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Service Manual

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1. Revision List

Manual xxxx xxx xxxx.0

- First release.

2. Technical Specifications and Connections

Index of this chapter:

[2.1 Technical Specifications](#)

[2.2 Directions for Use](#)

[2.3 Connections](#)

[2.4 Chassis Overview](#)

Notes:

- Figures can deviate due to the different set executions.
- Specifications are indicative (subject to change).

2.1 Technical Specifications

For on-line product support please use the links in [Table 2-1](#).

Here is product information available, as well as getting started, user manuals, frequently asked questions and software & drivers.

Table 2-1 Described Model numbers

CTN	Styling	Published in:
32PFL5604H/12	P & S Forward	3122 785 18440
42PFL5604H/12	Integration	3122 785 18440

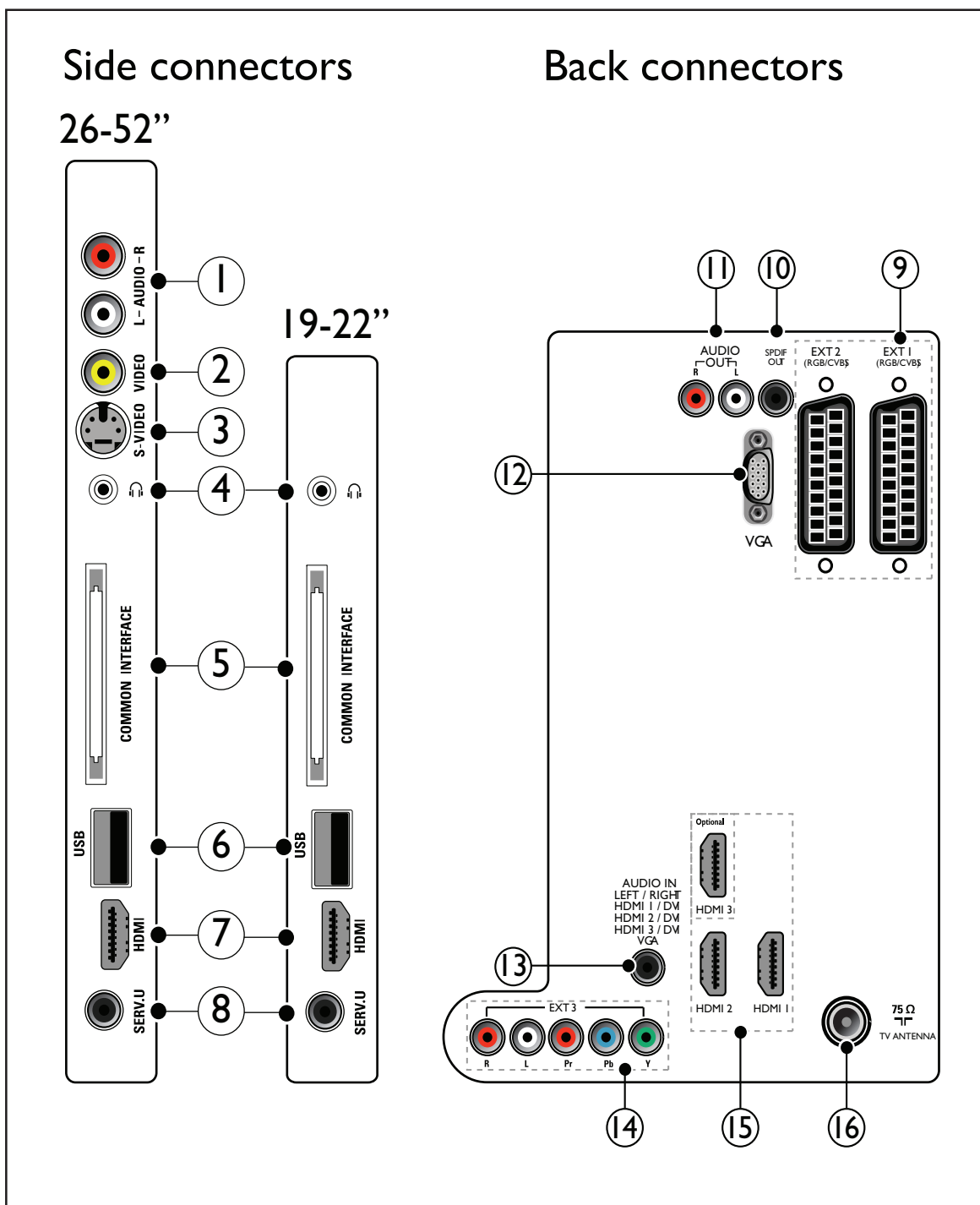
2.2 Directions for Use

You can download this information from the following websites:

<http://www.philips.com/support>

<http://www.p4c.philips.com>

2.3 Connections



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Figure 2-1 Connection overview

Note: The following connector colour abbreviations are used (according to DIN/IEC 757): Bk= Black, Bu= Blue, Gn= Green, Gy= Grey, Rd= Red, Wh= White, Ye= Yellow.

2.3.1 Side Connections

1 - Cinch: Audio - In

Rd - Audio R 0.5 V_{RMS} / 10 kΩ
Wh - Audio L 0.5 V_{RMS} / 10 kΩ



2 - Cinch: Video CVBS - In

Ye - Video CVBS 1 V_{PP} / 75 Ω



3 - S-Video (Hosiden): Video Y/C - In

1 - Ground Y Gnd
2 - Ground C Gnd
3 - Video Y 1 V_{PP} / 75 Ω
4 - Video C 0.3 V_{PP} / 75 Ω



4 - Head phone (Output)

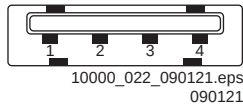
Bk - Head phone 32 - 600 Ω / 10 mW



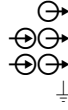
5 - Common Interface

68p - See diagram B05C [SSB: PCMCIA](#)

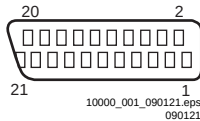


6 - USB2.0**Figure 2-2 USB (type A)**

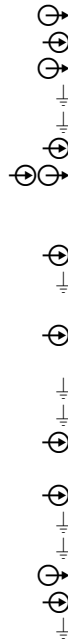
- | | | |
|---|------------|-----|
| 1 | - +5V | |
| 2 | - Data (-) | |
| 3 | - Data (+) | |
| 4 | - Ground | Gnd |

**7 - HDMI: Digital Video, Digital Audio - In (see connector 15)****8 - Service Connector (UART)**

- | | | |
|---|-----------|----------|
| 1 | - Ground | Gnd |
| 2 | - UART_TX | Transmit |
| 3 | - UART_RX | Receive |

**2.3.2 Rear Connections****9 - EXT1 & 2: Video RGB - In, CVBS - In/Out, Audio - In/Out****Figure 2-3 SCART connector**

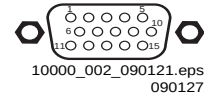
- | | | |
|----|-------------------|--|
| 1 | - Audio R | 0.5 V _{RMS} / 1 kΩ |
| 2 | - Audio R | 0.5 V _{RMS} / 10 kΩ |
| 3 | - Audio L | 0.5 V _{RMS} / 1 kΩ |
| 4 | - Ground Audio | Gnd |
| 5 | - Ground Blue | Gnd |
| 6 | - Audio L | 0.5 V _{RMS} / 10 kΩ |
| 7 | - Video Blue | 0.7 V _{PP} / 75 Ω |
| 8 | - Function Select | 0 - 2 V: INT
4.5 - 7 V: EXT 16:9
9.5 - 12 V: EXT 4:3 |
| 9 | - Ground Green | Gnd |
| 10 | - n.c. | |
| 11 | - Video Green | 0.7 V _{PP} / 75 Ω |
| 12 | - n.c. | |
| 13 | - Ground Red | Gnd |
| 14 | - Ground P50 | Gnd |
| 15 | - Video Red | 0.7 V _{PP} / 75 Ω |
| 16 | - Status/FBL | 0 - 0.4 V: INT
1 - 3 V: EXT / 75 Ω |
| 17 | - Ground Video | Gnd |
| 18 | - Ground FBL | Gnd |
| 19 | - Video CVBS/Y | 1 V _{PP} / 75 Ω |
| 20 | - Video CVBS | 1 V _{PP} / 75 Ω |
| 21 | - Shield | Gnd |

**10 - Cinch: S/PDIF - Out**

- | | | |
|----|-----------|---------------------------------|
| Bk | - Coaxial | 0.4 - 0.6V _{PP} / 75 Ω |
|----|-----------|---------------------------------|

**11 - Cinch: Audio - Out**

- | | | |
|----|-------------|------------------------------|
| Rd | - Audio - R | 0.5 V _{RMS} / 10 kΩ |
| Wh | - Audio - L | 0.5 V _{RMS} / 10 kΩ |

**12 - VGA: Video RGB - In****Figure 2-4 VGA Connector**

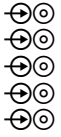
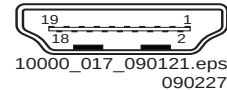
- | | | |
|----|---------------------|----------------------------|
| 1 | - Video Red | 0.7 V _{PP} / 75 Ω |
| 2 | - Video Green | 0.7 V _{PP} / 75 Ω |
| 3 | - Video Blue | 0.7 V _{PP} / 75 Ω |
| 4 | - n.c. | |
| 5 | - Ground | Gnd |
| 6 | - Ground Red | Gnd |
| 7 | - Ground Green | Gnd |
| 8 | - Ground Blue | Gnd |
| 9 | - +5V _{DC} | +5 V |
| 10 | - Ground Sync | Gnd |
| 11 | - n.c. | |
| 12 | - DDC_SDA | DDC data |
| 13 | - H-sync | 0 - 5 V |
| 14 | - V-sync | 0 - 5 V |
| 15 | - DDC_SCL | DDC clock |

**13 - Mini Jack: Audio - In**

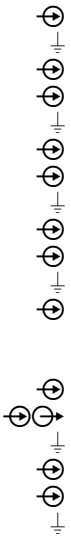
- | | | |
|----|-----------|------------------------------|
| Wh | - Audio L | 0.5 V _{RMS} / 10 kΩ |
| Rd | - Audio R | 0.5 V _{RMS} / 10 kΩ |

**14 - EXT3: Cinch: Video YPbPr - In, Audio - In**

- | | | |
|----|-------------|------------------------------|
| Gn | - Video Y | 1 V _{PP} / 75 Ω |
| Bu | - Video Pb | 0.7 V _{PP} / 75 Ω |
| Rd | - Video Pr | 0.7 V _{PP} / 75 Ω |
| Rd | - Audio - R | 0.5 V _{RMS} / 10 kΩ |
| Wh | - Audio - L | 0.5 V _{RMS} / 10 kΩ |

**15 - HDMI 1, 2 & 3 Digital Video, Digital Audio - In****Figure 2-5 HDMI (type A) connector**

- | | | |
|----|-----------|-----------------|
| 1 | - D2+ | Data channel |
| 2 | - Shield | Gnd |
| 3 | - D2- | Data channel |
| 4 | - D1+ | Data channel |
| 5 | - Shield | Gnd |
| 6 | - D1- | Data channel |
| 7 | - D0+ | Data channel |
| 8 | - Shield | Gnd |
| 9 | - D0- | Data channel |
| 10 | - CLK+ | Data channel |
| 11 | - Shield | Gnd |
| 12 | - CLK- | Data channel |
| 13 | - n.c. | |
| 14 | - n.c. | |
| 15 | - DDC_SCL | DDC clock |
| 16 | - DDC_SDA | DDC data |
| 17 | - Ground | Gnd |
| 18 | - +5V | |
| 19 | - HPD | Hot Plug Detect |
| 20 | - Ground | Gnd |

**16 - Aerial - In**

- | | | |
|---|-----------------|------------|
| - | - IEC-type (EU) | Coax, 75 Ω |
|---|-----------------|------------|

**2.4 Chassis Overview**

Refer to chapter [Block Diagrams](#) for PWB/CBA locations.

3. Precautions, Notes, and Abbreviation List

Index of this chapter:

[3.1 Safety Instructions](#)

[3.2 Warnings](#)

[3.3 Notes](#)

[3.4 Abbreviation List](#)

3.1 Safety Instructions

Safety regulations require the following **during** a repair:

- Connect the set to the Mains/AC Power via an isolation transformer (> 800 VA).
- Replace safety components, indicated by the symbol , only by components identical to the original ones. Any other component substitution (other than original type) may increase risk of fire or electrical shock hazard. Of de set ontploft!

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

- Route the wire trees correctly and fix them with the mounted cable clamps.
- Check the insulation of the Mains/AC Power lead for external damage.
- Check the strain relief of the Mains/AC Power cord for proper function.
- Check the electrical DC resistance between the Mains/AC Power plug and the secondary side (only for sets that have a Mains/AC Power isolated power supply):
 1. Unplug the Mains/AC Power cord and connect a wire between the two pins of the Mains/AC Power plug.
 2. Set the Mains/AC Power switch to the "on" position (keep the Mains/AC Power cord unplugged!).
 3. Measure the resistance value between the pins of the Mains/AC Power plug and the metal shielding of the tuner or the aerial connection on the set. The reading should be between 4.5 MΩ and 12 MΩ.
 4. Switch "off" the set, and remove the wire between the two pins of the Mains/AC Power plug.
- Check the cabinet for defects, to prevent touching of any inner parts by the customer.

3.2 Warnings

- All ICs and many other semiconductors are susceptible to electrostatic discharges (ESD ) . Careless handling during repair can reduce life drastically. Make sure that, during repair, you are connected with the same potential as the mass of the set by a wristband with resistance. Keep components and tools also at this same potential.
- Be careful during measurements in the high voltage section.
- Never replace modules or other components while the unit is switched "on".
- When you align the set, use plastic rather than metal tools. This will prevent any short circuits and the danger of a circuit becoming unstable.

3.3 Notes

3.3.1 General

- Measure the voltages and waveforms with regard to the chassis (= tuner) ground () , or hot ground () , depending on the tested area of circuitry. The voltages and waveforms shown in the diagrams are indicative. Measure them in the Service Default Mode with a colour bar signal and stereo sound (L: 3 kHz, R: 1 kHz unless stated otherwise) and

picture carrier at 475.25 MHz for PAL, or 61.25 MHz for NTSC (channel 3).

- Where necessary, measure the waveforms and voltages with () and without () aerial signal. Measure the voltages in the power supply section both in normal operation () and in stand-by () . These values are indicated by means of the appropriate symbols.

3.3.2 Schematic Notes

- All resistor values are in ohms, and the value multiplier is often used to indicate the decimal point location (e.g. 2K2 indicates 2.2 kΩ).
- Resistor values with no multiplier may be indicated with either an "E" or an "R" (e.g. 220E or 220R indicates 220 Ω).
- All capacitor values are given in micro-farads ($\mu = \times 10^{-6}$), nano-farads ($n = \times 10^{-9}$), or pico-farads ($p = \times 10^{-12}$).
- Capacitor values may also use the value multiplier as the decimal point indication (e.g. 2p2 indicates 2.2 pF).
- An "asterisk" (*) indicates component usage varies. Refer to the diversity tables for the correct values.
- The correct component values are listed on the Philips Spare Parts Web Portal.

3.3.3 Spare Parts

For the latest spare part overview, consult your Philips Spare Part web portal.

3.3.4 BGA (Ball Grid Array) ICs

Introduction

For more information on how to handle BGA devices, visit this URL: <http://www.atyourservice-magazine.com>. Select "Magazine", then go to "Repair downloads". Here you will find Information on how to deal with BGA-ICs.

BGA Temperature Profiles

For BGA-ICs, you **must** use the correct temperature-profile. Where applicable and available, this profile is added to the IC Data Sheet information section in this manual.

3.3.5 Lead-free Soldering

Due to lead-free technology some rules have to be respected by the workshop during a repair:

- Use only lead-free soldering tin. If lead-free solder paste is required, please contact the manufacturer of your soldering equipment. In general, use of solder paste within workshops should be avoided because paste is not easy to store and to handle.
- Use only adequate solder tools applicable for lead-free soldering tin. The solder tool must be able:
 - To reach a solder-tip temperature of at least 400°C.
 - To stabilize the adjusted temperature at the solder-tip.
 - To exchange solder-tips for different applications.
- Adjust your solder tool so that a temperature of around 360°C - 380°C is reached and stabilized at the solder joint. Heating time of the solder-joint should not exceed ~ 4 sec. Avoid temperatures above 400°C, otherwise wear-out of tips will increase drastically and flux-fluid will be destroyed. To avoid wear-out of tips, switch "off" unused equipment or reduce heat.
- Mix of lead-free soldering tin/parts with leaded soldering tin/parts is possible but PHILIPS recommends strongly **to avoid** mixed regimes. If this cannot be avoided, carefully clear the solder-joint from old tin and re-solder with new tin.

3.3.6 Alternative BOM identification

It should be noted that on the European Service website, "Alternative BOM" is referred to as "Design variant".

The **third digit** in the serial number (example: AG2B0335000001) indicates the number of the alternative B.O.M. (Bill Of Materials) that has been used for producing the specific TV set. In general, it is possible that the same TV model on the market is produced with e.g. two different types of displays, coming from two different suppliers. This will then result in sets which have the same CTN (Commercial Type Number; e.g. 28PW9515/12) but which have a different B.O.M. number.

By looking at the third digit of the serial number, one can identify which B.O.M. is used for the TV set he is working with. If the third digit of the serial number contains the number "1" (example: AG1B0335000001), then the TV set has been manufactured according to B.O.M. number 1. If the third digit is a "2" (example: AG2B0335000001), then the set has been produced according to B.O.M. no. 2. This is important for ordering the correct spare parts!

For the third digit, the numbers 1...9 and the characters A...Z can be used, so in total: 9 plus 26 = 35 different B.O.M.s can be indicated by the third digit of the serial number.

Identification: The bottom line of a type plate gives a 14-digit serial number. Digits 1 and 2 refer to the production centre (e.g. AG is Bruges), digit 3 refers to the B.O.M. code, digit 4 refers to the Service version change code, digits 5 and 6 refer to the production year, and digits 7 and 8 refer to production week (in example below it is 2006 week 17). The 6 last digits contain the serial number.



Figure 3-1 Serial number (example)

3.3.7 Board Level Repair (BLR) or Component Level Repair (CLR)

If a board is defective, consult your repair procedure to decide if the board has to be exchanged or if it should be repaired on component level.

If your repair procedure says the board should be exchanged completely, do not solder on the defective board. Otherwise, it cannot be returned to the O.E.M. supplier for back charging!

3.3.8 Practical Service Precautions

- **It makes sense to avoid exposure to electrical shock.** While some sources are expected to have a possible dangerous impact, others of quite high potential are of limited current and are sometimes held in less regard.
- **Always respect voltages.** While some may not be dangerous in themselves, they can cause unexpected reactions that are best avoided. Before reaching into a powered TV set, it is best to test the high voltage insulation. It is easy to do, and is a good service precaution.

3.4 Abbreviation List

0/6/12	SCART switch control signal on A/V board. 0 = loop through (AUX to TV), 6 = play 16 : 9 format, 12 = play 4 : 3 format
2DNR	Spatial (2D) Noise Reduction
3DNR	Temporal (3D) Noise Reduction
AARA	Automatic Aspect Ratio Adaptation: algorithm that adapts aspect ratio to remove horizontal black bars; keeps the original aspect ratio
ACI	Automatic Channel Installation: algorithm that installs TV channels directly from a cable network by means of a predefined TXT page
ADC	Analogue to Digital Converter
AFC	Automatic Frequency Control: control signal used to tune to the correct frequency
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
AP	Asia Pacific
AR	Aspect Ratio: 4 by 3 or 16 by 9
ASF	Auto Screen Fit: algorithm that adapts aspect ratio to remove horizontal black bars without discarding video information
ATSC	Advanced Television Systems Committee, the digital TV standard in the USA
ATV	See Auto TV
Auto TV	A hardware and software control system that measures picture content, and adapts image parameters in a dynamic way
AV	External Audio Video
AVC	Audio Video Controller
AVIP	Audio Video Input Processor
B/G	Monochrome TV system. Sound carrier distance is 5.5 MHz
BLR	Board-Level Repair
BTSC	Broadcast Television Standard Committee. Multiplex FM stereo sound system, originating from the USA and used e.g. in LATAM and AP-NTSC countries
B-TXT	Blue TeleteXT
C	Centre channel (audio)
CEC	Consumer Electronics Control bus: remote control bus on HDMI connections
CL	Constant Level: audio output to connect with an external amplifier
CLR	Component Level Repair
COLUMBUS	COLOR LUMinance Baseband Universal Sub-system
ComPair	Computer aided rePair
CP	Connected Planet / Copy Protection
CSM	Customer Service Mode
CTI	Color Transient Improvement: manipulates steepness of chroma transients
CVBS	Composite Video Blanking and Synchronization
DAC	Digital to Analogue Converter
DBE	Dynamic Bass Enhancement: extra low frequency amplification
DDC	See "E-DDC"

D/K	Monochrome TV system. Sound carrier distance is 6.5 MHz		lines. The fields are written in "pairs", causing line flicker.
DFI	Dynamic Frame Insertion	IR	Infra Red
DFU	Directions For Use: owner's manual	IRQ	Interrupt Request
DMR	Digital Media Reader: card reader	ITU-656	The ITU Radio communication Sector (ITU-R) is a standards body
DMSD	Digital Multi Standard Decoding		subcommittee of the International Telecommunication Union relating to radio communication. ITU-656 (a.k.a. SDI), is a digitized video format used for broadcast grade video.
DNM	Digital Natural Motion		Uncompressed digital component or digital composite signals can be used.
DNR	Digital Noise Reduction: noise reduction feature of the set		The SDI signal is self-synchronizing, uses 8 bit or 10 bit data words, and has a maximum data rate of 270 Mbit/s, with a minimum bandwidth of 135 MHz.
DRAM	Dynamic RAM		
DRM	Digital Rights Management		
DSP	Digital Signal Processing		
DST	Dealer Service Tool: special remote control designed for service technicians		
DTCP	Digital Transmission Content Protection; A protocol for protecting digital audio/video content that is traversing a high speed serial bus, such as IEEE-1394	ITV	Institutional TeleVision; TV sets for hotels, hospitals etc.
DVB-C	Digital Video Broadcast - Cable	JOP	Jaguar Output Processor
DVB-T	Digital Video Broadcast - Terrestrial	LS	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 to the customer's preferences
DVD	Digital Versatile Disc		Latin America
DVI(-d)	Digital Visual Interface (d= digital only)		Liquid Crystal Display
E-DDC	Enhanced Display Data Channel (VESA standard for communication channel and display). Using E-DDC, the video source can read the EDID information from the display.	LATAM	Light Emitting Diode
EDID	Extended Display Identification Data (VESA standard)	LCD	Monochrome TV system. Sound carrier distance is 6.5 MHz. L' is Band I, L is all bands except for Band I
EEPROM	Electrically Erasable and Programmable Read Only Memory	LED	LOcal REGression approximation
EMI	Electro Magnetic Interference	L/L'	noise reduction
EPLD	Erasable Programmable Logic Device		LG.Philips LCD (supplier)
EU	Europe		Loudspeaker
EXT	EXternal (source), entering the set by SCART or by cinches (jacks)	LPL	Low Voltage Differential Signalling
FBL	Fast BLanking: DC signal accompanying RGB signals	LS	Mega bits per second
FDS	Full Dual Screen (same as FDW)	LVDS	Monochrome TV system. Sound carrier distance is 4.5 MHz
FDW	Full Dual Window (same as FDS)	Mbps	Microprocessor without Interlocked Pipeline-Stages; A RISC-based microprocessor
FLASH	FLASH memory	M/N	Matrix Output Processor
FM	Field Memory or Frequency Modulation		Metal Oxide Silicon Field Effect Transistor, switching device
FPGA	Field-Programmable Gate Array	MIPS	Motion Pictures Experts Group
FTV	Flat TeleVision		Multi Platform InterFace
Gb/s	Giga bits per second	MOP	MUTE Line
G-TXT	Green TeleteXT	MOSFET	Not Connected
H	H_sync to the module	MPEG	Near Instantaneous Compounded Audio Multiplexing. This is a digital sound system, mainly used in Europe.
HD	High Definition	MPIF	Negative Temperature Coefficient, non-linear resistor
HDD	Hard Disk Drive	MUTE	National Television Standard Committee. Color system mainly used in North America and Japan. Color carrier NTSC M/N= 3.579545 MHz, NTSC 4.43= 4.433619 MHz (this is a VCR norm, it is not transmitted off-air)
HDCP	High-bandwidth Digital Content Protection: A "key" encoded into the HDMI/DVI signal that prevents video data piracy. If a source is HDCP coded and connected via HDMI/DVI without the proper HDCP decoding, the picture is put into a "snow vision" mode or changed to a low resolution. For normal content distribution the source and the display device must be enabled for HDCP "software key" decoding.	NC	Non-Volatile Memory: IC containing TV related data such as alignments
HDMI	High Definition Multimedia Interface	NICAM	Open Circuit
HP	HeadPhone		On Screen Display
I	Monochrome TV system. Sound carrier distance is 6.0 MHz	NTC	On screen display Teletext and Control; also called Artistic (SAA5800)
I ² C	Inter IC bus	NTSC	Project 50: communication protocol between TV and peripherals
I ² D	Inter IC Data bus		Phase Alternating Line. Color system mainly used in West Europe (color carrier= 4.433619 MHz) and South America (color carrier PAL M=
I ² S	Inter IC Sound bus	NVM	
IF	Intermediate Frequency	O/C	
Interlaced	Scan mode where two fields are used to form one frame. Each field contains half the number of the total amount of	OSD	
		OTC	
		P50	
		PAL	

	3.575612 MHz and PAL N= 3.582056 MHz)	TXT	TeleteXT
PCB	Printed Circuit Board (same as "PWB")	TXT-DW	Dual Window with TeleteXT
PCM	Pulse Code Modulation	UI	User Interface
PDP	Plasma Display Panel	uP	Microprocessor
PFC	Power Factor Corrector (or Pre-conditioner)	UXGA	1600x1200 (4:3)
PIP	Picture In Picture	V	V-sync to the module
PLL	Phase Locked Loop. Used for e.g. FST tuning systems. The customer can give directly the desired frequency	VCR	Video Cassette Recorder
POD	Point Of Deployment: a removable CAM module, implementing the CA system for a host (e.g. a TV-set)	VESA	Video Electronics Standards Association
POR	Power On Reset, signal to reset the uP	VGA	640x480 (4:3)
Progressive Scan	Scan mode where all scan lines are displayed in one frame at the same time, creating a double vertical resolution.	VL	Variable Level out: processed audio output toward external amplifier
PTC	Positive Temperature Coefficient, non-linear resistor	VSF	Vestigial Side Band; modulation method
PWB	Printed Wiring Board (same as "PCB")	WYSIWYR	What You See Is What You Record: record selection that follows main picture and sound
PWM	Pulse Width Modulation	WXGA	1280x768 (15:9)
QRC	Quasi Resonant Converter	XTAL	Quartz crystal
QTNR	Quality Temporal Noise Reduction	XGA	1024x768 (4:3)
QVCP	Quality Video Composition Processor	Y	Luminance signal
RAM	Random Access Memory	Y/C	Luminance (Y) and Chrominance (C) signal
RGB	Red, Green, and Blue. The primary color signals for TV. By mixing levels of R, G, and B, all colors (Y/C) are reproduced.	YPbPr	Component video. Luminance and scaled color difference signals (B-Y and R-Y)
RC	Remote Control	YUV	Component video
RC5 / RC6	Signal protocol from the remote control receiver		
RESET	RESET signal		
ROM	Read Only Memory		
RSDS	Reduced Swing Differential Signalling data interface		
R-TXT	Red TeleteXT		
SAM	Service Alignment Mode		
S/C	Short Circuit		
SCART	Syndicat des Constructeurs d'Appareils Radiorécepteurs et Téléviseurs		
SCL	Serial Clock I ² C		
SCL-F	CLock Signal on Fast I ² C bus		
SD	Standard Definition		
SDA	Serial Data I ² C		
SDA-F	DAta Signal on Fast I ² C bus		
SDI	Serial Digital Interface, see "ITU-656"		
SDRAM	Synchronous DRAM		
SECAM	SEquence Couleur Avec Mémoire. Color system mainly used in France and East Europe. Color carriers= 4.406250 MHz and 4.250000 MHz		
SIF	Sound Intermediate Frequency		
SMPS	Switched Mode Power Supply		
SoC	System on Chip		
SOG	Sync On Green		
SOPS	Self Oscillating Power Supply		
S/PDIF	Sony Philips Digital InterFace		
SRAM	Static RAM		
SRP	Service Reference Protocol		
SSB	Small Signal Board		
STBY	STand-BY		
SVGA	800x600 (4:3)		
SVHS	Super Video Home System		
SW	Software		
SWAN	Spatial temporal Weighted Averaging Noise reduction		
SXGA	1280x1024		
TFT	Thin Film Transistor		
THD	Total Harmonic Distortion		
TMDS	Transmission Minimized Differential Signalling		

4. Mechanical Instructions

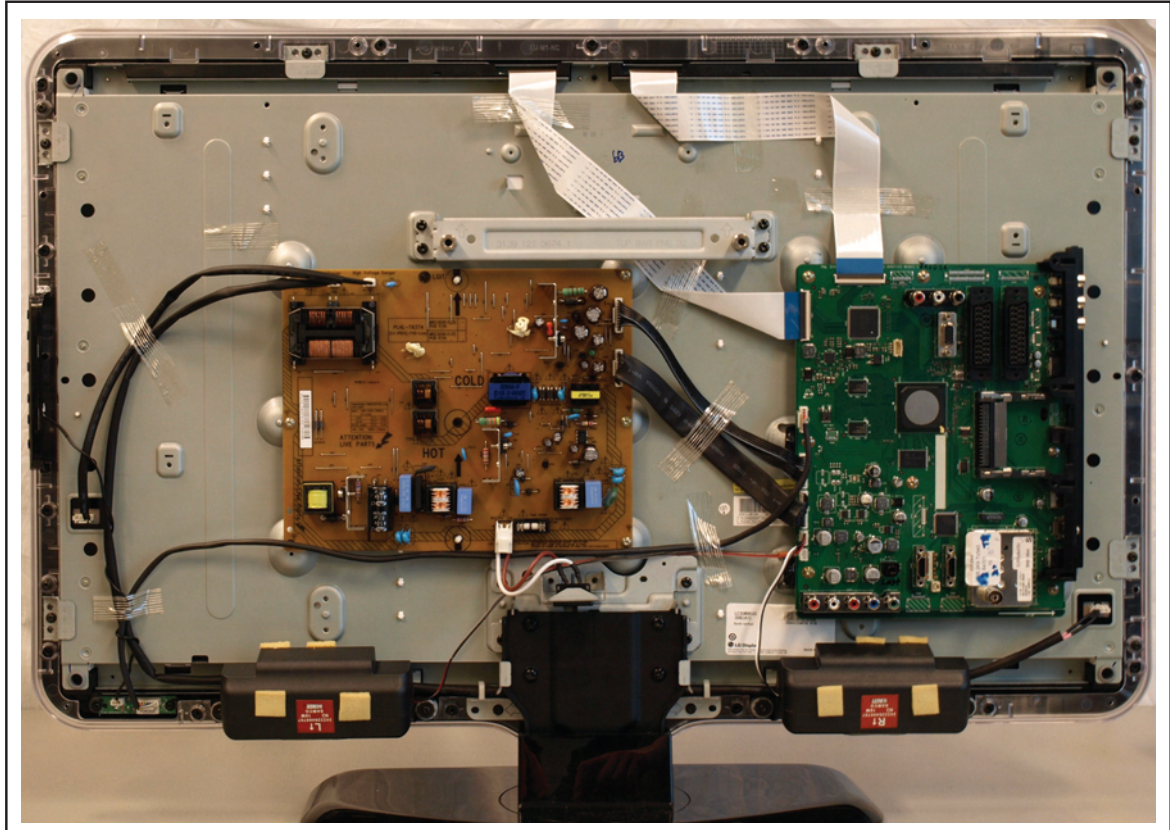
Index of this chapter:

- [4.1 Cable Dressing](#)
- [4.2 Service Positions](#)
- [4.3 Assy/Panel Removal](#)
- [4.4 Set Re-assembly](#)

Notes:

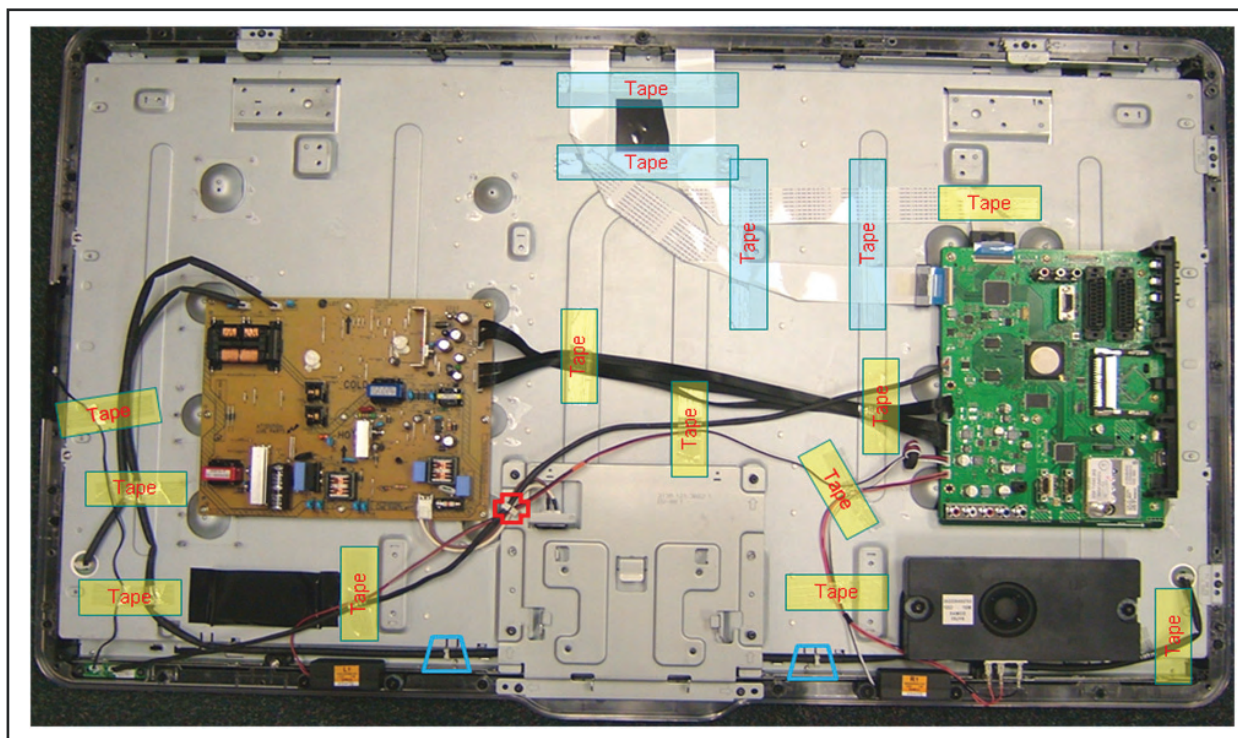
- Figures below can deviate slightly from the actual situation, due to the different set executions.

