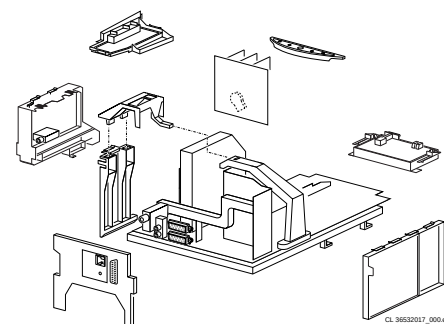


Service
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Service Manual

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1. Technical Specifications, Connection, and Chassis Overview

- Index of this chapter:
- 1. Technical Specifications
 - 2. Connection Overview
 - 3. Chassis Overview

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

1.1 Technical Specifications

1.1.1 Vision

- Display type
- Screen sizes
- Tuning system
- Colour systems
- Video playback
- Channel selections
- Aerial input
- : CRT-DV-RF
- : 28" (70 cm), 16:9
- : 32" (82 cm), 16:9
- : PLL
- : PAL B/G, D/K, I
- : SECAM B/G, D/K, L/L'
- : NTSC 3.58
- : NTSC 4.43
- : NTSC Play Back
- : 100 presets
- : UHF
- : VHF
- : Hyper-band
- : S-band
- : 75 ohm, Coax
- : IEC-type

1.1.2 Sound

- Sound systems
- Maximum power
- : FM/FM B/G, Czech
- : NICAM B/G, D/K, I, L
- : 4 x 15 W rms (int.)

1.1.3 Miscellaneous

- Mains voltage
- Mains frequency
- Ambient temperature
- Maximum humidity
- Power consumption
- Normal operation
- Standby
- : 220 - 240 V_ac
- : 50 / 60 Hz
- : +5 to +45 deg. C
- : 90 % R.H.
- :
- :
- : ≈ 130 W
- : < 1 W

1.2 Connection Overview

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

1.2.1 Top Control and Front / Side Connections

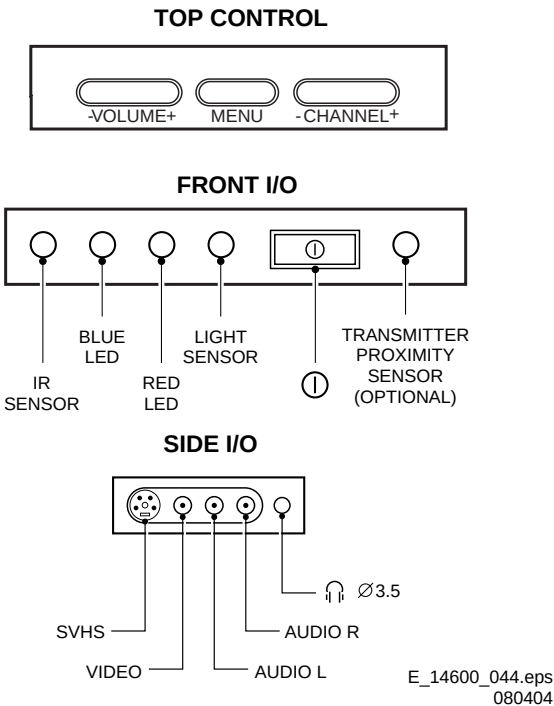


Figure 1-1 Top control and Front / Side connections

S-Video: In			
1	- Ground	Gnd	
2	- Ground	Gnd	
3	- Y	1 V_pp / 75 ohm	
4	- C	0.3 V_pp / 75 ohm	
Cinch: In			
Ye	- Video-CVBS	1 V_pp / 75 ohm	
Wh	- Audio - L	0.5 V_rms / 10 kohm	
Rd	- Audio - R	0.5 V_rms / 10 kohm	
Mini Jack: Headphone - Out			
	- Headphone	32 - 600 ohm / 10 mW	

1.2.2 Rear Connections

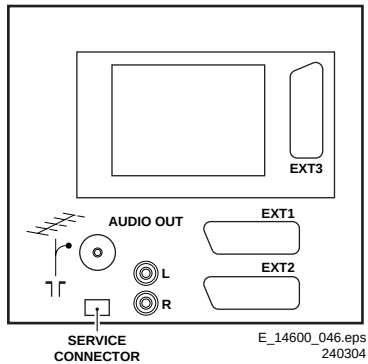


Figure 1-2 Rear view

Aerial - In

- IEC-type Coax, 75 ohm

**Cinch: Audio - Out**

Re - Audio - R 0.5 V_{rms} / 1 kohm
 Wh - Audio - L 0.5 V_{rms} / 1 kohm

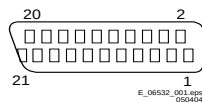
**External 1: RGB/YUV and CVBS - In/Out**

Figure 1-3 SCART connector

1 - Audio - R	0.5 V _{rms} / 1 kohm	⊕
2 - Audio - R	0.5 V _{rms} / 10 kohm	⊕
3 - Audio - L	0.5 V _{rms} / 1 kohm	⊕
4 - Audio - gnd	Ground	⊖
5 - Blue - gnd	Ground	⊖
6 - Audio - L	0.5 V _{rms} / 10 kohm	⊕
7 - Blue/U - in	0.7 V _{pp} / 75 ohm	⊕
8 - CVBS - status	0 - 2 V: INT 4.5 - 7 V: EXT 16:9 9.5 - 12 V: EXT 4:3	⊕
9 - Green - gnd	Ground	⊖
10 - n.c.		⊖
11 - Green/Y - in	0.7 V _{pp} / 75 ohm	⊕
12 - n.c.		⊖
13 - Red - gnd	Ground	⊖
14 - FBL - gnd	Ground	⊖
15 - Red/V - in	0.7 V _{pp} / 75 ohm	⊕
16 - Status / FBL	0 - 0.4 V: INT 1 - 3 V: EXT / 75 ohm	⊕
17 - Video	Ground	⊖
18 - Video	Ground	⊖
19 - CVBS - out	1 V _{pp} / 75 ohm	⊕
20 - CVBS - in	1 V _{pp} / 75 ohm	⊕
21 - Shielding	Ground	⊖

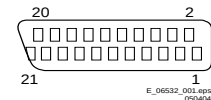
External 2: CVBS and SVHS - In (for video recorder)

Figure 1-4 SCART connector

1 - Audio - R	0.5 V _{rms} / 1 kohm	⊕
2 - Audio - R	0.5 V _{rms} / 10 kohm	⊕
3 - Audio - L	0.5 V _{rms} / 1 kohm	⊕
4 - Audio - gnd	Ground	⊖
5 - Blue - gnd	Ground	⊖
6 - Audio - L	0.5 V _{rms} / 10 kohm	⊕
7 - C - out	0.7 V _{pp} / 75 ohm	⊕
8 - CVBS - status	0 - 2 V: INT 4.5 - 7 V: EXT 16:9 9.5 - 12 V: EXT 4:3	⊕
9 - Green - gnd	Ground	⊖
10 - Easylink	(P50)	⊖
11 - n.c.		⊖
12 - n.c.		⊖
13 - Red - gnd	Ground	⊖
14 - FBL - gnd	Ground	⊖
15 - C - in	0.7 V _{pp} / 75 ohm	⊕
16 - n.c.		⊖
17 - Video	Ground	⊖
18 - Video	Ground	⊖
19 - CVBS - out	1 V _{pp} / 75 ohm	⊕
20 - Y / CVBS - in	1 V _{pp} / 75 ohm	⊕
21 - Shielding	Ground	⊖

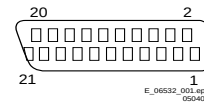
External 3: RGB and CVBS - In

Figure 1-5 SCART connector

1 - n.c.		⊖
2 - Audio - R	0.5 V _{rms} / 10 kohm	⊕
3 - n.c.		⊖
4 - Audio - gnd	Ground	⊖
5 - Blue - gnd	Ground	⊖
6 - Audio - L	0.5 V _{rms} / 10 kohm	⊕
7 - Blue - in	0.7 V _{pp} / 75 ohm	⊕
8 - CVBS - status	0 - 1.3 V: INT 4.5 - 7 V: EXT 16:9 9.5 - 12 V: EXT 4:3	⊕
9 - Green - gnd	Ground	⊖
10 - n.c.		⊖
11 - Green - in	0.7 V _{pp} / 75 ohm	⊕
12 - n.c.		⊖
13 - Red - gnd	Ground	⊖
14 - FBL - gnd	Ground	⊖
15 - Red - in	0.7 V _{pp} / 75 ohm	⊕
16 - Status / FBL	0 - 0.4 V: INT 1 - 3 V: EXT / 75 ohm	⊕
17 - Video	Ground	⊖
18 - Video	Ground	⊖
19 - n.c.		⊖
20 - CVBS - in	1 V _{pp} / 75 ohm	⊕
21 - Shielding	Ground	⊖

1.3 Chassis Overview

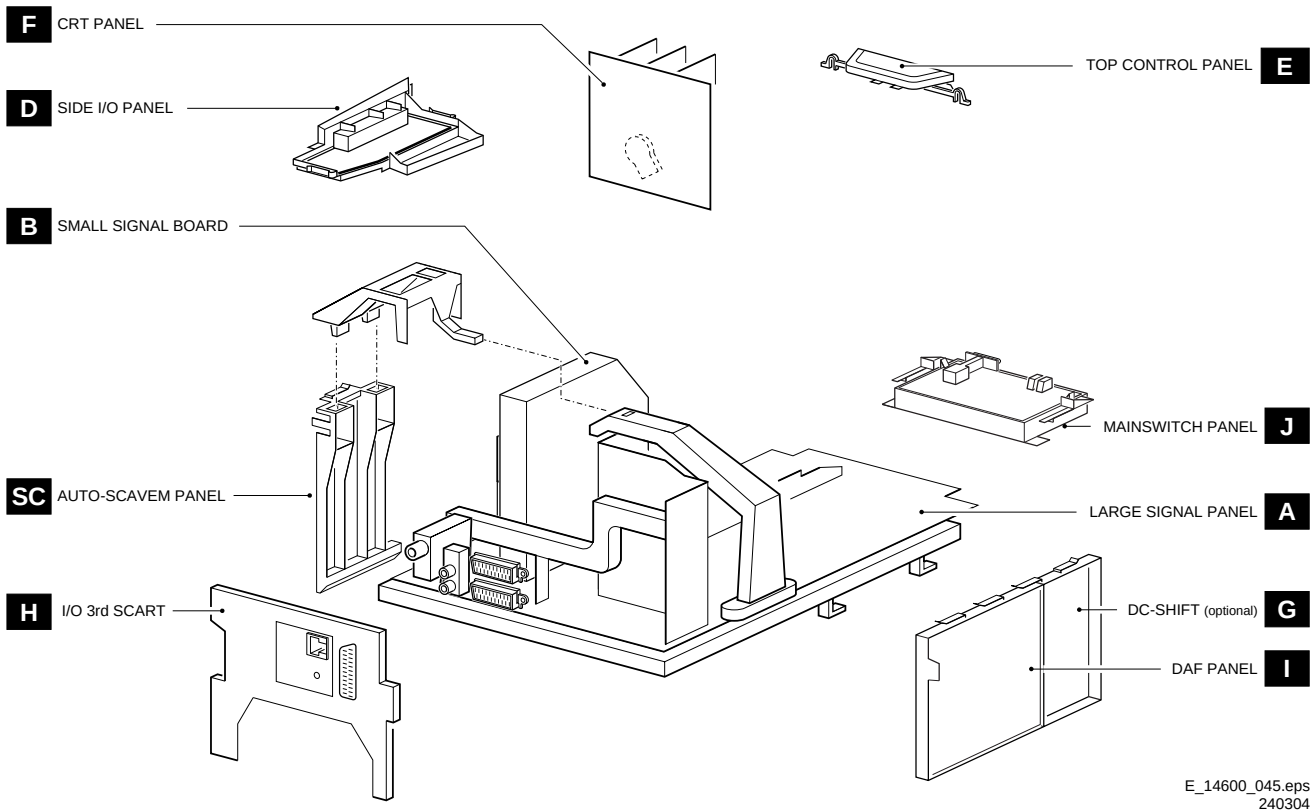


Figure 1-6 PWB locations

2. Safety and Maintenance Instructions, Warnings, and Notes

2.1 Safety Instructions

Safety regulations require that **during** a repair:

- Due to the chassis concept, a very large part of the circuitry (incl. deflection) is "hot". Therefore, connect the set to the mains via an isolation transformer.
- 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.
- Wear safety goggles when you replace the CRT.

