Guide**.
An increasing number of broadcasters are offering an extended programme guide service called **NEXTVIEW**. NEXTVIEW is a new way of presenting programme schedules and offers more features than common teletext. With NEXTVIEW it is possible to show for instance all the movies coming tonight.

Both facilities are integrated in this TV: NEXTVIEW and Teletext Programme Guide. If a TV channel supports NEXTVIEW then the TV will automatically present the NEXTVIEW programme schedule. If the TV channel supports just teletext, then the TV will switch automatically to Teletext Guide. Both facilities are offering the same functions: record, remind and info. However in case of Teletext Guide the broadcaster is responsible if these functions are possible.
You can search for the programmes you want to watch up to 7 days in advance. It is also possible to search for a programme by theme, e.g. sport, movie, etc. Once a programme has been selected it can be tagged, to remind you, or to record on the video recorder automatically (provided the video recorder is equipped with NEXTVIEWLink Level 2.0), once, daily, weekly or series. Teletext Guide/NEXTVIEW also allows direct access to detailed information about programmes if provided by the broadcaster.

*The broadcaster is responsible for the contents of the information.
The TV is responsible for the capture of that information and for the presentation to the user.*

Use of the Teletext Guide/NEXTVIEW menus

- 1 Press the **MENU** key on the remote control to display/cancel the Teletext Guide/ NEXTVIEW menu.
- 2 Use the cursor in the up/down, left/right directions to select the date, **CHANNEL** for the channel guide, **THEME** for the theme guide, **OVERVIEW** for an overview of all the programmes which are marked as reminders or for recording, the programme guide page number or to enter the programme list.

Teletext Guide

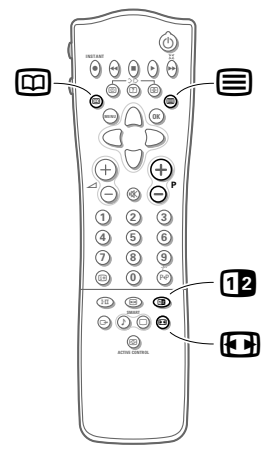
	Channel	Overview
	BBC1	BBC2
	p. 202	◀ 01 02 ... ▶
Record	BBC1	
Remind	11.03	.....
Info	14.35	..... 226/3
	17.50	..... 231

NEXTVIEW

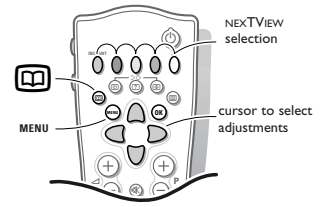
	Monday 9 Oct	18:03
Channel	Theme	Overview
	BBC1	NEXTVIEW
Record		
Remind	What's on now	
Info	Preview	
	Themes	
	Ratings	

- 3 Enter the proper programme guide page number with the digit keys or with the - P + keys.
 - 4 Press the cursor left/right to run through the subpages.
 - 5 Select a programme with the cursor up/down.
 - 6 Press one of the colour keys to select one of the basic functions (if available); **record**, **remind**, **info**. See Basic functions further on.
 - 7 Press the **OK** key to return to the header area again.
- 3 Select a programme with the cursor up/down.
 - 4 Press one of the colour keys to select one of the basic functions (if available); **record**, **remind**, **info**. See Basic functions further on.
 - 5 Press the **OK** key to return to the header area again.

Dual Screen



- 1 Press the **DS** key to switch on Dual Screen.
The TV screen is divided into 2 parts:
- the left side for the normal main picture,
- the right side for teletext broadcast by the selected TV channel or for NEXTVIEW/Teletext Guide.
To operate NEXTVIEW/Teletext Guide, see p. 15.
To operate teletext, see p. 19.
If Dual Screen is Off, the picture, teletext or NEXTVIEW/Teletext Guide are displayed full screen.
- 2 Press the **PS** key to select a vertical squeezed or a non vertical squeezed picture size
- 3 Press + **P** - to run through the teletext pages.
- 4 When in Teletext Dual Screen, press the **TT** key to return to a full picture screen or press the **DS** key to return to a full Teletext screen.
- 5 When in NEXTVIEW/Teletext Guide Dual Screen, press the **FS** key to return to a full picture screen or press the **DS** key to return to a full NEXTVIEW/Teletext Guide screen.



	Channel	Theme	Overview
	BBC 1	BBC 2	CNN
	p.202 ◀ 01 02 ... ▶		
Record		BBC 2	
Remind	11.03	.....
Info	14.35	.....	226/3
	17.50	.....	231
	One moment please		

Teletext guide

TV channels which broadcast teletext also transmit a page with the programme guide of the day. For each selected TV channel the programme guide page can be selected with the **□** key:

- automatically if the selected TV channel supports services like PDC (Programme Delivery Control) or MIP (Magazine Inventory Page).
- if automatic pre-selection is not possible then the index page is displayed and the proper programme guide page number of the selected TV channel has to be entered with the digit keys.

The programme guide page will be stored automatically only if it satisfies Video Programming via Teletext (VPT) requirements.

Every time you press the **□** key, the programme guide page of the selected TV channel will be available if the TV channel does not support NEXTVIEW.

The function items record, remind and info, corresponding with the coloured keys, become highlighted if the displayed programme page satisfies the Video Programming via Teletext (VPT) requirements. Select a programme item and press one of the function keys, e.g. Record or Remind. See Basic functions further on.

The Info item is enabled if the selected programme contains a page number with an optional subcode referring to a page with more info about the programme.

	Channel	Theme	Overview
	BBC1	CNN	BBC2
Record		BBC1	NEXTVIEW
Remind	.....	
Info	.....	
		

NEXTVIEW modes to sort and represent information

Channel

The Channel guide provides an overview of all programmes that are broadcast by a single channel during one day. Already passed programmes can be made visible via cursor up. The list will start with the earliest broadcast programme. With cursor left/right another favourite TV channel can be selected.

	Channel	Theme	Overview
	Culture	Movie	....
Record		BBC1	NEXTVIEW
Remind			
Info	BBC1		
	CNN		
	TVE		

Theme

The theme guide displays a list of all programmes at the selected date, that matches with the selected category (news, sport, culture, movies, ...). The default starting item will be the current or next programme on the current TV channel. The **THEME** selection is only present if programmes in the TV guide have defined themes.

Overview

The Overview menu provides a list of programmes that are marked as reminders or to be recorded each day. When more than one programme to be recorded has an overlap in time, these programmes will be marked by a red colour.

	Channel	Theme	Overview
	BBC1		NEXTVIEW
Record	BBC1	17.10	
Remind	CNN	17.30	
Info	TVE	18.05	
	BBC2	19.00	

After the programme has been broadcast, all items set for once will be deleted from the list the following day. This menu can be used to change a reminder or recorder.

Note: the TV will automatically interpret the broadcast time (as shown on the teletext guide) of your selected programme into the correct local time and date.

	Channel	Theme	Overview
		Travel Guide	
Record	11.03		
Remind	14.35	World news	
Info	◀Once▶	Daily Weekly Clear	
	17.50	Insight	
		
		Info block	

Basic functions

The functions Record, Remind and Info can be activated with the corresponding colour keys on the remote control. If the function is not available, then the text is shown at reduced brightness. Select a programme with the cursor up/down.

Record **□** or Remind **◇**

- 1 Press the red colour key to activate **Record** or the green colour key to activate **Remind**.
If the programme number of the broadcaster is not yet known, a message appears with the request to input the correct programme number with the cursor left/right and press OK.

A small menu pops up in which you can choose the interval: once, daily or weekly, or clear an earlier made record or remind setting. The default interval is set to **Once**. If a programme is an episode of a series, it is identified by the system and the options **daily** and **weekly** are replaced by the option **series**. In this case the system identifies when the next episode of the series will be broadcast. This is not possible in the Teletext guide.

- 2 Use the cursor in the left/right directions to select the interval. The colour of the tag refers to the interval.
- 3 Press the **OK** key.

When **Record **□**** is activated:

Storing is displayed to indicate the video recorder is programmed.

When **Remind **◇**** is activated:

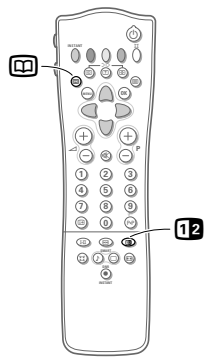
- a message will be displayed the moment the tagged programme with **◇** starts, when watching the TV later on.
- the TV switches on the moment the tagged programme with **◇** starts, when the TV is in standby.

Note: Recordings and reminders are not possible when the broadcaster does not transmit dates and times of the programmes.

*The message **No TV programming possible** appears. Make sure you are on the TV programming page.*

Info

- 1 Press the yellow colour key to activate **Info**. Advertisements or information relating to the selected programme are displayed. In some cases all of the information does not fit on the screen. Use the cursor up/down to browse through all the information.
- 2 Press the yellow colour key again to switch off the information.



Select Picture/NEXTVIEW-Teletext Guide

Press the **Teletext** key.
 Press the **I-ii** key.
 The screen is divided into two parts: the left side for the normal main picture, the right side for NEXTVIEW/Teletext Guide.
 Press the **I-ii** key to return to a full NEXTVIEW/Teletext guide screen, or press the **Teletext** key to return to a full picture screen.

Acquisition and updating of NEXTVIEW information

Acquisition and updating of NEXTVIEW is done when you are watching a TV channel supporting NEXTVIEW.



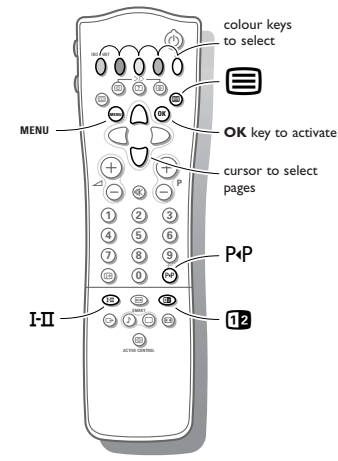
Video recorder restrictions with NEXTVIEW

The **Record** item and the automatic recording will only be present and possible if your video recorder is equipped with NEXTVIEWLink. Your video recorder should be connected to **EXTERNAL 2**. See Connect Peripheral Equipment, p. 22.

The daily, weekly and series options, the number of recordings set and the way overlapping recordings are managed, depend on the type of video recorder you have. When all video recorder timers are full, the item **Record** in the menu will not be present.

Upload video recorder overview
 When the TV is switched on, the timer recordings are uploaded to the TV to check if any manual addition or deletions have been done. This is shown in the overview.
 The video recorder manages and removes timer recordings when performed.

Some NEXTVIEWLink video recorders do not allow a daily programming of the recording to start on a Saturday or Sunday. In this case the item **daily** will be removed from the menu on those days.



Teletext

Most TV channels broadcast information via teletext. Each channel which broadcasts teletext transmits a page with information on how to use its teletext system. Look for the teletext page with the main index (usually p. 100). Depending on the TV channel, teletext is transmitted in different systems. The colours used in the options line correspond with the colour keys of your remote control.

About Easy Text

Easy Text considerably reduces the waiting time (on condition that the teletext broadcast of the particular TV channel is received for at least half a minute) by :

- a direct selection of previous and following pages which are in transmission and of the pages referred to in the options line
- a habit watcher list: frequently used pages are put automatically in a list of preferred pages, so that they are immediately available
- the precapturing of the page numbers referred to in the displayed page
- the precapturing of all the subpages.

Switch Teletext on and off

Press **Teletext** to switch the teletext on or off. The main index page appears on the screen together with two information lines at the top and one option line at the bottom of the screen.

*Remark: if the displayed teletext characters on screen do not correspond with the characters used in your language, press the **I-ii** key repeatedly to select Language group 1 or 2.*

Select a Teletext page

With the digit keys
 Enter the desired page number with the digit keys. The page counter seeks the page or the page appears immediately when the page number has been stored in the memory.
A message appears when you have entered a non-existent or incorrect page number. Page numbers beginning with 0 or 9 do not exist. Choose another number.

With the option line
 Select with the colour keys, corresponding to the coloured options at the bottom of the screen, the desired subject.

Select Picture/Teletext

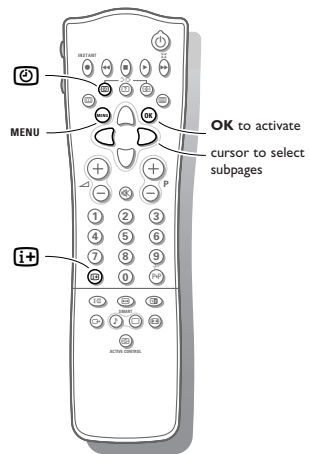
Select a TV channel which broadcasts teletext. Press the **I-ii** key. The screen is divided into two parts: the left side for the normal main picture, the right side for teletext broadcast by the selected TV channel. Press the **Teletext** key to return to a full screen picture or press the **I-ii** key to return to a full teletext picture.

Quickly run through the teletext pages

Press the cursor up/down or the - **P +** key to run through the previous or the following pages.

Select the previously selected teletext page

Press the **P+P** key.



Select the index teletext page

Press the white colour key to display the main index (usually p.100).

Only for T.O.P teletext broadcasts :

T.O.P orders the pages in categories and adds other possibilities of enhancing ease of use.

Press **[i+]**. A T.O.P overview of the teletext subjects available is displayed.

Not all TV channels broadcast T.O.P teletext. When the teletext system is not T.O.P teletext, a message appears at the top of the screen.

Select with the cursor up/down, left/right the desired subject and press the **OK** key.

Select subpages

When a selected teletext page consists of different subpages, one of the subpages appears on the screen.

The coloured number in the first information line refers to the displayed subpage.

The other subpages can be selected in 2 ways :

With the cursor left/right

The other subpage numbers appear in white as soon as the transmission has found them. They are stored in the memory so that they are available while the teletext page is on screen.

Select with the cursor left/right the previous or the following subpage.

With the **[i+]** key

• Enter the subpage number yourself:

Press **[i+]**. Enter the desired subpage with the digit keys : e.g. 3 for the third page of seven subpages.

The TV searches for the selected subpage.

• Automatically rotating subpages:

Press **[i+]** again to cancel the entered digit key for the subpage.

Now the subpages rotate automatically.

Press **[i+]** again to select the subpages with the cursor left/right again.

Special teletext functions

Hold

Press **[i+]** to stop the automatically rotating of the subpages or to stop the page counter from seeking when you have entered a wrong page number or when the page is not available.

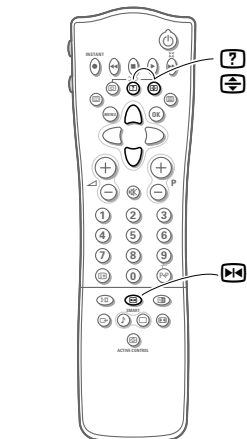
Enter another page number.

Enlarge

Press **[i+]** repeatedly to display the upper part, the lower part and then to return to the normal page size. When the upper part is displayed, you can scroll the text, line by line using the cursor up/down.

Reveal

Press **[i+]** to reveal/conceal the hidden information, such as solutions to riddles and puzzles.



Select Continuous Subtitles


TV channels with teletext often transmit programmes with subtitling. For each TV channel you can store a subtitle page which will be displayed continuously if the programme being broadcast is transmitted with subtitles.

Switch on teletext and select the proper subtitle page from the index. Switch off teletext.

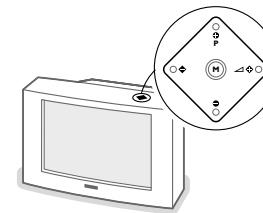
Now the subtitle page is stored for the selected TV channel.

Once subtitles have been stored and **Subtitle On** has been selected they will automatically be displayed on the selected TV channel if subtitles are in the transmission.

Select **Subtitle On** or **Off** in the Features menu, see p. 13.

The subtitle symbol  appears when **Subtitle On** is selected.

Remark: you are in teletext mode, so only teletext functions are available.



Keys on top of the TV

Should your remote control be lost or broken you can still change some of the basic picture settings with the keys on top of the TV.

Press the **M** key repeatedly to select **Volume, Brightness, Colour, Contrast**.

Press the **P** - or + keys to carry out the selected adjustment.

When the menu adjustment is not displayed, the **P**- or + keys enable you to select the TV channels, the **Δ** - or + keys to adjust the volume.

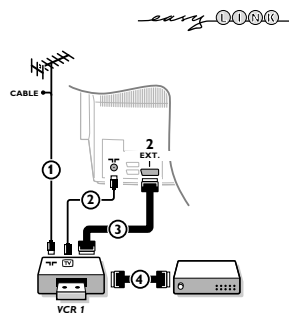
The selected adjustment automatically switches off when no action has been executed for 10 seconds.

Connect Peripheral Equipment

There is a wide range of audio and video equipment that can be connected to your TV. The following connection diagrams show you how to connect them.

Video recorder

Connect the aerial cables ①, ② and, to obtain the optimum picture quality, eurocable ③ as shown opposite.



easy ①②③④

If your video recorder is provided with the EasyLink function, the eurocable supplied with it should be connected to **EXTERNAL 2** to benefit from the EasyLink functionality.

If the eurocable ③ is not used the following steps are required:

Search for and store the test signal of the video recorder

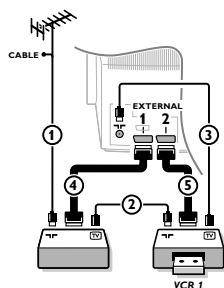
- 1 Unplug the aerial cable ① from the aerial socket of your video recorder.
- 2 Switch on your TV and put the video recorder on the test signal. (See the handbook for your video recorder.)
- 3 Search for the test signal of your video recorder in the same way as you searched for and stored the TV signals. See Installation, Searching for and storing TV channels, Manual installation, p. 5.
- 4 Store the test signal under programme number 0 or between 90 and 99.
- 5 Replace the aerial cable in the aerial socket of your video recorder after you have stored the test signal.

Decoder and video recorder

Connect a eurocable ④ to your decoder and to the special euroconnector of your video recorder. See also the video recorder handbook. See Define Decoder/Descrambler prog. numbers, p. 7. You can also connect your decoder directly to **EXTERNAL 1** or **2** with a eurocable.

Video recorder and other peripherals (except Digital Sources)

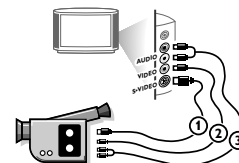
- 1 Connect the aerial cables ①, ② and ③ as shown opposite. Better picture quality can be obtained if you also connect eurocable ④ to **EXTERNAL 2** and a eurocable ⑤ to **EXTERNAL 1** or **EXTERNAL 3**.
- 2 Look for the test signal of your peripheral in the same way as you do for a video recorder.



When a video recorder is connected to **EXTERNAL 1** you can only record a programme from your TV.

Only when a video recorder is connected to **EXTERNAL 2** it is possible to record a programme from your TV as well as from other connected equipment. See Record with your video recorder, p. 26.

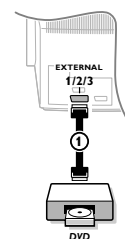
Note: **EXTERNAL 1** can handle CVBS and RGB, **EXTERNAL 2** CVBS and Y/C and RGB, **EXTERNAL 3** only CVBS.



Camera & camcorder

- 1 Connect your camera or camcorder to sockets at the right side of your TV.
- 2 Connect the equipment to **VIDEO 2** and **AUDIO L 3** for mono equipment.
- 3 For stereo equipment also connect **AUDIO R 3**.

S-VHS quality with an S-VHS camcorder is obtained by connecting the S-VHS cables with the **S-VIDEO** input ① and **AUDIO** inputs ③.



Digital equipment (DVD, digital satellite tuner,...)

Connect your digital equipment with a eurocable ① to one of the euroconnectors (**EXT1**, **EXT2** or **EXT3**), or with a cinch cable to the **VIDEO** input at the right side of the TV (see illustration above).

Note: the low quality of some digital picture material may be the cause of digital image distortion. In this case select **Eco** under the **SMART PICTURE** key on the remote control as this setting is intended to improve distorted picture quality.

Headphone

- 1 Insert the plug into the headphone socket at the right side of the TV.
- 2 Press **⏏** on the remote control to switch off the internal loudspeakers of the TV.

The headphone impedance must be between 8 and 4000 Ohm. The headphone socket has a 3.5 mm jack.

In the **SOUND** menu select **Headphone volume** to adjust the headphone volume, see p. 12.

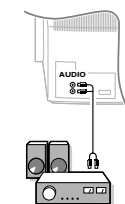


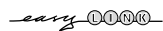
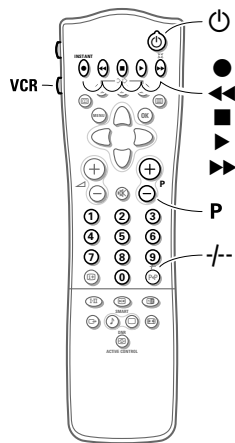
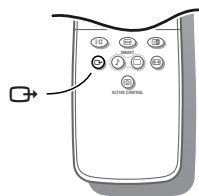
Audio equipment / Amplifier

Connect the audio cables to the audio input of your audio equipment and to **AUDIO L** and **R** at the back of your TV.

You can listen to your TV sound via your audio equipment.

If you want to connect more equipment to your TV, consult your dealer.





To select connected equipment

If the TV is connected to a video recorder with the EasyLink function, in some cases the TV will be switched on, even when it was in standby. (E.g. playback tape...) This is not possible when Child lock On is selected.

Equipment connected with an aerial cable only :

Select the programme number under which you have stored the test signal with the digit keys.

Equipment connected to a euroconnector or to the right side of the TV

Press the **TV** key repeatedly to select EXT1, EXT2, EXT3 or FRONT, according to where you connected your equipment at the back or the right side of your TV.

Remark : Most equipment (decoder, video recorder, satellite receiver) carries out the switching itself.

If you want to change to TV channels?

Enter the programme number of the TV channel which you want to watch with the digit keys or press the **TV** key repeatedly to select TV.

Audio and video equipment keys

Most of the audio and video equipment from our range of products can be operated with the remote control of your TV.

Video recorder

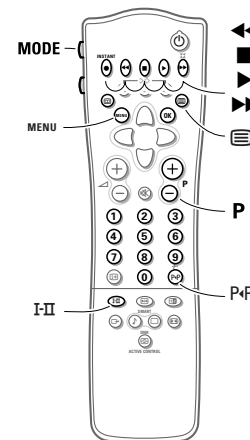
Keep the **VCR** key on the left side of the remote control pressed and simultaneously press:

- for record,
- ◀◀ for rewind,
- for stop,
- ▶ for play,
- ▶▶ for fast forward,
- /- for selecting 1- or 2-digit programme numbers from the video recorder,
- P + for sequential programme selection from the video recorder tuner,
- 0 to 9 to select a programme number from your video recorder tuner,
- ⏻ to switch the video recorder to standby

These keys function with equipment which use the RC5 signalling standard.

If your video recorder has the EasyLink function, the key **INSTANT** ● for recording, can be operated in the TV mode.

If your EasyLink video recorder has the system standby function, when you press the **⏻** key for 3 seconds, both TV and the video recorder are switched to standby.



Satellite receiver

Press the **OK** key simultaneously with the digit key 1. Now you can operate your satellite receiver with the remote control of your TV.

Keep the **MODE** key on the left side of the remote control pressed and simultaneously press:

MENU to switch the **SAT** menu on or off

These keys function with equipment which use the RC5 signalling standard.

DVD player

Press the **OK** simultaneously with the digit key 2.

Now you can operate your DVD player with the remote control of your TV.

Keep the **MODE** key on the left side of the remote control pressed and simultaneously press:

- MENU** to switch the DVD menu on or off
- ☰ to select a DVD title
- P+P to select a DVD chapter
- I-II to select your choice of audio language
- ◀◀ to search down
- stop
- ▶ play
- ▶▶ to search forward
- 0-9 to select a programme number from your DVD
- OK** to enter the selected menu item

●, ⏻, ⏹, ☰, ◀, ▶ have no function

Note: after replacing the batteries the default operational equipment is the satellite receiver.

These keys function with equipment which use the RC6 signalling standard.

Record with your video recorder

To record S-VHS quality, connect an S-VHS peripheral directly to the video recorder.

Record a TV programme

- 1 Select the programme number on your video recorder.
- 2 Set your video recorder to record.
See the handbook for your video recorder.

Switching programme numbers on your TV does not disturb recording!

Record a programme on your video recorder connected to EXTERNAL 2 from Audio/Video equipment connected to EXTERNAL 1, EXTERNAL 3 or to sockets on the right side of the TV

- 1 Switch on the equipment.
- 2 Select the right external on your video recorder.
- 3 Set your video recorder to record.
You record what you are watching on the screen.

Do not switch programme numbers or do not switch off your TV when you are recording!

Record with your video recorder with EasyLink

easy ①②③④

If you have connected an S-VHS video recorder provided with the EasyLink function, you can record S-VHS-quality from an S-VHS peripheral connected to the right side of the TV. (E.g. from an S-VHS camcorder.)

In TV mode, it is possible to start a direct recording of the programme which is being displayed on the TV screen.

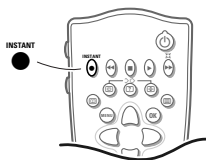
Press the **INSTANT** ● record key of the remote control.

The video recorder switches on from standby and a message of what is being recorded appears on the screen.

The video recorder starts recording the programme you are watching.
Switching programme numbers on your TV does not disturb recording!

When recording a programme from a peripheral connected to EXTERNAL 1, 3 or FRONT, you can not select another TV programme on the screen.
To watch TV programmes again, press the programme number you want to select twice.

Attention: the recording is stopped and your video recorder switches to standby.



Record with your video recorder with NEXTVIEWLink



If your video recorder is equipped with NEXTVIEWLink, and you tagged one or more programmes to be recorded automatically in the NEXTVIEW mode, it is not necessary for the TV to be in the standby mode or switched on for the recording to start.

Tips

Care of the screen

Clean the TV with a slightly damp soft cloth. Do not use abrasive solvent as it can damage the TV screen.

Poor Picture

- Have you selected the correct TV system?
- Is your TV or house aerial located too close to loudspeakers, non-earthed audio equipment or neon lights, etc.?
- Mountains or high buildings can cause double pictures or ghost images. Sometimes you can improve the picture quality by changing the direction of the aerial.
- Is the picture or teletext unrecognisable?
Check if you have entered the correct frequency. See Installation, p. 5.
- Are brightness and contrast out of adjustment? Select Factory settings in the Setup menu, p. 7.
- Sometimes poor picture quality is possible when having activated an S-VHS camera or camcorder connected to the right side of your TV and another peripheral is connected to EXT1 or EXT2 at the same time. In this case switch off one of the other peripherals.

No picture

- Is the aerial connected properly?
- Are the plugs tightly connected in the aerial socket?
- Is the aerial cable in good condition and does it have suitable plugs?
- Are the connection facilities to a possible second TV in good condition? If in doubt, consult your dealer.

No sound

- No sound on any channel? Check the volume isn't at minimum.
- Is the sound interrupted with the mute key **M**?

Remote control

If your TV no longer responds to the remote control, the batteries may be dead.

You can still use the **M** key and the **-/+** keys at the top of your TV.

Menu

Have you selected the wrong menu? Press the **MENU** key again to exit from the menu.

No solution

Switch your TV off and then on again once.

Never attempt to repair a defective TV yourself.

Check with your dealer or call a TV technician.

End of life directives

Philips is paying a lot of attention to produce environmentally-friendly in green focal areas. Your new TV contains materials which can be recycled and reused. At the end of its life specialised companies can dismantle the discarded TV to concentrate the reusable materials and to minimise the amount of materials to be disposed of. Please ensure you dispose of your old TV according to local regulations.

How to dispose of batteries?

The batteries supplied do not contain the heavy metals mercury and cadmium. Nevertheless in many countries batteries may not be disposed of with your household waste. Please ensure you dispose of batteries according to local regulations.

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Glossary

100 Hz

100 Hertz provides a superior solution to the problem of picture flicker which is particularly noticeable with larger screen sizes. In a conventional TV, the picture area is scanned 50 times a second (50 Hertz) – a frequency which is still detectable by the human eye in the form of a flickering picture. In 100 Hertz sets, the picture area is scanned at a rate of 100 times per second (100 Hertz). At this frequency, the eye cannot detect flicker, resulting in a clearer picture which is more relaxing to the eye.

Automatic Channel Installation (ACI)

Automatically installs all TV channels in the same order as offered by your cable company, provided of course that the data is transmitted. It also automatically includes programme number and programme name. With ACI, channel installation is fully automatic, simple and fast.

Child lock

Feature to prevent unauthorised use of your TV.

Digital Scan

If you look at a television screen you will see small imperfections in the picture caused by line vibration. Digital Scan (an internal process) removes interline flicker. When combined with 100 Hz, you will see a totally stable image.

Easy Link

Digital 'intelligent' ESI bus-system between TV and VCR (Scart connection required). Turns source selection and control into a one-button operation.

Easy Text

Teletext memory that automatically memorises Teletext pages and gives you instant access to them.

Euroconnector

A 21-pin connector system enabling you to simply connect various types of audio/video and computer equipment.

Menu

On-screen display of functions and facilities in a well-organised survey, which you can select using your remote control.

NEXTVIEW

NEXTVIEW is a new feature to assist the TV and VCR user in selecting the programmes she or he likes to watch from a television programme guide on the screen. It enables the user to see a description of every programme, and mark interesting programmes to be reminded (auto TV on) or recorded (NEXTVIEWLink video recorder required).

NTSC

The broadcasting system used in the USA, Japan and parts of South America and Southeast-Asia.

Smart Picture and Sound controls

Keys on the remote control to select predefined picture and sound settings.

Sleeptimer

Function with which you can set a time period after which the TV should switch itself to standby.

Picture Freeze

TV mode which allows you to "freeze" a certain image in order to study a specific detail at ease, e.g. to make notes of certain programme information like phone numbers.

Teletext

See also Easy Text

WST: World Standard Teletext.

FLOF: Full Level One Features. System applied by the BBC, RVE... that provides a fast access to the teletext pages.

TOP: Table of (Teletext) Pages. German system for an easy access to the teletext pages.

Tint

TV-function to modify the general colour balance between cool and warm and to adjust it according to your personal preference.

Table of TV frequencies.

Frequenztafel der Fernsehsender.

Liste des fréquences des émetteurs.

Frequenztafel TV-Zenders.

Tabella delle frequenze delle trasmissioni.

Lista de las frecuencias de las emisoras.

Lista das frequências dos emissores.

Liste over TV sendere.

Tabell over TV-frekvenser.

EUROPE

CHANNEL	FREQ (MHz)
E2	48.25
E3	55.25
E4	62.25
E5	175.25
E6	182.25
E7	189.25
E8	196.25
E9	203.25
E10	210.25
E11	217.25
E12	224.25
S1	105.25
S2	112.25
S3	119.25
S4	126.25
S5	133.25
S6	140.25
S7	147.25
S8	154.25
S9	161.25
S10	168.25
S11	231.25
S12	238.25
S13	245.25
S14	252.25
S15	259.25
S16	266.25
S17	273.25
S18	280.25
S19	287.25
S20	294.25
H1	301.25
H2	311.25
H3	318.25
H4	327.25
H5	335.25
H6	343.25
H7	351.25
H8	359.25
H9	367.25
H10	375.25
H11	383.25
H12	391.25
H13	399.25
H14	407.25
H15	415.25
H16	423.25
H17	431.25
H18	439.25
H19	447.25
21	471.25
22	479.25
23	487.25
24	495.25
25	503.25
26	511.25
27	519.25
28	527.25
29	535.25
30	543.25
31	551.25
32	559.25
33	567.25
34	575.25
35	583.25
36	591.25
37	599.25
38	607.25
39	615.25
40	623.25
41	631.25
42	639.25
43	647.25
44	655.25
45	663.25
46	671.25
47	679.25
48	687.25
49	695.25
50	703.25
51	711.25
52	719.25
53	727.25
54	735.25
55	743.25
56	751.25
57	759.25
58	767.25
59	775.25
60	783.25
61	791.25
62	799.25
63	807.25
64	815.25
65	823.25
66	831.25
67	839.25
68	847.25
69	855.25

EASTERN EUROPE

CANAL	FREQ (MHz)
R1	49.75
R2	56.75
R3	77.25
R4	35.25
RS	93.25
R 6	175.25
R 7	183.25
R 8	191.25
R 9	199.25
R10	207.25
R11	215.25
R12	223.25
S1	105.25
S2	112.25
S3	119.25
S4	126.25
S5	133.25
S6	140.25
S7	147.25
S8	154.25
S9	161.25
S10	168.25
S11	231.25
S12	238.25
S13	245.25
S14	252.25
S15	259.25
S16	266.25
S17	273.25
S18	280.25
S19	287.25
S20	294.25
S21	301.25
H1	303.25
H2	311.25
H3	319.25
H4	327.25
H5	335.25
H6	343.25
H7	351.25
H8	359.25
H9	367.25
H10	375.25
H11	383.25
H12	391.25
H13	399.25
H14	407.25
H15	415.25
H16	423.25
H17	431.25
H18	439.25
H19	447.25
H20	455.25
H21	463.25
H22	471.25
H23	479.25
H24	487.25
H25	495.25
H26	503.25
H27	511.25
H28	519.25
H29	527.25
H30	535.25
H31	543.25
H32	551.25
H33	559.25
H34	567.25
H35	575.25
H36	583.25
H37	591.25
H38	599.25
H39	607.25
H40	615.25
H41	623.25
H42	631.25
H43	639.25
H44	647.25
H45	655.25
H46	663.25
H47	671.25
H48	679.25
H49	687.25
H50	695.25
H51	703.25
H52	711.25
H53	719.25
H54	727.25
H55	735.25
H56	743.25
H57	751.25
H58	759.25
H59	767.25
H60	775.25
H61	783.25
H62	791.25
H63	799.25
H64	807.25
H65	815.25
H66	823.25
H67	831.25
H68	839.25
H69	847.25
H70	855.25

FRANCE

CANAL	FREQ (MHz)
2	65.75
3	69.50
4	63.75
5	176.0
6	184.0
7	192.0
8	200.0
9	208.0
10	216.0
11	116.25
C	128.75
D	140.75
E	152.75
F	164.75
G	176.75
H	188.75
I	200.75
J	212.75
K	224.75
L	236.75
M	248.75
N	260.75
O	272.75
P	284.75
Q	296.75
H1	308.25
H2	311.25
H3	319.25
H4	327.25
H5	335.25
H6	343.25
H7	351.25
H8	359.25
H9	367.25
H10	375.25
H11	383.25
H12	391.25
H13	399.25
H14	407.25
H15	415.25
H16	423.25
H17	431.25
H18	439.25
H19	447.25
21	471.25
22	479.25
23	487.25
24	495.25
25	503.25
26	511.25
27	519.25
28	527.25
29	535.25
30	543.25
31	551.25
32	559.25
33	567.25
34	575.25
35	583.25
36	591.25
37	599.25
38	607.25
39	615.25
40	623.25
41	631.25
42	639.25
43	647.25
44	655.25
45	663.25
46	671.25
47	679.25
48	687.25
49	695.25
50	703.25
51	711.25
52	719.25
53	727.25
54	735.25
55	743.25
56	751.25
57	759.25
58	767.25
59	775.25
60	783.25
61	791.25
62	799.25
63	807.25
64	815.25
65	823.25
66	831.25
67	839.25
68	847.25
69	855.25

ITALY

CANALE	FREQ (MHz)
A	53.75
B	61.75
C	82.25
D	175.25
E	183.75
F	192.25
G	201.25
H	210.25
H1	217.25
S1	105.25
S2	112.25
S3	119.25
S4	126.25
S5	133.25
S6	140.25
S7	147.25
S8	154.25
S9	161.25
S10	168.25
S11	231.25
S12	238.25
S13	245.25
S14	252.25
S15	259.25
S16	266.25
S17	273.25
S18	280.25
S19	287.25
S20	294.25
H1	303.25
H2	311.25
H3	319.25
H4	327.25
H5	335.25
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H12	391.25
H13	399.25
H14	407.25
H15	415.25
H16	423.25
H17	431.25
H18	439.25
H19	447.25
H20	455.25
H21	463.25
H22	471.25
H23	479.25
H24	487.25
H25	495.25
H26	503.25
H27	511.25
H28	519.25
H29	527.25
H30	535.25
H31	543.25
H32	551.25
H33	559.25
H34	567.25
H35	575.25
H36	583.25
H37	591.25
H38	599.25
H39	607.25
H40	615.25
H41	623.25
H42	631.25
H43	639.25
H44	647.25
H45	655.25
H46	663.25
H47	671.25
H48	679.25
H49	687.25
H50	695.25
H51	703.25
H52	711.25
H53	719.25
H54	727.25
H55	735.25
H56	743.25
H57	751.25
H58	759.25
H59	767.25
H60	775.25
H61	783.25
H62	791.25
H63	799.25
H64	807.25
H65	815.25
H66	823.25
H67	831.25
H68	839.25
H69	847.25
H70	855.25

GB

The frequencies used by a cable company may differ from the frequencies on the table. Consult your cable company or your dealer for detailed information.

D

In Kabelfernsehanlagen können Abweichungen von den in den Frequenztabellen aufgeführten Frequenzen vorkommen. Bitte wenden Sie sich an Ihren Fachhändler oder Ihre Kabelfernsehgeseellschaft, die Ihnen die zutreffenden Frequenzen mitteilt.

F

Les fréquences utilisées par une société de télédistribution peuvent être différentes de celles sur la liste des fréquences. Consultez votre société de télédistribution ou votre revendeur pour des informations plus détaillées.

NL

De frequenties die gebruikt worden door een kabelmaatschappij kunnen verschillen van deze op de tabel. Raadpleeg uw kabelexploitant of uw handelaar voor meer informatie.

I

Le frequenze usate per una società di tele Distribuzione possono essere differenti di

4. Mechanical Instructions

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

4.1 Access to the Service Connector (for ComPair)

1. Remove the 'Service Connector' cover (see Figure 4.1).
2. Connect the ComPair cable (for more info, see chapter 5).
3. Start ComPair and perform the diagnosis.

4.2 Rear Cover Removal

1. Remove all fixation screws [A] of the rear cover.
2. Use a knife (or other thin blade) to release the four fixation clamps [B] at the top of the TV-set. Press down until you here a click.
3. Now remove the rear cover.

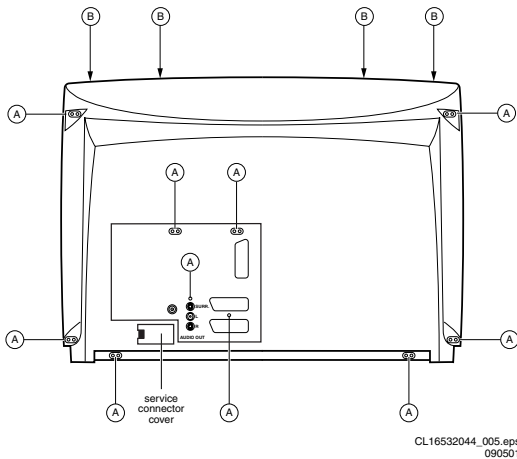


Figure 4-1 .eps

4.3 Print Removal

4.3.1 Large Signal Panel (LSP)

Service position 1: For better accessibility of the LSP, do the following (see Figure 4.2):

1. Remove the LSP-bracket from the bottom tray by pulling it backwards.
2. Hook the bracket in the first row of fixation holes of the bottom tray. In other words, reposition the bracket from [1] to [2].

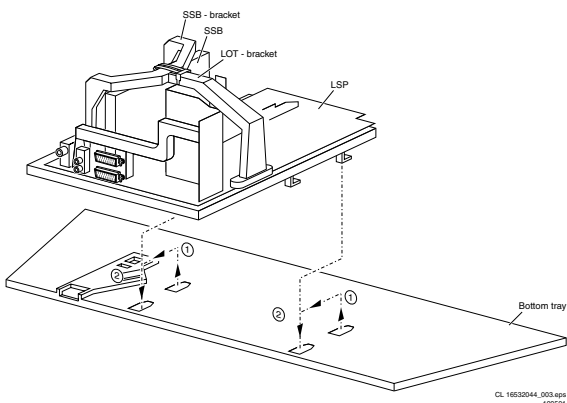


Figure 4-2 .eps

Service position 2: To get access to the bottom side (solder side) of the LSP, do the following (see Figure 4.3):

1. To disconnect the degaussing coil from the LSP, remove the cable from connector 1502 [1].
2. Release the wiring from their fixation clamps, in order to get room for repositioning the LSP.
3. Flip the LSP 90 degrees clockwise [2], and place it in the fixation hole at the left side of the bottom tray [3].

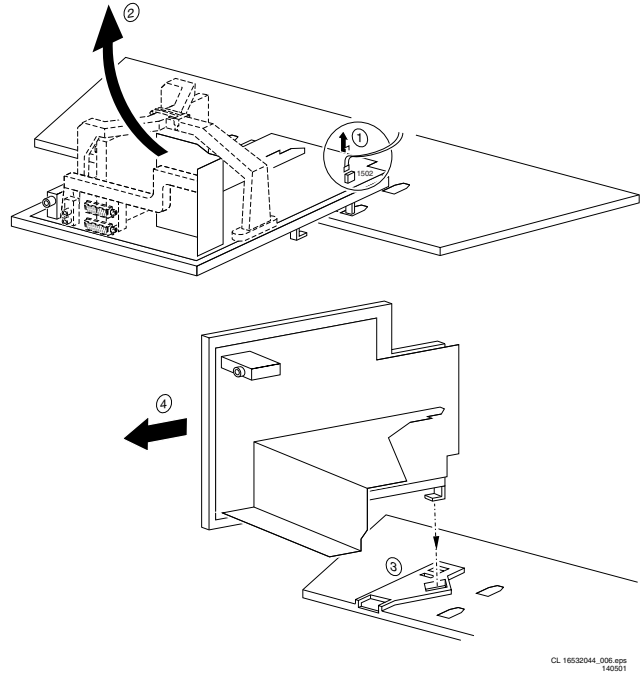


Figure 4-3 .eps

4.3.2 3rd SCART Panel

To remove the 3rd SCART module, do the following:

1. Remove the fixation screw [1].
2. To release the fixation peg, push it towards the CRT [2].
3. At the same time, pull the complete module away from the LSP [3]. It hinges in the LSP-bracket.
4. To remove the panel, disconnect the flat-cable from connector 1680 and remove the four panel screws [4].

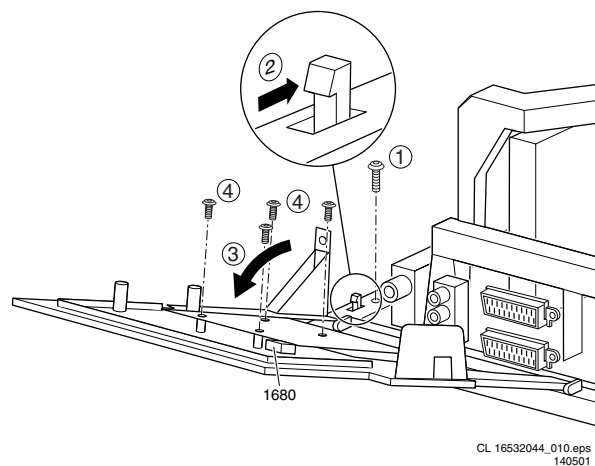


Figure 4-4 .eps

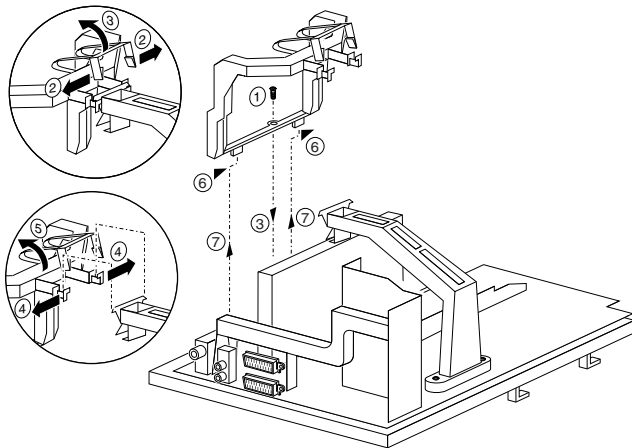
4.3.3 Small Signal Board (SSB)

In fact, there is no predefined service position for the SSB. Most test points are located on the A-side (side that is facing the tuner).

If you have to replace ICs, you must take the complete SSB module out of the SIMM-connector.

To get access to the SSB test points, do the following:

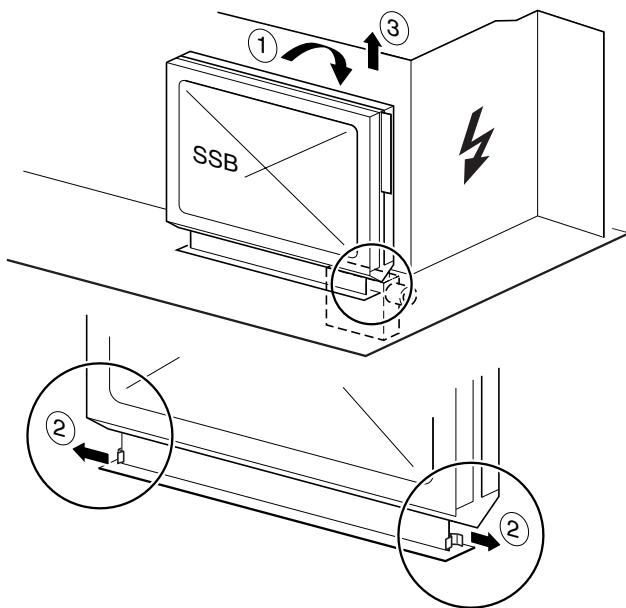
1. Put the LSP in service position 1 (as described above).
2. Remove the fixation screw, which holds the SSB-bracket [1].
3. Release the clamping jaw at the top of the SSB bracket [2] and [3].
4. Push the two clamping lugs outwards, and pull the top of the bracket at the same time upwards [4] and [5].
5. Now you can remove the complete bracket. Push it, at the height of the LSP-bracket, towards the CRT [6] and lift it out of the LSP-bracket [7].



CL 16532044_027.eps
160501

Figure 4-5 .eps

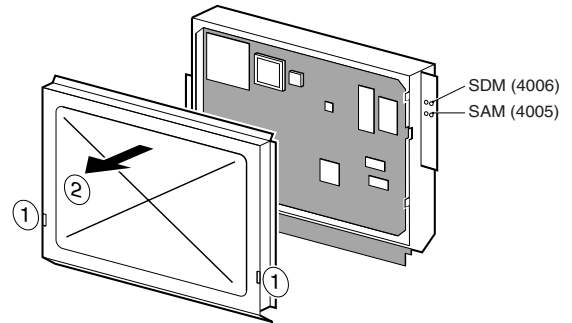
1. Push the top of the SSB towards the LOT [1].
2. Due to the pressure, the two metal clamps at both sides of the SIMM-connector will release [2].
3. Take the complete SSB out [3].



CL 16532044_007.eps
090501

Figure 4-6 .eps

1. Once you have taken out the SSB, remove the A-side shielding [2]. Sometimes it is necessary to unsolder some solder-tags first [1].
2. Now replace the SSB module in the SIMM-connector in reverse order.



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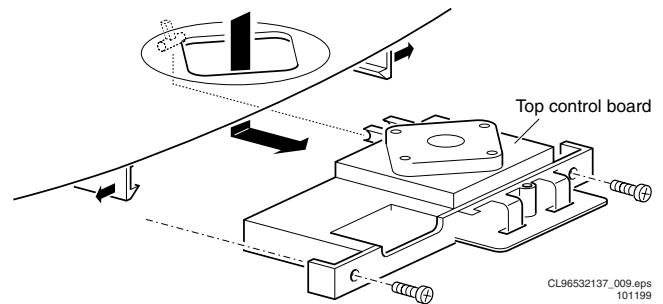
Figure 4-7

Note 1: For better access to the SSB, it is possible to order an 'extension board' under number 9965 000 07933.

Note 2: If necessary for the measurement, put the LSP in 'service position 2' (as described above).

4.3.4 Top Control Panel

1. Remove the two fixation screws.
2. Pull the board backward.

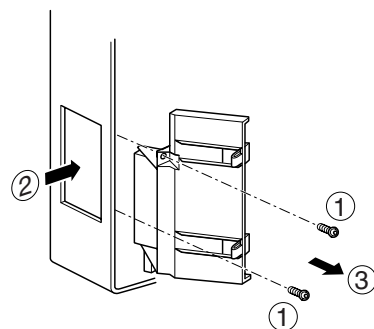


CL96532137_009.eps
101199

Figure 4-8

4.3.5 Side I/O Panel

1. Remove the two fixation screws [1].
2. Push the panel door inside and fix it in the lock [2].
3. Pull the module backward [3].
4. Now release the fixation clamps, in order to remove the print from its bracket.

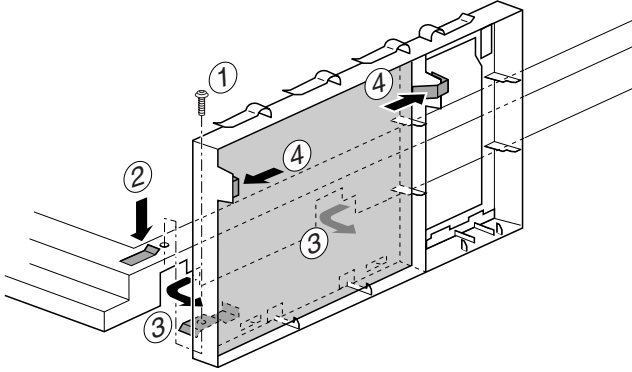


CL 16532044_009.eps
090501

Figure 4-9 .eps

4.3.6 DAF Panel

1. Remove the fixation screw [1].
2. Push down the fixation clamp [2], and pull the complete bracket at the same time away from the CRT [3]. The module is now free from the LSP-bracket.
3. Release the fixation clamps [4], in order to remove the print from its bracket.

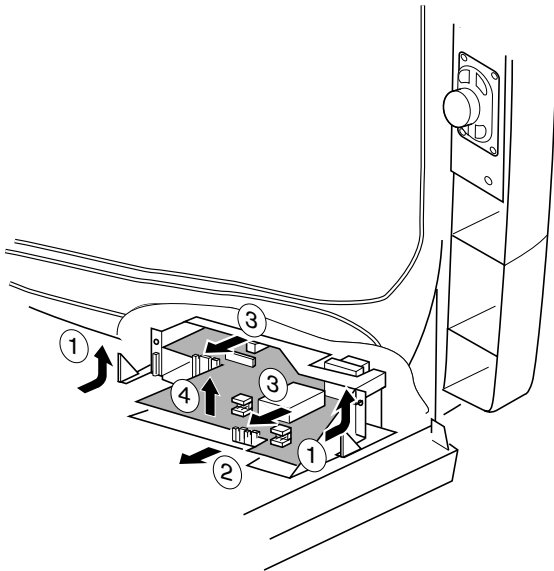


CL 16532044_011.eps
150501

Figure 4-10 .eps

4.3.7 Mains Switch / LED Panel

1. Release the two fixation clamps by pushing them upward [1].
2. At the same time, pull the complete assy backward [2].
3. Now release the two fixation clamps [3], in order to remove the print from its bracket [4].



CL 16532044_012.eps
090501

Figure 4-11 .eps

4.4 Rear Cover Assembly

Before you re-assemble the rear cover, perform the following checks:

- Check whether the mains cord is mounted correctly in the guiding brackets.
- Check whether all cables are placed in fixation clamps. This is very important due to the large 'hot' area of the set.

Note: If necessary, you can replace the light guide.

5. Service Modes, Error Codes and Fault Finding

Index of this chapter:

1. Test points.
2. Service Modes.
3. Problems and solving tips (related to CSM).
4. ComPair.
5. Error buffer.
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. They refer to the diagram letters. 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.

Measurements are performed under the following conditions:

- Service Default Mode.
- Video: colour bar signal.
- Audio: 3 kHz left, 1 kHz right.

5.2 Service Modes

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

5.2.1 Service Default Mode (SDM)

Purpose

- To create a pre-defined 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.
- Colour system: SECAM L for France or PAL B/G for the rest of Europe.
- All picture settings at 50 % (brightness, colour, contrast).
- All sound settings at 50 %, except volume at 25 %.
- All service-unfriendly modes (if present) are disabled, like:
 - (sleep) timer,
 - child/parental lock,
 - blue mute,
 - automatic volume limiter (AVL),
 - auto switch-off (when no 'IDENT' video signal was received for 10 minutes),
 - skip/blank of non-favorite pre-sets,
 - smart modes,
 - auto store of personal presets,
 - auto user menu time-out.

How to enter SDM

Use one of the following methods:

- Via a standard customer RC-transmitter : key in the code '062596' followed by the 'MENU' button (it is possible that, together with the SDM, the main menu will appear. To switch it off, push the 'MENU' button again).
- When you press the 'DEFAULT' button on the Dealer Service Tool (DST or RC7150) while the set is in the normal operation mode.
- When you shorten for a moment (⌚) the two solder pads on the 'external part' of the SSB print (see Figure 7 in Chapter 4), with the indication SDM (item 4006).

Activation can be performed in all modes, except when the set has a problem with the main-processor.

- Via ComPair.

* **Caution:** If the SDM is entered via the pins, all the software-controlled protections are de-activated.

After entering SDM, the following screen will be shown, with 'Service Default' at the lower right side for recognition.



CL 16532044_031.eps
140501

Figure 5-1

How to navigate

When you press the 'MENU' button on the RC transmitter, the set will toggle between the SDM and the normal user menu (with the SDM mode still active in the background).

How to exit SDM

Use one of the following methods:

- Switch the set to STANDBY (⏻) via the RC-transmitter, or
- Press the 'EXIT' button on the DST.

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.

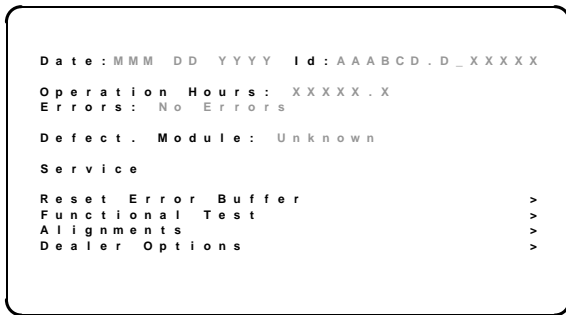
How to enter SAM

Use one of the following methods:

- Via a standard RC transmitter: key in the code '062596' directly followed by the OSD [i+] button, or
- When you press the ALIGN button on the DST while the set is in the normal operation mode, or
- When you shorten for a moment (⌚) the two solder pads on the 'external part' of the SSB print (see Figure 7 in Chapter 4), with the indication SAM (item 4005).
Activation can be performed in all modes, except when the set has a problem with the main-processor.
- Via ComPair.

* **Caution:** If the SAM is entered via the pins, all the software-controlled protections are de-activated.

The following screen will be shown, with SAM at the upper right side for recognition.



CL16532044_032.eps
140501

Figure 5-2

- **Date** Displays the software date.
- **ID** Displays the software version of the ROM. Example: EM3E11.0_01234 (AAABCD.D_XXXXX)
 - A = the chassis name (EM3).
 - B = the region: E = Europe, A = Asia Pacific, U = NAFTA, L = LATAM.
 - C = the language cluster number.
 - D = the main software version number.
 - X = latest 5 digits of 12nc code software.
- **SAM** Indication of the actual mode.
- **Operation Hours** Displays the accumulated total of operation hours (not the standby hours).
- **Errors** (followed by maximal 10 errors) The most recent error is displayed at the upper left (for an error explanation see paragraph 5.5.4).
- **Defect. Module** Here the module that generates the error is displayed. If there are multiple errors in the buffer that have not all been generated by a single module, there is probably another defect. It will then display the message 'Unknown' here.
- **Reset Error Buffer** When you press the 'OK' button, the error buffer is reset.
- **Functional Test** All devices are tested via the 'OK' button. Eventual errors are displayed in the error buffer. The error buffer is not erased, the content returns when this test is terminated.
- **Alignments** This will activate the Alignments sub-menu.
- **Dealer Options** Extra features for the dealers.
- **Errors** (followed by maximal 10 errors) The most recent error is displayed at the upper left (for an error explanation see paragraph 5.5.4).
- **Defect. Module** Here the module that generates the error is displayed. If there are multiple errors in the buffer that have not all been generated by a single module, there is probably another defect. It will then display the message 'Unknown' here.
- **Reset Error Buffer** When you press the 'OK' button, the error buffer is reset.
- **Functional Test** All devices are tested via the 'OK' button. Eventual errors are displayed in the error buffer. The error buffer is not erased, the content returns when this test is terminated.
- **Alignments** This will activate the Alignments sub-menu.
- **Dealer Options** Extra features for the dealers.

How to navigate

- In SAM, you can select the menu items with the CURSOR UP/DOWN key on the RC-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 [i+]' button.

- When you press the 'MENU' key in a submenu, you will return to the previous menu.