4.1 Cable Dressing



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090220

Figure 4-1 Cable dressing 32" with LG display



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090220

Figure 4-2 Cable dressing 42" with LG display

4.2 Service Positions

For easy servicing of this set, there are a few possibilities created:

- The buffers from the packaging.
- Foam bars (created for Service).

4.2.1 Foam Bars

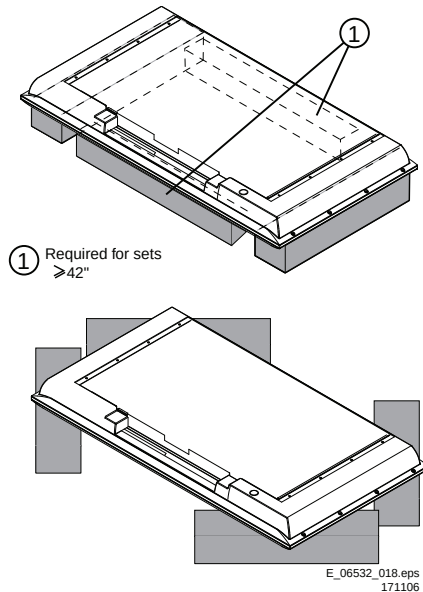


Figure 4-3 Foam bars

The foam bars (order code 3122 785 90580 for two pieces) can be used for all types and sizes of Flat TVs.

See figure [Figure 4-3](#) for details. Sets with a display of 42" and larger, require **four** foam bars [1]. Ensure that the foam bars are always supporting the cabinet and **never** only the display.

Caution: Failure to follow these guidelines can seriously damage the display!

By laying the TV face down on the (ESD protective) foam bars, a stable situation is created to perform measurements and alignments. By placing a mirror under the TV, you can monitor the screen.

4.3 Assy/Panel Removal

4.3.1 Rear Cover

Warning: Disconnect the mains power cord before you remove the rear cover.

Note: it is **not** necessary to remove the stand while removing the rear cover.

1. Remove all screws of the rear cover.
2. Lift the rear cover from the TV. Make sure that wires and flat coils are not damaged while lifting the rear cover from the set.

4.3.2 Speakers

Each speaker unit is mounted with two screws. A sticker on the the unit indicates if it is the right ("R") or left ("L") box, seen from the backside of the set, and a arrow points to the bottom of the set.

When defective, replace the whole unit.

4.3.3 IR & LED Board

1. Unplug the connectors leading to the SSB and IR & LED Board.
 2. Lift the board and take it out.
- When defective, replace the whole unit.

4.3.4 Key Board Control Panel

1. Unplug the key board connector from the IR & LED board.
 2. Release the clamp on the topside using a screwdriver.
 3. Lift the unit and take it out of the set.
- When defective, replace the whole unit.

4.3.5 Main Supply Panel

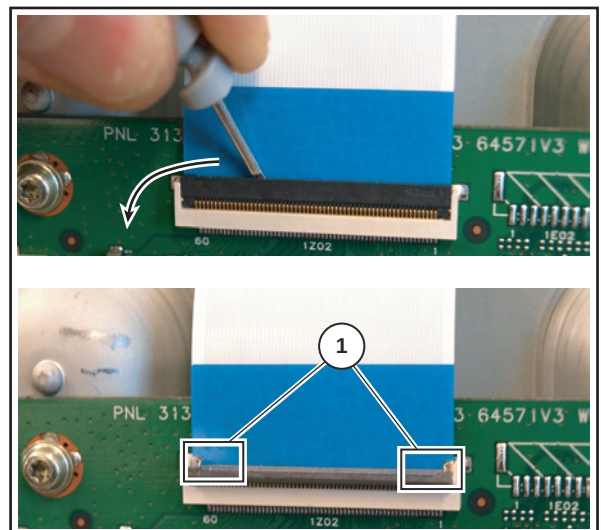
1. Unplug all connectors.
 2. Remove the fixation screws.
 3. Take the board out.
- When defective, replace the whole unit.

4.3.6 Small Signal Board (SSB)

Caution: It is mandatory to remount screws at their original position during re-assembly. Failure to do so may result in damaging the SSB.

Refer to [Figure 4-4](#) for details.

1. Release both LVDS foils. For each foil a clip must be turned downwards before the foil can be released. When remounting, make sure the cable fits correctly in the clamps of the connector [1].
2. Unplug all other connectors.
3. Remove all screws that hold the board.
4. The SSB can now be taken out of the set, together with the side cover.
5. To remove the side cover, push the clamp with a screwdriver in the middle of the cover and pull the cover sideways from the SSB.



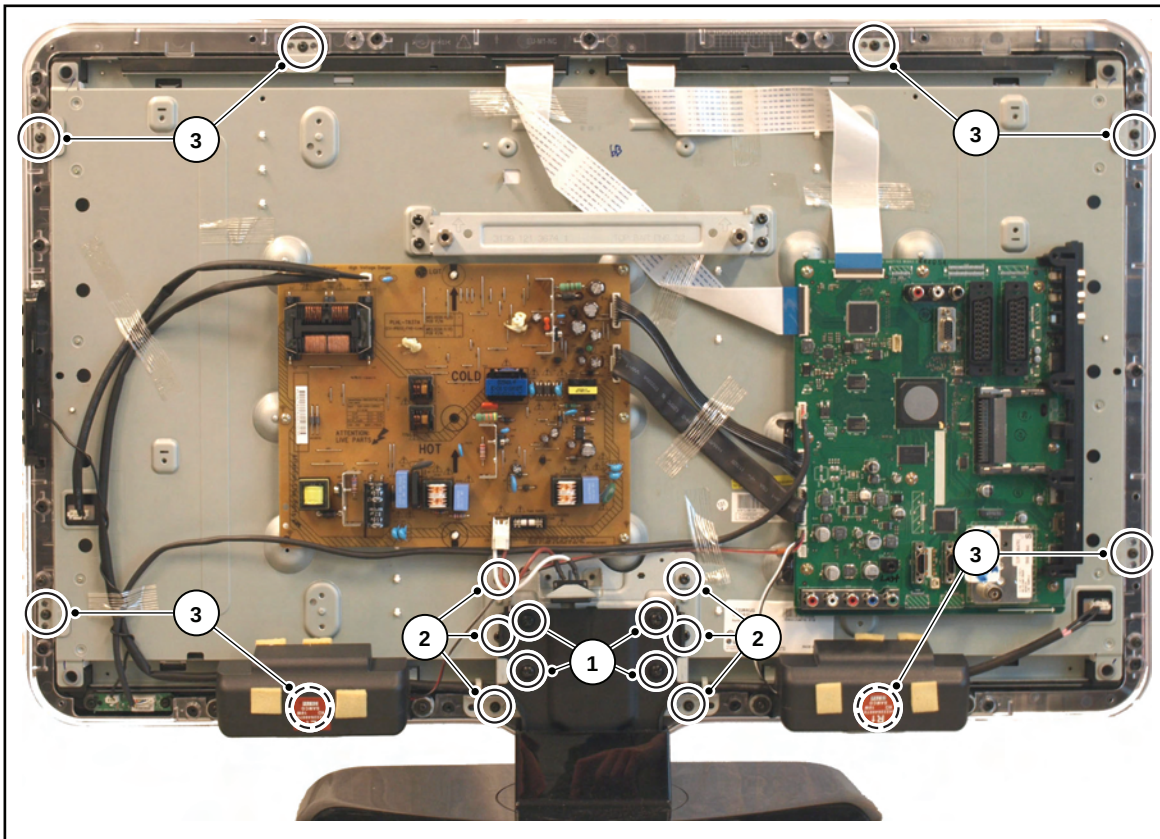
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090220

Figure 4-4 LVDS foil release

4.3.7 LCD Panel

Refer to [Figure 4-5](#) for details. As every screen size has a (slightly) different mechanical construction (some have the boards directly mounted on the LCD display, others use brackets), we only describe one model. Disassembly method of other LCD panels is similar to the one described below.

1. Remove the Main Supply Panel and Small Signal Board as earlier described.
2. Unplug the connectors to and from the Speakers, IR & LED Board and Key Board Control Panel.
3. Remove the stand [1].
4. Release the subframe of the stand [2].
5. Remove the brackets [3] that secure the LCD Panel.
6. The LCD panel can now be lifted from the front cabinet.



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090226

Figure 4-5 LCD Panel removal (sets with LG display)

4.4 Set Re-assembly

To re-assemble the whole set, execute all processes in reverse order.

Notes:

- While re-assembling, make sure that all cables are placed and connected in their original position. See [Figure 4-1](#) and [Figure 4-2](#).
- Pay special attention not to damage the EMC foams in the set. Ensure that EMC foams are mounted correctly.

5. Service Modes, Error Codes, and Fault Finding

Index of this chapter:

[5.1 Test Points](#)
[5.2 Service Modes](#)
[5.3 Step by step Start-up](#)
[5.4 Service Tools](#)
[5.5 Error Codes](#)
[5.6 The Blinking LED Procedure](#)
[5.7 Protections](#)
[5.8 Fault Finding and Repair Tips](#)
[5.9 Software Upgrading](#)

5.1 Test Points

As most signals are digital, it will be difficult to measure waveforms with a standard oscilloscope. However, several key ICs are capable of generating test patterns, which can be controlled via ComPair. In this way it is possible to determine which part is defective.

Perform measurements under the following conditions:

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

5.2 Service Modes

Service Default mode (SDM) and Service Alignment Mode (SAM) offers several features for the service technician, while the Customer Service Mode (CSM) is used for communication between the call centre and the customer.

This chassis also offers the option of using ComPair, a hardware interface between a computer and the TV chassis. It offers the abilities of structured troubleshooting, error code reading, and software version read-out for all chassis. (see also section [5.4.1 ComPair](#)).

Note: For the new model range, a new remote control (RC) is used with some renamed buttons. This has an impact on the activation of the Service modes. For instance the old "MENU" button is now called "HOME" (or is indicated by a "house" icon).

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 detected by stand-by processor and make the TV start up to the step just before protection (a sort of automatic step by step start up). See section [5.3 Step by step Start-up](#).
- To start the blinking LED procedure where only layer 2 errors are displayed (see also section [5.5 Error Codes](#)).

Specifications

Table 5-1 SDM default settings

Region	Freq. (MHz)	Default system
Europe, AP (PAL/Multi)	475.25	PAL B/G
Europe, AP DVB-T	546.00 PID Video: 0B 06 PID PCR: 0B 06 PID Audio: 0B 07	DVB-T

- 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.
 - Picture mute (blue mute or black mute).
 - Automatic volume levelling (AVL).
 - Skip/blank of non-favourite pre-sets.

How to Activate SDM

For this chassis there are two kinds of SDM: an **analog SDM** and a **digital SDM**. Tuning will happen according table "SDM Default Settings".

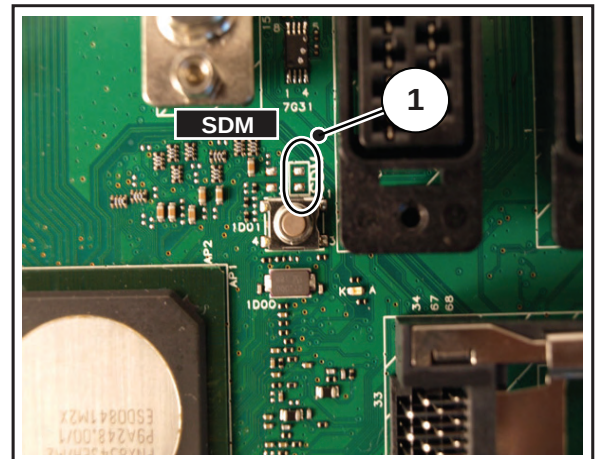
- **Analog SDM:** use the standard RC-transmitter and key in the code "062596", directly followed by the "MENU" (or HOME) button.

Note: It is possible that, together with the SDM, the main menu will appear. To switch it "off", push the "MENU" (or HOME) button again.

- **Digital SDM:** use the standard RC-transmitter and key in the code "062593", directly followed by the "MENU" (or HOME) button.

Note: It is possible that, together with the SDM, the main menu will appear. To switch it "off", push the "MENU" (or HOME) button again.

- **Analog SDM** can also be activated by, on the SSB, shorting for a moment the solder pads SDM [1] (see [Figure 5-1](#)).



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090306

Figure 5-1 Service mode pads

After activating this mode, "SDM" will appear in the upper right corner of the screen (when a picture is available).

How to Navigate

When the "MENU" (or HOME) button is pressed 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 STAND-BY via the RC-transmitter.
- Via a standard customer RC-transmitter: key in "00"-sequence.

5.2.2 Service Alignment Mode (SAM)

Purpose

- To perform (software) alignments.
- To change option settings.
- To easily identify the used software version.
- To view operation hours.
- To display (or clear) the error code buffer.

How to Activate SAM

Via a standard RC transmitter: key in the code "062596" directly followed by the "INFO" or "I+" button. After activating SAM with this method a service warning will appear on the screen, continue by pressing the red button on the RC.

Contents of SAM (see also [Table 6-4](#)):

- **Hardware Information**
 - **A. SW Version.** Displays the software version of the main software (**example:** Q5431-0.26.2.0= AAAaB_X.Y.W.Z).
 - **AAAA=** the chassis name, where "a" indicates the chip version: e.g. TV543/32= Q543, TV543/82= Q548, **Q543/92= Q549**.
 - **B=** the SW branch version. This is a sequential number (this is no longer the region indication, as the software is now multi-region).
 - **X.Y.W.Z=** the software version, where X is the main version number (different numbers are not compatible with one another) and Y.W.Z is the sub version number (a higher number is always compatible with a lower number).
 - **B. SBY PROC Version.** Displays the software version of the stand-by processor.
 - **C. Production Code.** Displays the production code of the TV, this is the serial number as printed on the back of the TV set. Note that if an NVM is replaced or is initialized after corruption, this production code has to be re-written to NVM. ComPair will foresee in a possibility to do this.
- **Operation Hours.** Displays the accumulated total of operation hours (not the stand-by hours). Every time the TV is switched "on/off", 0.5 hours is added to this number.
- **Errors** (followed by maximum 10 errors). The most recent error is displayed at the upper left (for an error explanation see section [5.5 Error Codes](#)).
- **Reset Error Buffer.** When "cursor right" (or the "OK" button) is pressed and then the "OK" button is pressed, the error buffer is reset.
- **Alignments.** This will activate the "ALIGNMENTS" sub-menu. See chapter [6. Alignments](#).
- **Dealer Options.** Extra features for the dealers. See [Table 6-4](#).
- **Options.** Extra features for Service. For more information regarding option codes, see chapter [6. Alignments](#). Note that if the option code numbers are changed, these have to be confirmed with pressing the "OK" button before the options are stored. Otherwise changes will be lost.
- **Initialize NVM.** The moment the processor recognizes a corrupted NVM, the "initialize NVM" line will be highlighted. Now, two things can be done (dependent of the service instructions at that moment):
 - Save the content of the NVM via ComPair for development analysis, **before** initializing. This will give the Service department an extra possibility for diagnosis (e.g. when Development asks for this).
 - Initialize the NVM.
- **Note:** When the NVM is corrupted, or replaced, there is a high possibility that no picture appears because the display code is not correct. So, before initializing the NVM via the SAM, a picture is necessary and therefore the correct display option has to be entered. Refer to chapter [6. Alignments](#) for details. To adapt this option, it's advised to use ComPair (the correct HEX values

for the options can be found in chapter 8 "Alignments") or a method via a standard RC (described below).

Changing the display option via a standard RC: Key in the code "062598" directly followed by the "MENU" (or HOME) button and "XXX" (where XXX is the 3 digit decimal display code as mentioned in table "Option code overview" in chapter 8 "Alignments"). Make sure to key in all three digits, also the leading zero's. If the above action is successful, the front LED will go out as an indication that the RC sequence was correct. After the display option is changed in the NVM, the TV will go to the Stand-by mode. If the NVM was corrupted or empty before this action, it will be initialized first (loaded with default values). This initializing can take up to 20 seconds.

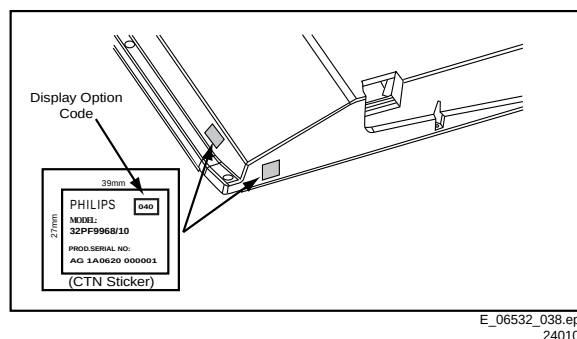


Figure 5-2 Location of Display Option Code sticker

- **Store - go right.** All options and alignments are stored when pressing "cursor right" (or the "OK" button) and then the "OK"-button.
- **SW Maintenance.**
 - **SW Events.** Not useful for Service purposes. In case of specific software problems, the development department can ask for this information.
 - **HW Events.** Not useful for Service purposes. In case of specific software problems, the development department can ask for this information.
- **Test settings.** For development purposes only.
- **Development file versions.** Not useful for Service purposes, this information is only used by the development department.
- **Upload to USB.** To upload several settings from the TV to an USB stick, which is connected to the SSB. The items are "Channel list", "Personal settings", "Option codes", "Display-related alignments" and "History list". **First a directory "repair" has to be created in the root of the USB stick.** To upload the settings select each item separately, press "cursor right" (or the "OK" button), confirm with "OK" and wait until "Done" appears. In case the download to the USB stick was not successful "Failure" will appear. In this case, check if the USB stick is connected properly and if the directory "repair" is present in the root of the USB stick. Now the settings are stored onto the USB stick and can be used to download onto another TV or other SSB. Uploading is of course only possible if the software is running and if a picture is available. This method is created to be able to save the customer's TV settings and to store them into another SSB.
- **Download from USB.** To download several settings from the USB stick to the TV. Same way of working as with uploading. To make sure that the download of the channel list from USB to the TV is executed properly, it is necessary to restart the TV and tune to a valid preset if necessary. **Note:** The "History list item" can not be downloaded from USB to the TV. This is a "read-only" item. In case of specific problems, the development department can ask for this information.

How to Navigate

- In SAM, the menu items can be selected with the "CURSOR UP/DOWN" key (or the scroll wheel) 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 (or the scroll wheel), it is possible to:
 - (De) activate the selected menu item.
 - (De) activate the selected sub menu.
- With the "OK" key, it is possible to activate the selected action.

How to Exit SAM

Use one of the following methods:

- Switch the set to STAND-BY via the RC-transmitter.
- Via a standard RC-transmitter, key in "00" sequence, or select the "BACK" key.

5.2.3 Customer Service Mode (CSM)

Purpose

When a customer is having problems with his TV-set, he can call his dealer or the Customer Helpdesk. 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 severity of the complaint. In many cases, he can advise the customer how to solve the problem, or he can decide if it is necessary to visit the customer.

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

When CSM is activated, the layer 1 error is displayed via blinking LED. Only the latest error is displayed. (see also section [5.5 Error Codes](#)).

When CSM is activated and there is a USB stick connected to the TV, the software will dump the complete CSM content to the USB stick. The file (Csm.txt) will be saved in the root of the USB stick. This information can be handy if no information is displayed.

Only for Q548.1:

When in the Q548.1 chassis CSM is activated, a test pattern will be displayed during 5 s.: 1 s. blue, 1 s. green, and 1 s. red, then again 1 s. blue and 1 s. green. This test pattern is generated by the PNX5100.

So if this test pattern is shown, it could be determined that the back end video chain (PNX5100, LVDS, and display) of the SSB is working.

For LED backlight TV sets, the test pattern is build as follows: 1 s. blue, 1 s. green, 1 s. red (generated by the PNX5100) and further on with 3 seconds RGB pattern from the LED Dimming Panel.

How to Activate CSM

Key in the code "123654" via the standard RC transmitter.

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

How to Navigate

By means of the "CURSOR-DOWN/UP" knob (or the scroll wheel) on the RC-transmitter, can be navigated through the menus.

Contents of CSM

The contents are displayed on three pages: General, Software versions, and Quality items. However, these group names itself are not shown anywhere in the CSM menu.

General

- **Set Type.** 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 the TV-set. Note that if an NVM is replaced or is initialized after corruption, this set type has to be re-written to NVM. ComPair will foresee in a possibility to do this.

- **Production Code.** Displays the production code (the serial number) of the TV. Note that if an NVM is replaced or is initialized after corruption, this production code has to be re-written to NVM. ComPair will foresee in a possibility to do this.
- **Installed date.** Indicates the date of the first installation of the TV. This date is acquired via time extraction.
- **Options 1.** Gives the option codes of option group 1 as set in SAM (Service Alignment Mode).
- **Options 2.** Gives the option codes of option group 2 as set in SAM (Service Alignment Mode).
- **12NC SSB.** Gives an identification of the SSB as stored in NVM. Note that if an NVM is replaced or is initialized after corruption, this identification number has to be re-written to NVM. ComPair will foresee in a possibility to do this. This identification number is the 12nc number of the SSB. Remark: the content here can also be a part of the 12NC of the SSB in combination with the serial number.
- **12NC display.** Shows the 12NC of the display
- **12NC supply.** Shows the 12NC of the supply.
- **12NC "fan board".** Shows the 12NC of the "fan board"-module (for sets with LED backlight).
- **12NC "LED Dimming Panel".** Shows the 12NC of the LED dimming Panel (for sets with LED backlight).

Software versions

- **Current main SW.** Displays the built-in main software version. In case of field problems related to software, software can be upgraded. As this software is consumer upgradeable, it will also be published on the Internet. Example: Q5431E_1.2.3.4.
- **Stand-by SW.** Displays the built-in stand-by processor software version. Upgrading this software will be possible via ComPair or via USB (see section [Software Upgrading](#)). Example: STDBY_1.2.3.4.
- **MOP ambient light SW.** Displays the MOP ambient light EPLD SW.
- **MPEG4 software.** Displays the MPEG4 software (for sets with MPEG4).
- **PNX5100 boot NVM.** Displays the SW-version that is used in the PNX5100 boot NVM (for sets with PNX5100).
- **LED Dimming SW.** Displays the LED dimming EPLD SW (for sets with LED backlight).

Quality items

- **Signal quality.** Poor/average/good
- **Child lock.** Not active/active. This is a combined item for locks. If any lock (Preset lock, child lock, lock after or parental lock) is active, the item shall show "active".
- **HDMI HDCP key.** Indicates of the HDMI keys (or HDCP keys) are valid or not. In case these keys are not valid and the consumer wants to make use of the HDMI functionality, the SSB has to be replaced.
- **Ethernet MAC address.** Not applicable.
- **Wireless MAC address.** Not applicable.
- **BDS key.** Indicates if the "BDS level 1" key is valid or not.
- **CI slot present.** If the common interface module is detected the result will be "YES", else "NO".
- **HDMI input format.** The detected input format of the HDMI.
- **HDMI audio input stream.** The HDMI audio input stream is displayed: present / not present.
- **HDMI video input stream.** The HDMI video input stream is displayed: present / not present.

How to Exit CSM

Press the "MENU" (or HOME) button twice on the RC-transmitter.

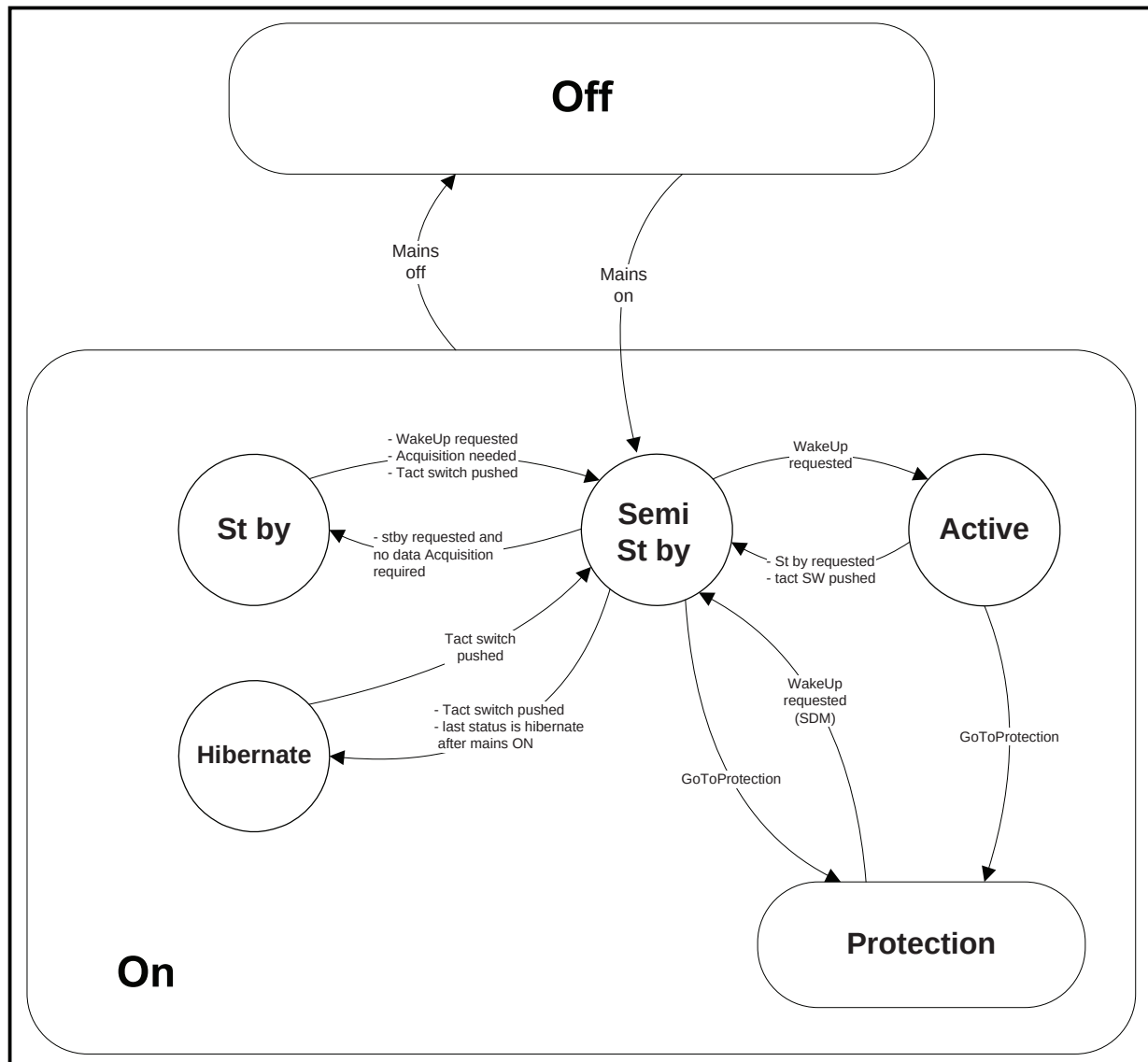
5.3 Step by step Start-up

When the TV is in a protection state due to an error detected by stand-by software (error blinking is displayed) **and** SDM is activated via short cutting the pins on the SSB, the TV starts up until it reaches the situation just before protection. So, this is a kind of automatic step by step start-up. In combination with the start-up diagrams below, it is shown which supplies are present at a certain moment. Important to know is, that if e.g. the 3V3 detection fails and thus layer 2 error = 18 is blinking while the TV is restarted via SDM, the Stand-by Processor will enable the 3V3, but the TV set will not go to protection now. The TV will stay in this situation until it is reset (Mains/AC Power supply interrupted).

Caution: in case the start-up in this mode with a faulty FET 7101-1 is done, all ICs supplied by the +3V3 could be destroyed, due to over voltage (12V on 3V3-line). It is recommended to measure first the FET 7101-1 or others FETs on short-circuit before activating SDM via the service pads.

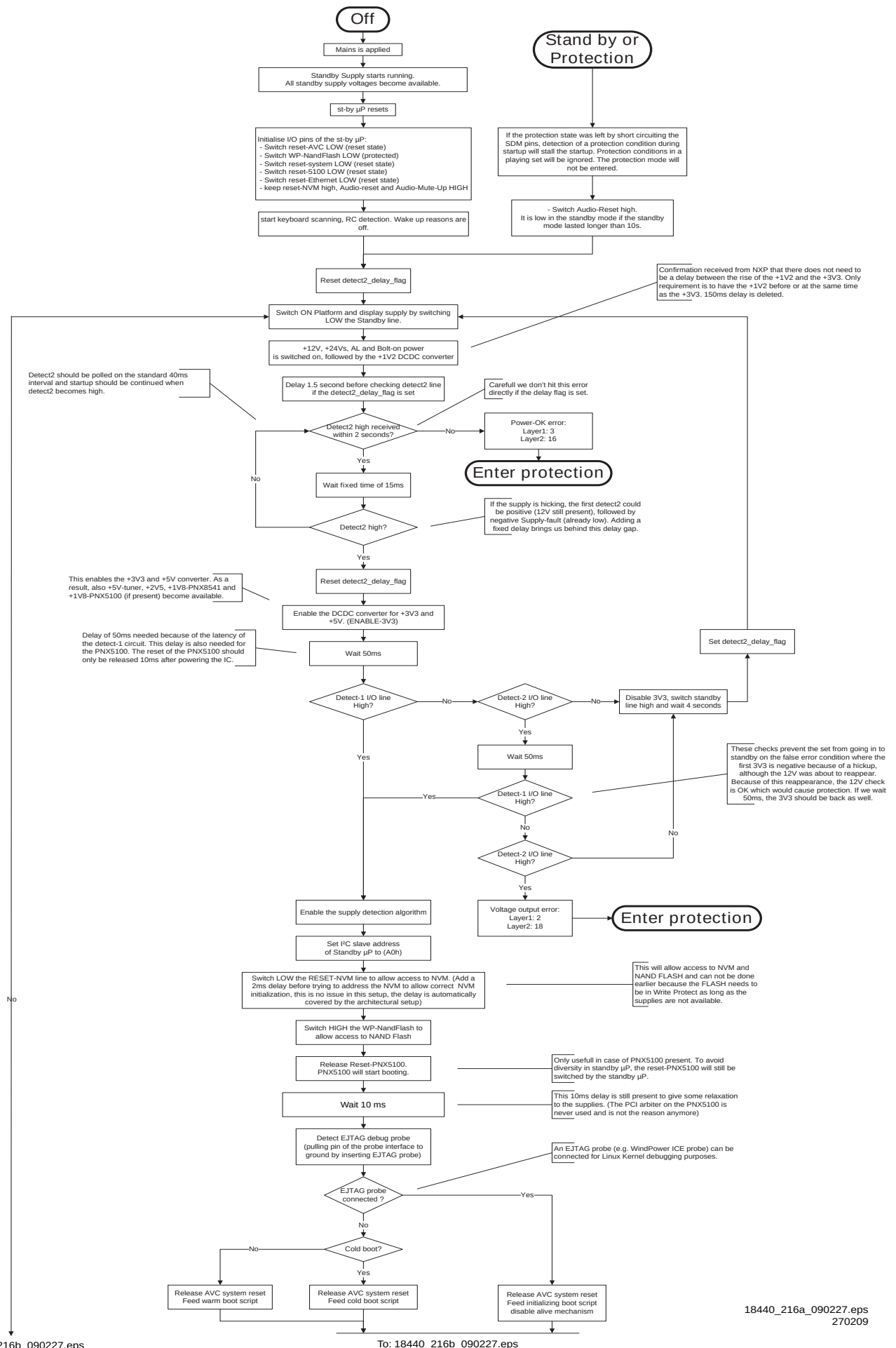
The abbreviations "SP" and "MP" in the figures stand for:

- SP: protection or error detected by the **Stand-by Processor**.
- MP: protection or error detected by the **MIPS Main Processor**.