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

- General repair instruction: as a strict precaution, we advise you to re-solder the solder connections through which the horizontal deflection current is flowing. In particular this is valid for the:
 1. Pins of the line output transformer (LOT).
 2. Fly-back capacitor(s).
 3. S-correction capacitor(s).
 4. Line output transistor.
 5. Pins of the connector with wires to the deflection coil.
 6. Other components through which the deflection current flows.

Note: This re-soldering is advised to prevent bad connections due to metal fatigue in solder connections, and is therefore only necessary for television sets more than two years old.

- Route the wire trees and EHT cable correctly and secure them with the mounted cable clamps.
- Check the insulation of the mains cord for external damage.
- Check the strain relief of the mains cord for proper function, to prevent the cord from touching the CRT, hot components, or heat sinks.
- Check the electrical DC resistance between the mains plug and the secondary side (only for sets that have an isolated power supply). Do this as follows:
 1. Unplug the mains cord and connect a wire between the two pins of the mains plug.
 2. Turn on the main power switch (keep the mains cord unplugged!).
 3. Measure the resistance value between the pins of the mains plug and the metal shielding of the tuner or the aerial connection of the set. The reading should be between 4.5 Mohm and 12 Mohm.
 4. Switch the TV "off" and remove the wire between the two pins of the mains plug.
- Check the cabinet for defects, to prevent the possibility of the customer touching any internal parts.

2.2 Maintenance Instructions

We recommend a maintenance inspection carried out by qualified service personnel. The interval depends on the usage conditions:

- When a customer uses the set under normal circumstances, for example in a living room, the recommended interval is three to five years.
- When a customer uses the set in an environment with higher dust, grease, or moisture levels, for example in a kitchen, the recommended interval is one year.
- The maintenance inspection includes the following actions:
 1. Perform the "general repair instruction" noted above.
 2. Clean the power supply and deflection circuitry on the chassis.
 3. Clean the picture tube panel and the neck of the picture tube.

2.3 Warnings

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

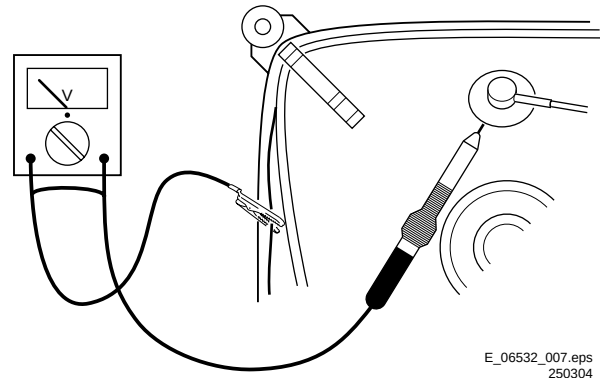


Figure 2-1 Discharge picture tube

- 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 potential. Available ESD protection equipment:
 - Complete kit ESD3 (small tablemat, wristband, connection box, extension cable and ground cable) 4822 310 10671.
 - Wristband tester 4822 344 13999.
- Together with the deflection unit and any multi-pole unit, flat square picture tubes form an integrated unit. The deflection and the multi-pole units are set optimally at the factory. We do not recommend adjusting this unit during repair.
- Be careful during measurements in the high voltage section and on the picture tube.
- Never replace modules or other components while the unit is "on".
- When you align the set, use plastic rather than metal tools. This will prevent any short circuits and the danger of a circuit becoming unstable.

2.4 Notes

2.4.1 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 (see chapter 5 "Service Modes, ...") 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 standby (Ⓢ). These values are indicated by means of the appropriate symbols.

- The picture tube panel has printed spark gaps. Each spark gap is connected between an electrode of the picture tube and the Aquadag coating.
- The semiconductors indicated in the circuit diagram and in the parts lists, are interchangeable per position with the semiconductors in the unit, irrespective of the type indication on these semiconductors.
- Manufactured under license from Dolby Laboratories. "Dolby", "Pro Logic" and the "double-D symbol", are trademarks of Dolby Laboratories.



Figure 2-2 Dolby PL Symbol

Device Replacement

The last step in the repair process is to solder the new component on the board. Ideally, the (LF)BGA should be aligned under a microscope or magnifying glass. If this is not possible, try to align the (LF)BGA with any board markers. To reflow the solder, apply a temperature profile according to the *IC data sheet*. So as not to damage neighbouring components, it may be necessary to reduce some temperatures and times.

More Information

For more information on how to handle BGA devices, visit this URL:

<http://www.atyourservice-magazine.com/workshop.shtml?v=main=en> (only accessible for dealers with subscription)

2.4.2 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 kohm).
- Resistor values with no multiplier may be indicated with either an "E" or an "R" (e.g. 220E or 220R indicates 220 ohm).
- All capacitor values are expressed 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 in the Electrical Replacement Parts List. Therefore, always check this list when there is any doubt.

2.4.3 Rework on BGA (Ball Grid Array) ICs

General

Although (LF)BGA assembly yields are very high, there may still be a requirement for component rework. By rework, we mean the process of removing the component from the PWB and replacing it with a new component. If an (LF)BGA is removed from a PWB, the solder balls of the component are deformed drastically so the removed (LF)BGA has to be discarded.

Device Removal

As is the case with any component that, it is essential when removing an (LF)BGA, the board, tracks, solder lands, or surrounding components are not damaged. To remove an (LF)BGA, the board must be uniformly heated to a temperature close to the reflow soldering temperature. A uniform temperature reduces the chance of warping the PWB. To do this, we recommend that the board is heated until it is certain that all the joints are molten. Then carefully pull the component off the board with a vacuum nozzle. For the appropriate temperature profiles, see the IC data sheet.

Area Preparation

When the component has been removed, the vacant IC area must be cleaned before replacing the (LF)BGA. Removing an IC often leaves varying amounts of solder on the mounting lands. This excessive solder can be removed with either a solder sucker or solder wick. The remaining flux can be removed with a brush and cleaning agent.

After the board is properly cleaned and inspected, apply flux on the solder lands and on the connection balls of the (LF)BGA.

Note: Do not apply solder paste, as this has shown to result in problems during re-soldering.

3. Directions for Use

You can download this information from the following website:
<http://www.philips.com/support>

1. Click on "Downloads and Troubleshooting" [1].
2. Fill in the TV model/type number in the field "Which Model/Type?" [2] and click on "Search" [3].
Note: The correct model/typenumber can be found on the rear cover of the set. If you do not have the complete model/typenumber, just fill in e.g. "32PW95" or "PW95" (do not use wildcards).
3. When results are returned, click on the desired model/typenumber under "Model" [4].
4. Now, click on the "Owner's manual" [5] in the desired language. To read/open the PDF files you can download and install the free Acrobat Reader
<http://www.adobe.com/products/acrobat/readstep2.html>

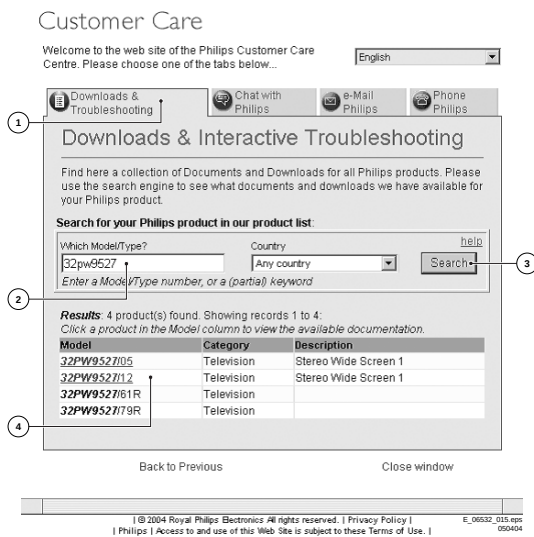


Figure 3-1 Screenshot DFU website (1)

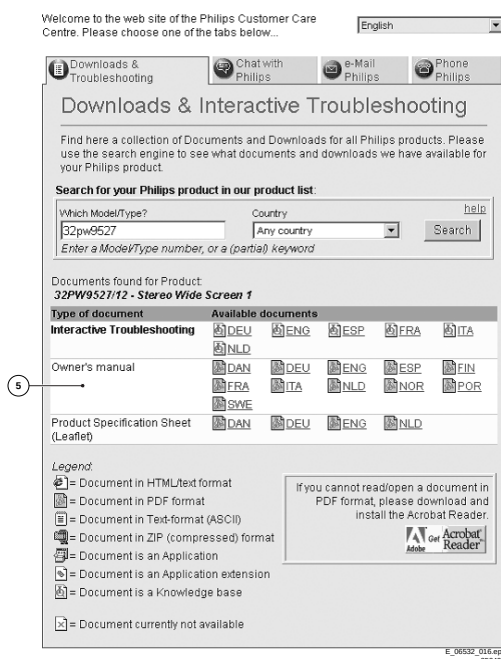


Figure 3-2 Screenshot DFU website (2)

4. Mechanical Instructions

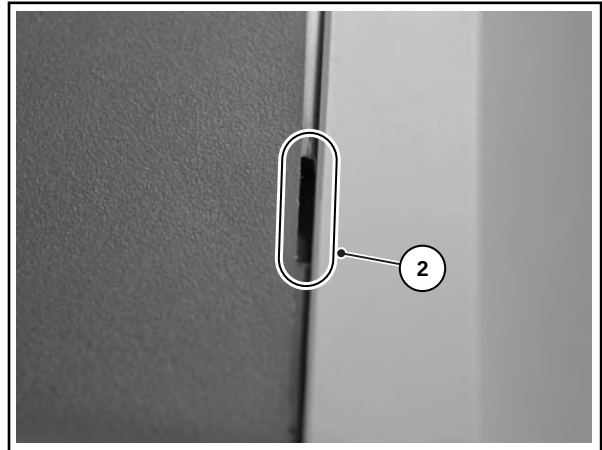
Index of this chapter:

1. Service connector
2. Set Disassembly
3. Service Positions
4. Assies / Panels Removal
5. Set Reassembly

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

4.1 Service Connector (for ComPair)

For service diagnostics with ComPair, it is not necessary to disassemble the set. You only have to connect the ComPair interface box via the appropriate cable, to the service connector on the rear of the set (see figure "Rear connections" in chapter "Technical specifications, ..."), and start the program (see also chapter "Service Modes").



E_13950_012 .eps

Figure 4-2 Opening

4.2 Set Disassembly

Follow the disassemble instructions in described order.