How to exit SAM

Use one of the following methods:

- Press the 'MENU' button on the RC-transmitter, or
- Switch the set to STANDBY (⏻) via the RC-transmitter, or
- Press the 'EXIT' button on the DST.

5.2.3 Customer Service Mode (CSM)

Purpose

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

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

How to enter CSM

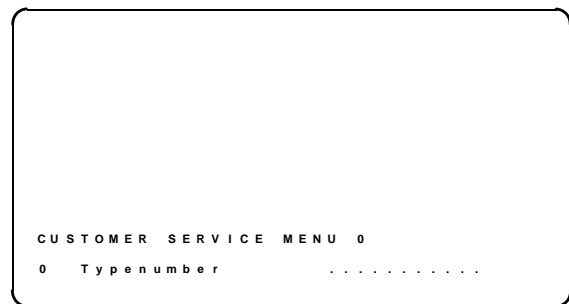
Use one of the following methods:

- Press the 'MUTE' button on the RC-transmitter **simultaneously** with the 'MENU' button on the TV (top control) for, at least 4 seconds.
- Key in the code '123654' via the standard RC transmitter.

Note 1: Activation of the CSM is only possible if there is no (user) menu on the screen !

Note 2: If you do not point the RC-transmitter correctly to the RC-receiver in the set, and you push the 'MENU' button for more than 6 s, the TV starts in 'demo' mode. To leave this mode, push 'MENU' again for more than 6 s.

After activation of the Customer Service Menu, the following screen (Customer Service Menu 0) will appear:



CL16532044_033.eps
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Figure 5-3

- Line 0 - **Type number** (e.g. 28PW8807/12) This information is very helpful for a helpdesk/workshop as reference for further diagnosis. In this way, it is not necessary for the customer to look at the rear of his TV-set.

By means of the 'CURSOR-DOWN' knob on the RC-transmitter the Customer Service Menu 1 will appear. By means of the 'CURSOR-UP' knob on the RC-transmitter the Customer Service Menu 0 will appear again.

Customer Service Menu 1 represents following information:

CUSTOMER SERVICE MENU 1		
1	SW Version	.....
2	Code 1	.....
3	Code 2	.....
4	LS Volume	..
5	LS Brightness	..
6	LS Contrast	..
7	LS Colour	..
8	LS Headphone	..
9	Sharpness	..
10	Dolby	.....
11	Surround Mode	.....
11a	Tuner Frequency	.....

CL16532044_034.eps
140501

Figure 5-4

- Line 1 - **Software version** (e.g. EM3E11.0_XXXXX) The build in software version. You will find details of the software versions in the chapter 'Software Survey' of the 'Product Survey - Colour Television' publication. This publication is generated four times a year.
- Line 2 - **Code 1** Gives the last 5 errors of the error buffer. As soon as the built-in diagnose software has detected an error the buffer is adapted. See paragraph 5.5.4 for a description.
- Line 3 - **Code 2** Gives the first 5 errors of the error buffer. As soon as the built-in diagnose software has detected an error the buffer is adapted. The last occurred error is displayed on the leftmost position of code 2. Each error code is displayed as a 3 digit number. When less than 10 errors occur, the rest of the line(s) is (are) empty. In case of no errors the text 'No Errors' is displayed. See paragraph 5.5.4 for a description.
- Line 4 - **LS Volume** Gives the Last Status of the volume as set by the customer for this selected transmitter. The value can vary from 0 (volume is minimum) to 36 (volume is maximum). Volume values can be changed via the volume key on the RC-transmitter.
- Line 5 - **LS Brightness** Gives the Last Status of the brightness as set by the customer for this selected transmitter. The value can vary from 0 (brightness is minimum) to 63 (brightness is maximum). Brightness values can be changed via the 'CURSOR LEFT' and 'CURSOR RIGHT' keys on the RC-transmitter after pressing the 'MENU' button and selecting 'PICTURE' and 'BRIGHTNESS'.
- Line 6 - **LS Contrast** Gives the Last Status of the contrast as set by the customer. The value can vary from 0 (contrast is minimum) to 63 (contrast is maximum). Contrast values can be changed via 'CURSOR LEFT' and 'CURSOR RIGHT' keys on the RC-transmitter after pressing the 'MENU' button and selecting 'PICTURE' and 'CONTRAST'.
- Line 7 - **LS Colour** Gives the Last Status of the colour saturation, as set by the customer. The value can vary from 0 (colour is minimum) to 63 (colour is maximum). Colour values can be changed via 'CURSOR LEFT' and 'CURSOR RIGHT' keys on the RC-transmitter after pressing the 'MENU' button and selecting 'PICTURE' and 'COLOUR'.
- Line 8 - **LS Headphone** Gives the Last Status of the headphone volume, as set by the customer. The value can vary from 0 (volume is minimum) to 24 (volume is maximum). Headphone volume values can be changed via the 'CURSOR LEFT' and 'CURSOR RIGHT' keys on the RC-transmitter after pressing the 'MENU' button and selecting 'SOUND' and 'HEADPHONE'.
- Line 9 - **Sharpness** Gives the sharpness value. The value can vary from 0 (sharpness is minimum) to 7 (sharpness is maximum). In case of bad antenna signals a too high value of the sharpness can result in a noisy picture. Sharpness values can be changed via the 'CURSOR LEFT' and 'CURSOR RIGHT' keys on the RC-

transmitter after pressing the 'MENU' button and selecting 'PICTURE' and 'SHARPNESS'.

- Line 10 - **Dolby** Indicates whether the received transmitter transmits Dolby sound (present) or not (not present). Attention: The presence of Dolby can only be tested by the software on the Dolby Signalling bit. If a Dolby transmission is therefore received without a Dolby Signalling bit, then this indicator will show 'not present' even though such a Dolby transmission is received.
- Line 11 - **Surround Mode** Indicates the by the customer selected surround mode (or automatically chosen mode). In case the set is a Non-Dolby set there will be displayed '0'. If it is a Dolby-set then is displayed: 'Stereo', '3D Surround', 'Dolby Pro Logic', 'Dolby 3 Stereo' or 'Hall'. These settings can be influenced by toggling the surround mode button on remote control (white button). It can also have been selected automatically by signalling bits (internal software)
- Line 11a - **Tuner Frequency** Indicates the frequency the selected transmitter is tuned to. The tuner frequency can be changed via the 'CURSOR LEFT' and 'CURSOR RIGHT' keys for fine tune or by entering directly with the digit keys 0 to 9 on the RC-transmitter after opening the installation menu and selecting 'MANUAL INSTALLATION'. The installation menu can be opened by pressing 'TIMER' and 'ENLARGE' at the same time.

By means of the 'CURSOR-DOWN' knob on the RC-transmitter the Customer Service Menu 2 will appear. By means of the 'CURSOR-UP' knob on the RC-transmitter the Customer Service Menu 1 will appear again.

Customer Service Menu 2 represents following information:

CUSTOMER SERVICE MENU 2		
13	Centre Volume	..
14	DNR	..
15	Noise Figure	..
16	Digital Option	..
17	Colour System	.....
18	TV System	.....
19	Audio System	.....
20	Tuned bit	.....
21	Speaker Config.	.....
22	Digital Sources	.....

CL16532044_035.eps
140501

Figure 5-5

- Line 13 - **Centre Volume** Not valid in this chassis. Must be 0.
- Line 14 - **DNR** Not valid.
- Line 15 - **Noise Figure** Gives the noise ratio for the selected transmitter. This value can vary from 0 (good signal) to 127 (average signal) and to 255 (bad signal).
- Line 16 - **Digital Option** Gives the selected digital mode, '100 HZ', 'DIGITAL SCAN', 'NATURAL MOTION' or 'DOUBLE LINES'. Change via the 'CURSOR LEFT' and 'CURSOR RIGHT' keys on the RC-transmitter, after pressing the 'MENU' button and selecting 'PICTURE', 'DIGITAL OPTIONS'.
- Line 17 - **Colour System** Gives information about the colour system of the selected transmitter.
 - Black and white: No colour carrier received
 - PAL: PAL signal received
 - SECAM: SECAM signal received
 - NTSC: NTSC signal received
- Line 18 - **TV System** Gives information about the video system of the selected transmitter.
 - BG: BG signal received
 - DK: DK signal received
 - I: PAL I signal received
 - L: SECAM L signals received

- M38.9: NTSC M signal received with video carrier on 38.9 MHz
- Line 19 - **Audio System** Gives information about the audio system of the selected transmitter.
 - Sound Muted: No sound
 - Dolby Pro Logic: Dolby Pro Logic sound received
 - Mono: Mono sound received
 - Stereo: Stereo sound received
 - Dual I: Language I received
 - Dual II: Language II received
 - Digital Mono: Digital mono sound is received
 - Digital Stereo: Digital stereo sound is received
 - Digital Dual I: Digital language I is received
 - Digital Dual II: Digital language II is received
- Line 20 - **Tuned bit** Gives information about the tuning method of the stored pre-set. If a channel is found via 'automatic installation' you will see the value 'Off'. When you change this (automatically found) frequency via 'fine tune' adjustment (installation menu - manual installation), the displayed value will change to 'On'. So when you see the value 'On' in this line, it is an indication that the received channel is a non-standard signal (e.g. of a VCR).
- Line 21 - **Speaker config.** Gives the speaker configuration settings. In case the set is a non-Dolby set, it displays '0'. If it is a Dolby-set, it displays: 'FULL INTERNAL', 'L/R EXTERNAL', 'SURROUND EXTERNAL' or 'FULL EXTERNAL'. Change the speaker configuration (for a Dolby-set), via the 'CURSOR LEFT' and 'CURSOR RIGHT' keys on the RC-handset after opening the 'INSTALLATION' menu and selecting 'SETUP'. Open the 'INSTALLATION' menu by pressing the 'TIMER' and 'ENLARGE' buttons at the same time.
- Line 22 - **Digital Sources** Gives the configuration setting for the digital source. It displays: 'FRONT', 'EXT1', 'EXT2', 'EXT3' or 'NONE'. If one of these is selected, the starting point is a top quality signal on that input and a number of settings are therefore changed automatically. Change the digital source via the 'CURSOR LEFT' and 'CURSOR RIGHT' keys on the RC-transmitter after opening the installation menu and selecting 'SETUP'. The installation menu can be opened by pressing 'TIMER' and 'ENLARGE' at the same time.

How to exit CSM

Use one of the following methods:

- After you press a key on the RC-transmitter (with exception of the 'CHANNEL' and 'VOLUME' keys), or
- After you switch the TV-set 'OFF' with the mains switch.

5.3 Problems and Solving Tips (related to CSM)

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 above. The new value(s) are automatically stored.

5.3.1 Picture Problems

Worse picture quality in case of DVD pictures

Check line 22 'Digital sources'. In case line 22 gives the indication 'Not Present', change the setting into 'Present' (via the 'installation' menu).

Snowy/noisy picture

1. Check line 15 'Noise Figure'. In case the value is 127 or higher and the value is also high on other programs, check the aerial cable/aerial system.
2. Check lines 9 'Sharpness' and 15 'Noise Figure'. In case the value of line 9 is 3 or 4 and the value of line 15 is high (127 or higher), decrease the 'Sharpness' value.

Picture too dark

1. Press 'Smart Picture' button on the RC-transmitter. In case the picture improves, increase the 'Brightness' or the 'Contrast' value. The new value(s) are automatically stored (in 'personal' pre-set) for all TV channels.
2. Check lines 5 'LS Brightness' and 6 'LS Contrast'. If the value of line 5 is low (< 10) or the value of line 6 is low (< 10), increase the 'Brightness' or the 'Contrast' value.

Picture too bright

1. Press 'Smart Picture' button on the RC-transmitter. In case the picture improves, decrease the 'Brightness' or the 'Contrast' value. The new value(s) are automatically stored (in 'personal' pre-set) for all TV channels.
2. Check lines 5 'LS Brightness' and 6 'LS Contrast'. If the value of line 5 is high (> 40) or the value of line 6 is high (> 50). Decrease the 'Brightness' value or increase the 'Contrast' value.

White line around picture elements and text

1. Press 'Smart Picture' button on the Remote Control. In case the picture improves, decrease the 'Sharpness' value. The new value is automatically stored (in 'personal' pre-set) for all TV channels.
2. Check line 9 'Sharpness'. Decrease the 'Sharpness' value. The new value is automatically stored for all TV channels.

No picture

Check line 20 'Tuned bit'. In case the value is 'On', install the required program again. Open the installation menu by pressing 'timer' and 'enlarge' at the same time and perform manual installation.

Blue picture

No proper signal is received. Check the aerial cable/aerial system.

Blue picture and/or unstable picture

A scrambled or decoded signal is received.

Black and white picture

Check line 7 'LS Colour'. In case the value is low (< 10) increase the 'Colour' value. The new value is automatically stored for all TV channels.

No colours/colour lines around picture elements

1. Check lines 17 'Colour System' and 18 'TV System'. If a 'strange' system pop's up, something has gone wrong during installation. Re-install the channel.
2. In case line 17 is 'PAL' and line 18 is 'L', the installed system for this pre-set is 'France', while 'West Europe' is required. Install the required program again: open the installation menu by pressing 'timer' and 'enlarge' at the same time and perform manual installation. Select system 'West Europe'.

Colours not correct

Check lines 17 'Colour System' and 18 'TV System'. In case line 17 is 'PAL' and line 18 is 'L', the installed system for this pre-set is 'France', while 'West Europe' is required. Install the required program again: open the installation menu by pressing 'timer' and 'enlarge' at the same time and perform manual installation. Select 'System; West Europe'.

Colours not correct/unstable picture

Check lines 17 'Colour System' and 18 'TV System'. In case line 17 is 'SECAM' and line 18 is 'BG', the installed system for this pre-set is 'West Europe', while 'France' is required. Install the required program again: open the installation menu by pressing 'timer' and 'enlarge' at the same time and perform manual installation. Select 'System; France'.

Unstable picture

Check lines 17 'Colour System' and 18 'TV System'. In case line 17 is 'SECAM' and line 18 is 'M 38,9', the installed system for this pre-set is 'West Europe', while 'France' is required. Install the required program again: open the installation menu by pressing 'timer' and 'enlarge' at the same time and perform manual installation. Select 'System; France'.

Menu text not sharp enough

1. Press 'Smart Picture' button on the RC-transmitter. In case picture improves, Decrease the contrast value. The new value(s) are automatically stored for all TV channels.
2. Check line 7 'LS Contrast'. The value of line 7 is high (> 50). Decrease the contrast value.

5.3.2 Sound Problems**No sound from left and right speaker**

1. Check line 4 'LS Volume'. The value is low. Increase the value of 'Volume'. The new value(s) are automatically stored (in 'personal' pre-set) for all TV channels.

Sound too loud for left and right speaker

1. Check line 4 'LS Volume'. The value is high. Decrease the value of 'LS Volume'. The new value(s) are automatically stored (in 'personal' pre-set) for all TV channels.

5.4 ComPair**5.4.1 Introduction**

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

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

5.4.2 Specifications

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

In case of the EM3E chassis, the ComPair interface box and the TV communicate via a bi-directional service cable via the service connector.

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

- Automatic (by communication with the television): ComPair can automatically read out the contents of the entire error buffer. Diagnosis is done on I²C level. ComPair can access the I²C bus of the television. ComPair can send and receive I²C commands to the micro controller of the television. In this way, it is possible

for ComPair to communicate (read and write) to devices on the I²C busses of the TV-set.

- Manually (by asking questions to you): Automatic diagnosis is only possible if the micro controller of the television is working correctly and only to a certain extent. When this is not the case, ComPair will guide you through the faultfinding tree by asking you questions (e.g. *Does the screen give 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 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 Stepwise Start Up / Shut Down

Under normal circumstances, a fault in the power supply, or an error during start-up, will switch the television to protection mode. ComPair can take over the initialisation of the television. In this way it is possible to distinguish which part of the start-up routine (hence which circuitry) is causing the problem.

Stepwise start up explanation

This is realised via ComPair and is very helpful when a **protection** is activated (see also chapter 5.7).

State	Description mode	Display LED (Red)	Enabled protection
0	Low power stbby: 5V2/3V3 present, uP in stbby-mode	On	None
1	High power Stbby: TV-set in stbby-mode	Wait 1s, flash 1 x	None
2	SSB is powered by stbby-supply (5V/8V). Degaussing (12 s) has been activated.	Wait 1s, flash 2 x	4 & 5
3	Semi stbby-mode: HIP, HOP, MSP and Tuner initialized leading to semi stbby-mode.	Wait 1s, flash 3 x	Plus 1, 6 & 18
4	All ICs are initialized, HOP activates the main supply, EHT-generation starts, black current stabilization is on	Wait 1s, flash 4 x	Plus 2 & 16
5	TV On: TV-set operates, un-blanked picture.	Wait 1s, flash 5 x	

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140501

Figure 5-6

Stepwise shut down explanation

In the stepwise shutdown mode, state 2 is skipped (it is not possible to de-initialise ICs).

State	Description mode	Display LED (Red)	Disabled protections
5	TV On: TV-set operates, un-blanked picture	Wait 1s, flash 5 x	-
3	Semi stdby-mode: SSB is powered by the stdby-supply	Wait 1s, flash 3 x	18, 16, 6, 2 & 1
1	High power stdby: TV-set in stdby-mode	Wait 1s, flash 1 x	4 & 5
0	Low power stdby: 5V2/3V3 present, uP in stdbymode	On	

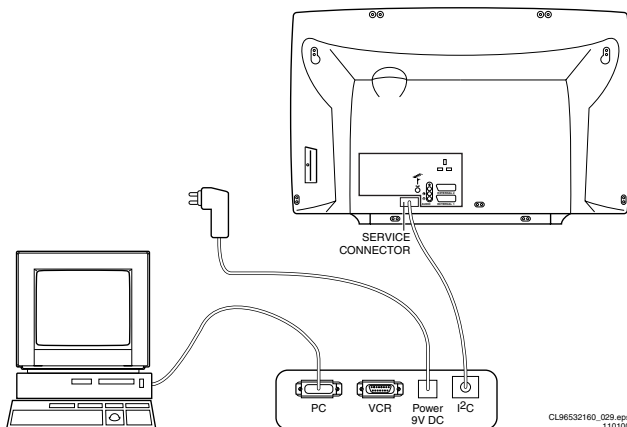
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Figure 5-7

Note: When the set is in stepwise mode and, due to stepping-up, a protection is activated, the set will really go into protection (blinking red LED). The set will not leave the stepwise-mode however. By stepping up, the set can be activated again, until state X where the protection was activated. At state (X-1) diagnostic measurements can be performed.

5.4.4 How To Connect

1. First install the ComPair Browser software (see the Quick Reference Card for installation instructions).
2. Connect the RS232 interface cable between a free serial (COM) port of your PC and the PC connector (marked with 'PC') of the ComPair interface.
3. Connect the mains adapter to the supply connector (marked with 'POWER 9V DC') of the ComPair interface.
4. Switch the ComPair interface 'OFF'.
5. Switch the television set 'OFF' with the mains switch.
6. Connect the ComPair interface cable between the connector on the rear side of the ComPair interface (marked with 'I²C') and the ComPair connector at the rear side of the TV (situated just below the tuner input, see also chapter 4).
7. Plug the mains adapter in a mains outlet, and switch the interface 'ON'. 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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Figure 5-8

5.4.5 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**5.5.1 Introduction**

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.

5.5.2 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.

5.5.3 How to Clear the Error Buffer

Use one of the following methods:

- By activation of the 'RESET ERROR BUFFER' command in the SAM menu:
- When you transmit the commands 'DIAGNOSE' - '99' - 'OK' with ComPair (or with a DST).
- If the content of the error buffer has not changed for 50 hours, it resets automatically.

5.5.4 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	Device	Description	Defective item	Diagram	Defect. module indication
1	ST24E32	NVM, spontaneous blinking 1-1-1..	7011	B5	Control
2	H fail protection	HFB			Horizontal Flyback Or HW-protection due to: - ARC_PROT - BRIDGE_PROT - NON_VFB PROT
3	SAA4978	PICNIC	7709	B3	Feature Box
4	Supply 5 V	5V2 protection		B5	+5 V Supply
5	Supply 8 V	8V6 protection		B5	+8 V Supply
6	Slow I ² C-bus blocked	Slow I ² C-bus blocked, spontaneous blinking 6-6-6..			Slow I ² C blocked
7	TDA9330	HOP video control/geometry	7301	B4	Video Controller
8	TDA9320	HIP I/O video processing	7323	B2	Chroma IF IO
9	PCF8574	Wireless expander			
10	Reserved				
11	Reserved				
12	TDA9178	LTP Peaking			Video Controller
13	UV1316/TEDE9	Tuner	U1200	A8	Tuner
14	MSP34xx	Sound processor + Dolby	7651	B6	Audio Module
15	Reserved				
16	Featurebox protection	Featurebox protection		B3	+3 V (FBX) supply
17	Reserved				
18	Fast I ² C-bus blocked	Fast I ² C-bus blocked, spontaneous blinking 18-18-18..			Fast I ² C blocked

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Figure 5-9

Note: Error codes 1, 6 or 18 are protection codes and in this case, supplies of some circuits will be switched off. Also in protection, the LED will blink the number of times equivalent to the most recent error code.

5.6 The Blinking LED Procedure

5.6.1 Introduction

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

When the SDM is entered, the front LED will show (blink) the contents of the error-buffer. Error-codes ≥ 10 are shown as follows:

- a long blink of 750 ms (which is an indication of the decimal digit),
- a pause of 1.5 s,
- n short blinks (where 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: Error **12 9 6 0 0**.

After activation of the SDM, the red front LED will show:

- 1 long blink of 750 ms (which is an indication of the decimal digit) 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.

Note 1: If errors 1, 6 or 18 occur, the LED *always* gives the last occurred error even if the set is NOT in service mode.

Note 2: If on the DST the text 'ERROR 2' is displayed, the communication from the TV to the DST has failed.

5.6.2 How to Enter

Use one of the following methods:

- Enter the SDM. The blinking red front LED will show the contents of the error buffer (this works only in 'normal operation' mode).
- Transmit the commands 'DIAGNOSE' - '0' - 'OK' with a DST/ComPair (this works both in 'Standby mode' and 'protection' mode). The complete error buffer is shown.
- Via the 'DIAGNOSE' - 'X' - 'OK' function on the DST/ComPair (where X is a number between 1 and 5):
 1. Press the 'DIAGNOSE' button on the DST (possible in all modes except SAM).
 2. Press '1' to view the last detected error (or '2', etc. to show the errors before).
 3. Press the 'OK' button. The red front LED will now give the requested error.

5.7 Protections

5.7.1 Introduction

The EM3E has only one micro-processor (OTC), which remains active during Standby. This because power of the microprocessor and the attached memory chip set is coming from the 3V3 supply, which is derived from the 5V Standby-circuitry (via stabiliser 7005). So in both Power-on as in Standby mode the microprocessor is connected to this power supply.

If a fault situation is detected, an error code will be generated and if necessary, the set is put in protection mode. The protection mode is indicated by the blinking of the red front LED at a frequency of 3 Hz (or by a coded blinking in special cases). In some error cases however, the micro processor does not put the set in the protection mode (this is the case with the - hardware - loudspeaker protection of the audio amplifier).

The content of the error buffer can be read via the service menu (SAM), the blinking LED procedure or via DST/ComPair.

The DST/ComPair 'diagnose' functionality will force the set into the 'Service Standby', which is alike the usual Standby, however the microprocessor remains completely in normal operation.

To get a quick diagnosis the EM3E has 3 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). In this mode items of the set can be adjusted via a menu and with the help of test patterns.

Both SDM & SAM modes can be entered via the 'service pads' on the SSB (see Figure 4-7), via an RC-transmitter (DST or standard RC) or via ComPair. It is not possible to enter the SAM in Standby, the set has to be in 'normal operation' mode.

The EM3E 'Protection Diagram' shows the structure of the protection system. See diagram below.

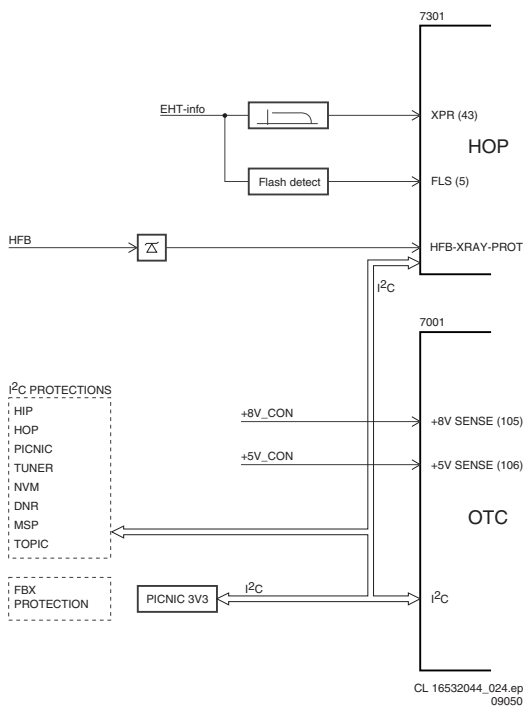


Figure 5-10

There are several types of protections:

- I²C related protections.
- OTC related protections (via polling on I/O pins or via algorithms).
- HOP related protections (mainly for deflection items).
- Hardware errors that are not sensed by the OTC (e.g. BRIDGECOIL_PROT, NON_VFB, ARC_PROT).

All protections are explained below.

5.7.2 I²C Related Protections

In normal operation, some registers of the I²C controlled ICs are refreshed every 200 ms. During this sequence, the I²C busses and the I²C ICs are checked.

An I²C protection will take place if the SDA and SCL lines are short-circuited to ground, or to each other. An I²C error will also occur, if the power supply of the IC is missing (e.g. FBX_PROT (error 16)).

5.7.3 OTC Related Protections

If a protection is detected at an OTC input, the OTC will start to scan all protection inputs every 200 ms for 5 times. If the protection on one of the inputs is still active after 1 s, the μ P will put the set in the protection mode. Before the scanning is started, a so called 'ESD refresh' is carried out. This is done, because the interrupt on one of the inputs is possibly caused either by a flash or by ESD. As a flash or ESD can influence IC settings, the HOP, HIP, MSP, PICNIC, NVM and Tuner are initialised again, to ensure the normal picture and sound conditions of the set.

8 V and 5 V protection: The μ P senses the presence of the 8 V and 5 V (via the '+5V_CON' and '+8V_CON' lines). If one (or both) of these voltages is (are) not present, an error code is stored in the error buffer of the NVM, and the set is put in the protection mode.

5.7.4 HOP Related Protections

Every 200 ms, the status register of the HOP is read by the OTC (via the I²C bus). If a protection signal is detected on one of the inputs of the HOP, the relevant error bit in the HOP register is set to 'high'. If this error bit is still 'high' after 1 s, the OTC will store the error code in the error buffer of the NVM and, depending on the relevancy of the error bit, the set will either go into the protection mode or not.

The following protections are implemented:

- **HFB (Horizontal Flyback):** If the horizontal flyback is not present, this is detected via the HOP (HFB_X-RAY_PROT). One status bit is set to 'high'. The error code is stored in the error buffer and the set will go into the protection mode.
- **Flash detection:** When a flash is detected via the EHT-info line (via D6303 and T7303), the H-drive (and so the Line output stage) is stopped immediately. The FLS-bit in the HOP status register is set to 'high'. As the duration of a flash is very short, the FLS-bit is re-set to 'low' again after the flash refresh, and via a 'slow start' the set will start again.

5.7.5 Hardware Related Protections

Due to the architecture (with 'hot' deflection) there are some protections that can not be sensed by the microprocessor. Three of these protections will lead to a protection on set level (Standby mode and blinking LED), while another will only lead to a circuit protection.

TV-set Protection

The following fault conditions will lead to a 'complete' set protection:

- **BRIDGECOIL protection:** This is sensed via the 'EW' signal going to the base of TS7652 (via R3495 and D6499). In a normal situation, the voltage on C2498 (diagram A4) is high, TS7652 is conducting. When bridge coil 5422 (diagram A3) is short circuited, the voltage on C2498 changes to low, which will block TS7652. In this case, also TS7641 will block and the voltage on 2642 will rise until TS7443 is forced in conduction. The 'SUP-ENABLE' signal (in normal operating condition -20 V) is shorted now to ground level, which will force the Main Power Supply to Standby mode.
- **ARC protection:** If there are 'open' connections (e.g. bad solder joints) in the *high energy* deflection circuitry, this can lead to damaging effects (read: fire). For that reason, the E/W current is sensed (via 3479//3480). If this current becomes too high, the 'thyristor' circuit (TS7653 and TS7654) is triggered. TS7442 is switched 'on' and TS7443 is forced into conduction. The 'SUP-ENABLE' signal is shorted now to ground level, which will force the Main Power Supply to Standby mode.

- **NON_VFB (No vertical Flyback) protection.** If the frame stage generates no pulses, TS7641 will block. TS7443 is now switched 'on', which will lead to Standby mode. So in normal operation condition, TS7641 and TS7652 are conducting, while TS7443 is blocked.

Circuit Protection

The following fault condition will lead to a 'partly' set protection:

- **PROT1 protection:** When a DC-voltage (positive or negative) is sensed on one of the loudspeaker outputs, the protection circuit (TS7704, 7705, 7706 and 7707), will put the IC7700 in Standby mode (via tri-state input pin 6). For more details see chapter 9.

5.8 Repair Tips

5.8.1 Miscellaneous

The relay you hear when you switch the set 'on' (from Standby or via the mains switch), is from the degaussing circuitry. It is not used for switching the Power Supply (as done in the MG-chassis).

Take care not to touch the 'hot' heatsink while disconnecting the SSB, despite the fact that the mains cord is out of the mains socket. There can still be an annoying rest-voltage on the heatsink for a short while. This, because the discharge resistors 3502 and 3503 (on the LSP between hot and cold part) are not stuffed for Europe.

Instead, discharge resistors 3066 and 3057 on the Mains Switch panel are used, but because they are located before the Mains switch, they only discharge when this switch is 'on'.

Advice: when you remove the SSB, disconnect the Mains cord, but keep the Mains switch 'on'.

Do not try to measure on the SSB side, which is facing the 'hot' heatsink. This is dangerous. Most service test points are guided to the 'tuner' side and are indicated by the 'service' printing. Where the circuitry was too 'crowded' for this printing, you can find the correct location on the 'test point overviews' in this manual (chapter 6).

A very large part of the LSP is 'hot', such as:

- the primary part of the Standby Supply,
- the whole Main supply (except for the secondary Audio supply),
- and the complete deflection circuitry (so notice that the deflection coil is hot !!).

5.8.2 Start-up Sequence

The start up sequence differs from other sets (e.g. MG-sets or EM2E-sets):

1. When the set is switched 'on', the 5 and 8 V lines ('+5V_CON' and '+8V_CON') of the standby power supply are activated.
2. After they are sensed by the OTC, the μ P will address the HOP via the I²C-bus, to start the drive [1].
3. Via the 'SUP-ENABLE' signal, the Main Supply is switched 'on' and will deliver the VBAT to the Line deflection stage [2].
4. EHT generation is now started.
5. The OTC will un-blank the picture.
6. When you switch 'off' the set, this is done in a controlled way via the POR signal [3].

Note: Standby is not directly achieved via the Standby line of the microprocessor, but indirectly via the HOP circuitry.

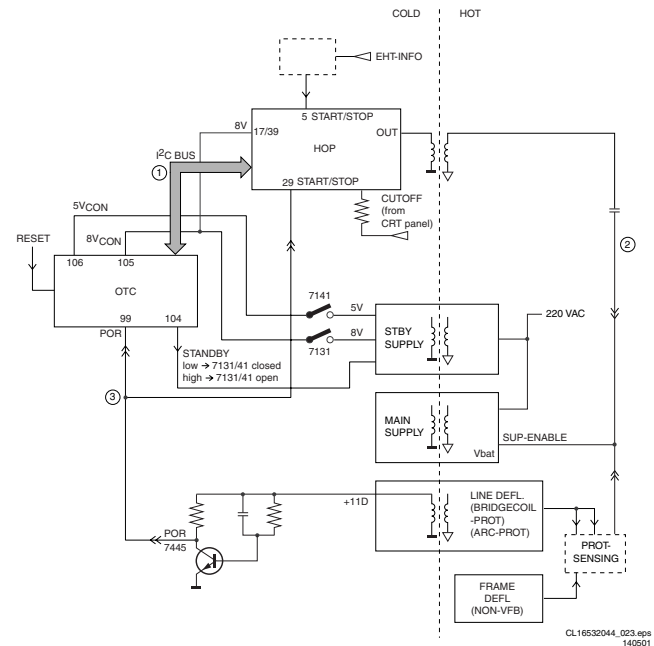


Figure 5-11

5.8.3 ComPair

This chassis does not have an IR transmitting LED (as in MG-sets). Therefore a 'Service' (ComPair) connector is implemented at the rear side of the set, which is directly accessible (as in EM2E-sets). In addition to this, there is also a blinking LED procedure to show the contents of the error buffer.

When you use ComPair, you have the possibility to activate a 'stepwise start-up' mode. With this mode, you can initiate the start-up sequence step by step. This also means that in certain steps, some protections are not activated. This is sometimes very convenient during repair (see also paragraph 5.4.3).

5.8.4 Protections

There are 'service pads' implemented on the SSB (items 4005 and 4006, outside the shielding), to force the set in SDM or SAM (see also Fig. 7 in Chapter 4). This will overrule the processor-controlled protections, but not the hardware protections. This means, that the A/D-input protections (5 and 8 V) and the I²C 'not-acknowledging' info from the feature box (FBX) are overruled. **Caution:** When doing this, the service technician must know what he is doing, as it could lead to damaging the set.

The 'ARC'- and/or 'BRIDGECOIL' protection are hardly ever triggered, however:

- When you suspect the 'ARC' protection, look for bad solderjoints and smell. By interrupting resistor 3497, this protection is disabled (special attention needed !).
- When you suspect the 'BRIDGECOIL' protection, which can also be due to a too wide picture amplitude, shorten G and S of of the E/W MOSFET 7480. This will disable the protection. You will now have a minimal horizontal amplitude. Re-align the horizontal amplitude in the SAM menu and remove the G/S short of TS7480.

5.8.5 Main Supply

- The simplest way is, to replace the components of the Main Supply with repair kit (3122 785 90310)
- More detailed way:

- Replace FET 7504 and zener 6505.
 - Remove the SSB panel.
 - Short B and E of TS7529, in order to put the Main Supply in 'on'-mode (TS7529 is blocking then).
Caution: To prevent that this will damage R3403 and TS7443, **first disable the HW-protection of the deflection circuit.** Therefore short circuit C2642 on the LSP (diagram A4)
 - Attach a load of 500 Ω to VBAT capacitor C2515 (the supply can not work without a minimum load).
 - Use a variac, and slowly increase the VMAINS. Measure over sensing resistors R3514//15 if a nice sawtooth voltage becomes available.
 - Also measure the VBAT . This may never exceed +141 V. If it does, there is something wrong in the feedback circuitry (e.g. regulator 7506).
- **Note:** Be careful when measuring on the gate of FET TS7504. This circuitry is very high-ohmic and can easily be damaged (first connect ground to measuring equipment, then measure the gate).

5.8.6 Standby Supply

The simplest way is to replace the components of the Standby Supply with repair kit 3122 785 90320.

5.8.7 Line Deflection

The simplest way is to replace the components of the Line Deflection circuitry with repair kit 3122 785 90330.

5.8.8 Frame Deflection

Caution: When the Frame Deflection circuitry is suspected, one must be careful. Because there is a DC-voltage on the frame deflection, the beam current could damage the CRT neck, leading to a defective CRT.

Best thing to do is:

1. Interrupt the resistors 3403 and 3404 on the CRT panel (diagram F), in order to remove the 'filament' voltage from the tube (no beam current, so no chance of destroying the CRT).
2. Interrupt resistor 3403 on the LSP (diagram A4) to disable the 'SUP-ENABLE' line.
3. Measure with a multimeter, or better with an oscilloscope, the functionality of the Frame stage.
4. After you've found the cause, exchange the defective component (e.g. TDA8177), and re-solder the interrupted resistors.

Phenomenon	Possible Cause	Repair tip
No picture, no LED.	Standby Supply defective.	Measure circuitry (see diagram A2). Start at test-point A19. When the Mains switch is 'on', this voltage must always be available
No picture, no LED.	Bad connection of SSB in SIMM-connector.	In case of a bad connection, it can happen that there is no picture, and that the Standby LED is not controllable. Re-place the SSB.
No picture, red LED blinking at 3 Hz.	Set is in protection due to various causes. For error codes see error-code list.	You have no picture, so: - or you read the error buffer via ComPair - or you read the blinking LED information via 'diagnose'-'x'-'ok' on DST - or you read the error code sequence via 'diagnose'-'0'-'ok' with the DST. When you have found the error, check the circuitry related to the supply voltage and I ² C-communication or the circuitry that triggers the protection.
No picture, red LED blinking with code 6-6-6 or 18-18-18.	No communication on slow I ² C- or fast I ² C-bus.	As processor cannot communicate with one of the 2 busses it the standby-led spontaneously starts blinking 6-6-6... or 18-18-18... If in the error buffer somewhere is an error 6 or 18, these will have the highest priority starting the mentioned blinking. Measure dependent of the error on the I ² C-bus which device is loading the bus. (use I ² C -overview)
No picture, red LED blinking with code 1-1-1.	No communication on NVM-I ² C bus to the μ P.	As the μ P cannot communicate with the NVM I ² C bus, it spontaneously starts blinking 1-1-1. Note: when there is no access to the NVM, a lot of picture setting can go wrong.
No picture, no sound. Set is making audible squeaking sound	Supply is possibly in hiccup-mode, which is audible via a squeaking supply transformer.	Possible causes: - V _{BAT} is shorted (caused by short circuited line transistor 7421), or - Sound winding is shorted (amplifier is shortening the power supply lines), or - D6514 is shorted (due to a too high V _{BAT}). Remove excessive load, to see what causes the failure, or check feedback circuit. See repair tip 'Main Power Supply' (supply needs a minimal load).
No picture, no sound. Green LED works fine	Supply does not work correctly.	If e.g. V _{BAT} is only about 90 V, it is possible that the regulator IC (7506) is defective.
No RC-reception. Red LED does not echo RC-commands.	μ P circuitry or RC-receiver is defective.	In case the set does react on a local keyboard operation, you must check the RC-receiver circuitry (diagram E).
Relay (degaussing) is not audible, when set is switched from 'off' or 'standby' to 'on'.	μ P is not working correctly. When pin 115 is low, the degaussing must be activated.	Check RESET-circuitry on diagram B5. Check the level on pin 115 when you switch the set 'on'. Signal must be low initially and go to high after approx. 12 s.
No sound, only picture.	Measure A7/A8 on diagram A1. Possibly the audio amplifier is defect (but not shorted), or the 'sound enable' line is high (diagram A5). Further, measure the audio signal path (HIP-MSP-Switch ICs-Amplifier).	In ComPair, a beep test can determine where the signal stops (use loudspeakers or headphone). Possible cause is also the 'PROT1' protection (see diagram. A6). This is a loudspeaker DC protection, which the μ P can not sense. Via circuitry 7701/7707, this signal can put audio amplifiers 7700 and 7702 in standby mode (tri-state input). Warning: Find out, which amplifier is causing the problem, because it is possible, that the other one is OK.
No sound at headphone output.	HP amplifier (7770), or the supply to it, malfunctions.	Measure test points A64 to A67, and the supply line (+/- 16/19V) on diagram A7.
Picture is rotated.	Rotation circuitry, or related supply to it, malfunctions.	Measure test points A52 and A53 on diagram A5.
Picture is continuously switching 'off' and 'on', showing heavy 'switch' spots (set does not go into protection).	200 V is missing on CRT panel.	Probably a bad connection from LSP connector 1424 to CRT connector 1224 (diagram F), or an interruption of the 200 V supply line (e.g. R3341 is interrupted).
Picture is not sharp.	Focus is possibly mis-aligned or SCAVEM-circuitry does not work correctly.	Re-align the 'focus' potmeter on the Line Output Transformer, or check the SCAVEM circuitry on the CRT-panel (diagram F). It is also possible that the DAF circuitry is defective (see diagram I). Check the V _{dc} values.
Picture is not synchronised.	The sync is derived in the HIP from xtal 1305 and/or 1308.	Maybe the crystals 1305 and/or 1308 are making a bad contact.
Picture is distorted.	Check video-path in Service Default Mode.	Investigate whether there is an error code present in the error buffer. In case there is one, check the I ² C-bus and/or supply lines (see overview supply lines). Measure and check signal path Tuner-HIP-PICNIC-HOP-RGB amplifier. In case it is a geometry issue, check opto-coupler 7482, OpAmps 7440/7450 and the Frame circuitry alignments or a possible corrupted NVM (7011).
Picture with horizontal stripes.	Feature box processing is malfunctioning	Check functionality of PICNIC (7709), FALCONIC (7726) and/or field memories (7714 and 7740). TS7726 and 7740 are suspected.
No menu, no OSD.	Probably a defective μ P.	Measure test points B61to B64 on diagram B5.
No NextView (EPG).	IC7012 defective or not powered.	Check circuitry around IC7012.
No Teletext.	IC7007 defective or not powered.	Check circuitry around IC7007. Check also B61to B64 around μ P on diagram B5.
Strange switch 'off' behaviour	TS7445 possibly defective.	Check, with a multimeter, whether transistor TS7445 is well functioning.
Various symptoms, due to missing local supply voltage.	An interrupted fuse, NFR-resistor or connection.	When no symptom or error code leads you to a specific circuitry, use the supply lines overview (see chapter 6), for a quick scan of all supply lines.

8. Electrical Alignments

Index of this chapter:

1. General alignment conditions.
2. Hardware alignments.
3. Software alignments.
4. Option settings.

Note: The Service Default Mode (SDM) and Service Alignment Mode (SAM) are described in chapter 5. Menu navigation is done with the 'CURSOR UP, DOWN, LEFT or RIGHT' keys of the remote control transmitter.

8.1 General Alignment Conditions

Perform all electrical adjustments under the following conditions:

- Power supply voltage: 230 V_{AC} / 50 Hz (± 10 %).
 - Connect the set to the mains via an isolation transformer with low internal resistance.
 - 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).
- Caution:** never use the cooling fins / plates as ground.
- Test probe: R_i > 10 MΩ, C_i < 20 pF.
 - Use an isolated trimmer/screwdriver to perform the alignments.

8.2 Hardware Alignments

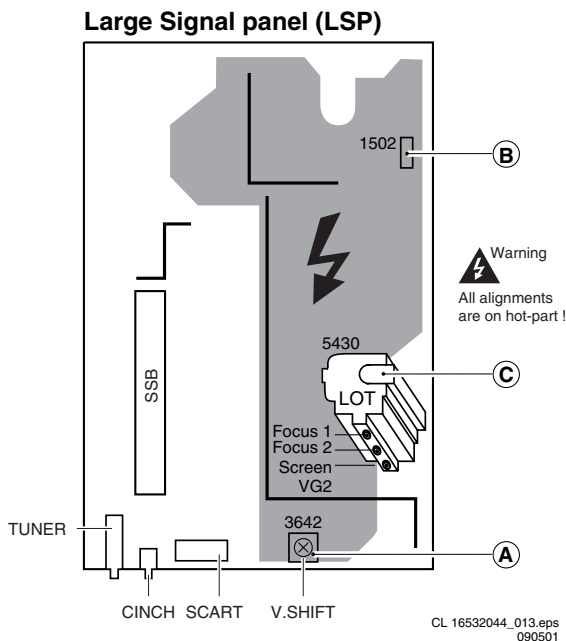


Figure 8-1

8.2.1 Vg2 Adjustment

Method 1 (without oscilloscope)

1. Activate the SAM.
2. Select 'Alignments'.
3. Select the 'General' sub-menu.
4. Set 'Vg2 Test Pattern' to 'On'.
5. First turn the Vg2 potmeter on the LOT (see Fig. 8-1) to the left (OSD feedback will show 'Out high').
6. Turn the Vg2 potmeter slowly clockwise until you read 'In low'. This is the correct value.

Method 2 (with oscilloscope)

In the frame-blanking period of the R, G and B signals applied to the CRT, the 'HOP' video processor inserts a measuring pulse with different DC levels. Measure the black level pulse during the vertical flyback at the RGB cathodes of the CRT.

1. Go, via the MENU key, to the normal user menu, select PICTURE, and set CONTRAST and BRIGHTNESS to 0.
2. Activate the SAM.
3. 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).
4. Set the channel of the oscilloscope to 50 V/div and the time base to 0.2 ms. Use external triggering on the vertical pulse (**caution:** use e.g. R3641, **which is at the 'cold' side!**).
5. Ground the scope at the CRT panel ('cold' side) and connect a 10:1 probe to one of the cathodes of the picture tube socket (see diagram F).
6. 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.
7. Select the cathode with the highest V_{DC} value for the alignment. Adjust the V_{cutoff} of this gun with the SCREEN potentiometer on the LOT (see Fig. 8-1) to the correct value (160 ± 3 V_{DC}).
8. Restore CONTRAST and BRIGHTNESS to normal (CONTRAST= 63 and BRIGHTNESS= 34).

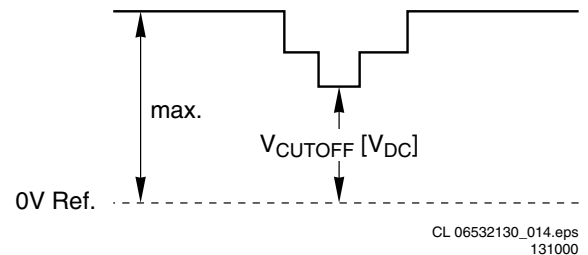


Figure 8-2

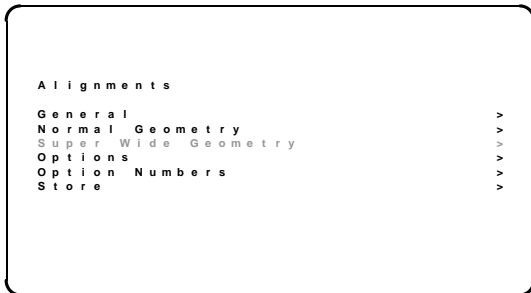
8.2.2 Focusing

1. Tune the set to a circle & crosshatch test pattern (use an external video pattern generator).
2. Choose picture mode 'NATURAL' with the 'SMART PICTURE' button on the remote control transmitter.
3. Adjust the FOCUS 1 potentiometer (upper potmeter, see Fig. 8-1) until the horizontal and vertical lines at 1/4 from east and west, at the height of the centre line, are of minimum width without visible haze.
4. Adjust the FOCUS 2 potentiometer (middle potmeter, see Fig. 8-1) until the horizontal and vertical lines at 1/4 from north and south, at the height of the centre line, are of minimum width without visible haze.

8.3 Software Alignments

8.3.1 Introduction

With the software alignments, it is possible to align the Geometry, White Tone and Tuner IF settings. Put the set in the SAM (see chapter 5.2.2). The SAM menu will now appear on the screen. Select, via 'Alignments', one of the following submenus:



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150501

Figure 8-3

- **General:** Select this sub-menu to perform general software alignments.
- **Normal Geometry:** Select this sub-menu to perform standard geometry alignments.
- **Super Wide Geometry:** Select this sub-menu to perform geometry alignments for the 'Panorama' position in 16:9 sets (only valid for wide screen sets). Alignments can be performed; however, it is better to set values as mentioned below.
- **Options:** Select this sub-menu to set the initialisation codes of the set via text menu's.
- **Option Numbers:** Select this sub-menu to set all options at once (expressed in two long numbers). The original factory settings are printed on a sticker that is placed on the CRT (inside the set).
- **Store:** Select this sub-menu to store the performed alignments.

The alignments are explained below in the sequence of the sub-menu.

Note:

- Once all alignments/settings have been completed the item 'Store' must be selected to record all the values in the permanent memory of the set.
- If the Option codes have been changed and stored, the set has to be switched 'OFF' and 'ON' using the mains switch to activate the new settings (when switching via Standby, the option code settings are NOT read by the microprocessor).
- If an empty EAROM (permanent memory) is detected, all settings are set to pre-programmed default values.
- A built-in test pattern can be called up in various sub-menus. The test pattern generator can be switched on using the item 'Test pattern on/off'. The test pattern only appears AFTER the specific alignment has been selected. The test patterns are generated by the Teletext-IC (OTC).

8.3.2 'General' alignments

Drive

Method 1 (with colour analyser):

1. Select 'Test pattern' and turn it 'On'. You will get a white block in middle of the image now.
2. Select 'Cathode' and adjust the set to the correct light output. This setting depends on the picture tube size and

brand. See table 'Cathode parameter' for the colour analyser readings.

3. Select 'Tint' and set it to one of the three colour temperatures ('Cool', 'Normal' or 'Warm')
4. Set the white levels according to the values in the table 'White levels'.

Cathode parameter	
CRT	Light output (cd/m ²)
28" RF WS	400
32" RF WS	350

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120601

Figure 8-4

White levels			
	Cool	Normal	Warm
X	280	289	313
Y	287	299	329
Temp. (K)	10200	8700	6500

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120601

Figure 8-5

Method 2 (without colour analyser):

1. Without having a colour-analyser one can set some parameters. This is the next best solution. The setting-parameters are average values coming from production (statistics).
2. Select 'Cathode' and enter the value '15' (for all picture tubes).
3. Select 'Tint' and set it to one of the three colour temperatures ('Cool', 'Normal' or 'Warm').
4. Set the 'Red', 'Green' and 'Blue' parameters according to the values in table 'Tint settings'.
5. 'Red BL offset': herewith the Black Level can be aligned very precise. Default value is 7.
6. 'Green BL offset': herewith the Black Level can be aligned very precise. Default value is 6.

Tint settings			
	δ Cool	Normal	δ Warm
R	-1	37	+ 4
G	0	30	0
B	+ 4	31	- 8

CL 16532044_092.pdf
120601

Figure 8-6

Luminance delays

With this alignment you place the luminance information exactly on the chrominance information (brightness is pushed onto the colour). Use a colour bar/grey scale pattern as test signal.

- **Lum. Delay Pal:** Apply a PAL colour bar/grey scale pattern as a test signal. Adjust this parameter until the transients of the colour part and black and white part of the test pattern are at the same position.
- **Lum. Delay Secam:** Apply a SECAM colour bar/grey scale pattern as a test signal. Adjust this parameter until the transients of the colour part and black and white part of the test pattern are at the same position.
- **Lum. Delay Bypass:** apply a NTSC colour bar/greyscale pattern as a test signal. Adjust this value until the transients of the colour and black & white part of the test area are at the same position.

EHT compensation

Fixed setting: 5

Soft clipper

Fixed setting: Pwl + 0%

Luma gain

Fixed setting: 1

IF AFC

Supply, via an external video generator (e.g. PM5518), a TV signal with a signal strength of at least 1 mV and a frequency of 475.25 MHz. Use system BG if possible, otherwise match the system of your generator with the received signal in the set.

Alignment procedure:

- Go to the 'Installation' menu.
- Select 'Manual installation'.
- Tune the TV-set to the system and frequency described above via 'Search' - '475' - 'OK'.
- If the frequency, showed in the line 'Fine tune', is between 475.18 MHz and 475.31 MHz, you don't need to re-adjust the 'IF AFC'.
- If not, adjust the frequency in the 'Fine tune' line to 475.25 MHz and 'Store' the program (this is **very important** because this will disable the AFC algorithm).
- Now go to the SAM and select 'Alignments' - 'General' - 'IF AFC'.
- During the 'IF AFC'-parameter adjustment, one can see OSD feedback in the top of the screen. This OSD feedback can give 4 kind of messages:

AFC-window	AFC-frequency vs. reference
Out	High
In	High
In	Low
Out	Low

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120601

Figure 8-7

The first item ('In' or 'Out') informs you whether you are in or out the AFC-window.

The second item ('High' or 'Low') informs you about whether the AFC-frequency is too high or too low.

- First you must align the 'IF AFC'-parameter such that you come into the AFC-window (= 'In')
- Then you must look for the point where the 'IF AFC'-parameter changes from 'High' to 'Low'. This level is the value you are looking for.
- After adjustment, 'Store' the value.
- Now return to the 'Installation' menu.
- Select 'Manual Installation' - 'Search' - '475' - 'OK' and 'Store'. This will set the AFC 'on' again.

Service tip: If you do not trust the frequency accuracy of your service generator, connect it to a 'good' TV set and check it with the 'Fine tune'-line.

Tuner AGC

- Set the external pattern generator to a colour bar video signal and connect the RF output to the aerial input. Set the amplitude to 10 mV and set the frequency to 475.25 MHz.
- Connect a DC multimeter between pin 1 and the shielding of the Tuner (item 1200 on the LSP).
- Adjust the 'TUNER AGC' value (default value is 25) with the LEFT/RIGHT cursor keys until the voltage at pin 1 of the tuner lies between 3.8 and 2.3 V.
- 'Store' the alignment.

Blend intensity

Use this alignment when you replace the microcontroller or the HOP. It aligns the level of transparency of the menu-picture blended into the main-picture.

- Position the BRIGHTNESS, CONTRAST and COLOUR setting in the middle position (picture-menu).
- Apply a signal with a 100 % white video-pattern.
- Connect an oscilloscope to pin 8 of connector 1298 of the CRT panel and measure the Red output level.
- Align the 'Blend intensity' parameter such, that the blended signal is 65 % of the black-white amplitude. In practice this is about 1.3 V (blended signal) versus 2 V (full white signal).
- The parameter can be adjusted in between 0 and 31.

Adjust Peak White Limiter

Enter value '4' for all picture tubes.

Vg2 Test Pattern

In this sub-menu, you can turn 'On' the OSD feedback for the Vg2 alignment (see chapter 8.2.1).

8.3.3 'Normal Geometry' alignments**Introduction**

Use for all geometry alignments, an external pattern generator with a geometry pattern (e.g. crosshatch). See figure below for the correct alignments.

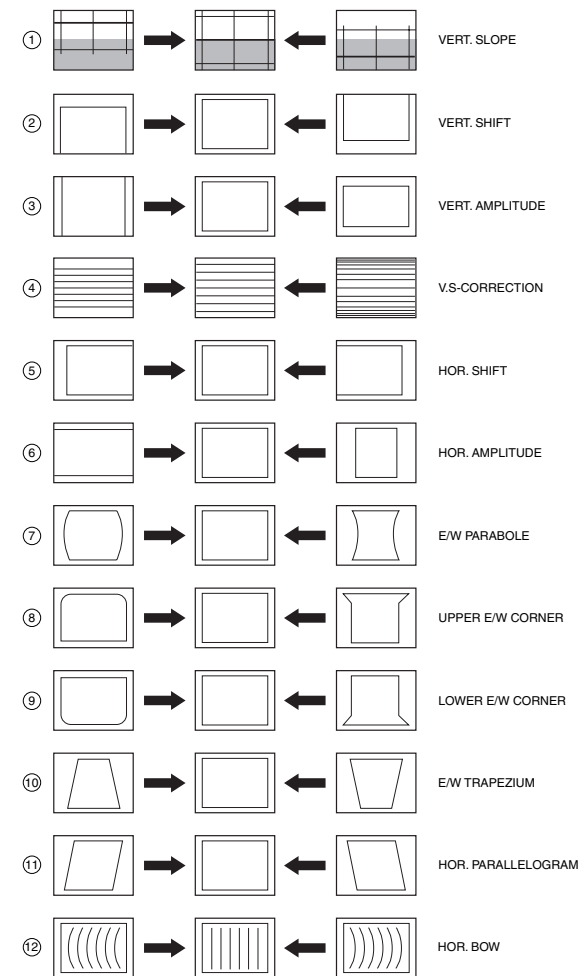
CL 16532044_022.eps
140501

Figure 8-8

Warning: The use of the 'Internal Test Pattern' will, at this moment, lead to a mis-alignment of the picture geometry. So use an external generator with a geometry pattern (e.g.

crosshatch) for a correct geometry alignment. Use the 'Internal Test Pattern' only for the 'Vertical slope' alignment.

V. slope

This alignment is meant to align the zero crossing of the frame deflection to the mechanical middle of the picture tube.

1. Set 'Test Pattern' to 'On' (read warning above).
2. Set the 'V. S-correction' value to '0' all sets (the boundary-stripes of the test pattern should be positioned on the edge of the picture tube).
3. Align 'V. slope' (when aligning, the lower half of the picture is blanked) such, that the middle line of the test pattern is matched with the edge of the pattern transient in the middle of the picture.
4. Push the 'MENU' button to return to the previous menu.

Vertical alignment

1. Use 'V. amplitude' to align the vertical amplitude so that the entire test pattern is visible.
2. Set 'V. shift' to value '32'.
3. Connect a voltmeter (V_{DC}) between R3624 and 'hot' ground.
4. Adjust the DC voltage to '0' with potmeter R3642.
5. Use 'V. shift' again to align the test pattern vertically in the middle.
6. Repeat the the alignment if necessary.