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Figure 5-3 Transition diagram



To: 18440_216b_090227.eps

To: 18440_216b_090227.eps

Figure 5-4 "Off/Stand-by" to "Semi Stand-by" flowchart (part 1)

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270209

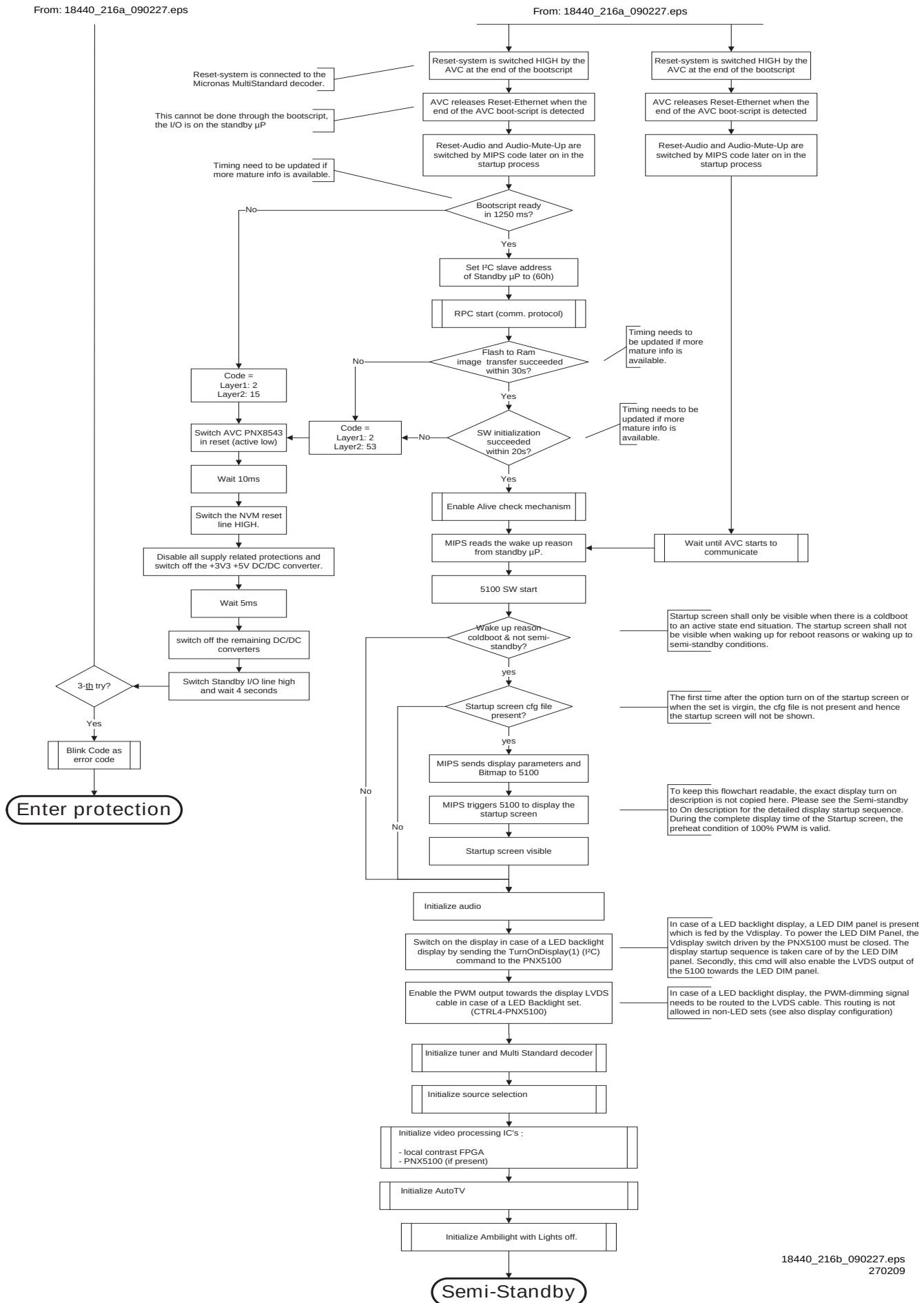


Figure 5-5 "Off/Stand-by" to "Semi Stand-by" flowchart (part 2)

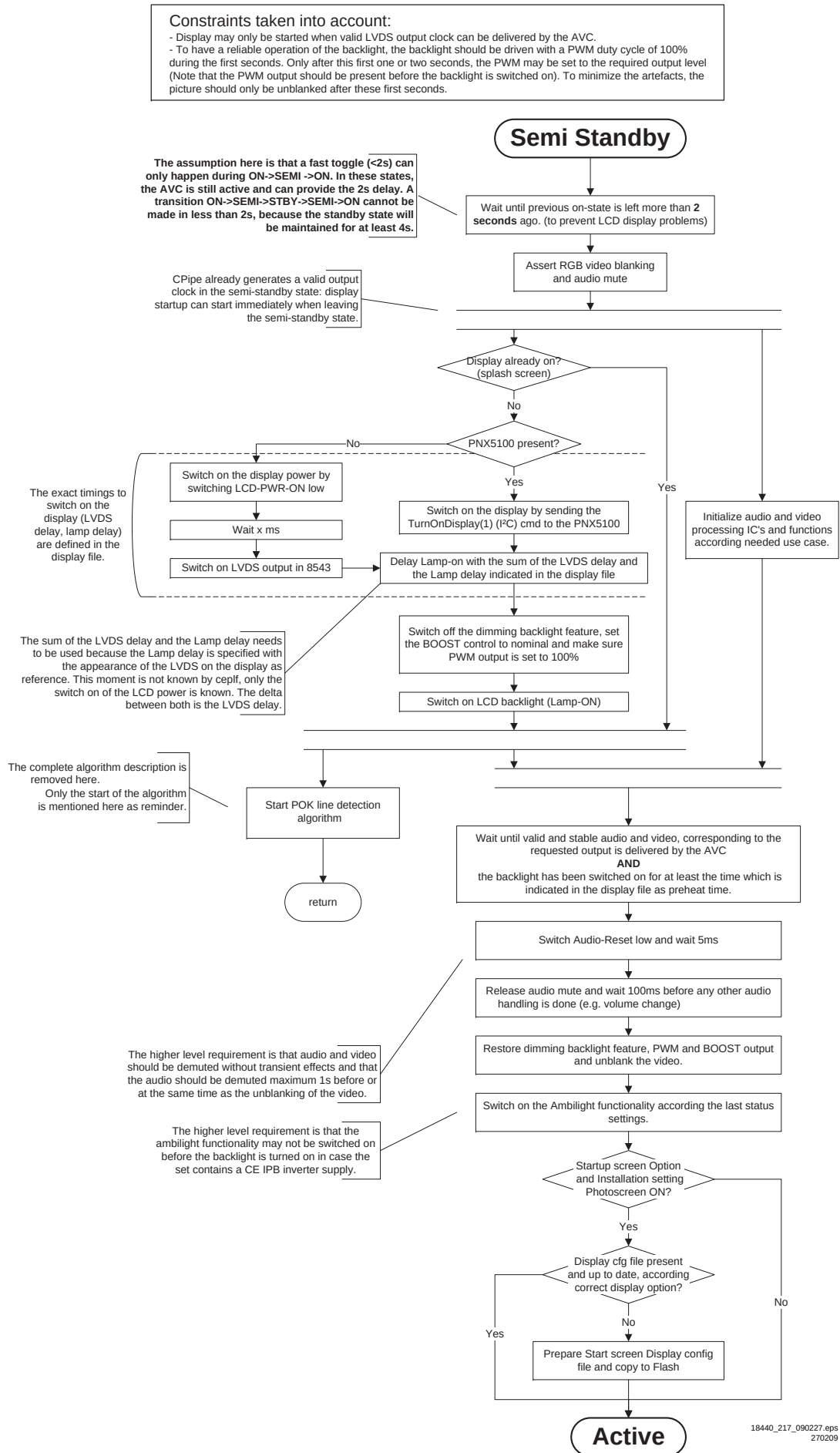


Figure 5-6 "Semi Stand-by" to "Active" flowchart

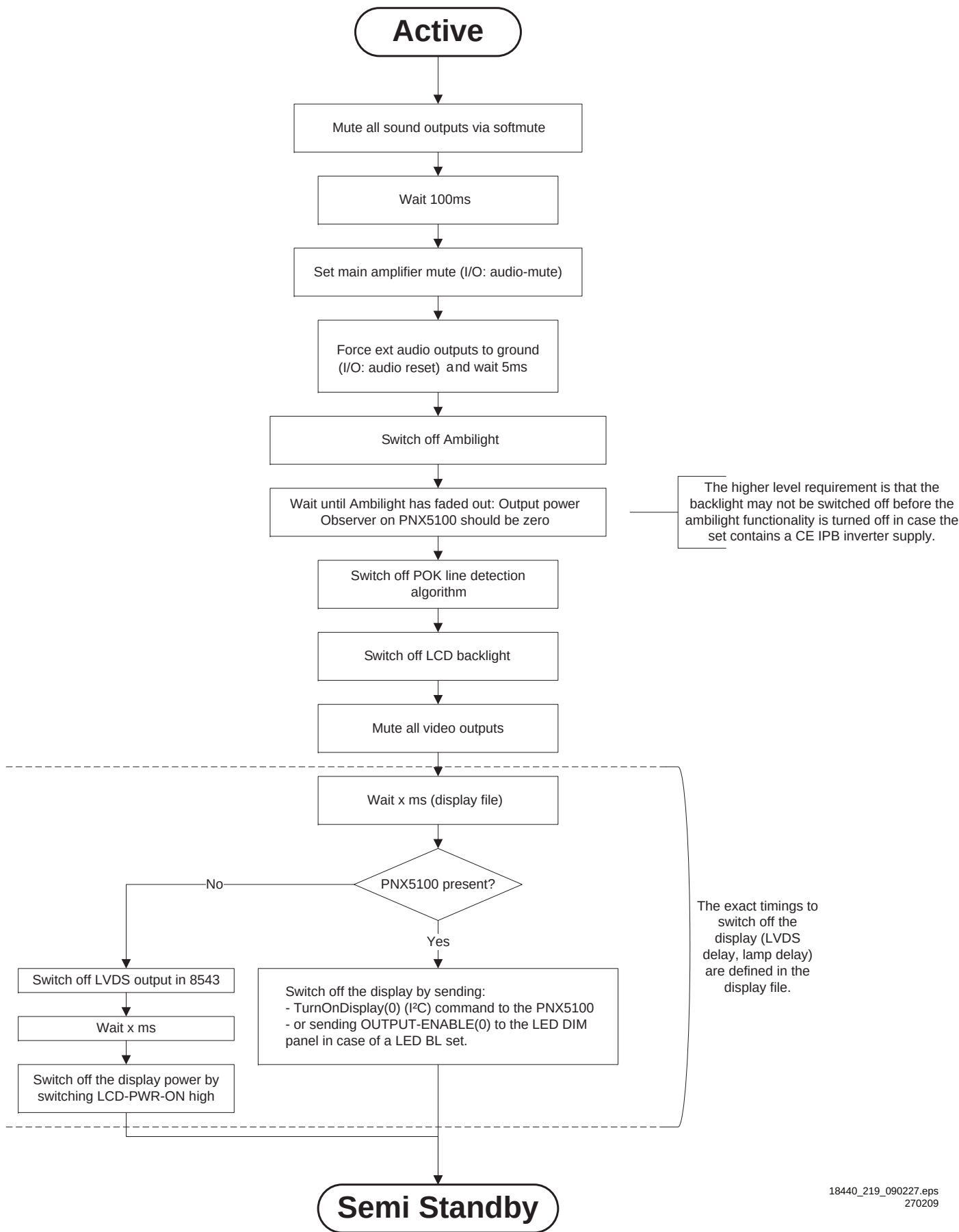


Figure 5-7 “Active” to “Semi Stand-by” flowchart

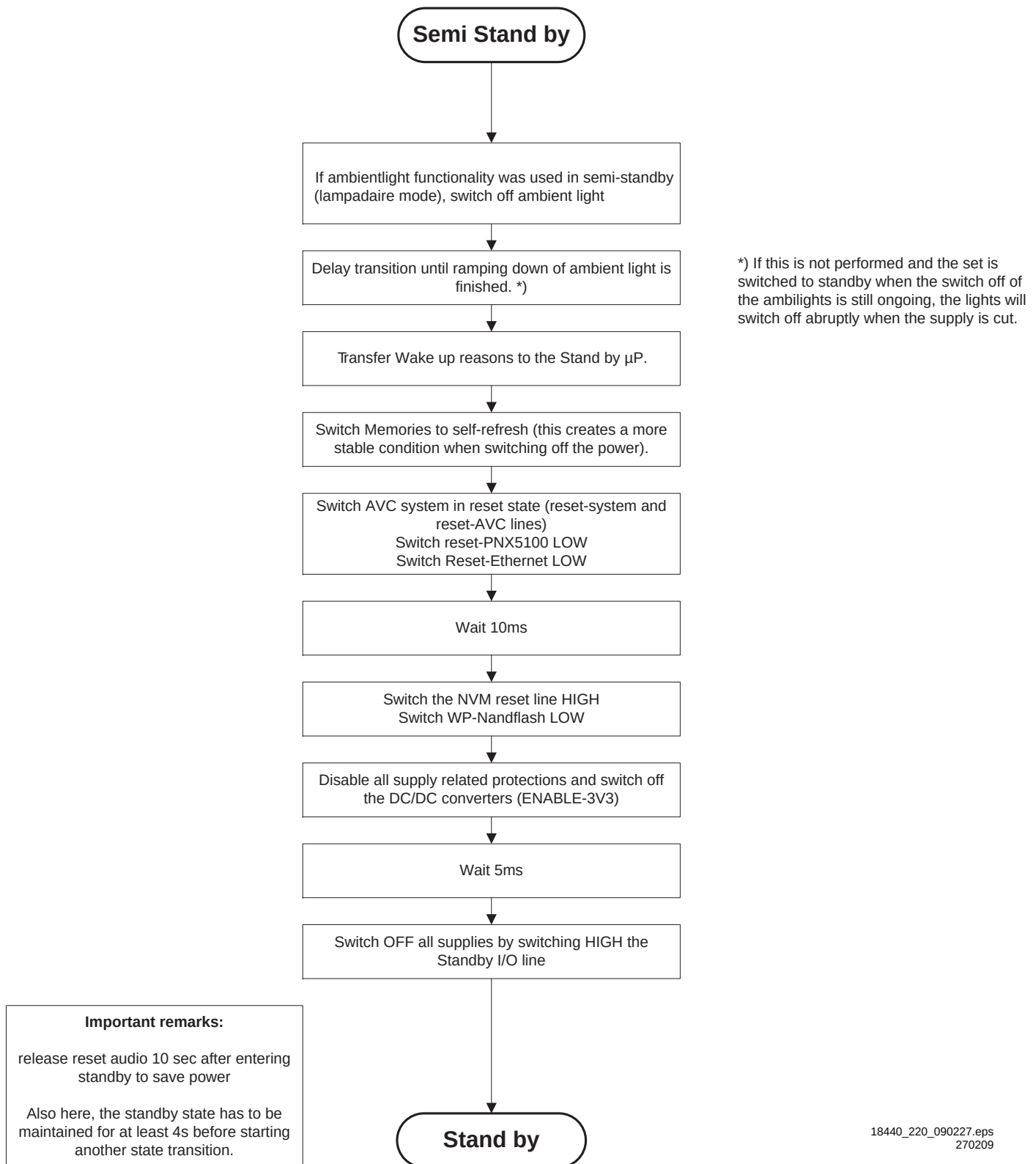


Figure 5-8 “Semi Stand-by” to “Stand-by” flowchart

5.4 Service Tools

5.4.1 ComPair

Introduction

ComPair (Computer Aided Repair) is a Service tool for Philips Consumer Electronics products, and offers the following:

1. ComPair helps to quickly get an understanding on how to repair the chassis in a short and effective way.
2. ComPair allows very detailed diagnostics and is therefore capable of accurately indicating problem areas. No knowledge on I²C or UART commands is necessary, because ComPair takes care of this.
3. ComPair speeds up the repair time since it can automatically communicate with the chassis (when the uP is working) and all repair information is directly available.
4. ComPair features TV software up possibilities.

Specifications

ComPair consists of a Windows based fault finding program and an interface box between PC and the (defective) product. The ComPair II interface box is connected **to the PC** via an USB cable. For the TV chassis, the ComPair interface box and the TV communicate via a bi-directional cable via the service connector(s).

The ComPair fault finding program is able to determine the problem of the defective television, by a combination of automatic diagnostics and an interactive question/answer procedure.

How to Connect

This is described in the chassis fault finding database in ComPair.

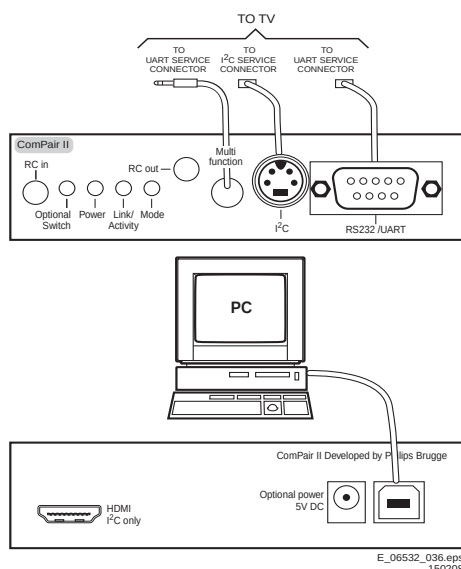


Figure 5-9 ComPair II interface connection

Caution: It is compulsory to connect the TV to the PC as shown in the picture above (with the ComPair interface in between), as the ComPair interface acts as a level shifter. If one connects the TV directly to the PC (via UART), ICs will be blown!

How to Order

ComPair II order codes:

- ComPair II interface: 3122 785 91020.
- Software is available via the Philips Service web portal.
- ComPair serial interface cable for Q52x.x. (using 3.5 mm Mini Jack connectors): 3138 188 75051.

Note: When having problems, please contact your local support desk.

5.5 Error Codes

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, new errors are logged at the left side, and all other errors shift one position to the right.

When an error occurs, it is added to the list of errors, provided the list is not full. When an error occurs and the error buffer is full, then the new error is not added, and the error buffer stays intact (history is maintained).

To prevent that an occasional error stays in the list forever, the error is removed from the list after more than 50 hrs. of operation.

When multiple errors occur (errors occurred within a short time span), there is a high probability that there is some relation between them.

New in this chassis is the way errors can be displayed:

There is a simple blinking LED procedure for board level repair (home repair) so called LAYER 1 errors next to the existing errors which are LAYER 2 errors (see [Table 5-3](#)).

- LAYER 1 errors are one digit errors
 - LAYER 2 errors are two digit errors.
 - In protection mode.
 - From consumer mode: **LAYER 1**.
 - From SDM mode: **LAYER 2**.
 - Fatal errors, if I²C bus is blocked and the set re-boots, CSM and SAM are not selectable.
 - From consumer mode: **LAYER 1**.
 - From SDM mode: **LAYER 2**.
- Important remark:
For all errors detected by MIPS which are fatal => rebooting of the TV set (reboot starts after LAYER 1 error blinking), one should short the solder paths at start-up from the power OFF state by mains interruption and not via the power button to trigger the SDM via the hardware pins.
- In CSM mode
 - When entering CSM: error **LAYER 1** will be displayed by blinking LED. Only the latest error is shown.
 - In SDM mode
 - When SDM is entered via Remote Control code or the hardware pins, **LAYER 2** is displayed via blinking LED.
 - In the ON state
 - In "Display error mode", set with the RC commands "mute_06250X_OK" **LAYER 2** errors are displayed via blinking LED.
 - Error display on screen.
 - In CSM no error codes are displayed on screen.
 - In SAM the complete error list is shown.

Basically there are three kinds of errors:

- **Errors detected by the Stand-by software which lead to protection.** These errors will always lead to protection and an automatic start of the blinking LED LAYER 1 error. (see section [5.6 The Blinking LED Procedure](#)).
- **Errors detected by the Stand-by software which not lead to protection.** In this case the front LED should blink the involved error. See also section [Extra Information](#). Note that it can take up several minutes before the TV starts blinking the error (e.g. LAYER 1 error = 2, LAYER 2 error = 15 or 53).
- **Errors detected by main software (MIPS).** In this case the error will be logged into the error buffer and can be read out via ComPair, via blinking LED method LAYER 1-2 error, or in case picture is visible, via SAM.

5.5.2 How to Read the Error Buffer

Use one of the following methods:

- On screen via the SAM (only when a picture is visible).
E.g.:
 - 00 00 00 00 00**: No errors detected
 - 23 00 00 00 00**: Error code 23 is the last and only detected error.
 - 37 23 00 00 00**: Error code 23 was first detected and error code 37 is the last detected error.
 - Note that no protection errors can be logged in the error buffer.
- Via the blinking LED procedure. See section [5.5.3 How to Clear the Error Buffer](#).
- 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.
- With a normal RC, key in sequence "MUTE" followed by "062599" and "OK".
- If the content of the error buffer has not changed for 50+ hours, it resets automatically.

5.5.4 Error Buffer

In case of non-intermittent faults, clear the error buffer before starting to repair (**before** clearing the buffer, write down the

content, as this history can give significant information). This 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).

There are several mechanisms of error detection:

- Via error bits in the status registers of ICs.
- Via polling on I/O pins going to the stand-by processor.
- Via sensing of analogue values on the stand-by processor or the PNX8541.
- Via a "not acknowledge" of an I²C communication.

Take notice that some errors need several minutes before they start blinking or before they will be logged. So in case of problems wait 2 minutes from start-up onwards, and then check if the front LED is blinking or if an error is logged.

Table 5-2 Layer 1 code overview (multi chassis overview)

LAYER 1 codes		
SSB	2	
Display supply	3	
Platform supply	4	Only for display option 196 and 197
Fan	7	
AmbiLight or DC/DC or 3D LED dim panel	8	

Table 5-3 Error code overview (multi chassis overview)

Description	LAYER 1 error	LAYER 2 error	Monitored	Medium	Error/Prot.	EB: in Error Buffer BL: Blinking LED	Device	Defective board	Special Remarks
Main NVM	2	0	MIPS	I ² C1	E	x	STM24C128	SSB	TV shut down with red LED blinking 2.
Temp. protection	3	12	MIPS	I ² C4	P	BL/EB		Supply	
I ² C3	2	13	MIPS	I ² C3	E	BL/EB	SSB	SSB	TV is rebooting endlessly with red LED blinking "2".
I ² C2	2	14	MIPS	I ² C2	E	BL/EB	SSB	SSB	
PNX does not boot (HW cause) PNX 5100 does not boot	2	15	St-by µP	I ² C1	P	BL	SSB	SSB	TV is rebooting endlessly with red LED blinking "2"
12V	3	16	St-by µP	I/O	P	BL		Supply	TV shut down with red LED blinking "3".
12V	3	16	St-by µP	I/O	P	BL		Platform Supply	
Inverter or display supply	3	17	Mips	I/O	E	EB		Supply	TV still in normal operation mode, but without backlights. Enter CSM Layer 1 red LED blinking "3".
Only for display option 196 and 197	4	17	Mips	I/O	E	EB		Display Supply	
1V2, 1V2, 3V3, 5V to low	2	18	St-by µP	I/O	P	BL		SSB	TV shut down with red LED blinking "2".
PNX 5100	2	21	MIPS	I ² C3	E	EB	PNX 5100	SSB	TV is rebooting endlessly, with red LED blinking "2" (shown every 20 second).
HDMI MUX	2	23	MIPS	I ² C3	E	EB	TDA9996	SSB	Activate CSM red LED blinking "2".
I ² C switch	2	24	Mips	I ² C2	E	EB	PCA9540	SSB	
Boot-NVM PNX5100	2	25	MIPS	I ² C3	E	EB	STM24C08	SSB	TV is rebooting endlessly, with red LED blinking "2" (shown every minute).
Multi Standard demodulator (Micronas IF)	2	27	MIPS	I ² C3	E	EB	DRX3616K DRX3626K	SSB	TV is in normal operation but without video displayed (RF).
ARM (AL)	8	28	MIPS	I ² C3	E	EB	NXP LPC2103	AL mod. or DC/DC	TV is in normal operation but without AMBILIGHT "on".
FPGA (Local contrast)	2	29	MIPS	I ² C3	E	EB	Altera	SSB	
Tuner1	2	34	MIPS	I ² C3	E	EB	UV1783S HD1816	SSB	TV is in normal operation but without video displayed (RF).
FAN I ² C expander	7	41	MIPS	I ² C2	E	EB	PCA 9533	FAN mod.	
Tx sensor	7	42	MIPS	I ² C2	E	EB	LM 75	Tx sensor	
FAN 1	7	43	MIPS	I ² C2	E	EB		FAN	
FAN 2	7	44	MIPS	I ² C2	E	EB		FAN	
MIPS does not boot (SW cause)	2	53	St-by µP	I ² C1	P	BL	PNX8543	SSB	TV is rebooting endlessly with white LED blinking.
Display	5	64	MIPS	I ² C2	E	BL/EB	Altera	Display	
FPGA LED dim 2D	2	65	MIPS	I ² C3	E	EB	Xilinx	SSB	
FPGA LED dim 3D	8	65	MIPS	I ² C2	E	EB	Altera	SSB	

Extra Information

- **Rebooting.** When a TV is constantly rebooting due to internal problems, most of the time no errors will be logged or blinked. This rebooting can be recognized via a ComPair interface and Hyperterminal (for Hyperterminal settings, see section [5.8.6 UART Logging](#)). It's shown that the loggings which are generated by the main software keep continuing. In this case diagnose has to be done via ComPair.
- **Main NVM.** When there is no I²C communication towards the main NVM, LAYER 1 error = "2" will be displayed via the blinking LED procedure. In SDM, LAYER 2 error can be "19". Check the logging for keywords like "I²C bus blocked".
- **Error 13 (I²C bus 3 blocked).** When this error occurs, the TV will constantly reboot due to the blocked bus. The best way for further diagnosis here, is to use ComPair.
- **Error 15 (PNX8541 doesn't boot).** Indicates that the main processor was not able to read his bootscript. This error will point to a hardware problem around the PNX8541 (supplies not OK, PNX 8541 completely dead, I²C link between PNX and Stand-by Processor broken, etc...). When error 15 occurs it is also possible that I²C2 bus is blocked (NVM). I²C2 can be indicated in the schematics as follows: SCL-UP-MIPS, SDA-UP-MIPS, SCL-2 or SDA-2. Other root causes for this error can be due to hardware problems with: NVM PNX5100, PNX5100 itself, or DDRs.
- **Error 16 (12V).** This voltage is made in the power supply and results in protection (LAYER 1 error = "3"). When SDM is activated we see blinking LED LAYER 2 error = "16".
- **Error 17 (POK).** The display is switched "on" with the signal "Lamp On". If the inverter starts (or 24V display is OK) the POK line becomes "high". If the POK line is not "high", the set backlight will be switched "off" and "on" again for 3 times (start-up). If the set POK line becomes "high" after the retries, no error is logged; if the POK stays "low", error is logged: LAYER 1 error = "3", LAYER 2 error = "17". No protection is required, the start-up goes on.
- **Error 18 (1V2-3V3-5V too low).** All these supplies are generated by the DC/DC supply on the SSB. If one of these supplies is too low, protection occurs and blinking LED LAYER 1 error = "2" will be displayed automatically. In SDM this gives LAYER 2 error = "18".
- **Error 21 (PNX 5100).** When there is no I²C communication towards the PNX5100 after start-up (power "off" by disconnection of the mains cord), LAYER 2 error will blink continuously via the blinking LED procedure in SDM. (start-up the TV with the solder paths short to activate SDM).
- **Error 23 (HDMI).** When there is no I²C communication towards the HDMI multiplexer after start up, LAYER 2 error = "23" will be logged and displayed via the blinking LED procedure if SDM is switched "on".
- **Error 25 (Boot-NVM PNX5100).** When there is no I²C communication towards the PNX5100 NVM after start-up, TV is rebooting endlessly with blinking LAYER 1 error = 2 (shown every minute). When SDM is activated we see blinking LED LAYER 2 error = "25".
- **Error 27 (Multi Standard demodulator).** When there is no I²C communication towards the Multi Standard demodulator after start up, LAYER 2 error = "27" will be logged and displayed via the blinking LED procedure when SDM is switched "on".
- **Error 28 (FPGA ambilight).** When there is no I²C communication towards the FPGA ambilight after start up, LAYER 2 error = "28" will be logged and displayed via the blinking LED procedure if SDM is switched "on". Note that it can take up several minutes before the TV starts blinking LAYER 1 error = "2" in CSM or in SDM, LAYER 2 error = "28".
- **Error 34 (Tuner).** When there is no I²C communication towards the tuner after start up, LAYER 2 error = "34" will be logged and displayed via the blinking LED procedure when SDM is switched on.
- **Error 53.** This error will indicate that the PNX8541 has read his bootscript (when this would have failed, error 15 would blink) but initialization was never completed because

of hardware problems (NAND flash,...) or software initialization problems. Possible cause could be that there is no valid software loaded (try to upgrade to the latest main software version). Note that it can take up to 2 minutes before the TV starts blinking LAYER 1 error = "2" or in SDM, LAYER 2 error = "53".

5.6 The Blinking LED Procedure**5.6.1 Introduction**

The blinking LED procedure can be split up into two situations:

- **Blinking LED procedure LAYER 1 error.** In this case the error is automatically blinked when the TV is put in CSM. This will be only one digit error, namely the one that is referring to the defective board (see table [5-3 Error code overview \(multi chassis overview\)](#)) which causes the failure of the TV. This approach will especially be used for home repair and call centres. The aim here is to have service diagnosis from a distance.
- **Blinking LED procedure LAYER 2 error.** Via this procedure, the contents of the error buffer can be made visible via the front LED. In this case the error contains 2 digits (see table [5-3 Error code overview \(multi chassis overview\)](#)) and will be displayed when SDM (hardware pins) is activated. This is especially useful for fault finding and gives more details regarding the failure of the defective board.

Important remark:

For all errors detected by MIPS which are fatal (rebooting of the TV set, with reboot starts after LAYER 1 error blinking), one should short the SDM solder paths at start-up from the power OFF state by mains interruption and not via the power button, to trigger the SDM via the hardware pins.

When one of the blinking LED procedures is activated, the front LED will show (blink) the contents of the error-buffer. Error codes greater than 10 are shown as follows:

1. "n" long blinks (where "n" = 1 to 9) indicating decimal digit
2. A pause of 1.5 s
3. "n" short blinks (where "n" = 1 to 9)
4. A pause of approximately 3 s,
5. When all the error codes are displayed, the sequence finishes with a LED blink of 3 s
6. The sequence starts again.

Example: Error 12 8 6 0 0.

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

1. One long blink of 750 ms (which is an indication of the decimal digit) followed by a pause of 1.5 s
2. Two short blinks of 250 ms followed by a pause of 3 s
3. Eight short blinks followed by a pause of 3 s
4. Six short blinks followed by a pause of 3 s
5. One long blink of 3 s to finish the sequence
6. The sequence starts again.

5.6.2 How to Activate

Use one of the following methods:

- **Activate the CSM.** The blinking front LED will show only the latest layer 1 error, this works in "normal operation" mode or automatically when the error/protection is monitored by the stand-by processor. At the time of this release, this layer 1 error blinking was not working as expected.
In case no picture is shown and there is no LED blinking, read the logging to detect whether "error devices" are mentioned. (see section [5.8.6 UART Logging](#)).
- **Activate the SDM.** The blinking front LED will show the entire contents of the layer 2 error buffer, this works in "normal operation" mode or when SDM (via hardware pins) is activated when the tv set is in protection.

Important remark:

For all errors detected by MIPS which are fatal => rebooting of the TV set (reboot starts after LAYER 1 error blinking), one should short the solder paths at start-up from the power OFF state by mains interruption and not via the power button to trigger the SDM via the hardware pins.

- **Transmit the commands "MUTE" - "062500" - "OK" with a normal RC.** The complete error buffer is shown. Take notice that it takes some seconds before the blinking LED starts.
- **Transmit the commands "MUTE" - "06250x" - "OK" with a normal RC** (where "x" is a number between 1 and 5). When x = 1 the last detected error is shown, x = 2 the second last error, etc.... Take notice that it takes some seconds before the blinking LED starts.

5.7 Protections**5.7.1 Software Protections**

Most of the protections and errors use either the stand-by microprocessor or the MIPS controller as detection device. Since in these cases, checking of observers, polling of ADCs, and filtering of input values are all heavily software based, these protections are referred to as software protections. There are several types of software related protections, solving a variety of fault conditions:

- **Protections related to supplies:** check of the 12V, +5V, +3V3 and 1V2.
- **Protections related to breakdown of the safety check mechanism.** E.g. since the protection detections are done by means of software, failing of the software will have to initiate a protection mode since safety cannot be guaranteed any more.

Remark on the Supply Errors

The detection of a supply dip or supply loss during the normal playing of the set does not lead to a protection, but to a cold reboot of the set. If the supply is still missing after the reboot, the TV will go to protection.

Protections during Start-up

During TV start-up, some voltages and IC observers are actively monitored to be able to optimise the start-up speed, and to assure good operation of all components. If these monitors do not respond in a defined way, this indicates a malfunction of the system and leads to a protection. As the observers are only used during start-up, they are described in the start-up flow in detail (see section [5.3 Step by step Start-up](#)).

5.7.2 Hardware Protections

The only real hardware protection in this chassis appears in case of an audio problem e.g. DC voltage on the speakers. The audio protection circuit pulls the "supply-fault" low and the tv set will blink LAYER 1 error = 2 or in SDM, LAYER 2 error = 19.

Be very careful to overrule this protection via SDM (not to cause damage to the Class D audio amplifier). Check audio part first before activating via SDM. **In case one of the speakers is not connected, the protection can also be triggered.**

Repair Tips

- It is also possible that the set has an audio DC protection because of an interruption in one or both speakers (the DC voltage that is still on the circuit cannot disappear through the speakers).
Caution: (Dis)connecting the speakers during the ON state of the TV can damage the audio amplifier.

5.7.3 Important remark regarding the blinking LED indication

As for the blinking LED indication, the blinking LED of layer 1 error displaying can be switched "off" by pushing the power button on the keyboard.

This condition is not valid after the set was unpowered (via mains interruption). The blinking LED starts again and can only be switched "off" by unplugging the mains connection. This can be explained by the fact that the MIPS can not load the keyboard functionality from software during the start-up and does not recognise the keyboard commands at this time.

5.8 Fault Finding and Repair Tips

Read also section "5.5 Error Codes, 5.5.4 Error Buffer, Extra Information".

5.8.1 Ambilight

Due to degeneration process of the AmbiLights, there can be a difference in the colour and/or light output of the spare ambilight module in comparison with the originals ones contained in the TV set. Via ComPair, the light output can be adjusted.

5.8.2 CSM

When CSM is activated and there is a USB stick connected to the TV, the software will dump the complete CSM content to the USB stick. The file (Csm.txt) will be saved in the root of the USB stick. If this mechanism works it can be concluded that a large part of the operating system is already working (MIPS, USB...)

5.8.3 Exit "Factory Mode"

When an "F" is displayed in the screen's right corner, this means the set is in "Factory" mode, and it normally happens after a new SSB is mounted. To exit this mode, push the "VOLUME minus" button on the TV's local keyboard for 10 seconds (this disables the continuous mode). Then push the "SOURCE" button on the TV's local keyboard for 10 seconds until the "F" disappears from the screen.

5.8.4 DC/DC Converter

Introduction

- The best way to find a failure in the DC-DC converters is to check their starting-up sequence at "power-on via the mains cord", presuming that the stand-by microprocessor is operational.
- If the input voltage of DC-DC converters is around 12.7 V (measured on decoupling capacitors 2107 and 2123 and the enable signals are "low" (active), then the output voltages should have their normal values. The +12V and +5VPOD supplies start-up first (enabled by PODMODE signal from the stand-by microprocessor). There is a supplementary condition for 12V to start-up: if the +5V-POD does not start up due to a local defect, then +12V will not be available as well. The +5V-ON supply is enabled by the ONMODE signal (coming also from the stand-by microprocessor). The +1V2 supply starts up when the +12V appears, then at least 100 ms later, the +3V3 will be activated via the ENABLE-3V3 signal from the stand-by microprocessor. If the +12V value is less than 10 V, the last enumerated voltages will not show up due to the under-voltage detection circuit 7105-1 + 6101 and surrounding components. Furthermore, if the +12V is less than 8 V, then also the +1V2 will not be available. The +5V5-TUN generator 7202 (present only for the analogue version of China platforms) will start to operate as soon as the 12V (PSU) is present.
- The consumption of controller IC 7103 is around 19 mA (that means almost 200 mV drop voltage across resistor 3108).
- The current capability of DC-DC converters is quite high (short-circuit current is 7 to 10 A).
- The DETECT1 signal (active "low") is an internal protection (error 18) of the DC-DC convertor and will occur if the output voltage of any DC-DC convertor is out of limits (10% of the normal value).