4.2.1 Rear Cover Removal

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

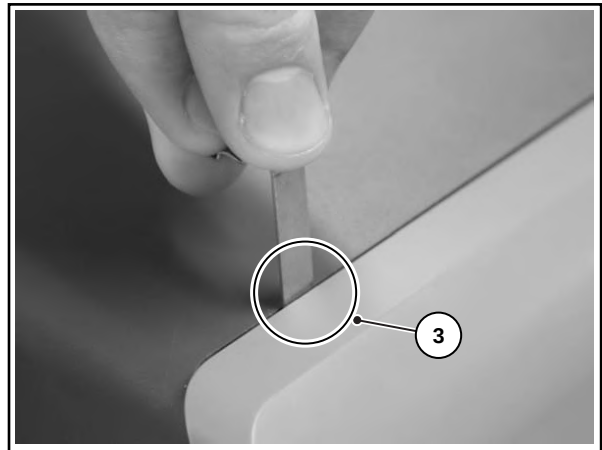
1. Remove all screws. If you do not remove them, you cannot access the clips.
2. Tilt the set a little forward, so that you can release the two clickfit clamps that are located at the bottomplate of the set.
3. Four openings (1) can be found at the top (32" sets). The openings are very small (2).

Note: 28" sets only have the two openings.

4. Underneath every opening there is a clip. Push this clip down with a very thin piece of metal (3), until you hear a click.

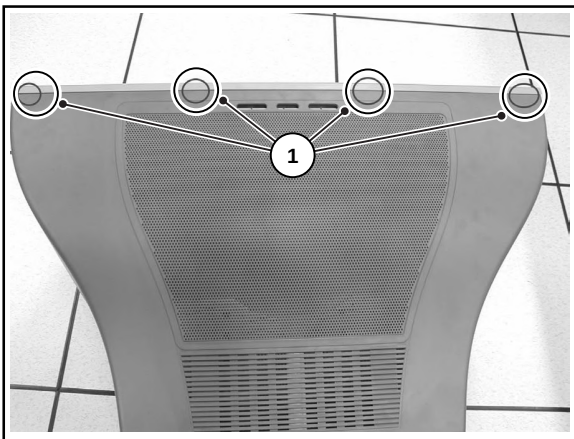
Caution: do not use a screwdriver, this will damage the cabinet.

5. When all four clips are pushed down, the back cover can be removed a little (15 cm).
6. Before completely removing the back cover, the cable of the top control must be disconnected from the side I/O panel, otherwise damage can occur.
7. When reassembling the set, take care not to forget to connect the cable again.



E_13950_013.eps

Figure 4-3 Pushing clips down



E_13950_011 .eps
050404

Figure 4-1 Rear cover (for FL13B styling)

4.3 Service Positions

This chassis has several predefined service positions, for better accessibility. They are explained below in more detail.

4.3.1 Solder Side 'I/O 3rd SCART' panel

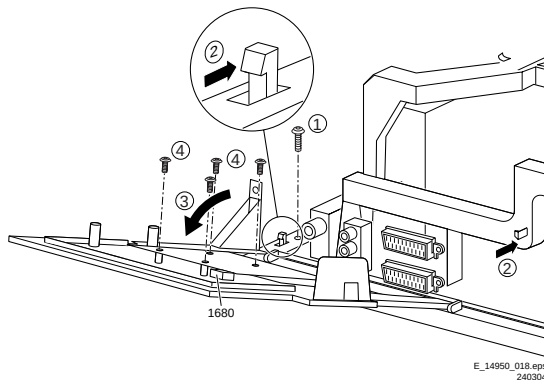


Figure 4-4 Service position 1

To remove or access the 'I/O 3rd SCART' panel, do the following:

1. Remove the fixation screw (1) (if present).
2. Release the two pegs (2).
3. At the same time, pull the complete module away from the LSP bracket (3). It hinges in the LSP bracket.
4. To remove the panel, disconnect the flat-cables, and remove the four panel screws (4).

4.3.2 Component Side LSP

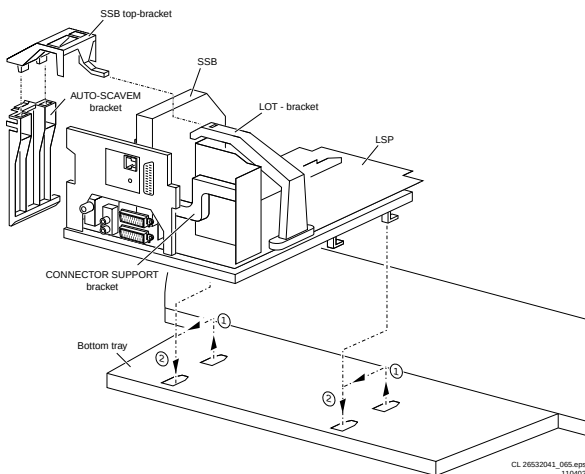


Figure 4-5 Service position 2

For better accessibility of the LSP, do the following (see figure above):

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

4.3.3 Solder Side LSP

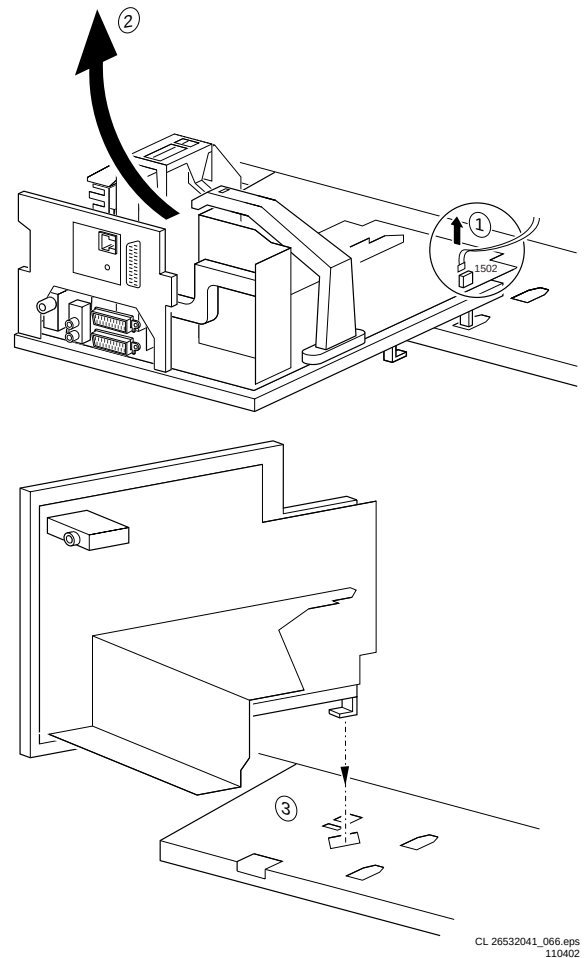


Figure 4-6 Service position 3

To get access to the bottom side (solder side) of the LSP, do the following (see figure above):

1. Remove the DAF-module (see paragraph 'DAF Assy/ Panel' below).
2. The 3 pin cable of side IO must be disconnected or complete side IO Assy released from its hooks.
3. To disconnect the degaussing coil from the LSP, remove the cable from connector 1502 (1).
4. Release the wiring from their fixation clamps, in order to get room for repositioning the LSP.
5. Flip the LSP 90 degrees clockwise (2), and place it in the fixation hole at the left side of the bottom tray (3).

4.3.4 Small Signal Board (SSB)

Caution:

Always switch the set completely "OFF" (disconnected the mains cord) before you remove or replace the SSB. As the 5V2 standby voltage is always present (while the set is switched "ON", in "standby" or in "Protection" mode) on the SIMM connector, it is very risky to remove the SSB in this situation, because the risk of short circuiting is very great.

In fact, there is no predefined service position for the SSB. Most test points are located on the A-side (side that is facing the tuner). If you have to replace ICs, you must take the complete SSB module out of the SIMM-connector.

Note: For good access to the A-side, it is necessary to remove the Auto-Scavem Assy (at the left side of the SSB). See description in paragraph "Auto-SCAVEM Assy/Panel" below.

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

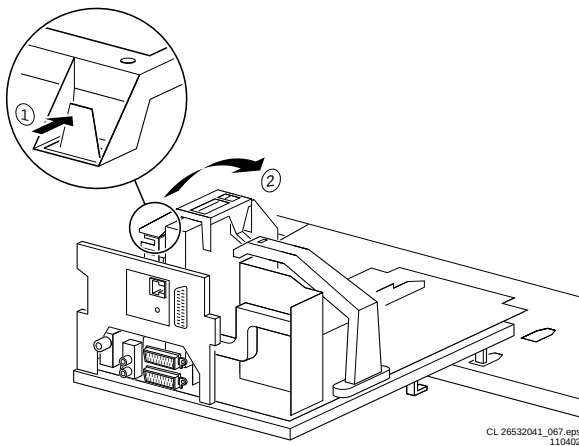


Figure 4-7 SSB removal (part 1)

1. Put the LSP in service position 2 (as described above).
2. Release the two clamps at the top of the SSB bracket (1) and pull the bracket upward (2) (it hinges in the bracket at the LOT side).
3. Now you can remove the complete SSB bracket.

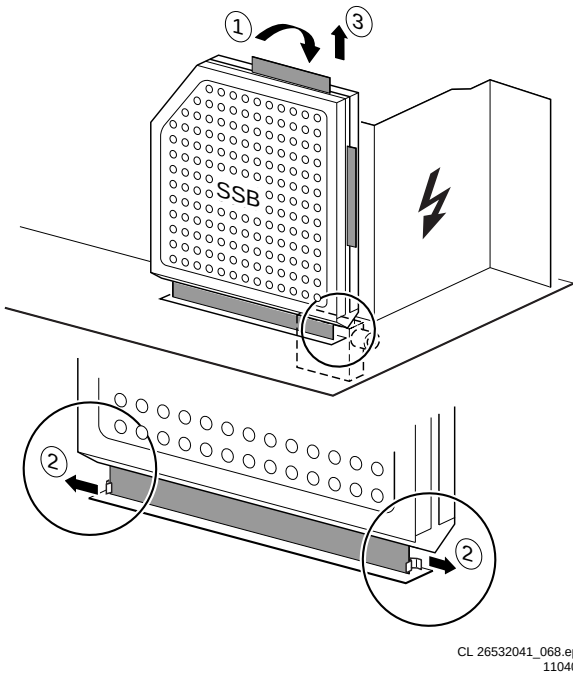


Figure 4-8 SSB removal (part 2)

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

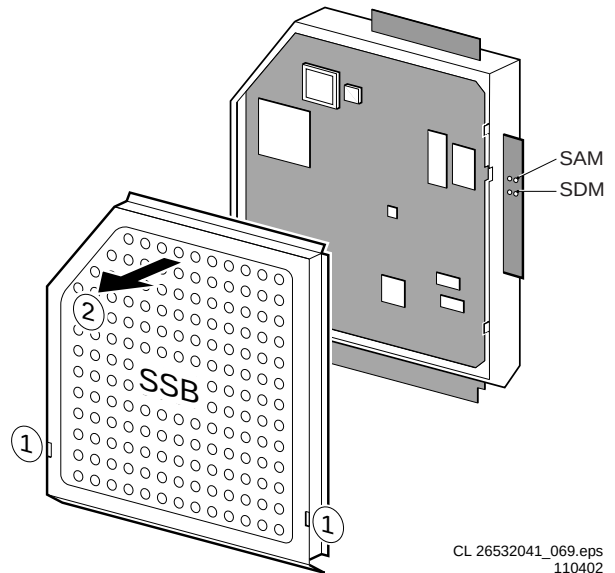


Figure 4-9 SSB removal (part 3)

1. Once you have taken out the SSB, remove the shieldings (2). Sometimes it is necessary to unsolder some solder-tags first (1).
2. Now re-place the SSB module in the SIMM-connector in reverse order.