Horizontal alignment

1. Use 'H. amplitude' to align the horizontal amplitude so that the entire test pattern is visible.
2. Use 'H. shift' to align the picture horizontally in the middle.
3. Repeat the 'H. amplitude' alignment if necessary.

Note: In case the horizontal linearity in wide-screen mode is out of tolerance, add a 'DC-shift correction' panel (3104 328 06230) to connector 1419 of the DAF-panel [I]. Be sure to switch 'off' the set first.

On the DC-shift panel, cut diode 6433 for correction to the right or diode 6432 for correction to the left.

Caution: never plug in a *not pre-aligned* module in a set !!!

East/west alignment

1. Use 'East/West Parabola' to align the vertical lines until straight.
2. Use 'Upper East/West corner' to align the vertical lines in the upper corners until straight.
3. Use 'Lower East/West corner' to align the vertical lines in the lower corners until straight.
4. Use 'East/West Trapezium' to align for a rectangular.
5. Use 'Horizontal Parallelogram' to align for straight vertical lines if necessary.
6. Use 'Horizontal Bow' to correct the E/W parabola such, that it becomes symmetrical. Default value is '31'.
7. Repeat steps 1 to 6 if necessary.

8.3.4 'Super wide geometry' alignments (only for widescreen sets)

Note: The header of this paragraph and also the menu's are somewhat misleading. We only need to set the following values (if the normal geometry alignment has been performed correctly):

1. For 'V. shift' use the default value 33.
2. For 'V. amplitude' use the default value 25.
3. 'V. S-Correction', enter value of 'normal geometry' alignment.
4. 'H. amplitude', enter value of 'normal geometry' alignment subtracted by 1.
5. 'East/west Parabola', enter value of 'normal geometry' alignment.

8.4 Option Settings

8.4.1 Introduction

The microprocessor communicates with a large number of I²C ICs in the set. To ensure good communication and to make digital diagnosis possible, the microprocessor has to know which ICs to address. The presence / absence of these specific ICs (or functions) is made known via the option codes.

You can set the 'hardware related' options via the SAM - 'Alignments' - 'Options' or 'Option Numbers' menu.

You can set the 'software related' options via the SAM - 'Dealer Options' menu .

After you have changed the option(s), save them via the 'Store' command.

The new option setting is only active after the TV is switched OFF and ON again via the mains switch (the EAROM is then read out again).

8.4.2 Options

Select this sub-menu to set the initialisation codes (= options) of the set via text menu's.

Menu-item	Subjects	Options	Physically in the set
Dual screen/PIP	Aux type	None	Feature not present.
	Text Dual Screen	Yes	Text Dual Screen present
		No	Text Dual Screen not present
Teletext/EPG	TXT	Yes	Teletext present
		No	Teletext not present
	NextView present	Yes	NextView set
		No	NextView not set
	NextView type	Flashram	Flash-RAM present
No Flashram		Flash-RAM present	
Communication	Easylink Plus	Yes	Easylink Plus set
		No	Easylink Plus not set
Picture Tube	CRT Type	4:3	4:3 picture tube
		16:9	16:9 picture tube
	Picture Rotation	Yes	Frame rotation circuitry present (diagram A5)
		No	Frame rotation circuitry not present
	Dynamic focus	Yes	Dynamic focus (DAF) present (diagram I)
		No	Dynamic focus (DAF) not present
	One Point Control	Yes	
No			
Video repro	Featurebox type	Eco	PROZONIC not present
		Prozonic	PROZONIC present
		Falconic	FALCONIC present
		1050i/1250i	Progressive scan mode
	Field memories	2	
		3	
	Lightsensor	Yes	Lightsensor present
		No	Lightsensor not present
	PALplus	Yes	PALplus module present
		No	PALplus module not present
	Combfilter	Yes	Not valid for Europe
		No	
	Picture improvement	Yes	LTP present
		No	LTP not present
	Picnic	Yes	PICNIC present
		No	PICNIC not present
	Picnic AGC	Yes	In normal operation: Yes
No		During 'Drive' alignments: No	
Signalling bits	Yes		
	No		
Source Selection	External 3	Yes	3rd EURO connector present (diagram H)
		No	No 3rd EURO connector present
	External 4	Yes	4th EURO connector present
		No	No 4th EURO connector present
Audio Repro	Dolby	None	
		Pro Logic	
	Rear speakers	Corded	Passive surroundbox present
		Virtual	Virtual Dolby (without rear speakers)
		Cordless	Active surroundbox present
	Acoustic system	FL9 Monitor	Modern design with only tweeters at both sides (monitor look)
		FL9 DAS	Modern design with full range speakers at both sides
		FL12	Soft design with full range speakers at both sides
	Virtual Dolby	Yes	
		No	
AVL	On	Automatic Volume Limiter on	
	Off	Automatic Volume Limiter off	
Miscellaneous	Heatsink Present	Yes	Heatsink present on CRT/SCAVEM panel (diagram F)
		No	Heatsink not present on CRT/SCAVEM panel (diagram F)
	Tuner type	UV1316	
		TEDE9	

Figure 8-9

8.4.3 Option numbers

Select this sub-menu to set all options at once (expressed in two long numbers).

An option number (or 'option byte') represents a number of different options. When you change these numbers directly, you can set all options very fast. All options are controlled via eight option numbers.

When the EAROM is replaced, all options will require a re-setting. To be certain that the factory settings are reproduced exactly, you must set **both** option number lines. You can find

the correct option numbers on a CRT sticker inside the TV set.

Example: The CRT sticker in the 32PW8870 gives the following option numbers:

04866 04384 08001 00016

12407 00001 00000 00071

The first line indicates the hardware options 1 to 4, the second line is reserved for the software options.

Every 5-digit number represents 16 bits (so maximum number can be 65536 if all options are set).

When all the correct options are set, the sum of the decimal values of each Option Byte (OB) will give the option number.

OB	Bit	Option name	Settings (given in decimal values)		Option number
0	0	Cabinet	0 = FL6 (n/a)	1 = FL7 (n/a)	Sum OB0
	1		2 = FL8 (n/a)	3 = FL9 DAS	
	2		4 = FL9 Monitor	5 = FL10 (n/a)	
	3		6 = FL11 (n/a)	7 = FL12	
	6	AVL	0 = Off	64 = On	
	1				
2	0	CTI	0 = Off	1 = On	Sum OB2
3	0	Auto TV	0 = Off	1 = On	Sum OB3
	1	Auto Store Mode	0 = None	2 = PDC/VPS	
	2		4 = TXT Page	6 = PDC/VPS/TXT Page	
	3				
	4	Picture Mute	0 = Off	16 = On	
	5	Demo	0 = Off	32 = On	
	6	Virgin	0 = Off	64 = On	
	12	TXT Preference	0 = TOP	4096 = FLOF	
13	TXT Region	0 = East	8192 = West		
4	0				Sum OB4
	2	China IF	0 = Off	4 = On	
	3	Tuner	0 = Philips	8 = Alps	
	4	TXT	0 = Off	16 = On	
	5	China TXT	0 = Off	32 = On	
5	0	EXT3	0 = Off	1 = On	Sum OB5
	1	EXT4	0 = Off	2 = On	
	4	Dual Screen	0 = None	16 = PIP	
	5		32 = Dual Screen		
	6	TXT/EPG/DS	0 = Off	64 = On	
	7	Aux. Headph. Sound	0 = Off	128 = On	
	8	Aspect Ratio	0 = 4:3	1 = 16:9	
	9	Tilt	0 = Off	512 = On	
	10	DAF	0 = Off	1024 = On	
	11	One Point Control	0 = Off	2048 = On	
	12	Heat Sink	0 = Off	4096 = On	
	13				
	14	Home Cinema	0 = Off	16384 = On	
	6	0			
1		Dolby ProLogic	0 = Off	2 = On	
2		Virtual Rear Spkrs	0 = Off	4 = On	
3		Cordless Rear Spkrs	0 = Off	8 = On	
4		Dolby Digital	0 = Off	16 = On	
5		Virtual Dolby	0 = Off	32 = On	
8		P50 Easylink	0 = Off	256 = On	
12		EPG	0 = Off	4096 = On	
13	EPG Type	0 = Type 2	8192 = Type 2C3		
7	0	Featurebox	0 = Eco	1 = Prozonic	Sum OB7
	1		2 = Melzonic (n/a)	3 = Falconic	
	2				
	3	Comb Filter	0 = Off	8 = On	
	4	PALplus	0 = Off	16 = On	
	5	Field Memories	0 = 2 memories	32 = 3 memories	
	6	Light Sensor	0 = Off	64 = On	
	7	Luma Trans. Proc.	0 = Off	128 = On	
	8	PICNIC	0 = Off	256 = On	
	9	PICNIC-AGC	0 = Off	512 = On	
	10				
	11	LNA	0 = Off	2048 = On	
	12	WSS	0 = Off	4096 = On	
13	Time Constant	0 = Normal	8192 = Fast		

Figure 8-10

8.4.4 Dealer Options

Menu name	Subjects	Options	Physically in set
Picture	CTI	Yes	CTI enabled
		No	CTI disabled
Personal	Blue Mute	Yes	Blue mute activeri case no picture detected
		No	Noise in case of no picture detected
	Virgin Mode	Yes	TV starts up once with language selection menu after mains switch on for the first time (virgin mode)
		No	TV does not starts up once with language selection menu after mains switch on for the first time (virgin mode)
	Auto Store Mode	None	Autostore mode disabled (not in installation menu)
		PDC-VPS	Autostore mode via ATS (PDC/VPS) enabled
		TXT page	Autostore mode via ACI enabled
		PDC-VPS-TXT	Autostore mode via ACI or ATS enabled
	Demo Menu Enable	Yes	Demo menu enable
		No	Demo menu disable
Auto TV	Yes	Auto TV mode enabled	
	No	Auto TV mode disabled	
Teletext	TXT Preference	TOP	Preference to TOP Teletext
		FLOF	Preference to FLOF Teletext
	East/West TXT	West	TXT characters for non -/58 sets
		East	TXT characters for -/58 sets

9. Circuit Descriptions and Abbreviation List

Index of this chapter

1. Introduction
2. Block diagram
3. Power supply
4. Control
5. Tuner & IF
6. Video: High-end Input Processor
7. Video: Feature box
8. Video: High-end Output Processor
9. Synchronisation
10. Horizontal deflection
11. Vertical deflection
12. Audio
13. Teletext / NexTView
14. CRT / SCAVEM / Rotation
15. Software related features
16. Abbreviation list

with dedicated (de) solder equipment for exchanging these ICs.

In case one must replace a Flash-RAM or a Mask-ROM in the field, the Dealer will receive always an up-to-date Flash-RAM.

Warning: Be aware that half of the LSP-circuitry is 'hot', including the deflection coils.

9.1 Introduction

The EM3 Europe is a higher specified chassis as the EM2 Europe. EM stands for Eco-MG, 3 for an indication that this set is higher specified as the EM2E. So EM2E is a known chassis with Digital Scan, EM3E is set with Natural Motion, EM4E will be the EM3E set inclusive a Digital Reception board. -

Differences between the EM3E versus EM2E:

- the start-up method is much more simple (no POR-bit anymore)
- the set has an advanced Standby Power Supply, including MOSFET-switches for making Semi-standby (needed for Easylink and digital reception in future)
- added features as Natural Motion, EPG, LTP and upgraded Auto-TV
- the sound amplifiers have symmetrical supply voltages now. The IC is changed from TDA2616 to TDA7490 (class-D amplifier, needing very little cooling)
- the vertical amplitude hardware alignment is changed to a software alignment via the SAM menu
- the vertical shift alignment is split into a hardware **and** a software alignment (needed due to spread)
- the Frame drive signals from the HOP are symmetrical.

The architecture consist of a conventional large signal panel (LSP) and a small signal board (SSB) module, placed into a so called SIMM-connector (Standard Interface, 80 pins).

The LSP is built up very conventional, with hardly any surface mounted components on the copper side. Similar with the EM2E (but different as with the MG-chassis), the EM3E LSP has a very large 'hot' part, including both deflection coils.

The SSB is a high tech module (2 sides reflow technology, full SMC) with very high component density and complete shielding for EMC-reasons. Despite this, it is designed in such a way, that repair on component level still is possible. To achieve this, attention was paid to:

- The position of service test lands: most of them are at the Tuner side.
- Accessibility (Tuner side). If there are still problems with the accessibility, one can order an extension board (see parts list).
- Clearance around surface mounted ICs (for replacing).
- Detailed diagnostics and fault finding is possible via ComPair.

Attention: During the first 4 to 6 months of production, the EM3E set-software will be integrated into a Flash-RAM on the SSB. After that period, a Mask-ROM will be used. Which IC is used is not of interest for Service, however for both solutions it means that Service Workshops must be equipped

9.2 Block Diagram

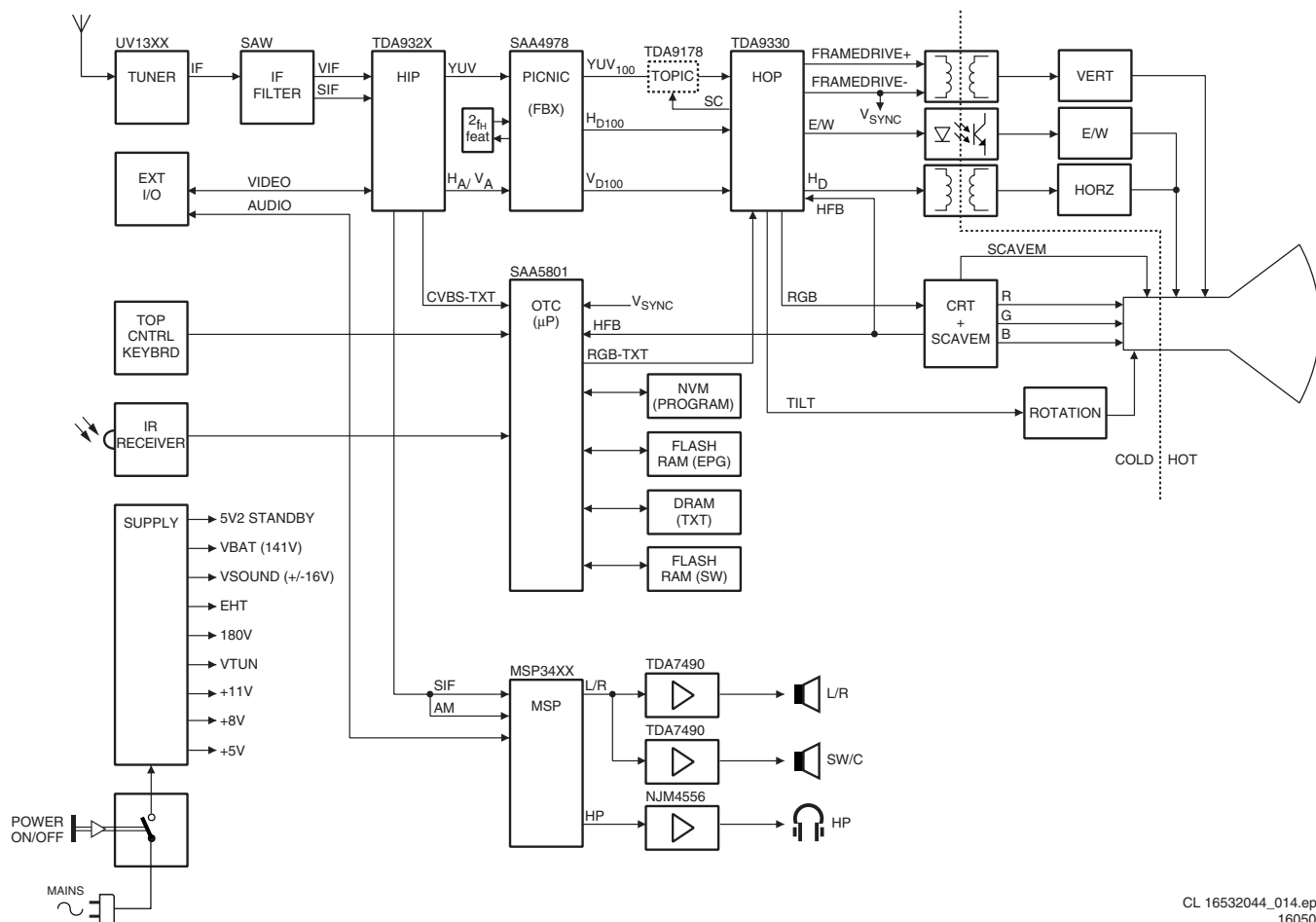


Figure 9-1

The Tuner (item 1200) is a PLL tuner and delivers the IF-signal, via audio & video SAW-filters, to the HIP (High-end Input Processor). The HIP has the following functions:

- IF modulation.
- Video source- and record select.
- Colour decoder.
- Synchronisation.

Three SCART-connectors can be used:

- SCART1 is fully equipped,
- SCART2 is meant for VCR. Pin 10 is used for Easylink and there is a possibility for Y/C in. The CVBS-out on pin 19 is meant for WYSIWYR (What You See Is What You Record).
- SCART3 is a CVBS and audio L/R input.

The HIP delivers YUV and sync signals to the PICNIC. This IC takes care of:

- Analogue to Digital conversion and vice versa.
- 50 to 100 Hz conversion.
- Panorama mode.
- Noise reduction.
- Dynamic contrast.

The '2fh features'-block in the diagram gives several options:

- for Digital Scan the PROZONIC is required
- for Natural Motion the FALCONIC is required.

After the PICNIC the, now 100 Hz, YUV- and H/V-signals are fed to the HOP (High-end Output Processor). This IC handles the video control and geometry part. The RGB-signals for TXT/OSD (from the μ P) are also inserted via the HOP. The video part delivers the RGB signals to the CRT-panel and the

geometry part delivers the H-drive, V-drive and also a drive-signal for rotation.

Both deflection circuits are 'hot' and located on the LSP. They are driven by the HOP. To make a galvanic separation, the Line Drive is driven via transformer 5410 and the Frame Drive via transformer 5621. The horizontal output stage generates some supply voltages and the EHT-, focus- and Vg2-voltages.

The RGB amplifiers on the CRT-panel are integrated in one IC and are supplied with 200 V from the LOT. The SCAVEM circuit modulates transitions of the Luminance (Y) signal on the horizontal deflection current, giving a sharper picture.

The sound part is built around the MSP34xx (Multi-channel Sound Processor) for IF sound detection, sound control and source selection. Dolby decoding is also done by the MSP. Amplification is done via a 'class D' integrated power amplifier IC, the TDA7490.

The microprocessor, called OTC (OSD, Teletext and Control) takes care of the analogue TXT input- and output processing. The OTC, ROM and RAM are supplied with 3.3 V, which is derived from the +5V2STANDBY. The NVM (Non Volatile Memory) is used to store the settings, one Flash-RAM contains the set software, the other Flash-RAM (7012) is for EPG and the DRAM is used for storing the Teletext pages.

In EM3E there is a separate Standby Supply, in order to reduce the Standby power consumption. During Standby, the

Main Supply is switched 'off' (via TS7529). A relay (1550) is used to switch the Degaussing circuit. It is switched 'on' after set start-up and switched 'off' by the μ P after 12 s. The Main Supply, an SMPS that is based on the 'down-converter' principle, generates the 141 V (V_{BAT}) and the +/- 16 V for the audio part. Difference with former MG-sets is that V_{BAT} is **not** mains isolated ('hot') and is alignment free.

9.3 Power Supply (diagram A1 & A2)

The power supply has a number of main functions:

- Mains harmonic filter.
- Degaussing picture tube.
- Standby power supply.
- Main supply.

9.3.1 Mains Harmonic Filter (diagram A1)

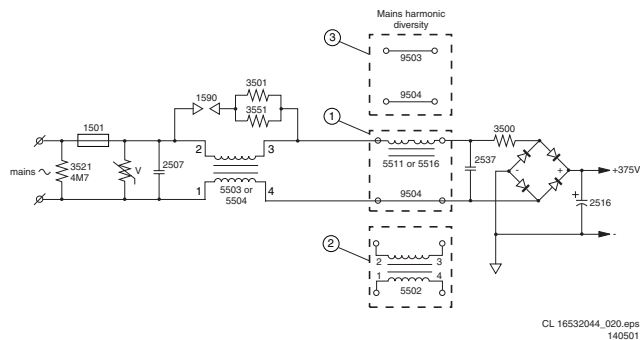


Figure 9-2

The mains harmonic filter has 2 functions: to prevent that high frequency signals (harmonics) are transferred into the mains and to protect the set from lightning damage.

C2507 prevents that the high frequency signals, generated by the set, are conveyed into the mains (it forms a short-circuit).

In case of a lightning surge between the 2 phases (differential mode) the energy is immediately bled away through the VDR (R3509) to the other phase.

In case of a lightning surge on both phases of the mains in relation to the aerial earth, the filter acts as a high resistance ($U_{EMK} = L \cdot dl/dt$), as a result of which the voltage across coil L5503/04 increases. A spark gap (1590) prevents that the voltage increases too much, which would lead to a damaged coil. When ignited, the current will be discharged via this spark gap.

Resistor R3500 is used for limiting the inrush-current.

9.3.2 Degaussing (diagram A1)

The 5V2 is present, as soon the set is switched 'on' via the mains switch. As the 'DEGAUSSING' signal from the processor (OTC) is 'low', transistor 7528 will conduct and relay 1550 is activated. Initially a considerable current will flow, via PTC 3516, through the degaussing coil. The PTC will heat up, resistance will rise and the current will decay rapidly. The OTC makes the 'DEGAUSSING' signal 'high' after 12 s, which will switch the relay 'off'.

9.3.3 Standby power supply (diagram A2)

Principle

This power supply is of a SOPS type (Self-Oscillating Power Supply) and is regulated by the controlled switching of an oscillator. It uses the so-called 'Flyback' principle:

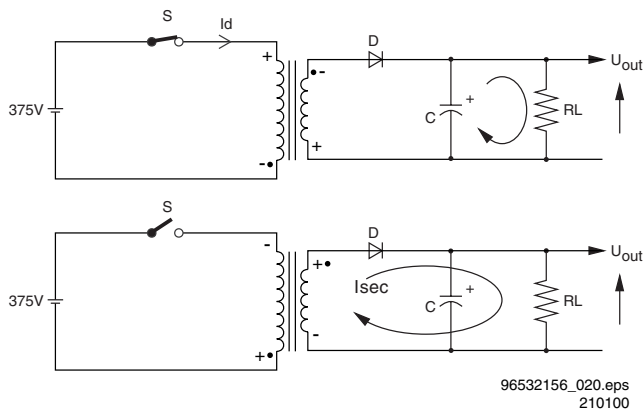


Figure 9-3

- After closing switch 'S', the current I_D will increase linear in time. The magnetic energy in the primary coil is directly proportional with the self-inductance of the coil and current I_D (thus with the time the switch is closed). The voltage polarity at the secondary winding is negative (due to different winding direction), meaning that diode D will block. Capacitor C will discharge via R_L , U_{OUT} will decrease.
- Opening switch 'S' will generate a counter-e.m.f. in the primary winding, trying to maintain current I_D . Through this the polarity of the secondary voltage will invert. The magnetic energy, stored in the coil, will now be transformed to the secondary side. Diode D will now conduct, capacitor C will be charged and U_{OUT} will increase.

Implementation

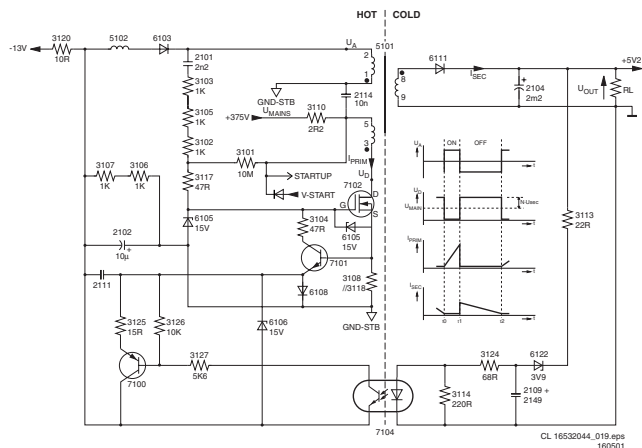


Figure 9-4

To apply this on the EM3E (diagram A2): replace switch 'S' by FET TS7102, coil L by L5101/L5100, diode D by D6111 and C by C2104.

- **Time interval $t_0 - t_1$:** After switching 'on' the TV-set, the gate of MOSFET TS7102 will be high (max. 15 V due to zener diode D6105). This will drive the FET into saturation ($U_{DS} = 0$ V). The DC-voltage U_{MAINS} will be transposed across the primary winding of L5101 (3, 5), resulting in a linear increasing current through this coil. The voltage across the co-coupled coil (1, 2) is also positive and will keep the FET into conductivity via C2101, R3103/3105/3102 and R3117 for some time. The self-induction of the coil and the magnitude of the supply voltage (+375 V) determine the slope of the primary current. The maximum current is determined by the time the FET stays into conductance ($t_0 - t_1$). This time is directly determined by the voltage across R3108/

/R3118 ($= 5 \Omega$). This voltage is a measure of the current and if it exceeds 1.4 V, TS7101 will be driven into conductivity and consequently connects the gate of TS7102 to earth. The FET will block. The current is: $1.4 \text{ V} / 5 \Omega = 0.28 \text{ A}$. The voltage across the secondary winding (8,9) will be negative, diodes D6111 and D6107 will block.

- **Time interval t1 - t2:** The sudden current interruption in the primary coil will induce a counter-e.m.f. that wants to maintain the current. The voltage on the drain of the FET will increase. The secondary voltage (8, 9) will become positive and will charge C2104 via D6111. All energy that was stored in L5101 during t0 - t1 will be transferred into the load. Due to the transformer principle, a voltage will now be induced in the primary winding (3, 5) and the co-coupled winding (1, 2). This voltage will be $N \cdot U_{\text{SEC}}$ (N = winding ratio). The voltage across the co-coupled coil will be negative, keeping the FET blocked.
- **Time t2:** At t2, the current through the secondary coil will be reduced to zero, as C2104 is no longer charged. As a consequence, the voltages will decay and will change polarity. The gate of the FET will be again made positive, is driven into conductivity and the cycle starts again.

Feedback and stabilisation

The Standby Power Supply always oscillates at maximum power. The only limiting factor is the maximum primary current, which has been pre-set with R3108//3118.

R3114, R3124, R3113 and zener diode D6122 determine U_{OUT} . If the voltage across R3114 exceeds the threshold voltage of the diode of the optocoupler 7104 ($\pm 1 \text{ V}$) or, in other words, U_{OUT} exceeds 5.2 V, the transistor of the optocoupler will conduct.

Transistor TS7100 is now driven, and a negative voltage will be transposed to the emitter of TS7101. When TS7101 conducts, the gate of the FET is at earth potential, forcing the oscillator stop. Due to the load, the secondary voltage U_{OUT} will decrease. At a certain voltage, optocoupler TS7104 will block and the oscillator will start again.

Since there are no capacitors, and there is a high amplification factor in the feedback circuit, the feedback is ultra-fast. This is why the ripple on U_{OUT} is minimal. The negative supply voltage (-13 V) used in the feedback circuit, originates from the co-coupling coil and is rectified through D6103.

Stabilisation is not affected through duty-cycle control but through burst-mode of TS7100.

Burst-mode is load dependent. If the power supply is less loaded, the secondary voltage will have the tendency to increase more rapidly. If the load on the power supply increases, then the oscillator stops less often, right up to the moment that the oscillator is operating continuously: maximum load. If the power supply is now loaded even more, the output voltage will decay. The maximum primary current set by R3108//3118 determines the maximum load.

Protection

If the optocoupler would fail, the secondary voltage will increase. This would have disastrous consequences since many ICs (e.g. OTC, Flash-RAM and DRAM) are fed with this 5.2 V. In other words; very expensive repairs would be required.

We already know that the negative supply is directly dependent upon the secondary 5.2 V, as a consequence of which the negative supply will increase proportionally as the secondary voltage increases.

If the negative supply in the mean time reaches -15 V, D6106 will start to zener and as a consequence TS7101 will start conducting. Basically, D6106 will take over the stabilisation task of the optocoupler, however, with a considerable spread: from -13 V to -15 V is a 15 % increase, thus U_{OUT} will increase from 5.2 V to max. 6 V.

Tuner Supply

The Standby supply produces 2 voltages for the Tuner: +33V (V_{TUN}) and +5VT.

- The +33V is the tuning voltage for the Tuner.
- The +5VT is derived from the +8V with stabiliser 7911, and is used to supply the tuner only.

SSB Supply

There are several voltages going to the SSB: +8V, +5V and +3V3.

- The +5V and +(always present) come directly from the Standby power supply.
- The +3V3 is derived from the +5V with stabiliser 7910 (on the LSP).

9.3.4 Main Supply (diagram A1)

Some **important** notes on beforehand:

- V_{BAT} is not isolated from the main supply ('hot').
- V_{BAT} is alignment free.

Principle

The Main Power Supply, generates the 141 V (V_{BAT}) and the +/- 16 V for the audio part. It is based on the so-called 'down converter' principle.

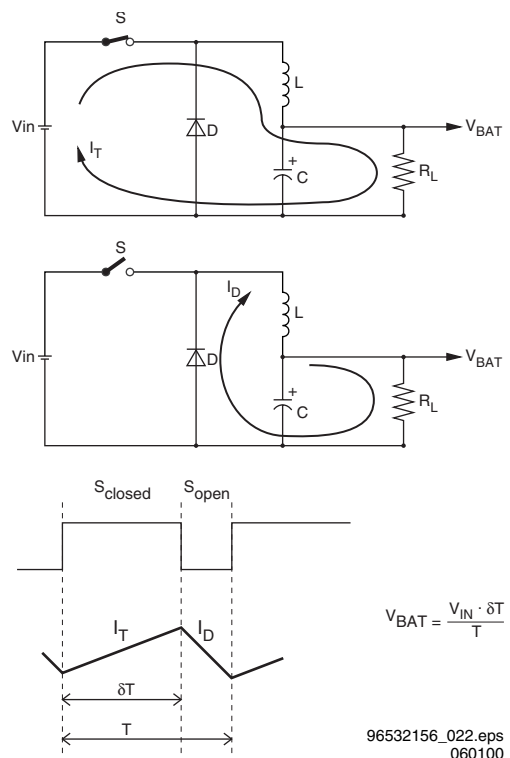


Figure 9-5

- After closing switch 'S', the linear in time increasing current I_T , will charge capacitor C.
- Opening switch 'S' will generate a counter-e.m.f. in coil L, trying to maintain current I_T . This is possible via diode D (this diode is also called 'freewheel diode'). So after opening 'S', the magnetic energy stored in coil L will be transferred to electrostatic energy in capacitor C. The V_{IN} will only supply current during the time that 'S' is closed while a constant current is flowing through R_L .
- V_{BAT} is directly proportional with V_{IN} and the time that 'S' is closed and reverse proportional with period time 'T'. So by changing the duty cycle, it will be possible to control V_{BAT} .

Implementation

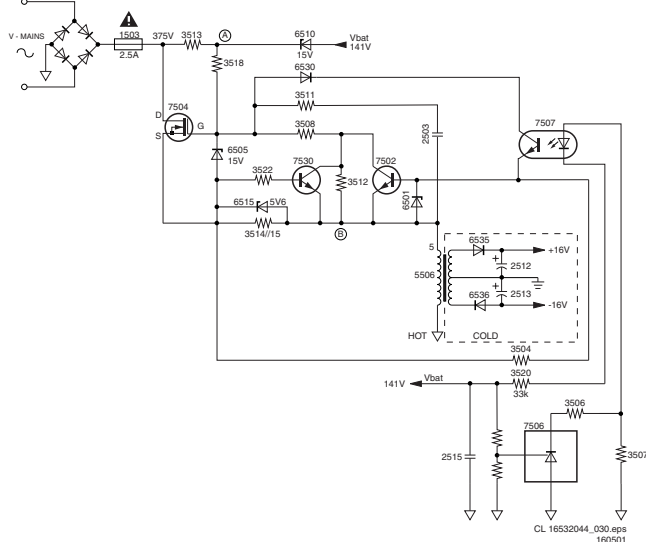


Figure 9-6

At start-up of the main supply, C2515 can be assumed as being a short-circuit. U_{AB} will be 15 V (R3513, D6510) and U_{GS} of the FET will be +5.4 V. The FET will be driven into saturation (same as closing switch 'S'). The drain-current will increase linear in time. With other words: resistors R3513 and R3518 will start the oscillator.

The voltage across the co-coupled coil (4, 5) is also positive and will keep the FET into conductivity.

The drive concept of the MOSFET TS7504 has changed (compared to the EM2E chassis). In EM2E, TS7502 was a high-voltage semiconductor, in EM3E it is changed to a low-voltage semiconductor. The added opto-coupler 7505 is used to bridge the different voltage levels.

Via this opto-coupler, the DC-current through R3504 is influenced. The changed current through R3504, changes the V_{BE} of TS7502, which will influence the drive of MOSFET TS7504 (= switch 'S' in Fig. 5).

The sudden current interruption in the primary coil, will induce a counter-e.m.f. that wants to maintain the current via the 'freewheel' diode D6508. This current is linear decreasing in time and as it is also flowing through R3414//R3415, TS7502 will be blocked after a certain time period. The gate of the FET will be again made positive, is driven into conductivity and the cycle starts again.

For safety reasons, transistor TS7530 is added as a back-up solution for TS7502. If B-E of TS7502 is shorted, TS7530 takes over its function.

Stabilisation of V_{BAT}

The output voltage V_{BAT} is determined by: $V_{BAT} = V_{IN} \cdot T_{ON} / (T_{ON} + T_{OFF}) = V_{IN} \cdot \text{duty-cycle}$.

To stabilise the output voltage, a feedback loop is implemented, which will reduce T_{ON} when V_{BAT} increases and vice versa.

Via a voltage divider, consisting of (1 %) resistors R3507, R3510 and R3527, a voltage of 2.5 V (when $V_{BAT} = 141$ V) is fed to the input of precision shunt regulator 7506. This regulator will conduct, a current will flow through the diode part of the opto-coupler 7507. The base of TS7502 will now be set at a certain positive voltage. As this transistor switches the FET TS7504 on and off, this circuit can determine the duty-cycle.

E.g. when the load increases, V_{BAT} will decrease. As a consequence, the input voltage of regulator 7506 will decrease, resulting in a lower current. Via opto-coupler 7505

and transistor TS7502, T_{ON} of the FET is changed (will increase). The output voltage V_{BAT} will rise.

If the load continues to increase, the regulator will block at a certain moment. T_{ON} will be now at maximum value. This is the point where V_{BAT} will go below 141 V and, at further increasing load, is switched 'off' (the voltage across the co-coupled coil (4, 5) will decrease, due to the increasing load. Therefore the voltage on the gate of TS7504 comes below the threshold voltage. The supply switches 'off' and an audible hiccupping can be heard).

On the other hand when the load decreases, V_{BAT} will rise. As a consequence, the input voltage of TS7506 will also rise, resulting in a higher current. This changes the base voltage of TS7502, and through that the T_{ON} (will decrease) of the FET. The output voltage V_{BAT} will be reduced.

If, for instance, V_{IN} will decrease (e.g. U_{MAINS} is 180 V i.s.o. 240 V), the slope of the drain-current will be flattened, through which the FET will be longer into conductance, keeping V_{OUT} constant.

If, for any reason, the stabilisation circuit might fail, the output voltage V_{BAT} can never exceed 200 V (via D6514). D6514 will form a short-circuit, V_{BAT} will drop and the set will switch off (this will result in an audible hiccupping of the supply).

Switch to 'Standby' (via RC)

When the set is switched to 'Standby' mode via the Remote Control, the Main supply is switched 'off' by the circuit around TS7529 (see diagram A1).

During 'on'-state, the Main supply is fed with line pulses via the 'SUP-ENABLE' line. They are rectified and smoothed via D6517, D6516 and C2530 and fed to TS7529. Because they are less than -13 V, this transistor is blocked. When these pulses are stopped, TS7529 will be saturated and TS7502 will switch 'off'. This will switch 'off' the Main supply.

Set to 'On' (via 'SUP-ENABLE')

Via the 'STANDBY' command from the OTC, the MOSFETS 7141 and 7131 are switched 'on'. When the +5V and +8V are sensed by the OTC, a command is given to the HOP to start the drive (via I²C).

When this is sensed via the 'SUP-ENABLE' line (at the base of line transistor TS7421), the main supply is switched 'on' via TS7529.

Audio Supply

The pulses on the secondary winding of L5506 are rectified by D6535 (+16 V) and D6536 (-16V), and smoothed by C2542 and C2543.

9.4 Control (diagram B5)

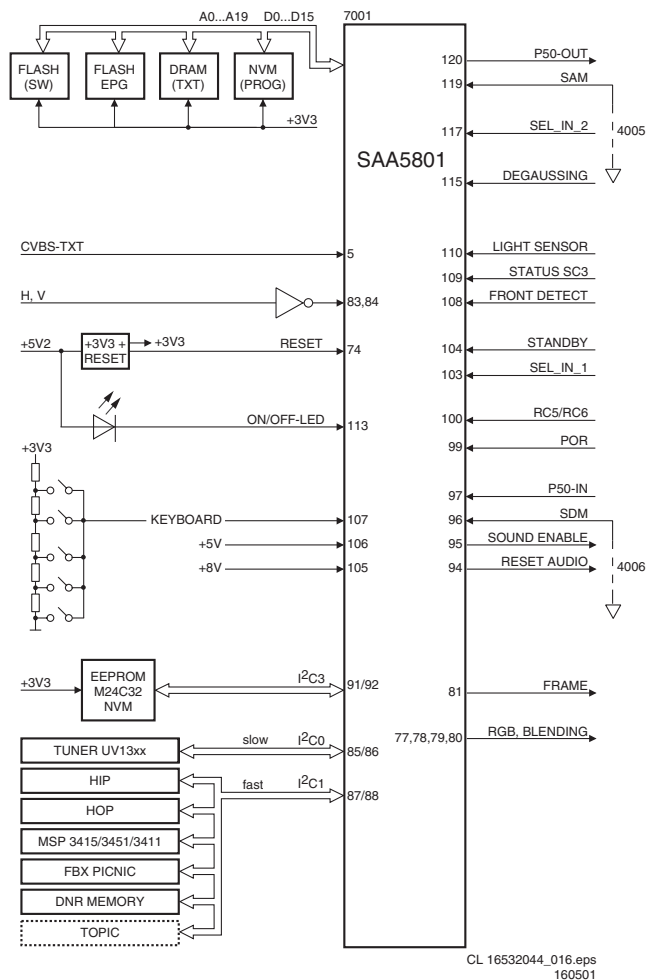


Figure 9-7

9.4.1 OTC

Introduction

The SAA5801 (IC7001) is called the OTC (OSD, TXT and Control). In this IC, the microprocessor and the TXT-decoder (level 2.5) are integrated.

Some of its functions are:

- Set control.
- TXT/OSD acquisition.
- RGB-outputs to the HOP
- Menu blending; for blending the contrast, software controlled.
- I/O-ports for I²C, RC5/RC6, LED, and service modes.
- Error code generation.

Data Storage

The software for EM3E can be 2 MB (Megabyte). It is possible to store 1200 TXT pages in IC7007. This is a DRAM of 4 MBit and this IC is also used to store data of a working set.

For EPG a Flash-RAM (7012) is used.

The Non Volatile Memory IC7011 is a 4 kB version M24C32W6.

Power Supply

All ICs in this part are supplied with 3V3. For this voltage a 3V3 stabiliser is used (IC7005).

With the circuitry around TS7003 and 7004 (diagram B5) a reset is generated to wake up the OTC (pin 74). During this reset all I/O pins of the OTC are made 'high'.

Via pins 105 and 106, the +8 V and the +5 V are sensed. If one of them is not present, the Main supply is switched 'off' (set in protection and the red LED will blink at 3 Hz). The OTC will generate an error code to indicate what was wrong.

OSD/TXT

The horizontal (H_{D100}) and vertical (V_{SYNC}) sync pulses are also fed to the OTC for stable OSD and TXT. The RGB-outputs (77/78/79) together with fading (pin 80) are fed to the HOP. The fading pin has a double function: it is used for making a transparent menu and as fast-blanking signal for TXT.

9.4.2 I²C Busses

In the EM3E chassis with OTC-processor there are three I²C busses used:

- Slow (max. 100 kHz) hardware I²C-bus (called I²C0), used for the Tuner.
- Fast (max. 400 kHz) hardware I²C-bus (called I²C1), used for all ICs.
- Separate short bus (called I²C3) for the Non Volatile Memory (NVM), to avoid data corruption.

9.4.3 NVM

The Non Volatile Memory contains all set related data that must be kept permanently, such as:

- Software identification.
- Operational hours.
- Error-codes.
- Option codes.
- All factory alignments.
- Last Status items for the customer + a complete factory recall.
- Txt featuring (keeping habit watch data).
- EPG data.

9.5 Tuner & IF (diagram A8 & B2)

The tuner is I²C controlled, and is capable of receiving off-air, S- (cable) and Hyperband channels:

- Low 44 - 156 MHz
- Mid 156 - 441 MHz
- High 141 - 865 MHz

The tuning is done via I²C. The reference voltage on pin 9 is 33 V. This voltage (V_{TUN}) is derived from the secondary side of the standby supply, via D6134 and R3116//R3115 and a 33 V zener diode (D6200). The OTC, together with the HIP, controls the tuning procedure. There is also automatic switching for the different video systems.

The IF-filter is integrated in a SAW (Surface Acoustic Wave) filter. The type of this filter depends on the received standard(s). There are two SAW filters: one for filtering picture-IF and a second one for sound-IF. An extra filter (5403), tuned at 40.4 MHz, is necessary for L/L' sets (with 6.5 MHz sound), to suppress the neighbour channel.

The output of the tuner is controlled via an IF-amplifier with AGC-control. This is a voltage feedback from pin 62 of the HIP to pin 1 of the tuner. AGC take-over point is adjusted via the service alignment mode 'Tuner AGC'. If there is too much noise in the picture, it is possible that the AGC setting is wrong. It is also possible that the AGC-setting is mis-aligned, if the picture deforms with a perfect signal. Then the IF-circuit amplifies too much.

The video IF-signal is fed to pins 2/3 of the PLL-controlled IF-demodulator. The voltage controlled oscillator of the PLL is

adjusted via the service menu 'IF AFC'. If the alignment is correct, the displayed frequency in the installation menu is the same as the applied frequency from a generator. The external coil L5408 connected between pins 7/8 is used as reference.

The demodulated IF-video signal is available at pin 10 of the HIP. In this video signal, there is a rest of the sound carrier, which is filtered out by the sound trap 1407.

Then the signal is again fed to the HIP on pin 12, where the group delay is corrected, dependent on the standard that is received.

The CVBS-signal is available at pin 13 for further processing in the set. Via TS7322, the signal is supplied to EXT1 (monitor out) and again back into the HIP (pin 14) to the source/record selection.

To realise Quasi Split Sound (QSS), the IF-signal is fed to the HIP on pin 63/64 via SAW-filter 1405. The FM (or AM for L-norm) -modulated signal is available on pin 5 and is fed to the audio demodulator MSP34xx (7651).

9.6 Video: High-end Input Processor (HIP, diagram B2))

In the EM3E, the HIP TDA932xH is used, which contains the following functions:

- IF demodulation.
- Group delay correction.
- AFC signal generation, used to track drifting transmitters.
- Sound carrier re-generation (SIF).
- AM demodulation.
- Sync acquisition, delivering H_A and V_A .
- Switching off IF-filtering.

9.6.1 Inputs

The HIP has various inputs:

- Full matrix switch with:
 - 2 CVBS inputs
 - 2 Y/C (or additional CVBS) inputs
 - 1 CVBS front end input.
- Two RGB inputs and 2 status-inputs

The input signals from the Front I/O are fed to the HIP, and front detection is fed to the OTC.

- EXT1 is full SCART: thus CVBS and RGB. The RGB-selection is done in the HIP.
- EXT2 is meant for VCR and has therefore some additional signals in relation to EXT1 but no RGB. EXT2 has also the possibility for Y/C_in and Easylink-Plus (P50). Y_in is with pin 20 and Chroma in with pin 15. Easylink is handled via pin 10 of the SCART and this is a bi-directional communication.
- EXT3 is meant for CVBS input only.

9.6.2 Outputs

One can select three, separate switchable, outputs:

- 1 YUV-output, which is fed to the PICNIC
- 2 CVBS outputs, one for Teletext Dual Screen and the other for output to EXT2 to have WYSIWYR (What You See Is What You Record).

9.6.3 I/O Switching

The external signals are fed directly to the I/O part of the HIP with status from pin 8 of SCART. On the HIP there are two status inputs available (pins 15, 17) with two voltage levels:

- 4:3 -> 2.2 V
- 16:9 -> 5.5 V

9.6.4 P50

Easylink supports the next features:

- Signal quality and aspect ratio matching
- One touch play
- One touch text
- Pre-set download
- WYSIWYR
- Automatic Standby

With Easylink-Plus (P50+) is added:

- Country and language installation
- System Standby
- Intelligent set top box features
- NextView download
- Timer record control
- VCR control feature

9.6.5 Video Processing

The sandcastle-pulse of the HIP is not used for synchronisation. The HOP will generate synchronisation signal derived from the feature box (PICNIC) signals. If a VCR is connected, there is also an automatic correction for MacroVision. This is active for the external sources and the pre-sets 0, 90-99.

The HIP itself (no external voltage) controls the Y/C switch in the HIP.

The chrominance decoder in the HIP is full multi-standard: PAL/SECAM/NTSC.

Two different crystals can be connected to the pins 54 & 57 without any alignment. The crystals are also used as a reference for the synchronisation. A digital control circuit that is locked to the reference signal of the colour decoder determines the start-up of the sync. The original one may only replace this crystal. If just a crystal is taken, the internal capacitance will be different and the effect will be that there is no colour.

In the HIP a sync separation circuit is integrated; the HIP delivers the HA_{50} and VA_{50} to the PICNIC.

9.7 Video: Feature Box (PICNIC and FALCONIC, diagram B3)

9.7.1 Introduction

The basic function of the Feature box (FBX6) is picture improvement, and depending on the version, several scan conversion methods are possible. The PICNIC (SAA4978H) is the central key component.

In the EM3E-chassis, the feature-box is integrated on the SSB.

The PICNIC is used for the 100Hz conversion and has the following functions:

- The ADC.
- The DAC.
- The 100 Hz conversion.
- Dual screen compression
- The Panorama mode.
- Automatic Aspect Ratio Adaptation (AARA)
- Colour Transient Improvement (CTI)
- The contrast improvement (Dynamic Contrast).

All these functions are integrated in one IC: SAA4978H, 160 pins QFP

9.7.2 ADC/DAC

Analogue to Digital conversion is done with three identical 9-bit ADC's.

Digital to Analogue conversion uses three identical 10-bit DAC's.

In the PICNIC there are three 9 bits ADCs present for Y,U,V. For digitising the Y (luminance), 9 bits are used (to realise a

more detailed picture). These 9 bits are only internally used. Via dithering the 9 bits are reduced to 8 bits and this data is stored into memory. The data in the memory is fed back to the PICNIC and via un-dithering the data is again reproduced to 9 bits for processing.

U/V (colour difference signals) is also sampled with 9 bits. These two 9 bit data streams are multiplexed to 4 bits data streams. As the perception for colours by the human eye is less sensitive as for luminance, this reduction is allowed.

9.7.3 100 Hz Conversion

The main task of the PICNIC is the conversion from 50Hz to 100Hz for YUV and HV-sync. In order to remove 'large area flicker' (especially visible in a white picture), the field-rate of the video is doubled by the FBX6. A 50/60 Hz frame frequency is converted to 100/120 Hz. Also the line frequency (16 kHz) is doubled (32 kHz).

Basically, when the video input contains fields A, B etc..., the conversion provides an AABB sequence on the display. The actual conversion is done in the first Field Memory (by reading it twice at double speed, while writing it once.

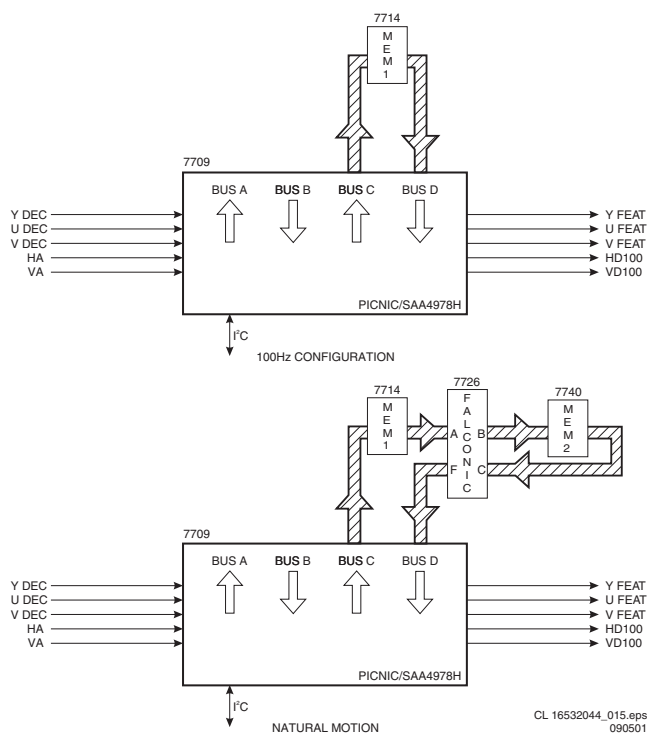


Figure 9-8

For extra 100 Hz features, it is possible to add an extra IC to the PICNIC. This IC, called the 'Field And Line CONverter IC' (FALCONIC), has three modes:

1. **100 Hz** (to eliminate field flicker). Only one memory IC (7714) is used to store one frame. It displays an ABBB sequence.
2. **Digital Scan** (to additionally eliminate line flicker). Together with two memory ICs (7714 and 7740), it displays an AA'BB' or ABAB sequence.
3. **Natural Motion** (to additionally eliminate movement juddering). Together with two memory ICs (7714 and 7740), it displays an AB'A'B sequence.

9.7.4 Dual Screen Compression

The PICNIC can provide horizontal video compression up to 50%. The compress mode can be used to display dual screens with Teletext (only for wide-screen sets).

9.7.5 The Panorama Mode

To fit 4:3 pictures into a 16:9 display, it is possible to apply a panoramic horizontal distortion, to make a screen-fitting picture without black sidebars or lost video.

The centre horizontal gain is programmable and the side gain is automatically adapted to make a screen-fit.

9.7.6 Automatic Aspect Ratio Adaptation (AARA)

This feature uses data from the 'black bar detection circuit' to adapt the vertical and horizontal amplitude to an aspect ratio belonging to the display, without the black bars.

9.7.7 Colour Transient Improvement (CTI)

At CVBS video signals, the bandwidth of colour signals is limited to 1/4 of the luminance bandwidth. Transients between areas of different colours are therefore not very sharp.

The PICNIC can steepen these transients artificially with a time manipulation algorithm.

9.7.8 Dynamic Contrast

To make the contrast (black/white) range wider, Philips has invented Dynamic Contrast. It uses the digital memory used in 100 Hz sets. It measures every A-field (25 x per second), and digitally analyses where on the greyscale most of the image is located.

If it is a relatively dark image, the lighter part of that image is stretched towards white, so that more contrast will become visible in that picture.

If it is a relatively light image, the darker part of that image is stretched towards black, so that these darker parts will have more contrast.

When the image is in the middle of the greyscale, both dark and light parts are stretched.

9.8 Video: High-end Output Processor (HOP) and TOPIC (diagram B4)

9.8.1 General

The YUV-signals from the PICNIC are fed to the HOP (High-end Output Processor, TDA9330). The video and geometry control parts are integrated in the HOP. Also the RGB-signals for TXT/OSD (from the μ P), are inserted via the HOP. The geometry part delivers the H-drive, EW-drive, V-drive and also a drive signal for rotation.

The main functions of the HOP are:

- Video control (contrast, brightness, saturation, etc.).
- Deflection drive.
- 2nd RGB interface for OSD/TXT.
- Peak White Limiting.
- Cut-off control and White Drive (RGB outputs).
- Geometry control.

The TOPIC (The most Outstanding Picture improvement IC, item 7302, type TDA9178), is an **optional** IC between the PICNIC and the HOP. It has the following (picture improvement) functions:

- Luminance Transient Processor (LTP), for detail enhancement.
- Chrominance delay circuitry, to compensate timing differences between Y and C.
- Spectral processor, for improved sharpness and colour transient improvement (CTI).
- Colour vector processor, for skintone correction, green enhancement and blue stretch.
- Measure and detection circuitry, for AutoTV.

The sandcastle pulse from the HOP is fed to pin 1 of the TOPIC, which is used as reference for timing.

9.8.2 Video Control

After source selection, the HOP controls the signals for Saturation, Contrast and Brightness. Output is RGB again.

9.8.3 OSD/TXT Control

On pins 35 to 38 the RGB and fast blanking from the OTC (OSD and TXT) are inserted. The sync signal V_{SYNC} is derived from the 'FRAMEDRIVE-' signal.

9.8.4 Peak White Limiting

On pin 43 there is a Peak White Limiting signal line (PWL). If the beam current increases, the 'EHT-info' voltage will decrease. Average limiting via R3343/C2333 controls PWL.

9.8.5 Cut-off Control

The following will happen when you switch the TV to Standby:

1. The vertical scan is completed.
2. The vertical flyback is completed (the horizontal output is gated with the flyback pulse, so that the horizontal output transistor cannot be switched 'on' during the flyback pulse).
3. The 'slow stop' of the horizontal output is started, by gradually reducing the 'on' time at the horizontal output from nominal to zero (this will take 50 ms).
4. At the same time, the fixed beam current is forced via the black-current-loop for 25 ms. This is done by setting the RGB outputs to a maximum voltage of 5.6V.

In the EM3E a 'one-point' cut-off control is used: A current of $8 \mu\text{A}$ (for cut-off) is fed to pin 44 of the HOP. This is done with a measurement pulse during the frame flyback. During the 1st frame, 3 pulses are generated to adjust the cut-off voltage at a current of $8 \mu\text{A}$. With this measurement the black level at the RGB-outputs is adjusted. So at start-up there is no monitor pulse anymore. At start-up, the HOP measures the pulses, which come back via pin 44. The RGB-outputs have to be between 1.5 V and 3.5 V. If one of the outputs is higher than 3.5 V or one of them lower than 1.5 V, the RGB-outputs will be blanked.

9.8.6 Geometry control

All geometry control is done via I²C and the data is stored in the NVM (IC7011) of the SSB.

9.8.7 Deflection Control

Line Drive

The Line drive is derived from an internal VCO of 13.75 MHz. As a reference, an external resonator is used (1301). The internal VCO is locked with the HD₁₀₀-pulse, which comes from the PICNIC.

The 'PHI-2' part in the HOP receives the HFB_X-RAY_PROT (pin 13) to correct the phase of the Line drive. The EHT-info is supplied to pin 14 (DYN-PHASE-CORR) to compensate picture breathing depending on the beam current.

Note: This is not used in the EM3E, therefore EHT-compensation in the SAM menu is put to zero.

Frame Drive

At pins 1 and 2 the symmetrical frame drive signals are available. The V_{SYNC} signal, for synchronisation of the OSD/TXT, is derived from the 'FRAMEDRIVE-' signal.

East/West Drive

At pin 3, the E/W-drive is available. Pin 4 is a feedback input for the EHT-info, and is used to prevent pumping of the picture. The EHT varies also dependent on the beam current. For wide-screen without load this is 31.5 kV and with load (1.5 mA) 29.5 kV.

Frame Rotation

For frame rotation, a control voltage is used from pin 25 of the HOP. Frame rotation is only used in wide-screen sets.

9.8.8 Protections

Flash detection

When a flash occurs, the EHT-info will become negative very fast. Via R3316/D6304/D6303, TS7303 starts to conduct. This makes pin 5 of HOP 'high'. The output (pin 8) is immediately stopped.

If the H-drive stops, then also pin 5 will become 'low' again, which will reset the flash detection.

A bit (FLS) is set in an output status register, so that the OTC can see that there was a flash. This FLS-bit will be reset when the OTC has read that register.

HFB protection

If the HFB is not present, it is detected via the HOP. The OTC puts the TV into protection and reads a register in the HOP. An error code is generated.

9.9 Synchronisation (diagram B2, B3 & B4)

The HIP video processor provide the vertical and horizontal sync pulses V_A and H_A . They are synchronised with the incoming CVBS signal. Then these pulses are fed to the PICNIC, where they are doubled to be synchronous with the 100 Hz picture. The outgoing pulses, VD₁₀₀ and HD₁₀₀, are fed to the HOP, which supplies the vertical and horizontal drive pulses and the 100 Hz (2f_H) sandcastle pulse.