Fault Finding

- Symptom:** +1V2 not present (even for a short while ~10 ms)
 - Check 12 V availability (resistor 3108, MOS-FETs 7101 and 7102), value of +12 V, and surrounding components)
 - Check the voltage on pin 9 (1.5 V),
 - Check for +1V2 output voltage short-circuit to GND that can generate pulsed over-currents 7...10 A through coil 5103.
 - Check the over-current detection circuit (2106 or 3131 interrupted).
- Symptom:** +1V2 present for about 100ms, +3V3 not rising.
 - Check the ENABLE-3V3 signal (active "low"),
 - Check the voltage on pin 8 (1.5 V),
 - Check the under-voltage detection circuit (the voltage on collector of transistor 7105-1 should be less than 0.8 V),
 - Check for output voltages short-circuits to GND (+3V3) that can generate pulsed over currents 7...10 A through coil 5101,
 - Check the over-current detection circuit (2105 or 3127 interrupted).
- Symptom:** +1V2 OK, +3V3 present for about 100 ms. **Possible cause:** SUPPLY-FAULT line stays "low" even though the +3V3 and +1V2 is available - the stand-by microprocessor is detecting that and switching "off" all supply voltages.
 - Check the drop voltage across resistor 3108 (they could be too high, meaning a defective controller IC or MOS-FETs),
 - Check if the boost voltage on pin 4 of controller IC 7103 is less than 14 V (should be 19 V),
 - Check if +1V2 or +3V3 are higher than their normal values - that can be due to defective DC feedback of the respective DC-DC convertor (ex. 3152, 3144).
- Symptom:** +1V2 and +3V3 show a high level of ripple voltage (audible noise can come from the filtering coils 5101, 5103). **Possible cause:** instability of the frequency and/or duty cycle of a DC-DC converter or stabiliser.
 - Check the resistor 3164, capacitors 2102 and 2103, input and output decoupling capacitors.
 - Check AC feedback circuits (2120, 2129, 3141, 3153, 2110, 2114 and 3135).
- Symptom:** +1V2, +3V3 ok, no +5V5-TUN (analogue sets only). **Possible cause:** the "+5V5-TUN GENERATOR" circuit (7202 and surroundings components) is defective: check transistor 7202 (it has to have gate voltage pulses of about 10 V amplitude and drain voltage pulses of about 35 V amplitude) and surrounding components. A high consumption (more than 6 mA) from +5V5-TUN voltage can cause also +5V5-TUN voltage to be too low or zero.

Note: when a pair of power MOSFETs (7101 or 7102) becomes defective, the controller IC 7103 should be replaced as well

5.8.5 Fan self test (only for sets with LED backlight)

In case fans are present, a softest can be done by pushing the red coloured button on the remote control while the TV set is in CSM. Exit CSM and check the status of the fans in the error buffer by entering SAM (062596 + info button on the RC). In case of failure (fully red screen) more detailed information is available in the error buffer (error 41, 42, 43, 44).

5.8.6 UART Logging

When something is wrong with the TV set (f.i. the set is rebooting) checking the UART logging using hyperterminal can be done to find more information. Hyperterminal is a standard Windows application. It can be found via Programs, Accessories, Communications, Hyperterminal. Connect a "ComPair UART"-cable (3138 188 75051) from the Service connector in the TV set, **via the ComPair interface (this is compulsory, otherwise ICs are blown in the PC)**, to the "COMx"-port of the PC. After start-up of Hyperterminal, fill in a name (f.i. "logging") in the "Connection Description" box, then apply the following settings:

1. COMx
2. Bits per second = 115200
3. Data bits = 8
4. Parity = none
5. Stop bits = 1
6. Flow control = none

During the start-up of the TV set, the logging will be displayed. This is also the case during rebooting of the TV set (the same logging appears time after time). Also available in the logging is the "Display Option Code" (useful when there is no picture), look for item "DisplayRawNumber" in the beginning of the logging.

Tip: When there is no picture available during reboot, it is possible to check for "error devices" in the logging (LAYER 2 error). This can be very helpful to determine the failure cause of the reboot. For protection state, there is no logging.

5.8.7 Loudspeakers

Make sure that the volume is set to minimum during disconnecting the speakers in the "on" state of the TV. The audio amplifier can be damaged by disconnecting the speakers during "on" state of the set! Sometimes the set can go into protection, but that is not always the case.

5.8.8 Tuner

Attention: In case the tuner is replaced, always check the tuner options!

5.8.9 Display option code

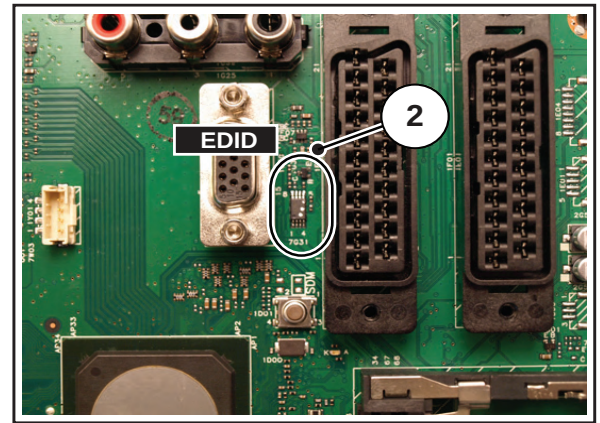
Attention: In case the SSB is replaced, always check the display option code in SAM, even when picture is available. Performance with the incorrect display option code can lead to unwanted side-effects for certain conditions. See also [Table 6-3](#) for the code.

5.8.10 Upgrade HDMI EDID NVM

To upgrade the HDMI EDID, see ComPair for further instructions.

5.8.11 Upgrade VGA EDID NVM

To upgrade the VGA EDID NVM, pin 7 of the EDID NVM [2] has to be short circuited to ground. See ComPair for further instructions.



18440_201_090225.eps
090306

Figure 5-10 VGA EDID NVM

5.8.12 SSB Replacement

Follow the instructions in the flowchart in case a SSB has to be exchanged. See [Figure 5-11](#).

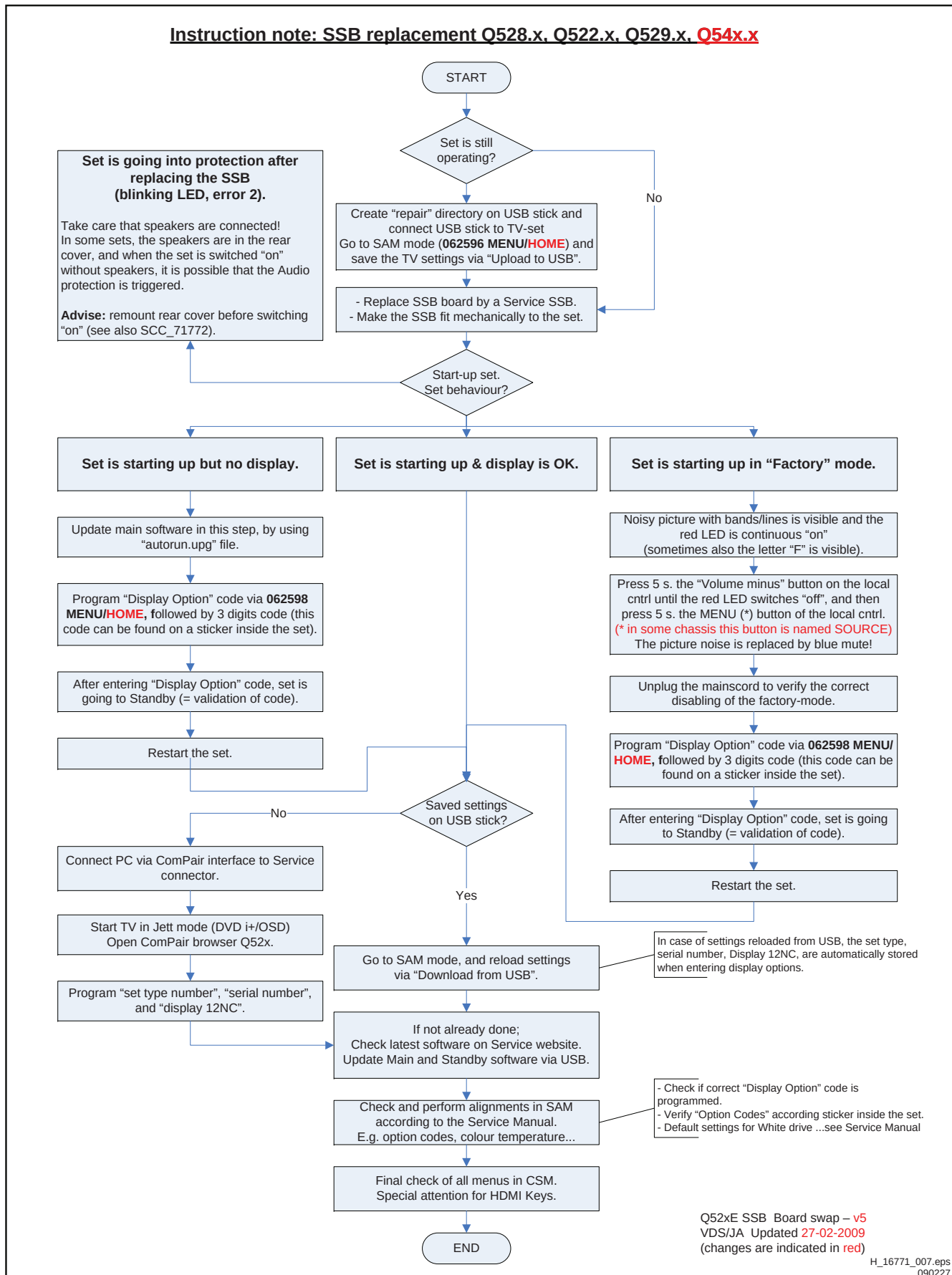


Figure 5-11 SSB replacement flowchart

5.9 Software Upgrading

5.9.1 Introduction

The set software and security keys are stored in a NAND-Flash, which is connected to the PNX8541 via the PCI bus.

It is possible **for the user** to upgrade the **main** software via the USB port. This allows replacement of a software image in a stand alone set, without the need of an E-JTAG debugger. A description on how to upgrade the main software can be found in the DFU.

Important: When the NAND-Flash must be replaced, a new SSB must be ordered, due to the presence of the security keys! (copy protection keys, MAC address, ...). It is however also possible to replace the NAND-Flash with a good one from a scrap-board.

Perform the following actions after SSB replacement:

1. Set the correct option codes (see sticker inside the TV).
2. Update the TV software (see the DFU for instructions).
3. Perform the alignments as described in section [Reset of Repaired SSB](#).
4. Check in CSM if the HDMI keys are valid.

For the correct order number of a new SSB, always refer to the Spare Parts list, available on the Philips Spare Part web portal.

5.9.2 Main Software Upgrade

- The "UpgradeAll.upg" file is only used in the factory.
- The "FlashUtils.upg" file is only used by Service centres that are allowed to do component level repair on the SSB.

Automatic Software Upgrade

In "normal" conditions, so when there is no major problem with the TV, the main software and the default software upgrade application can be upgraded with the "AUTORUN.UPG" (FUS part of the one-zip file: e.g. FUS_Q5431E_1.25.5.0_commercial.zip). This can also be done by the consumers themselves, but they will have to get their software from the commercial Philips website or via the Software Update Assistant in the user menu (see DFU). The "autorun.upg" file must be placed in the root of the USB stick.

How to upgrade:

1. Copy "AUTORUN.UPG" to the root of the USB stick.
2. Insert USB stick in the set while the set is in ON MODE. The set will restart and the upgrading will start automatically. As soon as the programming is finished, a message is shown to remove the USB stick and restart the set.

Manual Software Upgrade

In case that the software upgrade application does not start automatically, it can also be started manually.

How to start the software upgrade application manually:

1. Disconnect the TV from the Mains/AC Power.
2. Press the "OK" button on a Philips TV remote control or a Philips DVD RC-6 remote control (it is also possible to use a TV remote in "DVD" mode). Keep the "OK" button pressed while reconnecting the TV to the Mains/AC Power.
3. The software upgrade application will start.

Attention!

In case the download application has been started **manually**, the "autorun.upg" will maybe not be recognized.

What to do in this case:

1. Create a directory "UPGRADES" on the USB stick.
2. Rename the "autorun.upg" to something else, e.g. to "software.upg". Do not use long or complicated names, keep it simple. Make sure that "AUTORUN.UPG" is no longer present in the root of the USB stick.
3. Copy the renamed "upg" file into this directory.
4. Insert USB stick into the TV.

5. The renamed "upg" file will be visible and selectable in the upgrade application.

Back-up Software Upgrade Application

If the default software upgrade application does not start (could be due to a corrupted boot 2 sector) via the above described method, try activating the "back-up software upgrade application".

How to start the "back-up software upgrade application" manually:

1. Disconnect the TV from the Mains/AC Power.
2. Press the "INFO"-button on a Philips remote control or "CURSOR DOWN" button on a Philips DVD RC-6 remote control (it is also possible to use a TV remote in "DVD" mode). Keep the "INFO"-button (or "cursor down" button) pressed while reconnecting the TV to the Mains/AC Power.
3. The software upgrade application will start.

5.9.3 Stand-by Software Upgrade via USB

In this chassis it is possible to upgrade the Stand-by software via a USB stick. The method is similar to upgrading the main software via USB.

Use the following steps:

1. Create a directory "UPGRADES" on the USB stick.
2. Copy the Stand-by software (part of the one-zip file, e.g. StandbySW_CFT69_84.0.0.0.upg) into this directory.
3. Insert the USB stick into the TV.
4. Start the download application manually (see section [Manual Software Upgrade](#)).
5. Select the appropriate file and press the "red" button to upgrade.

5.9.4 Content and Usage of the One-Zip Software File

Below the content of the One-Zip file is explained, and instructions on how and when to use it.

File name	Description
907.5_PnSEsticker.zip	Contains the E-sticker data. Not to be used by Service technicians.
cabinet_TV543_x.x.x.x.zip	Contains acoustic parameters per cabinet. Not to be used by Service technicians.
ceisp2padll_P2PAD_x.x.x.x.zip	Not to be used by Service technicians. For ComPair development only.
display_TV543_x.x.x.x.zip	Not to be used by Service technicians.
EJTAGDownload_Q5431_x.x.x.x.zip	Only used by service centra which are allowed to do Component Level Repair.
Factory_Q5431_x.x.x.x.zip	Only for production purposes, not to be used by Service technicians.
FlashUtils_Q5431_x.x.x.x.zip	Not to be used by Service technicians.
FUS_Q5431_x.x.x.x.zip	Contains the "autorun.upg" which is needed to upgrade the TV main software and the software download application.
HDMI_FHD_EDID_Q5431_x.x.x.x.zip	Contains the EDID content of the different (FHD) HDMI NVM's. See ComPair for further instructions.
HDMI_HD_EDID_Q5431_x.x.x.x.zip	Contains the EDID content of the different (HD) HDMI NVM's. See ComPair for further instructions.
lightGuide_TV543_x.x.x.x.zip	Not to be used by Service technicians.
OAD_Q5431_x.x.x.x.zip	Not to be used by Service technicians.
Pgamma_xxxxxxx_Q5431_x.x.x.x.zip	Contains NVM data for the specific display control board. Not to be used by Service technicians.
PQ_Q5431_x.x.x.x.zip	Not to be used by Service technicians.
processNVM_Q5431_x.x.x.x.zip	Default NVM content. Must be programmed via ComPair.

File name	Description
StandbySW_CFT69_x.x.x.x.zip	Contains the Stand-by software in "upg" and "hex" format. - The "StandbySW_XXXXX_prod.upg" file can be used to upgrade the Stand-by software via USB. - The "StandbySW_XXXXX.hex" file can be used to upgrade the Stand-by software via ComPair. - The files "StandbySW_XXXXX_exhex.hex" and "StandbySW_XXXXX_dev.upg" may not be used by Service technicians (only for development purposes).
Tcon_XXXXXXX_Q5431_x.x.x.x.zip	Contains NVM data for the specific display control board. Not to be used by Service technicians.
UpgradeAll_Q5431_x.x.x.x.zip	Only for production purposes, not to be used by Service technicians. Caution: Never try to use this file, because it will overwrite the HDCP keys!
UpgradeExe_Q5431_x.x.x.x.zip	Only for production purposes, not to be used by Service technicians.
VGA_FHD_EDID_TV543_x.x.x.x.zip	Contains the EDID content of the different (FHD) VGA NVM. See ComPair for further instructions.
VGA_HD_EDID_TV543_x.x.x.x.zip	Contains the EDID content of the different (HD) VGA NVM. See ComPair for further instructions.

6. Alignments

Index of this chapter:

[6.1 General Alignment Conditions](#)

[6.2 Hardware Alignments](#)

[6.3 Software Alignments](#)

[6.4 Option Settings](#)

[6.5 Reset of Repaired SSB](#)

[6.6 Total Overview SAM modes](#)

6.1 General Alignment Conditions

Perform all electrical adjustments under the following conditions:

- Power supply voltage (depends on region):
 - AP-NTSC:** 120 V_{AC} or 230 V_{AC} / 50 Hz (± 10%).
 - AP-PAL-multi:** 120 - 230 V_{AC} / 50 Hz (± 10%).
 - EU:** 230 V_{AC} / 50 Hz (± 10%).
 - LATAM-NTSC:** 120 - 230 V_{AC} / 50 Hz (± 10%).
 - US:** 120 V_{AC} / 60 Hz (± 10%).
 - Connect the set to the mains via an isolation transformer with low internal resistance.
 - Allow the set to warm up for approximately 15 minutes.
 - Measure voltages and waveforms in relation to correct ground (e.g. measure audio signals in relation to AUDIO_GND).
- Caution:** It is not allowed to use heat sinks as ground.
- Test probe: R_i > 10 MΩ, C_i < 20 pF.
 - Use an isolated trimmer/screwdriver to perform alignments.

6.1.1 Alignment Sequence

- First, set the correct options:
 - In SAM, select "Options", and then "Option numbers".
 - Fill in the option settings for "Group 1" and "Group 2" according to the set sticker (see also section [Option Settings](#)).
 - Press OK on the remote control before the cursor is moved to the left.
 - In submenu "Option numbers" select "Store" and press OK on the RC.
- OR:
 - In main menu, select "Store" again and press OK on the RC.
 - Switch the set to Stand-by.
- Warming up (>15 minutes).

6.2 Hardware Alignments

Not applicable.

6.3 Software Alignments

Put the set in SAM mode (see chapter [5. Service Modes, Error Codes, and Fault Finding](#)). The SAM menu will now appear on the screen. Select ALIGNMENTS and go to one of the sub menus. The alignments are explained below.

The following items can be aligned:

- Tuner AGC.
- White point.

To store the data:

- Press OK on the RC **before the cursor is moved to the left**.
- In main menu select "Store" and press OK on the RC.
- Press MENU on the RC to switch back to the main menu.
- Switch the set to stand-by mode.

For the next alignments, supply the following test signals via a video generator to the RF input:

- EU/AP-PAL models:** a PAL B/G TV-signal with a signal strength of at least 1 mV and a frequency of 475.25 MHz
- US/AP-NTSC models:** an NTSC M/N TV-signal with a signal strength of at least 1 mV and a frequency of 61.25 MHz (channel 3).
- LATAM models:** an NTSC M TV-signal with a signal strength of at least 1 mV and a frequency of 61.25 MHz (channel 3).

6.3.1 Tuner AGC (RF AGC Take Over Point Adjustment)

Purpose: To keep the tuner output signal constant as the input signal amplitude varies.

No alignment is necessary, as the AGC alignment is done automatically (standard value: "64").

Store settings and exit SAM.

6.3.2 White Point

- Set "Active control" to "Off".
- Choose "TV menu", "TV Settings" and then "Picture" and set picture settings as follows:

Picture Setting	
Dynamic backlight	Off
Dynamic Contrast	Off
Colour Enhancement	Off
Picture Format	Un scaled
Light Sensor	Off
Brightness	50
Colour	0
Contrast	100

- Go to the SAM and select "Alignments"-> "White point".

White point alignment LCD screens:

- Use a 100% white screen as input signal and set the following values:
 - "Colour temperature": "Normal".
 - All "White point" values to: "127".
 - "Red BL offset" values to "7".
 - "Green BL offset" values to "7".

In case you have a colour analyser:

- Measure with a calibrated contactless colour analyser in the centre of the screen. Consequently, the measurement needs to be done in a dark environment.
- Adjust the correct x, y coordinates (while holding one of the White point registers R, G or B on 127) by means of decreasing the value of one or two other white points to the correct x, y coordinates (see [Table 6-1](#)). Tolerance: dx: ± 0.004, dy: ± 0.004.
- Repeat this step for the other colour temperatures that need to be aligned.
- When finished press OK on the RC and then press STORE (in the SAM root menu) to store the aligned values to the NVM.
- Restore the initial picture settings after the alignments.

Table 6-1 White D alignment values

Value	Cool (11000K)	Normal (9000K)	Warm (6500K)
x	0.278	0.289	0.314
y	0.278	0.291	0.319

If you do not have a colour analyser, you can use the default values. This is the next best solution. The default values are average values coming from production.

- Select a COLOUR TEMPERATURE (e.g. COOL, NORMAL, or WARM).

- Set the RED, GREEN and BLUE default values according to the values in the "Tint settings" table.
- When finished press OK on the RC, then press STORE (in the SAM root menu) to store the aligned values to the NVM.
- Restore the initial picture settings after the alignments.

Table 6-2 White tone default settings

White Tone	32"			42"			Black level offset	
Colour Temp	R	G	B	R	G	B	R	G
Normal	127	103	102	127	122	112	7	7
Cool	127	105	122	122	122	127	7	7
Warm	127	94	68	127	111	70	7	7

6.3.3 LCD Panel Flicker Alignment

Note: This is only necessary for Forward Integration models (sets that have the LCD Timing Controller (TCON) located on the SSB).

See ComPair for further instructions.

6.4 Option Settings

6.4.1 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 PNX5100 ICs (back-end advanced video picture improvement IC which offers motion estimation and compensation features (commercially called HDNM) plus integrated Ambilight control) is made known by the option codes.

Notes:

- After changing the option(s), save them by pressing the OK button on the RC before the cursor is moved to the left, select STORE in the SAM root menu and press OK on the RC.
- The new option setting is only active after the TV is switched "off" / "stand-by" and "on" again with the mains switch (the NVM is then read again).

6.4.2 Dealer Options

For dealer options, in SAM select "Dealer options". See [Table 6-4](#).

6.4.3 (Service) Options

Select the sub menu's to set the initialisation codes (options) of the model number via text menus. See [Table 6-4](#).

6.4.4 Opt. No. (Option numbers)

Select this sub menu to set all options at once (expressed in two long strings of 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 quickly. All options are controlled via eight option numbers.
When the NVM is replaced, all options will require resetting. 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 sticker inside the TV set and in table "Option code overview".

Example: The options sticker gives the following option numbers:

- 08192 00133 01387 45160
- 12232 04256 00164 00000

The first line (group 1) indicates hardware options 1 to 4, the second line (group 2) indicate software options 5 to 8. Every 5-digit number represents 16 bits (so the maximum value will 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. See tables "Option code overview" for the options.

Diversity

Not all sets with the same Commercial Type Number (CTN) necessarily have the same option code!
Use of Alternative BOM An alternative BOM number usually indicates the use of an alternative display or power supply. This results in another display code thus in another Option code. For the power supply there is no difference.
Refer to [3. Precautions, Notes, and Abbreviation List](#).

6.4.5 Option Code Overview

Table 6-3 Option and display code overview

CTN (Alt. BOM#)	Options Group 1	Options Group 2	Disp. code
32PFL5604H/12 (Alt. BOM 1)	08192 00133 01387 45160	10184 12448 00165 00000	200
32PFL5604H/12 (Alt. BOM 2)	08192 00133 01387 45160	10183 12448 00165 00000	199
42PFL5604H/12	08192 00135 01387 45160	10186 12448 00165 00000	202

Important: after having edited the option numbers as described above, you **must press OK** on the remote control **before the cursor is moved to the left!**

6.5 Reset of Repaired SSB

A very important issue towards a repaired SSB from a service repair shop implies the reset of the NVM on the SSB.
A repaired SSB in service should get the service Set type "00PF0000000000" and Production code "00000000000000". Also the virgin bit is to be set. To set all this, you can use the ComPair tool.
In case of a display replacement, reset the "Operation hours" to "0", or to the operation hours of the replacement display.

6.6 Total Overview SAM modes

Table 6-4 SAM mode overview

Main Menu	Sub-menu 1	Sub-menu 2	Sub-menu 3	Description
Hardware Information	A. SW VERSION	e.g. "Q5431_0.26.10.0"		Display TV & Stand-by SW version and CTN serial number.
	B. Stand-by processor version	e.g. "STDBY_84.69.0.0"		
	C. Production code	e.g. "See type plate"		
Operation hours				Displays the accumulated total of operation hours. TV switched "on/off" & every 0.5 hours is increase one
Error				Displayed the most recent error.
Reset error buffer				Clears all content in the error buffer.
Alignment	Tuner AGC			RF-AGC Take over point adjustment (AGC default value is 64)
	White point	Colour temperature	Normal	3 difference modes of colour temperature can be selected
			Warn	
			Cool	
		White point red		LCD White Point Alignment. For values, see Table 6-1 .
		White point green		
		White point blue		
		Red black level offset		
		Green black level offset		
Dealer options	Picture mute	Off/On		Select Picture mute On/Off. Picture is muted / not muted in case no input signal is detected at input connectors.
	Virgin mode	Off/On		Select Virgin mode On/Off. TV starts up / does not start up (once) with a language selection menu after the mains switch is turned "on" for the first time (virgin mode)
	E-sticker	Off/On		Select E-sticker On/Off (USP's on-screen)
	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
Options	Digital broadcast	DVB	Off/On	Select DVB On/Off
		DVB - T installation	Off/On or Country dependent	Select DVB T installation On/Off or by country
		DVB - T light	Off/On	Select DVB T light On/Off
		DVB - C	Off/On	Select DVB C On/Off
		DVB - C installation	Off/On or Country dependent	Select DVB C installation On/Off or by country
		Over the air download	Off/On or Country dependent	Select Over the air download On/Off or by country
		8 days EPG	Off/On	Select 8 day EPG On/Off
	Digital features	USB	Off/On	Select USB On/Off
		Ethernet	Off/On	Select Ethernet On/Off
		Wi-Fi	Off/On	Select Wi-Fi On/Off
		DLNA	Off/On	Select DLNA On/Off
		On-line service	Off	On-line service is Off
		PTP (Picture Transfer Protocol)	Off/On	Select PTP On/Off
		Update assistant	Off/On	Select Update assistant On/Off
		Internet software update	Off	Internet software update is Off
	Display	Screen	201 / LCD LGD WUE SBA1 37"	Displayed the panel code & type model.
		LightGuide	Off/On	Select LightGuide On/Off
		Display fans	Not present/Present	Select Display fans Present/Not present.
		Temperature sensor	No sensor	N.A
		Temperature LUT	0	N.A
		E-box & monitor	Off/On	Select E-box & monitor On/Off
	Video reproduction	Picture processing	None/PNX5100	Select Picture processing None/PNX5100 (Q543.xE chassis).
		MOP local contrast	Off/On	Select MOP local contrast On/Off
		Light sensor	Off/On	Select Light sensor On/Off
		Light sensor type	0/1/2/3	Select Light sensor type form 0 to 3 (for difference styling).
		Pixel Plus type	Pixel Plus HD	Select type of picture improvement.
			Perfect Pixel HD	
			Pixel Precise HD	
			Pixel Plus HD (used in Q543.xE)	
			Pixel Precise HD (used in Q548.1E)	
		Ambilight	None,	Select type of Ambilight modules use.
			2 sided 2/2	For 8400 series only
			2 sided 4/4	
			3 sided 2/3/2	
			3 sided 4/3/4	
			3 sided 4/5/4	
			4 sided 4/3/4/3	
		Ambilight technology	LED/Future use	Ambilight technology LED is in use.
		MOP ambilight	Off/On	Select MOP ambilight On/Off

Main Menu	Sub-menu 1	Sub-menu 2	Sub-menu 3	Description
	Audio reproduction	Acoustic system		Cabinet design used for setting dynamic audio parameters.
	Source selection	EXT1/AV1 type	SCART CBVS RGB LR	Select input source when connected with external equipment.
			CVBS Y/C YPbPr LR	
			CVBS Y/C YPbPr HV LR	
			(CVBS) YPbPr LR	
		EXT2/AV2 type	SCART CBVS RGB LR	Select input source when connected with external equipment.
			CVBS Y/C LR	
			(CVBS) YPbPr LR	
			CVBS Y/C LR	
		EXT3/AV3 type	None	Select input source when connected with external equipment.
			CVBS	
			CVBS LR	
			YPbPr	
			YPbPr LR	
			YPbPr HV LR	
		VGA	Off/On	Select VGA On/Off
		SIDE I/O	Off/On	Select SIDE I/O On/Off
		HDMI 1	Off/On	Select HDMI 1 On/Off
		HDMI 2	Off/On	Select HDMI 2 On/Off
		HDMI 3	Off/On	Select HDMI 3 On/Off
		HDMI 4	Off/On	Select HDMI 4 On/Off
		HDMI side	Off/On	Select HDMI side On/Off
		HDMI CEC	Off/On	Select HDMI CEC On/Off
		HDMI CEC RC pass through	Off/On	Select HDMI CEC RC pass through On/Off
		HDMI CEC Pixel Plus link	Off/On	Select Pixel Plus link On/Off
	Miscellaneous	Region	Europe/AP-PAL-MULTI/Australia	Select Region/country.
		Tuner type	HD1816-MK1/TD1716-MK4/TD1716-MK3/HD1816-MK2	Select type of Tuner used.
		System RC support	Off/On	Select System RC support On/Off.
		Embedded user manual	Off/On	Select Embedded user manual On/Off.
		Start-up screen	Off/On	Select Start-up screen On/Off.
		Wallpaper	Off/On	Select Wallpaper On/Off.
		Hotel mode	Off	Hotel mode is Off.
Option number	Group 1	e.g. "08192.02181.01387.45160"		The first line (group 1) indicates hardware options 1 to 4.
	Group 2	e.g. "10185.12448.00164.00000"		The second line (group 2) indicates software options 5 to 8.
	Store			Store after changing.
Initialise NVM				N.A
Store				Select Store in the SAM root menu after making any changes.
Software maintenance	Software events	Display		Display information is for development purposes.
		Clear		
		Test reboot		
		Test reboot is to restart the TV.		
	Hardware events	Display		Display information is for development purposes.
		Clear		
Operation hours display		0003		In case the display must be swapped for repair, you can reset the "Display operation hours" to "0". So, this one does keeps up the lifetime of the display itself (mainly to compensate the degeneration behaviour).
Test setting	Digital information	QAM modulation: 64-QAM		Display information is for development purposes.
		Symbol rate: 23:29		
		Original network ID: 12817		
		Network ID:12817		
		Transport stream ID: 2		
		Service ID: 3		
		Hierarchical modulation: 0		
		Selected video PID: 35		
		Selected main audio PID: 99		
		Selected 2nd audio PID: -1		
	Install start frequency	000		Install start frequency from 0 MHz
	Install end frequency	999		Install end frequency as 999 MHz
	Default install frequency			
	Installation	Digital only		Select Digital only or Digital + Analogue before installation.
		Digital + Analogue		

Main Menu	Sub-menu 1	Sub-menu 2	Sub-menu 3	Description
Development file versions	Development 1 file version	Display parameters DISPT 4.0.8.11		Display information is for development purposes.
		Acoustics parameters ACSTS 3.0.6.1		
		PQF - Fixed settings 1 "4.54.34.32.34"		
		PQS - Profile set 1 "4.57.34.32.34"		
		PQU - User styles 1 "4.56.34.32.34"		
	Development 2 file version	12NC one zip software		Display information is for development purposes.
		Initial main software		
		NVM version Q5431_0.4.3.0		
		Flash units SW Q5431_0.16.48.24		
Upload to USB	Channel list			To upload several settings from the TV to an USB stick
	Personal settings			
	Option codes			
	Display-related alignment			
	History list			
Download from USB	Channel list			To download several settings from the USB stick to the TV.
	Personal settings			
	Option codes			
	Display-related alignment			

7. Circuit Descriptions

Index of this chapter:

- [7.1 Introduction](#)
- [7.2 Power Supply](#)
- [7.3 DC-DC Converter](#)
- [7.4 Front-End](#)
- [7.5 HDMI](#)
- [7.6 Video and Audio Processing - PNX8543](#)
- [7.7 Back-End - On-board Timing Controller \(TCON\)](#)
- [7.8 Common Interface CI+](#)

Notes:

- Only **new** circuits (circuits that are not published recently) are described.
- Figures can deviate slightly from the actual situation, due to different set executions.
- For a good understanding of the following circuit descriptions, please use the wiring, block (see chapter [9. Block Diagrams](#)) and circuit diagrams (see chapter [10. Circuit Diagrams and PWB Layouts](#)).Where necessary, you will find a separate drawing for clarification.

Main difference with the previous platform is the presence of the Timing Controller (TCON) on the SSB instead of on the LCD Panel.

7.1.1 Implementation

Key components of this chassis are:

- PNX8543 Digital Colour Decoder
- R8J01070FT Timing Controller
- HD1816AF Hybrid Tuner
- DRX3926K Demodulator
- TDA9996 HDMI Switch
- TPA3123D2PWP Class D Power Amplifier.

7.1.2 TV543 Architecture Overview

- For details about the chassis block diagrams refer to chapter [9. Block Diagrams](#). An overview of the TV543 architecture can be found in [Figure 7-1](#).

7.1 Introduction

The Q543.3E LA chassis (platform name TV543/32) is a derivative from the Q522.2E LA chassis (platform TV522).