Notes:

- For better access to the SSB, it is possible to order an 'extension tool' under number **9965 000 14526**.
- If necessary for the measurement, you can put the LSP in "Service position 2" (as described above).

4.4 Assies/Panels Removal

Sometimes, it can be necessary to swap a complete assy or Printed Wiring Board (PWB). How that can be done is explained below.

4.4.1 Top Control Assy/Panel

Notes:

- PV02 styling: assy is mounted in the front cabinet;
- FL13B styling: assy is mounted in the rear cover.

1. Remove the two fixation screws.
2. Push the assy a little bit upwards, and then pull it backwards to release it from the front hinge.
3. Lift the panel from its bracket, while releasing the four fixation clamps.

4.4.2 Side-I/O Assy/Panel

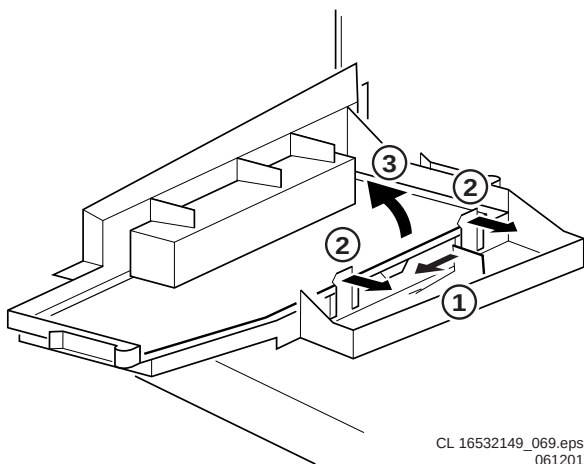


Figure 4-10 Side I/O Assy/Panel

1. Release the snap-hook (1) with your finger.
2. At the same time, pull the assy backwards (2).
3. Release the two fixation clamps on the right side of the bracket (the panel hinges at the left side).
4. Remove the panel from the bracket (3).

4.4.3 Mains Switch Assy/Panel

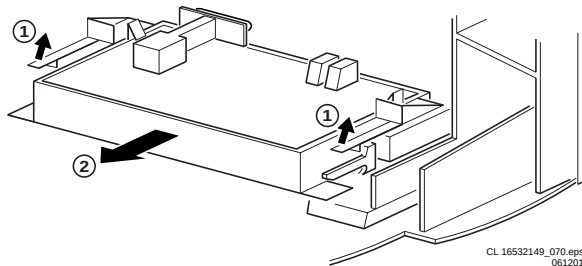


Figure 4-11 Mains Switch Assy/Panel

1. Release the two fixation clamps (rather difficult to reach), by pushing them upwards (1). At the same time, pull the complete assy backwards (2).
- Note:** be aware that the degaussing coil can hamper this.
2. Release the two fixation clamps on the two sides of the bracket (the panel hinges at the connector side).
 3. Remove the panel from the bracket.
 4. When the light guide (sitting in the cabinet, in front of the LEDs) is defective, you can replace it by pushing it forwards at the left side (it hinges at the right side, seen from the rear).

4.4.4 DAF Assy/Panel

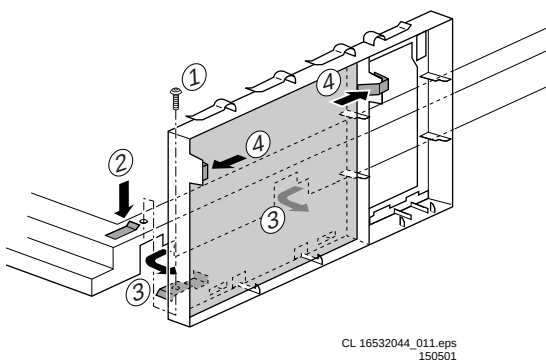


Figure 4-12 DAF-module

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

4.4.5 Auto-SCAVEM Assy/Panel

This panel is placed on the left side of the SSB (See figure 'Service Position 2'). Because most of its components are placed on the bottom side, you must lift the panel from its bracket before you can measure it.

1. Therefore, release the two fixation clamps at the top.
2. Lift the panel from the bracket (it hinges at the bottom).

To remove the bracket:

1. First, remove the panel from the bracket, as described above.
2. Remove the SSB bracket (see paragraph "Small Signal Board (SSB)" above).
3. Remove the two fixation screws at the bottom.
4. Lift the Auto-Scavem bracket slightly up, and at the same time bend the top a little away from the tuner.
5. Now, push the bracket into the direction of the CRT, and lift it out of the LSP-bracket.

4.4.6 Large Signal Panel (LSP)

1. Remove the "I/O 3rd SCART" assy (see paragraph "I/O 3rd SCART" above).
2. Remove the DAF assy (see paragraph "DAF Assy/Panel" above).
3. Remove the SSB bracket and the SSB (see paragraph "Small Signal Board (SSB)" above).
4. Remove the Auto-SCAVEM bracket (see paragraph "Auto-SCAVEM assy/panel" above).
5. Remove the two fixation screws at the bottom by the LOT bracket. Lift the LOT bracket from the right side slightly up, and at the same time release it from the fastening at the top, and remove the LOT bracket.
6. Disconnect the necessary cables.
7. Remove the two fixation screws. One screw is located nearby the SIMM-connector and the second screw is located nearby the degaussing coil.
8. Release the fixation clamps on the left side and on the top side of the LSP-bracket (the panel hinges at the right side).
9. Remove the panel from the bracket.

4.5 Set Re-assembly

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

Note: be sure that, before the rear cover is mounted:

- The mains cord is mounted correctly in its guiding brackets.
- All wires/cables are returned in their original positions. This is very important due to the large "hot" area of the set

5. Service Modes, Error Codes, and Fault Finding

Index of this chapter:

1. Test points
2. Service Modes
3. Problems and solving tips (related to CSM)
4. ComPair
5. Error Codes
6. The blinking LED procedure
7. Protections
8. Repair tips

5.1 Test Points

The chassis is equipped with test points printed on the circuit board assemblies. They refer to the diagram letters.

Perform measurements under the following conditions:

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

5.2 Service Modes

Service Default Mode (SDM) and Service Alignment Mode (SAM) offer several features for the service technician, while the Customer Service Mode (CSM) is used for communication between a Philips Customer Care Centre (P3C) and a customer.

There is also the option of using ComPair, a hardware interface between a computer (see requirements below) and the TV chassis. It offers the ability of structured troubleshooting, test pattern generation, error code reading, software version readout, and software upgrading.

Minimum requirements: a Pentium processor, Windows 95/98, and a CD-ROM drive (see also paragraph "ComPair").

Note: In this chassis, two LED configurations are possible: with bicoloured LED (red/green) or with separate blue and red LEDs. The bicoloured version is the one we know from EM5E. The version with blue LED works slightly different. The blue LED is controlled by software (via ON_OFF_LED). The red LED will light in anti-phase to the blue one, but with a time delay. This means that if the blue LED is blinking fast, the red LED will stay off. But after the blue LED is "OFF" long enough, the red LED will go "ON".

So take care: In certain service modes (e.g. blinking LED, stepwise start-up, etc.) you must observe the blue LED and ignore the red LED.

5.2.1 Service Default Mode (SDM)

Purpose

- To create a pre-defined setting, to get the same measurement results as given in this manual.
- To override SW protections.
- To start the blinking LED procedure.

Specifications

- Tuning frequency: 475.25 MHz for PAL/SECAM.
- Colour system: SECAM L for France or PAL B/G for the rest of Europe.
- All picture settings at 50 % (brightness, colour, contrast).
- All sound settings at 50 %, except volume at 25 %.
- All service-unfriendly modes (if present) are disabled, like:
 - (Sleep) timer.
 - Child/parental lock.
 - Blue mute.
 - Automatic volume limiter (AVL).

- Auto switch-off (when no video signal was received for 10 minutes).
- Skip/blank of non-favourite pre-sets.
- Smart modes.
- Auto store of personal presets.
- Auto user menu time-out.

How to enter SDM

- Use one of the following methods:
- Use the standard RC-transmitter and key in the code "062596", directly followed by the "MENU" button.
Note: It is possible that, together with the SDM, the main menu will appear. To switch it off, push the "MENU" button again.
- When you shorten for a moment the two solder pads on the 'external part' of the SSB print, with the indication "SDM". Activation can be performed in all modes, except when the set has a problem with the main-processor.
Caution: If the SDM is entered via the pins, all the software-controlled protections are de-activated.
- Use the DST-emulation feature of ComPair.
- Use the "DEFAULT" button on the Dealer Service Tool (RC7150).

After entering this mode, "SDM" will appear in the upper right corner of the screen.

How to navigate

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

How to exit SDM

Use one of the following methods:

- Switch the set to STANDBY via the RC-transmitter.
- Press the "EXIT" button on the DST.
- 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.

Specifications

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

How to enter SAM

Use one of the following methods:

- Via a standard RC transmitter: key in the code "062596" directly followed by the "OSD [i+]" button. After activating SAM with this method a service warning will appear on the screen, you can continue by pressing any digit key on the RC.
- Short for a moment the two solder pads on the 'external part' of the SSB print, with the indication SAM. Depending on the software version it is possible that the service warning will appear, you can continue by pressing any digit key on the RC.
- Use the DST-emulation feature of ComPair.
- Press the ALIGN button on the DST while the set is in the normal operation

After entering this mode, "SAM" will appear in the upper right corner of the screen.

Contents of SAM:

- **OPERATION HOURS.** Displays the accumulated total of operation hours (not the standby hours).
- **HARDWARE INFO**
 - **ROM VERSION.** Displays the date of the software and the software version of the ROM (example: EM53EU1-1.0_01234 = AAABBC-X.Y_NNNNN).
 - **AAA**= the chassis name.
 - **BB**= the region: EU= Europe, AP= Asia Pacific PAL/Multi, AN= Asia Pacific NTSC, US= USA, LT= LATAM.
 - **C**= the language cluster number.
 - **X.Y**= the software version, where X is the main version number (different numbers are not compatible with one another) and Y is the sub version number (a higher number is always compatible with a lower number).
 - **NNNNN**= last five digits of 12nc code software.
 - **FBX VERSION.** The 12NC-number of the build in Feature Box software.
- **ERRORS** (followed by maximal 10 errors). The most recent error is displayed at the upper left (for an error explanation see paragraph "Error Codes").
- **DEFECTIVE MODULE.** Here the module that generates the error is displayed. If there are multiple errors in the buffer, which are not all generated by a single module, there is probably another defect. It will then display the message "UNKNOWN" here.
- **RESET ERROR BUFFER.** When you press the "OK" button, the error buffer is reset.
- **ALIGNMENTS.** This will activate the "ALIGNMENTS" sub-menu.
- **DEALER OPTIONS.** Extra features for the dealers.
- **SERVICE OPTIONS.** Extra features for Service.
- **INITIALISE NVM.** When an NVM was corrupted (or replaced) in the former EM3 chassis, the microprocessor replaces the content with default data (to assure that the set can operate). However, all pre-sets and alignment values are gone now, and option numbers are not correct. Therefore, this was a very drastic way. In this chassis, the procedure is implemented in another way: The moment the processor recognises a corrupted NVM, the "INITIALISE NVM" line will be highlighted. Now, you can do two things (dependent of the service instructions at that moment):
 - Save the content of the NVM via ComPair for development analysis, before initialising. This will give the Philips Service department an extra possibility for diagnosis (e.g. when Development asks for this).
 - Initialise the NVM (same as in the past, however now it happens conscious).
- **STORE.** All options and alignments are stored when pressing the "OK"-button
- **FUNCTIONAL TEST.** All devices are tested via the "OK" button. Eventual errors are displayed in the error buffer. The error buffer is not erased, the content returns when this test is terminated.
- **DAILY MENU.** With the "OK" button, you can go to the normal user menu. SAM is still active in the background. With the "MENU" button, you return from the user menu to SAM menu. This feature can be helpful to quickly change some settings in the user menu.
- **SW MAINTENANCE**
 - **UPGRADE.** Not applicable for this chassis
 - **EVENTS.** Not useful for service purposes. In case of specific software problems, the development department can ask for this info.
 - **BDM INFO.** Broadcast Debug Menu info. The purpose of this menu is to debug the broadcast, NOT the TV. The menu gives an overview of what is received on the current preset. Following items are displayed:

Presetnr:	--	UTC:	--:--:--
Presetname:	-----	LTO:	--:--:--
		Time:	--:--:--
		Date:	--/--/----
CNI NVM:	----		
CNI F1:	----		
CNI F2:	----	Time TXT:	--:--:--
CNI VPS:	----	Time 8/30 F1:	--:--:--
Morning Prog:	----	Date 8/30 F1:	--/--/----
Name 8/30 F1:	-----	LTO 8/30 F1:	--:--:--
Name 8/30 F2:	-----		
Name TXT:	-----	WSS G1:	----
Signal Strength:	----	WSS G2:	----
		WSS G3:	----
		WSS G4:	----
EPG Service:	---		

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Figure 5-1 Broadcast debug menu overview.