The VD₁₀₀ pulse from the PICNIC is inverted by TS7304 to the V_D signal. The OTC is synchronised on the HFB pulse from the CRT and on the V_{SYNC} from the HOP, for the synchronisation of TXT/OSD/EPG

When no CVBS is offered to the video processor, the V_{A50} and H_{A50} pulses are switched 'off' by the HIP, and the pulses are generated by the PICNIC (to assure a stable OSD).

9.10 Horizontal (Line) Deflection (diagram A3)

9.10.1 Principle

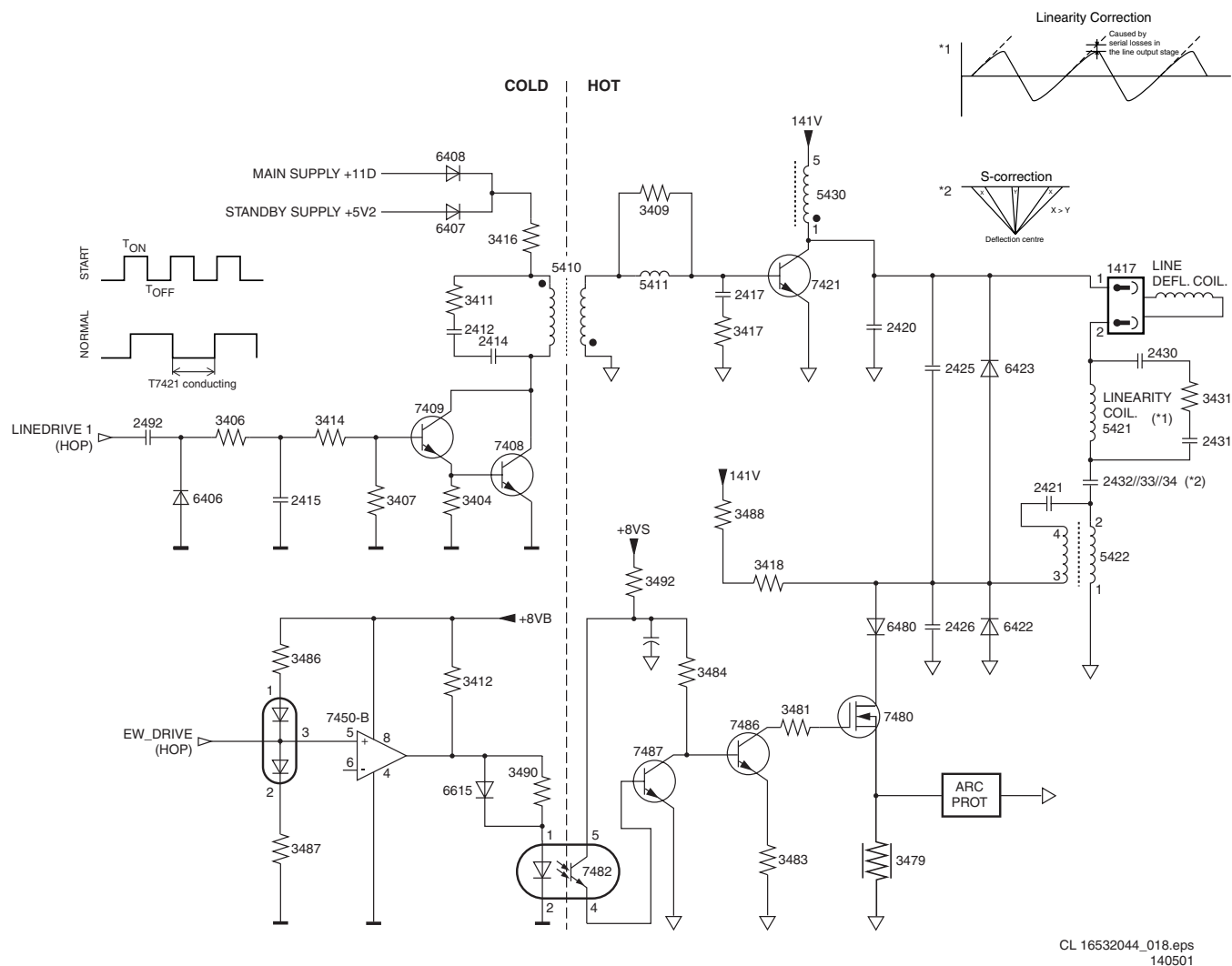


Figure 9-9

The HOP (located on the SSB) generates the line-drive pulses (LINEDRIVE1), which have a frequency of 31250 Hz ($T = 32 \mu\text{s}$).

When the LINEDRIVE1 signal is high, TS7409 and TS7408 will conduct. A constant DC voltage will be applied across L5410, causing a linear increasing current through this coil. The secondary voltage of L5410 has a negative polarity so that TS7421 will block. When the set is switched 'on', the current through L5410 is supplied by the 5V2 Standby supply (via D6407), and taken over by the +11D voltage (via D6408) of the main supply.

When the LINEDRIVE1 signal becomes low, TS7409 and TS7408 will block. The voltage polarity across the primary winding of L5410 will invert. The positive voltage on the secondary winding will now drive TS7421 into conductivity. Because of the storage time of the line transistor (TS7421), L5410 cannot transfer its energy immediately to the secondary side. This may result in high voltage peaks on the collector of TS7409 and TS7408. To prevent that these peaks will damage the transistors, a 'snubber' circuit (C2414, C2412 and R3411) will suppress them.

When the LINEDRIVE1 signal is high again, the above described sequence starts again. Circuit L5411 and R3409 will increase the switch 'off' time of the line transistor.

The line stage is started via a 'slow start' principle. During start-up, the HOP generates line drive pulses with a small T_{ON} and a high frequency (50 kHz). T_{OFF} is constant and T_{ON} is gradually increased until the frequency is 31.25 kHz (normal condition).

The time interval from start to normal condition takes about 150 ms.

When switching off, the same procedure is followed, but now in reverse order.

9.10.2 Implementation

To explain the operation of the line output stage, we use the following start conditions:

- C2433 is charged to max. 141 V (V_{BAT})
- TS7421 is driven into conductivity.

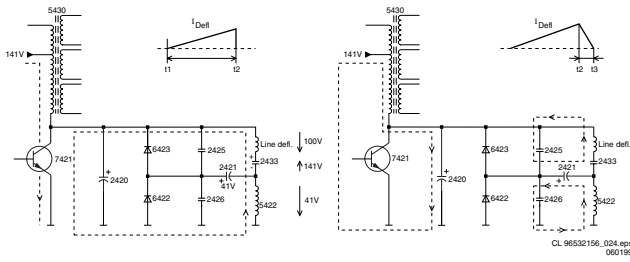


Figure 9-10

- **Period t1 - t2:** When TS7421 is driven into conductivity, the capacitor voltage of 141 V, will be divided across bridge-coil L5422 and the deflection coil (connector 0317). Due to the chosen inductance values, there will be 100 V across the deflection coil and 41 V across L5422. The linear increasing current in the deflection coil will result in a spot moving from the centre of the picture tube to the right. The voltage across L5422 will also charge C2421 (41 V - 0.7 V).
- **Period t2 - t3:** At the moment the LINEDRIVE signal becomes high, TS7421 will stop conducting. In the coils a voltage will be induced, trying to maintain the current. The current through the line deflection coils continues to flow through C2425 and C2421 and the current through L5422 continues to flow through C2426 and C2421. The energy stored in the line deflection coil is passed to C2425, and the energy of L5422 to C2426. The resonance-frequencies of these 2 LC-circuits define the flyback time of the spot from the right side of the picture tube to the left. On average no current flows through C2421 and thus the voltage across this capacitor remains constant.

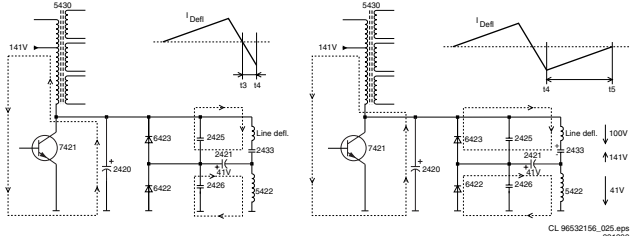


Figure 9-11

- **Period t3 - t4:** As for the period t2 - t3; but now the current flows in the opposite direction, since the voltage across C2425 and C2426 is higher than the voltage across C2433 and C2421.
- **Period t4 - t5:** The coils want to maintain the negative current and will charge the capacitors negative. Because of this, D6422 and D6423 will conduct. The voltage is 100 V across the deflection coil and 41 V across L5422. As both diodes conduct, we may consider the voltage to be constant. A linear current flows with the same changing characteristics as in period t1 - t2. The spot now moves from the extreme left of the picture tube to the centre. Before the current becomes zero, and the spot is located in the centre of the frame, TS7421 reverts back into conductivity. First a short negative current will flow. The cycle starts again.

9.10.3 Corrections

Several corrections are necessary to obtain a correct picture.

Linearity Correction

A constant voltage across the horizontal deflection coil should result in a linear increasing saw-tooth current. This is not the case however, as the resistance of the coil is not

negligible. In order to compensate for this, a pre-magnetised coil L5421 in series with the deflection coil is used. This coil ensures that during time interval t1 - t3 the circuit resistance will be higher than during t4 - t5.

L5421 is called the linearity coil. To avoid self-oscillation, R3431 and C2431 are placed parallel to L5421.

See also Figure 9-9-(*1).

S-correction

Since the sides of the picture are further away from the point of deflection than the centre, a linear saw-tooth current would result in a non-linear image (the centre would be scanned slower than the sides).

To solve this, the deflection current for the right- and left side is reduced.

C2433 is charged quadratic during time interval t1 - t2. Left and right the voltage across the deflection coil decreases, causing the deflection to slow down. In the centre, the voltage increases and the deflection will be faster.

An S-shaped current is superimposed on the saw-tooth current. This correction is called 'finger-length correction' or 'S-Correction'.

C2433 is relatively small, as a result of which the saw-tooth current will generate a parabolic voltage with negative voltage peaks. The current also results in a parabolic voltage across C2421, resulting in the finger-length correction, proportionally increasing with the picture width.

The EW-DRIVE signal will ensure the largest picture width in the centre of the frame. Here the largest correction is applied. The larger the picture width, the higher the deflection current through C2433.

See also Figure 9-9-(*2).

EW-correction

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

The EW drive signal originates in the HOP and is supplied to TS7480 via OpAmp 7450-B and optocoupler TS7482. The shape of this signal determines the various geometric correction parameters:

- H amplitude
- EW-parabola
- EW-corner
- EW-trapezium
- Horizontal parallelogram
- Horizontal bow

TS7480 will charge capacitor C2421 more or less, increasing the deflection current when reaching the centre of the screen. The moment TS7480 is driven into saturation, C2421 will discharge during the flyback. As a consequence of which C2421 must be charged again during the scan via the conduction diode D6422 (as long as C2421 is not charged to the voltage across L5422, D6422 will conduct).

The current in the deflection coil is therefore larger than the current flowing in L5422 (1-2). The voltage across the deflection coil increases, so the picture width increases. When TS7480 blocks, C2421 will not discharge anymore, and the voltage across C2421 will remain constant. The result is that the voltage across the deflection coil is minimal. The voltage across coil L5422, however, is maximal. This coil (L5422) consists of a transformer with the following properties:

- As the current through the coil 1-2 increases (smaller picture width), the current through coil 3-4 decreases. Because of the transformer characteristic a higher voltage will be subjected to coil 3-4, which will counteract the current. The current will diminish even further.
- When the current through coil 1-2 diminishes (larger picture width), the current through coil 3-4 increases.

Frame Output Protection

Via the circuit built around TS7641 the frame output stage is guarded. If the frame output stage is working properly, TS7641 and TS7652 will both conduct and thereby discharge C2642. TS7407 is blocked, so the SUP-ENABLE signal is 'high'.

If there are frame pulses missing, TS7641 will block and capacitor C2642 is charged. Transistor TS7407 starts conducting and the SUP-ENABLE signal is grounded via R3403. This will switch 'off' the main supply (see diagram A1).

ARC Protection

If there are 'open' connections (e.g. bad solder joints) in the high energy deflection circuitry, this can lead to damaging effects (read: fire). For that reason, the E/W current is sensed (via 3479//3480). If this current becomes too high, the 'thyristor' circuit (TS7653 and TS7654) is triggered. TS7442 is switched 'on' and TS7443 is forced into conduction. The 'SUP-ENABLE' signal is shorted now to ground level, which will force the Main Power Supply to Standby mode

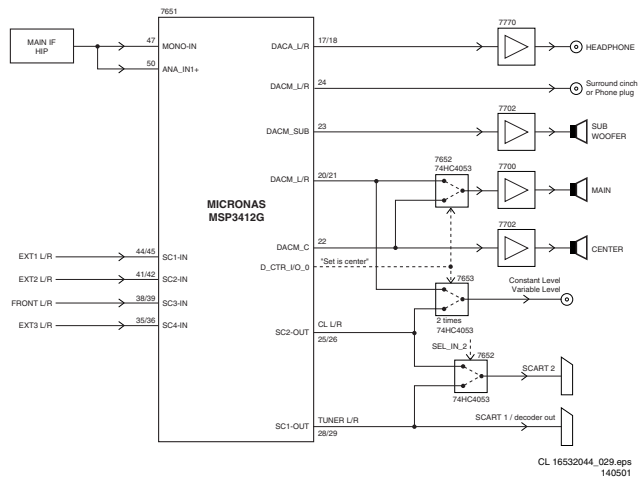


Figure 9-14

Following amplifier configurations are possible:

- Virtual Dolby, L/R, 2 x 15 W (88XX-series)
- 3D Surround, L/R, Centre, Subwoofer, 4 x 15 W (95XX-series).

9.12 Audio (diagram B6, A6 & A7)

9.12.1 Introduction

All EM3E sets contain one of ITT's Multi-standard Sound Processing (MSP) ICs for sound decoding. The diversity arises because each member of the MSP-family handles its own set of sound standards:

- MSP3411: Virtual Dolby decoding.
- MSP3412: Dolby ProLogic decoding.

Both versions also handle NICAM.

The MSP IC takes care of the main FM sound decoding. AM decoding for the L system is done by the HIP. The demodulated L sound is then again source selected and processed in the MSP. The reason for this is the bad AM detection performance of the MSP. However in case of NICAM L, it is handled by the MSP.

All MSP versions contain digital audio processing, used for the basic left/right stereo sound, such as bass, treble, balance, incredible sound and spatial.

In addition to that, both versions are capable of Dolby processing:

- The MSP3411 can perform 'Virtual Dolby' processing (a Dolby approved sound mode for surround sound reproduction with left/right speakers only).

9.12.2 Inputs / Outputs

Both versions can cover 4 stereo inputs and one AM (mono) input. This means in practice: 3 SCART inputs, 1 side input and 1 AM (mono) input.

Both versions have the following outputs: SCART1 (CVBS/decoder out), SCART2 (record select/WYSIWYR out) and headphone.

9.12.3 Source Selection

The constant level output to SCART2 is connected via a so-called 'Régimbeau' switch (IC7652) (see also Figure 9-13). This switch is needed to prevent acoustic feedback (Larsen effect). This effect is caused, when EXT2 is chosen as input signal, and the output of SCART2 is selected. This means that the main picture is also EXT2, which will cause the Larsen effect.

To prevent this, the record select must be switched to 'Tuner'. This is especially important when decoders are used, behind a 'transparent' VCR connected to EXT2.

To get a constant level output if the Tuner is selected, the SCART1 output ('Tuner' at any time), has to be fed back to the input selector and selected as input for the MSP (SCART1 input).

The MSP34XX has a separate headphone output, so sound control be done separate from the speakers.

9.12.4 Audio Decoding

At the input a choice can be made between two IF-signals; SIF and SIFM.

The selected signal is fed to the AGC. After this, an ADC converts the IF-signal to digital.

Two demodulation channels can process this digital signal. The first one is able to handle FM and NICAM signals. The second one can handle FM and AM signals.

Each channel contains a mixer to shift the incoming signal in the frequency domain. This shift is determined by the value of a DCO.

After the down-mix, the signal is fed, via a filter, to a discriminator. From here the AM, FM or NICAM demodulation can be performed.

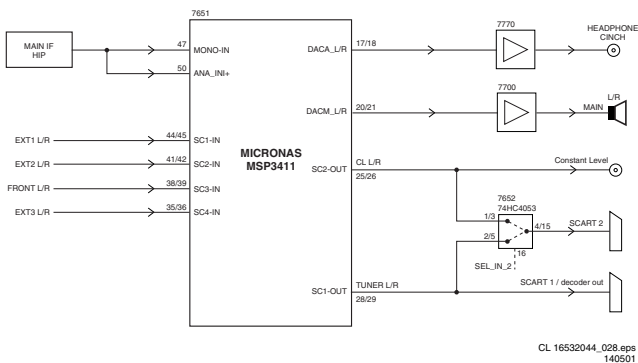


Figure 9-13

- The MSP3412 can perform 'Dolby ProLogic' processing (left, right and (mono) surround).

Both channels contain an 'automatic carrier mute' function, which automatically mutes the output of the analogue section when no carrier is detected.

After demodulation, the FM-signals are subjected to a de-emphasis operation. After that the matrix of the stereo system is applied.

9.12.5 Audio Processing

The sound processing in EM3E is completely done by the MSP's:

- Volume control is done by the user via the SOUND menu.
- Tone control in 'Stereo' sets is done via the BASS/TREBLE control, in 'Virtual Dolby' sets via the 5-band equaliser.
- Headphone control, the MSP has a separate Headphone output so separate sound control is possible.

Automatic Volume Levelling (AVL)

One of the features of the MSP-family is Automatic Volume Limiting (AVL). If used, it limits the big volume differences in the broadcast between e.g. news transmissions and commercials, or within a movie.

To be able to get a Dolby approval (for the Virtual Dolby sets), the AVL feature must be switchable. Therefore, the AVL feature is customer switchable via the menu.

9.12.6 Audio Amplifier (diagram A6)

The audio amplifier is an integrated 'class-D' power amplifier IC, the TDA7490. It delivers an output of 2 x 15 WRMS to 2 full range speakers. For the higher specified sets, a subwoofer and centre speaker are easy to implement, by adding a second amplifier.

Principle

Audio-power-amplifier systems have traditionally used linear amplifiers, which are well known for being inefficient. In fact, a linear Class AB amplifier is designed to act as a variable resistor network between the power supply and the load. The transistors operate in their linear region and the voltage that is dropped across the transistors (in their role as variable resistors) is lost as heat, particularly in the output transistors. Class D amplifiers were developed as a way to increase the efficiency of audio-power-amplifier systems.

The Class D amplifier works by varying the duty cycle of a Pulse Width Modulated (PWM) signal.

By comparing the input voltage to a triangle wave, the amplifier increases duty cycle to increase output voltage, and decreases duty cycle to decrease output voltage.

The output transistors of a Class D amplifier switch from full 'off' to full 'on' (saturated) and then back again, spending very little time in the linear region in between. Therefore, very little power is lost to heat.

If the transistors have a low 'on' resistance $R_{DS(ON)}$, little voltage is dropped across them, further reducing losses.

The advantage of Class D is increased efficiency (= less heat dissipation). Class D amplifiers can drive the same output power as a Class AB amplifier using less supply current.

The disadvantage is the large output filter that drives up cost and size. The main reason for this filter, is that the switching waveform results in maximum current flow. This causes more loss in the load, which causes lower efficiency.

An LC filter with a cutoff frequency less than the Class D switching frequency (200 kHz), allows the switching current to flow through the filter instead of the load. The filter is less lossy than the speaker, which causes less power dissipated at high output power and increases efficiency in most cases.

The supply voltage is a symmetrical voltage of +/- 16 V (or +/- 19 V depending on the set execution), generated by the main supply via L5512 (or L5506).

Mute

Sound-mute is done via the STBY-MUTE line connected to pin 6 (tri-state input) of the amplifier IC. This line is activated via the SOUND-ENABLE line (software controlled) and/or POR line (hardware controlled).

This signal is inverted by TS7701 and/or TS7703, as a result of which at a high level of the SOUND-ENABLE signal, current is sunk from pin 2 and the IC mutes.

Protection

A loudspeaker DC protection is implemented. The amplifier IC TDA7490 has a 'standby-mute-play' feature via the tri-state input pin 6. When the voltage on pin 6 is:

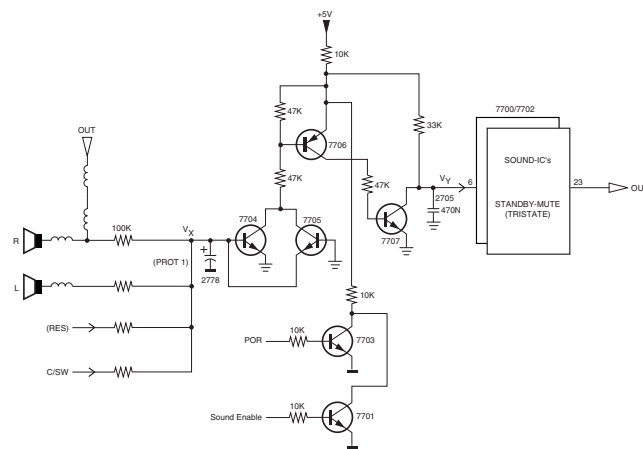
- 0 - 0.7 V, the IC is in 'standby' mode
- 1.7 - 2.5 V, the IC is in 'mute' mode
- 4 - 5 V, the IC is in 'play' mode (normal operation).

Note: this is a 'local' protection, **not** known to the microprocessor.

This works as follows:

- During normal operation, V_X is 'low' (0 V) and V_Y is 'high' (+5 V).
- When a **positive** DC-voltage is detected on a loudspeaker output (= V_X), TS7704, TS7706 and TS7707 will conduct, making V_Y 'low'.
- When a **negative** DC-voltage is detected on a loudspeaker output (= V_X), TS7705, TS7706 and TS7707 will conduct, making V_Y also 'low'.

When V_Y is 'low' (read 0 V), the tri-state input (pin 6) puts the amplifier IC in 'standby' mode.



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140501

Figure 9-15

9.12.7 Headphone Amplifier (diagram A7)

The headphone amplifier is a straight forward OpAmp amplifier (7770, NJM4556). It is supplied with +/- 16 V.

9.13 Teletext and NexTView

9.13.1 Teletext

The TXT-decoder in the OTC gets its video signal directly on pin 5 (from the HIP).

The RGB-outputs are available on pins 77/78/79. Fast blanking is realised via pen 80.

The DRAM (IC7007) of the microprocessor is used for storage of the TXT pages.

9.13.2 NexTVView

NexTVView allows the user to display a program guide on the TV screen, that contains extensive information for each program (only when supported by the programs provider).

This information can be displayed in a number of different summaries:

- **DAY:** The daily summary shows, from the current moment, the program schedule for several stations for a short time ahead.
- **CHANNEL:** The channel summary shows the program schedule for one station.
- **THEME:** The theme summary shows, for each theme, the program schedule of the various stations. These themes consist of sport, film, culture, etc. and is determined from the station side.

NexTVView does not have to restrict itself to information about the station that is being viewed, but also offers information about other stations. In the various summaries 3 different commands can be given for the various program overviews. These commands appear as follows:

- **WATCH:** The set immediately switches over to the station concerned.
- **REMINDER:** The start time and date and the station of the program concerned is stored in the TV reminder list. The TV will give an OSD-message with the program information, or switch on the set at the correct moment (provided the set is in Standby) and tune to the station concerned.
- **RECORD:** The timer of the video recorder with 'Easylink Plus' is programmed with the data of the program concerned. There has to be a video recorder (with Easylink Plus) connected to SCART2 otherwise the 'RECORD' function will not be highlighted. The connection is via pin 10 from SCART. This means that it has to be a full SCART or at least pin 10 has to be wired.

In order to be able to realise NexTVView, two teletext type data flows, Data stream 1 and 2, are transmitted with various sub-code pages of information. This data flow can transport limited information (max. 40 pages). Data stream 1 is quick repeating with a repetition time of approximately 20 to 30 seconds. However, Data stream 2 has a much longer repetition time of approximately half an hour and has a large transport capacity.

- Data stream 1 contains information of the station that is being viewed.
- Data stream 2 contains up to one week of advance information from various stations that are covered by the provider.

9.14 CRT / SCAVEM / Rotation (diagram F)

9.14.1 RGB Amplifiers

On the CRT panel, the RGB amplifier (TDA6108, IC7307) is located. Via the outputs 7, 8 and 9 the cathodes of the picture tube are driven.

The supply voltage for the amplifier is 200 V and is derived from the LOT.

9.14.2 SCAVEM

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

Principle

SCAVEM will improve the slope as follows:

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

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

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

Implementation

Via the three resistors R33358, R33359 and R3360, Red, Green and Blue are added together, buffered and offered to the emitter of TS7300. On the collector of this transistor, configured in a common base, the sum of these 3 signals is obtained. Via the emitter follower formed with TS7301, this signal is conveyed to the differentiator C2330, R3324 and R3318. Only the high frequencies are differentiated (small RC-time).

The positive and negative pulses of this signal drive respectively TS7303 and TS7302 into conductivity. The DC setting of the output stage is set by R3304, R3308, R3316 and R3319. The working voltage of the transistors is settled at half the supply voltage.

At the positive section of the pulse, the current flows through R3318, C2307, the SCAVEM-coil and TS7303. At the negative section of the pulse, the current flows through R3318, C2309, the SCAVEM-coil and TS7302.

9.14.3 Rotation

In sets with a rotation coil (wide screen sets), the amount of frame rotation is adjusted with the DAC-output of the HOP (see also 'Vertical Deflection').

9.15 Software Related Features

Following features are described:

- Auto TV
- 'Switch On' Behaviour

9.15.1 AutoTV

The AutoTV (or 'Automatic Picture Control' or 'Active Control') aims at giving the customer the best possible picture performance at any time. Therefore it does real time processing of the video signal and as a result, it decides to adapt several video parameters throughout the whole chassis.

The AutoTV feature integrates traditional picture performance, AutoTV functionality and 'smart controls' in order to come to a kind of 'super smart' TV. It can be subdivided in:

- **Auto Noise Reduction.** This algorithm measures the amount of noise in the incoming video signal (this is done by the LIMERIC part of the PICNIC). As a result of this measurement, the amount of noise in the picture is corrected, starting from that noise level which is annoying for the customer. Which parameters exactly can be used is depending on the hardware.
- **Auto Sharpness.** This algorithm measures the amount of sharpness via the bandwidth of the incoming video signal and adapts the peaking frequency in the PICNIC according to this info. If the 'sharpness meter' sees the video content as 'sharp', high frequency peaking will be used. On the other hand, if the picture content is seen as

'not sharp', a low/mid frequency peaking is used. There is a coupling between the Auto Noise and the Auto Sharpness algorithm: if noise is present in the video content, then in general the sharpness will be made less aggressive. Special care has to be taken to the interaction of the LIMERIC and the vertical peaking of the PICNIC: a too big amount of vertical peaking increases the visibility of the 2DNR artefacts.

9.15.2 'Switch On' Behaviour

Below find the start-up sequence:

1. After the power is applied, the 'Standby supply' starts oscillating, generating the +5V2 (and +3V3). A RESET is generated and the OTC is awakened.
2. Next step is the check whether the set needs to be in 'Standby' mode or not. Therefore, the NVM content is read and the Standby-bit is checked. If the set is to stay in Standby, there is no further action.
3. If the set will switch 'on', first the degaussing will be activated (12 seconds). Meanwhile the MSP is reset and the Standby line is pulled low, leading to a full semi standby mode (5 V and 8V switched on)
4. The OTC waits until the +5V and the +8 V are fully present. This is done by checking the AD-input of the OTC. The +5V, +8V and I²C protection-algorithms are activated.
5. The HOP is instructed via the I²C-bus to start the drive. Via the SUP-ENABLE signal, the main supply is activated. The Line Deflection circuitry is supplied now with the V_{BAT}, and the EHT generation can start.
6. During start-up of the deflection, I²C traffic must be disabled for 250 ms to avoid data corruption. If flashes or spikes are generated during EHT start-up, I²C data could be disturbed or corrupted.
7. After deflection is powered up completely, all the other protection-algorithms are activated. The black current stabilisation loop in the HOP is switched on. Some extra checking is done to ensure that the loops are completely stabilised. The OTC sets all the necessary parameters for a correct sound and image and unblanks the picture.

9.16 Abbreviation List

AARA	Automatic Aspect Ratio Adaptation: algorithm that adapts aspect ratio to remove horizontal black bars; keeping up the original aspect ratio
ACI	Automatic Channel Installation: algorithm that installs TV sets directly from cable network by means of a predefined TXT page
ADC	Analogue Digital Converter
AFC	Automatic Frequency Control: control signal used to tune to the correct frequency
AGC	Automatic Gain Control: algorithm that controls the video input of the feature-box
AM	Amplitude Modulation
ANR	Automatic Noise Reduction: one of the algorithms of Auto TV
AR	Aspect Ratio: 4 by 3 or 16 by 9
Artistic	see OTC 2.5: main processor
ASF	Auto Screen Fit: algorithm that adapts aspect ratio to remove horizontal black bars but without throwing away video information
ATV	See Auto TV
AUDIO_C	Audio Centre
AUDIO_L	Audio Left
AUDIO_R	Audio Right
AUDIO_SL	Audio Surround Left
AUDIO-SR	Audio surround right
AUDIO_SW	Audio Subwoofer
Auto TV	Name for the combination of picture features/improvements which work automatically (ANR / Auto sharpness/Auto Histo/ambient light).
BG	System B and G
B-SC1-IN	Blue SCART1 in
B-SC2-IN	Blue SCART2 in
B-TXT	Blue teletext
CL	Constant Level: audio output to connect with an external amplifier
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
CVBS-TER	CVBS terrestrial
DAC	Digital to Analogue Converter
DBE	Dynamic Bass Enhancement: extra low frequency amplification
DC-filament	Filament supply voltage
DFU	Direction For Use: description for the end user
DNR	Digital Noise Reduction: noise reduction feature of the box
DSP	Digital Signal Processing
DST	Dealer Service Tool: special remote control designed for dealers to enter e.g. service mode
DVD	Digital Versatile Disc
DYN-FASE-COR	Dynamic phase correction
EHT	Extra High Tension
EHT-INFO	Extra High Tension information
EPG	Electronic Program Guide: system used by broadcasters to transmit TV guide information (= NexTView)
EW	East West, related to horizontal deflection of the set

EXT	External (source), entering the set via SCART or via cinches	SCAVEM	Scan Velocity Modulation
FBL	Fast Blanking: DC signal accompanying RGB signals	S/C	Short Circuit
FBX	Feature Box: part of small signal / separate module which contains 100 Hz processing, extra featuring and AutoTV algorithms	SIF	Sound Intermediate Frequency
FILAMENT	Filament of CRT	SIMM	80-fold connector between LSP and SSB
FLASH	Flash memory	SNERT	Synchronous No parity Eight bit Reception and Transmit
FM	Field Memory or Frequency Modulation	SSB	Small Signal Board
G-TXT	Green teletext	STBY	Standby
HA50	Horizontal Acquisition 1fh: horizontal sync pulse coming out of the HIP	SW	Subwoofer
HD100	Horizontal Drive 2fh: horizontal sync pulse coming out of the feature-box	TXT	Teletext
HFB	Horizontal Flyback Pulse: horizontal sync pulse from large signal deflection	TXT DS	Teletext Dual Screen
HIP	High-end video Input Processor: video and chroma decoder of EM3E	µP	Microprocessor
HOP	High-end video Output Processor: video, sync and geometry controller of EM3E	U100	U from Feature Box
HP	Headphone	V100	V from Feature Box
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.	VA50	Vertical Acquisition 1Fh
Last Status	The settings last chosen by the customer and read and stored in RAM or in the NVM. They are called at start-up of the set to configure it according the customers wishes	VBAT	Main supply for deflection (mostly 141 V)
LDP	Line Deflection Protection	VD100	Vertical Drive 2fh: vertical sync pulse from deflection
LED	Light Emitting Diode	VFB	Vertical Flyback Pulse: vertical sync pulse coming from the feature box
LINE-DRIVE	Line drive signal	VL	Variable Level out: processed audio output towards external amplifier
LNA	Low Noise Adapter	WYSIWYR	What You See Is What You Record: record selection that follows main picture and sound
LSP	Large signal panel	XTAL	Quartz crystal
MSP	Multi-standard Sound Processor: ITT sound decoder of EM3E	Y100	Y from Feature Box
MUTE	Mute-Line	Y-OUT	Luminance-signal to HOP IC
NC	Not Connected		
NVM	Non Volatile Memory: IC containing TV related data e.g. alignments		
O/C	Open Circuit		
ON/OFF LED	On/Off control signal for the LED		
OSD	On Screen Display		
OTC	On screen display Teletext and Control; also named Artistic (SAA5800)		
P50	Project 50 communication: protocol between TV and peripherals		
PCB	Printed Circuit board		
PICNIC	Peripheral Integrated Combined Network IC: main IC for 100 Hz featuring and feature processing		
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		
RAM	Random Access Memory		
R-TXT	Red teletext		
RC	Remote Control		
RC5 / RC6	Signal protocol from the remote control receiver		
RESET	Reset signal		
ROM	Read Only Memory		
SAM	Service Alignment Mode		
SC	Sandcastle: pulse derived from sync signals		

10. Spare Parts List

Large Signal Panel [A]

Various

0010	2422 025 16374	2P Male
0020	4822 267 10774	2P Male
0032	4822 492 70788	IC-SPRING
0037	3104 304 21112	LOT SSB SUPPORT
0045	4822 267 10734	5P MALE
0065	3104 304 22031	LOT SPACER
0066	3104 304 21591	SCART SUPPORT BRACKET
0150	4822 265 11253	FUSE HOLDER
0153	4822 265 11253	FUSE HOLDER
0317	4822 265 20723	2P MALE
0324	3104 311 01881	CABLE 7P 480mm
0325	2422 025 16382	3P Male
0735	2422 025 16407	3P Male
0736	2422 025 16382	3P Male
0936	2422 025 12485	11P Male
0940	4822 267 10968	11P FEMALE
0943	4822 267 10748	3P MALE
0945	4822 267 10735	3P MALE
0946	5322 268 90415	2P MALE
0947	4822 267 10734	5P MALE
1001	4822 252 60151	SURGE PROTECT
1002	2422 132 07411	RELAY 1P 5V 5A
1003	4822 267 10973	1P
1200	4822 210 10848	UV1316/A I U-2
1205	2422 025 16599	80P Female SIMM
1501	4822 070 34002	FUSE 4A
1503	2422 086 10912	FUSE 2,5A
1901	4822 267 10771	IC SOCKET 42P
1902	4822 267 10982	2P
8000	4822 320 12525	CABLE
8001	4822 320 20234	EHT CABLE
8015	4822 320 20216	CABLE
	3122 785 100	Supply Kit Mains Supply EM2E
	3122 785 100	Supply Kit Standby Supply EM2E
	3122 785 100	Line Repair Kit EM2E

-II-

2101	5322 122 32818	2.2nF 10% 100V
2102	4822 124 40248	10µF 20% 63V
2103	5322 122 32531	100pF 5% 50V
2104	4822 123 14025	2200µF 20% 16V
2105	5322 122 32531	100pF 5% 50V
2106	5322 126 10223	4.7nF 10% 63V
2107	5322 122 32818	2.2nF 10% 100V
2108	4822 121 70162	10nF 5% 400V
2109	4822 126 13482	470nF 80/20% 16V
2110	5322 121 42498	680nF 5% 63V
2111	4822 121 43526	47nF 5% 250V
2113	4822 122 33127	2.2nF 10% 63V
2114	4822 126 10206	2.2nF 10% 500V
2200	4822 124 40196	220µF 20% 16V
2201	4822 126 14076	220nF 25V
2202	4822 126 13473	220nF 80-20% 50V
2203	4822 124 41584	100µF 20% 10V
2400	4822 124 11575	47µF 20% 160V
2412	4822 126 13751	47nF 10% 63V
2413	4822 124 12255	10µF 20% 50V
2414	4822 126 13751	47nF 10% 63V
2415	4822 122 33575	220pF 5% 63V
2417	4822 126 14076	220nF 25V
2419	4822 126 14237	470pF 10% 2KV
2420	4822 121 70594	1nF 5% 2KV
2421	2022 333 00086	470nF 5% 250V
2421	4822 121 42634	560nF 5% 250V
2425	4822 121 10526	9N1 5% 2KV
2425	4822 121 70435	10nF 5% 2KV
2426	4822 121 10653	22nF 5% 630V
2426	4822 121 10658	24nF 5% 630V
2429	4822 121 43343	4.7nF 10% 400V
2430	4822 121 41857	10nF 5% 250V
2431	4822 121 42077	6.8nF 10% 400V
2431	4822 126 13599	3.3nF 10% 500V
2433	2022 333 00086	470nF 5% 250V
2433	4822 121 42634	560nF 5% 250V
2435	4822 121 10526	9N1 5% 2KV
2450	5322 121 42578	100nF 5% 250V
2455	5322 126 10511	1nF 5% 50V
2460	4822 124 40784	3300µF 20% 16V
2461	4822 122 31177	470pF 10% 500V
2462	4822 124 80061	1000µF 20% 25V

2463	4822 122 31177	470pF 10% 500V
2464	4822 124 80061	1000µF 20% 25V
2465	4822 122 31177	470pF 10% 500V
2468	4822 124 12297	4.7µF 20% 350V
2469	4822 122 31177	470pF 10% 500V
2480	4822 121 51442	2.2nF 10% 50V
2489	4822 124 40433	47µF 20% 25V
2490	4822 122 33891	3.3nF 10% 63V
2491	4822 124 40768	0.47µF 20% 100V
2492	4822 126 14076	220nF 25V
2495	4822 126 13838	100nF 20% 50V
2499	4822 126 13838	100nF 20% 50V
2501	4822 126 11524	1.5nF 10% 1KV
2502	5322 122 32818	2.2nF 10% 100V
2503	5322 121 42489	33nF 5% 250V
2505	4822 126 14504	3.3nF 20% 250V
2507	4822 126 13589	470nF 275V
2508	4822 126 14153	2.2nF 10%B 1KV
2509	4822 126 14153	2.2nF 10%B 1KV
2510	4822 124 12415	220µF 20% 400V
2512	4822 124 12056	1000µF 20% 35V
2513	5322 122 34099	470pF 10% 63V
2514	5322 122 31863	63V 330pF 5%
2515	4822 124 11575	47µF 20% 160V
2518	4822 126 11308	47pF 5% 500V
2519	5322 122 32818	2.2nF 10% 100V
2520	4822 126 14585	100nF 10% 50V
2521	4822 122 33216	270pF 5% 50V
2528	4822 126 14585	100nF 10% 50V
2530	4822 126 14585	100nF 10% 50V
2531	4822 122 31169	1.5nF 10% 500V
2535	4822 121 43913	470nF 10% 100V
2536	4822 126 10206	2.2nF 10% 500V
2537	4822 124 11913	22nF 20% 275V
2538	5322 126 10223	4.7nF 10% 63V
2600	4822 121 43913	470nF 10% 100V
2601	4822 121 51252	470nF 5% 63V
2602	4822 124 40433	47µF 20% 25V
2603	4822 122 33177	10nF 20% 50V
2604	4822 124 40248	10µF 20% 63V
2610	4822 122 33127	2.2nF 10% 63V
2620	4822 126 14076	220nF 25V
2621	4822 126 13838	100nF 20% 50V
2622	4822 124 40255	100µF 20% 63V
2624	4822 121 51252	470nF 5% 63V
2625	4822 121 51252	470nF 5% 63V
2627	5322 124 40641	10µF 20% 100V
2642	4822 124 40255	100µF 20% 63V
2700	4822 124 21913	1µF 20% 63V
2701	4822 124 21913	1µF 20% 63V
2730	4822 124 81151	22µF 50V
2731	4822 124 81151	22µF 50V
2732	4822 124 40255	100µF 20% 63V
2733	4822 124 40255	100µF 20% 63V
2734	4822 124 81151	22µF 50V
2735	4822 124 81151	22µF 50V
2736	5322 122 31865	1.5nF 10% 63V
2737	5322 122 31865	1.5nF 10% 63V
2756	4822 126 13751	47nF 10% 63V
2760	4822 124 80061	1000µF 20% 25V
2761	4822 124 80061	1000µF 20% 25V
2765	4822 124 40255	100µF 20% 63V
2767	4822 124 40255	100µF 20% 63V
2782	4822 126 13751	47nF 10% 63V
2902	5322 122 31863	330pF 5% 63V
2903	5322 122 31863	330pF 5% 63V
2906	5322 122 32531	100pF 5% 50V
2909	5322 122 31863	330pF 5% 63V
2910	5322 122 32531	100pF 5% 50V
2912	4822 124 40248	10µF 20% 63V
2913	4822 126 14585	100nF 10% 50V
2915	5322 122 31863	330pF 5% 63V
2916	5322 122 31863	330pF 5% 63V
2917	5322 122 32531	100pF 5% 50V
2919	5322 122 31863	330pF 5% 63V
2920	5322 122 32531	100pF 5% 50V
2923	5322 122 31863	330pF 5% 63V
2925	5322 122 31863	330pF 5% 63V
2926	4822 124 81044	470µF 20% 6.3V
2927	4822 124 40433	47µF 20% 25V
2941	5322 122 31865	1.5nF 10% 63V
2942	5322 122 31865	1.5nF 10% 63V
2951	4822 124 21913	1µF 20% 63V
2952	4822 126 13751	47nF 10% 63V
2953	4822 126 13751	47nF 10% 63V



3101 4822 053 20106 10M 5% 0.25W

3102	4822 050 26801	680Ω 1% 0.6W
3103	4822 050 26801	680Ω 1% 0.6W
3104	4822 116 52195	47Ω 5% 0.5W
3105	4822 050 26801	680Ω 1% 0.6W
3106	4822 116 52256	2k2 5% 0.5W
3107	4822 116 52256	2k2 5% 0.5W
3108	4822 116 52182	15Ω 5% 0.5W
3110	4822 052 10109	10Ω 5% 0.33W
3113	4822 116 52182	15Ω 5% 0.5W
3114	4822 116 83872	220Ω 5% 0.5W
3117	4822 116 52195	47Ω 5% 0.5W
3118	4822 050 24708	4Ω 7% 1% 0.6W
3120	4822 051 20109	100k 5% 0.1W
3123	4822 116 52176	10Ω 5% 0.5W
3124	4822 116 52199	68Ω 5% 0.5W
3125	4822 116 52182	15Ω 5% 0.5W
3126	4822 050 21003	10k 1% 0.6W
3127	4822 116 52289	5k6 5% 0.5W
3200	4822 051 20101	100Ω 5% 0.1W
3201	4822 051 20101	100Ω 5% 0.1W
3250	4822 051 20223	22k 5% 0.1W
3402	4822 117 10837	100k 5% 0.1W
3403	4822 051 20101	100Ω 5% 0.1W
3404	4822 051 20471	470Ω 5% 0.1W
3406	4822 051 20101	100Ω 5% 0.1W
3407	4822 117 10833	10k 1% 0.1W
3410	4822 051 20479	47Ω 5% 0.1W
3411	4822 116 52193	39Ω 5% 0.5W
3414	4822 117 13577	330Ω 1% 1.25W
3415	3198 012 31590	15Ω 5% 3W
3415	4822 117 12836	10Ω 5% 3W
3417	4822 116 52176	10Ω 5% 0.5W
3418	4822 050 22704	270k 1% 0.6W
3431	4822 052 10101	100Ω 5% 0.33W
3431	4822 052 10221	220Ω 5% 0.33W
3450	4822 116 52303	8k2 5% 0.5W
3450	4822 116 83961	6k8 5%
3451	4822 116 52257	22k 5% 0.5W
3460	4822 052 10108	1Ω 5% 0.33W
3461	4822 052 10108	1Ω 5% 0.33W
3462	4822 052 10108	1Ω 5% 0.33W
3463	4822 052 10108	1Ω 5% 0.33W
3464	4822 052 10108	1Ω 5% 0.33W
3465	4822 052 10108	1Ω 5% 0.33W
3466	4822 052 10688	6Ω 8 5% 0.33W
3466	4822 052 10828	8Ω 2 5% 0.33W
3467	4822 052 10108	1Ω 5% 0.33W
3468	4822 052 11688	6Ω 8 5% 0.5W
3475	4822 116 52175	100Ω 5% 0.5W
3481	4822 116 52175	100Ω 5% 0.5W
3483	4822 051 10102	1k 2% 0.25W
3484	4822 117 11139	1k5 1% 0.1W
3485	4822 117 11454	820Ω 1% 0.1W
3486	4822 117 12955	2k7 1% 0.1W
3487	4822 117 11449	2k2 1% 0.1W
3488	4822 116 52272	330k 5% 0.5W
3488	4822 116 83874	220k 5% 0.5W
3489	4822 117 11449	2k2 1% 0.1W
3491	4822 050 21504	150k 1% 0.6W
3495	4822 051 20683	68k 5% 0.1W
3496	4822 117 11507	6k8 1% 0.1W
3497	4822 117 10834	47k 1% 0.1W
3498	4822 051 20472	4k7 5% 0.1W
3499	4822 117 10837	100k 1% 0.1W
3500	4822 117 12074	1Ω 5% 10W
3501	3198 013 04710	470Ω 2% 1/2W
3504	4822 116 83883	470Ω 5% 0.5W
3507	4822 050 21604	160k 1% 0.6W
3508	3198 012 16820	6.8k 1W
3509	2322 595 90021	VDR DC 1M A/495V
3510	4822 117 11951	2k 1% 0.1W
3511	4822 116 52276	3k9 5% 0.5W
3512	4822 116 52297	68k 5% 0.5W
3513	4822 116 52272	330k 5% 0.5W
3514	4822 053 10108	1Ω 5% 1W
3515	4822 053 10108	1Ω 5% 1W
3516	4822 116 10075	9Ω 220V
3518	4822 050 11204	120k 1% 0.4W
3519	4822 051 20223	22k 5% 0.1W

3530	4822 116 52297	68k 5% 0.5W
3531	4822 117 10833	10k 1% 0.1W
3533	4822 051 20159	15Ω 5% 0.1W
3535	4822 051 20273	27k 5% 0.1W
3536	4822 117 10837	100k 1% 0.1W
3537	4822 117 10833	10k 1% 0.1W
3538	4822 051 20332	3k3 5% 0.1W
3539	4822 117 10833	10k 1% 0.1W
3540	4822 117 10834	47k 1% 0.1W
3541	4822 117 10833	10k 1% 0.1W
3542	3198 012 11570	0Ω15 5% 1W
3543	4822 051 20478	40Ω 5% 0.1W
3544	4822 051 20479	47Ω 5% 0.1W
3600	4822 050 22205	2M2 1% 0.6W
3601	4822 050 22205	2M2 1% 0.6W
3602	4822 051 20332	3k3 5% 0.1W
3603	4822 101 11319	100Ω LIN
3605	4822 051 20273	27k 5% 0.1W
3606	4822 051 10102	1k 2% 0.25W
3607	4822 051 20223	22k 5% 0.1W
3608	4822 051 20223	22k 5% 0.1W
3609	4822 101 11193	47k 30% LIN 0.1W
3610	4822 051 20683	68k 5% 0.1W
3611	4822 051 20822	8k2 5% 0.1W
3612	4822 051 20274	270k 5% 0.1W
3613	4822 051 20274	270k 5% 0.1W
3614	4822 050 21005	1M 1% 0.6W
3615	4822 050 18204	820k 1% 0.4W
3615	4822 116 52292	560k 5% 0.5W
3616	4822 116 52285	470k 5% 0.5W
3617	4822 050 11002	1k 1% 0.4W
3618	4822 051 10102	1k 2% 0.25W
3619	4822 051 20562	5k6 5% 0.1W
3620	4822 116 80176	1Ω 5% 0.5W
3620	4822 116 80676	1Ω5 5% 0.5W
3621	4822 116 80176	1Ω 5% 0.5W
3622	4822 116 80176	1Ω 5% 0.5W
3623	4822 117 10834	47k 1% 0.1W
3624	4822 052 10158	1Ω5 5% 0.33W
3625	4822 116 83872	220Ω 5% 0.5W
3626	4822 116 83872	220Ω 5% 0.5W
3627	4822 050 21003	10k 1% 0.6W
3630	4822 051 10102	1k 2% 0.25W
3631	4822 051 20332	3k3 5% 0.1W
3632	4822 117 10833	10k 1% 0.1W
3633	4822 050 21003	10k 1% 0.6W
3644	4822 117 10833	10k 1% 0.1W
3645	4822 116 52245	150k 5% 0.5W
3652	4822 051 20101	100Ω 5% 0.1W
3701	4822 117 10833	10k 1% 0.1W
3702	4822 117 10833	10k 1% 0.1W
3730	4822 117 10833	10k 1% 0.1W
3731	4822 117 10833	10k 1% 0.1W
3732	4822 051 20822	8k2 5% 0.1W
3733	4822 051 20822	8k2 5% 0.1W
3734	4822 117 10834	47k 1% 0.1W
3735	4822 117 10834	47k 1% 0.1W
3736	4822 051 10102	1k 2% 0.25W
3737	4822 051 10102	1k 2% 0.25W
3738	4822 117 11148	56k 1% 0.1W
3739	4822 117 11148	56k 1% 0.1W
3740	4822 051 20683	68k 5% 0.1W
3741	4822 051 20683	68k 5% 0.1W
3742	4822 116 52199	68Ω 5% 0.5W
3743	4822 116 52199	68Ω 5% 0.5W
3756	4822 117 10833	10k 1% 0.1W
3762	4822 051 20828	8Ω2 5% 0.1W
3765	4822 117 11507	6k8 1% 0.1W
3770	4822 117 10834	47k 1% 0.1W
3771	4822 116 83933	15k 1% 0.1W
3773	4822 116 83933	15k 1% 0.1W
3789	4822 051 20828	8Ω2 5% 0.1W
3790	4822 051 10102	1k 2% 0.25W
3792	4822 051 10102	1k 2% 0.25W
3900	4822 116 83868	150Ω 5% 0.5W
3901	4822 117 10353	150Ω 1% 0.1W
3902	4822 117 10353	150Ω 1% 0.1W
3903	4822 117 10353	150Ω 1% 0.1W
3905	4822 116 83883	470Ω 5% 0.5W
3906	4822 116 52201	75Ω 5% 0.5W
3907	4822 051 20561	560Ω 5% 0.1W
3908	4822 116 52201	75Ω 5% 0.5W
3909	4822 116 52201	75Ω 5% 0.5W
3910	4822 116 52201	75Ω 5% 0.5W
3911	4822 116 52201	75Ω 5% 0.5W
3913	4822 116 52201	75Ω 5% 0.5W
3915	4822 116 52201	75Ω 5% 0.5W
3916	4822 051 20822	8k2 5% 0.1W
3918	4822 051 20392	3k9 5% 0.1W
3919	4822 051 10102	1k 2% 0.25W
3920	4822 051 10102	1k 2% 0.25W
3921	4822 117 10353	150Ω 1% 0.1W
3922	4822 117 10353	150Ω 1% 0.1W
3923	4822 117 10353	150Ω 1% 0.1W

3924	4822 117 10353	150Ω 1% 0.1W
3925	4822 052 10688	6Ω8 5% 0.33W
3928	4822 051 20101	100Ω 5% 0.1W
3929	4822 117 10833	10k 1% 0.1W
3930	4822 051 20561	560Ω 5% 0.1W
3932	4822 116 52201	75Ω 5% 0.5W
3935	4822 116 52201	75Ω 5% 0.5W
3936	4822 117 10353	150Ω 1% 0.1W
3937	4822 117 10353	150Ω 1% 0.1W
3940	4822 117 10353	150Ω 1% 0.1W
3941	4822 117 10353	150Ω 1% 0.1W
3942	4822 051 20822	8k2 5% 0.1W
3944	4822 051 10102	1k 2% 0.25W
3945	4822 051 20392	3k9 5% 0.1W
3946	4822 051 10102	1k 2% 0.25W
3970	4822 051 20471	470Ω 5% 0.1W
3971	4822 117 10833	10k 1% 0.1W
3972	4822 117 10833	10k 1% 0.1W
3991	4822 116 52175	100Ω 5% 0.5W
3992	4822 051 20101	100Ω 5% 0.1W
3993	4822 051 20101	100Ω 5% 0.1W
3994	4822 116 52175	100Ω 5% 0.5W
3995	4822 116 52175	100Ω 5% 0.5W
3996	4822 116 52175	100Ω 5% 0.5W
3997	4822 116 52175	100Ω 5% 0.5W
3998	4822 116 52175	100Ω 5% 0.5W
4xxx	4822 051 10008	0Ω 5% 0.25W
4xxx	4822 051 20008	0Ω 5% 0.25W
9220	4822 051 20008	JUMPER
9225	4822 051 20008	JUMPER
9723	4822 051 20008	JUMPER
9724	4822 051 20008	JUMPER

5101	4822 146 11065	STANDBY TFM
5102	4822 157 70436	8.2μH
5103	4822 526 10704	BEAD 50MHZ
5104	4822 157 11411	BEAD 100MHZ
5105	4822 526 10704	BEAD 100MHZ
5200	4822 157 11775	6.8μH 5%
5400	4822 157 11869	33μH 10%
5410	4822 146 11065	TFM SIG FIX
5411	4822 157 71097	0.56μH
5421	4822 157 11204	COIL LINE CORR. (29")
5421	4822 157 11839	COIL LINE CORR. (28")
5421	4822 157 11841	COIL LINE CORR. (28"WS,32"WS)
5422	4822 157 71535	COIL BRIDGE
5424	4822 157 63255	COIL BRIDGE
5430	8204 000 73321	LOT (29")
5430	8228 001 33243	LOT (25",28")
5461	4822 157 11411	BEAD 100MHZ
5463	4822 157 11411	BEAD 100MHZ
5465	4822 157 11411	BEAD 100MHZ
5466	4822 157 71467	39U 10%
5467	4822 157 11411	BEAD 100MHZ
5504	2422 549 43286	MAINS 35mH 1A5
5505	4822 157 11411	BEAD 100MHZ
5506	2422 531 98042	TFM W8085-002 Y
5510	4822 157 11411	BEAD 100MHZ
5620	4822 157 11771	0.09μH 10%

6103	4822 130 42488	BYD33D
6105	4822 130 34281	BZX79-B15
6106	4822 130 34499	BZX79-B20
6108	4822 130 30621	1N4148
6109	4822 130 31083	BYW55
6111	4822 130 32715	SB340
6120	4822 130 30621	1N4148
6121	4822 130 30621	1N4148
6122	3198 010 53980	BZX79-B3V9
6200	9322 149 10685	BZM55-C33
6201	4822 130 83757	BAS216
6202	4822 130 83757	BAS216
6203	4822 130 10852	BZX284-C6V8
6204	4822 130 10852	BZX284-C6V8
6205	4822 130 83757	BAS216
6405	4822 130 11027	BZX284-C33
6406	4822 130 83757	BAS216
6407	4822 130 83757	BAS216
6408	4822 130 42488	BYD33D
6421	4822 130 10753	BY359X-1500
6422	4822 130 10218	BY229X-800
6442	9322 129 42685	BZM55-C15
6461	4822 130 82512	BYV29F-400
6462	4822 130 41487	BYV95C
6464	5322 130 31938	BYV27-200
6468	4822 130 42488	BYD33D
6480	4822 130 42488	BYD33D

6481	4822 130 31024	BZX79-B18
6482	4822 130 83757	BAS216
6499	4822 130 83757	BAS216
6501	4822 130 31083	BYW55
6502	4822 130 31083	BYW55
6503	4822 130 31083	BYW55
6504	4822 130 31083	BYW55
6505	4822 130 34281	BZX79-B15
6506	4822 130 30621	1N4148
6507	4822 130 80791	BYV28-200/20
6508	4822 130 11415	BYV28-400/20
6510	4822 130 34281	BZX79-B15
6511	4822 130 83757	BAS216
6512	4822 130 83757	BAS216
6514	5322 130 31932	BZT03-C200
6515	4822 130 32904	BZV85-C5V6
6516	4822 130 83757	BAS216
6517	4822 130 31983	BAT85
6518	4822 130 83757	BAS216
6520	4822 130 42488	BYD33D
6521	4822 130 83757	BAS216
6522	4822 130 83757	BAS216
6600	4822 130 31983	BAT85
6616	4822 130 83757	BAS216
6619	4822 130 42488	BYD33D
6620	5322 130 31938	BYV27-200
6621	4822 130 42488	BYD33D
6622	5322 130 33635	BZV85-C8V2
6623	4822 130 83757	BAS216