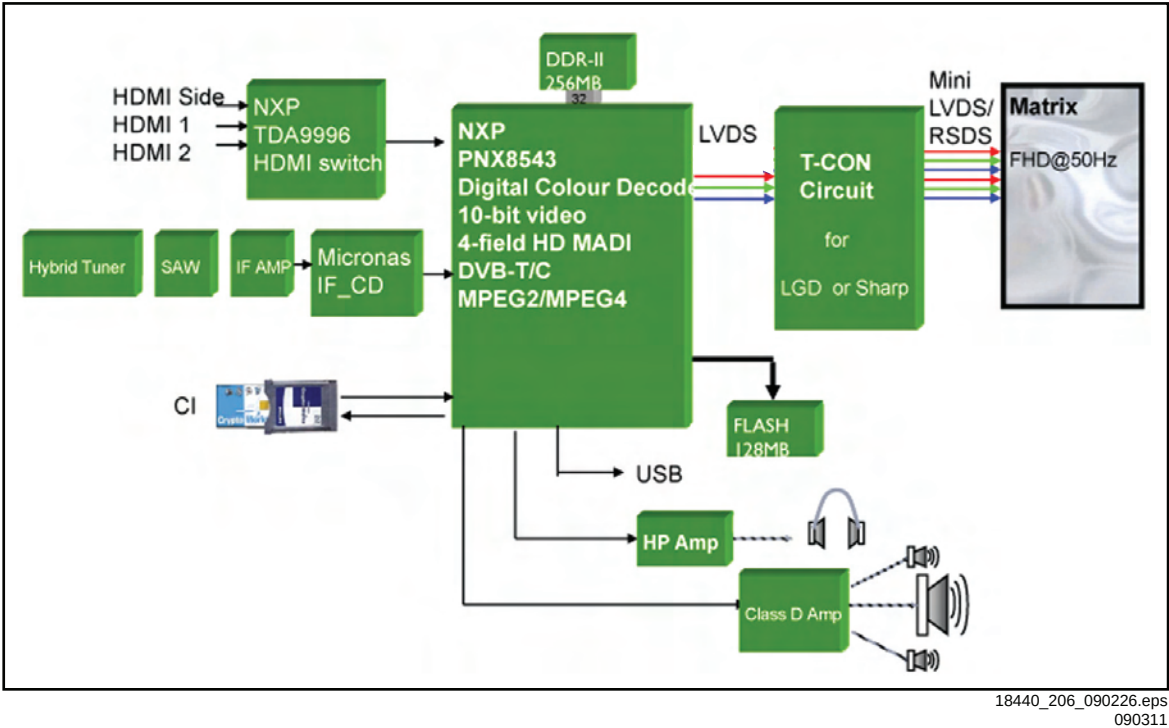


Figure 7-1 Architecture of TV543/32 Forward Integration platform

7.1.3 SSB Cell Layout

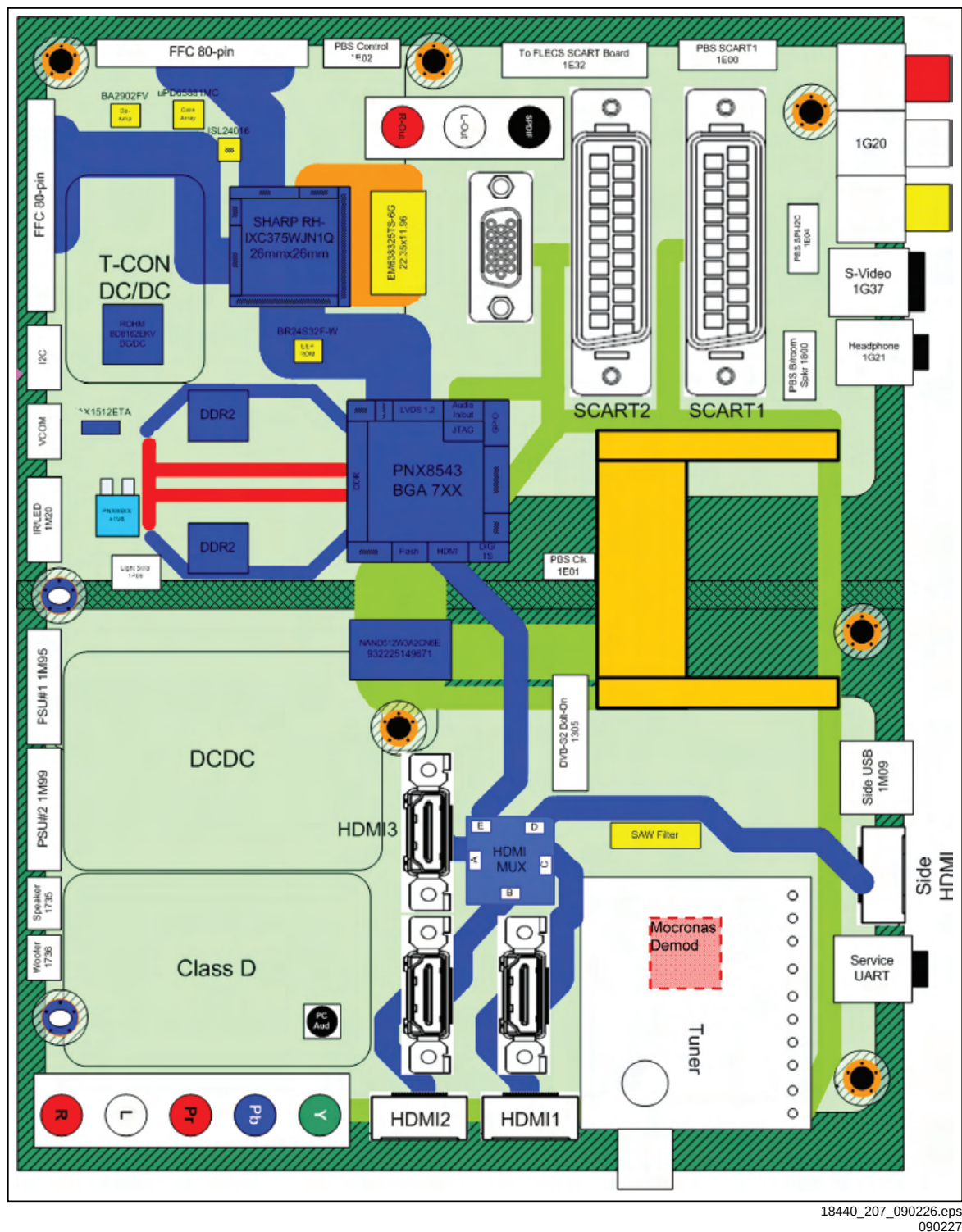


Figure 7-2 SSB layout cells (top view)

7.2 Power Supply

All power supplies described below are a black box for Service. When defective, a new board must be ordered and the defective one must be returned, unless the main fuse of the board is broken. Always replace a defective fuse with one with the correct specifications! This part is available in the regular market.

Consult the Service Spare Parts website for the order codes of the boards.

7.2.1 Specifications

The only type of power supply used in the TV543 Forward Integration platform is the Integrated Power Board (IPB) - incl. inverter.

In this manual, no detailed information is available because of design protection issues.

7.2.2 Diversity

Below find an overview of the different PSUs that are used:

Table 7-1 Supply diversity

Supplier	PSU	Model	Input Voltage Range
LGIT	PLHL-T837A	32" LG display	High Mains (198 to 265 V _{AC})
LGIT	PLHL-T813A	42" LG display	High Mains (198 to 265 V _{AC})
tbd	tbd	32" Sharp display	tbd
tbd	tbd	42" Sharp display	tbd

It should be noted that for different display manufacturers, different PSUs are used. When ordering a new PSU, always check which LCD panel is used in the set, and order the correct PSU!

7.2.3 Application

An application diagram can be found below:

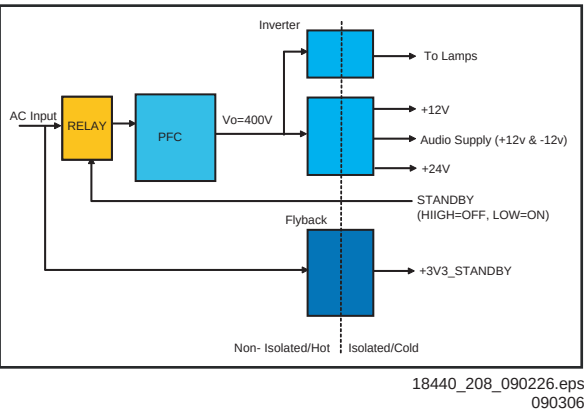


Figure 7-3 Application Integrated Power Board

7.2.4 Power Supply Timing

The STANDBY signal controls the on-mode voltages +12V, +V_{snd} and +24V. During chassis cold start from AC mains, +12V can be expected to be stable within 1.0 seconds, while for a warm start, i.e. wake up from stand-by power state, this timing becomes 0.5 seconds maximum. During AC switch off, stand-by power +3V3-STANDBY decay is at least 20 ms but

not more than 5.0 seconds compared to +12V. Refer to [Figure 7-4](#):

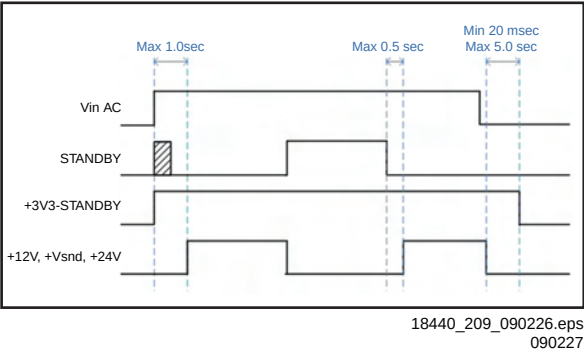


Figure 7-4 PSU Timing Diagram

7.2.5 Power Supply Protection

Power supply protection is implemented via the stand-by controller of the PNX8543 via the following signals:

- POWER-OK: signal from PSU to indicate if the supply output from the IPB is normal
- DETECT1: signal to indicate if the +5V, +3V3 and +1V2 voltages on the chassis are present
- DETECT2: signal to indicate if the +12V voltage on the chassis is present.

7.3 DC-DC Converter

Input power is obtained from the IPB module via the following voltages:

- +3V3-STANDBY (stand-by-mode only)
- +12V (on-mode)
- +V_{snd} (audio power) (on-mode)
- +24V (bolt-on power) (on-mode).

Control is achieved by the PNX8543 controller via the STANDBY signal.

Audio power is specifically for audio supply usage only and does not go through any DC conversion.

Below find a block diagram of the on-board DC-DC converters.

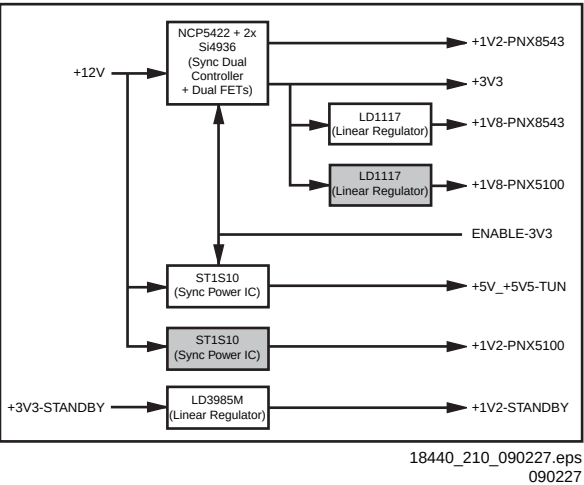


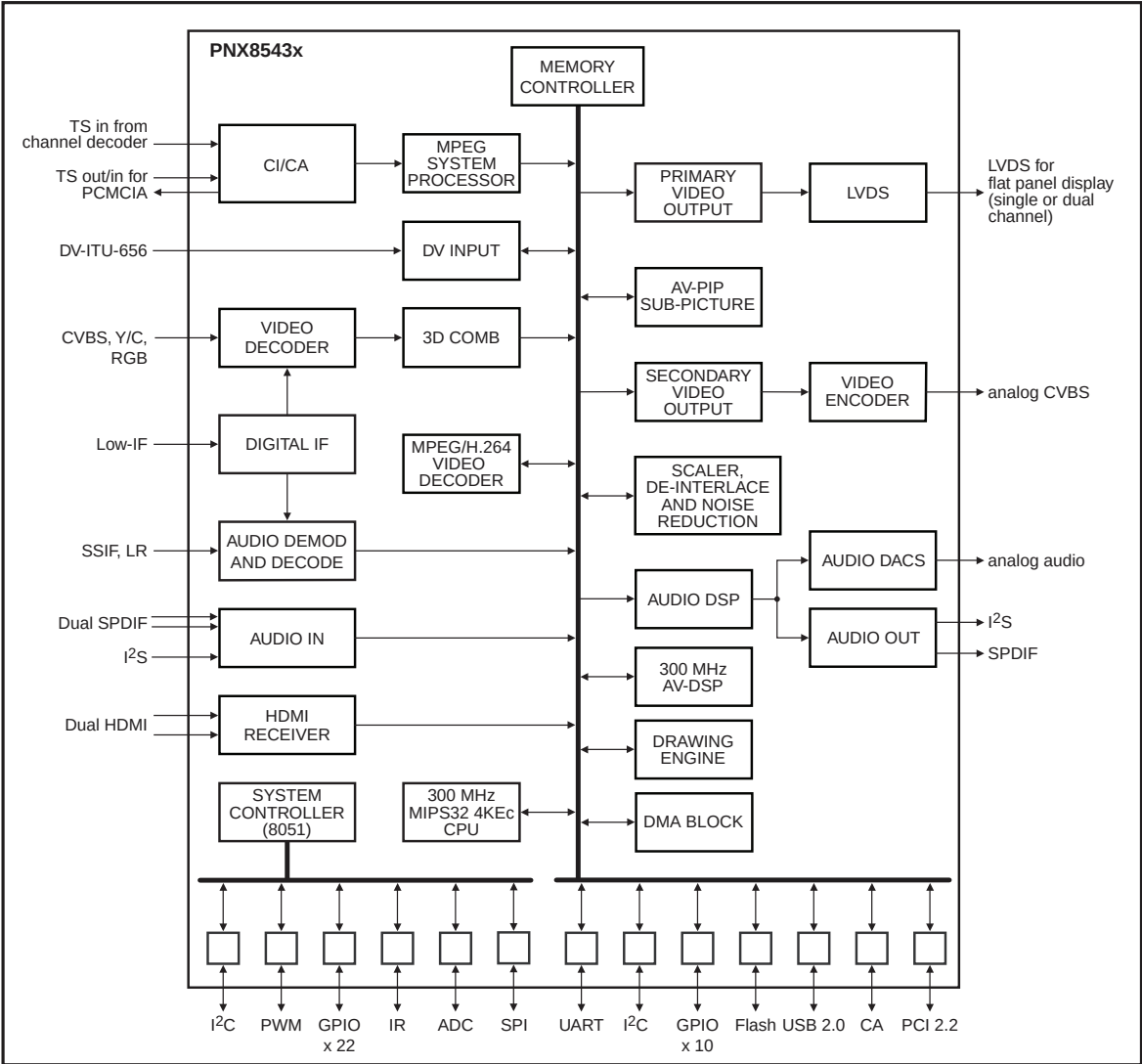
Figure 7-5 DC-DC converters

7.6 Video and Audio Processing - PNX8543

The PNX8543 is the main audio and video processor (or System-on-Chip) for this platform. It is a member of the PNX85xx SoC family (described in earlier chassis) with the addition of the MPEG4 functionality; the separate STi710x MPEG4 decoder is no longer implemented in this platform.

The PNX8543 handles the digital and analogue audio- and video decoding and processing. The processor is a MIPS32 general purpose CPU and a 8051-based TV controller for power management and user event handling.

- For a functional diagram of the PNX8543, refer to [Figure 7-9](#).



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Figure 7-9 PNX8543 functional diagram

7.6.1 Video Subsystem

Refer to [Figure 7-10](#) for the main video interfaces for the PNX8543 and the video signal flow between blocks and memory.

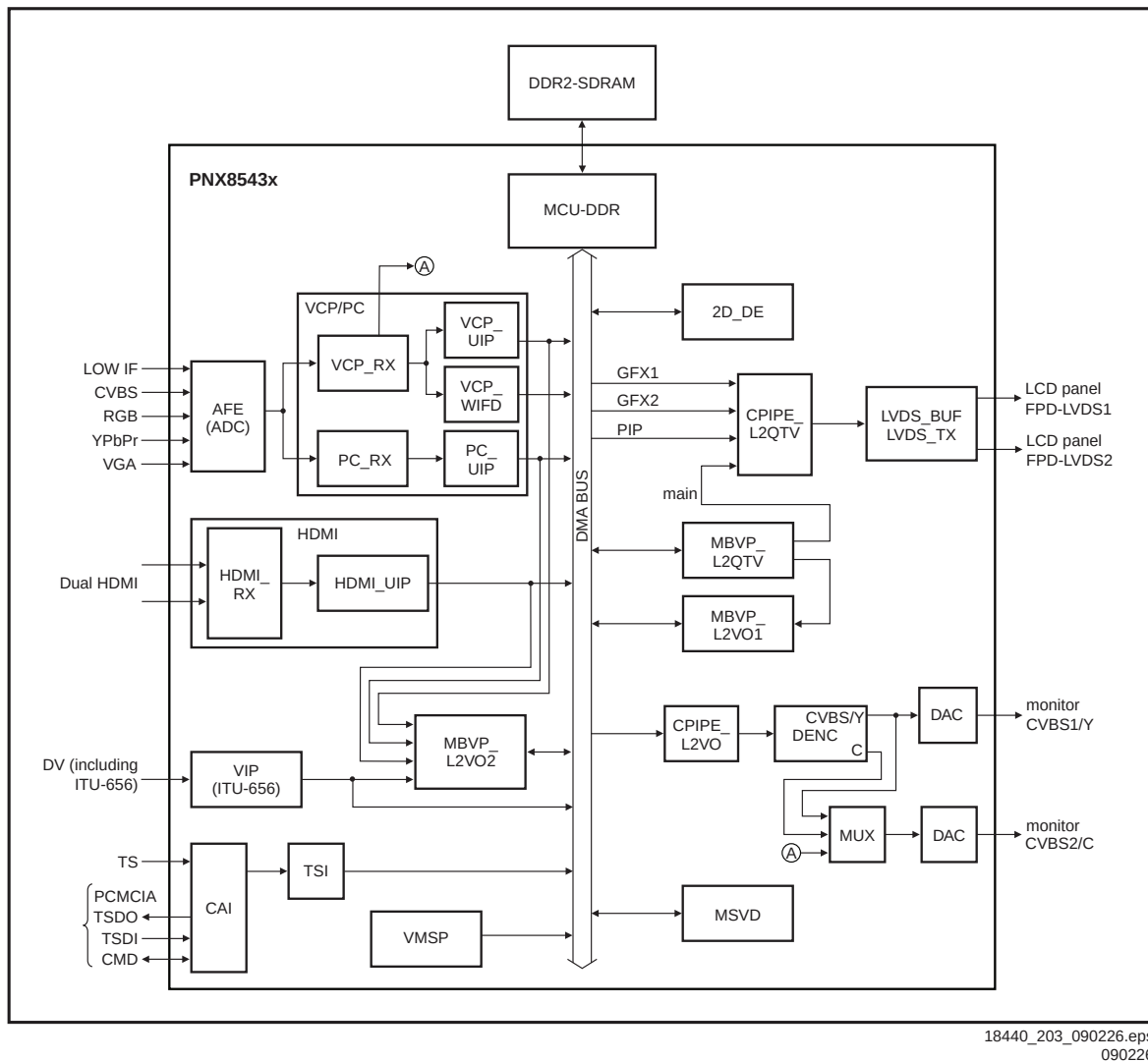


Figure 7-10 PNX8543 video flow diagram

The Video Subsystem consist of the following blocks:

- Analogue Front-End (AFE) block
- Video and PC Capture (VPC/PC) pipe
- HDMI Receiver interface
- Memory-Based Video Processor MBVP)
- Video Composition Pipe (CPIPE)
- Memory Based Video Processor (MBVP) VO-1
- Memory Based Video Processor (MBVP) VO-2
- Video Composition Pipe (CPIPE)
- Dual Flat Panel Display-LVDS (FPD-LVDS)
- Digital Encoder (DENC)
- Digital Video VIP
- 2D graphics block.

7.6.2 Audio Subsystem

Refer to [Figure 7-11](#) for the main audio interfaces for the PNX8543 and the audio signal flow between blocks and memory.

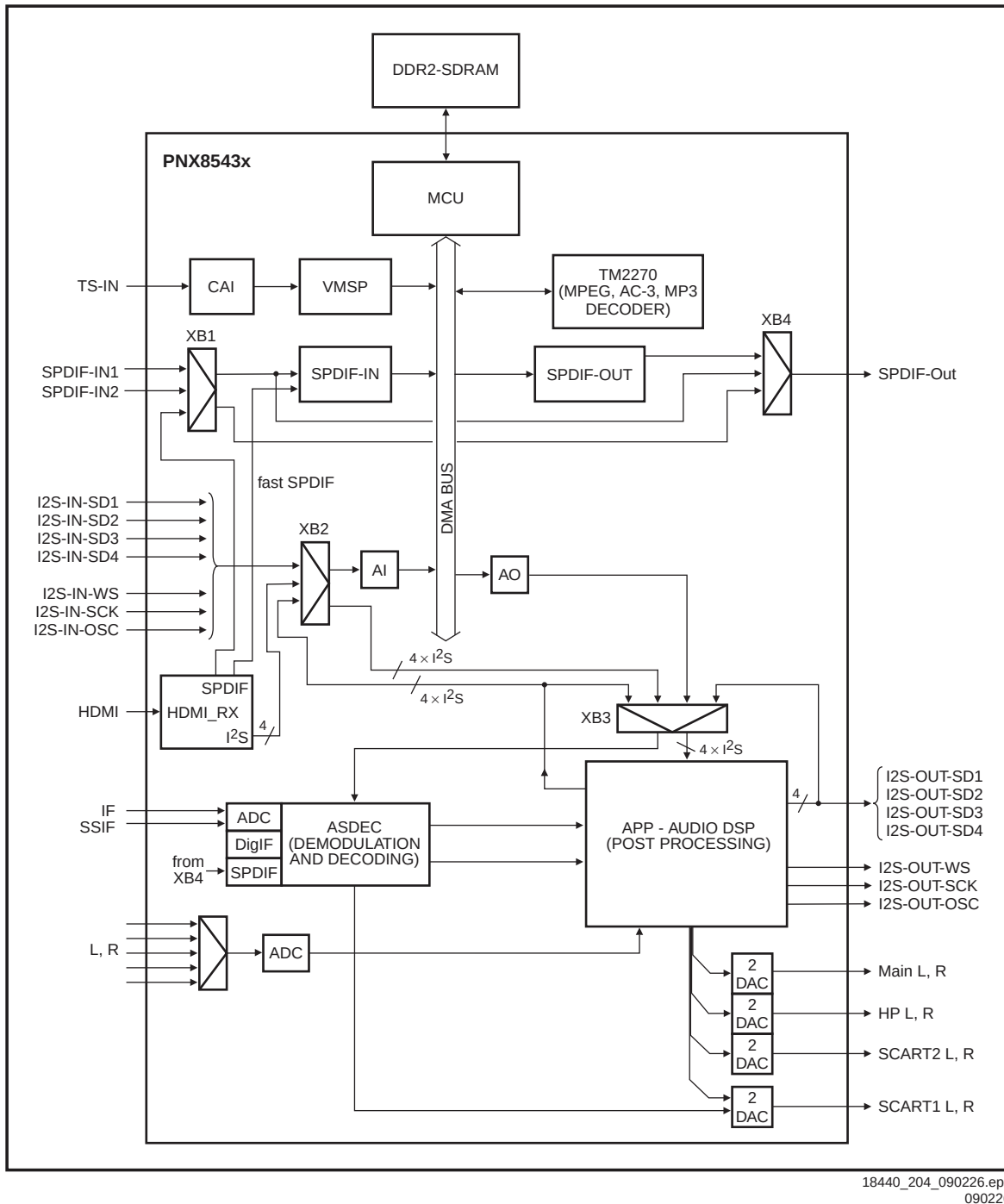


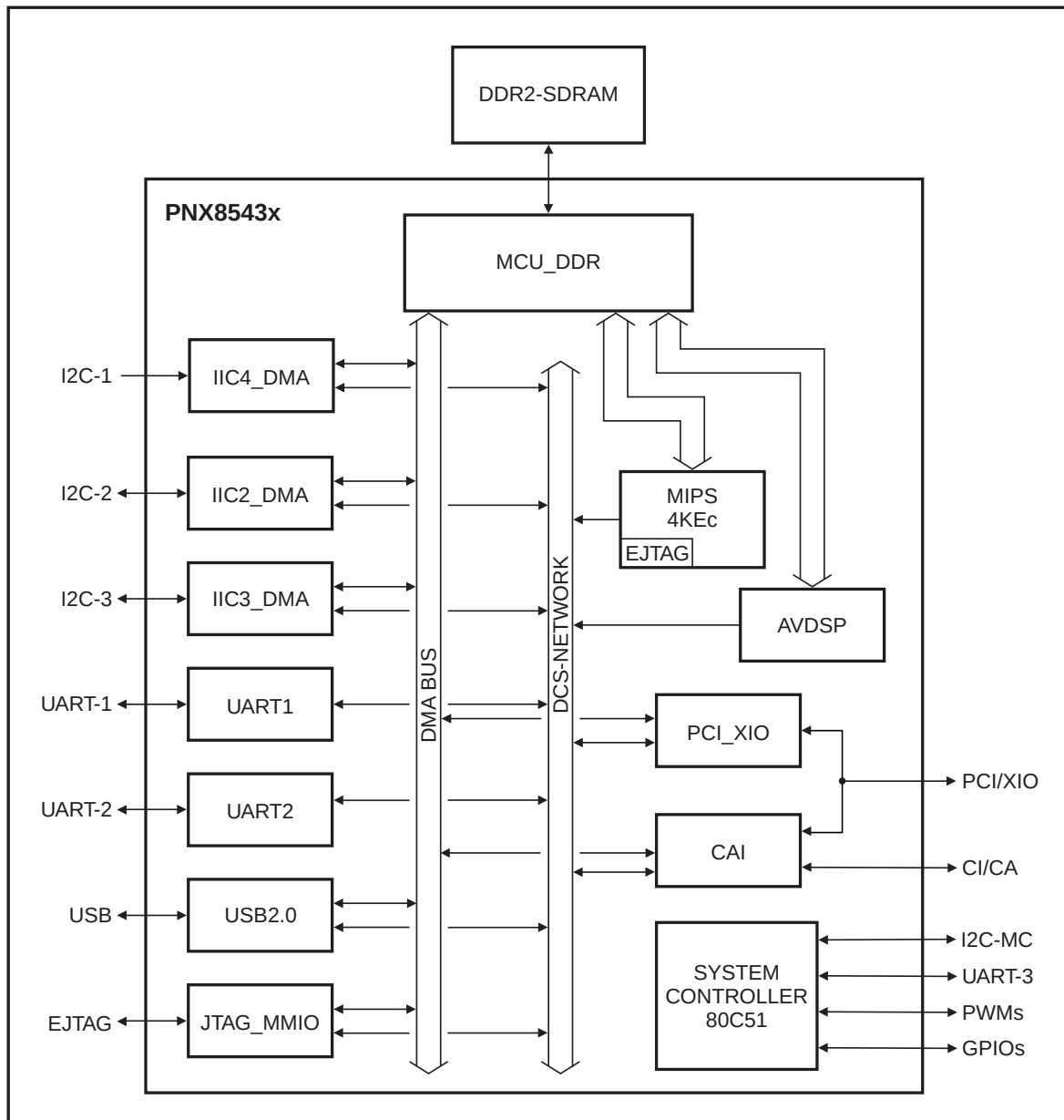
Figure 7-11 PNX8543 audio flow diagram

The Audio Subsystem consist of the following blocks:

- Analogue Audio Front End (AAFE) used to capture Baseband Audio Inputs and to sample Secondary Sound IF (SSIF) directly or via Low-IF input
- HDMI Receiver interface block
- SPDIF input block
- Audio Input (AI) block
- Audio Output (AO) block
- Demodulation & Decoding (ASDEC) DSP for decoding all analogue terrestrial TV sound standards
- Audio Post-Processing (APP) block
- Digital Audio decoder.

7.6.3 Connectivity and Compute Subsystem

Refer to [Figure 7-12](#) for the connectivity and compute subsystem.



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Figure 7-12 PNX8543 connectivity and compute subsystem

The Connectivity Subsystem consists of:

- PCI/XIO interface
- USB2.0 interface
- Three 2-wire UARTs
- Four Master/Slave I²C interfaces
- Common Interface/Conditional Access Interface.

The Computing Subsystem consists of:

- 32-bit MIPS RISC core
- Enhanced JTAG (EJTAG) block inside the MIPS
- JTAG_MMIO blocks
- TV controller
- Audio/Video DSP (AV_DSP)
- Memory Control Unit (MCU).

7.6.4 Service Notice - FLASH RAM / PNX8543 exchange

The FLASH RAM (item 7M00) and/or PNX8543 (item 7600) can only be exchanged by an authorised central workshop with dedicated programming tools. Due to the presence of (CI+) keys in the components, **unauthorised exchange of these components will always result in a defective board.**

7.7 Back-End - On-board Timing Controller (TCON)

In this platform, the Timing Controller (TCON) does not come together with the LCD panel, but is integrated into the SSB. The following figure shows the generic block diagram.

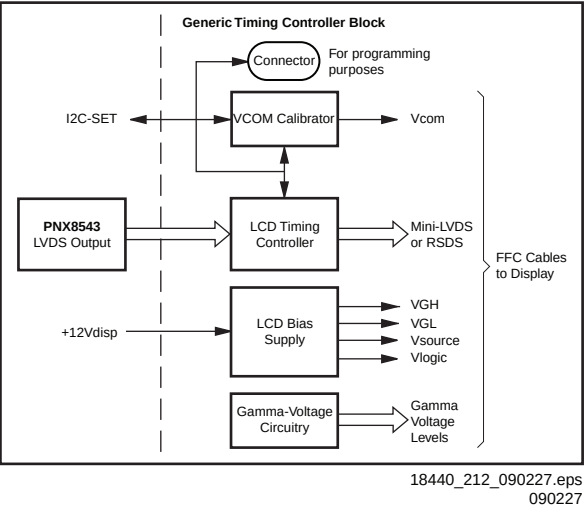


Figure 7-13 Block diagram Timing Controller

A Timing Controller is a key element in the “make-up” of an LCD module. It forms the control centre, where it routes and re-formats the data to column drivers on the LCD module.

Until now, the TCON was usually integrated into the LCD panel and implemented through the use of ASIC devices, which makes it impossible to re-use the TCON in other LCD panel designs. Along with TCONs, discrete LVDS devices, using the LVDS protocol, were also required for interface and control of the LCD module.

A “new generation” of (programmable) Timing Controllers has been designed which can be used on multiple LCD panel designs. They can support non-standard resolutions and different LCD panel configurations from various LCD manufacturers. These TCON offer higher levels of integration and, in addition, a new high-speed low voltage differential interface protocol between the TCON and Column Driver (CD) has been developed, called Reduced Swing Different Signalling (RSDS). The use of this protocol offers higher data transfer rates.

In this chassis, such a “new generation” programmable TCON has been implemented. The inputs to the TCON are the LVDS output from the PNX8543 and the +12V display supply. The TCON converts the LVDS signal into the required format:

- mini-LVDS signals for LG LCD panels, or
- RSDS signals for Sharp LCD panels.

The LCD bias supply block generates the bias voltages V_{GH} and V_{GL} , as well as the source voltage V_{source} and logic voltage V_{logic} for the LCD panel.

The output signal of the VCOM Calibrator, V_{com} , is a reference voltage for Liquid Crystal Driving. This can be aligned to minimize flicker on the display resulting from non-symmetrical voltages that aligns the liquid crystals. Both Sharp and LG TCONs use a programmable VCOM Calibrator IC for V_{com} adjustment. The adjusted VCOM data will be stored inside on-chip memory and will be automatically recalled during each power-up. For instructions on how to program the TCON and set the correct value of the reference voltage, refer to ComPair.

It should be noted that in this platform the use of the TCON is display-related: the use of a different branded LCD panel

automatically implies the use of another TCON, thus another SSB.

For trouble shooting, below find an overview of the DC voltages used on the TCON circuitry.

Table 7-2 DC voltages

Signal	Display		Destination
	LG	Sharp	
V_{GH}	+25 V	+35 V	to gate drivers (high voltage)
V_{GL}	-6 V	-6 V	to gate drivers (low voltage)
V_{CC}	+3.3 V	+3.3 V	timing controller IC supply voltage
V_{CC}	+1.2 V	+1.5 V	timing controller IC supply voltage
V_{ref}	+16 V	+15.2 V	gamma reference voltage
V_{DD}	+16 V	+15.6 V	source driver supply
MV_{LS}	-	+9 V	MPD IC supply voltage

7.8 Common Interface CI+

Together with this platform, an extension to the Common Interface (CI) Conditional Access system is added, called CI+.

CI+ or Common Interface Plus is a specification that extends the Common Interface (DVB-CI) as described in the digital broadcasting standard DVB.

The weakness of the conventional CI module used in a Conditional Access system was the absence of a Copy Protection mechanism, as decrypted content could be sent over the PCMCIA interface unscrambled. With the CI+ extension, a form of copy protection is established between the Conditional Access Module (CAM) and the Integrated Digital Television (IDTV). The security mechanisms in CI+ are derived/copied from POD (with the exception of Out Of Band (OOB) used in US CA systems). For more information about conventional CA systems using a CI module, refer to the BJ3.0E L/PA or BL2.xU Service Manual.

The CI+ standard is downwards compatible with the existing CI standard.

The following figure shows the implementation of the CI+ Conditional Access system in the TV543 platform.