Table 5-1 Broadcast debug menu explanation

Item	Source	Description
Presetnr	Set	Presetnumber of the current selected preset.
Presetname	Set	Presetname of the current selected preset.
CNI NVM	Broadcaster	CNI number stored in NVM for the current preset.
CNI F1	Broadcaster	CNI number from transmitted Packet 8/30 Format 1.
CNI F2	Broadcaster	CNI number from transmitted Packet 8/30 Format 2.
CNI VPS	Broadcaster	CNI number from transmitted VPS line.
Morning Prog	Broadcaster	"ARD" or "ZDF" according to dedicated bit in 8/30 Format 1.
Name 8/30 F1	Broadcaster	Name extracted from status message of 8/30 Format 1.
Name 8/30 F2	Broadcaster	Name extracted from status message of 8/30 Format 2.
Name TXT	Broadcaster	Name extracted from TXT header.
Signal Strength	FBX	Noise figure measured for selected preset.
EPG Service	Set	EPG Service stored in NVM for current preset displayed as "TXT", "MCP", "SCP", "OCP".
UTC	Set	UTC (Universal Time Code formerly known as Greenwich Mean Time) used in the set.
LTO	Set	LTO (Local Time Offset) used in the set. Used by EPG for all Nextview displays. (= Time TXT header - Time 8/30 F1)
Time	Set	Current time running in the set. Was extracted at startup, then maintained by software.
Date	Set	Current date running in the set. Was extracted at startup, then maintained by software.
Time TXT	Broadcaster	TXT header time from the selected preset.
Time 8/30 F1	Broadcaster	UTC time from 8/30 Format 1.
Date 8/30 F1	Broadcaster	Date from 8/30 Format 1.
LTO 8/30 F1	Broadcaster	LTO from 8/30 Format 1.
WSS G1	Broadcaster	WSS Group 1 (Aspect Ratio) bits 0 1 2 3
WSS G2	Broadcaster	WSS Group 2 (Enhanced Services) bits 4 5 6 7
WSS G3	Broadcaster	WSS Group 3 (Subtitles) bits 8 9 10
WSS G4	Broadcaster	WSS Group 4 (Reserved) bits 11 12 13

How to navigate

- In SAM, you can select the menu items with the "CURSOR UP/DOWN" key on the RC-transmitter. The selected item will be highlighted. When not all menu items fit on the screen, move the "CURSOR UP/DOWN" key to display the next/previous menu items.
- With the "CURSOR LEFT/RIGHT" keys, it is possible to:
 - (De) activate the selected menu item.
 - Change the value of the selected menu item.
 - Activate the selected submenu.

How to exit SAM

Use one of the following methods:

- Press the "MENU" button on the RC-transmitter, or
- Switch the set to STANDBY via the RC-transmitter, or
- Press the "EXIT" button on the DST.

5.2.3 Customer Service Mode (CSM)**Purpose**

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

How to enter CSM

Use one of the following methods:

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

Note: 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 on the RC-transmitter, you can navigate through the five menus.

Contents of CSM*Customer Service Menu 1*

- **SOFTWARE VERSION (example: EM53EU1-1.0_01234).** Displays the build in software version. In case of field problems related to software, software flash-RAM pos.7006 must be changed by a new one. Do this via soldering. You will find details of the software versions in the chapter "Software Survey" of the "Product Survey - Colour Television" publication. This publication is generated four times a year.
- **FEATURE BOX.** The 12NC-number of the build in Feature Box software
- **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.
- **CODE 1.** Gives the latest 5 errors of the error buffer. As soon as the built-in diagnose software has detected an error the buffer is adapted. The last occurred error is displayed on the leftmost position. Each error code is displayed as a 3-digit number. When less than 10 errors occur, the rest of the buffer is empty (000). See also paragraph "Error Codes" for a description.
- **CODE 2.** Gives the first 5 errors of the error buffer. See also paragraph Error Codes for a description.
- **VOLUME.** Gives the last status of the volume as set by the customer. The value can vary from 0 (volume is minimum) to 100 (volume is maximum). Volume values can be changed via the volume key on the RC-transmitter.
- **BRIGHTNESS.** Gives the last status of the brightness as set by the customer. The value can vary from 0 (brightness is minimum) to 100 (brightness is maximum). Brightness values can be changed via the "CURSOR LEFT" and "CURSOR RIGHT" keys on the RC-transmitter after pressing the "MENU" button and selecting "PICTURE" and "BRIGHTNESS".
- **CONTRAST.** Gives the last status of the contrast as set by the customer. The value can vary from 0 (contrast is minimum) to 100 (contrast is maximum). Contrast values can be changed via "CURSOR LEFT" and "CURSOR

RIGHT" keys on the RC-transmitter after pressing the "MENU" button and selecting "PICTURE" and "CONTRAST".

- **COLOUR.** Gives the last status of the colour saturation, as set by the customer. The value can vary from 0 (colour is minimum) to 100 (colour is maximum). Colour values can be changed via "CURSOR LEFT" and "CURSOR RIGHT" keys on the RC-transmitter after pressing the "MENU" button and selecting "PICTURE" and "COLOUR".
- **HUE.** Only relevant for NTSC-signals (e.g. some NTSC-DVD-discs).

Customer Service Menu 2

- **SHARPNESS.** Gives the sharpness value. The value can vary from 0 (sharpness is minimum) to 7 (sharpness is maximum). In case of bad antenna signals, a too high value of the sharpness can result in a noisy picture. Sharpness values can be changed via the "CURSOR LEFT" and "CURSOR RIGHT" keys on the RC-transmitter after pressing the "MENU" button and selecting "PICTURE" and "SHARPNESS".
- **HEADPHONE VOLUME.** Gives the last status of the headphone volume, as set by the customer. The value can vary from 0 (volume is minimum) to 100 (volume is maximum). Headphone volume values can be changed via the "CURSOR LEFT" and "CURSOR RIGHT" keys on the RC-transmitter after pressing the "MENU" button and selecting "SOUND" and "HEADPHONE VOLUME".
- **SURROUND MODE.** Indicates the by the customer selected surround mode (or automatically chosen mode). In case the set is a Non-Dolby set, there will be displayed "0". If it is a Dolby-set then is displayed: "STEREO", "3 STEREO", "HALL", "3DSURROUND", "DOLBY PRO LOGIC" or "DOLBY DIGITAL". These settings can be influenced after pressing the "MENU" button and selecting "SOUND" and SURROUND MODE". It can also have been selected automatically by signalling bits (internal software).
- **TUNER FREQUENCY.** Indicates the frequency the selected transmitter is tuned to. The tuner frequency can be changed via the "CURSOR LEFT" and "CURSOR RIGHT" keys for fine tune after opening the installation menu and selecting "INSTALL" and "MANUAL INSTALL".
- **DIGITAL OPTION.** Gives the selected digital mode, "100 HZ", "DIGITAL SCAN", "NATURAL MOTION", "DOUBLE LINES", or "PIXEL PLUS". Change via "MENU", "PICTURE", "DIGITAL OPTIONS".
- **CENTRE TRIM.** Indicates the difference between main volume and volume of centre speaker. Change via: "MENU", "SETUP", "SPEAKERS", and "CENTRE VOLUME" (not available when "Surround Mode" is set to "STEREO" or "HALL"). The value can vary from "-10" to "+10"
- **TV SYSTEM.** Gives information about the video system of the selected transmitter.
 - **BG:** PAL BG signal received.
 - **DK:** PAL DK signal received.
 - **I:** PAL I signal received.
 - **L/La:** SECAM L/La signals received.
 - **M:** NTSC M signal received with video carrier on 38.9 MHz.

Customer Service Menu 3

- **BALANCE.** Indicates the balance settings, between "-50" and "+50". Change via "MENU", "SOUND", and "BALANCE". Not applicable for Dolby Pro Logic sets.
- **CENTRE MODE.** Indicates if centre mode is set "ON" or "OFF". When centre mode is on, all TV speakers are used as one centre speaker. Change Centre mode via "MENU", "SETUP", "SPEAKERS", and "CENTRE MODE".
- **DNR.** Gives the selected DNR setting (Dynamic Noise Reduction), "OFF", "MINIMUM", "MEDIUM", or "MAXIMUM". Change via "MENU", "PICTURE", "DNR"
- **NOISE FIGURE.** Gives the noise ratio for the selected transmitter. This value can vary from 0 (good signal) to 127

(average signal) and to 255 (bad signal). For some software versions, the noise figure will only be valid when "Active Control" is set to "medium" or "maximum".

- **SOURCE.** Indicates which source is used and the video/audio signal quality of the selected source. (Example: Tuner, Video/NICAM) Source: "TUNER", "EXT1", "EXT2", "EXT3", "EXT4", "SIDE", "AV1", "AV2", "AV3" or "AV4". Video signal quality: "VIDEO", "S-VIDEO", "RGB 1FH", "YPBPR 1FH 480P", "YPBPR 1FH 576P", "YPBPR 1FH 1080I", "YPBPR 2FH 480P", "YPBPR 2FH 576P", "YPBPR 2FH 1080I", "RGB 2FH 480P", "RGB 2FH 576P" or "RGB 2FH 1080I". Audio signal quality: "STEREO", "SPDIF 1", "SPDIF 2" or "SPDIF".
- **AUDIO SYSTEM.** Gives information about the audio system of the selected transmitter: "ANALOGUE MONO", "ANALOGUE STEREO", "PCM 2/0", "DD 1/0", "DD 2/0 LrRt", "DD 2/0 L0R0", "DD 2/1", "DD 2/2", "DD 3/0", "DD 3/1", "DD 3/2", "DD 1+1", "MPEG 1/0", "MPEG 2/0", "MPEG 2/0 LrRt", "MPEG 2/1", "MPEG 2/2", "MPEG 3/0", "MPEG 3/1", "MPEG 3/2", "MPEG 1+1" or "MPEG 2+2".
- **TUNED BIT.** Gives information about the tuning method of the stored pre-set. If a channel is found via "automatic installation", you will see the value "Off". When you change this (automatically found) frequency via "fine tune" adjustment (installation menu - manual installation), the displayed value will change to "On". Therefore, when you see the value "On" in this line, it is an indication that the received channel is a non-standard signal (e.g. of a VCR).
- **SURROUND SPEAKERS.** Indicates if the surround speakers are present, "YES" or "NO". Change via "MENU", "SETUP", "SPEAKERS", and "SURROUND SPEAKERS".
- **ON TIMER.** Indicates if the "On Timer" is set "ON" or "OFF" and if the timer is "ON" also displays start time, start day and program number. Change via "MENU", "TV", "FEATURES", and "ON TIMER".
- **PRESET LOCK.** Indicates if the selected preset has a child lock: "LOCKED" or "UNLOCKED". Change via "MENU", "TV", "FEATURES", "CHILD LOCK", and "CUSTOM LOCK".