7100	4822 130 44568	BC557B
7101	4822 130 40959	BC547B
7102	4822 130 11417	STP3NB60FP
7104	4822 130 11418	TCDT1102G
7407	4822 130 60511	BC847B
7408	9332 592 40126	BC368
7409	4822 130 60511	BC847B
7421	4822 130 63666	BU2520DF
7480	4822 130 11417	STP3NB60FP
7481	4822 130 44568	BC557B
7482	4822 130 11418	TCDT1102G
7499	4822 130 60373	BC856B
7502	4822 130 61675	BF487
7504	9322 126 65687	STP5NB60FP
7505	4822 130 60373	BC856B
7506	4822 209 81397	TL431CLPST
7510	4822 130 60511	BC847B
7511	4822 130 60373	BC856B
7528	4822 130 40981	BC337-25
7529	4822 130 60511	BC847B
7600	4822 130 44461	BC546B
7602	4822 130 60511	BC847B
7603	4822 130 60373	BC856B
7605	4822 130 60511	BC847B
7606	4822 130 60511	BC847B
7610	4822 130 11418	TCDT1102G
7620	4822 209 90009	TDA8177
7641	4822 130 60511	BC847B
7652	4822 130 60511	BC847B
7720	4822 130 60511	BC847B
7721	4822 130 60511	BC847B
7722	4822 130 60373	BC856B
7723	4822 130 60373	BC856B
7724	4822 130 60511	BC847B
7725	4822 130 60511	BC847B
7730	4822 130 60511	BC847B
7750	4822 209 32269	TDA2616/N1
7900	4822 130 40959	BC547B
7901	4822 130 40959	BC547B
7905	9332 592 40126	BC368
7906	4822 209 12334	L4940V85
7907	4822 130 60511	BC847B

Small Signal Panel [B]

Various

1001	2422 543 89022	RES XTL 6M000
1301	2422 540 98456	RES 12MHZ
1305	2422 543 01092	RES XTL 4M433619
1308	2422 543 01097	RES XTL 3M579545
1405	2422 549 44369	FIL SAW 38MHZ
1407	2422 549 44324	FIL TPWCC0

-H-			
2001	4822 126 11671	33pF	
2002	4822 126 11669	27pF	
2003	4822 126 13879	220nF 20% 16V	
2004	4822 126 13879	220nF 20% 16V	
2005	4822 126 14305	100nF 10% 16V	
2006	4822 126 14305	100nF 10% 16V	
2007	4822 126 14305	100nF 10% 16V	
2008	4822 126 14305	100nF 10% 16V	
2009	4822 122 33777	47pF 5% 63V	
2010	4822 122 33777	47pF 5% 63V	
2011	4822 122 33777	47pF 5% 63V	
2012	4822 122 33777	47pF 5% 63V	
2013	4822 124 12095	100µF 20% 16V	
2014	4822 126 14305	100nF 10% 16V	
2015	4822 126 14305	100nF 10% 16V	
2016	4822 124 12095	100µF 20% 16V	
2017	4822 126 14305	100nF 10% 16V	
2019	4822 126 14305	100nF 10% 16V	
2020	4822 126 13883	220pF 5% 50V	
2022	4822 126 14305	100nF 10% 16V	
2023	4822 126 14305	100nF 10% 16V	
2024	4822 126 14305	100nF 10% 16V	
2025	4822 126 14305	100nF 10% 16V	
2026	4822 126 14305	100nF 10% 16V	
2027	4822 126 14305	100nF 10% 16V	
2028	4822 126 14305	100nF 10% 16V	
2029	4822 126 14305	100nF 10% 16V	
2031	4822 126 14305	100nF 10% 16V	
2032	4822 126 14305	100nF 10% 16V	
2033	4822 126 14226	82pF 5% 50V	
2034	4822 126 14226	82pF 5% 50V	
2035	4822 126 14226	82pF 5% 50V	
2036	4822 126 14226	82pF 5% 50V	
2037	4822 126 14226	82pF 5% 50V	
2038	4822 126 14305	100nF 10% 16V	
2300	4822 124 12095	100µF 20% 16V	
2303	5322 126 11583	10nF 10% 50V	
2304	4822 122 33741	10pF 10% 50V	
2306	4822 126 13881	470pF 5% 50V	
2307	4822 126 14305	100nF 10% 16V	
2308	4822 122 33741	10pF 10% 50V	
2313	4822 121 70159	0.1µF 16V	
2314	4822 124 12095	100µF 20% 16V	
2315	4822 126 14305	100nF 10% 16V	
2317	4822 126 14491	2.2µF 10V	
2318	4822 126 14494	22nF 10% 25V	
2319	5322 126 11583	10nF 10% 50V	
2320	4822 122 33741	10pF 10% 50V	
2321	4822 126 14305	100nF 10% 16V	
2322	4822 126 14305	100nF 10% 16V	
2323	4822 126 14305	100nF 10% 16V	
2324	5322 126 11583	10nF 10% 50V	
2325	4822 126 14305	100nF 10% 16V	
2328	4822 122 33761	22pF 5% 50V	
2329	4822 126 14305	100nF 10% 16V	
2330	4822 126 14305	100nF 10% 16V	
2331	4822 126 14305	100nF 10% 16V	
2332	4822 126 14305	100nF 10% 16V	
2333	4822 126 14491	2.2µF 10V	
2334	4822 126 14491	2.2µF 10V	
2335	4822 124 80349	47µF 20% 6.3V	
2336	4822 126 14491	2.2µF 10V	
2338	5322 126 11583	10nF 10% 50V	
2340	4822 124 23002	10µF 16V	
2341	4822 124 12095	100µF 20% 16V	
2350	4822 126 14305	100nF 10% 16V	
2351	4822 126 14305	100nF 10% 16V	
2352	4822 126 14305	100nF 10% 16V	
2356	4822 126 14305	100nF 10% 16V	
2357	4822 126 14305	100nF 10% 16V	
2358	5322 126 11579	3.3nF 10% 63V	
2359	4822 122 33752	15pF 5% 50V	
2361	3198 016 31580	1P5 50V	
2362	4822 126 11663	12pF	
2365	4822 126 14305	100nF 10% 16V	
2366	4822 126 14305	100nF 10% 16V	
2367	4822 126 14305	100nF 10% 16V	
2368	4822 126 14305	100nF 10% 16V	
2369	4822 126 14305	100nF 10% 16V	
2370	4822 126 14305	100nF 10% 16V	
2371	4822 126 13193	4.7nF 10% 63V	
2372	4822 126 14043	1µF 20% 16V	
2373	4822 126 14305	100nF 10% 16V	
2374	4822 126 14491	2.2µF 10V	
2375	4822 126 14494	22nF 10% 25V	
2376	4822 126 14305	100nF 10% 16V	
2377	4822 124 12095	100µF 20% 16V	
2378	4822 126 14305	100nF 10% 16V	
2384	4822 126 14305	100nF 10% 16V	
2406	4822 126 13883	220pF 5% 50V	
2407	4822 126 13956	68pF 5% 63V	
2408	3198 016 32780	2P7 50V	
2409	4822 126 14491	2.2µF 10V	
2410	4822 126 14472	1µF 10% 10V	
2411	4822 126 14305	100nF 10% 16V	
2412	4822 126 13193	4.7nF 10% 63V	
2413	4822 124 80151	47µF 16V	
2417	3198 017 44740	470nF 10V	
2418	4822 126 13956	68pF 5% 63V	
2420	4822 122 33753	150pF 5% 50V	
2501	4822 122 33777	47pF 5% 63V	
2502	4822 122 32927	220nF 20% 50V	
2503	4822 122 32927	220nF 20% 50V	
2504	4822 122 32927	220nF 20% 50V	
2505	4822 122 32927	220nF 20% 50V	
2508	4822 124 12095	100µF 20% 16V	
2546	4822 124 23002	10µF 16V	
2547	4822 124 23002	10µF 16V	
2548	4822 124 23002	10µF 16V	
2549	4822 124 23002	10µF 16V	
2550	4822 126 14241	330P 50V	
2551	5322 126 11579	3.3nF 10% 63V	
2609	3198 016 31020	0603 25V 1nF	
2610	4822 126 14238	2N2 50V	
2611	5322 126 11578	1nF 10% 50V	
2629	4822 122 32927	220nF 20% 50V	
2636	4822 122 32927	220nF 20% 50V	
2637	4822 122 32927	220nF 20% 50V	
2638	4822 122 32927	220nF 20% 50V	
2640	4822 126 13879	220nF 20% 16V	
2641	4822 122 32927	220nF 20% 50V	
2642	4822 122 32927	220nF 20% 50V	
2651	4822 126 14305	100nF 10% 16V	
2652	4822 122 33777	47pF 5% 63V	
2653	4822 122 32927	220nF 20% 50V	
2654	4822 126 13881	470pF 5% 50V	
2655	4822 126 13881	470pF 5% 50V	
2656	4822 126 13881	470pF 5% 50V	
2657	4822 126 13881	470pF 5% 50V	
2658	4822 126 13881	470pF 5% 50V	
2661	4822 122 32927	220nF 20% 50V	
2662	4822 122 32927	220nF 20% 50V	
2663	4822 126 13881	470pF 5% 50V	
2664	4822 126 13881	470pF 5% 50V	
2665	4822 124 12095	100µF 20% 16V	
2666	4822 124 12095	100µF 20% 16V	
2667	3198 016 33380	3P3 50V	
2668	3198 016 33380	3P3 50V	
2669	4822 124 23002	10µF 16V	
2670	5322 126 11583	10nF 10% 50V	
2673	3198 016 31020	1nF 25V	
2674	3198 016 31020	1nF 25V	
2675	4822 124 23002	10µF 16V	
2677	3198 030 82280	2U2 20% 50V	
2677	4822 124 23002	10µF 16V	
2678	4822 124 23002	10µF 16V	
2679	4822 126 14305	100nF 10% 16V	
2680	4822 124 23002	10µF 16V	
2681	4822 126 14305	100nF 10% 16V	
2682	4822 124 23002	10µF 16V	
2685	3198 016 31020	1nF 25V	
2686	3198 016 31020	1nF 25V	
2690	4822 126 14305	100nF 10% 16V	
2691	4822 126 14305	100nF 10% 16V	
2692	4822 126 14305	100nF 10% 16V	
2693	4822 126 13883	220pF 5% 50V	
2702	4822 124 23002	10µF 16V	
2703	4822 126 14305	100nF 10% 16V	
2704	4822 124 23002	10µF 16V	
2706	4822 124 12095	100µF 20% 16V	
2707	4822 126 14305	100nF 10% 16V	
2708	4822 124 23002	10µF 16V	
2709	4822 126 14305	100nF 10% 16V	
2710	4822 124 23002	10µF 16V	
2712	4822 124 23002	10µF 16V	
2713	4822 126 14305	100nF 10% 16V	
2717	4822 126 14218	3.9pF 50V	
2718	4822 126 11669	27pF	
2719	4822 126 11663	12pF	
2720	4822 126 14218	3.9pF 50V	
2721	4822 126 11669	27pF	
2723	4822 126 11663	12pF	
2724	4822 126 14218	3.9pF 50V	
2725	4822 126 11669	27pF	
2726	4822 126 11663	12pF	
2728	4822 126 14305	100nF 10% 16V	
2729	4822 126 14225	56pF 5% 50V	
2730	4822 126 14494	22nF 10% 25V	
2731	4822 122 31765	100pF 2% 63V	
2733	4822 126 14494	22nF 10% 25V	
2738	4822 126 14494	22nF 10% 25V	
2743	4822 126 14494	22nF 10% 25V	
2747	4822 126 14507	18pF 5% 50V	
2748	4822 126 14507	18pF 5% 50V	
2755	4822 126 14305	100nF 10% 16V	
2756	4822 126 14305	100nF 10% 16V	
2757	4822 124 23002	10µF 16V	
2758	4822 126 14305	100nF 10% 16V	
2759	4822 126 14305	100nF 10% 16V	
2760	4822 126 14305	100nF 10% 16V	
2761	4822 126 14305	100nF 10% 16V	
2762	4822 126 14305	100nF 10% 16V	
2763	4822 126 14305	100nF 10% 16V	
2764	4822 126 14305	100nF 10% 16V	
2765	4822 126 14305	100nF 10% 16V	
2766	4822 126 14305	100nF 10% 16V	
2767	4822 126 14305	100nF 10% 16V	
2770	4822 126 14305	100nF 10% 16V	
2771	4822 126 14305	100nF 10% 16V	
2772	4822 126 14305	100nF 10% 16V	
2773	4822 126 14305	100nF 10% 16V	
2774	4822 126 14305	100nF 10% 16V	
2776	4822 126 14305	100nF 10% 16V	
2785	4822 126 14305	100nF 10% 16V	
2786	4822 126 14305	100nF 10% 16V	
2788	4822 126 14305	100nF 10% 16V	
2790	4822 126 14305	100nF 10% 16V	
2792	4822 126 14305	100nF 10% 16V	
2795	4822 126 14305	100nF 10% 16V	
2796	4822 126 14305	100nF 10% 16V	
2797	4822 126 13956	68pF 5% 63V	
2798	3198 016 36810	680P 25V	
2902	5322 126 11583	10nF 10% 50V	
□			
3001	4822 051 30472	4k7 5% 0.062W	
3002	4822 051 30472	4k7 5% 0.062W	
3003	4822 051 30223	22k 5% 0.062W	
3006	4822 051 30471	470Ω 5% 0.062W	
3007	4822 117 13521	470Ω 5% 0.63W	
3008	4822 117 13526	150Ω 5% 0.63W	
3009	4822 051 30689	68Ω 5% 0.063W	
3011	4822 051 30471	470Ω 5% 0.062W	
3012	4822 051 30471	470Ω 5% 0.062W	
3013	4822 051 30103	10k 5% 0.062W	
3014	4822 051 30682	6k8 5% 0.062W	
3015	4822 051 30474	470k 5% 0.062W	
3016	4822 051 30152	1k5 5% 0.062W	
3017	4822 051 30472	4k7 5% 0.062W	
3018	4822 051 30103	10k 5% 0.062W	

3306	4822 051 30221	220Ω 5% 0.062W	3656	4822 051 30101	100Ω 5% 0.062W	5653	2422 549 43769	100mH
3307	4822 051 30183	18k 5% 0.062W	3657	4822 051 30334	330k 5% 0.062W	5654	4822 157 11716	BLM21P300SPT
3308	4822 051 30684	680k 5% 0.062W	3658	4822 051 30334	330k 5% 0.062W	5701	4822 157 71206	BLM21A601SPT
3310	4822 117 12925	47k 1% 0.063W	3659	4822 051 30334	330k 5% 0.062W	5702	2422 535 95427	100mH
3311	4822 117 13632	100k 1% 0.62W	3660	4822 051 30334	330k 5% 0.062W	5703	4822 157 11716	BLM21P300SPT
3314	4822 051 30103	10k 5% 0.062W	3661	4822 117 11817	1k2 1% 1/16W	5704	4822 157 11716	BLM21P300SPT
3315	4822 051 30102	1k 5% 0.062W	3662	4822 117 11817	1k2 1% 1/16W	5705	2422 535 95427	100mH
3316	4822 051 30123	12k 5% 0.062W	3663	4822 117 11817	1k2 1% 1/16W	5706	4822 157 11778	5U6 10%
3317	4822 051 30221	220Ω 5% 0.062W	3665	4822 051 30272	2k7 5% 0.062W	5707	4822 157 11781	BLM11A601SPT1
3318	4822 051 30102	1k 5% 0.062W	3673	4822 051 30472	4k7 5% 0.062W	5708	4822 157 11778	5U6 10%
3320	4822 051 30101	100Ω 5% 0.062W	3676	4822 117 11817	1k2 1% 1/16W	5709	4822 157 11778	5U6 10%
3321	4822 051 30101	100Ω 5% 0.062W	3677	4822 051 30334	330k 5% 0.062W	5710	4822 157 11778	5U6 10%
3322	4822 051 10102	1k 2% 0.25W	3678	4822 117 11817	1k2 1% 1/16W	5711	4822 157 11781	BLM11A601SPT1
3324	4822 051 30222	2k2 5% 0.062W	3679	4822 051 30334	330k 5% 0.062W	5713	4822 157 11781	BLM11A601SPT1
3327	4822 117 13632	100k 1% 0.62W	3680	4822 117 11817	1k2 1% 1/16W	5718	3198 018 33370	0U33 10%
3328	4822 051 30393	39k 5% 0.062W	3683	4822 051 30272	2k7 5% 0.062W	5720	4822 157 11781	BLM11A601SPT1
3329	4822 117 13568	6Ω 8 5%	3684	3198 021 90030	JUMPER	5910	4822 157 11781	BLM11A601SPT1
3330	4822 051 30332	3k3 5% 0.062W	3685	3198 021 90030	JUMPER			
3331	4822 051 30102	1k 5% 0.062W	3688	3198 021 90030	JUMPER			
3333	4822 051 30102	1k 5% 0.062W	3689	3198 021 90030	JUMPER			
3334	4822 051 30102	1k 5% 0.062W	3702	4822 117 12139	22Ω 5% 0.062W			
3335	4822 051 30332	3k3 5% 0.062W	3703	4822 051 30101	100Ω 5% 0.062W	6001	4822 130 11528	1PS76SB10
3336	4822 051 30102	1k 5% 0.062W	3705	4822 051 30101	100Ω 5% 0.062W	6003	4822 130 11594	BZX284-C47
3337	4822 117 12903	1k8 1% 0.063W	3706	4822 051 30109	10Ω 5% 0.062W	6304	4822 130 83757	BAS216
3338	4822 051 30682	68k 5% 0.062W	3707	4822 051 30392	3k9 5% 0.063W	6306	9322 129 37685	BZM55-C5V6
3340	4822 051 30101	100Ω 5% 0.062W	3708	4822 051 30272	2k7 5% 0.062W	6307	4822 130 11528	1PS76SB10
3341	4822 051 30101	100Ω 5% 0.062W	3709	3198 021 90030	JUMPER	6309	4822 130 83757	BAS216
3342	4822 051 30101	100Ω 5% 0.062W	3710	4822 051 30391	390Ω 5% 0.062W	6310	9322 129 38685	BZM55-C6V8
3343	4822 051 30683	68k 5% 0.062W	3711	4822 051 30102	1k 5% 0.062W	6311	9322 149 08685	BZM55-C22
3344	4822 051 30222	2k2 5% 0.062W	3712	4822 051 30391	390Ω 5% 0.062W	6319	4822 130 83757	BAS216
3345	4822 051 30103	10k 5% 0.062W	3713	4822 051 30391	390Ω 5% 0.062W	6334	4822 130 83757	BAS216
3346	4822 051 30333	33k 5% 0.062W	3714	4822 117 12139	22Ω 5% 0.062W	6403	4822 130 10414	BA792
3347	4822 051 30223	22k 5% 0.062W	3716	4822 051 30472	4k7 5% 0.062W	6652	9322 129 40685	BZM55-C10
3348	4822 051 30222	2k2 5% 0.062W	3717	4822 051 30472	4k7 5% 0.062W	6653	4822 130 83757	BAS216
3362	4822 051 30103	10k 5% 0.062W	3718	4822 051 30221	220Ω 5% 0.062W			
3363	4822 051 30102	1k 5% 0.062W	3719	4822 117 13574	1Ω5 5% 1206			
3364	4822 051 30683	68k 5% 0.062W	3720	4822 117 13574	1Ω5 5% 1206			
3365	4822 051 30472	4k7 5% 0.062W	3721	4822 117 13572	22Ω 5% 1206			
3366	4822 051 30102	1k 5% 0.062W	3722	4822 117 13572	22Ω 5% 1206			
3367	4822 051 30102	1k 5% 0.062W	3725	4822 051 30105	1M 5% 0.062W			
3370	4822 051 30101	100Ω 5% 0.062W	3728	4822 051 30101	100Ω 5% 0.062W	7001	9352 629 88557	SAA5801/011 V30
3371	4822 051 30479	47Ω 5% 0.062W	3731	4822 051 30101	100Ω 5% 0.062W	7002	5322 130 42756	BC857C
3372	4822 051 30471	470Ω 5% 0.062W	3732	4822 051 10102	1k 2% 0.25W	7003	3198 010 42310	BC847BW
3376	4822 051 30101	100Ω 5% 0.062W	3733	4822 051 30101	100Ω 5% 0.062W	7004	3198 010 42310	BC847BW
3377	4822 051 30101	100Ω 5% 0.062W	3739	4822 051 30101	100Ω 5% 0.062W	7005	9322 116 74668	LD1117D33
3378	4822 051 30153	15k 5% 0.062W	3740	3198 021 90030	JUMPER	7006	3104 317 42211	SOFTW.ASSY 310431702211
3382	4822 051 30471	470Ω 5% 0.062W	3741	4822 051 30102	1k 5% 0.062W	7007	9322 136 53668	MSM51V18165D-60JS
3384	4822 051 30101	100Ω 5% 0.062W	3744	4822 051 30102	1k 5% 0.062W	7008	3198 010 42310	BC847BW
3385	4822 051 30471	470Ω 5% 0.062W	3745	4822 051 30102	1k 5% 0.062W	7009	3198 010 42310	BC847BW
3386	4822 051 30223	22k 5% 0.062W	3746	4822 051 30472	4k7 5% 0.062W	7010	5322 130 42756	BC857C
3388	4822 051 30102	1k 5% 0.062W	3747	4822 051 30689	68Ω 5%	7011	4822 209 17377	M24C32-WMN6/PROG
3389	4822 117 12925	47k 1% 0.063W	3748	4822 051 30689	68Ω 5%	7301	9352 625 23518	TDA9330H/N2
3390	4822 051 30153	15k 5% 0.062W	3749	4822 051 30689	68Ω 5% 0.063W	7303	5322 130 42756	BC857C
3391	4822 051 30683	68k 5% 0.062W	3754	4822 051 30109	10Ω 5% 0.062W	7308	9340 310 30215	PDTC144ET
3393	4822 117 13632	100k 1% 0.62W	3755	3198 021 90030	JUMPER	7309	9340 310 30215	PDTC144ET
3394	4822 051 30472	4k7 5% 0.062W	3757	3198 021 90030	JUMPER	7310	9340 310 30215	PDTC144ET
3400	4822 117 11152	4Ω 27 5%	3759	3198 021 90030	JUMPER	7311	3198 010 42310	BC847BW
3406	4822 051 30479	47Ω 5% 0.062W	3790	4822 117 13522	100Ω 5% 0.63W	7312	3198 010 42310	BC847BW
3411	4822 051 30472	4k7 5% 0.062W	3791	4822 117 13522	100Ω 5% 0.63W	7320	3198 010 42310	BC847BW
3414	4822 051 30472	4k7 5% 0.062W	3792	4822 117 13522	100Ω 5% 0.63W	7322	3198 010 42310	BC847BW
3415	4822 117 12902	8k2 1% 0.063W	3793	4822 117 12662	10Ω 5%	7323	9352 625 24518	TDA9321H/N2
3416	4822 117 13568	6Ω 8 5%	3793	4822 117 13522	100Ω 5% 0.63W	7324	5322 130 63679	BC847CW
3418	4822 051 30391	390Ω 5% 0.062W	3794	4822 117 12662	10Ω 5%	7403	4822 130 60511	BC847B
3419	4822 051 30759	75Ω 5% 0.062W	3794	4822 117 13522	100Ω 5% 0.63W	7407	4822 130 60373	BC856B
3435	4822 051 30472	4k7 5% 0.062W	3795	4822 117 12662	10Ω 5%	7411	4822 130 60511	BC847B
3436	4822 051 30221	220Ω 5% 0.062W	3795	4822 117 13522	100Ω 5% 0.63W	7651	9322 143 53671	MSP3415D-FH-B3
3437	4822 051 30102	1k 5% 0.062W	3796	4822 051 30101	100Ω 5% 0.062W	7651	9322 149 63671	MSP3451G-FH-A1
3439	4822 051 30471	470Ω 5% 0.062W	3796	4822 051 30109	10Ω 5% 0.062W	7652	9351 874 90118	74HC4052PW
3441	4822 051 30393	39k 5% 0.062W	3797	4822 051 30101	100Ω 5% 0.062W	7656	9340 425 20115	BC847BS
3445	4822 051 30471	470Ω 5% 0.062W	3900	4822 051 30221	220Ω 5% 0.062W	7658	9340 425 20115	BC847BS
3446	4822 051 30101	100Ω 5% 0.062W	3901	4822 051 30221	220Ω 5% 0.062W	7663	9340 425 20115	BC847BS
3532	4822 051 30102	1k 5% 0.062W	3903	4822 051 30221	220Ω 5% 0.062W	7674	3198 010 42310	BC847BW
3533	4822 051 30103	10k 5% 0.062W	3905	4822 051 30221	220Ω 5% 0.062W	7675	9351 874 90118	74HC4052PW
3540	4822 051 30103	10k 5% 0.062W	3906	4822 051 30101	100Ω 5% 0.062W	7680	3198 010 42310	BC847BW
3550	4822 051 30102	1k 5% 0.062W	3907	4822 051 30221	220Ω 5% 0.062W	7681	3198 010 42310	BC847BW
3551	4822 051 30102	1k 5% 0.062W	3909	4822 051 30221	220Ω 5% 0.062W	7701	5322 130 42756	BC857C
3552	4822 051 30472	4k7 5% 0.062W	3910	4822 051 30221	220Ω 5% 0.062W	7702	3198 010 42310	BC847BW
3610	4822 117 12925	47k 1% 0.063W	3911	4822 051 30101	100Ω 5% 0.062W	7704	4822 209 73852	PMBT2369
3611	4822 117 12925	47k 1% 0.063W				7708	4822 209 90034	SAA4990H/V0
3612	4822 117 12925	47k 1% 0.063W				7709	9352 640 20557	SAA4978H/V203
3613	4822 117 12925	47k 1% 0.063W				7713	9322 116 74668	LD1117D33
3614	4822 117 12925	47k 1% 0.063W	5301	4822 157 11876	6.8μH 10%	7714	4822 209 17307	MSM54V12222A-30JS
3615	4822 117 12925	47k 1% 0.063W	5302	4822 157 11876	6.8μH 10%	7715	4822 209 17307	MSM54V12222A-30JS
3616	4822 051 30682	6k8 5% 0.062W	5403	2422 549 44461	IND VAR 40mH	7716	2422 486 80737	IC SOCKET 32P
3617	4822 051 30682	6k8 5% 0.062W	5404	2422 535 95427	100mH			
3621	4822 051 30105	1M 5% 0.062W	5405	2422 535 95427	IND FXD 100mHz 120R			
3636	4822 051 30105	1M 5% 0.062W	5406	3198 018 33980	3U9 10%			
3637	4822 051 30105	1M 5% 0.062W	5407	3198 018 56880	6U8 10%			
3638	4822 051 30105	1M 5% 0.062W	5408	2422 549 44459	IND VAR 78mH			
3642	4822 051 30105	1M 5% 0.062W	5409	3198 018 51080	1U 10%			
3644	4822 051 30105	1M 5% 0.062W	5410	3198 018 33370	0U33 10%			
3653	3198 021 90030	JUMPER	5651	2422 549 43769	100mH			
3654	3198 021 90030	JUMPER	5652	2422 549 43769	100mH			
3655	4822 051 30101	100Ω 5% 0.062W						



6001	4822 130 11528	1PS76SB10
6003	4822 130 11528	1PS76SB10
6303	4822 130 11594	BZX284-C47
6304	4822 130 83757	BAS216

0947 4822 267 10734 5P MALE
1910 4822 130 91478 IR RECEIVER
1951 4822 276 14024 2P 4/128A

—||—

2930 4822 124 41584 100µF 20% 10V

□

3957 4822 053 21335 3M3 5% 0.5W
3966 4822 053 21335 3M3 5% 0.5W
3978 4822 051 20101 100Ω 5% 0.1W
3982 4822 117 13577 330Ω 1% 1.25W

→|←

6901 4822 130 10859 TLDR5400

CRT Panel [F]

Various

0298 2422 500 80052 9P FEMALE
0340 3104 311 02321 CABLE 11P 400mm
0383 2422 025 16382 3P MALE

—||—

2300 4822 124 40764 22µF 100 V
2301 4822 124 40196 220µF 20% 16V
2302 5322 122 32286 3.3pF 5% 50V
2303 5322 122 32268 470pF 10% 50V
2304 4822 121 41856 22nF 5% 250V
2305 4822 124 41751 47µF 20% 50V
2306 4822 126 14585 100nF 10% 50V
2307 5322 122 32654 22nF 10% 63V
2308 4822 126 13486 15pF 2% 63V
2309 5322 122 32654 22nF 10% 63V
2310 4822 126 13689 18pF 1% 63V
2312 5322 122 32658 22pF 5% 50V
2313 4822 124 11565 10µF 20% 250V
2316 4822 121 40518 100nF 10% 250V
2317 5322 121 44356 4.7nF 5% 2KV
2318 5322 122 32654 22nF 10% 63V
2320 4822 126 13838 100nF 20% 50V
2321 5322 122 32531 100pF 5% 50V
2322 5322 122 32531 100pF 5% 50V
2323 5322 122 32531 100pF 5% 50V
2325 4822 126 14585 100nF 10% 50V

□

3300 4822 052 10109 10Ω 5% 0.33W
3301 4822 053 12103 10k 5% 3W
3302 4822 051 20182 1k8 5% 0.1W
3303 4822 117 10965 18k 1% 0.1W
3304 4822 117 11454 820Ω 1% 0.1W
3305 4822 117 13577 330Ω 1% 1.25W
3306 4822 051 20478 4Ω7 5% 0.1W
3307 4822 051 20109 10Ω 5% 0.1W
3308 4822 117 11148 56k 1% 0.1W
3309 4822 117 10353 150Ω 1% 0.1W
3310 4822 051 10102 1k 2% 0.25W
3311 4822 051 20101 100Ω 5% 0.1W
3312 4822 117 11449 2k2 1% 0.1W
3313 4822 116 83872 220Ω 5% 0.5W
3314 4822 116 83872 220Ω 5% 0.5W
3315 4822 117 11139 1k5 1% 0.1W
3316 4822 117 11148 56k 1% 0.1W
3317 4822 051 20122 1k2 5% 0.1W
3318 4822 051 20159 15Ω 5% 0.1W
3319 4822 117 11454 820Ω 1% 0.1W
3320 4822 051 10102 1k 2% 0.25W
3334 4822 050 11002 1k 1% 0.4W
3335 4822 051 10102 1k 2% 0.25W
3336 4822 051 10102 1k 2% 0.25W
3337 4822 051 10102 1k 2% 0.25W
3338 3198 013 01020 1k 2% 1/2W
3339 3198 013 01020 1k 2% 1/2W
3340 3198 013 01020 1k 2% 1/2W
3341 4822 052 10151 150Ω 5% 0.33W
3342 4822 051 20471 470Ω 5% 0.1W
3344 4822 116 52191 33Ω 5% 0.5W
3345 4822 116 52191 33Ω 5% 0.5W
3347 3198 013 01520 1k5 2% 1/2W
3348 4822 050 11204 120k 1% 0.4W
3349 3198 013 01020 1k 2% 1/2W
3350 4822 116 83883 470Ω 5% 0.5W