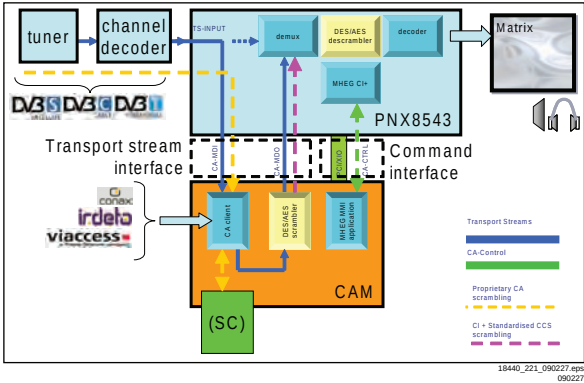


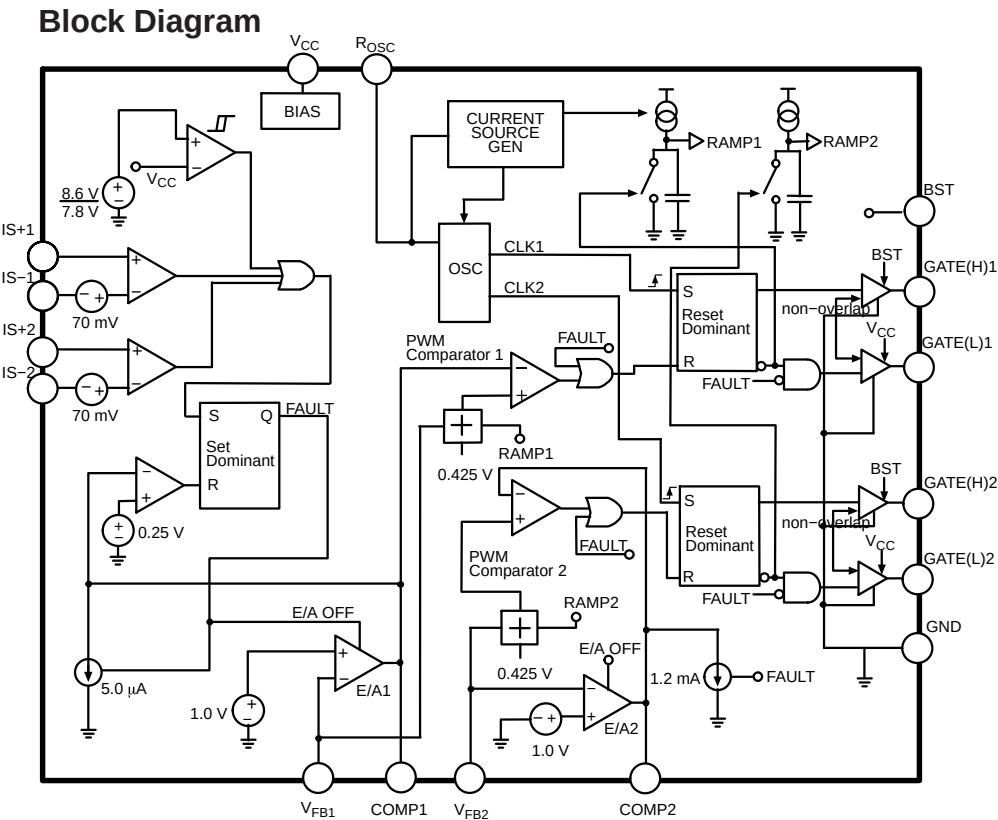
Figure 7-14 CI+ Conditional Access implementation

8. IC Data Sheets

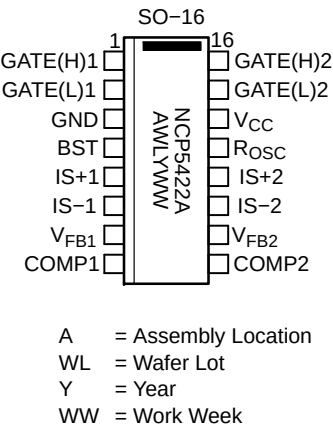
This chapter shows the internal block diagrams and pin configurations of ICs that are drawn as “black boxes” in the

electrical diagrams (with the exception of “memory” and “logic” ICs).

8.1 Diagram [SSB: DC/DC +3V3 +1V2](#) B01A, NCP5422AD (IC 7103)



Pin Configuration

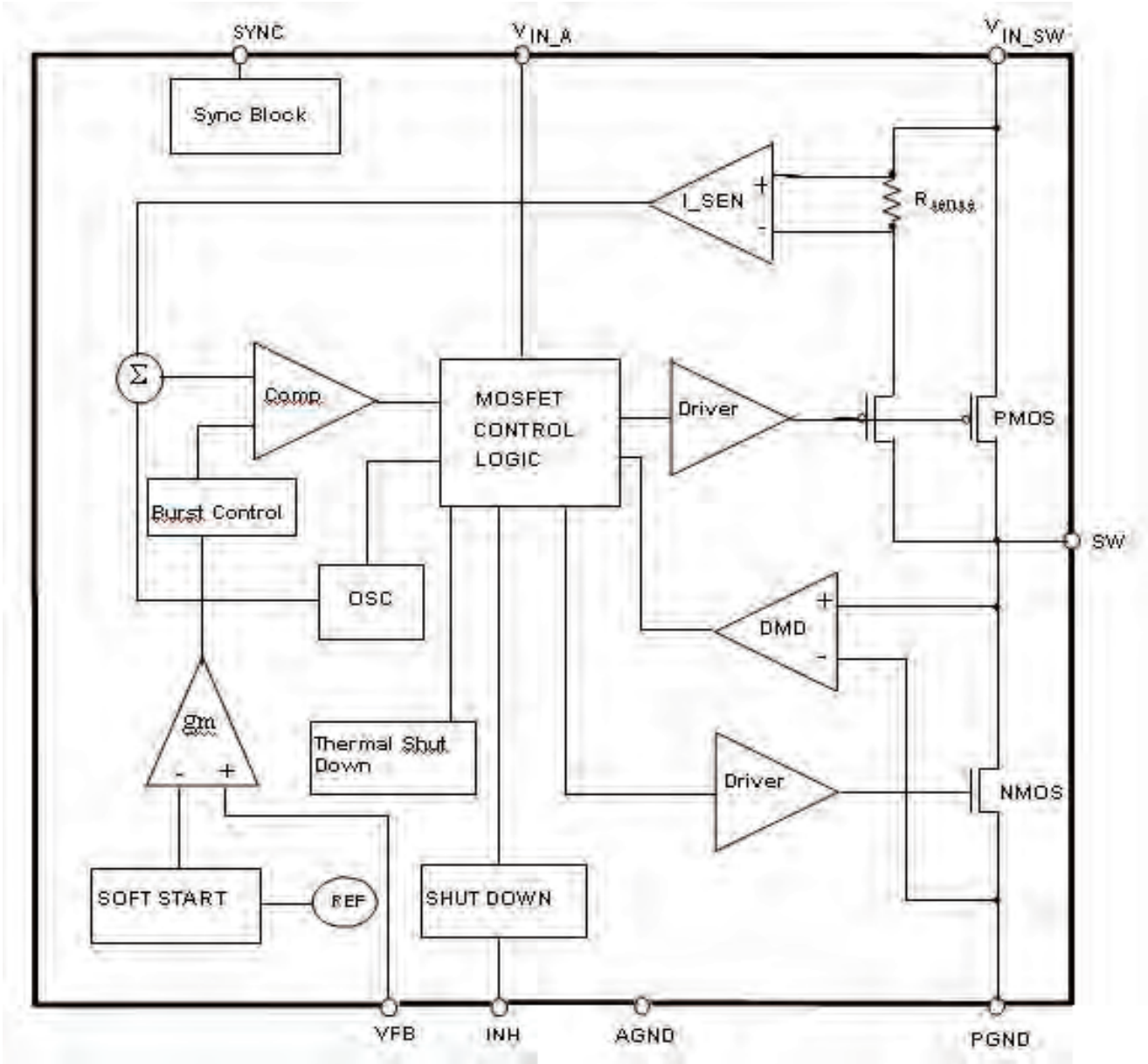


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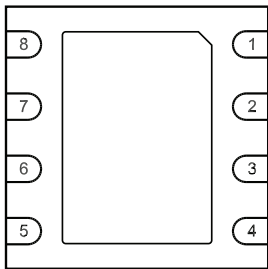
Figure 8-1 Internal block diagram and pin configuration

8.2 Diagram [SSB: DC/DC +3V3 +1V2 Standby](#) B01B, ST1S10PH (IC 7202/7222)

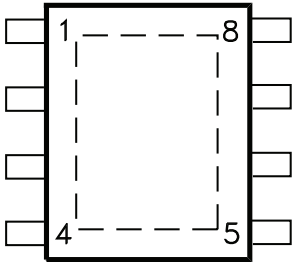
Block Diagram



Pin Configuration



DFN8 (4x4)



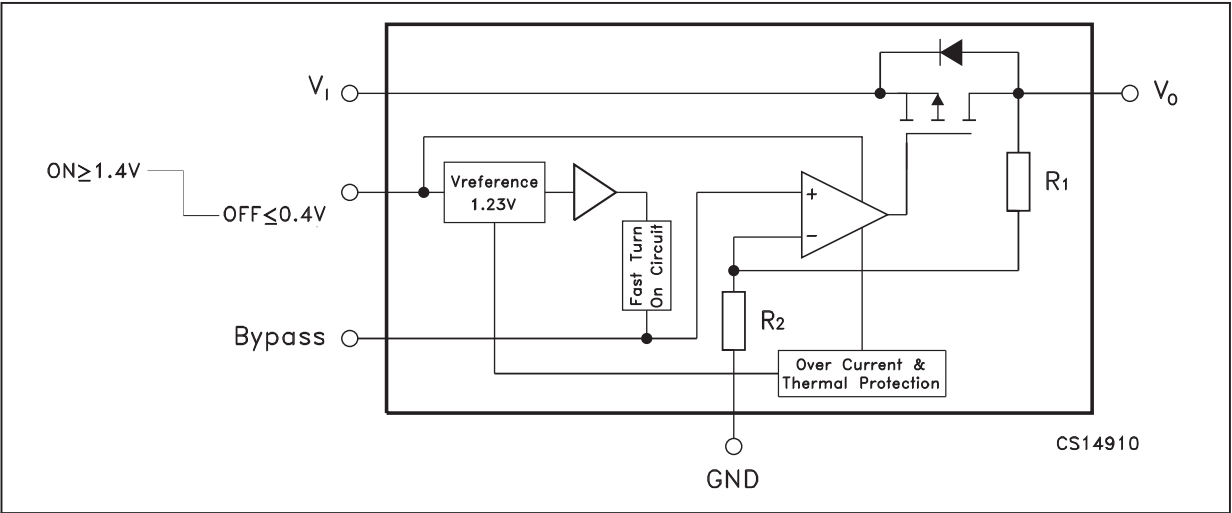
PowerSO-8

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130608

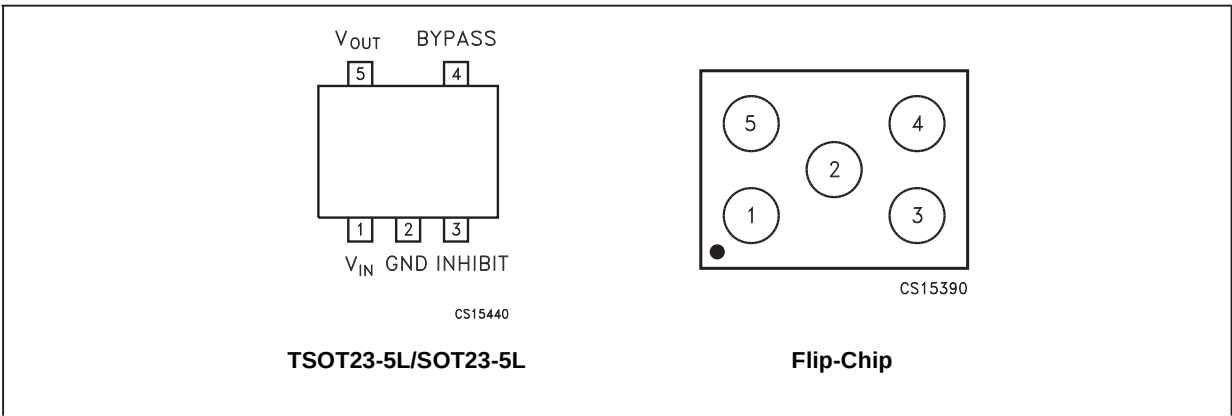
Figure 8-2 Internal block diagram and pin configuration

8.3 Diagram [SSB: DC/DC +3V3 +1V2 Standby](#) B01B, LD3985M (IC 7201)

Block Diagram



Pin Configuration

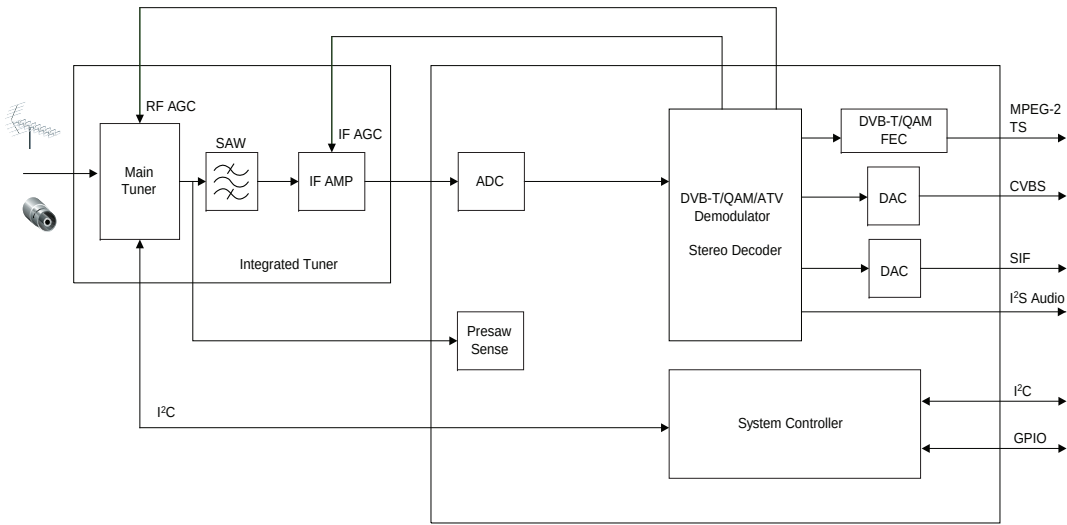


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020206

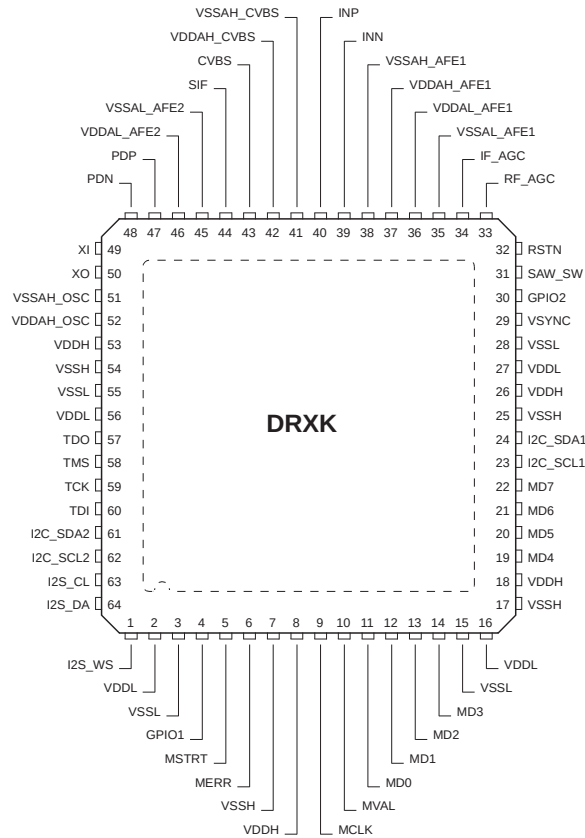
Figure 8-3 Internal block diagram and pin configuration

8.4 Diagram [SSB: Front End](#) B02A, DRX3926K (IC 7303)

Block Diagram



Pin Configuration

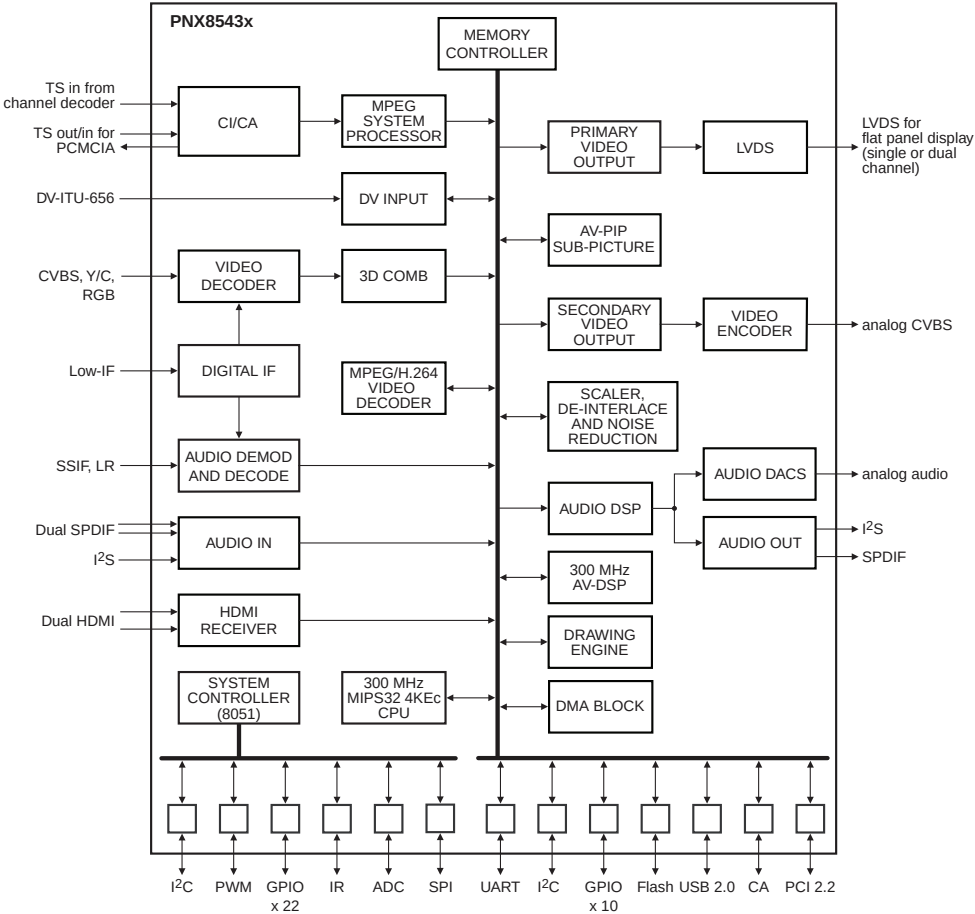


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090303

Figure 8-4 Pin configuration

8.5 Diagram [SSB: PNX8543 - Power](#) B03A, PNX8543 (IC7600)

Block Diagram



Pin Configuration

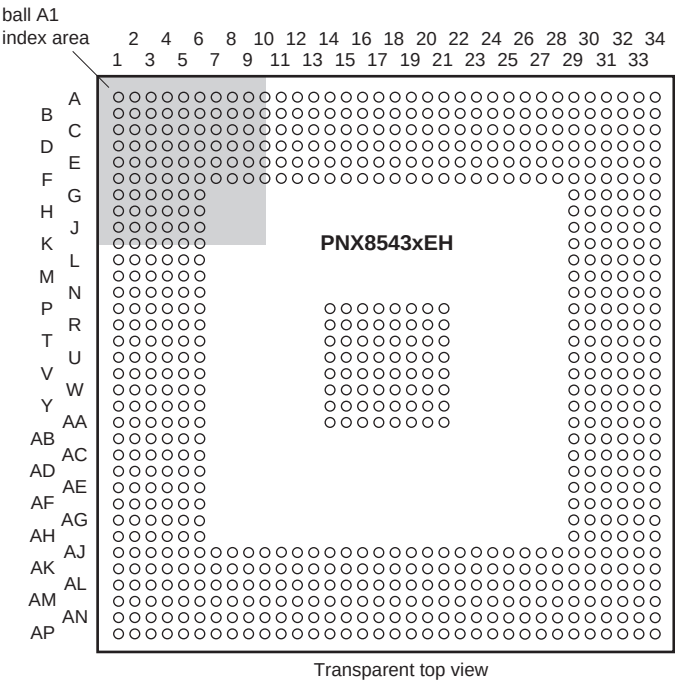
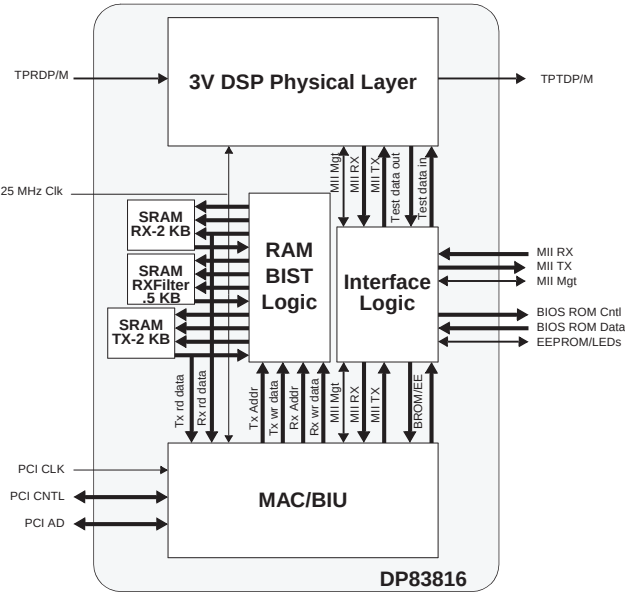


Figure 8-5 Internal block diagram and pin configuration

8.6 Diagram [SSB: Ethernet](#) B05B, DP83816 (IC7N04)

Block Diagram



Pin Configuration

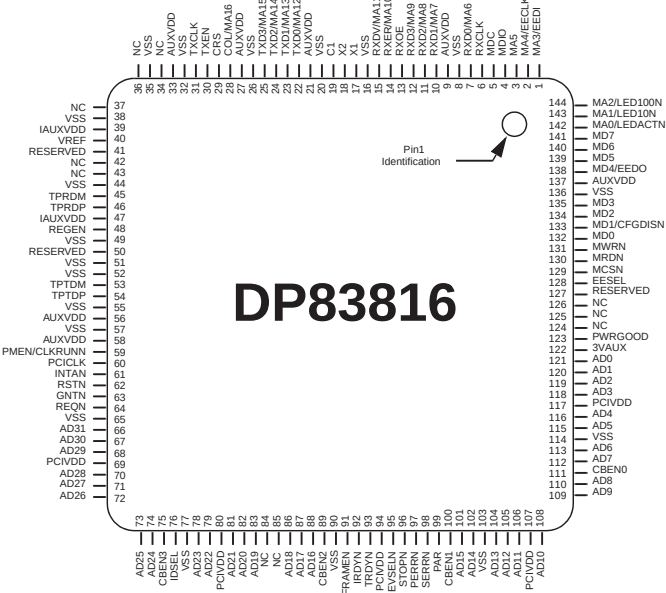
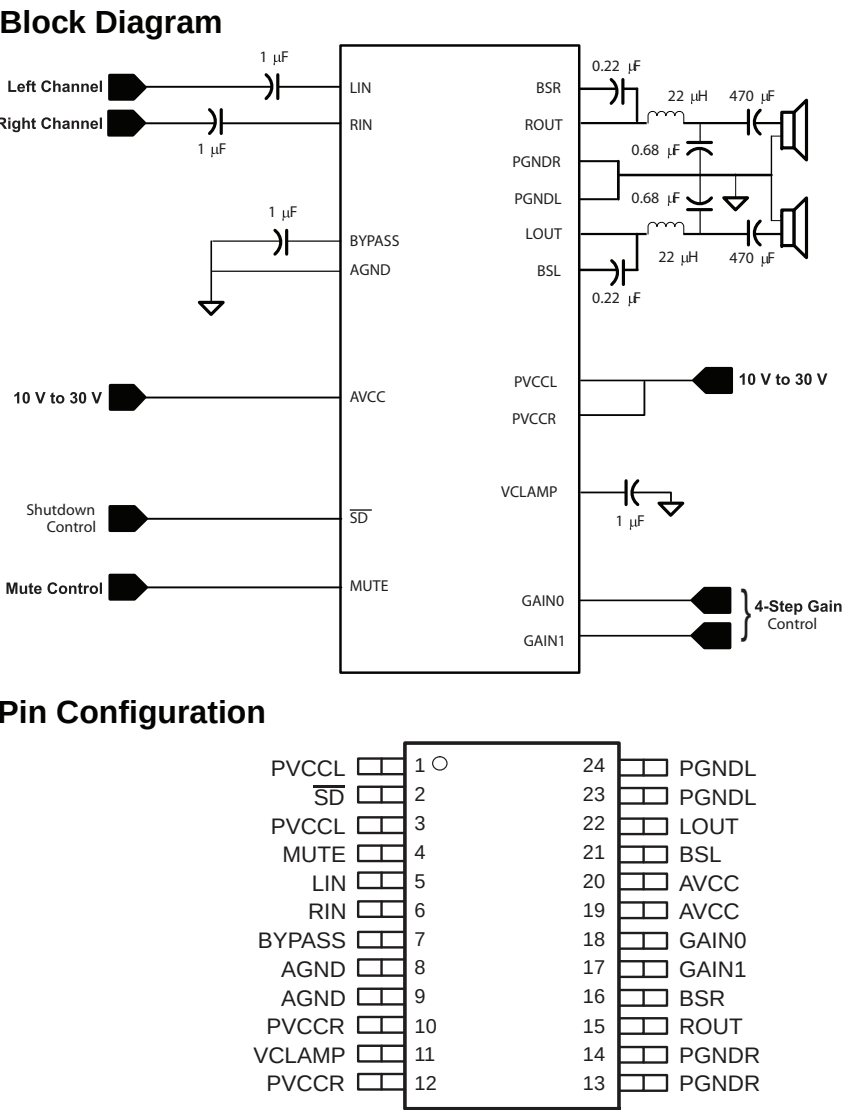


Figure 8-6 Internal block diagram and pin configuration

8.7 Diagram [SSB: Class-D](#) B06A, TPA3123D (IC 7L10)



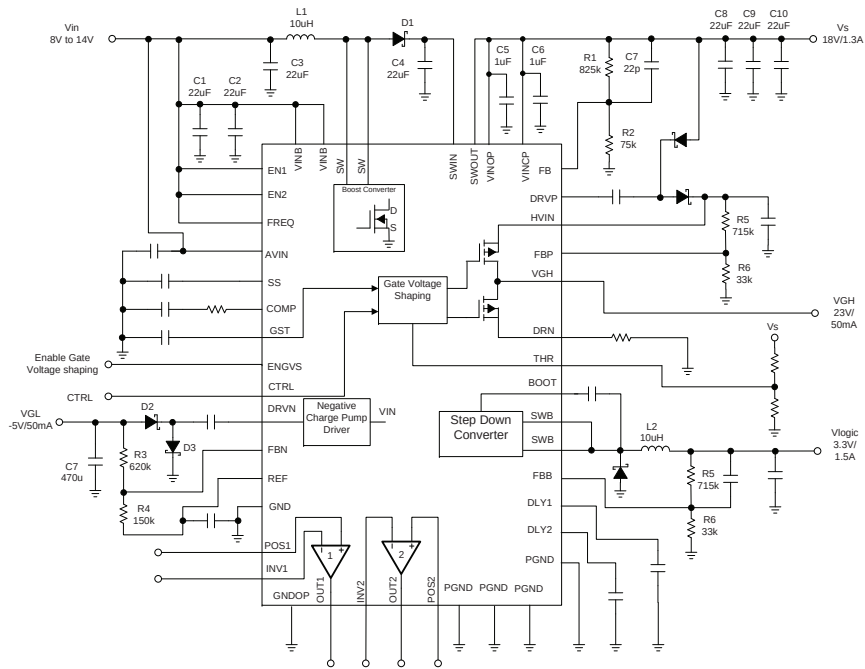
TERMINAL		I/O/P	DESCRIPTION
NAME	24-PIN (PWP)		
SD	2	I	Shutdown signal for IC (low = disabled, high = operational). TTL logic levels with compliance to AVCC
RIN	6	I	Audio input for right channel
LIN	5	I	Audio input for left channel
GAIN0	18	I	Gain select least-significant bit. TTL logic levels with compliance to AVCC
GAIN1	17	I	Gain select most-significant bit. TTL logic levels with compliance to AVCC
MUTE	4	I	Mute signal for quick disable/enable of outputs (high = outputs switch at 50% duty cycle, low = outputs enabled). TTL logic levels with compliance to AVCC
BSL	21	I/O	Bootstrap I/O for left channel
PVCCCL	1, 3	P	Power supply for left-channel H-bridge, not internally connected to PVCCR or AVCC
LOUT	22	O	Class-D 1/2-H-bridge positive output for left channel
PGNDL	23, 24	P	Power ground for left-channel H-bridge
VCLAMP	11	P	Internally generated voltage supply for bootstrap capacitors
BSR	16	I/O	Bootstrap I/O for right channel
ROUT	15	O	Class-D 1/2-H-bridge negative output for right channel
PGNDR	13, 14	P	Power ground for right-channel H-bridge.
PVCCR	10, 12	P	Power supply for right-channel H-bridge, not connected to PVCCCL or AVCC
AGND	9	P	Analog ground for digital/analog cells in core
AGND	8	P	Analog ground for analog cells in core
BYPASS	7	O	Reference for preamplifier inputs. Nominally equal to AVCC/8. Also controls start-up time via external capacitor sizing.
AVCC	19, 20	P	High-voltage analog power supply. Not internally connected to PVCCR or PVCCCL
Thermal pad	Die pad	P	Connect to ground. Thermal pad should be soldered down on all applications to properly secure device to printed wiring board.

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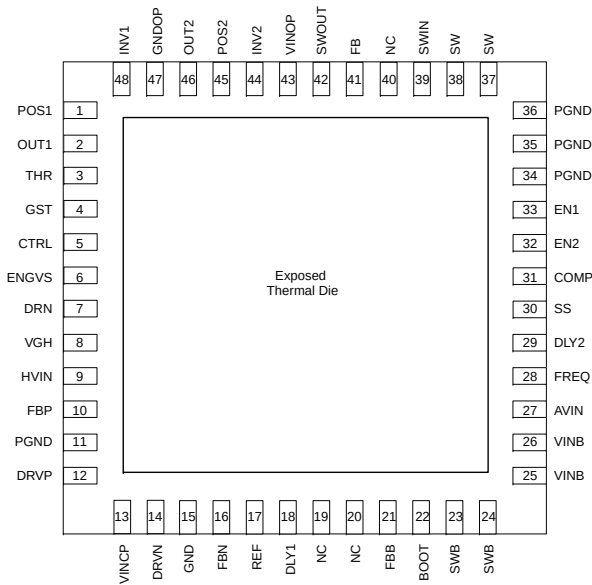
Figure 8-7 Internal block diagram and pin configuration

8.8 Diagram [SSB: T-Con DC/DC](#) B09A, TPS65162RGZR (IC 7W02)

Block Diagram



Pin Configuration



Top View

Note: The thermally enhance Power Pad is connected to PGND

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090303

Figure 8-8 Typical application schematic and pin configuration

8.9 Diagram [SSB: T-Con LG420WUN Control](#) B09B, R8J01070FT (IC 7Y01)

Block Diagram

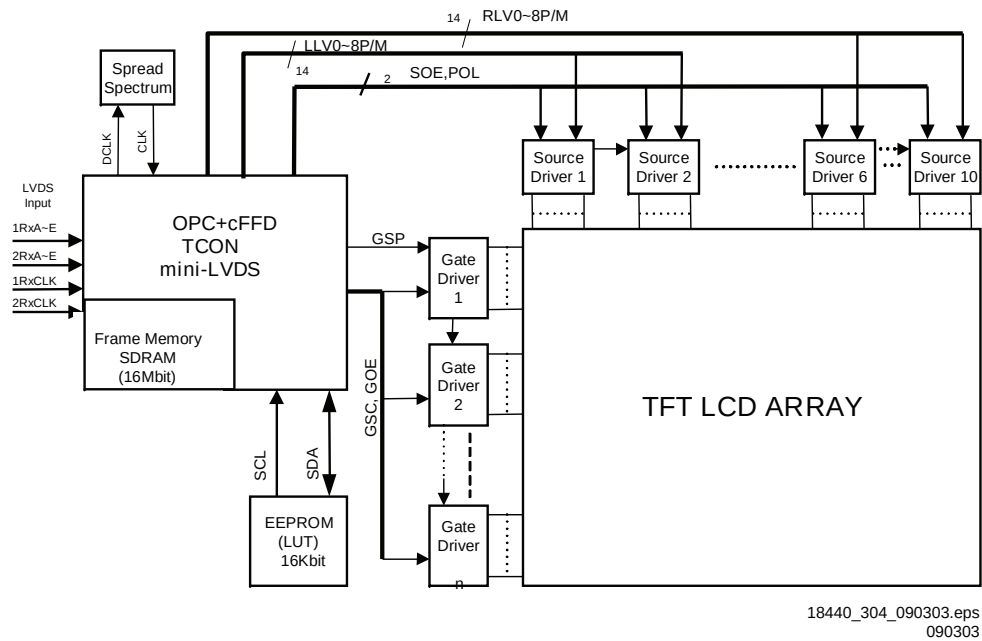
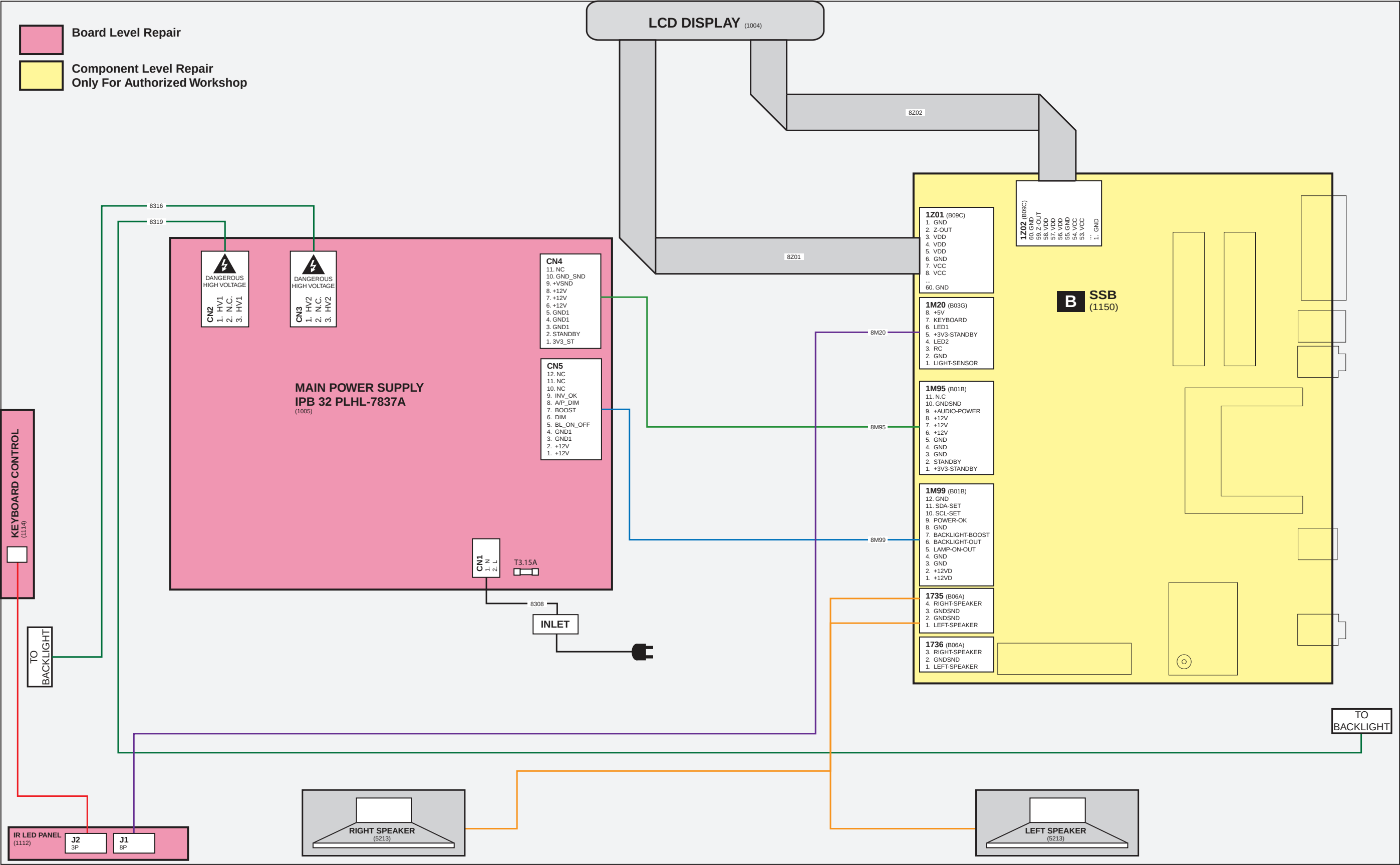