Customer Service Menu 4

- **CHILD LOCK.** Indicates the last status of the general child lock: "UNLOCK", "LOCK", or "CUSTOM LOCK". Change via "MENU", "TV", "FEATURES", "CHILD LOCK", and "LOCK".
- **AGE LOCK.** Indicates the last status of the EPG rating for child lock: "OFF", "4 YEARS", "6 YEARS", "8 YEARS", "10 YEARS", "12 YEARS", "14 YEARS" or "16 YEARS". This is only displayed if child lock is set to "CUSTOM LOCK".
- **LOCK AFTER.** Indicates at what time the child lock is set: "OFF" or e.g. "18:45" (lock time). This is only displayed if child lock is set to "CUSTOM LOCK".
- **CATEGORY LOCK.** Indicates the last status of the EPG theme childlock: "MOVIES", "NEWS", "SHOWS", "SPORTS", "CHILDREN", "MUSIC", "CULTURE", or "SERIES". This is only displayed if child lock is set to "CUSTOM LOCK". It is possible that more than one value is shown.
- **PROGRAM CATEGORY.** Indicates the theme of the selected transmitter: "MOVIES", "NEWS", "SHOWS", "SPORTS", "CHILDREN", "MUSIC", "CULTURE", or "SERIES".
- **TV RATINGS LOCK.** Only applicable for US.
- **MOVIE RATINGS LOCK.** Only applicable for US.
- **V-CHIP TV STATUS.** Only applicable for US.

Customer Service Menu 5

- **V-CHIP MOVIE STATUS.** Only applicable for US.
- **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).

- **AVL.** Indicates the last status of AVL (Automatic Volume Level): "ON" or "OFF". Change via "MENU", "TV", "SOUND", "AVL".
- **DELTA VOLUME.** Indicates the last status of the delta volume for the selected preset as set by the customer: from "-12" to "+12". Change via "MENU", "TV", "SOUND", "DELTA VOLUME".
- **SURROUND TRIM L.** Indicates the last status of "SURROUND LEFT VOLUME" as set by the customer: from "-10" to "+10". Only available in Digital Dolby sets. Change via "MENU", "SETUP", "SPEAKERS", "SURROUND L VOLUME".
- **SURROUND TRIM R.** Indicates the last status of "Surround Right Volume" as set by the customer: from "-10" to "+10". Only available in Digital Dolby sets. Change via "MENU", "SETUP", "SPEAKERS", "SURROUND R VOLUME".
- **FRONT SPKR DIST.** Indicates the last status of the distance to the front speakers as set by the customer: "1m", "2m", or "3m",.... Change via "MENU", "SETUP", "SPEAKERS", "TO FRONT".
- **SURR. SPKR DIST.** Indicates the last status of the distance to the surround speakers as set by the customer: "1m", "2m", or "3m",.. Change via "MENU", "SETUP", "SPEAKERS", "TO SURROUND".

How to exit CSM

Use one of the following methods:

- After you press a key on the RC-transmitter (with exception of the "CHANNEL", "VOLUME" and digit (0-9) keys), or
- After you switch the TV-set "OFF" with the mains switch.

5.3 Problems and Solving Tips (related to CSM)

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

5.3.1 Picture Problems

Snowy/noisy picture

1. Check line 24 "Noise Figure". In case the value is 127 or higher, and the value is also high on other programs, check the aerial cable/aerial system. For some software versions, the noise figure will only be valid when "Active Control" is set to "medium" or "maximum".
2. Check lines 11 "Sharpness" and 24 "Noise Figure". In case the value of line 11 is 3 or 4 and the value of line 24 is high (127 or higher), decrease the "Sharpness" value.

Picture too dark

1. Press "MENU", "TV", "PICTURE", "SMART PICTURE". In case the picture improves, increase the "Brightness" or the "Contrast" value. The new value(s) are automatically stored (in "personal" pre-set) for all TV channels.
2. Check line 7 "Brightness" and 8 "Contrast". If the value of line 7 is low (< 10) or the value of line 8 is low (< 10), increase the "Brightness" or the "Contrast" value.

Picture too bright

1. Press "MENU", "TV", "PICTURE", "SMART PICTURE". In case the picture improves, decrease the "Brightness" or the "Contrast" value. The new value(s) are automatically stored (in "personal" pre-set) for all TV channels.
2. Check lines 7 "Brightness" and 8 "Contrast". If the value of line 7 is high (> 40) or the value of line 8 is high (> 50). Decrease the "Brightness" value or increase the "Contrast" value.

White line around picture elements and text

1. Press "MENU", "TV", "PICTURE", "SMART PICTURE". In case the picture improves, decrease the "Sharpness" value. The new value is automatically stored (in "personal" pre-set) for all TV channels.
2. Check line 11 "Sharpness". Decrease the "Sharpness" value. The new value is automatically stored for all TV channels.

No picture

Check line 27 "Tuned bit". In case the value is "No", install the required program again. Open the installation menu and perform manual installation.

Blue picture

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

Blue picture and/or unstable picture

A scrambled or decoded signal is received.

Black and white picture

Check line 9 "Colour". In case the value is low (< 10), increase the "Colour" value. The new value is automatically stored for all TV channels.

No colours/colour lines around picture elements or colours not correct or unstable picture

1. Check line 20 "TV System". If a "strange" system pops up, something has gone wrong during installation. Re-install the channel.
2. In case line 20 is "L", the installed system for this pre-set is "France", while "West Europe" is required. Install the required program again: open the installation menu and perform manual installation. Select system "West Europe".

Menu text not sharp enough

1. Press "MENU", "TV", "PICTURE", "SMART PICTURE". In case picture improves, decrease the contrast value. The new value(s) are automatically stored for all TV channels.
2. Check line 8 "Contrast". The value of line 8 is high (> 50). Decrease the contrast value.

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

Check line 6 "Volume". The value is low. Increase the value of "Volume". The new value(s) are automatically stored (in "personal" pre-set) for all TV channels.

Sound too loud for left and right speaker

Check line 6 "Volume". The value is high. Decrease the value of "Volume". The new value(s) are automatically stored (in "personal" pre-set) for all TV channels.

5.4 ComPair**5.4.1 Introduction**

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

- ComPair helps you to quickly get an understanding on how to repair the chassis in a short time by guiding you systematically through the repair procedures.
- ComPair allows very detailed diagnostics (on I2C level) and is therefore capable of accurately indicating problem areas. You do not have to know anything about I2C commands yourself because ComPair takes care of this.

- ComPair speeds up the repair time since it can automatically communicate with the chassis (when the microprocessor is working) and all repair information is directly available. When ComPair is installed together with the SearchMan electronic manual of the defective chassis, schematics and PWBs are only a mouse click away.

5.4.2 Specifications

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

For this chassis, the ComPair interface box and the TV communicate via a bi-directional service cable via the service connector.

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

- **Automatic** (by communication with the television): ComPair can automatically read out the contents of the entire error buffer. Diagnosis is done on I2C level. ComPair can access the I2C bus of the television. ComPair can send and receive I2C commands to the micro controller of the television. In this way, it is possible for ComPair to communicate (read and write) to devices on the I2C busses of the TV-set.
- **Manually** (by asking questions to you): Automatic diagnosis is only possible if the micro controller of the television is working correctly and only to a certain extent. When this is not the case, ComPair will guide you through the faultfinding tree by asking you questions (e.g. Does the screen give a picture? Click on the correct answer: YES / NO) and showing you examples (e.g. Measure test-point I7 and click on the correct oscillogram you see on the oscilloscope). You can answer by clicking on a link (e.g. text or a waveform picture) that will bring you to the next step in the faultfinding process.

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

Beside fault finding, ComPair provides some **additional features** like:

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

5.4.3 Stepwise Start-up

Under normal circumstances, a fault in the power supply, or an error during start-up, will switch the television to protection mode. ComPair can take over the initialisation of the television. In this way, it is possible to distinguish which part of the start-up routine (hence which circuitry) is causing the problem. Take notice that the transition between two steps can take some time, so give the set some time to reach a stable state. During the transition time the LED can blink strangely.

Stepwise start-up explanation

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

Table 5-2 Stepwise start-up table

State	Description mode	Display LED	Enabled protection
0	Low power standby: 5V2/3V3 present, uP in standby-mode	On	None
1	High power Standby: TV-set in standby-mode	Wait 1s, flash 1 x	None
2	Main Power On: HOP in standby, 5V/8V present, I2C protections on, SSB is powered by standby-supply (5V/8V). Degaussing (12 s) has been activated, MSP is reset.	Wait 1s, flash 2 x	4 & 5
3	Initialized (Semi standby): most IC's are initialized, HOP still in standby	Wait 1s, flash 3 x	Plus 1, 6 & 18
4	HOP: HOP fully powered and working, EHT is present, rest of IC's initialized, black current stabilisation is off, picture is still blanked	Wait 1s, flash 4 x	Plus 2 & 16
5	On: TV-set operates, black current stabilisation is on, picture is unblanked.	Wait 1s, flash 5 x	

Note (*):

- When the set is in stepwise mode and, due to stepping-up, a protection is activated, the set will really go into protection (blinking LED). The set will not leave the stepwise-mode however. If state X is the state where the set went to protection, stepwise start-up will return to state X-1. At state (X-1) diagnostic measurements can be performed. Also, in the short time the set is in state X but not yet in protection, you can also do some measurements.

5.4.4 How To Connect

- First, install the ComPair Browser software (see the Quick Reference Card for installation instructions).
- Connect the RS232 interface cable between a free serial (COM) port of your PC and the PC connector (marked with "PC") of the ComPair interface.
- Connect the mains adapter to the supply connector (marked with "POWER 9V DC") of the ComPair interface.
- Switch the ComPair interface "OFF".
- Switch the television set "OFF" with the mains switch.
- Connect the ComPair interface cable between the connector on the rear side of the ComPair interface (marked with "I2C") and the ComPair connector at the rear side of the TV (situated just below the tuner input, see also chapter 4).
- Plug the mains adapter in a mains outlet, and switch the interface "ON". The green and red LEDs light up together. The red LED extinguishes after approx. 1 second while the green LED remains lit.
- Start the ComPair program and read the "Introduction" chapter.