3351 4822 116 83883 470Ω 5% 0.5W
3352 4822 116 83883 470Ω 5% 0.5W
3354 4822 117 11449 2k2 1% 0.1W
3355 4822 051 20478 4Ω7 5% 0.1W
3356 4822 051 10102 1k 2% 0.25W
3357 4822 051 20478 4Ω7 5% 0.1W
4xxx 4822 051 10008 0Ω 5% 0.25W
4xxx 4822 051 20008 0Ω 5% 0.25W

~~~~~

5300 2422 531 98035 TFM S13974-01 Y

→|←

6305 4822 130 30842 BAV21  
6306 4822 130 30842 BAV21  
6307 4822 130 30842 BAV21  
6310 4822 130 83757 BAS216

⊗

7300 4822 130 44154 BF199  
7301 4822 130 42589 BF370  
7302 5322 130 41888 BD140-16  
7303 5322 130 41886 BD139-16  
7307 9352 561 40112 TDA6108  
8317 3104 311 01901 CABLE 2P 560mm  
8325 3104 311 01911 CABLE 3P 680mm

### Side I/O Panel [O]

#### Various

0900 2422 026 04926 4P FEMALE  
0901 4822 267 10975 3P  
0902 4822 267 31014 HEADPHONE SOCKET  
0936 2422 025 12485 11P MALE

—||—

2905 4822 122 33177 10nF 20% 50V  
2906 4822 122 33177 10nF 20% 50V

□

3901 4822 051 20101 100Ω 5% 0.1W  
3902 4822 116 52201 75Ω 5% 0.5W  
3903 4822 051 20101 100Ω 5% 0.1W  
3904 4822 116 52201 75Ω 5% 0.5W  
3905 4822 050 11002 1k 1% 0.4W  
3906 4822 050 11002 1k 1% 0.4W  
3907 4822 117 10834 47k 1% 0.1W  
3908 4822 050 11002 1k 1% 0.4W  
3909 4822 117 10834 47k 1% 0.1W  
3910 4822 116 52276 3k9 5% 0.5W  
3911 4822 050 21003 10k 1% 0.6W  
3912 4822 050 21003 10k 1% 0.6W

### Top Control Panel [P]

#### Various

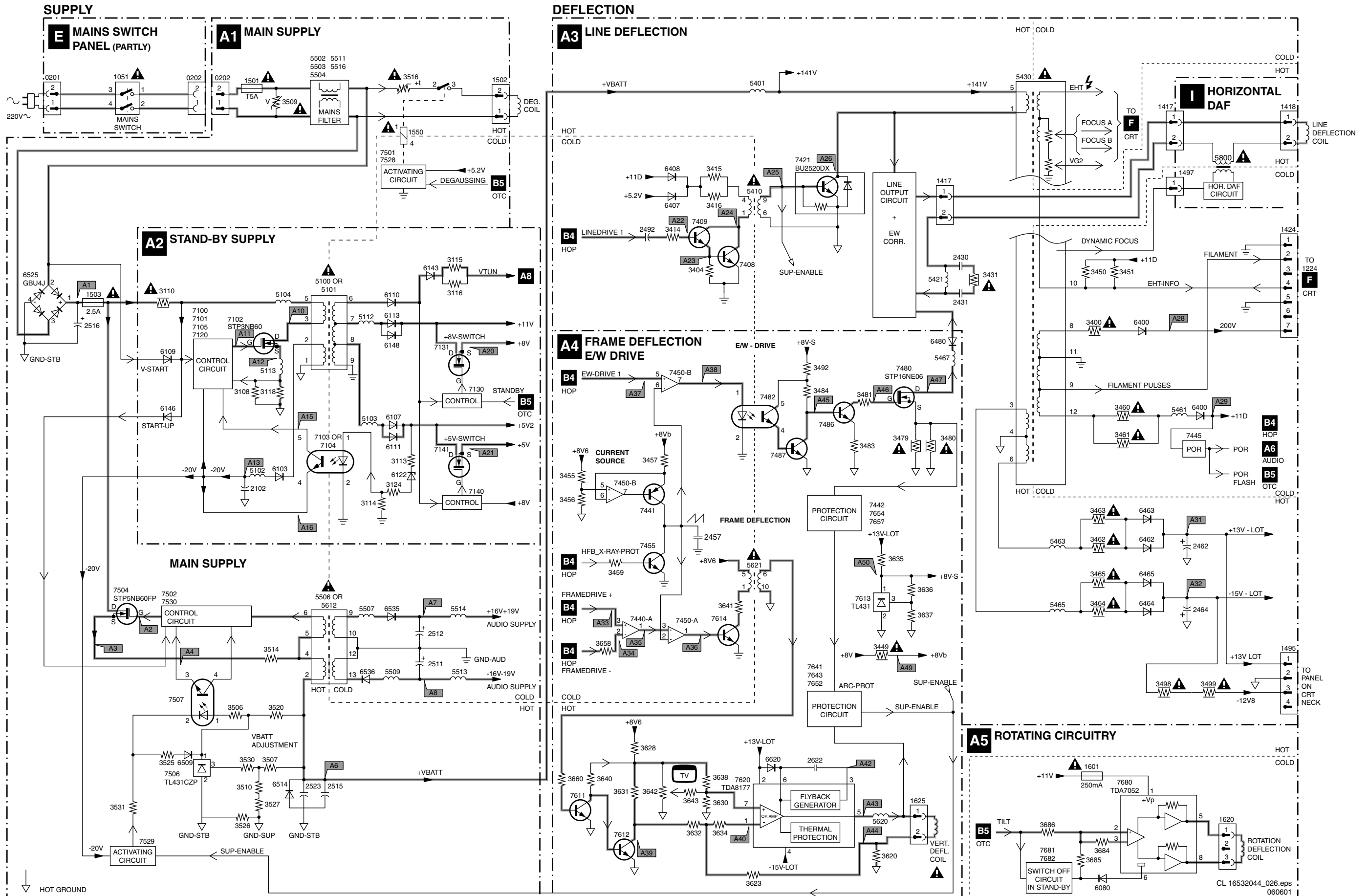
0345 4822 267 10748 3P MALE  
1701 4822 276 13775 SWITCH  
1702 4822 276 13775 SWITCH  
1703 4822 276 13775 SWITCH  
1704 4822 276 13775 SWITCH  
1705 4822 276 13775 SWITCH

□

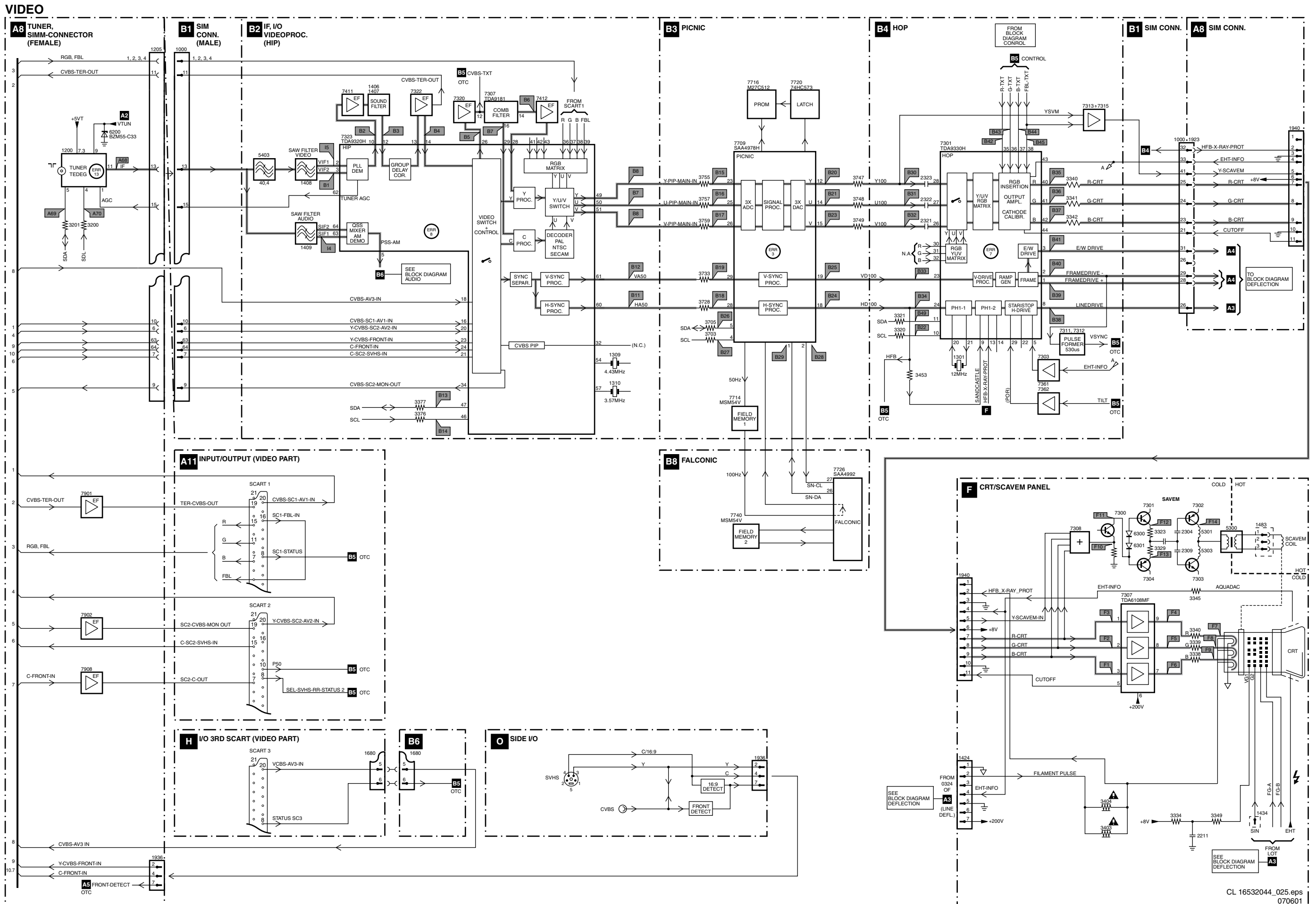
3701 4822 051 20391 390Ω 5% 0.1W  
3702 4822 117 13528 200Ω 1% 0.125W  
3703 4822 117 10845 620Ω 1% 0.1W  
3704 4822 117 11534 1k1 1% 0.1W  
3705 4822 117 11951 2k 1% 0.1W  
3999 4822 051 10102 1k 2% 0.25W

# 6. Block Diagrams, Wiring and Supply Diagram and Testpoints

## Block Diagram LSP



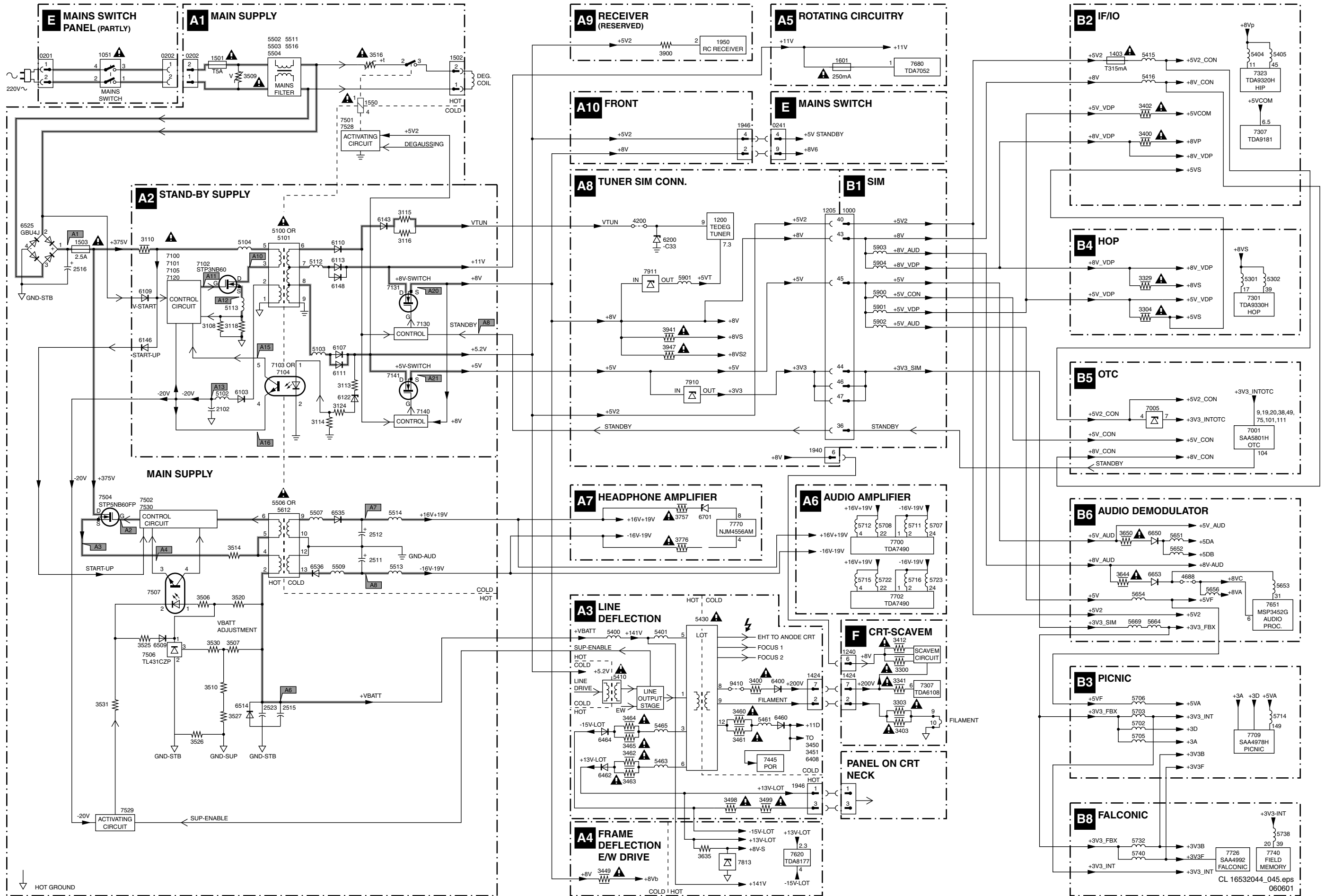
### Block Diagram SSB Video



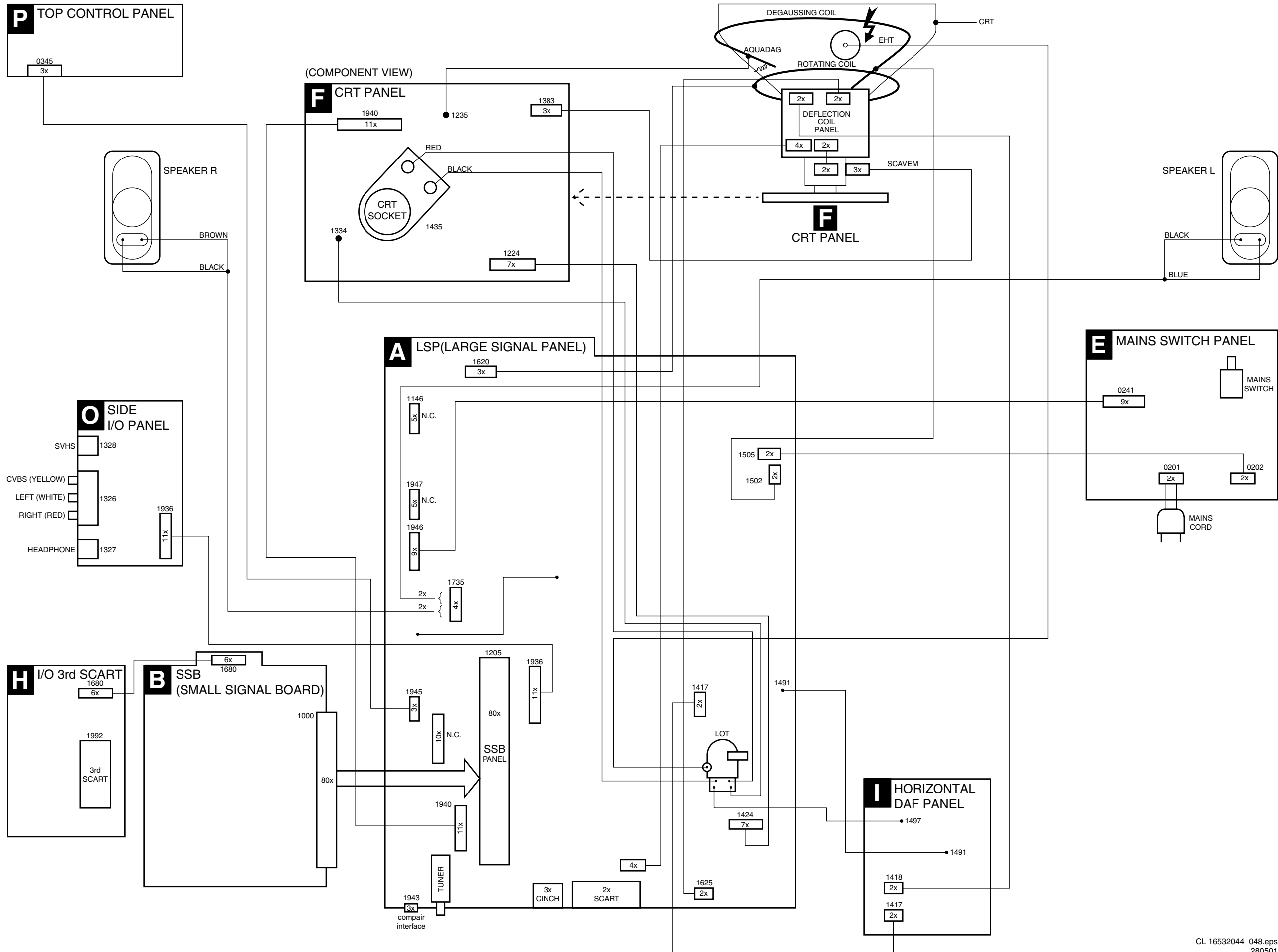




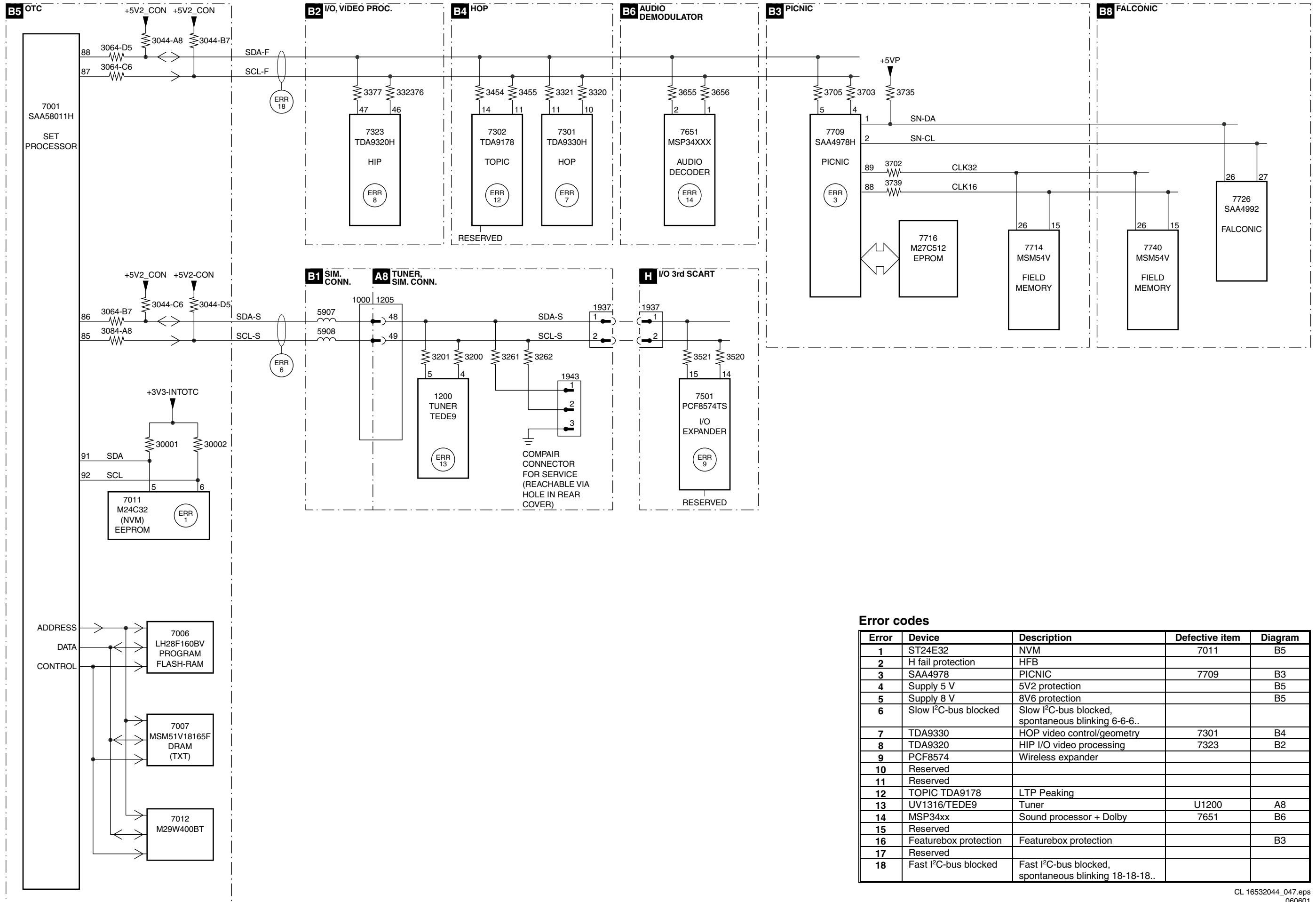
### Supply Lines Overview



### Wiring Diagram



I<sup>2</sup>C Overview



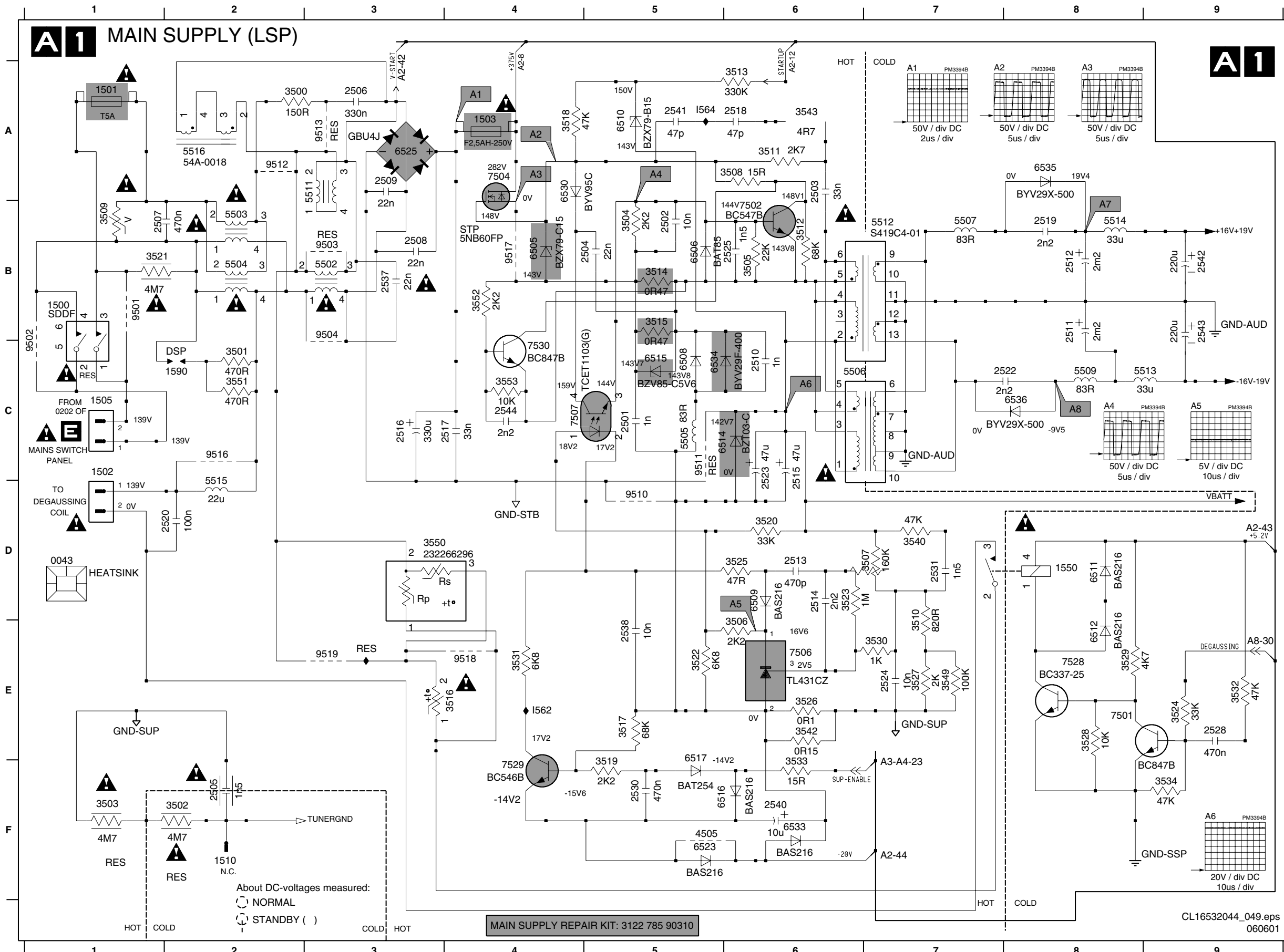
Error codes

| Error | Device                            | Description                                                        | Defective item | Diagram |
|-------|-----------------------------------|--------------------------------------------------------------------|----------------|---------|
| 1     | ST24E32                           | NVM                                                                | 7011           | B5      |
| 2     | H fail protection                 | HFB                                                                |                |         |
| 3     | SAA4978                           | PICNIC                                                             | 7709           | B3      |
| 4     | Supply 5 V                        | 5V2 protection                                                     |                | B5      |
| 5     | Supply 8 V                        | 8V6 protection                                                     |                | B5      |
| 6     | Slow I <sup>2</sup> C-bus blocked | Slow I <sup>2</sup> C-bus blocked, spontaneous blinking 6-6-6..    |                |         |
| 7     | TDA9330                           | HOP video control/geometry                                         | 7301           | B4      |
| 8     | TDA9320                           | HIP I/O video processing                                           | 7323           | B2      |
| 9     | PCF8574                           | Wireless expander                                                  |                |         |
| 10    | Reserved                          |                                                                    |                |         |
| 11    | Reserved                          |                                                                    |                |         |
| 12    | TOPIC TDA9178                     | LTP Peaking                                                        |                |         |
| 13    | UV1316/TEDE9                      | Tuner                                                              | U1200          | A8      |
| 14    | MSP34xx                           | Sound processor + Dolby                                            | 7651           | B6      |
| 15    | Reserved                          |                                                                    |                |         |
| 16    | Featurebox protection             | Featurebox protection                                              |                | B3      |
| 17    | Reserved                          |                                                                    |                |         |
| 18    | Fast I <sup>2</sup> C-bus blocked | Fast I <sup>2</sup> C-bus blocked, spontaneous blinking 18-18-18.. |                |         |



# 7. Electrical Diagrams and PWB's

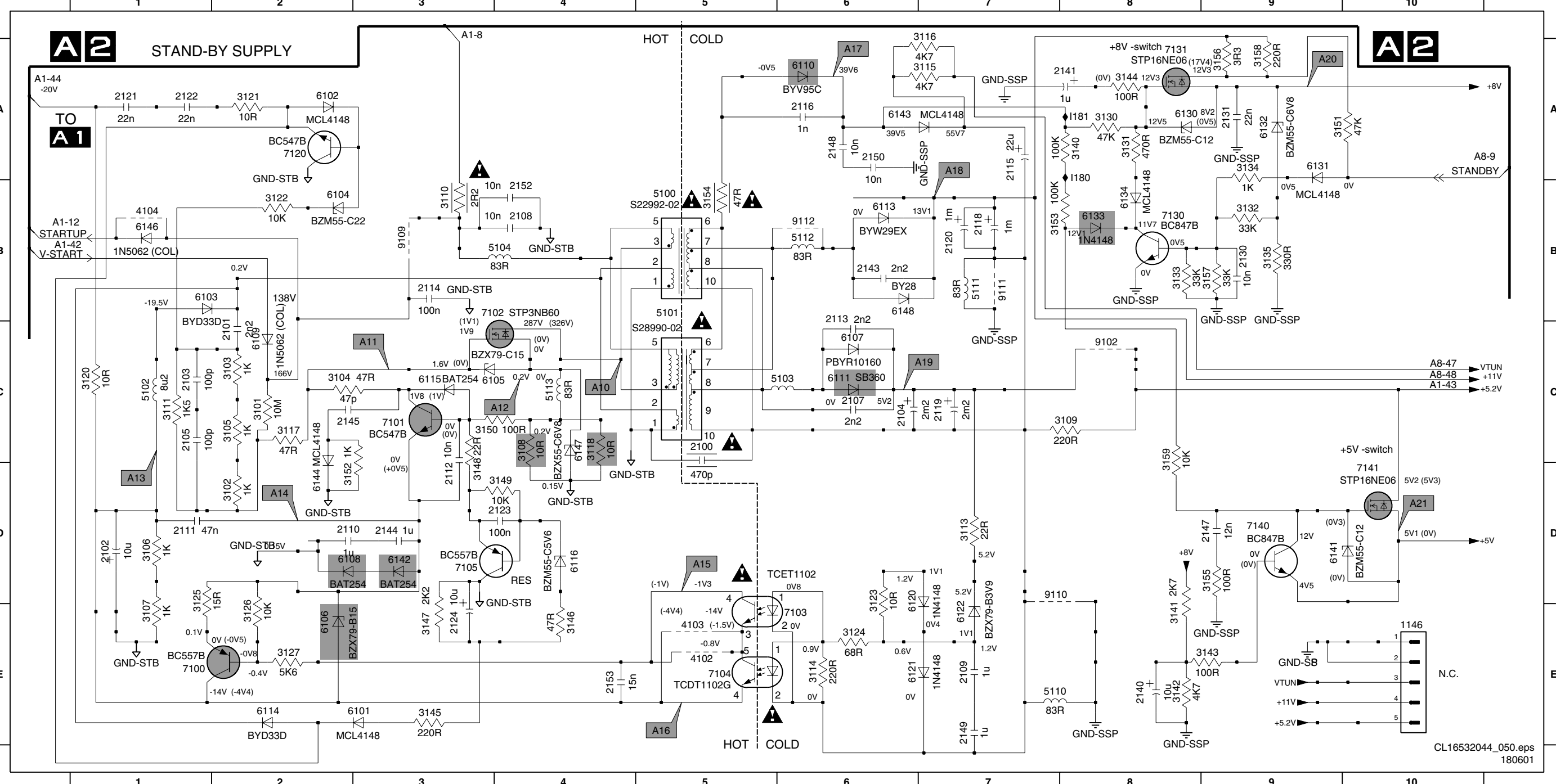
## Large Signal Panel: Main Supply



|         |         |         |
|---------|---------|---------|
| 0043 D1 | 3519 F5 | 7529 F4 |
| 1500 B1 | 3520 D6 | 7530 C4 |
| 1501 A1 | 3521 B1 | 9501 B1 |
| 1502 C1 | 3522 E5 | 9502 C1 |
| 1503 A4 | 3523 D6 | 9503 B3 |
| 1505 C1 | 3524 E9 | 9504 B3 |
| 1510 F2 | 3525 D6 | 9510 D5 |
| 1550 D8 | 3526 E6 | 9511 C5 |
| 1590 C2 | 3527 E7 | 9512 A2 |
| 2501 C5 | 3528 E8 | 9513 A3 |
| 2502 B5 | 3529 E8 | 9516 C2 |
| 2503 A6 | 3530 E7 | 9517 B4 |
| 2504 B5 | 3531 E4 | 9518 E4 |
| 2505 F2 | 3532 E9 | 9519 E3 |
| 2506 A3 | 3533 F6 |         |
| 2507 B1 | 3534 F9 |         |
| 2508 B3 | 3540 D7 |         |
| 2509 A3 | 3542 E6 |         |
| 2510 C6 | 3543 A6 |         |
| 2511 B8 | 3549 E7 |         |
| 2512 B8 | 3550 D3 |         |
| 2513 D6 | 3551 C2 |         |
| 2514 D6 | 3552 B4 |         |
| 2515 C6 | 3553 C4 |         |
| 2516 C3 | 4505 F5 |         |
| 2517 C4 | 5502 B3 |         |
| 2518 A6 | 5503 B2 |         |
| 2519 B8 | 5504 B2 |         |
| 2520 D2 | 5505 C5 |         |
| 2522 C8 | 5506 C6 |         |
| 2523 C6 | 5507 B7 |         |
| 2524 E7 | 5509 C8 |         |
| 2525 B6 | 5511 A3 |         |
| 2528 E9 | 5512 B7 |         |
| 2530 F5 | 5513 C9 |         |
| 2531 D7 | 5514 B8 |         |
| 2537 B3 | 5515 D2 |         |
| 2538 E5 | 5516 A2 |         |
| 2540 F6 | 6505 B4 |         |
| 2541 A5 | 6506 B5 |         |
| 2542 B9 | 6508 C5 |         |
| 2543 B9 | 6509 D6 |         |
| 2544 C4 | 6510 A5 |         |
| 3500 A2 | 6511 D8 |         |
| 3501 C2 | 6512 E8 |         |
| 3502 F2 | 6514 C6 |         |
| 3503 F1 | 6515 C5 |         |
| 3504 B5 | 6516 F6 |         |
| 3505 B6 | 6517 E5 |         |
| 3506 E6 | 6523 F5 |         |
| 3507 D7 | 6525 A3 |         |
| 3508 A6 | 6530 A4 |         |
| 3509 B1 | 6533 F6 |         |
| 3510 E7 | 6534 C5 |         |
| 3511 A6 | 6535 A8 |         |
| 3512 B6 | 6536 C8 |         |
| 3513 A6 | 7501 E8 |         |
| 3514 B5 | 7502 B6 |         |
| 3515 B5 | 7504 A4 |         |
| 3516 E4 | 7506 E6 |         |
| 3517 E5 | 7507 C4 |         |
| 3518 A4 | 7528 E8 |         |

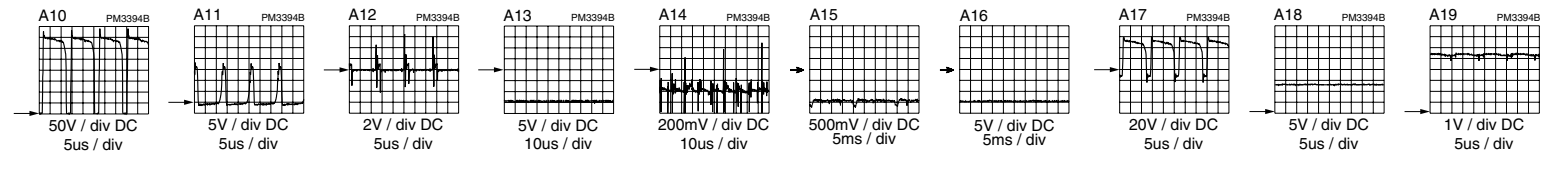
### Large Signal Panel: Standby Supply

|          |         |         |         |         |         |         |         |         |         |         |         |         |         |          |
|----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|
| 1146 E10 | 2110 D2 | 2121 A1 | 2145 C2 | 3104 C2 | 3115 A7 | 3126 E2 | 3142 E8 | 3152 D2 | 4104 B1 | 6101 E3 | 6111 C6 | 6132 A9 | 7100 E1 | 7141 D10 |
| 2100 C5  | 2111 D1 | 2122 A1 | 2147 D9 | 3105 C2 | 3116 A7 | 3127 E2 | 3143 E9 | 3153 B7 | 5100 B5 | 6102 A2 | 6113 B6 | 6133 B8 | 7101 C3 | 9102 C8  |
| 2101 C2  | 2112 D3 | 2123 D4 | 2148 A6 | 3106 D1 | 3117 C2 | 3130 A8 | 3144 A8 | 3154 B5 | 5101 B5 | 6103 B1 | 6114 E2 | 6134 B8 | 7102 B3 | 9109 B3  |
| 2102 D1  | 2113 C6 | 2124 E3 | 2149 E7 | 3107 E1 | 3118 C4 | 3131 A8 | 3145 E3 | 3155 D9 | 5102 C1 | 6104 B2 | 6115 C3 | 6141 D9 | 7103 E6 | 9110 D7  |
| 2103 C1  | 2114 B3 | 2130 B9 | 2150 A6 | 3108 C4 | 3120 C1 | 3132 B9 | 3146 E4 | 3156 A9 | 5103 C6 | 6105 C3 | 6116 D4 | 6142 D3 | 7104 E5 | 9111 B7  |
| 2104 C6  | 2115 A7 | 2131 A9 | 2152 B4 | 3109 C8 | 3121 A2 | 3133 B8 | 3147 E3 | 3157 B9 | 5104 B4 | 6106 E2 | 6120 D6 | 6143 A6 | 7105 D3 | 9112 B6  |
| 2105 C1  | 2116 A6 | 2140 E8 | 2153 E4 | 3110 B3 | 3122 B2 | 3134 A9 | 3148 D3 | 3158 A9 | 5110 E7 | 6107 C6 | 6121 E6 | 6144 D2 | 7120 A2 |          |
| 2107 C6  | 2118 B7 | 2141 A8 | 3101 C2 | 3111 C1 | 3123 D6 | 3135 B9 | 3149 D4 | 3159 C8 | 5111 B7 | 6108 D2 | 6122 E7 | 6146 B1 | 7130 B8 |          |
| 2108 B4  | 2119 C7 | 2143 B6 | 3102 D2 | 3113 D7 | 3124 E6 | 3140 A8 | 3150 C3 | 4102 E5 | 5112 B6 | 6109 C2 | 6130 A8 | 6147 C4 | 7131 A8 |          |
| 2109 E7  | 2120 B7 | 2144 D3 | 3103 C2 | 3114 E6 | 3125 D1 | 3141 E8 | 3151 A9 | 4103 E5 | 5113 C4 | 6110 A6 | 6131 A9 | 6148 B6 | 7140 D9 |          |



About DC-voltages measured:  
 ○ NORMAL  
 ○ STANDBY ( )

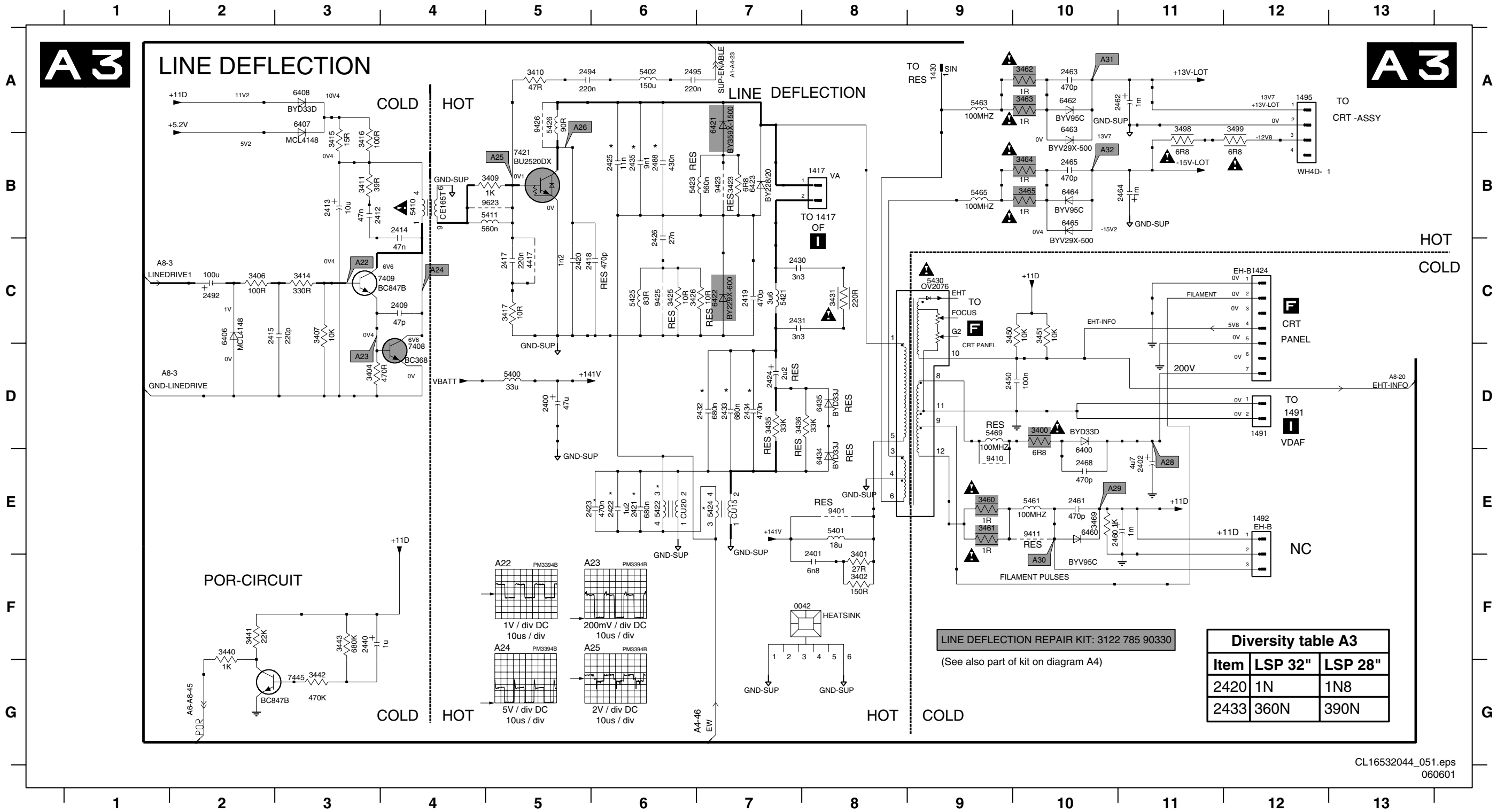
STANDBY SUPPLY REPAIR KIT: 3122 785 90320





Large Signal Panel: Line Deflection

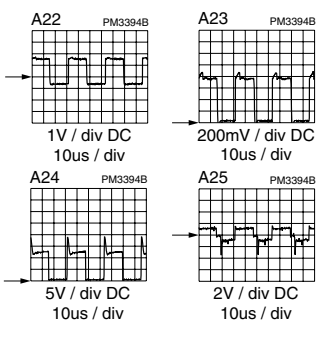
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|----------|----------|---------|---------|----------|----------|----------|---------|---------|----------|----------|----------|---------|----------|----------|----------|----------|---------|
| 0042 F7  | 2400 D5  | 2415 C2 | 2423 E6 | 2433 D7  | 2462 A11 | 2494 A5  | 3407 C3 | 3417 C5 | 3440 F2  | 3461 E9  | 3499 A12 | 5421 C7 | 5461 E10 | 6408 A3  | 6462 A10 | 7445 G3  | 9623 B5 |
| 1417 B8  | 2401 F8  | 2417 C5 | 2424 D7 | 2434 D7  | 2463 A10 | 2495 A6  | 3409 B5 | 3423 B7 | 3441 F2  | 3462 A10 | 4417 C5  | 5422 E6 | 5463 A9  | 6421 A7  | 6463 A10 | 9401 E8  |         |
| 1424 C12 | 2402 E11 | 2418 C6 | 2425 B6 | 2435 B6  | 2464 B10 | 3400 D10 | 3410 A5 | 3425 C6 | 3442 G3  | 3463 A10 | 5400 D5  | 5423 B6 | 5465 B9  | 6422 C7  | 6464 B10 | 9410 E9  |         |
| 1430 A9  | 2409 C4  | 2419 C7 | 2426 B6 | 2440 F3  | 2465 B10 | 3401 F8  | 3411 B3 | 3426 C6 | 3443 F3  | 3464 B10 | 5401 E8  | 5424 E7 | 5469 D9  | 6423 B7  | 6465 B10 | 9411 E10 |         |
| 1491 D12 | 2412 B3  | 2420 C5 | 2430 C7 | 2450 D9  | 2468 E10 | 3402 F8  | 3414 C3 | 3431 C8 | 3450 C9  | 3465 B10 | 5402 A6  | 5425 C6 | 6400 D10 | 6434 E8  | 7408 D4  | 9423 B7  |         |
| 1492 E12 | 2413 B3  | 2421 E6 | 2431 C7 | 2460 E10 | 2488 B6  | 3404 D3  | 3415 A3 | 3435 D7 | 3451 C10 | 3469 E10 | 5410 B4  | 5426 A5 | 6406 C2  | 6435 D8  | 7409 C3  | 9425 C6  |         |
| 1495 A12 | 2414 B4  | 2422 E6 | 2432 D7 | 2461 E10 | 2492 C2  | 3406 C2  | 3416 A3 | 3436 D7 | 3460 E9  | 3498 A11 | 5411 B5  | 5430 C9 | 6407 A3  | 6460 E10 | 7421 B5  | 9426 A5  |         |



LINE DEFLECTION

LINE DEFLECTION

POR-CIRCUIT

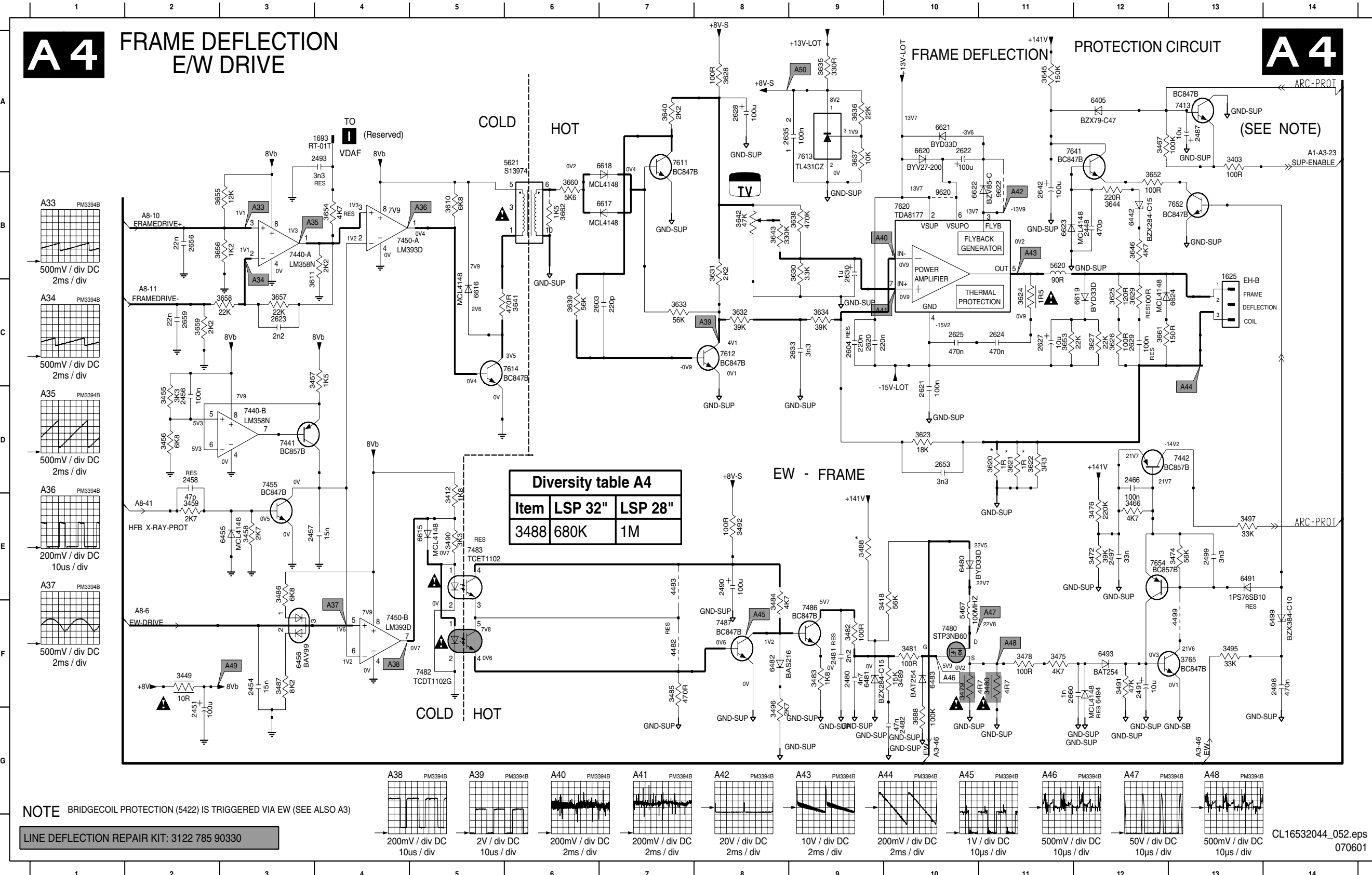


LINE DEFLECTION REPAIR KIT: 3122 785 90330  
(See also part of kit on diagram A4)

| Diversity table A3 |         |         |
|--------------------|---------|---------|
| Item               | LSP 32" | LSP 28" |
| 2420               | 1N      | 1N8     |
| 2433               | 360N    | 390N    |

Large Signal Panel: Frame Deflection

|          |          |          |          |          |          |          |          |          |          |          |          |          |          |           |          |          |
|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|----------|----------|
| 1625 B13 | 2481 F9  | 2604 C9  | 2630 B9  | 3418 F10 | 3474 E13 | 3485 F7  | 3497 E13 | 3627 C12 | 3637 A9  | 3652 B12 | 3662 B6  | 6455 E3  | 6615 E5  | 7440-A B3 | 7483 E5  | 7653 F13 |
| 1693 A3  | 2482 G10 | 2620 C9  | 2633 C9  | 3449 F2  | 3475 F11 | 3486 E3  | 3610 B5  | 3628 A8  | 3638 B9  | 3653 C11 | 3688 G10 | 6456 F3  | 6616 C5  | 7440-B D3 | 7486 F9  | 7654 E12 |
| 2448 B12 | 2487 A13 | 2621 D10 | 2635 A8  | 3455 D2  | 3476 E12 | 3487 F3  | 3611 C3  | 3629 C12 | 3639 C6  | 3654 B4  | 4482 F7  | 6480 E10 | 6617 B7  | 7441 D3   | 7487 F8  | 9620 B10 |
| 2451 G2  | 2490 E8  | 2622 A10 | 2642 B11 | 3456 D2  | 3478 F11 | 3488 E9  | 3620 D11 | 3630 B9  | 3640 A7  | 3655 B3  | 4483 E7  | 6481 F9  | 6618 A7  | 7442 D13  | 7611 A7  | 9622 B11 |
| 2454 F3  | 2491 F12 | 2623 C3  | 2653 D10 | 3457 C4  | 3479 F10 | 3489 F10 | 3621 D11 | 3631 B8  | 3641 C6  | 3656 B3  | 4499 F13 | 6482 F8  | 6619 C12 | 7443 A13  | 7612 C8  |          |
| 2456 D2  | 2493 A4  | 2624 C11 | 2656 B2  | 3458 E3  | 3480 F11 | 3490 E5  | 3622 D11 | 3632 C8  | 3642 B8  | 3657 C3  | 5467 F10 | 6483 F10 | 6620 A10 | 7450-A B4 | 7613 A9  |          |
| 2457 E3  | 2497 E12 | 2625 C10 | 2659 C2  | 3459 E2  | 3481 F10 | 3491 F12 | 3623 D10 | 3633 C7  | 3643 B8  | 3658 C3  | 5620 B11 | 6491 E13 | 6621 A10 | 7450-B F4 | 7614 C5  |          |
| 2458 D2  | 2498 F14 | 2627 C11 | 2660 F11 | 3466 E12 | 3482 F9  | 3492 E8  | 3624 C11 | 3634 C9  | 3644 B12 | 3659 C2  | 5621 A5  | 6493 F12 | 6622 B10 | 7455 D3   | 7620 B10 |          |
| 2466 D12 | 2499 E13 | 2628 A8  | 3403 A13 | 3467 A12 | 3483 F9  | 3495 F13 | 3625 C12 | 3635 A9  | 3645 A11 | 3660 B6  | 6405 A12 | 6494 F12 | 6623 B11 | 7480 F10  | 7641 A11 |          |
| 2480 F9  | 2603 C6  | 2629 C12 | 3412 E5  | 3472 E12 | 3484 F8  | 3496 G8  | 3626 C12 | 3636 A9  | 3646 B12 | 3661 C12 | 6442 B12 | 6499 F14 | 6624 C13 | 7482 F5   | 7652 B13 |          |

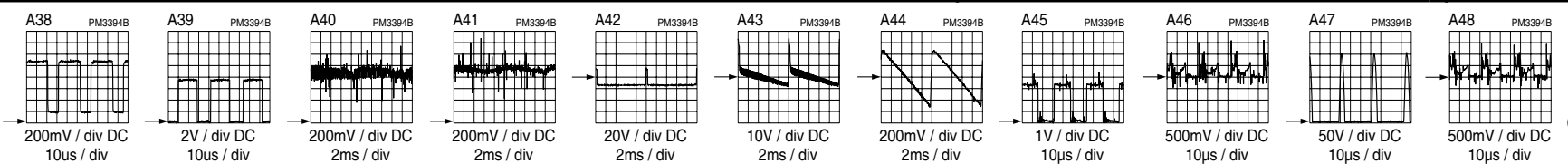


Diversity table A4

| Item | LSP 32" | LSP 28" |
|------|---------|---------|
| 3488 | 680K    | 1M      |

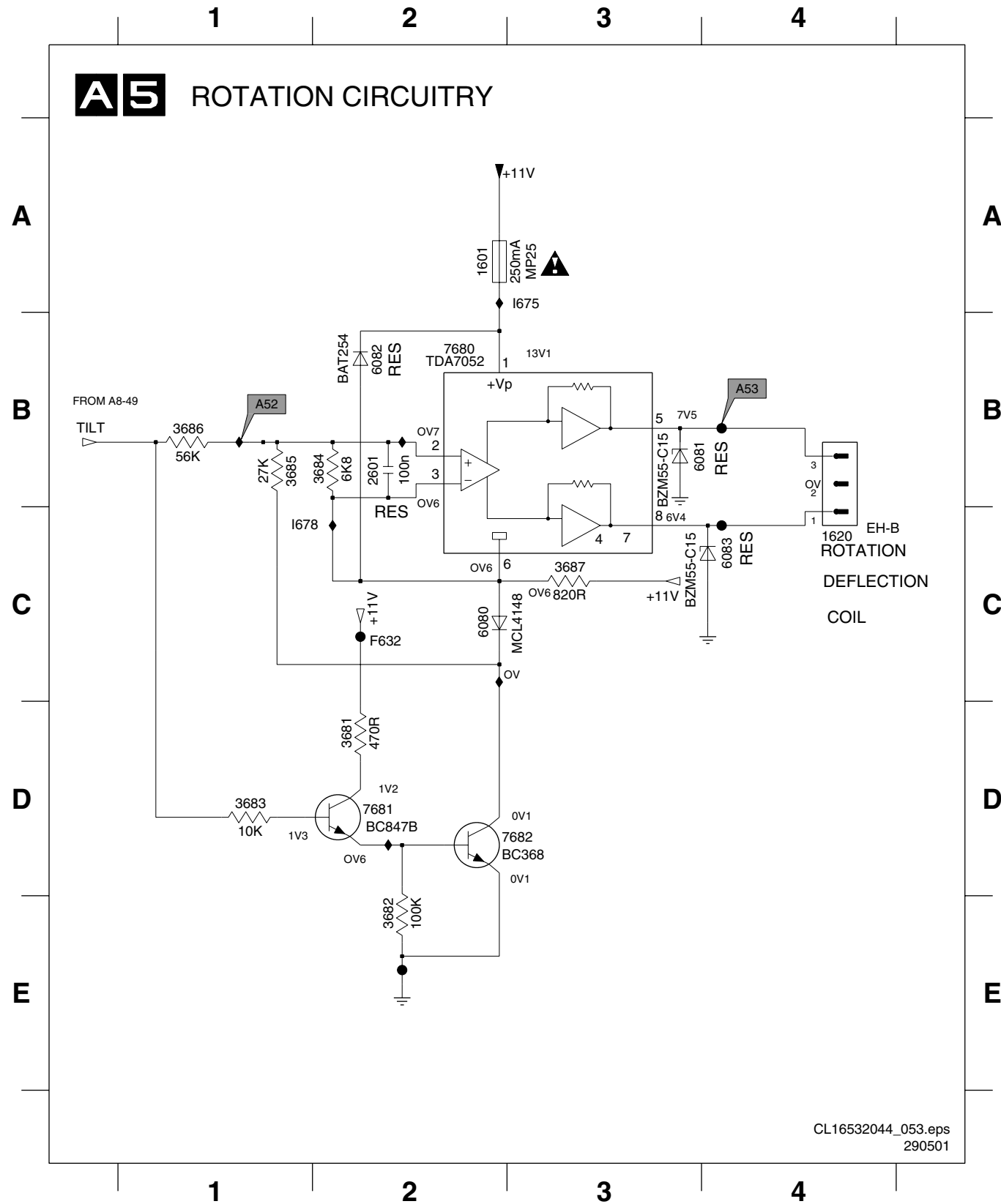
NOTE BRIDGECOIL PROTECTION (5422) IS TRIGGERED VIA EW (SEE ALSO A3)

LINE DEFLECTION REPAIR KIT: 3122 785 90330



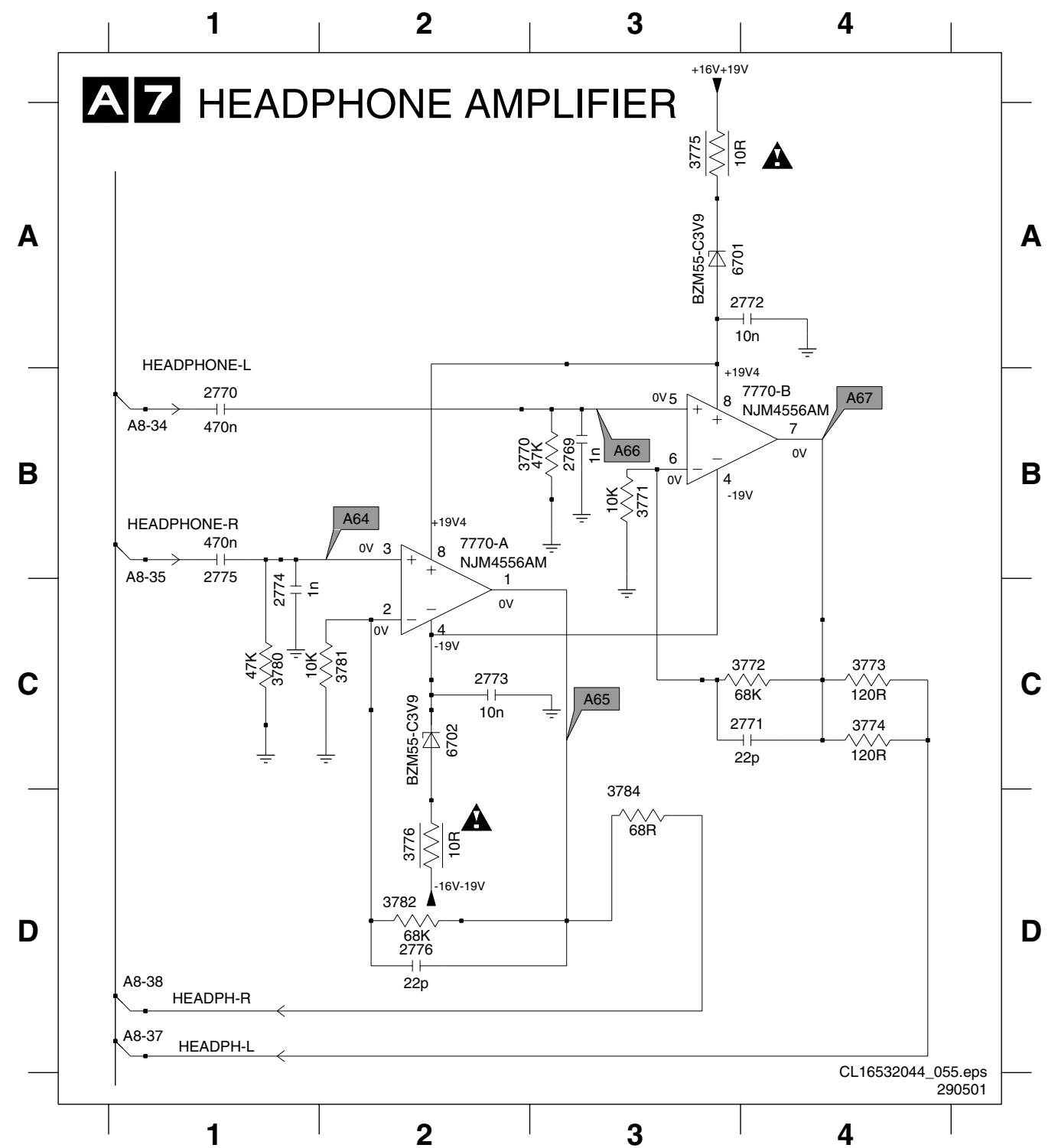
Large Signal Panel: Rotation Circuitry

|         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|
| 1601 A2 | 3681 D2 | 3684 B2 | 3687 C3 | 6082 B2 | 7681 D2 |
| 1620 C4 | 3682 E2 | 3685 B1 | 6080 C2 | 6083 C4 | 7682 D2 |
| 2601 B2 | 3683 D1 | 3686 B1 | 6081 B3 | 7680 B2 |         |



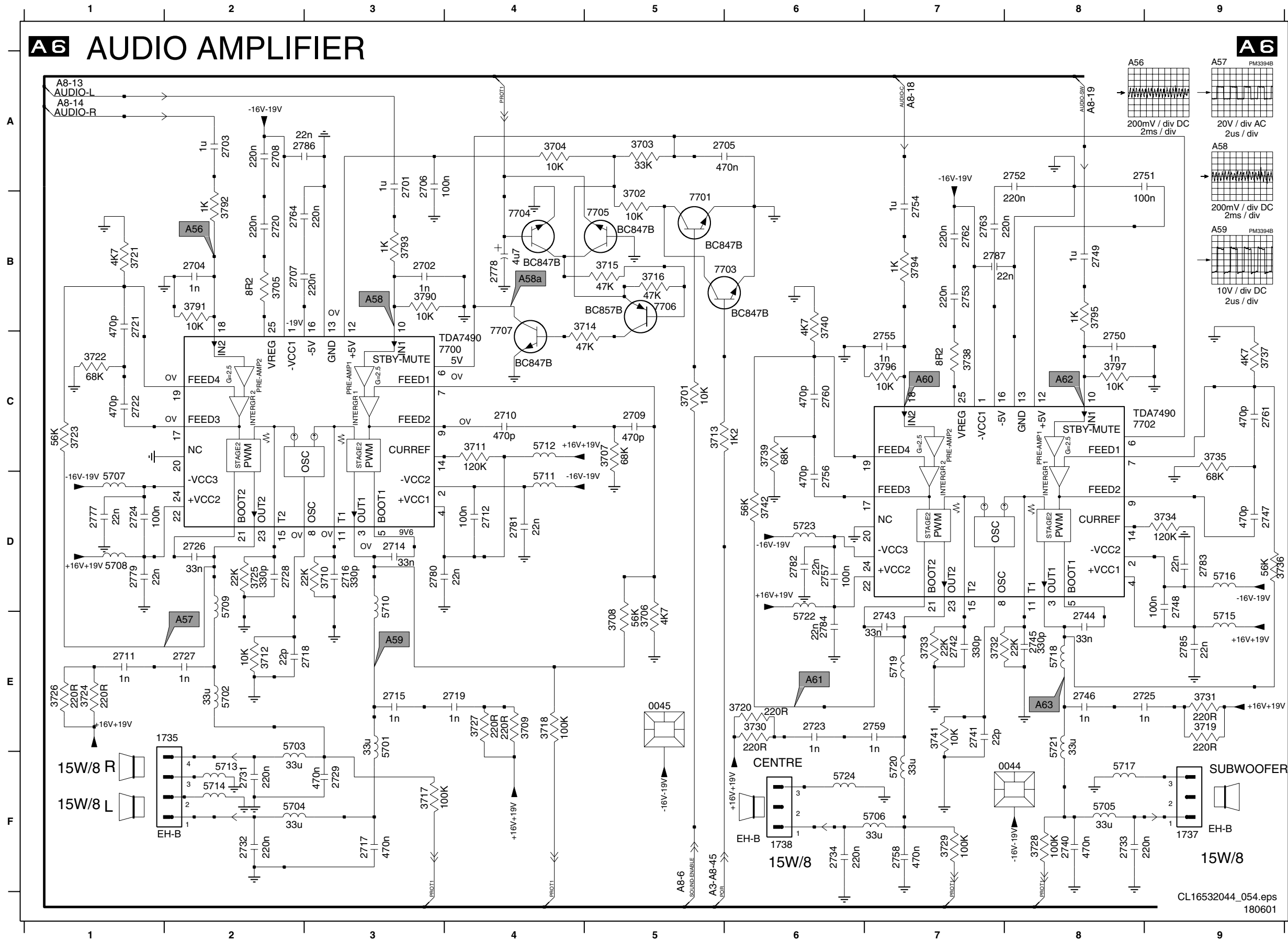
Large Signal Panel: Headphone Amplifier

|         |         |         |         |           |
|---------|---------|---------|---------|-----------|
| 2769 B3 | 2774 C1 | 3772 C4 | 3780 C1 | 6702 C2   |
| 2770 B1 | 2775 B1 | 3773 C4 | 3781 C2 | 7770-A B2 |
| 2771 C4 | 2776 D2 | 3774 C4 | 3782 D2 | 7770-B B4 |
| 2772 A4 | 3770 B2 | 3775 A3 | 3784 D3 |           |
| 2773 C2 | 3771 B3 | 3776 D2 | 6701 A3 |           |



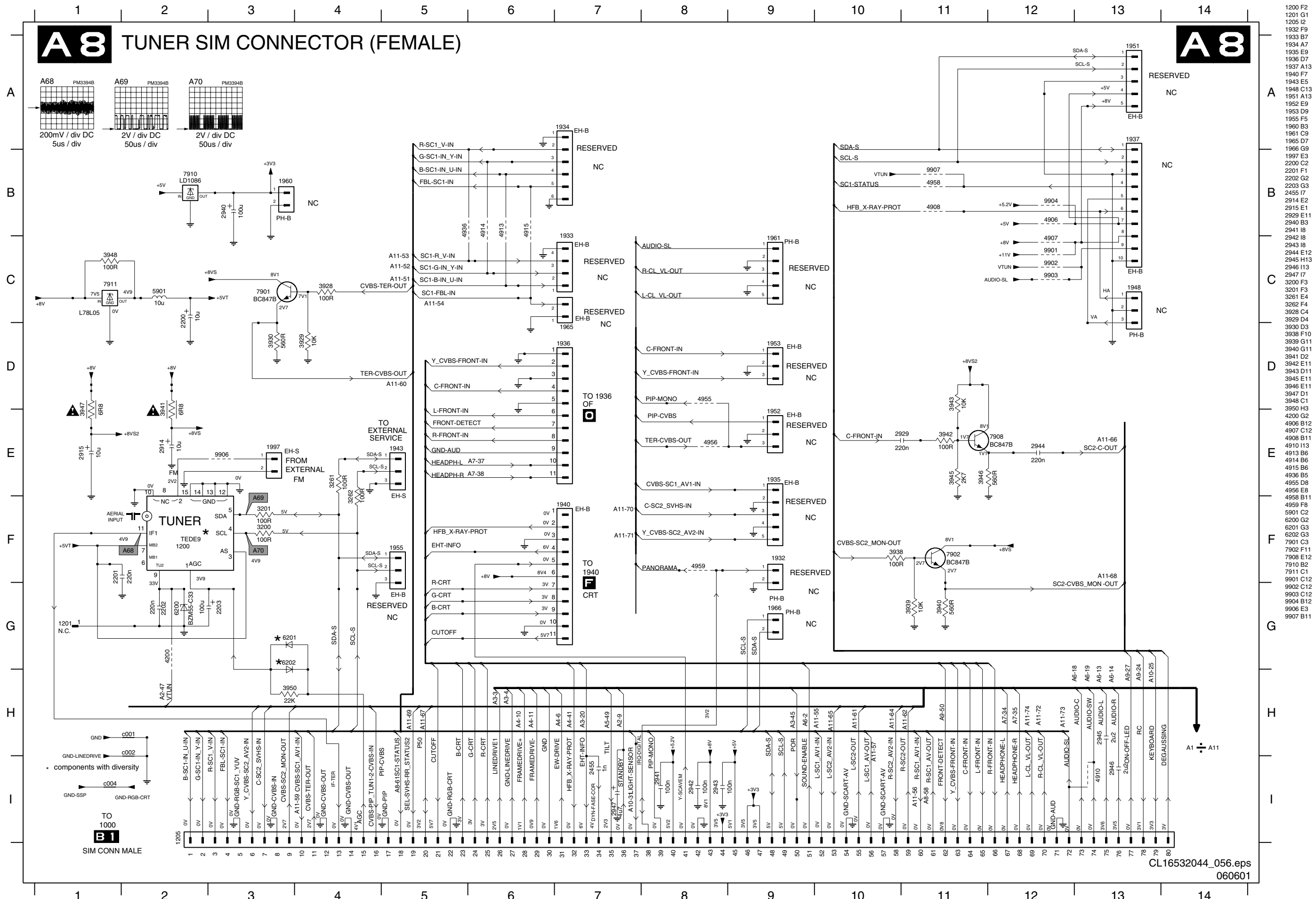
Large Signal Panel: Audio Amplifier

A6 AUDIO AMPLIFIER



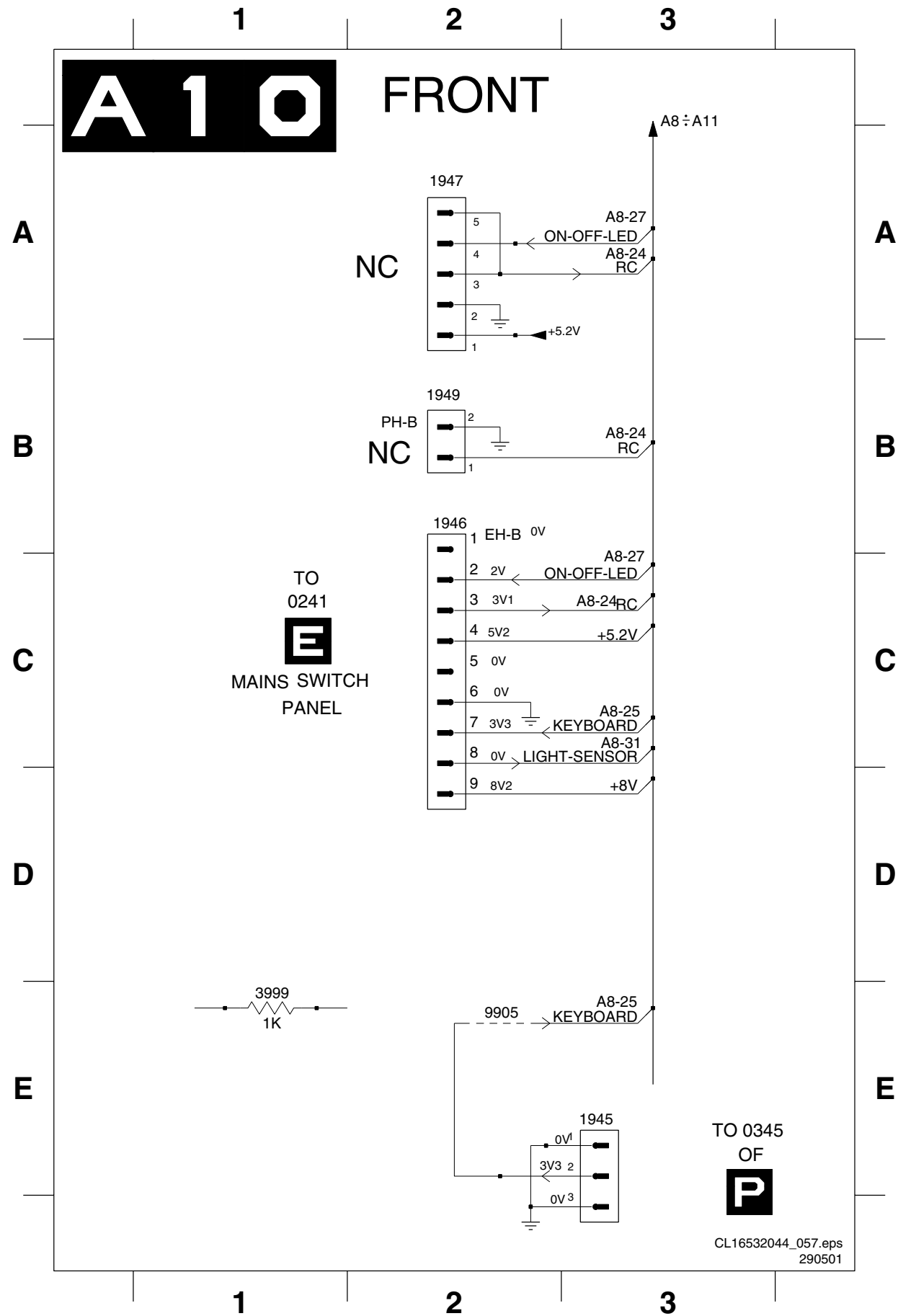
|         |         |         |
|---------|---------|---------|
| 0044 F7 | 2764 B2 | 3797 C8 |
| 0045 E5 | 2777 D1 | 5701 E3 |
| 1735 E2 | 2778 B4 | 5702 E2 |
| 1737 F9 | 2779 D1 | 5703 E2 |
| 1738 F6 | 2780 D3 | 5704 F2 |
| 2701 A3 | 2781 D4 | 5705 F8 |
| 2702 B3 | 2782 D6 | 5706 F7 |
| 2703 A2 | 2783 D9 | 5707 D1 |
| 2704 B2 | 2784 E6 | 5708 D1 |
| 2705 A5 | 2785 E9 | 5709 D2 |
| 2706 A3 | 2786 A2 | 5710 D3 |
| 2707 B2 | 2787 B7 | 5711 D4 |
| 2708 A2 | 3701 C5 | 5712 C4 |
| 2709 C5 | 3702 A5 | 5713 F2 |
| 2710 C4 | 3703 A5 | 5714 F2 |
| 2711 E1 | 3704 A4 | 5715 E9 |
| 2712 D4 | 3705 B2 | 5716 D9 |
| 2714 D3 | 3706 E5 | 5717 F8 |
| 2715 E3 | 3707 C5 | 5718 E8 |
| 2716 D3 | 3708 E5 | 5719 E7 |
| 2717 F3 | 3709 E4 | 5720 F7 |
| 2718 E2 | 3710 D3 | 5721 E8 |
| 2719 E4 | 3711 C4 | 5722 E6 |
| 2720 B2 | 3712 E2 | 5723 D6 |
| 2721 B1 | 3713 C5 | 5724 F6 |
| 2722 C1 | 3714 B5 | 7700 C3 |
| 2723 E6 | 3715 B5 | 7701 B5 |
| 2724 D1 | 3716 B5 | 7702 C8 |
| 2725 E8 | 3717 F3 | 7703 B5 |
| 2726 D2 | 3718 E4 | 7704 B4 |
| 2727 E2 | 3719 E9 | 7705 B5 |
| 2728 D2 | 3720 E6 | 7706 B5 |
| 2729 F3 | 3721 B1 | 7707 C4 |
| 2731 F2 | 3722 C1 |         |
| 2732 F2 | 3723 C1 |         |
| 2733 F8 | 3724 E1 |         |
| 2734 F6 | 3725 D2 |         |
| 2740 F8 | 3726 E1 |         |
| 2741 E7 | 3727 E4 |         |
| 2742 E7 | 3728 F8 |         |
| 2743 E7 | 3729 F7 |         |
| 2744 E8 | 3730 E6 |         |
| 2745 E8 | 3731 E9 |         |
| 2746 E8 | 3732 E7 |         |
| 2747 D9 | 3733 E7 |         |
| 2748 D9 | 3734 D9 |         |
| 2749 B8 | 3735 C9 |         |
| 2750 C8 | 3736 D9 |         |
| 2751 A8 | 3737 C9 |         |
| 2752 A8 | 3738 C7 |         |
| 2753 B7 | 3739 C6 |         |
| 2754 B7 | 3740 B6 |         |
| 2755 C7 | 3741 E7 |         |
| 2756 D6 | 3742 D6 |         |
| 2757 D6 | 3790 B3 |         |
| 2758 F7 | 3791 B2 |         |
| 2759 E7 | 3792 B2 |         |
| 2760 C6 | 3793 B3 |         |
| 2761 C9 | 3794 B7 |         |
| 2762 B7 | 3795 B8 |         |
| 2763 B7 | 3796 C7 |         |

### Large Signal Panel: Tuner SIM Connector (Female)



- 1200 F2
- 1201 G1
- 1205 I2
- 1932 F9
- 1933 B7
- 1934 A7
- 1935 E9
- 1936 D7
- 1937 A13
- 1940 F7
- 1943 E5
- 1948 C13
- 1951 A13
- 1952 E9
- 1953 D9
- 1955 F5
- 1960 B3
- 1961 C9
- 1965 D7
- 1966 G9
- 1997 E3
- 2200 C2
- 2201 F1
- 2202 G2
- 2203 G3
- 2455 I7
- 2914 E2
- 2915 E1
- 2929 E11
- 2940 B3
- 2941 I8
- 2942 I8
- 2943 I8
- 2944 E12
- 2945 H13
- 2946 I13
- 2947 I7
- 3200 F3
- 3201 F3
- 3261 E4
- 3262 F4
- 3928 C4
- 3929 D4
- 3930 D3
- 3938 F10
- 3939 G11
- 3940 G11
- 3941 D2
- 3942 E11
- 3943 D11
- 3945 E11
- 3946 E11
- 3947 D1
- 3948 C1
- 3950 H3
- 4200 G2
- 4906 B12
- 4907 C12
- 4908 B11
- 4910 I13
- 4913 B6
- 4914 B6
- 4915 B6
- 4936 B5
- 4955 D8
- 4956 E8
- 4958 B11
- 4959 F8
- 5901 C2
- 6200 G2
- 6201 G3
- 6202 G3
- 7901 C3
- 7902 F11
- 7908 E12
- 7910 B2
- 7911 C1
- 9901 C12
- 9902 C12
- 9903 C12
- 9904 B12
- 9906 E3
- 9907 B11

Large Signal Panel: Front



1945 E3  
1946 B2  
1947 A2  
3999 E1  
9905 E2

Personal Notes:

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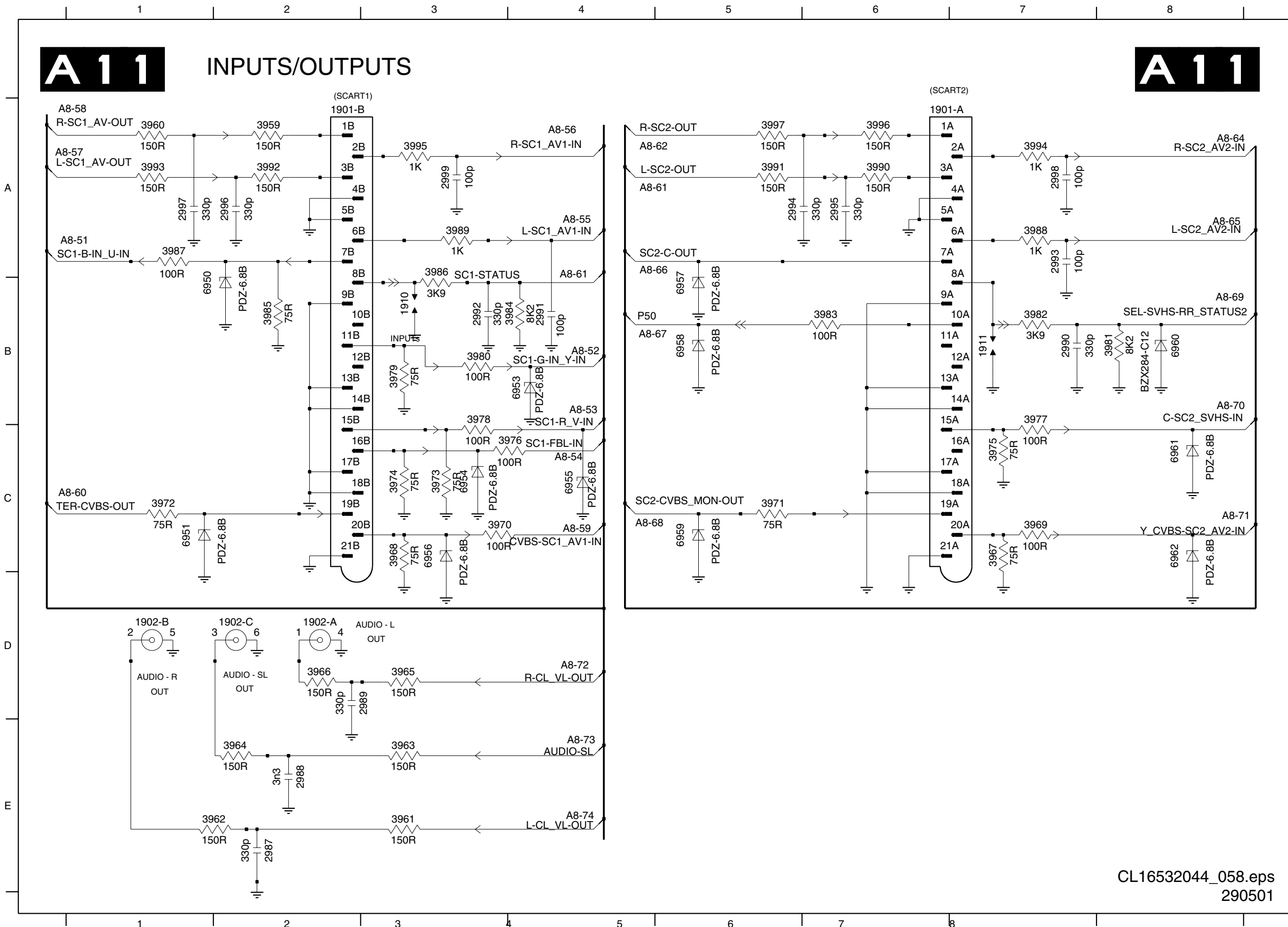
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Large Signal Panel: Inputs / Outputs



|           |         |
|-----------|---------|
| 1901-A A6 | 3992 A2 |
| 1901-B A2 | 3993 A1 |
| 1902-A D2 | 3994 A7 |
| 1902-B D1 | 3995 A3 |
| 1902-C D2 | 3996 A6 |
| 1910 B3   | 3997 A5 |
| 1911 B7   | 6950 B1 |
| 2987 E2   | 6951 C1 |
| 2988 E2   | 6953 B4 |
| 2989 D2   | 6954 C3 |
| 2990 B7   | 6955 C4 |
| 2991 B4   | 6956 C3 |
| 2992 B3   | 6957 B5 |
| 2993 A7   | 6958 B5 |
| 2994 A5   | 6959 C5 |
| 2995 A6   | 6960 B8 |
| 2996 A2   | 6961 C8 |
| 2997 A1   | 6962 C8 |