Figure 8-9 Internal block diagram

Personal Notes:

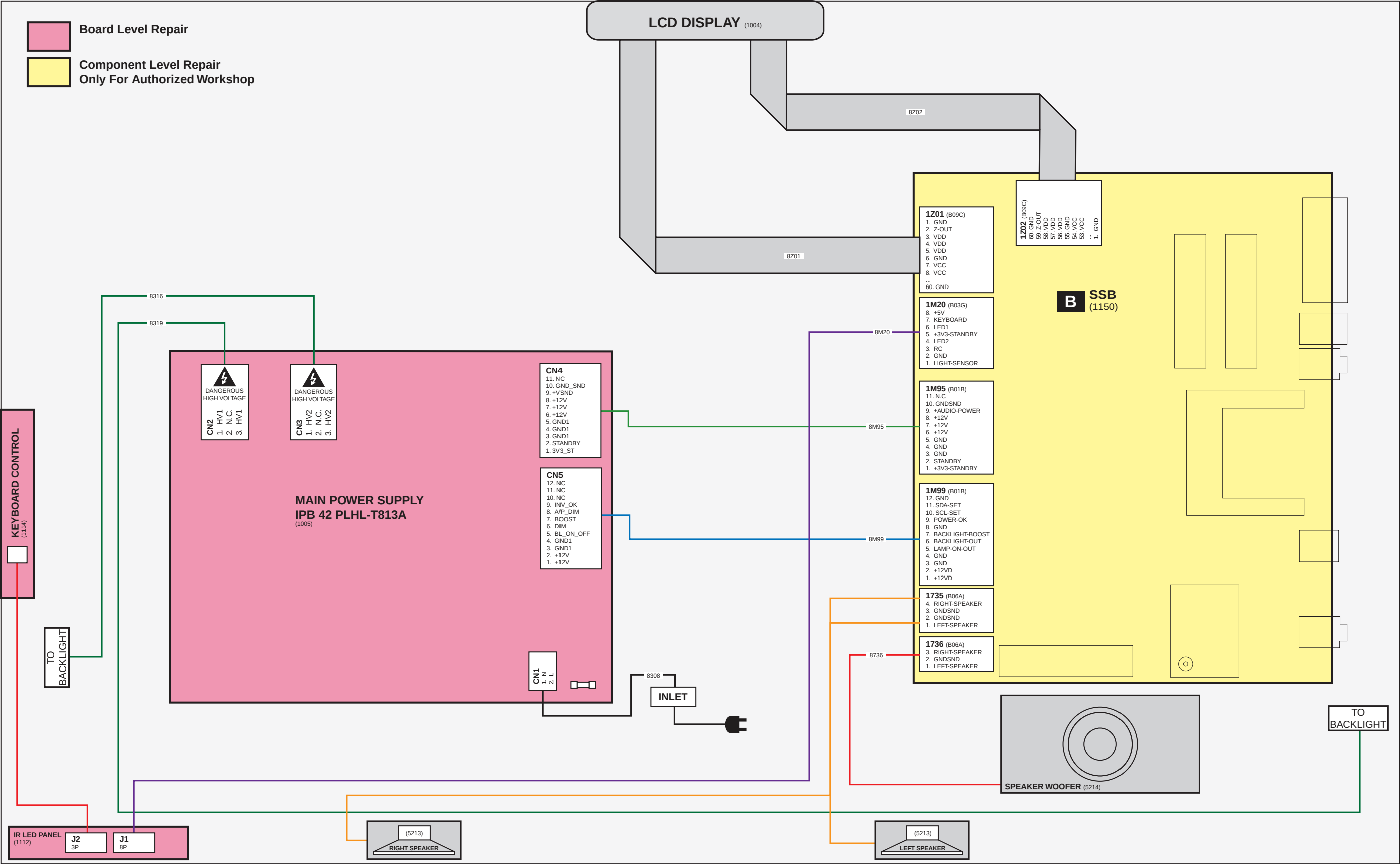
9. Block Diagrams

Wiring Diagram 32" LG forward integration (P&S)
WIRING DIAGRAM 32" LG FORWARD INTEGRATION (P&S)

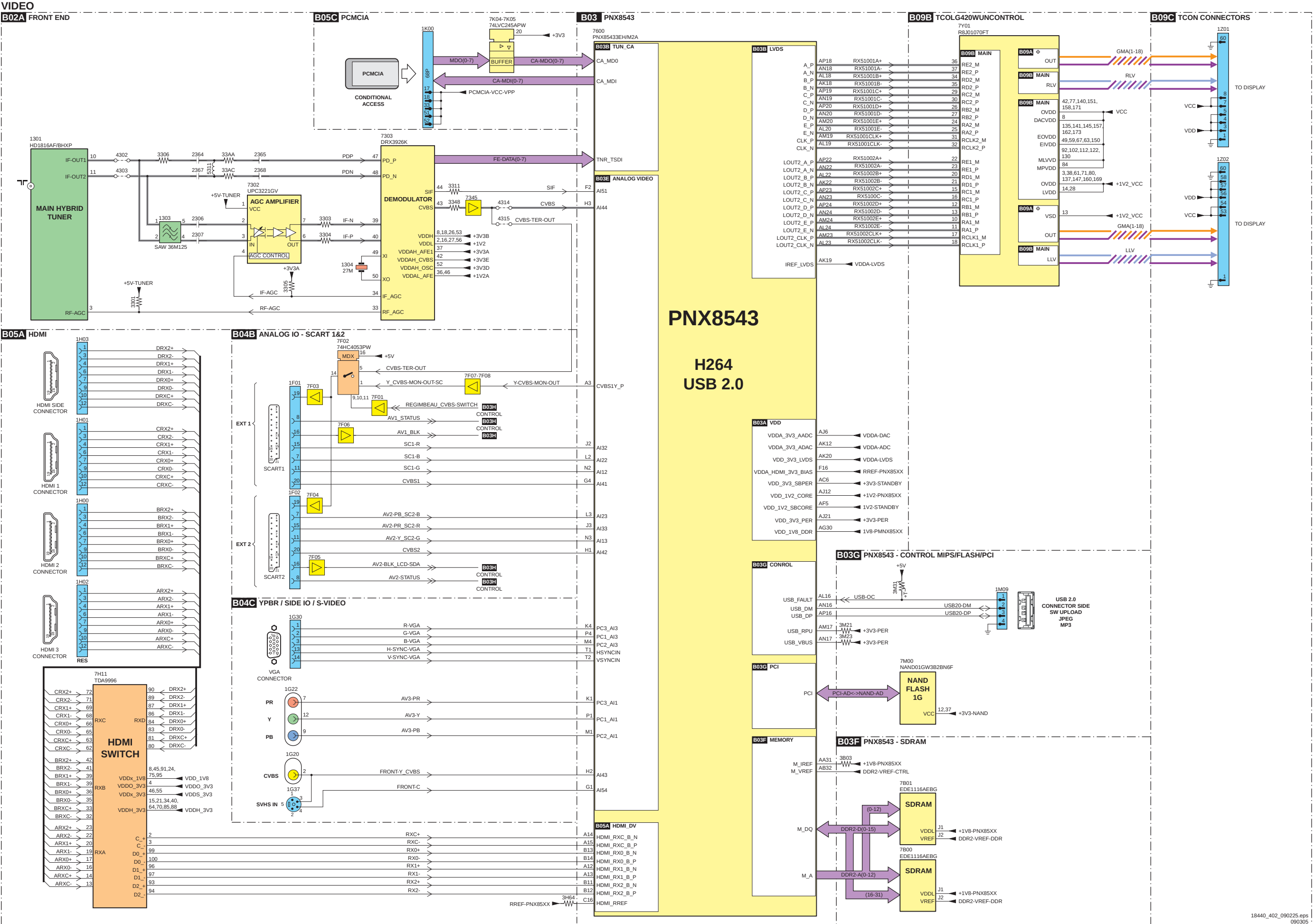


Wiring Diagram 42" LG forward integration (P&S)

WIRING DIAGRAM 42" LG FORWARD INTEGRATION (P&S)

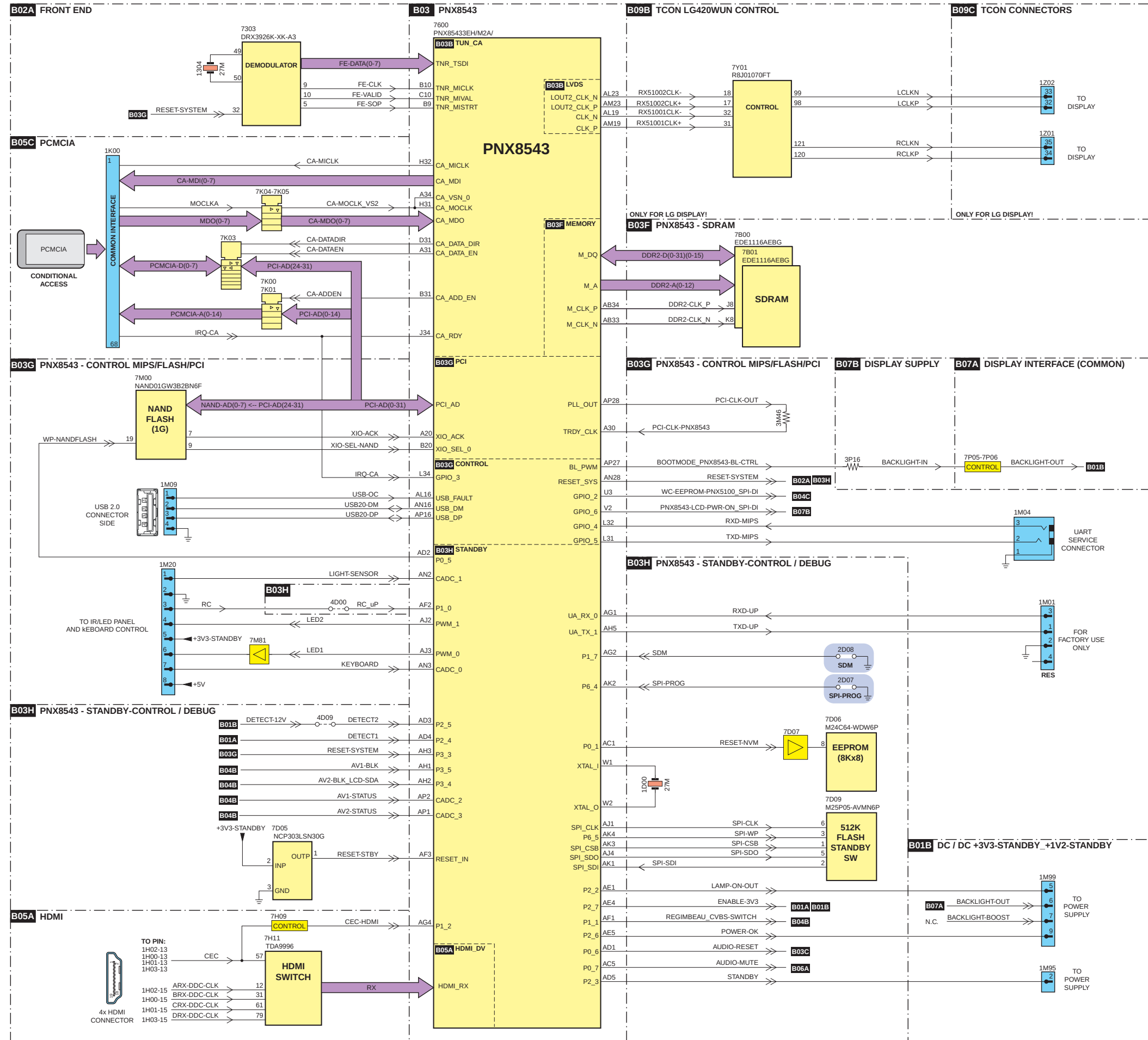


Block Diagram Video

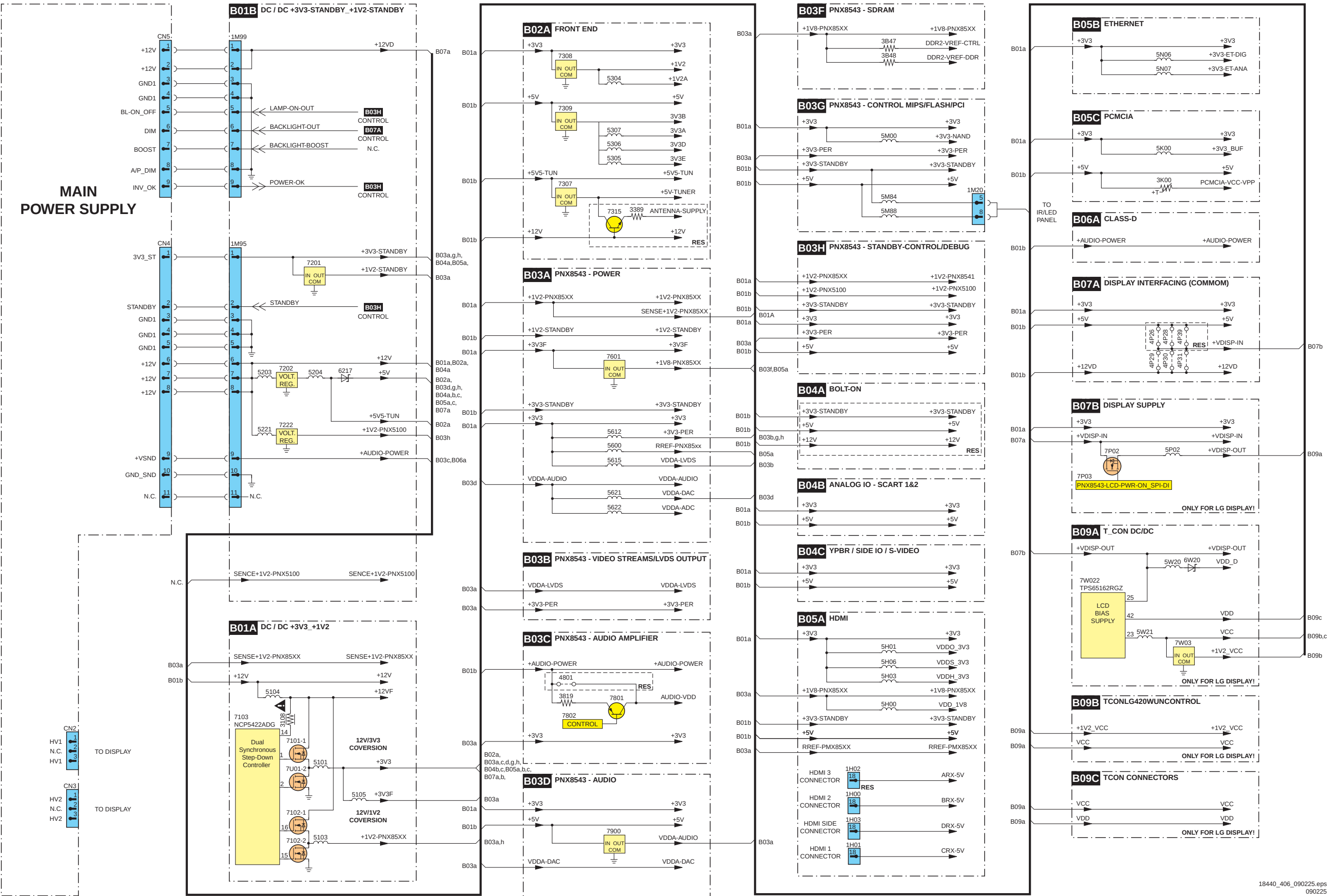


Block Diagram Control & Clock Signals

CONTROL + CLOCK SIGNALS

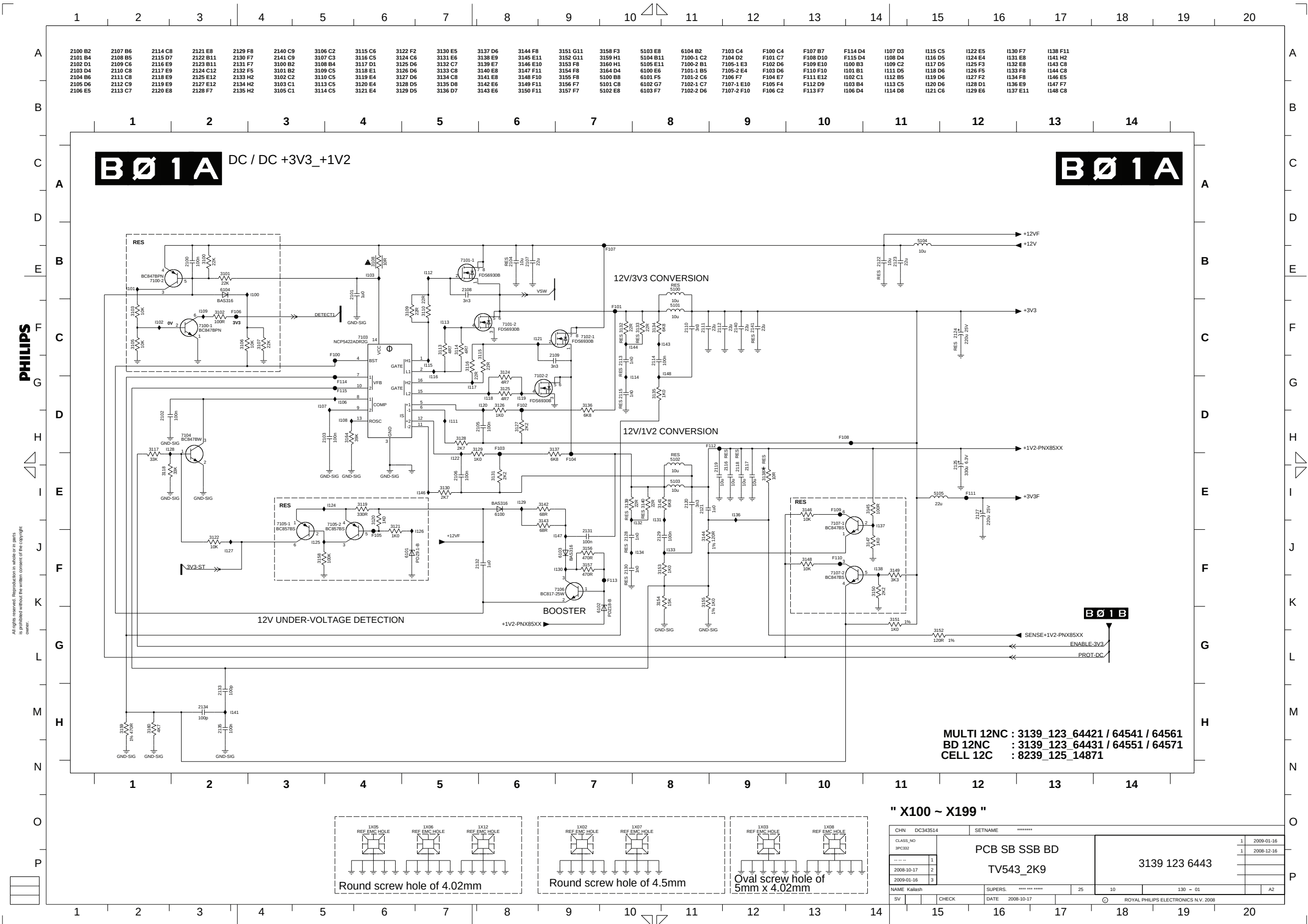


Supply Lines Overview
SUPPLY LINES OVERVIEW

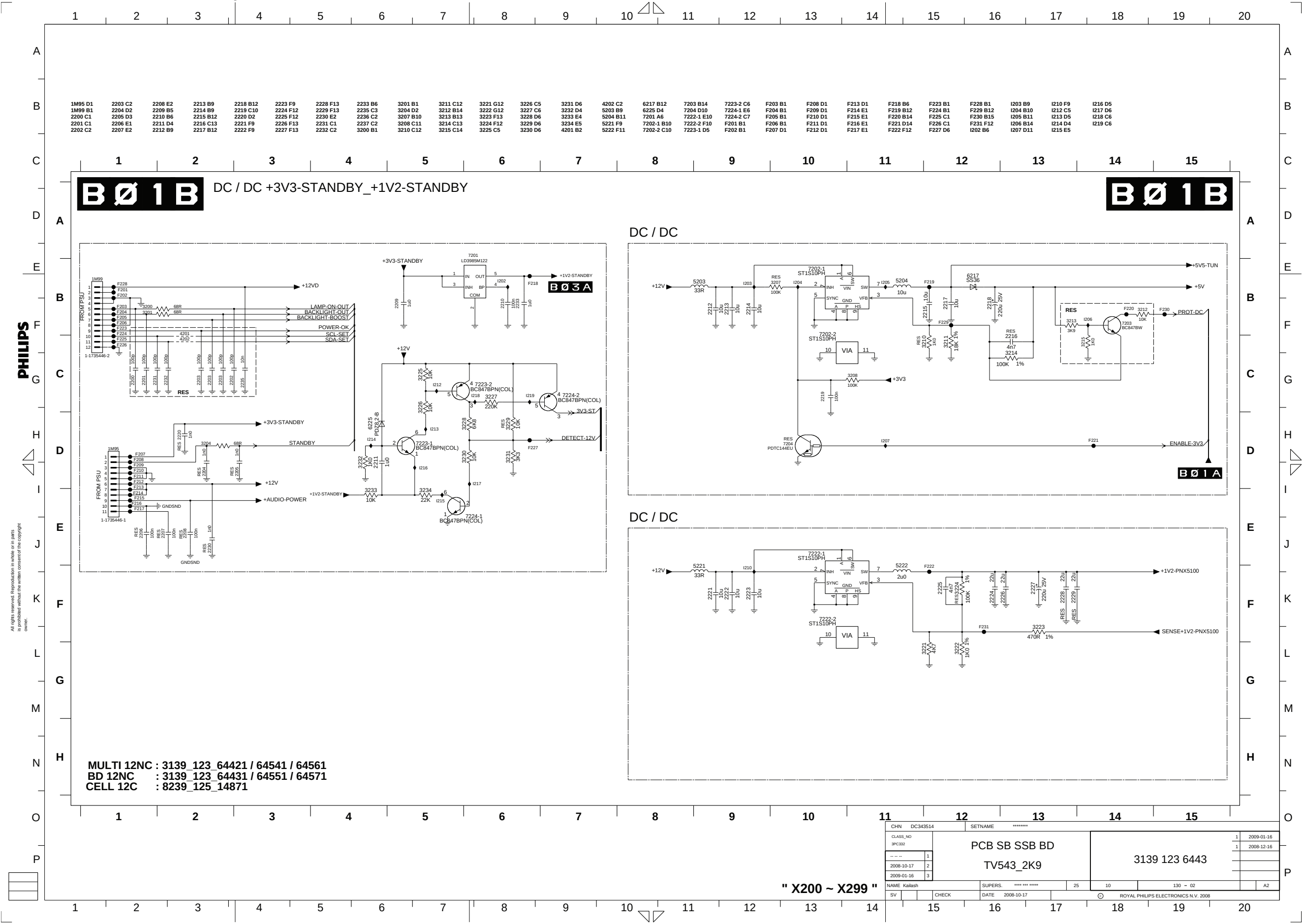


10. Circuit Diagrams and PWB Layouts

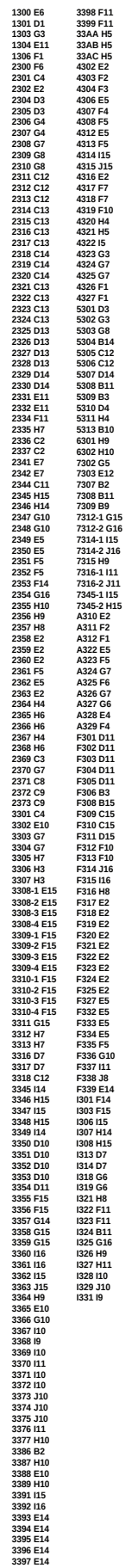
SSB: DC/DC +3V3 +1V2



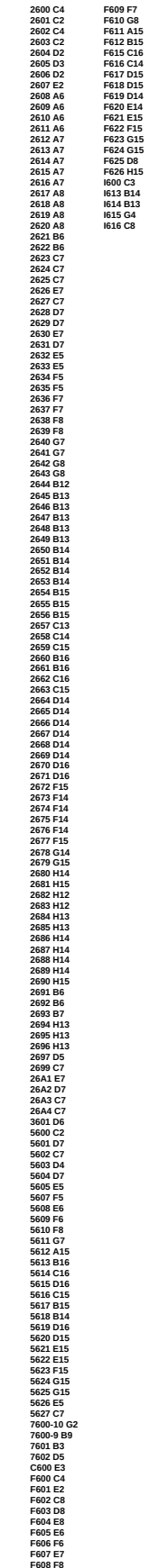
SSB: DC/DC +3V3 +1V2 Standby



RØ2 A FRONT END



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
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PHILIPS

PNX8543 - VIDEO STREAMS / LVDS OUTPUT

7600-11 PNX85439E

7600-5 PNX85439E

7600-12 PNX85439E

7600-11 B2

7600-12 F5

7600-5 B5

7600-5 B6

7600-5 B7

7600-5 B8

7600-5 B9

7600-5 B10

7600-5 B11

7600-5 B12

7600-5 B13

7600-5 B14

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[illegible]

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PHILIPS

PNX8543 - ANALOG AV

B03E

B04C

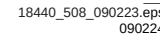
B02A

MULTI 12NC : 3139 123 64421 / 64541 / 64561
BD 12NC : 3139 123 64431 / 64551 / 64571
CELL 12C : 8239 125 14871

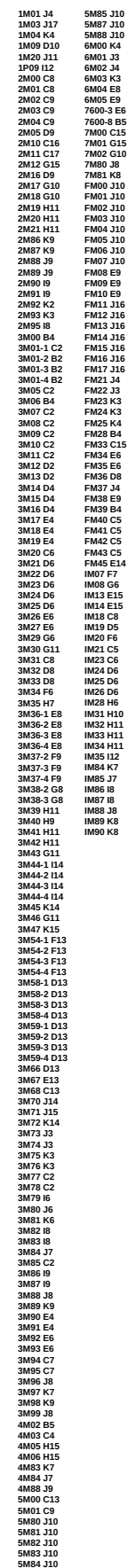
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2	2008-10-17	2	2008-10-17	2	2008-10-17	2
3	2009-01-16	3	2009-01-16	3	2009-01-16	3