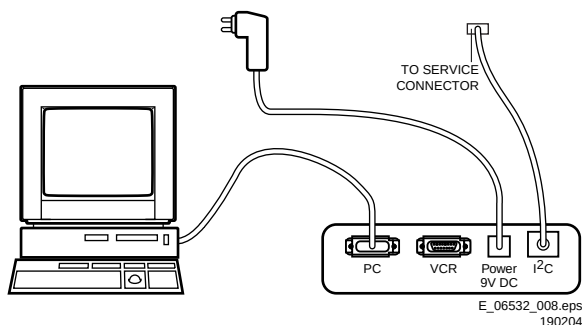


Figure 5-2 ComPair Interface connection

5.4.5 How To Order

ComPair order codes:

- Starter kit ComPair32/SearchMan32 software and ComPair interface (excl. transformer): 3122 785 90450.
- ComPair interface (excluding transformer): 4822 727 21631.
- Starter kit ComPair32 software (registration version): 3122 785 60040.
- Starter kit SearchMan32 software: 3122 785 60050.
- ComPair32 CD (update): 3122 785 60070 (year 2002, 3122 785 60110 (year 2003)).
- SearchMan32 CD (update): 3122 785 60080 (year 2002), 3122 785 60120 (year 2003).
- ComPair interface cable: 3122 785 90004.
- ComPair firmware upgrade IC: 3122 785 90510.
- Transformer (non-UK): 4822 727 21632.
- Transformer UK: 4822 727 21633.

Note: If you encounter any problems, 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 has occurred, the error is added to the list of errors, provided the list is not full or the error is a protection error.

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), except when the error is a protection error.

To prevent that an occasional error stays in the list forever, the error is removed from the list after 50+ operation hours.

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

5.5.2 How to read the Error Buffer

Use one of the following methods:

- On screen via the SAM (only if you have a picture).
Examples:
 - 0 0 0 0**: No errors detected
 - 6 0 0 0**: Error code 6 is the last and only detected error
 - 9 6 0 0**: Error code 6 was first detected and error code 9 is the last detected error
- Via the blinking LED procedure (when you have no picture). See next paragraph.
- Via ComPair.

5.5.3 How to clear the Error Buffer

Use one of the following methods:

- By activation of the "RESET ERROR BUFFER" command in the SAM menu.
- With a normal RC, key in sequence "MUTE" followed by "062599" and "OK".
- When you transmit the commands "DIAGNOSE" - "99" - "OK" with ComPair (or with a DST).
- If the content of the error buffer has not changed for 50+ hours, it resets automatically.

5.5.4 Error Codes

In case of non-intermittent faults, clear the error buffer before you begin the repair. This to ensure that old error codes are no longer present. Before clearing the buffer, write down the content, as this history can give you significant information.

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 various errors:

- I2C device errors.
- I2C bus errors.
- Protection errors.
- Errors not related to an I2C device, but of importance:
 - **BLACK CURRENT LOOP (ERROR 28)**: detection of a continuous fail of the black current stabilisation loop of the HOP.
 - **FEM (ERROR 26)**: at start-up, after initialisation of the PICNIC, the presence of the FALCONIC can be checked.
 - **EAGLE (ERROR 27)**: at start-up, after initialisation of the PICNIC, the presence of the Eagle can be checked.

Table 5-3 Error table.

Error	Device	Description	Def. item	Defect. module indication	Diagram
1	M24C32	NVM, spontaneous blinking error 1	7011	Control	B5a
2	Hfail Protection	Horizontal Flyback protection	/	Horizontal Flyback	/
3	SAA4978	PICNIC	7713	Feature Box	B3a
4	Supply 5V	5V protection	/	+5V Supply	B5a
5	Supply 8V	8V protection	/	+8V Supply	B5a
6	Slow I2C bus blocked	Spontaneous blinking error 6	/	Slow I2C Blocked	/
7	TDA9330	HOP High-end Output Processor	7301	Video Controller	B4
8	TDA932x	HIP High-end Input Processor	7323	Chroma IF IO	B2
12	TDA9178	Topic	7302	Video Controller	B4
13	UV1318/...	Tuner protection	1T01	Tuner	A8
14	MSPxxxx	ITT sound processor	7651	Audio module	B6a
16	FBX	Feature Box Protection	/	+3V (Fbx) Supply	B3
18	Fast I2C bus blocked	Spontaneous blinking error 18	/	Fast I2C Blocked	/
19	TDA8444	Auto Scavem DAC	7500	Auto Scavem	SC1
26	SAA4998	FEM	7760	+3V (Fbx) Supply	B3b
27	T6TX5EF	Eagle	7720	+3V (Fbx) Supply	B3c
28	Black current loop	Black current loop	/	Video Controller	/
32	M29W400BT	Flash Ram (EPG)	7012	EPG Memory	B5a
35	T6TU5XB	Columbus	7752	Video Controller	B3d

Note:

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

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

5.6.2 How to Enter

Use one of the following methods:

- Enter the SDM (only via soldering pads marked "SDM" on SSB). The blinking red front LED will show the entire contents of the error buffer (this works in "normal operation" mode and in "protection" mode).
- 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 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 LED starts.
- "DIAGNOSE X" with the DST (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.... When x = 0 all errors are shown.

5.6 The Blinking LED Procedure

5.6.1 Introduction

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

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

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

Example: Error 12 9 6 0 0.

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

- 1 long blink of 750 ms (which is an indication of the decimal digit) followed by a pause of 1.5 s,
- 2 short blinks followed by a pause of 3 s,
- 9 short blinks followed by a pause of 3 s,
- 6 short blinks followed by a pause of 3 s,
- 1 long blink of 3 s to finish the sequence,
- The sequence starts again.

5.7 Protections

5.7.1 Introduction

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

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

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

To get a quick diagnosis, this chassis has three service-modes implemented:

- The **Customer Service Mode (CSM)**.
- The **Service Default Mode (SDM)**. Start-up of the set in a predefined way.
- The **Service Alignment Mode (SAM)**. In this mode, items of the set can be adjusted via a menu.

You can enter both SDM and SAM modes via the 'service pads' on the SSB, via an RC-transmitter (DST or standard RC), or via ComPair. It is not possible to enter the SAM in "standby"; the TV has to be in "normal operation" mode.

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

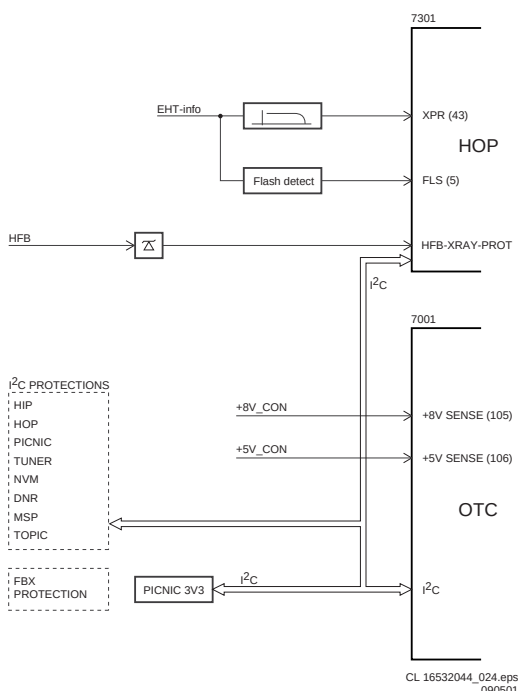


Figure 5-3 Protection diagram

There are several types of protections:

- I2C related protections.
- OTC related protections (via polling on I/O pins or via algorithms).
- HOP related protections (mainly for deflection items).

- Hardware errors that are not sensed by the OTC (e.g. vertical flyback protection, bridge coil protection, E/W protection, arcing protection). All protections are explained below.

5.7.2 I2C Related Protections

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

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

5.7.3 OTC Related Protections

If a protection is detected at an OTC input, the OTC will start to scan all protection inputs every 200 ms for 5 times. If the protection on one of the inputs is still active after 1 s, the microprocessor will put the set in the protection mode. Before the scanning is started, a so-called "ESD refresh" is carried out. This is done, because the interrupt on one of the inputs is possibly caused either by a flash or by ESD. As a flash or ESD can influence IC settings, the HIP, MSP, 3D Comb (US only) and wireless module are initialised again, to ensure the normal picture and sound conditions of the set.

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

5.7.4 HOP Related Protections

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

The following protections are implemented:

- **HFB (Horizontal Flyback):** If the horizontal flyback is not present, this is detected via the HOP (HFB_X-RAY_PROT). One status bit is set to "high". The error code is stored in the error buffer and the set will go into the protection mode.
- **XPR (X-ray protection):** If the HFB pulses are too low (level detection), the HOP will detect this via the XPR-bit. The error will be logged in the error buffer and the set will go into protection mode.

Note: Both errors will be logged as HFB-failure.

5.7.5 Hardware Related Protections

Due to the architecture ("hot" deflection), some protections cannot be sensed by the microprocessor. Three of these protections will lead to a protection on set level (Standby mode and blinking LED), while another will only lead to a circuit protection.

TV-set Protection

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

- **BRIDGECOIL protection:** This is sensed via the "EW" signal going to the base of TS7652 (via R3495 and D6499). In a normal situation, the voltage on C2498 (diagram A4) is high and TS7652 is conducting. When bridge coil 5422 (diagram A3) is short circuited, the voltage on C2498

changes to low, which will block TS7652. In this case, also TS7641 will block and the voltage on 2642 will rise until TS7443 is forced in conduction. The "SUP-ENABLE" signal (in normal operating condition -20 V) is shorted now to ground level, which will force the Main Power Supply to Standby mode.

- **ARC protection:** If there are "open" connections (e.g. bad solder joints) in the high-energy deflection circuitry, this can lead to damaging effects (read: fire). For that reason, the E/W current is sensed (via 3479//3480). If this current becomes too high, the "thyristor" circuit (TS7653 and TS7654) is triggered. TS7442 is switched "on" and TS7443 is forced into conduction. The "SUP-ENABLE" signal is shorted now to ground level, which will force the Main Power Supply to Standby mode.
- **NON_VFB (No vertical Flyback) protection:** If the frame stage generates no pulses, TS7641 will block. TS7443 is now switched "on", which will lead to Standby mode. Therefore, in normal operation condition, TS7641 and TS7652 are conducting, while TS7443 is blocked.

Circuit Protection

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

- **PROT1 (DC) protection:** When a DC-voltage (positive or negative) is sensed on one of the loudspeaker outputs, the protection circuit (TS7704, 7705, 7706 and 7707 in diagram A6) will put the IC7700 in Standby mode (via tri-state input pin 6). For more details, see chapter "Circuit Descriptions".

5.8 Repair tips

5.8.1 Miscellaneous

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

Take care not to touch the "hot" heatsink while disconnecting the SSB, despite the fact that the mains cord is out of the mains socket. There can still be an annoying rest-voltage on the heatsink for a short while. This, because the discharge resistors 3502 and 3503 (on the LSP between hot and cold part) are not stuffed for Europe. Instead, discharge resistors 3066 and 3057 on the Mains Switch panel are used, but because they are located before the Mains switch, they only discharge when this switch is "on".

Advice: when you remove the SSB, disconnect the Mains cord, but keep the Mains Switch "on".

Do not try to measure on the SSB side, which is facing the 'hot' heatsink. This is dangerous. Most service test points are guided to the 'tuner' side and are indicated by the 'service' printing.

Where the circuitry was too "crowded" for service printing, you can find the correct location on the "test point overviews" in this manual.