| 2998 A7   |         |
| 2999 A3   |         |
| 3959 A2   |         |
| 3960 A1   |         |
| 3961 E3   |         |
| 3962 E2   |         |
| 3963 E3   |         |
| 3964 E2   |         |
| 3965 D3   |         |
| 3966 D2   |         |
| 3967 C7   |         |
| 3968 C3   |         |
| 3969 C7   |         |
| 3970 C3   |         |
| 3971 C5   |         |
| 3972 C1   |         |
| 3973 C3   |         |
| 3974 C3   |         |
| 3975 C7   |         |
| 3976 C4   |         |
| 3977 B7   |         |
| 3978 B3   |         |
| 3979 B3   |         |
| 3980 B3   |         |
| 3981 B8   |         |
| 3982 B7   |         |
| 3983 B6   |         |
| 3984 B4   |         |
| 3985 B2   |         |
| 3986 A3   |         |
| 3987 A1   |         |
| 3988 A7   |         |
| 3989 A3   |         |
| 3990 A6   |         |
| 3991 A5   |         |



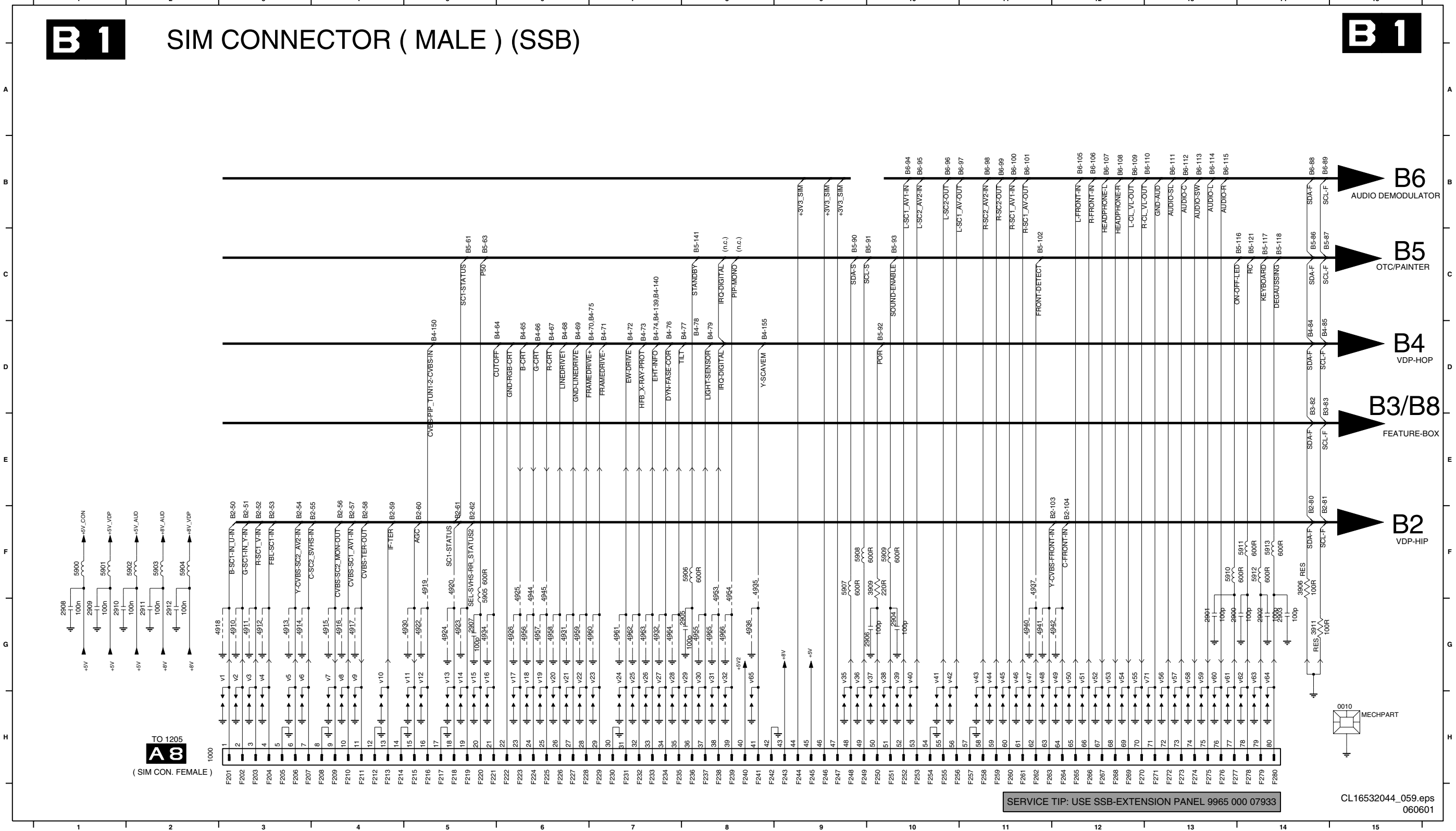
Small Signal Board: Sim Connector (Male)

|       |       |        |        |        |        |        |        |         |         |         |         |         |         |         |         |          |          |          |          |          |         |         |         |         |          |          |         |         |         |         |         |          |          |          |
|-------|-------|--------|--------|--------|--------|--------|--------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|----------|----------|---------|---------|---------|---------|----------|----------|---------|---------|---------|---------|---------|----------|----------|----------|
| v1 G3 | v5 G3 | v9 G4  | v13 G5 | v17 G6 | v21 G6 | v25 G7 | v29 G8 | v35 G9  | v39 G10 | v43 G11 | v47 G11 | v51 G12 | v55 G12 | v59 G13 | v63 G14 | 0010 H15 | 2902 G14 | 2906 G10 | 2910 G1  | 3909 F10 | 4912 G3 | 4916 G4 | 4920 F5 | 4925 F6 | 4932 G7  | 4937 F11 | 4944 F6 | 4955 G8 | 4959 G6 | 4963 G7 | 5900 F1 | 5904 F2  | 5908 F9  | 5912 F14 |
| v2 G3 | v6 G3 | v10 G4 | v14 G5 | v18 G6 | v22 G6 | v26 G7 | v30 G8 | v36 G9  | v40 G10 | v44 G11 | v48 G11 | v52 G12 | v56 G13 | v60 G13 | v64 G14 | 1000 H2  | 2903 G14 | 2907 G5  | 2911 G2  | 3911 G14 | 4913 G3 | 4917 G4 | 4922 G5 | 4926 G6 | 4934 G5  | 4940 G11 | 4945 F6 | 4956 G6 | 4960 G7 | 4964 G7 | 5901 F1 | 5905 F5  | 5909 F10 | 5913 F14 |
| v3 G3 | v7 G4 | v11 G5 | v15 G5 | v19 G6 | v23 G7 | v27 G7 | v31 G8 | v37 G10 | v41 G10 | v45 G11 | v49 G12 | v53 G12 | v57 G13 | v61 G13 | v65 G8  | 2900 G13 | 2904 G10 | 2908 G1  | 2912 G2  | 4910 G3  | 4914 G3 | 4918 G3 | 4923 G5 | 4930 G5 | 4935 F8  | 4941 G11 | 4953 F8 | 4957 G6 | 4961 G7 | 5902 F2 | 5906 F8 | 5910 F13 |          |          |
| v4 G3 | v8 G4 | v12 G5 | v16 G5 | v20 G6 | v24 G7 | v28 G7 | v32 G8 | v38 G10 | v42 G10 | v46 G11 | v50 G12 | v54 G12 | v58 G13 | v62 G14 | v71 G12 | 2901 G13 | 2905 G8  | 2909 G1  | 3906 F14 | 4915 G4  | 4919 F5 | 4924 G5 | 4931 G6 | 4936 G8 | 4942 G12 | 4954 F8  | 4958 G6 | 4962 G7 | 5903 F2 | 5907 F9 |         |          |          |          |

**B 1**

SIM CONNECTOR ( MALE ) (SSB)

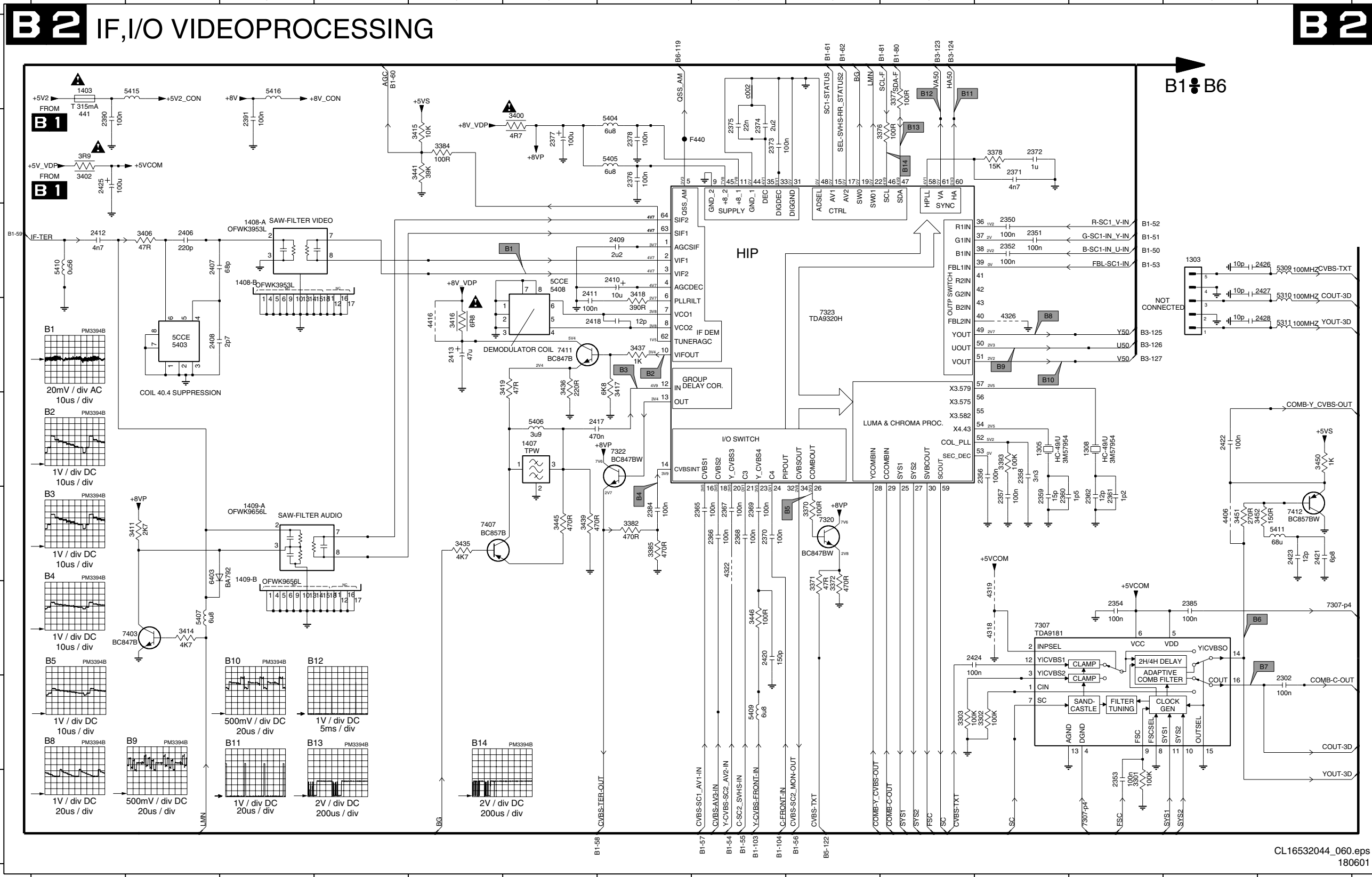
**B 1**



TO 1205  
**A 8**  
(SIM CON. FEMALE)

SERVICE TIP: USE SSB-EXTENSION PANEL 9965 000 07933

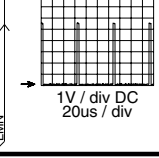
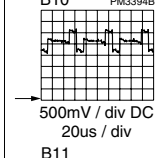
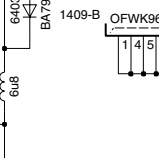
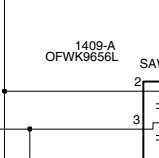
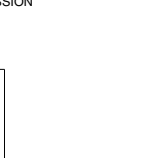
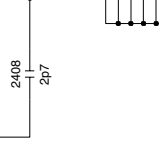
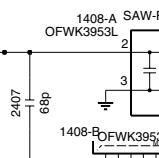
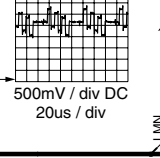
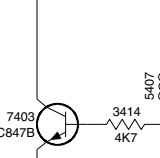
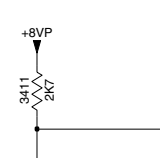
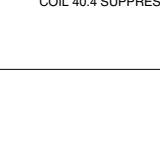
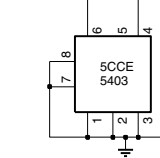
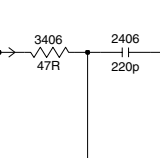
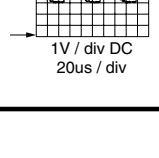
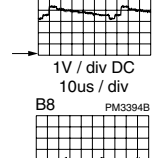
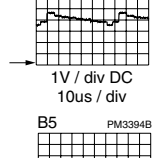
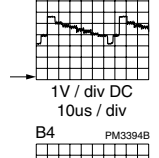
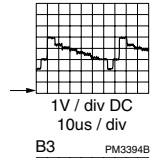
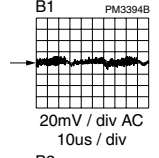
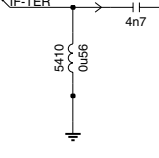
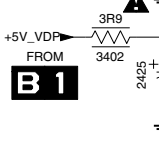
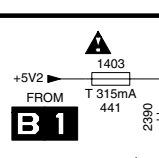
Small Signal Board: IF, I/O Videoprocessing



**B2**

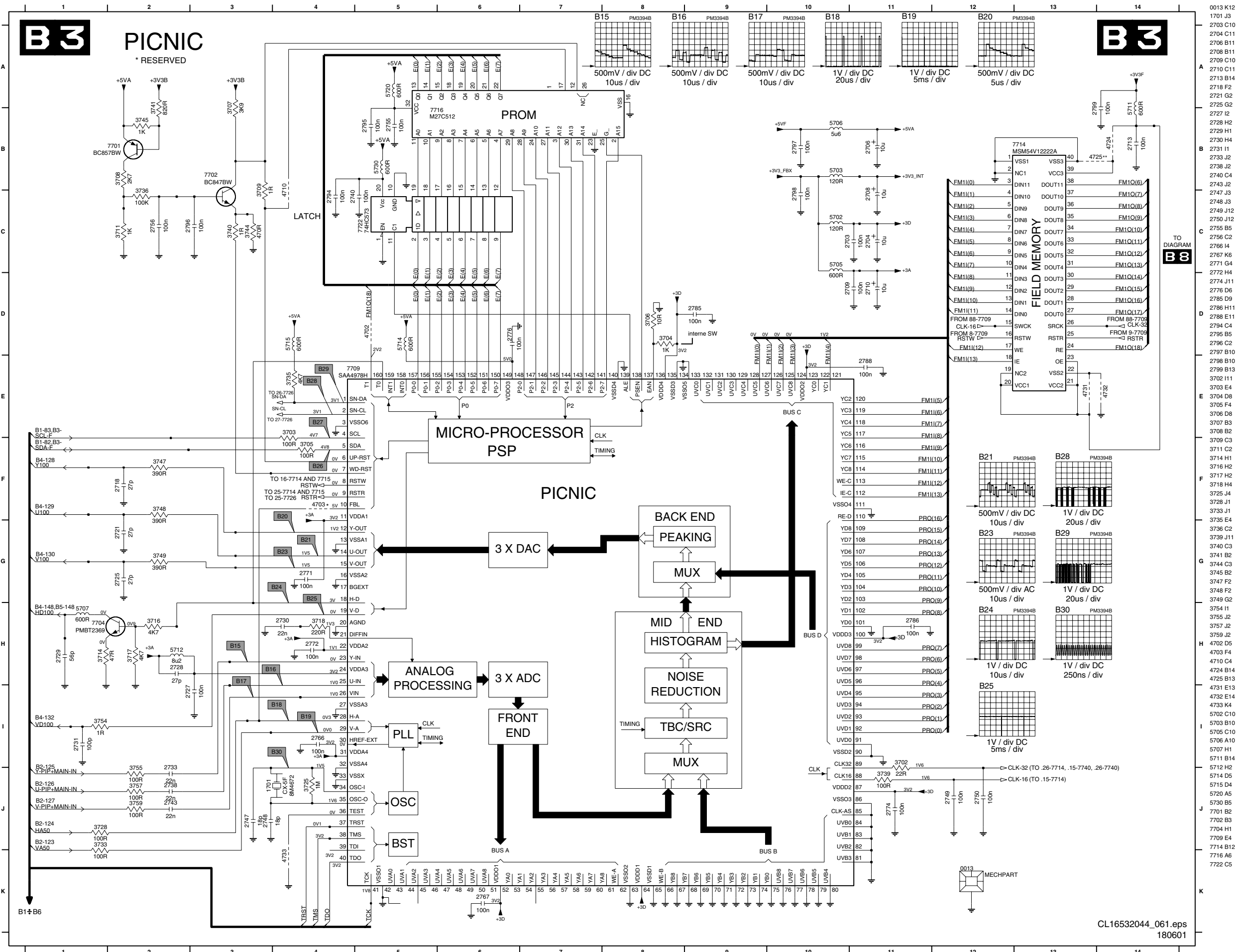
IF, I/O VIDEOPROCESSING

B1:B6



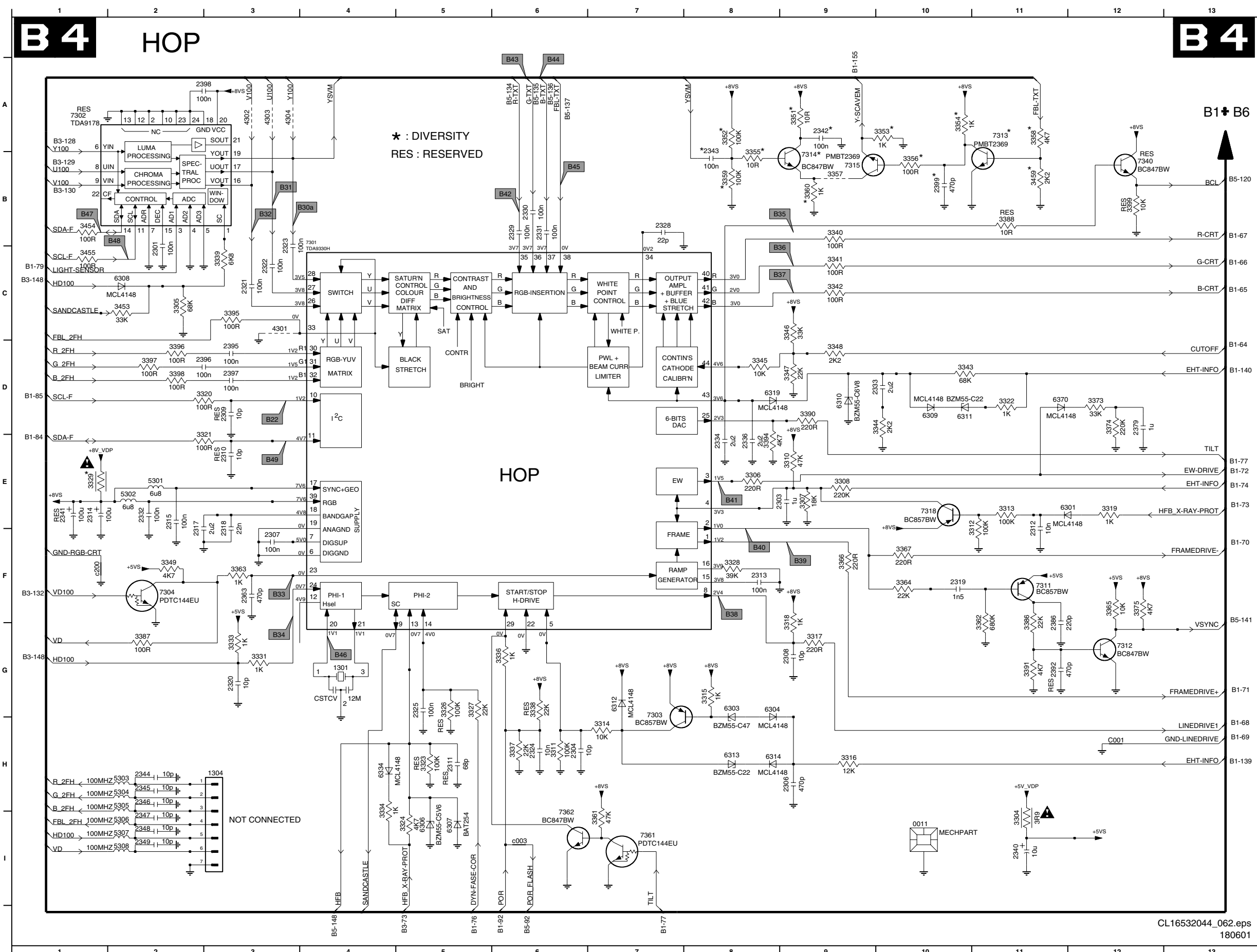
- 1303 C13
- 1305 E11
- 1308 E12
- 1403 A1
- 1407 E6
- 1408-A C3
- 1408-B C3
- 1409-A F3
- 1409-B G3
- 2302 H14
- 2350 C11
- 2351 C11
- 2352 C11
- 2353 I12
- 2354 G12
- 2356 E11
- 2357 F11
- 2358 E11
- 2359 F11
- 2360 F11
- 2361 F12
- 2362 F12
- 2365 F8
- 2366 F8
- 2367 F8
- 2368 F8
- 2369 F8
- 2370 F8
- 2371 B11
- 2372 B11
- 2373 B8
- 2374 B8
- 2375 B8
- 2376 B7
- 2377 B6
- 2378 B7
- 2384 F7
- 2385 G13
- 2390 B1
- 2391 B3
- 2406 C2
- 2407 C2
- 2408 D2
- 2409 C7
- 2410 C7
- 2411 C6
- 2412 C1
- 2413 D5
- 2417 E6
- 2418 D6
- 2420 G8
- 2421 F14
- 2422 E13
- 2423 F14
- 2424 G10
- 2425 B1
- 2426 C14
- 2427 C14
- 2428 D14
- 3301 I12
- 3302 H11
- 3303 H10
- 3370 F9
- 3371 G9
- 3372 G9
- 3376 B10
- 3377 A10
- 3378 B11
- 3382 F7
- 3384 B5
- 3385 F7
- 3393 E11
- 3400 B6
- 3402 B1
- 3406 C2
- 3411 F2
- 3414 G2
- 3415 B5
- 3416 D5
- 3417 D7
- 3418 C7
- 3419 D6
- 3435 F5
- 3436 D6
- 3437 D7
- 3439 F6
- 3441 B5
- 3445 F6
- 3446 G8
- 3450 E14
- 3451 F13
- 3452 F14
- 4318 G11
- 4319 G11
- 4322 F8
- 4323 D11
- 4406 F13
- 4416 D5
- 5309 C14
- 5310 C14
- 5311 D14
- 5403 D2
- 5404 B7
- 5405 B7
- 5406 E6
- 5407 G2
- 5408 C6
- 5409 H8
- 5410 C1
- 5411 F14
- 5415 A2
- 5416 A3
- 6403 F2
- 7307 F11
- 7320 F9
- 7322 E7
- 7323 D9
- 7403 G2
- 7407 F5
- 7411 D6
- 7412 F14
- 0002 A8

**Small Signal Board: PICNIC**



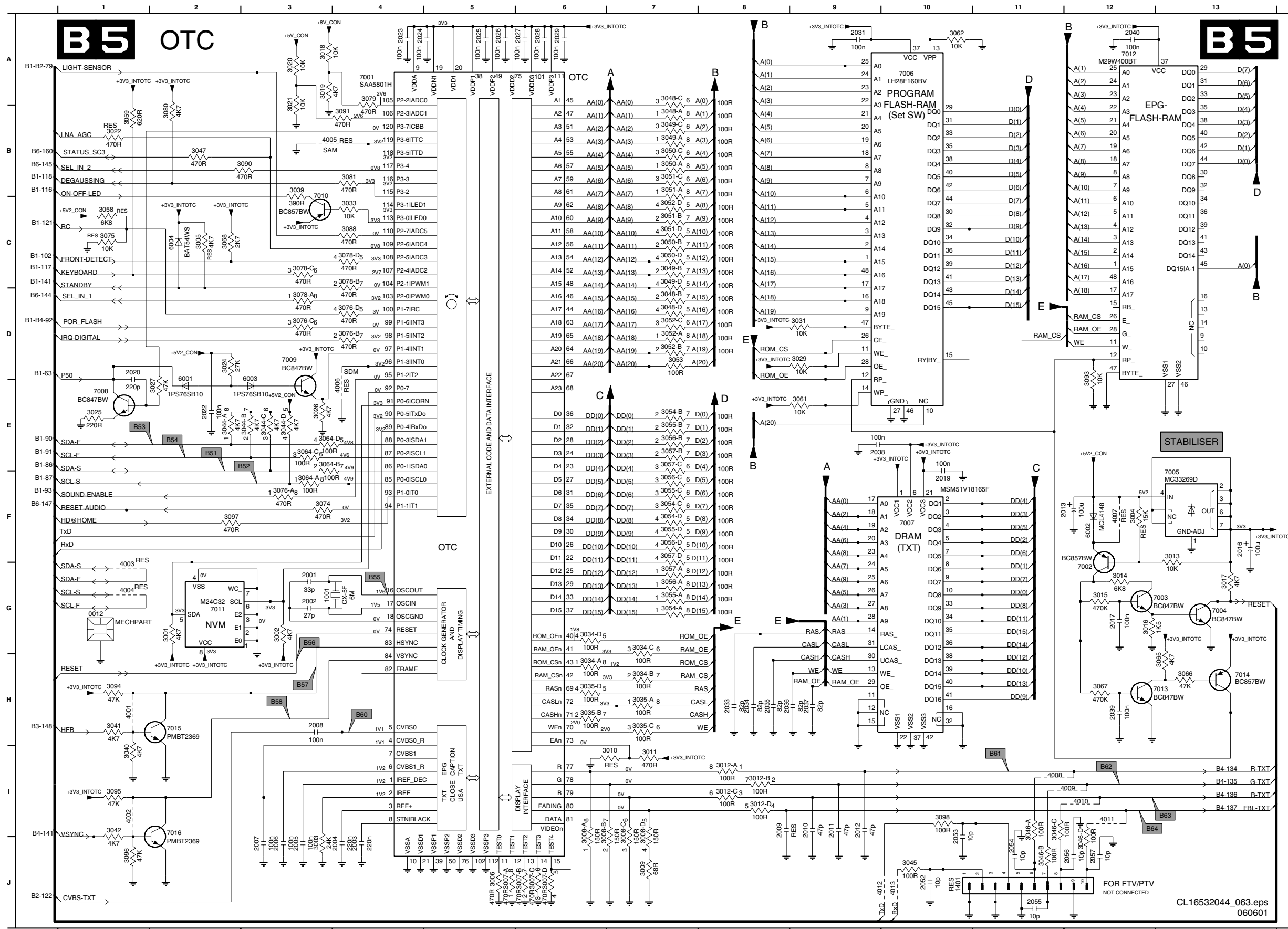
- 0013 K12
- 1701 J3
- 2703 C10
- 2704 C11
- 2706 B11
- 2708 B11
- 2709 C10
- 2710 C11
- 2713 B14
- 2718 F2
- 2721 G2
- 2725 G2
- 2727 I2
- 2728 H2
- 2729 H1
- 2730 H4
- 2731 I1
- 2733 J2
- 2738 J2
- 2740 C4
- 2743 J2
- 2747 J3
- 2748 J3
- 2749 J12
- 2750 J12
- 2755 B5
- 2756 C2
- 2766 I4
- 2767 K6
- 2771 G4
- 2772 H4
- 2774 J11
- 2776 D6
- 2785 D9
- 2786 H11
- 2788 E11
- 2794 C4
- 2795 B5
- 2796 C2
- 2797 B10
- 2798 B10
- 2799 B13
- 3702 I1
- 3703 E4
- 3704 D8
- 3705 F4
- 3706 D8
- 3707 B3
- 3708 B2
- 3709 C3
- 3711 C2
- 3714 H1
- 3716 H2
- 3717 H2
- 3718 H4
- 3725 J4
- 3728 J1
- 3733 J1
- 3735 E4
- 3736 C2
- 3739 J11
- 3740 C3
- 3741 B2
- 3744 C3
- 3745 B2
- 3747 F2
- 3748 F2
- 3749 G2
- 3754 I1
- 3755 J2
- 3757 J2
- 3759 J2
- 4702 D5
- 4703 F4
- 4710 C4
- 4724 B14
- 4725 B13
- 4731 E13
- 4732 E14
- 4733 K4
- 5702 C10
- 5703 B10
- 5705 C10
- 5706 A10
- 5707 H1
- 5711 B14
- 5712 H2
- 5714 D5
- 5715 D4
- 5720 A5
- 5730 B5
- 7701 B2
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- 7704 H1
- 7705 E4
- 7714 B16
- 7716 A6
- 7722 C5

**Small Signal Board: HOP**

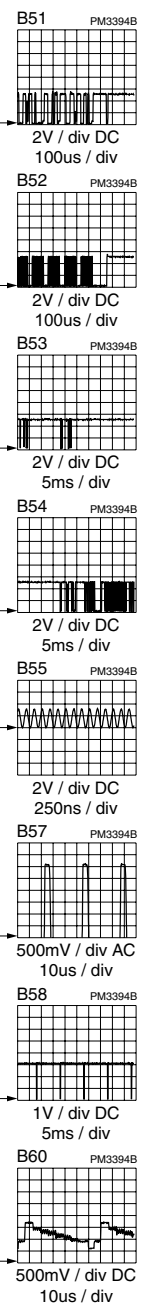


|          |          |      |                             |
|----------|----------|------|-----------------------------|
| 0011 I10 | 3351 A9  | B30a | 1V / div DC<br>10us / div   |
| 1301 G4  | 3352 A8  | B31  | 1V / div DC<br>10us / div   |
| 1304 H3  | 3353 A10 | B32  | 1V / div DC<br>10us / div   |
| 2301 C2  | 3354 A10 | B33  | 1V / div DC<br>5ms / div    |
| 2303 E9  | 3355 B8  | B34  | 1V / div DC<br>10us / div   |
| 2304 H6  | 3356 B10 | B35  | 1V / div DC<br>10us / div   |
| 2306 H9  | 3357 B9  | B36  | 1V / div DC<br>10us / div   |
| 2307 F3  | 3358 A11 | B37  | 1V / div DC<br>10us / div   |
| 2308 G9  | 3359 B8  | B39  | 500mV / div DC<br>5ms / div |
| 2309 D3  | 3360 B9  | B40  | 500mV / div DC<br>5ms / div |
| 2310 E3  | 3361 I7  | B41  | 500mV / div DC<br>5ms / div |
| 2311 H5  | 3362 F11 | B46  | 500mV / div DC<br>5ms / div |
| 2312 E11 | 3363 F3  |      |                             |
| 2313 F8  | 3364 F10 |      |                             |
| 2314 E1  | 3365 F12 |      |                             |
| 2315 E2  | 3366 F9  |      |                             |
| 2317 E2  | 3367 F10 |      |                             |
| 2318 E3  | 3370 D12 |      |                             |
| 2319 F10 | 3371 D12 |      |                             |
| 2320 G3  | 3386 F11 |      |                             |
| 2321 C3  | 3387 G2  |      |                             |
| 2322 C3  | 3388 B11 |      |                             |
| 2323 B3  | 3390 D9  |      |                             |
| 2324 H6  | 3391 G11 |      |                             |
| 2325 G5  | 3394 E8  |      |                             |
| 2328 B7  | 3395 C3  |      |                             |
| 2329 B6  | 3396 D2  |      |                             |
| 2330 B6  | 3397 D2  |      |                             |
| 2331 B6  | 3398 D2  |      |                             |
| 2332 E2  | 3399 B12 |      |                             |
| 2333 D10 | 3453 C2  |      |                             |
| 2334 E8  | 3454 B1  |      |                             |
| 2336 E8  | 3455 C1  |      |                             |
| 2340 I11 | 3459 B11 |      |                             |
| 2341 E1  | 4301 C3  |      |                             |
| 2342 A9  | 4302 A3  |      |                             |
| 2343 B8  | 4303 A3  |      |                             |
| 2344 H2  | 4304 A3  |      |                             |
| 2345 H2  | 5301 E2  |      |                             |
| 2346 H2  | 5302 E2  |      |                             |
| 2347 I2  | 5303 H2  |      |                             |
| 2348 I2  | 5304 H2  |      |                             |
| 2349 I2  | 5305 H2  |      |                             |
| 2363 F3  | 5306 I2  |      |                             |
| 2371 D12 | 5307 I2  |      |                             |
| 2386 F11 | 5308 I2  |      |                             |
| 2392 G11 | 6301 E12 |      |                             |
| 2395 D3  | 6303 G8  |      |                             |
| 2396 D2  | 6304 G8  |      |                             |
| 2397 D3  | 6306 I5  |      |                             |
| 2398 A2  | 6307 I5  |      |                             |
| 2399 B10 | 6308 C2  |      |                             |
| 3304 I11 | 6309 D10 |      |                             |
| 3305 C2  | 6310 D9  |      |                             |
| 3306 E8  | 6311 D10 |      |                             |
| 3307 E9  | 6312 G7  |      |                             |
| 3308 E9  | 6313 H8  |      |                             |
| 3310 E9  | 6314 H8  |      |                             |
| 3311 H6  | 6319 D8  |      |                             |
| 3312 E11 | 6334 H4  |      |                             |
| 3313 E11 | 6370 D11 |      |                             |
| 3314 H7  | 7301 B4  |      |                             |
| 3315 G8  | 7302 A1  |      |                             |
| 3316 H9  | 7303 G7  |      |                             |
| 3317 G9  | 7304 F2  |      |                             |
| 3318 F9  | 7311 F11 |      |                             |
| 3319 E12 | 7312 G12 |      |                             |
| 3320 D3  | 7313 A11 |      |                             |
| 3321 E3  | 7314 B9  |      |                             |
| 3322 D11 | 7315 B9  |      |                             |
| 3323 H5  | 7318 E10 |      |                             |
| 3324 I5  | 7340 B12 |      |                             |
| 3326 G5  | 7361 I7  |      |                             |
| 3327 G5  | 7362 I7  |      |                             |
| 3328 F8  | 7362 I7  |      |                             |
| 3329 E1  | c003 I6  |      |                             |
| 3331 G3  | c200 F1  |      |                             |
| 3333 G3  |          |      |                             |
| 3334 H4  |          |      |                             |
| 3336 G6  |          |      |                             |
| 3337 H6  |          |      |                             |
| 3338 G6  |          |      |                             |
| 3339 C3  |          |      |                             |
| 3340 B9  |          |      |                             |
| 3341 C9  |          |      |                             |
| 3342 C9  |          |      |                             |
| 3343 D10 |          |      |                             |
| 3344 D10 |          |      |                             |
| 3345 D8  |          |      |                             |
| 3346 C9  |          |      |                             |
| 3347 D9  |          |      |                             |
| 3348 D9  |          |      |                             |
| 3349 F2  |          |      |                             |

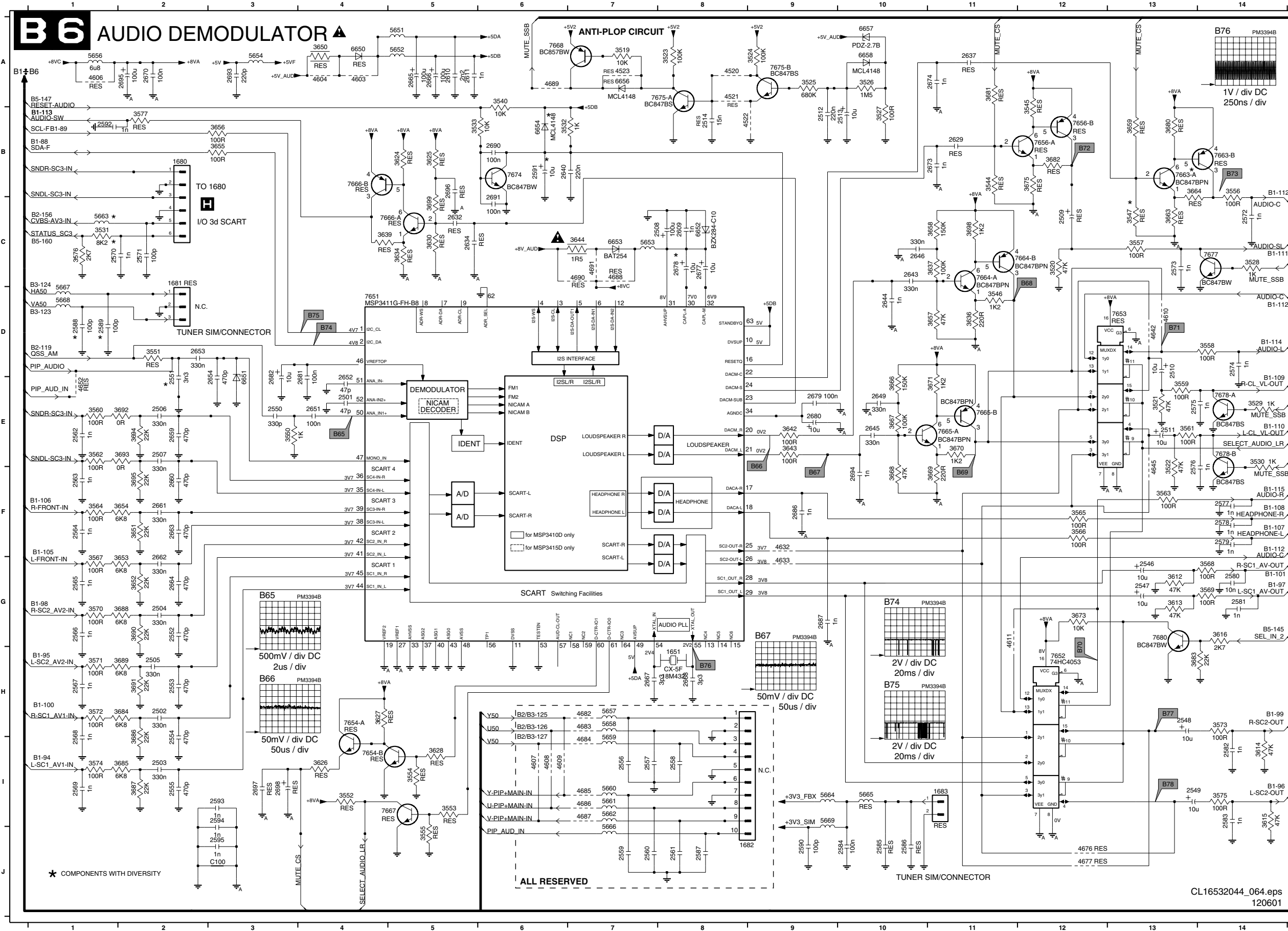
Small Signal Board: OTC



|           |            |          |
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| 1001 J10  | 3044-C E3  | 6003 E3  |
| 2001 G3   | 3044-D E3  | 6004 C2  |
| 2002 G3   | 3045 J10   | 7001 A4  |
| 2003 J4   | 3046-A H11 | 7002 G12 |
| 2004 J4   | 3046-B H11 | 7003 G12 |
| 2005 J3   | 3046-C H11 | 7004 G13 |
| 2006 J3   | 3046-D J12 | 7005 F13 |
| 2007 J3   | 3047 B2    | 7006 A10 |
| 2008 H3   | 3048-A B7  | 7007 F10 |
| 2009 I8   | 3048-B D7  | 7008 E1  |
| 2010 I9   | 3048-C A7  | 7009 D3  |
| 2011 I9   | 3048-D D7  | 7010 C3  |
| 2012 I9   | 3049-A B7  | 7011 G2  |
| 2013 F12  | 3049-B C7  | 7012 A12 |
| 2016 F13  | 3049-C B7  | 7013 H12 |
| 2017 G12  | 3050-A B7  | 7015 H2  |
| 2019 I10  | 3050-B C7  | 7016 I2  |
| 2020 E1   | 3050-C B7  |          |
| 2022 E2   | 3050-D C7  |          |
| 2023 A4   | 3051-A B7  |          |
| 2024 A4   | 3051-B C7  |          |
| 2025 A5   | 3051-C B7  |          |
| 2026 A5   | 3051-D C7  |          |
| 2027 A6   | 3052-A D7  |          |
| 2028 A6   | 3052-B D7  |          |
| 2029 A6   | 3052-C D7  |          |
| 2031 A9   | 3052-D C7  |          |
| 2033 H8   | 3053 D7    |          |
| 2034 H8   | 3054-A G7  |          |
| 2035 H8   | 3054-B E7  |          |
| 2036 H8   | 3054-C F7  |          |
| 2037 H9   | 3054-D F7  |          |
| 2038 E9   | 3055-A G7  |          |
| 2039 H12  | 3055-B E7  |          |
| 2040 A12  | 3055-C F7  |          |
| 2052 J10  | 3055-D F7  |          |
| 2053 I10  | 3056-A G7  |          |
| 2054 J11  | 3056-B E7  |          |
| 2055 J11  | 3056-C F7  |          |
| 2056 J12  | 3056-D F7  |          |
| 2057 J12  | 3057-A G7  |          |
| 3001 G2   | 3057-B E7  |          |
| 3002 G3   | 3057-C F7  |          |
| 3003 J3   | 3057-D E7  |          |
| 3004 F12  | 3058 C1    |          |
| 3005 C2   | 3059 B1    |          |
| 3006 J5   | 3061 E9    |          |
| 3007-A J5 | 3062 A10   |          |
| 3007-B J6 | 3064-A F3  |          |
| 3007-C J6 | 3064-B E3  |          |
| 3007-D J6 | 3064-C E3  |          |
| 3008-A I6 | 3064-D E3  |          |
| 3008-B I6 | 3065 H13   |          |
| 3008-C I7 | 3066 H13   |          |
| 3008-D I7 | 3067 H12   |          |
| 3009 J7   | 3068 C2    |          |
| 3010 I7   | 3074 F3    |          |
| 3011 I7   | 3075 C1    |          |
| 3012-A I8 | 3076-A F3  |          |
| 3012-B I8 | 3076-B D4  |          |
| 3012-C I8 | 3076-C D3  |          |
| 3012-D I8 | 3076-D D3  |          |
| 3013 F13  | 3078-A D3  |          |
| 3014 G12  | 3078-B C4  |          |
| 3015 G12  | 3078-C C4  |          |
| 3016 G12  | 3078-D C3  |          |
| 3017 G13  | 3079 A4    |          |
| 3018 A3   | 3080 B2    |          |
| 3019 A3   | 3081 B4    |          |
| 3020 A3   | 3082 C4    |          |
| 3021 A3   | 3090 B3    |          |
| 3022 B1   | 3091 B4    |          |
| 3024 D2   | 3093 D12   |          |
| 3025 E1   | 3094 H1    |          |
| 3026 E3   | 3095 I1    |          |
| 3027 E2   | 3096 J1    |          |
| 3029 D9   | 3097 F2    |          |
| 3031 D9   | 3098 H10   |          |
| 3033 C4   | 4001 H1    |          |
| 3034-A H6 | 4002 I1    |          |
| 3034-B H7 | 4003 G1    |          |
| 3034-C G7 | 4004 G1    |          |
| 3034-D G6 | 4005 B3    |          |
| 3035-A H7 | 4006 E4    |          |
| 3035-B H6 | 4007 F12   |          |
| 3035-C H7 | 4008 H1    |          |
| 3035-D H6 | 4009 I2    |          |
| 3039 B3   | 4010 I2    |          |
| 3040 I1   | 4011 I2    |          |
| 3041 H1   | 4012 J10   |          |
| 3042 I1   | 4013 J10   |          |
| 3044-A E2 | 6001 E2    |          |



Small Signal Board: Audio Demodulator



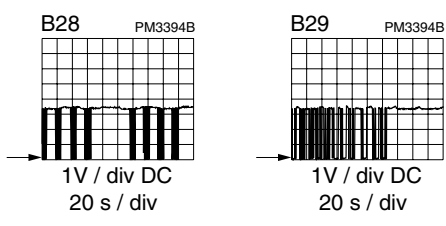
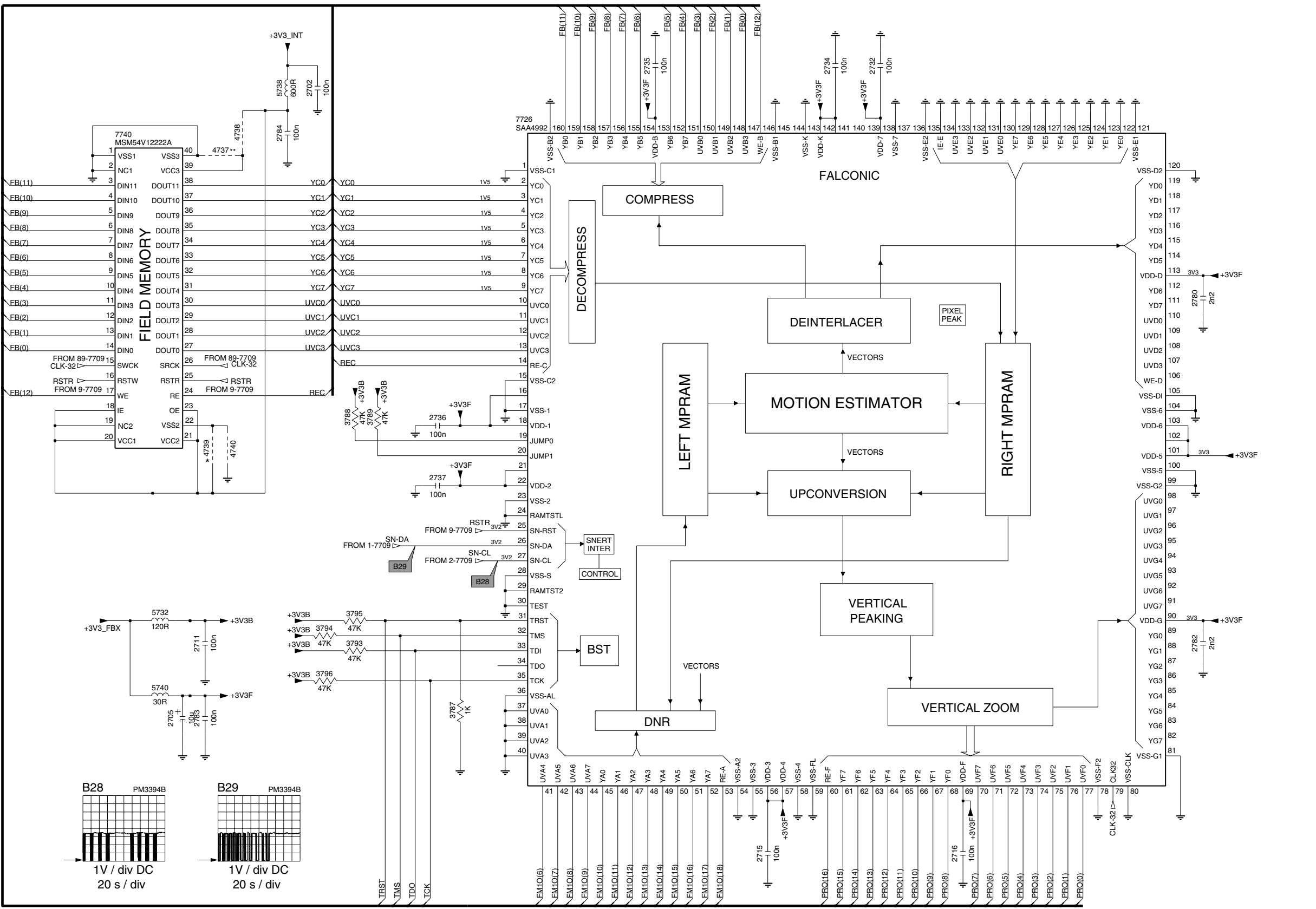
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| 1680 B2  | 3546 D11 | 5669 I9    |
| 1681 C2  | 3547 C13 | 6650 A4    |
| 1682 H8  | 3550 E3  | 6651 E3    |
| 1683 I11 | 3551 D2  | 6652 C8    |
| 2501 E4  | 3552 I4  | 6653 C7    |
| 2502 H2  | 3553 I5  | 6654 B6    |
| 2503 I2  | 3554 I5  | 6656 A7    |
| 2504 G2  | 3555 J5  | 6657 A10   |
| 2505 H2  | 3556 B14 | 6658 A10   |
| 2506 E2  | 3557 C13 | 6659 D1    |
| 2507 E2  | 3558 D14 | 7652 H12   |
| 2508 C8  | 3559 E13 | 7653 D13   |
| 2509 C12 | 3560 E1  | 7654 A H4  |
| 2510 D13 | 3561 E13 | 7654 B H4  |
| 2511 E13 | 3562 E1  | 7656 A B12 |
| 2512 B9  | 3563 F13 | 7656 B B12 |
| 2513 B10 | 3564 F1  | 7663 A B13 |
| 2514 B8  | 3565 F12 | 7663 B B14 |
| 2546 G13 | 3566 F12 | 7664 A C11 |
| 2547 G13 | 3567 G1  | 7664 B C11 |
| 2548 H13 | 3568 G14 | 7665 A E11 |
| 2549 I13 | 3569 G14 | 7665 B E11 |
| 2550 E3  | 3570 G1  | 7666 A C4  |
| 2551 E2  | 3571 H1  | 7666 B B4  |
| 2552 G2  | 3572 H1  | 7667 H1    |
| 2553 H2  | 3573 H14 | 7668 A6    |
| 2554 I2  | 3574 I1  | 7674 B6    |
| 2555 I2  | 3575 I14 | 7675 A A8  |
| 2556 I7  | 3576 C1  | 7675 B A9  |
| 2557 I7  | 3577 B2  | 7677 B2    |
| 2558 I8  | 3612 G13 | 7678 A E14 |
| 2559 J7  | 3613 G13 | 7678 B B14 |
| 2560 J7  | 3614 I14 | 7680 G13   |
| 2561 I4  | 3615 I14 | 7681 I5    |
| 2562 E1  | 3616 G14 | C100 J3    |
| 2563 F1  | 3624 B5  |            |
| 2564 F1  | 3625 B5  |            |
| 2565 G1  | 3626 I4  |            |
| 2566 H1  | 3627 H4  |            |
| 2567 H1  | 3628 I5  |            |
| 2568 I1  | 3630 C5  |            |
| 2569 I1  | 3634 C5  |            |
| 2570 C1  | 3636 D11 |            |
| 2571 C2  | 3637 C11 |            |
| 2572 C14 | 3639 C4  |            |
| 2573 C13 | 3642 E9  |            |
| 2574 D14 | 3643 E9  |            |
| 2575 E13 | 3644 C7  |            |
| 2576 F13 | 3651 F2  |            |
| 2577 F14 | 3651 F2  |            |
| 2578 F14 | 3652 G2  |            |
| 2579 F14 | 3653 G2  |            |
| 2580 G14 | 3654 F2  |            |
| 2581 G14 | 3655 J10 |            |
| 2582 H14 | 3656 B3  |            |
| 2583 I14 | 3657 D11 |            |