NAME: Vincent Yap / Lee CW
SV: CHECK
DATE: 2008-10-17
SUPERS: ****
25
10
130 - 08
A2
ROYAL PHILIPS ELECTRONICS N.V. 2008

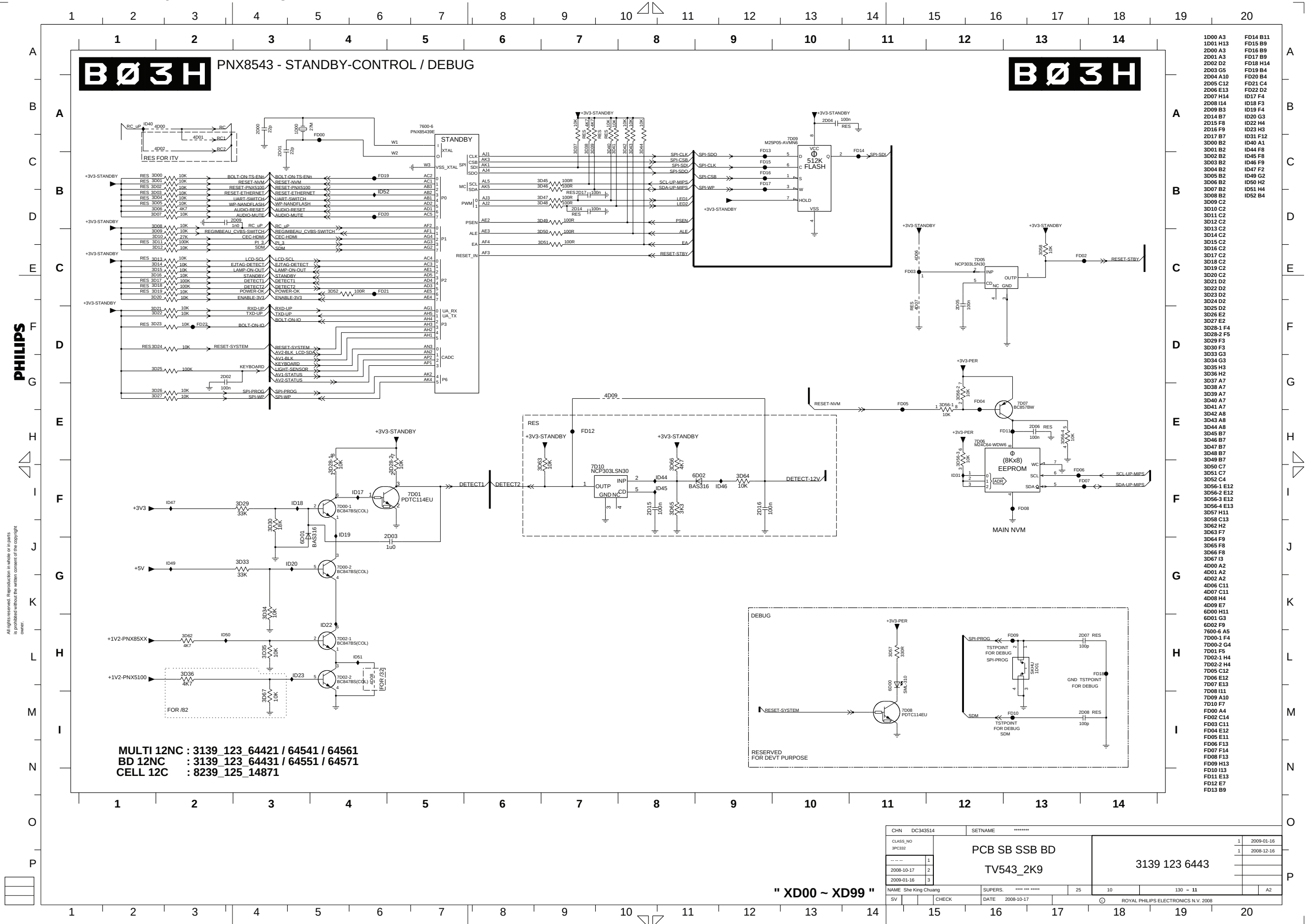
PHILIPS



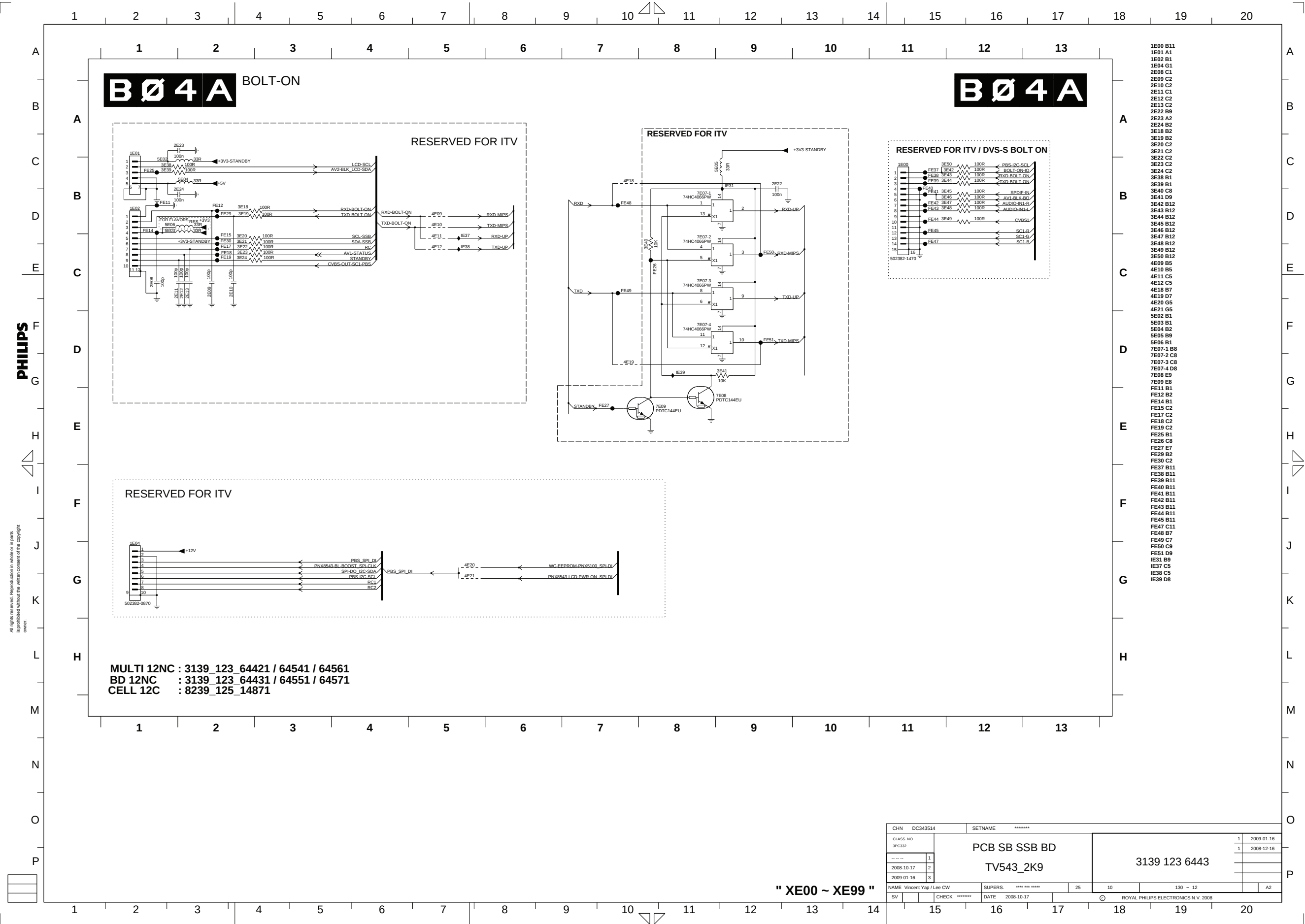
PNX8543 - CONTROL MIPS/FLASH/PCI



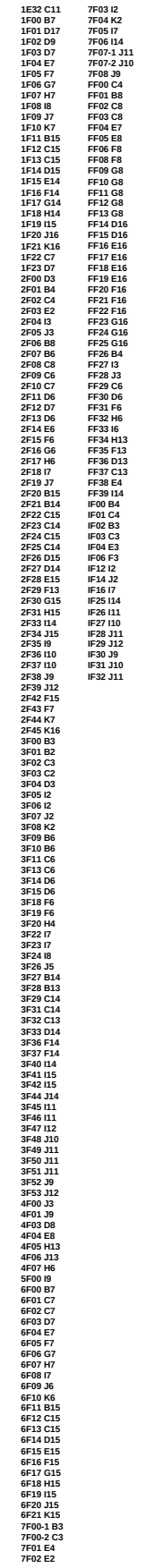
SSB: PNx8543 Standby Control/Debug



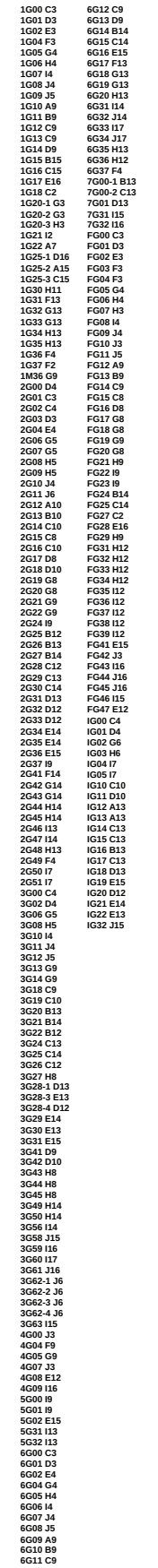
SSB: Bolt-on



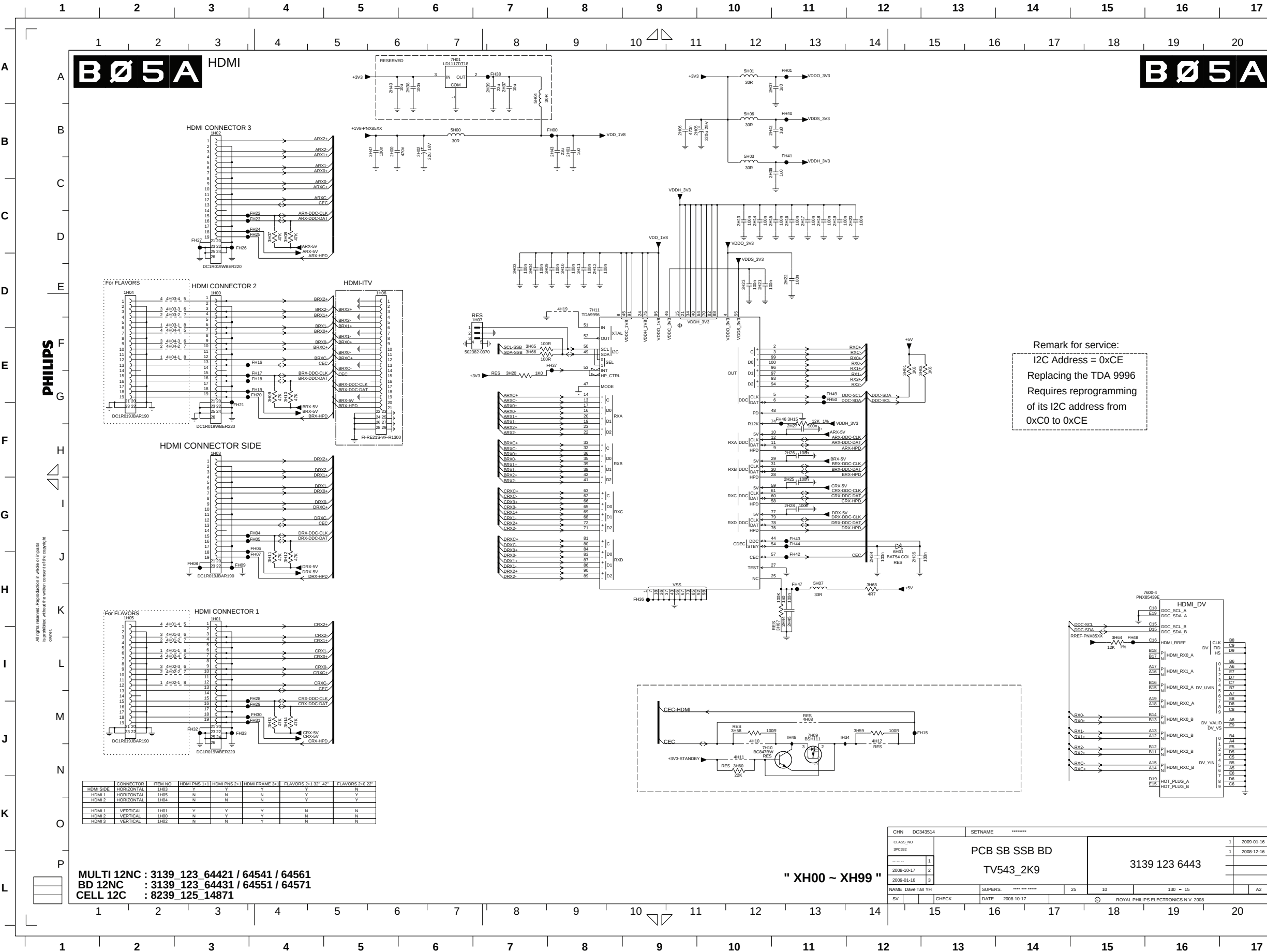
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
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SSB: HDMI



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PHILIPS



PHILIPS

CLASS-D AUDIO AMP

TPA3123D2PWP

TPA3123D2PWP

TO SPEAKERS

TO SUBWOOFER

MULTI 12NC : 3139 123 64421 / 64541 / 64561
BD 12NC : 3139 123 64431 / 64551 / 64571
CELL 12C : 8239 125 14871

CHN DC343514 SETNAME *****

CLASS_NO 3PC332

PCB SB SSB BD

TV543_2K9

3139 123 6443

NAME Hor Siew Lee SUPERS. **** ** 25

SV CHECK DATE 2008-10-17

ROYAL PHILIPS ELECTRONICS N.V. 2008

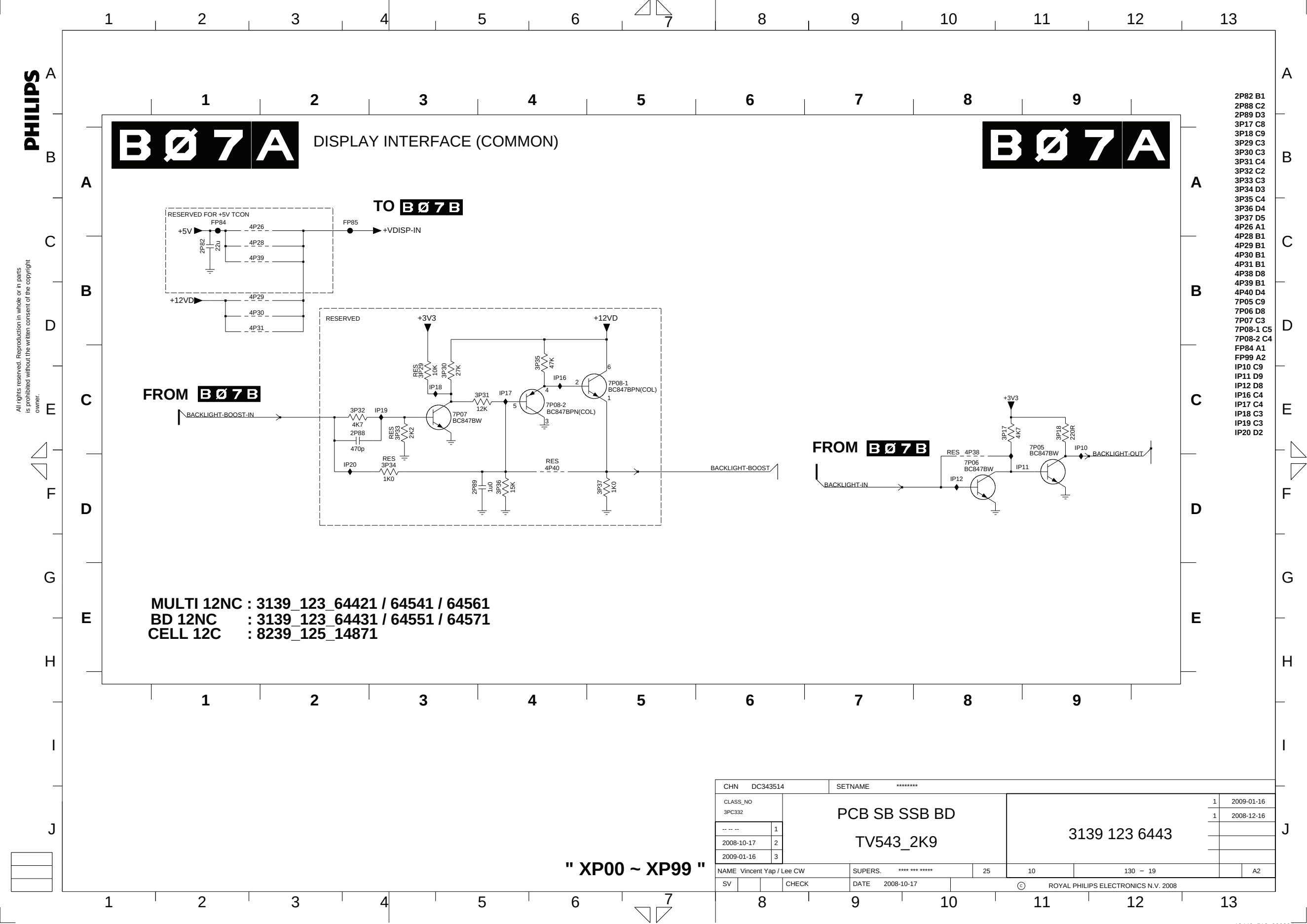
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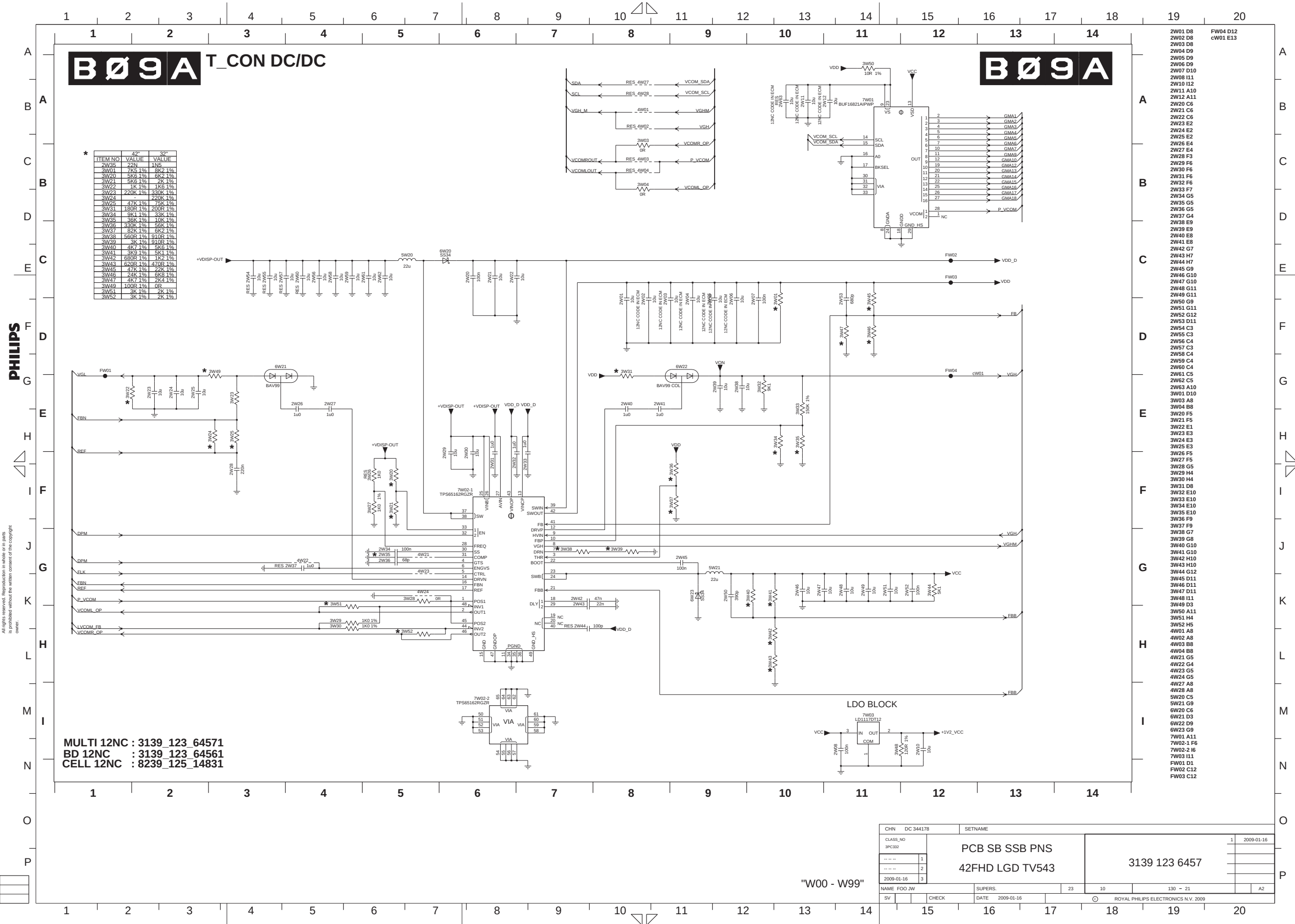
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"XL00-XL99"

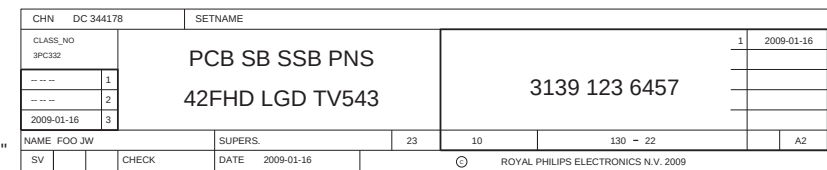
SSB: Display Interface (Common)



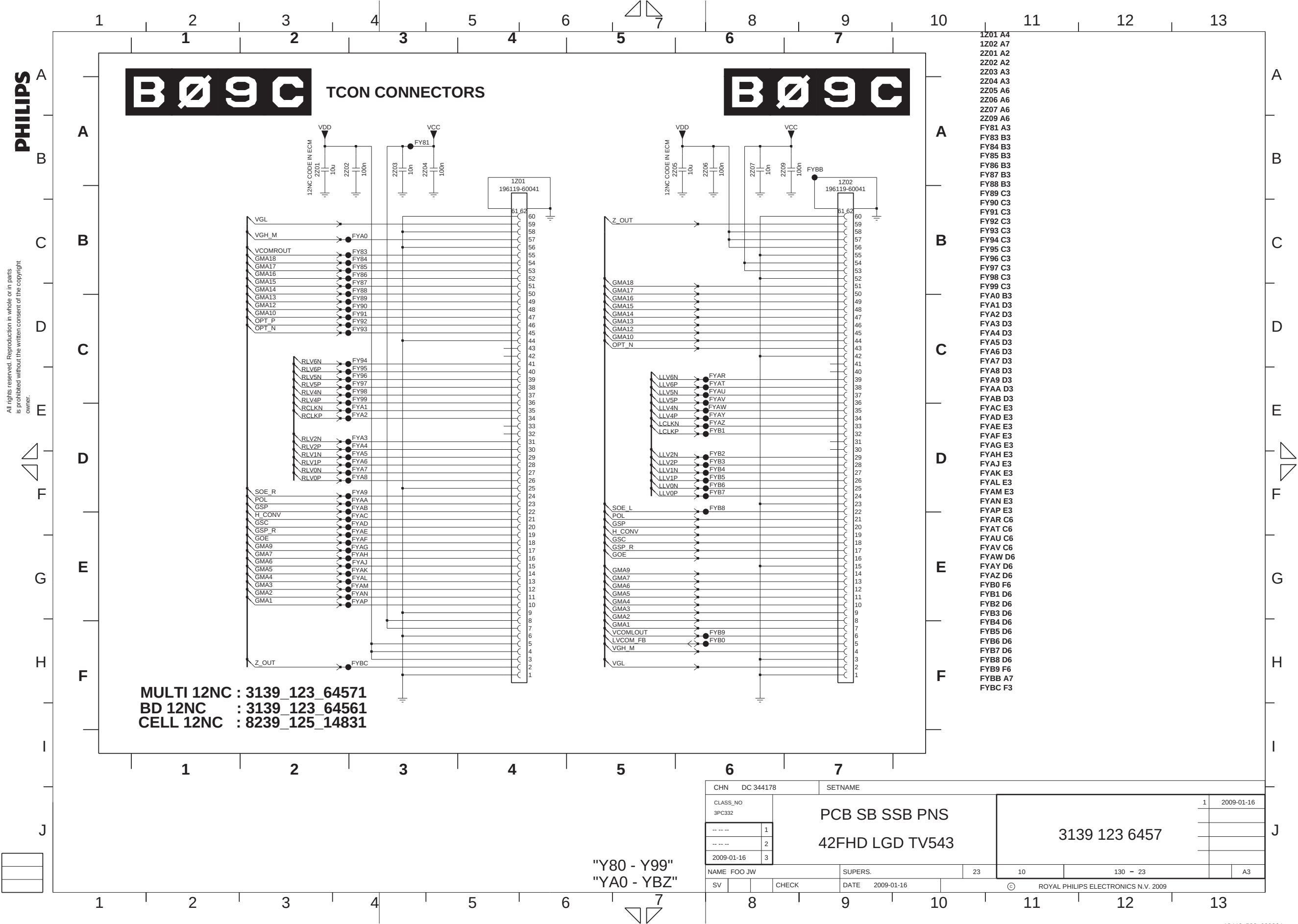
SSB: T-Con DC/DC



B Ø 9 B TCONLG420WUNCONTROL



SSB: Tcon Connectors



SSB: SRP List Part 2

Netname	Diagram									
PCI-AD25	B05B (1×)	PCMCIA-A9	B05C (2×)	RX51001A-	B09B (1×)	SDA-SSB	B02A (1×)	WP-NANDFLASH	B03G (2×)	
PCI-AD25	B05C (1×)	PCMCIA-D0	B05C (2×)	RX51001A+	B03B (1×)	SDA-SSB	B03G (2×)	WP-NANDFLASH	B03H (2×)	
PCI-AD26	B03G (2×)	PCMCIA-D1	B05C (2×)	RX51001A+	B09B (1×)	SDA-SSB	B04A (1×)	XIO-ACK	B03G (3×)	
PCI-AD26	B05B (1×)	PCMCIA-D2	B05C (2×)	RX51001B-	B03B (1×)	SDA-SSB	B05A (1×)	XIO-SEL-NAND	B03G (3×)	
PCI-AD26	B05C (1×)	PCMCIA-D3	B05C (2×)	RX51001B-	B09B (1×)	SDA-TUNER	B02A (2×)	Y_CVBS-MON-OUT	B03E (1×)	
PCI-AD27	B03G (2×)	PCMCIA-D4	B05C (2×)	RX51001B+	B03B (1×)	SDA-UP-MIPS	B03G (3×)	Y_CVBS-MON-OUT	B04B (1×)	
PCI-AD27	B05B (1×)	PCMCIA-D5	B05C (2×)	RX51001B+	B09B (1×)	SDA-UP-MIPS	B03H (2×)	Y_CVBS-MON-OUT-SC	B04B (2×)	
PCI-AD27	B05C (1×)	PCMCIA-D6	B05C (2×)	RX51001C-	B03B (1×)	SDM	B03H (3×)	Z_OUT	B09C (2×)	
PCI-AD27	B03G (2×)	PCMCIA-D7	B05C (2×)	RX51001C-	B09B (1×)	SENSE+1V2-PNX5100	B01B (2×)			
PCI-AD27	B05C (1×)	PCMCIA-VCC-VPP	B05C (5×)	RX51001C+	B03B (1×)	SENSE+1V2-PNX85XX	B01A (1×)			
PCI-AD28	B03G (2×)	PDN	B02A (2×)	RX51001C+	B09B (1×)	SENSE+1V2-PNX85XX	B03A (1×)			
PCI-AD28	B05B (1×)	PDP	B02A (2×)	RX51001CLK-	B03B (1×)	SIF	B02A (1×)			
PCI-AD28	B05C (1×)	PI_3	B03H (2×)	RX51001CLK-	B09B (1×)	SIF	B03E (1×)			
PCI-AD29	B03G (2×)	PI_3	B09B (1×)	RX51001CLK+	B03B (1×)	SIF-GND	B02A (1×)			
PCI-AD29	B05B (1×)	PNX8543-BL-BOOST_SPI-CLK	B03G (2×)	RX51001CLK+	B09B (1×)	SIF-GND	B03E (2×)			
PCI-AD29	B05C (1×)	PNX8543-BL-BOOST_SPI-CLK	B04A (1×)	RX51001D-	B03B (1×)	SOE_L	B09B (1×)			
PCI-AD3	B03G (1×)	PNX8543-BL-BOOST_SPI-CLK	B07B (1×)	RX51001D-	B09B (1×)	SOE_L	B09C (1×)			
PCI-AD3	B05B (1×)	PNX8543-LCD-PWR-ON_SPI-DI	B03G (2×)	RX51001D+	B03B (1×)	SOE_R	B09B (1×)			
PCI-AD3	B05C (1×)	PNX8543-LCD-PWR-ON_SPI-DI	B04A (1×)	RX51001D+	B09B (1×)	SOE_R	B09C (1×)			
PCI-AD30	B03G (2×)	PNX8543-LCD-PWR-ON_SPI-DI	B07B (1×)	RX51001E-	B03B (1×)	SPDIF-IN	B03D (1×)			
PCI-AD30	B05B (1×)	POL	B09B (1×)	RX51001E-	B09B (1×)	SPDIF-IN	B04A (1×)			
PCI-AD30	B05C (1×)	POL	B09C (2×)	RX51001E+	B03B (1×)	SPDIF-OUT	B04B (1×)			
PCI-AD31	B03G (2×)	POWER-OK	B01B (1×)	RX51001E+	B09B (1×)	SPDIF-OUT	B04C (1×)			
PCI-AD31	B05B (1×)	POWER-OK	B03H (2×)	RX51002A-	B03B (1×)	SPDIF-OUT-1	B03D (1×)			
PCI-AD31	B05C (1×)	PROT-DC	B01A (1×)	RX51002A-	B09B (1×)	SPDIF-OUT-1	B04C (1×)			
PCI-AD4	B03G (1×)	PROT-DC	B01B (1×)	RX51002A+	B03B (1×)	SPI-CLK	B03H (2×)			
PCI-AD4	B05B (1×)	PSEN	B03H (1×)	RX51002A+	B09B (1×)	SPI-CSB	B03H (2×)			
PCI-AD4	B05C (1×)	RBF	B09B (1×)	RX51002B-	B03B (1×)	SPI-DO_I2C-SDA	B03G (2×)			
PCI-AD5	B03G (1×)	RC	B03G (1×)	RX51002B-	B09B (1×)	SPI-DO_I2C-SDA	B04A (1×)			
PCI-AD5	B05B (1×)	RC	B03H (1×)	RX51002B+	B03B (1×)	SPI-PROG	B03H (3×)			
PCI-AD5	B05C (1×)	RC	B04A (1×)	RX51002B+	B09B (1×)	SPI-SDI	B03H (2×)			
PCI-AD6	B03G (1×)	RC_uP	B03H (2×)	RX51002C-	B03B (1×)	SPI-SDO	B03H (2×)			
PCI-AD6	B05B (1×)	RC1	B03H (1×)	RX51002C-	B09B (1×)	SPI-WP	B03H (3×)			
PCI-AD6	B05C (1×)	RC1	B04A (1×)	RX51002C+	B03B (1×)	STANDBY	B01B (1×)			
PCI-AD7	B03G (1×)	RC1	B04C (1×)	RX51002C+	B09B (1×)	STANDBY	B03H (2×)			
PCI-AD7	B05B (1×)	RC2	B03H (1×)	RX51002CLK-	B03B (1×)	STANDBY	B04A (1×)			
PCI-AD7	B05C (1×)	RC2	B04A (1×)	RX51002CLK-	B09B (1×)	TXD	B03G (1×)			
PCI-AD8	B03G (1×)	RC2	B04C (1×)	RX51002CLK+	B03B (1×)	TXD	B04A (1×)			
PCI-AD8	B05B (1×)	RCLKN	B09B (1×)	RX51002CLK+	B09B (1×)	TXD-BOLT-ON	B04A (3×)			
PCI-AD8	B05C (1×)	RCLKN	B09C (1×)	RX51002D-	B03B (1×)	TXD-MIPS	B03G (2×)			
PCI-AD9	B03G (1×)	RCLKP	B09B (1×)	RX51002D-	B09B (1×)	TXD-MIPS	B04A (2×)			
PCI-AD9	B05B (1×)	RCLKP	B09C (1×)	RX51002D+	B03B (1×)	TXD-MIPS2	B03G (2×)			
PCI-AD9	B05C (1×)	REF	B09A (2×)	RX51002D+	B09B (1×)	TXD-UP	B03G (1×)			
PCI-CBE0	B03G (1×)	REGIMBEAU_CVBS-SWITCH	B03H (2×)	RX51002E-	B03B (1×)	TXD-UP	B03H (2×)			
PCI-CBE0	B05B (1×)	REGIMBEAU_CVBS-SWITCH	B04B (1×)	RX51002E-	B09B (1×)	TXD-UP	B04A (2×)			
PCI-CBE1	B03G (2×)	RESET	B09B (2×)	RX51002E+	B03B (1×)	UART-SWITCH	B03H (2×)			
PCI-CBE1	B05B (1×)	RESET-ETHERNET	B03H (2×)	RX51002E+	B09B (1×)	USB20-DM	B03G (2×)			
PCI-CBE1	B05C (1×)	RESET-ETHERNET	B05B (2×)	RXC-	B05A (2×)	USB20-DP	B03G (2×)			
PCI-CBE2	B03G (2×)	RESET-NVM	B03H (3×)	RXC+	B05A (2×)	USB-OC	B03G (2×)			
PCI-CBE2	B05B (1×)	RESET-PNX5100	B03H (2×)	RXD	B03G (1×)	VCC	B09A (3×)			
PCI-CBE2	B05C (1×)	RESET-STBY	B03H (2×)	RXD	B04A (1×)	VCC	B09B (20×)			
PCI-CBE3	B03G (1×)	RESET-SYSTEM	B02A (1×)	RXD-BOLT-ON	B04A (3×)	VCC	B09C (2×)			
PCI-CBE3	B05B (1×)	RESET-SYSTEM	B03G (1×)	RXD-MIPS	B03G (2×)	VCO	B09B (2×)			
PCI-CLK-ETHERNET	B03G (1×)	RESET-SYSTEM	B03H (3×)	RXD-MIPS	B04A (2×)	VCOM_SCL	B09A (2×)			
PCI-CLK-ETHERNET	B05B (1×)	REVERSE	B09B (2×)	RXD-MIPS2	B03G (2×)	VCOM_SCL	B09B (1×)			
PCI-CLK-OUT	B03G (2×)	RF-AGC	B02A (2×)	RXD-UP	B03G (1×)	VCOM_SDA	B09A (2×)			
PCI-CLK-PNX5100	B03G (1×)	RIGHT-SPEAKER	B06A (4×)	RXD-UP	B03H (2×)	VCOM_SDA	B09B (1×)			
PCI-CLK-PNX8543	B03G (2×)	RLV0N	B09B (1×)	RXD-UP	B04A (2×)	VCOML_OP	B09A (2×)			
PCI-DEVSEL	B03G (2×)	RLV0N	B09C (1×)	SC1-B	B03E (1×)	VCOMLOUT	B09A (1×)			
PCI-DEVSEL	B05B (1×)	RLV0P	B09B (1×)	SC1-B	B04A (1×)	VCOMLOUT	B09C (1×)			
PCI-FRAME	B03G (2×)	RLV0P	B09C (1×)	SC1-B	B04B (2×)	VCOMR_OP	B09A (2×)			
PCI-FRAME	B05B (1×)	RLV1N	B09B (1×)	SC1-G	B03E (1×)	VCOMROUT	B09A (1×)			
PCI-GNT	B03G (2×)	RLV1N	B09C (1×)	SC1-G	B04A (1×)	VCOMROUT	B09C (1×)			
PCI-GNT	B05B (1×)	RLV1P	B09B (1×)	SC1-G	B04B (2×)	VDD	B09A (4×)			
PCI-IRDY	B03G (2×)	RLV1P	B09C (1×)	SC1-R	B03E (1×)	VDD	B09C (2×)			
PCI-IRDY	B05B (1×)	RLV2N	B09B (1×)	SC1-R	B04A (1×)	VDD_1V8	B05A (2×)			
PCI-PAR	B03G (1×)	RLV2N	B09C (1×)	SC1-R	B04B (1×)	VDD_D	B09A (4×)			
PCI-PAR	B05B (1×)	RLV2P	B09B (1×)	SCL	B09A (1×)	VDDA-ADC	B03A (1×)			
PCI-PERR	B03G (2×)	RLV2P	B09C (1×)	SCL	B09B (3×)	VDDA-AUDIO	B03A (2×)			
PCI-PERR	B05B (1×)	RLV4N	B09B (1×)	SCL1	B03G (2×)	VDDA-AUDIO	B03D (4×)			
PCI-REQ	B03G (2×)	RLV4N	B09C (1×)	SCL2	B03G (3×)	VDDA-DAC	B03A (1×)			
PCI-REQ	B05B (1×)	RLV4P	B09B (1×)	SCL3	B03G (2×)	VDDA-DAC	B03D (1×)			
PCI-SERR	B03G (2×)	RLV4P	B09C (1×)	SCL-DISP	B03G (1×)	VDDA-LVDS	B03A (1×)			
PCI-SERR	B05B (1×)	RLV5N	B09B (1×)	SCL-DISP	B09B (1×)	VDDA-LVDS	B03B (1×)			
PCI-STOP	B03G (2×)	RLV5N	B09C (1×)	SCL-SET	B01B (1×)	VDDH_3V3	B05A (3×)			
PCI-STOP	B05B (1×)	RLV5P	B09B (1×)	SCL-SET	B03G (3×)	VDDO_3V3	B05A (2×)			
PCI-TRDY	B03G (2×)	RLV5P	B09C (1×)	SCL-SSB	B02A (1×)	VDDS_3V3	B05A (2×)			
PCI-TRDY	B05B (1×)	RLV6N	B09B (1×)	SCL-SSB	B03G (2×)	VGH	B09A (3×)			
PCMCIA-A0	B05C (2×)	RLV6N	B09C (1×)	SCL-SSB	B04A (1×)	VGH_M	B09A (1×)			
PCMCIA-A1	B05C (2×)	RLV6P	B09B (1×)	SCL-SSB	B05A (1×)	VGH_M	B09C (2×)			
PCMCIA-A10	B05C (2×)	RLV6P	B09C (1×)	SCL-TUNER	B02A (2×)	VGHM	B09A (2×)			
PCMCIA-A11	B05C (2×)	RREF-PNX85XX	B03A (2×)	SCL-UP-MIPS	B03G (3×)	VGL	B09A (1×)			
PCMCIA-A12	B05C (2×)	RREF-PNX85XX	B05A (1×)	SCL-UP-MIPS	B03H (2×)	VGL	B09C (2×)			
PCMCIA-A13	B05C (2×)	R-VGA	B03E (1×)	SDA	B09A (1×)	VON	B09A (1×)			
PCMCIA-A14	B05C (2×)	R-VGA	B04C (1×)	SDA	B09B (3×)	VSW	B01A (1×)			
PCMCIA-A2	B05C (2×)	RX0-	B05A (2×)	SDA1	B03G (2×)	V-SYNC-VGA	B03E (1×)			
PCMCIA-A3	B05C (2×)	RX0+	B05A (2×)	SDA2	B03G (3×)	V-SYNC-VGA	B04C (1×)			
PCMCIA-A4	B05C (2×)	RX1-	B05A (2×)	SDA3	B03G (2×)	WC-EEPROM-PNX5100_SPI-DI	B03G (1×)			
PCMCIA-A5	B05C (2×)	RX1+	B05A (2×)	SDA-DISP	B03G (1×)	WC-EEPROM-PNX5100_SPI-DI	B04A (1×)			
PCMCIA-A6	B05C (2×)	RX2-	B05A (2×)	SDA-DISP	B09B (1×)	WC-EEPROM-PNX5100_SPI-DI	B04C (1×)			
PCMCIA-A7	B05C (2×)	RX2+	B05A (2×)	SDA-SET	B01B (1×)	WP1	B09B (2×)			
PCMCIA-A8	B05C (2×)	RX51001A-	B03B (1×)	SDA-SET	B03G (3×)	WP2	B09B (2×)			
3139 123 6457.1										

2009-Mar-12