| 2584 J10 | 3658 C11 |            |
| 2585 J10 | 3659 B13 |            |
| 2586 J10 | 3660 B13 |            |
| 2587 J8  | 3664 B13 |            |
| 2588 D1  | 3666 E10 |            |
| 2589 D1  | 3667 E10 |            |
| 2590 J9  | 3668 F10 |            |
| 2591 B6  | 3669 F11 |            |
| 2592 B1  | 3670 E11 |            |
| 2593 I3  | 3671 E11 |            |
| 2594 I3  | 3673 G12 |            |
| 2595 J3  | 3675 B12 |            |
| 2596 C9  | 3680 B11 |            |
| 2610 A5  | 3681 A11 |            |
| 2611 A5  | 3682 B12 |            |
| 2629 B11 | 3683 H13 |            |
| 2632 C5  | 3684 H2  |            |
| 2634 C5  | 3685 I2  |            |
| 2637 A11 | 3686 I2  |            |
| 2640 B6  | 3687 I2  |            |
| 2643 C10 | 3688 G2  |            |
| 2644 D10 | 3689 H2  |            |
| 2645 E10 | 3690 G2  |            |
| 2646 C10 | 3691 H2  |            |
| 2649 E10 | 3692 E2  |            |
| 2651 E4  | 3693 E2  |            |
| 2660 F2  | 4520 A8  |            |
| 2661 F2  | 4521 A8  |            |
| 2662 G2  | 4522 G2  |            |
| 2663 F2  | 4523 A7  |            |
| 2664 G2  | 4603 A4  |            |
| 2665 A5  | 4604 A4  |            |
| 2666 A5  | 4606 A1  |            |
| 2667 H7  | 4607 I6  |            |
| 2668 H8  | 4608 I6  |            |
| 2670 A2  | 4609 I6  |            |
| 2673 B11 | 4610 D13 |            |
| 2674 A11 | 4611 G11 |            |
| 2677 C8  | 4632 F9  |            |
| 2678 C8  | 4633 G9  |            |
| 2679 E9  | 4642 D13 |            |
| 2680 E9  | 4645 F13 |            |
| 2681 E4  | 4652 E1  |            |
| 2682 E3  | 4676 J12 |            |
| 2686 F9  | 4677 J12 |            |
| 2687 G9  | 4682 H7  |            |
| 2690 B6  | 4683 H7  |            |
| 2691 C6  | 4684 I7  |            |
| 2693 A3  | 4685 I7  |            |
| 2694 F10 | 4686 I7  |            |
| 2695 A2  | 4687 I7  |            |
| 2696 B5  | 4688 C7  |            |
| 2697 I3  | 4689 A6  |            |
| 2698 I3  | 4690 C7  |            |
| 3519 A7  | 4691 C7  |            |
| 3520 C12 | 5651 A5  |            |
| 3521 E13 | 5652 A5  |            |
| 3522 F13 | 5653 C7  |            |
| 3523 A8  | 5654 A3  |            |
| 3524 A9  | 5656 A1  |            |
| 3525 A9  | 5657 H7  |            |
| 3526 A10 | 5658 H7  |            |
| 3527 B10 | 5659 I7  |            |
| 3528 C14 | 5660 I7  |            |
| 3529 E14 | 5661 I7  |            |
| 3530 E14 | 5662 I7  |            |
| 3531 C1  | 5663 C1  |            |
| 3532 B6  | 5664 I9  |            |
| 3533 B5  | 5665 I10 |            |
| 3540 A6  | 5666 J7  |            |
| 3544 B11 | 5667 D1  |            |

Small Signal Board: Falconic

B8

FALCONIC

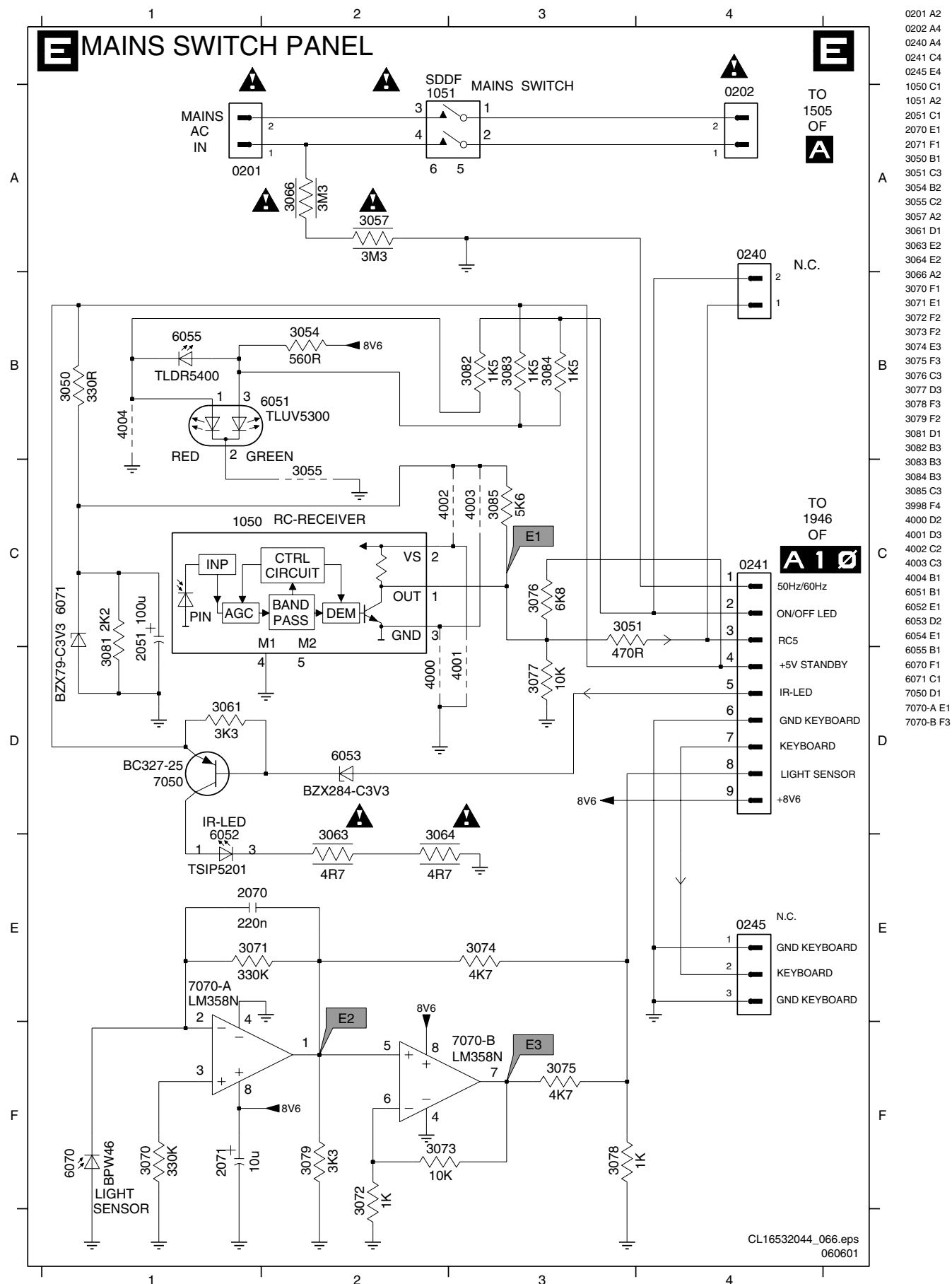
\* RESERVED



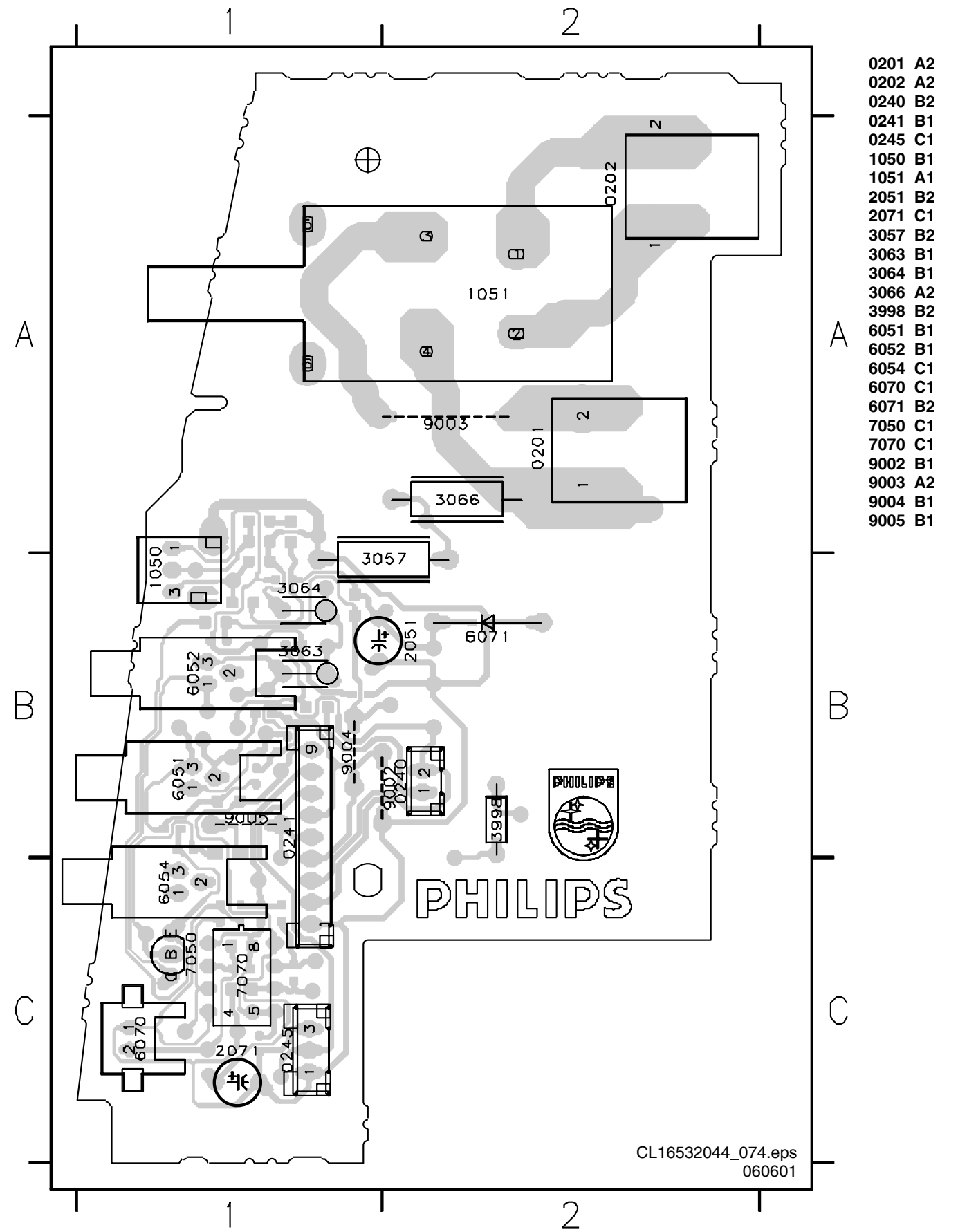
- 2702 B3
- 2705 H2
- 2711 G2
- 2715 I8
- 2716 I9
- 2732 A9
- 2734 A8
- 2735 A7
- 2736 E5
- 2737 E5
- 2780 D12
- 2782 G12
- 2783 H2
- 2784 B3
- 3787 G5
- 3788 E4
- 3789 E4
- 3793 G4
- 3794 G3
- 3795 G4
- 3796 G3
- 4737 B2
- 4738 B3
- 4739 E2
- 4740 E3
- 5732 G2
- 5738 B3
- 5740 G2
- 7726 B5
- 7740 B1



Mains Switch Panel

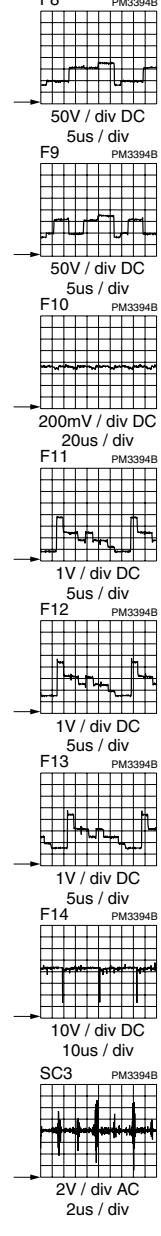
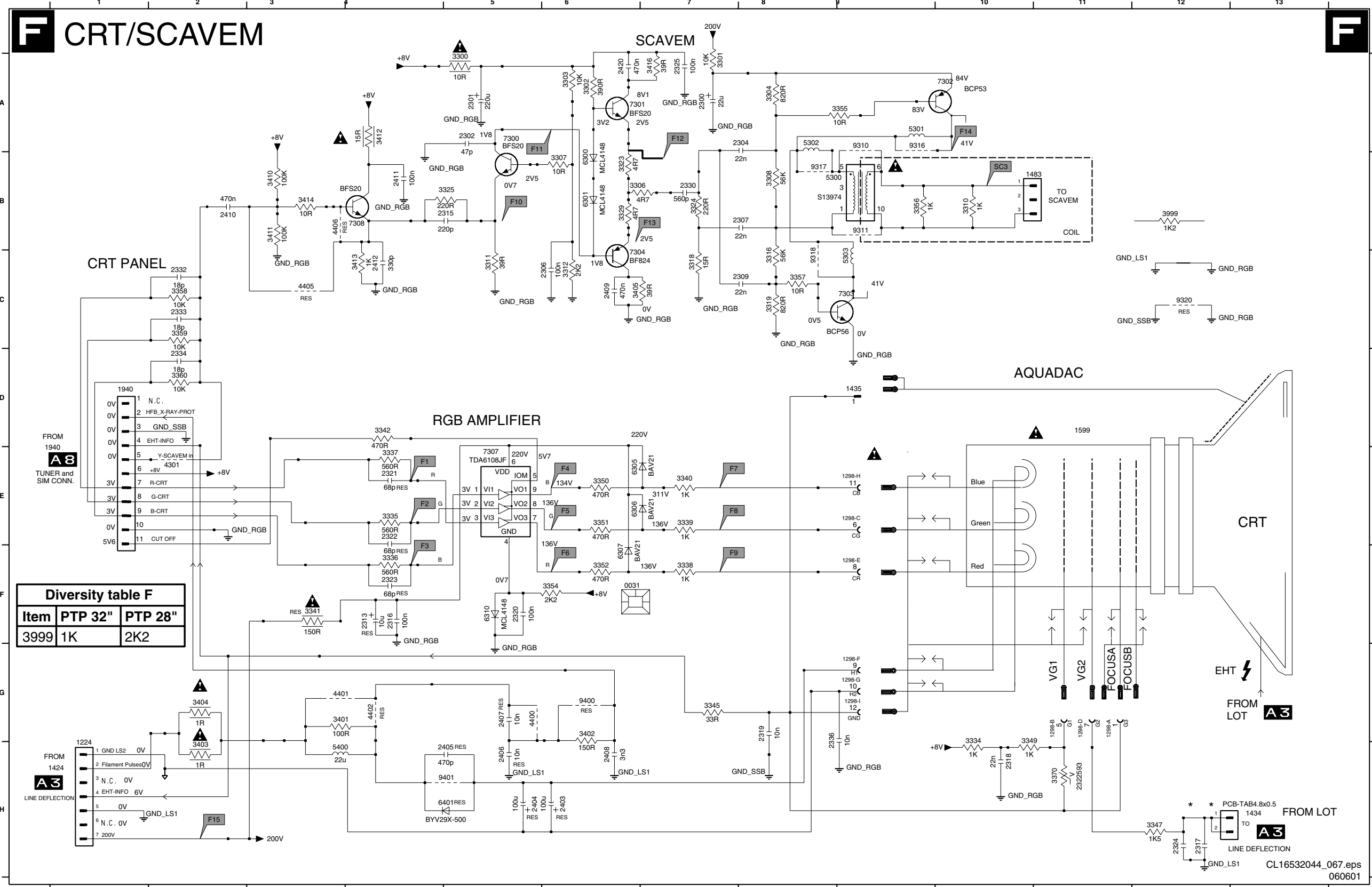
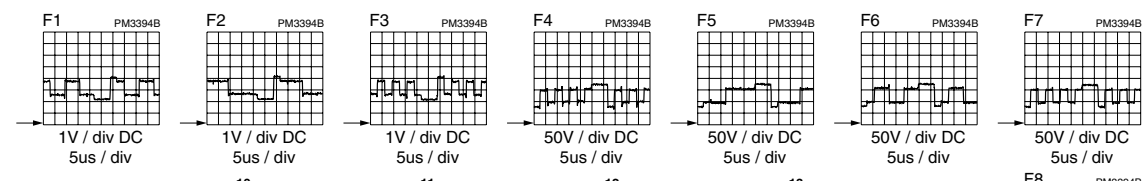


Layout Mains Switch Panel (Top View)



CRT / SCAVEM Panel

|            |           |          |          |         |         |          |          |          |         |          |          |         |          |         |         |
|------------|-----------|----------|----------|---------|---------|----------|----------|----------|---------|----------|----------|---------|----------|---------|---------|
| 0031 F6    | 1298-I G9 | 2304 A8  | 2319 G8  | 2333 C2 | 2409 C6 | 3304 A8  | 3319 C8  | 3338 F7  | 3351 E6 | 3370 H11 | 3413 C4  | 4405 C3 | 6305 E6  | 7304 C6 | 9401 H5 |
| 1298-A G11 | 1424 H1   | 2306 C6  | 2320 F5  | 2334 D2 | 2410 B2 | 3306 B6  | 3323 B6  | 3339 E7  | 3352 F6 | 3401 G3  | 3414 B3  | 4406 B3 | 6306 E6  | 7307 E5 |         |
| 1298-B G11 | 1434 H13  | 2307 B8  | 2321 E4  | 2336 G8 | 2411 B4 | 3307 B6  | 3324 B7  | 3340 E7  | 3354 F6 | 3402 G6  | 3416 A7  | 5300 B8 | 6307 F6  | 7308 B4 |         |
| 1298-C E9  | 1435 D9   | 2309 C8  | 2322 E4  | 2403 H6 | 2412 C4 | 3308 B8  | 3325 B5  | 3341 F3  | 3355 A9 | 3403 H2  | 3999 B12 | 5301 A9 | 6310 F5  | 9310 A9 |         |
| 1298-D G11 | 1483 B10  | 2313 F4  | 2323 F4  | 2404 H5 | 2420 A6 | 3310 B10 | 3329 B6  | 3342 D4  | 3356 B9 | 3404 G2  | 4300 F3  | 5302 A8 | 6401 H5  | 9311 B9 |         |
| 1298-E F9  | 1940 D1   | 2315 B5  | 2324 H12 | 2405 H5 | 3300 A5 | 3311 C5  | 3334 H10 | 3345 G7  | 3357 C8 | 3405 C6  | 4301 E2  | 5303 C9 | 7300 A5  | 9316 A9 |         |
| 1298-F G9  | 2300 A7   | 2316 F4  | 2325 A7  | 2406 H5 | 3301 A7 | 3312 C6  | 3335 E4  | 3347 H12 | 3358 C2 | 3410 B3  | 4400 G5  | 5400 H3 | 7301 A6  | 9317 B8 |         |
| 1298-G G9  | 2301 A5   | 2317 H12 | 2330 B7  | 2407 G5 | 3302 A6 | 3316 C8  | 3336 F4  | 3349 H10 | 3359 C2 | 3411 B3  | 4401 G3  | 6300 B6 | 7302 A10 | 9318 C8 |         |
| 1298-H E9  | 2302 A5   | 2318 H10 | 2332 C2  | 2408 H6 | 3303 A6 | 3318 C7  | 3337 E4  | 3350 E6  | 3360 D2 | 3412 A4  | 4402 G4  | 6301 B6 | 7303 C9  | 9400 G6 |         |



Diversity table F

| Item | PTP 32" | PTP 28" |
|------|---------|---------|
| 3999 | 1K      | 2K2     |

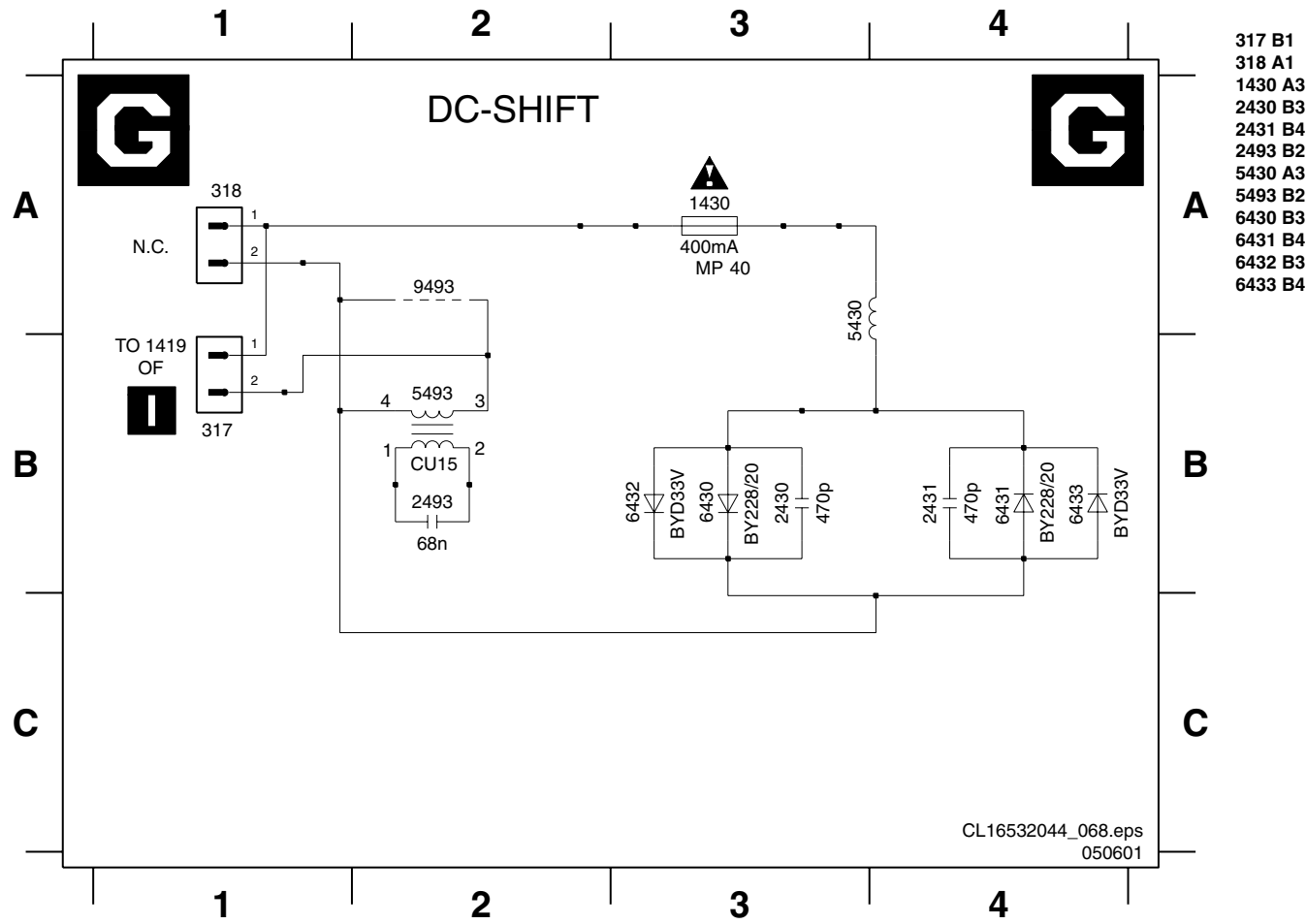
FROM 1424

|   |                 |         |
|---|-----------------|---------|
| 1 | GND_LS2         | 0V      |
| 2 | Filament Pulses | 0V      |
| 3 | N.C.            | 0V      |
| 4 | EHT-INFO        | 6V      |
| 5 | 0V              | GND_LS1 |
| 6 | N.C.            | 0V      |
| 7 | 200V            |         |

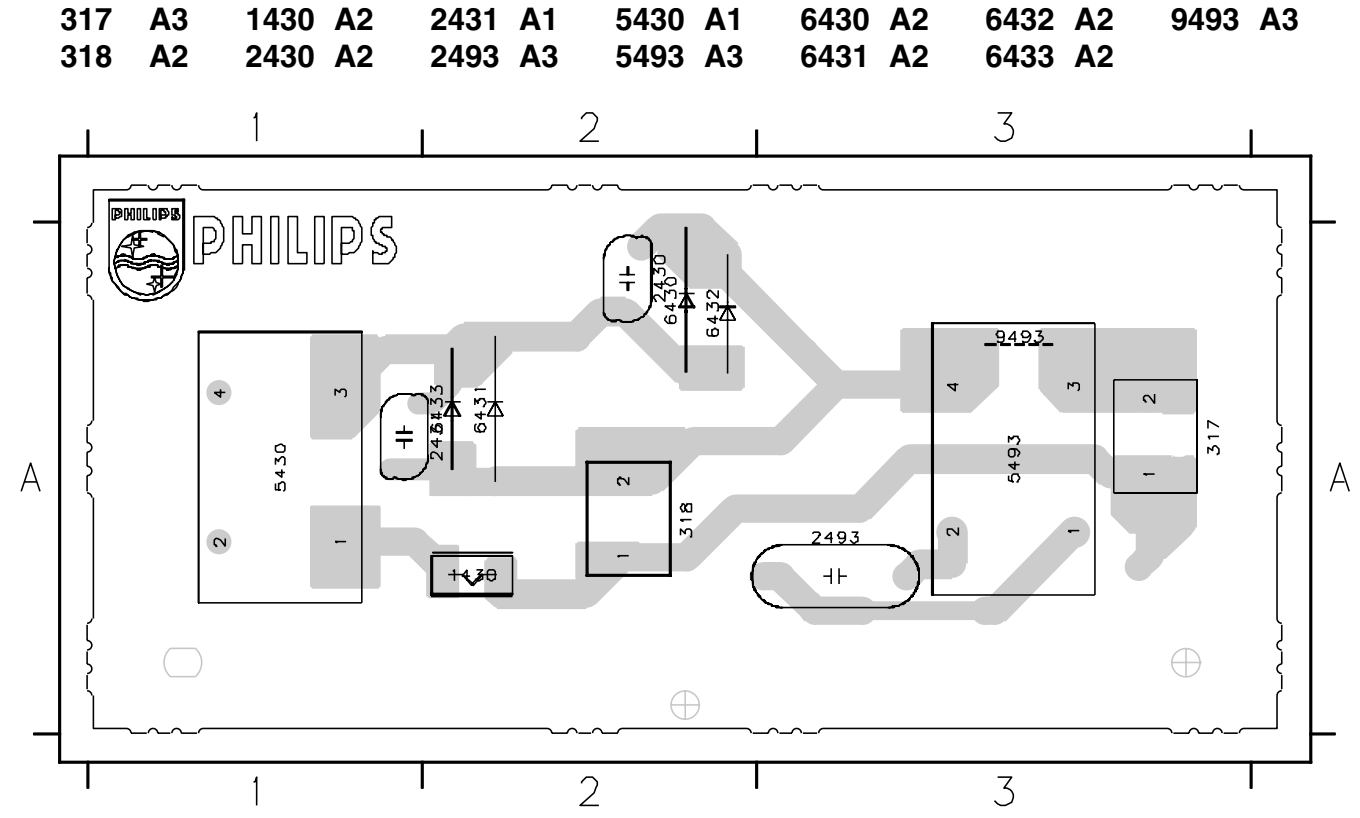
FROM LOT

|   |                |      |
|---|----------------|------|
| 1 | PCB-TAB4.8x0.5 | 1434 |
| 2 | TO             | A3   |

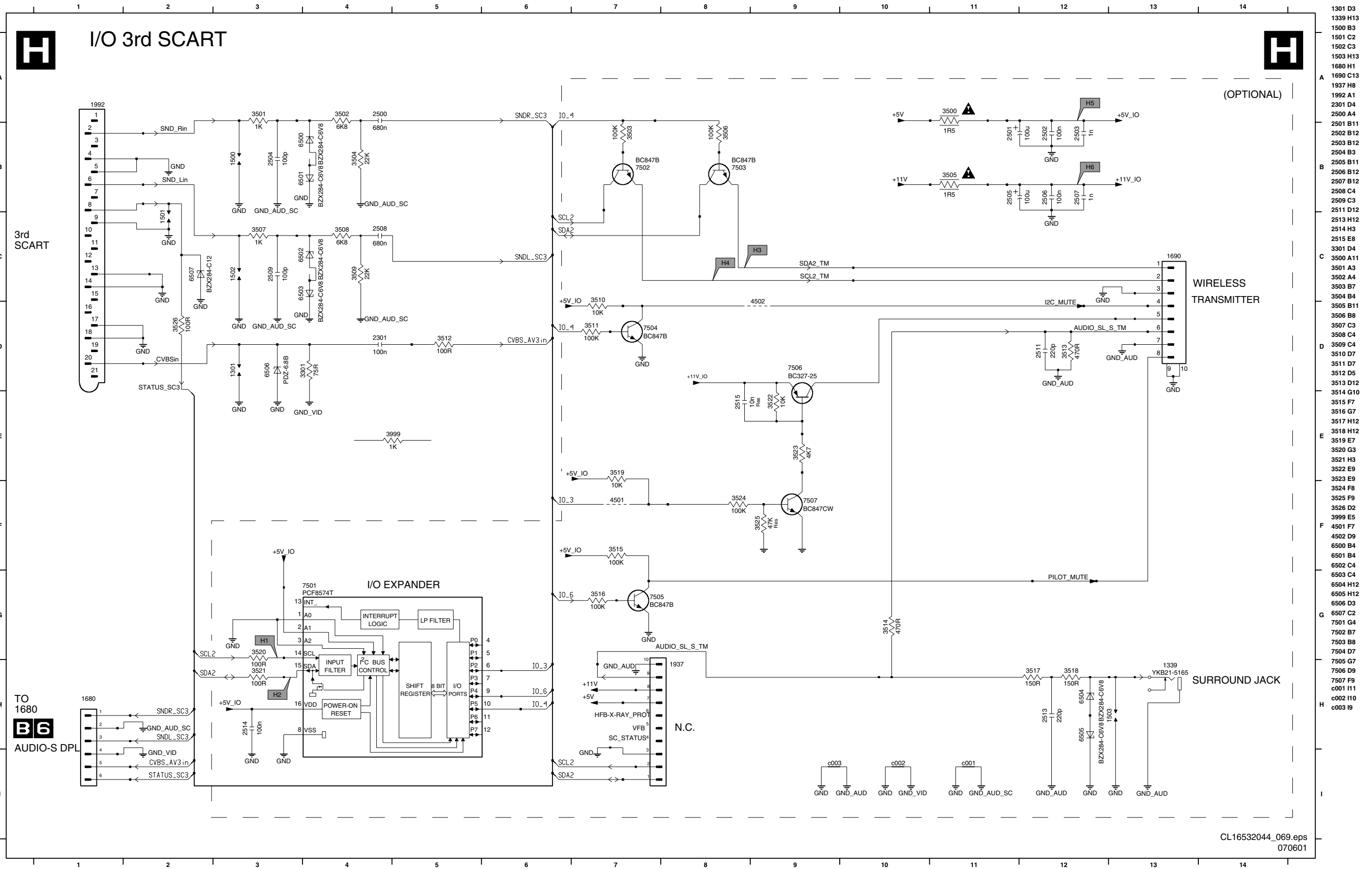
DC-Shift



Layout DC-Shift Panel (Top Side)

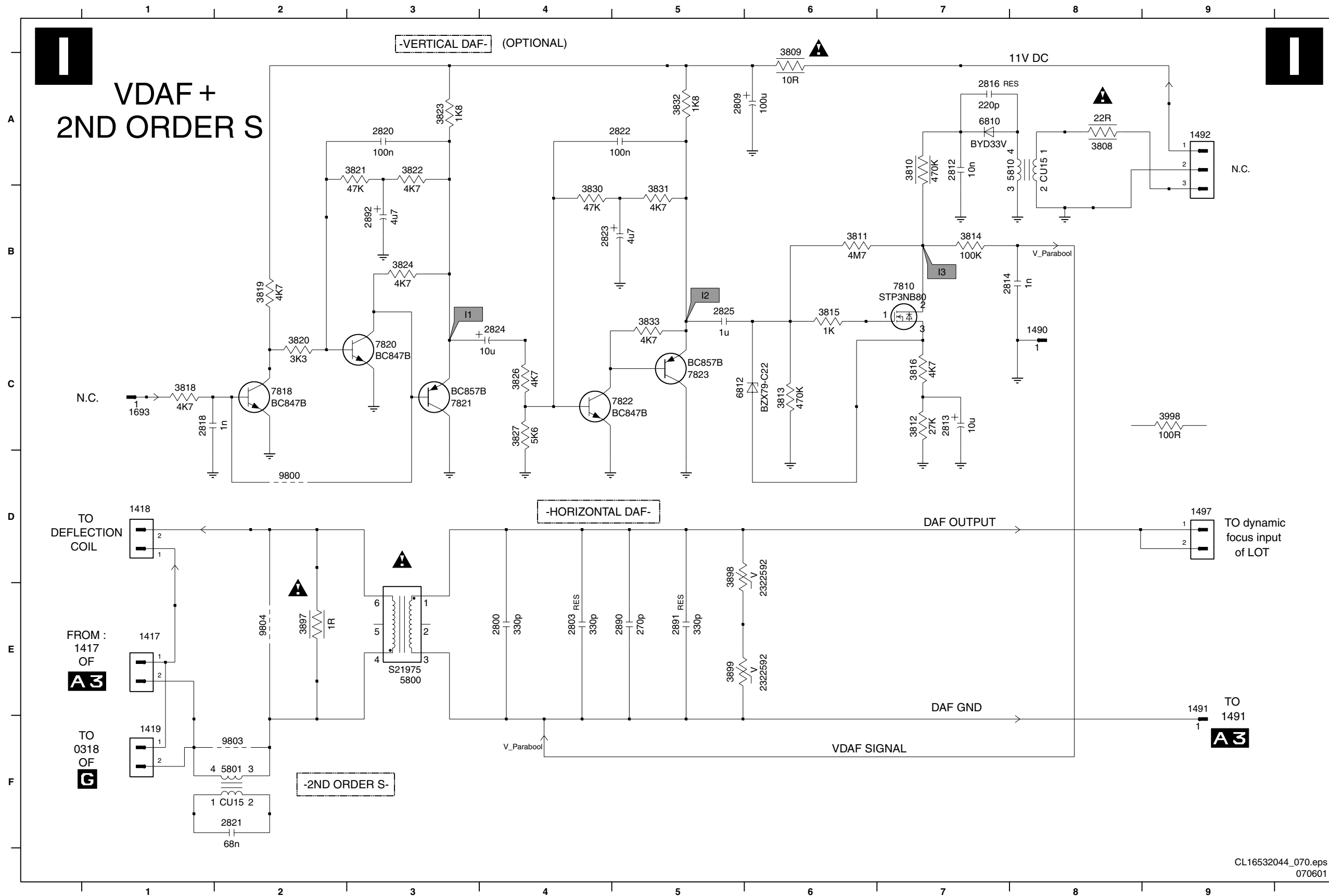


I/O 3rd SCART Panel



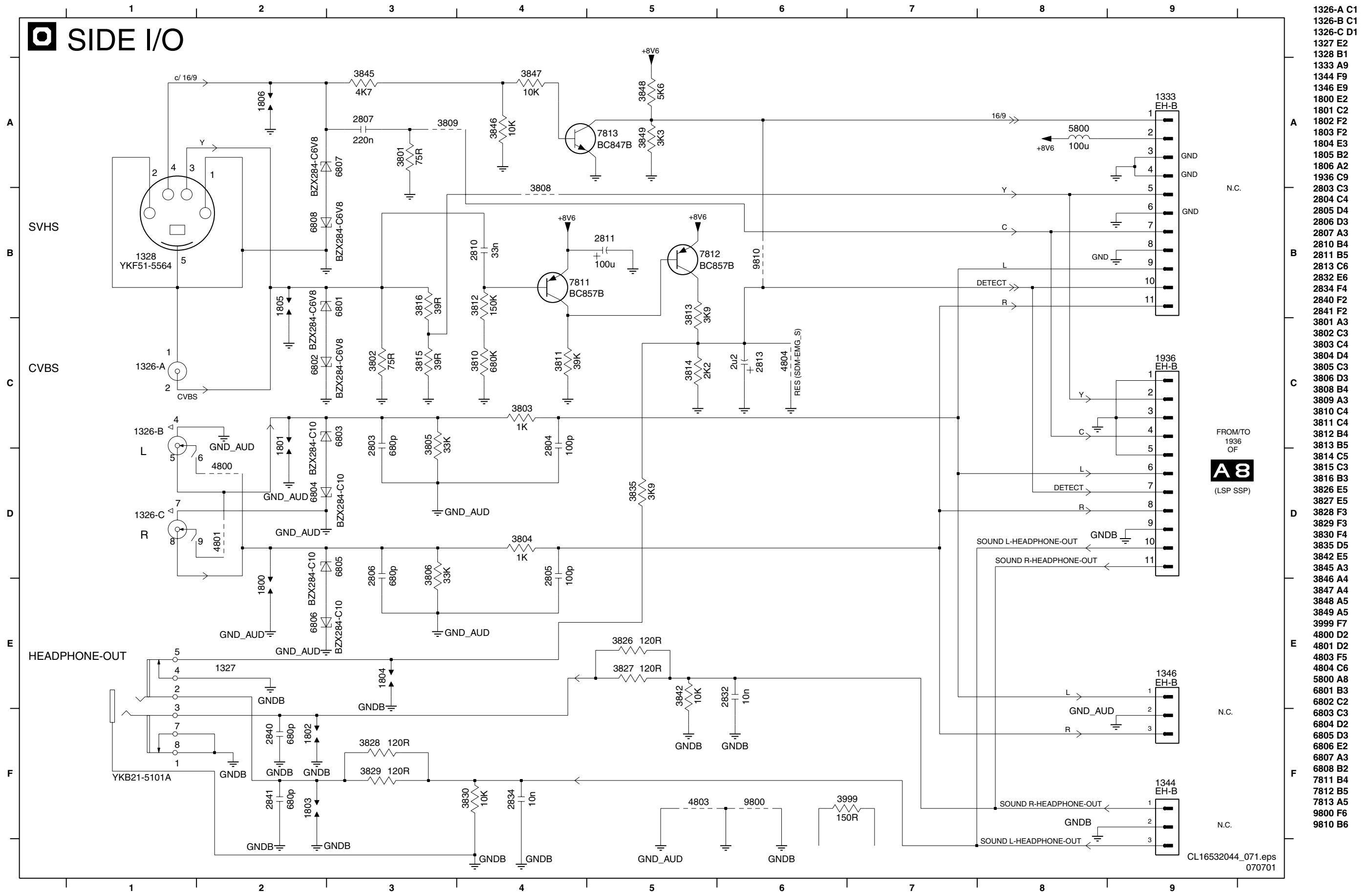
- 1301 D3
- 1339 H13
- 1500 B3
- 1501 C2
- 1502 C3
- 1503 H13
- 1680 H1
- 1690 C13
- 1937 H8
- 1992 A1
- 2301 D4
- 2500 A4
- 2501 B11
- 2502 B12
- 2503 B12
- 2504 B3
- 2505 B11
- 2506 B12
- 2507 B12
- 2508 C4
- 2509 C3
- 2511 D12
- 2513 H12
- 2514 H3
- 2515 E8
- 3301 D4
- 3500 A11
- 3501 A3
- 3502 A4
- 3503 B7
- 3504 B4
- 3505 B11
- 3506 B8
- 3507 C3
- 3508 C4
- 3509 C4
- 3510 D7
- 3511 D7
- 3512 D5
- 3513 D12
- 3514 G10
- 3515 F7
- 3516 G7
- 3517 H12
- 3518 H12
- 3519 E7
- 3520 G3
- 3521 H3
- 3522 E9
- 3523 E9
- 3524 F8
- 3525 F9
- 3526 D2
- 3999 E5
- 4501 F7
- 4502 D9
- 6500 B4
- 6501 B4
- 6502 C4
- 6503 C4
- 6504 H12
- 6505 H12
- 6506 D3
- 6507 C2
- 7501 G4
- 7502 B7
- 7503 B8
- 7504 D7
- 7505 G7
- 7506 D9
- 7507 F9
- c001 I11
- c002 I10
- c003 I9

VDAF + 2nd Order S Panel



- 1417 E1
- 1418 D1
- 1419 F1
- 1490 C8
- 1491 E9
- 1492 A9
- 1497 D9
- 1693 C1
- 2800 E4
- 2803 E4
- 2809 A5
- 2812 A7
- 2813 C7
- 2814 B8
- 2816 A7
- 2818 C1
- 2820 A3
- 2821 F2
- 2822 A5
- 2823 B4
- 2824 C4
- 2825 B5
- 2890 E5
- 2891 E5
- 2892 B3
- 3808 A8
- 3809 A6
- 3810 A7
- 3811 B6
- 3812 C7
- 3813 C6
- 3814 B7
- 3815 B6
- 3816 C7
- 3818 C1
- 3819 B2
- 3820 C2
- 3821 A3
- 3822 A3
- 3823 A3
- 3824 B3
- 3826 C4
- 3827 C4
- 3830 B4
- 3831 B5
- 3832 A5
- 3833 C5
- 3897 E2
- 3898 D5
- 3899 E5
- 3998 C9
- 5800 E3
- 5801 F2
- 5810 A8
- 6810 A7
- 6812 C5
- 7810 B7
- 7818 C2
- 7820 C3
- 7821 C3
- 7822 C5
- 7823 C5
- 9800 D2
- 9803 F2
- 9804 E2

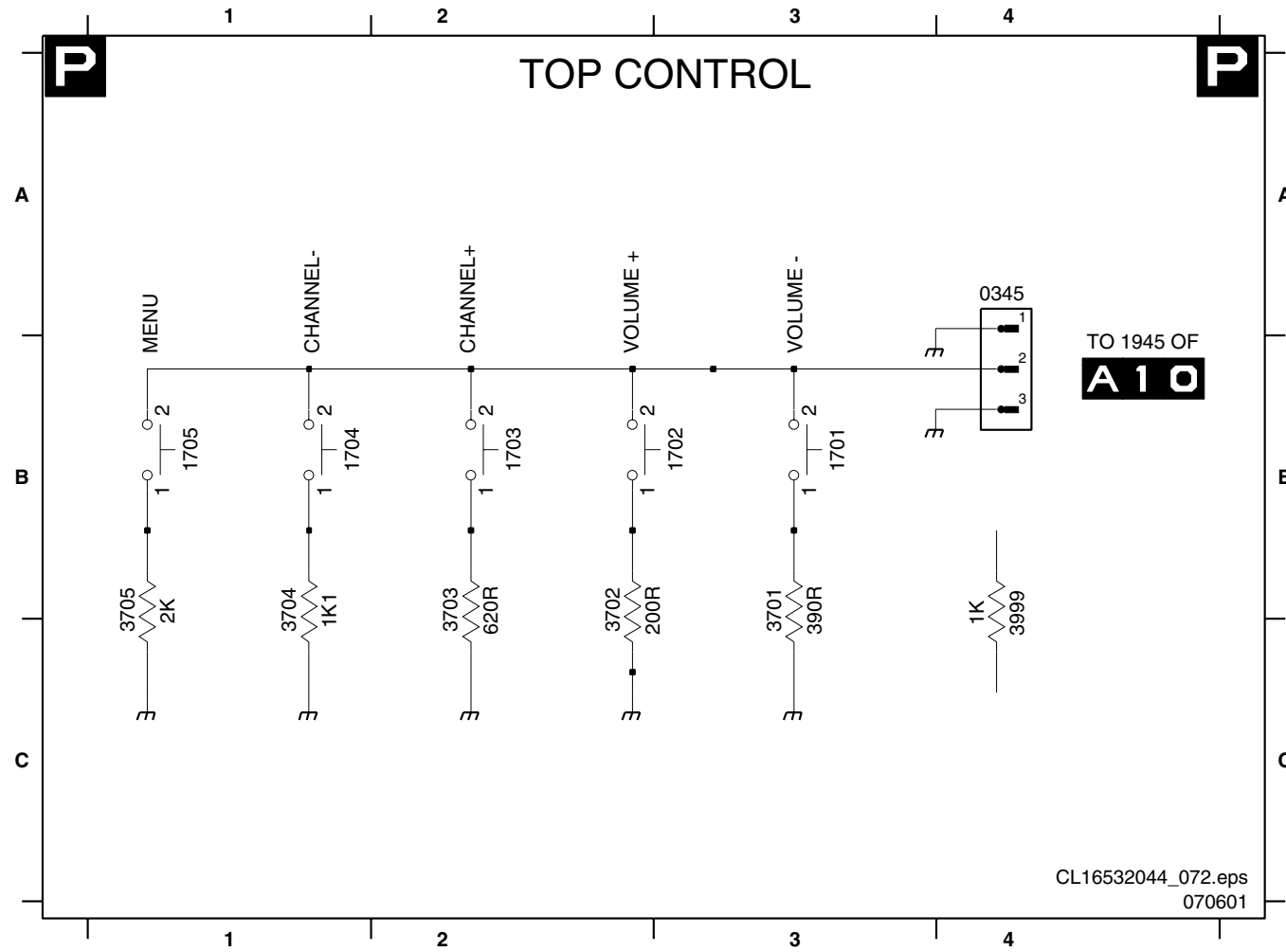
Side I/O Panel



- 1326-A C1
- 1326-B C1
- 1326-C D1
- 1327 E2
- 1328 B1
- 1333 A9
- 1344 F9
- 1346 E9
- 1800 E2
- 1801 C2
- 1802 F2
- 1803 F2
- 1804 E3
- 1805 B2
- 1806 A2
- 1936 C9
- 2803 C3
- 2804 C4
- 2805 D4
- 2806 D3
- 2807 A3
- 2810 B4
- 2811 B5
- 2813 C6
- 2832 E6
- 2834 F4
- 2840 F2
- 2841 F2
- 3801 A3
- 3802 C3
- 3803 C4
- 3804 D4
- 3805 C3
- 3806 D3
- 3808 B4
- 3809 A3
- 3810 C4
- 3811 C4
- 3812 B4
- 3813 B5
- 3814 C5
- 3815 C3
- 3816 B3
- 3826 E5
- 3827 E5
- 3828 F3
- 3829 F3
- 3830 F4
- 3835 D5
- 3842 E5
- 3846 A4
- 3847 A4
- 3848 A5
- 3849 A5
- 3999 F7
- 4800 D2
- 4801 D2
- 4803 F5
- 4804 C6
- 5800 A8
- 6801 B3
- 6802 C2
- 6803 C3
- 6804 D2
- 6805 D3
- 6806 E2
- 6807 A3
- 6808 B2
- 7811 B4
- 7812 B5
- 7813 A5
- 9800 F6
- 9810 B6

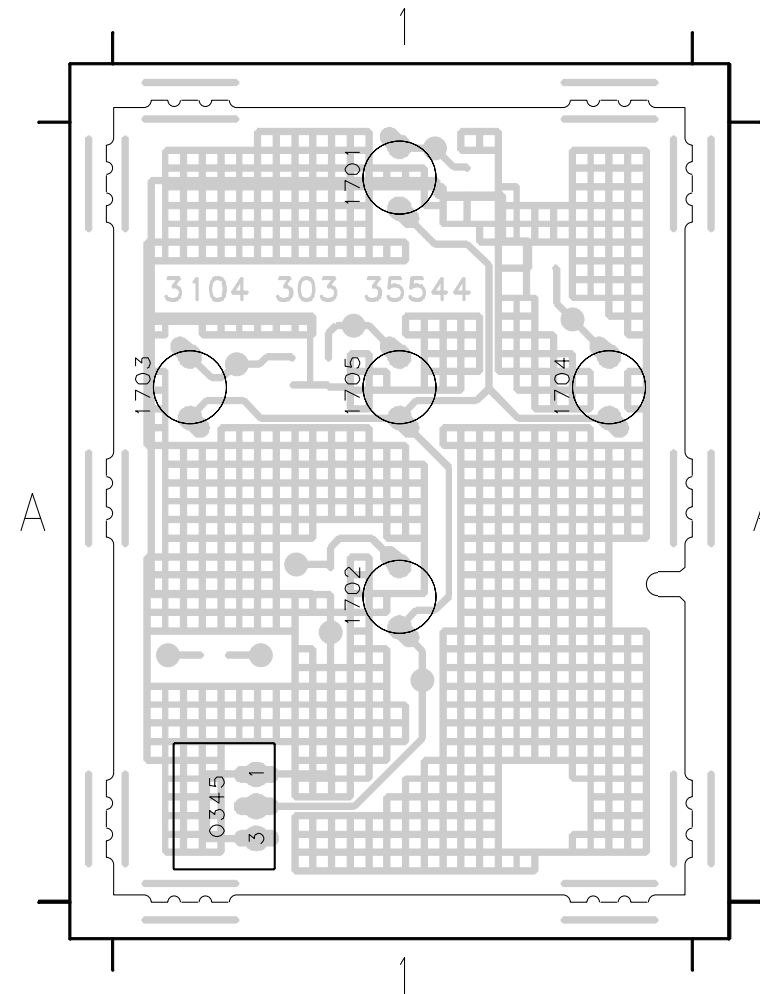
Top Control Panel

0345 A4 1702 B3 1704 B1 3701 B3 3703 B2 3705 B1  
 1701 B3 1703 B2 1705 B1 3702 B2 3704 B1 3999 B4



CL16532044\_072.eps  
070601

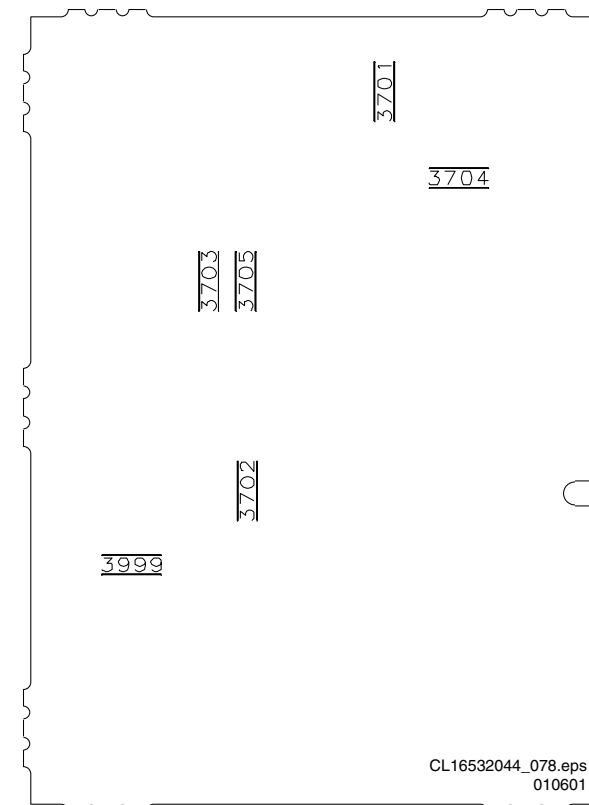
Layout Top Control Panel (Top Side)



0345 A1  
 1701 A1  
 1702 A1  
 1703 A1  
 1704 A1  
 1705 A1  
 3701 A1  
 3702 A1  
 3703 A1  
 3704 A1  
 3705 A1  
 3999 A1

CL16532044\_079.eps  
010601

Layout Top Control Panel (Bottom Side)



CL16532044\_078.eps  
010601



Service  
Service  
**Service**

# Service Information

Ⓞ **CHANGES IN COURSE OF PRODUCTION**

**INTRODUCTION OF NEW L.O.T.**

During production (from AG02 onwards), a new Line Output Transformer (from Eldor) is introduced. Together with this change, the LSP is changed to version 4, and some components on LSP and PTP panel are changed (see table).

The new L.O.T. is pin-compatible with the current one.

Involved sets:

- 28PW8807.
- 32PW8807.
- 32PW9556.
- 32PW9566.
- 32PW9576.

| EM3E     | Philips L.O.T.<br>(3128 138 21531)                                                             | Eldor L.O.T. 1392.9002D<br>(2422 531 02532)                                                      |
|----------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| 28PWxxxx | 3403: not present <sup>(1)</sup><br><b>3404: 1R</b> <sup>(2)</sup>                             | 3403 : 3R3 (4822 052 11338).<br><b>3404 : 3R3 (4822 052 11338).</b>                              |
| 32PWxxxx | 2420: 1n0 <sup>(1)</sup><br>3403: not present <sup>(1)</sup><br><b>3404: 1R</b> <sup>(2)</sup> | 2420: 1n2 (4822 121 70595).<br>3403: 3R3 (4822 052 11338).<br><b>3404: 3R3 (4822 052 11338).</b> |
|          |                                                                                                | In the NVM, EHT compensa-<br>tion has been set to 12 iso 9.                                      |

1. In regular font: Changes on LSP (Large Signal Panel)
2. In **bold** font: Changes on PTP (Picture Tube Panel).

**Note:**

- On the Eldor L.O.T., the 2 focus wires are inverted. A yellow dot on top of the L.O.T. marks the place where the red wire has to be inserted.
- Also, the potmeters for static and dynamic focus have switched place and the turn direction is contrary to the one on the Philips L.O.T.

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Ⓞ **ÄNDERUNGEN BEI DER PRODUKTION**

**EINFÜHRUNG DES NEUEN L.O.T.**

Während der Produktion (ab AG02) wird ein neuer Zeilenablenkungstransformer (engl. Line Output Transformer) von Eldor eingeführt. Zusammen mit dieser Änderung wird das Großsignal-Panel auf Version 4 aktualisiert, und einige Bauteile auf dem Großsignal-Panel und dem Bildröhren-Panel werden geändert (siehe Tabelle).

Der neue L.O.T. ist Pin-kompatibel zu dem derzeitigen.

Betroffene Geräte:

- 28PW8807.
- 32PW8807.
- 32PW9556.
- 32PW9566.
- 32PW9576.

| EM3E     | Philips L.O.T.<br>(3128 138 21531)                                                             | Eldor L.O.T. 1392.9002D<br>(2422 531 02532)                                                            |
|----------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| 28PWxxxx | 3403: not present <sup>(1)</sup><br><b>3404: 1R</b> <sup>(2)</sup>                             | 3403 : 3R3 (4822 052 11338).<br><b>3404 : 3R3 (4822 052 11338).</b>                                    |
| 32PWxxxx | 2420: 1n0 <sup>(1)</sup><br>3403: not present <sup>(1)</sup><br><b>3404: 1R</b> <sup>(2)</sup> | 2420: 1n2 (4822 121 70595).<br>3403: 3R3 (4822 052 11338).<br><b>3404: 3R3 (4822 052 11338).</b>       |
|          |                                                                                                | Im nicht-flüchtigen Speicher<br>wurde die Höchstspannung-<br>kompensation auf 12 iso 9<br>eingestellt. |

1. In normaler Schrift: Änderungen am Großsignal-Panel.
2. In **Fettschrift**: Änderungen am Bildröhren-Panel.

**Hinweis:**

- Beim Eldor L.O.T. sind die beiden Fokusdrähte vertauscht. Ein gelber Punkt auf dem L.O.T. markiert die Stelle, an der das rote Kabel eingesteckt werden muss.
- Außerdem haben die Potentiometer für den statischen und den dynamischen Fokus die Plätze getauscht, und die Drehrichtung ist entgegengesetzt zu der beim Philips-L.O.T.



## F MODIFICATIONS EN COURS DE PRODUCTION

### INTRODUCTION D'UN NOUVEAU TRANSFORMATEUR LOT.

Un nouveau transformateur de sortie de ligne (Eldor) a été introduit au cours de la production (à partir d'AG02). Cette modification s'accompagne d'un changement de version (version 4) pour la platine forts signaux (LSP), et certains composants de la platine forts signaux (LSP) et de la platine tube-image (PTP) ont été modifiés (voir tableau). Le brochage du nouveau transformateur LOT est compatible avec l'existant.

Postes concernés :

- 28PW8807.
- 32PW8807.
- 32PW9556.
- 32PW9566.
- 32PW9576.

| EM3E     | Philips L.O.T.<br>(3128 138 21531)                                                             | Eldor L.O.T. 1392.9002D<br>(2422 531 02532)                                                      |
|----------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| 28PWxxxx | 3403: not present <sup>(1)</sup><br><b>3404: 1R</b> <sup>(2)</sup>                             | 3403 : 3R3 (4822 052 11338).<br><b>3404 : 3R3 (4822 052 11338).</b>                              |
| 32PWxxxx | 2420: 1n0 <sup>(1)</sup><br>3403: not present <sup>(1)</sup><br><b>3404: 1R</b> <sup>(2)</sup> | 2420: 1n2 (4822 121 70595).<br>3403: 3R3 (4822 052 11338).<br><b>3404: 3R3 (4822 052 11338).</b> |
|          |                                                                                                | Dans la NVM, la compensation THT a été réglée à 12 au lieu de 9.                                 |

1. En caractères normaux : modifications apportées à la platine forts signaux (LSP)
2. En caractères **gras**: modifications apportées à la platine tube-image (PTP).

#### Note :

- Sur le transformateur LOT Eldor, les deux fils de la commande de mise au point ont été inversés. Un point jaune sur le LOT marque l'endroit où le fil rouge doit être placé.
- En outre, les potentiomètres de mise au point statique et dynamique ont changé de place, et leur sens de rotation est contraire à celui du transformateur LOT Philips.

## E CAMBIOS DURANTE LA PRODUCCIÓN

### INTRODUCCIÓN DEL NUEVO L.O.T.

Durante la producción (desde AG02 en adelante), se ha introducido un nuevo transformador de salida de línea (de Eldor). Conjuntamente con este cambio, se ha cambiado el LSP a la versión 4 y algunos componentes de los paneles LSP y PTP han cambiado (véase la tabla).

El nuevo L.O.T. es compatible con el actual a nivel de patillas.

Equipos involucrados:

- 28PW8807.
- 32PW8807.
- 32PW9556.
- 32PW9566.
- 32PW9576.

| EM3E     | Philips L.O.T.<br>(3128 138 21531)                                                             | Eldor L.O.T. 1392.9002D<br>(2422 531 02532)                                                      |
|----------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| 28PWxxxx | 3403: not present <sup>(1)</sup><br><b>3404: 1R</b> <sup>(2)</sup>                             | 3403 : 3R3 (4822 052 11338).<br><b>3404 : 3R3 (4822 052 11338).</b>                              |
| 32PWxxxx | 2420: 1n0 <sup>(1)</sup><br>3403: not present <sup>(1)</sup><br><b>3404: 1R</b> <sup>(2)</sup> | 2420: 1n2 (4822 121 70595).<br>3403: 3R3 (4822 052 11338).<br><b>3404: 3R3 (4822 052 11338).</b> |
|          |                                                                                                | En la NVM, la compensación EHT se ha fijado en 12 en vez de 9.                                   |

1. Con letra normal: cambios del LSP (panel de señales fuertes)
2. Con letra **negrita**: cambios del PTP (panel del tubo de imagen).

#### Nota:

- En el L.O.T. de Eldor, se han invertido los 2 hilos del foco. Un punto amarillo en la parte superior del L.O.T. marca el lugar donde debe introducirse el hilo rojo.
- Además, los potenciómetros del foco estático y dinámico han cambiado de lugar y la dirección de giro es inversa a la del L.O.T. de Philips

## ① MODIFICHE IN CORSO DI PRODUZIONE

### INTRODUZIONE DEL NUOVO TRASFORMATORE DI USCITA DI LINEA (L.O.T.)

Durante la produzione è stato introdotto (da AG02 in poi), un nuovo trasformatore di uscita di linea (della Eldor). Assieme a questa modifica, l'LSP è stato modificato alla versione 4 ed alcuni componenti sull'LSP e sul pannello PTP sono stati cambiati (fare riferimento alla tabella).

Il nuovo L.O.T. è compatibile con i piedini di quello attuale.

Apparecchi interessati:

- 28PW8807.
- 32PW8807.
- 32PW9556.
- 32PW9566.
- 32PW9576.

| EM3E     | Philips L.O.T.<br>(3128 138 21531)                                                             | Eldor L.O.T. 1392.9002D<br>(2422 531 02532)                                                      |
|----------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| 28PWxxxx | 3403: not present <sup>(1)</sup><br><b>3404: 1R</b> <sup>(2)</sup>                             | 3403 : 3R3 (4822 052 11338).<br><b>3404 : 3R3 (4822 052 11338).</b>                              |
| 32PWxxxx | 2420: 1n0 <sup>(1)</sup><br>3403: not present <sup>(1)</sup><br><b>3404: 1R</b> <sup>(2)</sup> | 2420: 1n2 (4822 121 70595).<br>3403: 3R3 (4822 052 11338).<br><b>3404: 3R3 (4822 052 11338).</b> |
|          |                                                                                                | In NVM, la compensazione EHT è stata impostata su 12 iso 9.                                      |

1. In caratteri regolari: modifiche sull'LSP (Large Signal Panel, pannello a segnale largo)
2. In **grassetto**: modifiche sul PTP (Picture Tube Pane, pannello del cinescopio).

#### Nota

- Sull'LOT Eldor i due fili del fuoco sono invertiti. Un punto giallo sopra il trasformatore di uscita di linea, contrassegna il punto in cui inserire il filo rosso.
- Inoltre, i potenziometri per il fuoco statico e quello dinamico sono stati collocati in posizioni diverse e la direzione di giro è all'opposto rispetto a quella dell' LOT della Philips.