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

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

5.8.2 Start-up Sequence

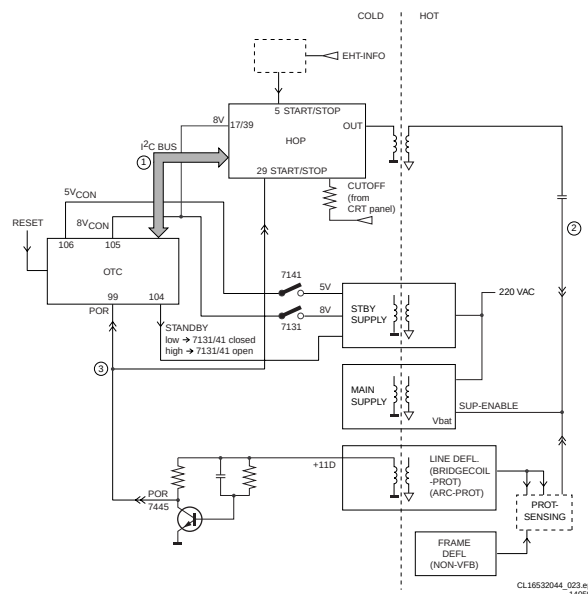


Figure 5-4 Start-up circuitry

The start up sequence differs from other sets (e.g. MG-sets or EM2E-sets, but is same as in EM3E-set):

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

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

5.8.3 ComPair

This chassis does not have an IR transmitting LED (as in MG-sets). Therefore, a "Service" (ComPair) connector is implemented at the rear side of the set, which is directly accessible (as in A10-, EM2E-, EM3E and EM5E-sets). In addition to this, there is also a blinking LED procedure to show the contents of the error buffer.

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

5.8.4 Protections

Activating SDM via the "service pads" will overrule the processor-controlled protections, but not the hardware protections. This means, that the A/D-input protections (5 and 8 V) and the I2C "not-acknowledging" info of the feature box (FBX) and of the Tuner are overruled.

Caution: When doing this, the service technician must know what he is doing, as it could lead to damaging the set.

The "ARC"- and/or "BRIDGE COIL" protection are hardly ever triggered, however:

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

5.8.5 Main Supply

The simplest way is, to replace the components of the Main Supply with repair kit 3122 785 90310.

More detailed way:

1. Replace FET 7504 and zener 6505.
2. Remove the SSB panel.
3. Short B and E of TS7529, in order to put the Main Supply in "on"-mode (TS7529 is blocking then). **Caution:** To prevent that R3403 and TS7443 will be damaged, **first disable the HW-protection of the deflection circuit.** Therefore short circuit C2642 on the LSP (diagram A4).
4. Attach a load of 500 Ω to V_BAT capacitor C2515 (the supply can not work without a minimum load).
5. Use a variac, and slowly increase the V_MAINS. Measure over sensing resistors R3514//15, if a nice sawtooth voltage becomes available.
6. Also measure the V_BAT. This may never exceed +141 V. If it does, there is something wrong in the feedback circuitry (e.g. regulator 7506).

Note: Be careful when measuring on the gate of FET TS7504. This circuitry is very high ohmic and can easily be damaged (first connect ground to measuring equipment, than measure the gate).

5.8.6 Standby Supply

The simplest way is to replace the components of the Standby Supply with repair kit 3122 785 90460.

5.8.7 Line Deflection

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

5.8.8 Frame Deflection

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

To prevent this from happening, you must:

1. Interrupt the resistors 3403 and 3404 on the CRT panel (diagram F1), in order to remove the "filament" voltage from the tube (no beam current, so no chance of destroying the CRT).
2. Interrupt resistor 3403 on the LSP (diagram A4) to disable the "SUP-ENABLE" line.

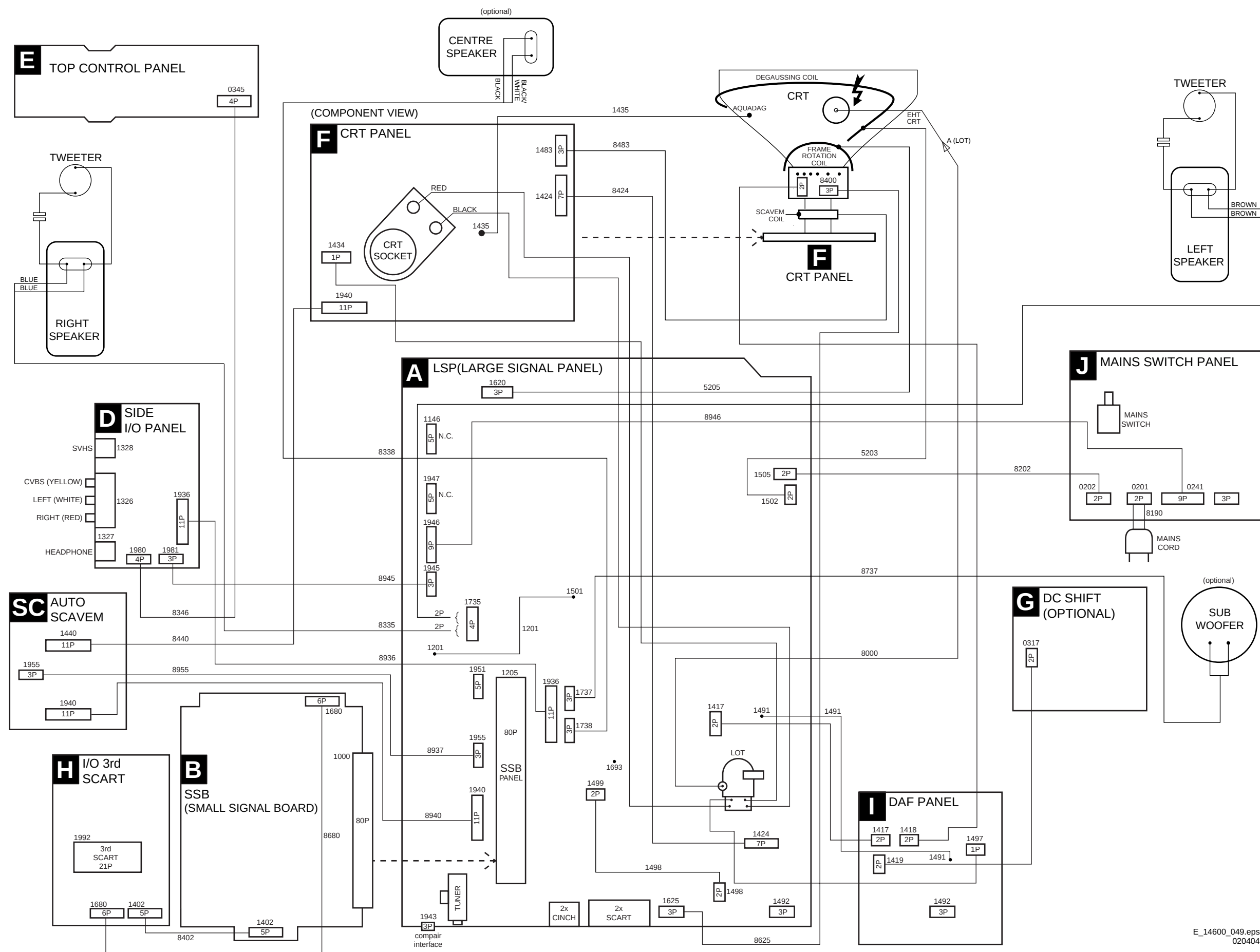
3. Measure with a multi-meter, or better with a oscilloscope, the functionality of the Frame stage.
4. After you have found the cause, exchange the defective component (e.g. TDA8177), and re-solder the interrupted resistors.

Table 5-4 Repair Tips

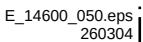
Phenomenon	Possible Cause	Repair tip
No picture, no LED.	Standby Supply defective.	Measure circuitry (see diagram A2). Start at test-point A19. When the Mains switch is 'on', this voltage must always be available
No picture, no LED.	Bad connection of SSB in SIMM-connector.	In case of a bad connection, it can happen that there is no picture, and that the Standby LED is not controllable. Re-place the SSB.
No picture, LED blinking at 3 Hz.	Set is in protection due to various causes. For error codes see error-code list.	You have no picture, so: - Read the error buffer via ComPair (error buffer is accessible when set is in protection, compare-file will guide you to this) - Read the blinking LED information via standard remote command <mute>06250X<ok> - Or you read the error code sequence via standard remote command <mute>062500<ok>. When you have found the error, check the circuitry related to the supply voltage and I ² C-communication or the circuitry that triggers the protection.
No picture, LED blinking with code 6-6-6 or 18-18-18.	No communication on slow I ² C- or fast I ² C-bus.	As processor cannot communicate with one of the 2 busses it the standby-led spontaneously starts blinking 6-6-6... or 18-18-18... If in the error buffer somewhere is an error 6 or 18, these will have the highest priority starting the mentioned blinking. Measure dependent of the error on the I ² C-bus which device is loading the bus. (Use I ² C -overview)
No picture, LED blinking with code 1-1-1.	No communication on NVM-I ² C bus to the uP.	As the uP cannot communicate with the NVM I ² C bus, it spontaneously starts blinking 1-1-1. Note: when there is no access to the NVM, a lot of picture setting can go wrong.
No picture, no sound. Set is making audible squeaking sound	Supply is possibly in hiccup-mode, which is audible via a squeaking supply transformer.	Possible causes: - V _{BAT} is shorted (caused by short circuited line transistor 7421), or - Sound winding is shorted (amplifier is shortening the power supply lines), or - D6514 is shorted (due to a too high V _{BAT}). Remove excessive load, to see what causes the failure, or check feedback circuit. See repair tip 'Main Power Supply' (supply needs a minimal load).
No picture, no sound. Power LED works fine	Supply does not work correctly.	If e.g. V _{BAT} is only about 90 V, it is possible that the regulator IC (7506) is defective.
No RC-reception. LED does not echo RC-commands.	uP circuitry or RC-receiver is defective.	In case the set does react on a local keyboard operation, you must check the RC-receiver circuitry.
Relay (degaussing) is not audible, when set is switched from 'off' or 'standby' to 'on'.	uP is not working correctly. When pin 115 is low, the degaussing must be activated.	Check RESET-circuitry on diagram B5. Check the level on pin 115 when you switch the set 'on'. Signal must be low initially and go to high after approx. 12 s.
Picture is rotated.	Rotation circuitry on diagram A5, or related supply to it, malfunctions.	Measure test points on diagram A5.
Picture is continuously switching 'off' and 'on', showing heavy 'switch' spots (set does not go into protection).	200 V is missing on CRT panel.	Probably a bad connection from LSP connector 1424 to CRT connector 1424 (diagram F), or an interruption of the 200 V supply line (e.g. R3341 on circuit F is interrupted).
Picture is not sharp.	Focus is possibly mis-aligned or SCAVEM-circuitry does not work correctly.	Re-align the 'focus' potmeter on the Line Output Transformer, or check the SCAVEM circuitry on the CRT-panel (diagram F). It is also possible that the DAF circuitry is defective (see diagram I). Check the V _{dc} values.
Picture is not synchronised.	The sync is derived in the HIP from x-tal 1305 and/or 1308.	Maybe the crystals 1305 and/or 1308 are making a bad contact.
Picture is distorted.	Check video-path in Service Default Mode.	Investigate whether there is an error code present in the error buffer. In case there is one, check the I ² C -bus and/or supply lines (see overview supply lines). Measure and check signal path Tuner-HIP-PICNIC-HOP-RGB amplifier. In case it is a geometry issue, check on diagram A4 opto-coupler 7482, Opamps 7440/7450 and the Frame circuitry alignments or a possible corrupted NVM (7011) on diagram B5.
No menu, no OSD.	Probably a defective uP.	Measure test points B61 to B64 on diagram B5.
How to measure if soldering connections of a BGA are OK		For most BGA's the pins/balls are ESD protected via diodes to ground, it is possible to measure these diodes with a multi-meter. Overload means no or bad connection.
How to measure on other IC's		It is advisable to measure both on the pins itself and the solder pads on the PWB. This to find possible solder faults.

6. Block Diagrams, Test Point Overview, and Waveforms

Wiring Diagram

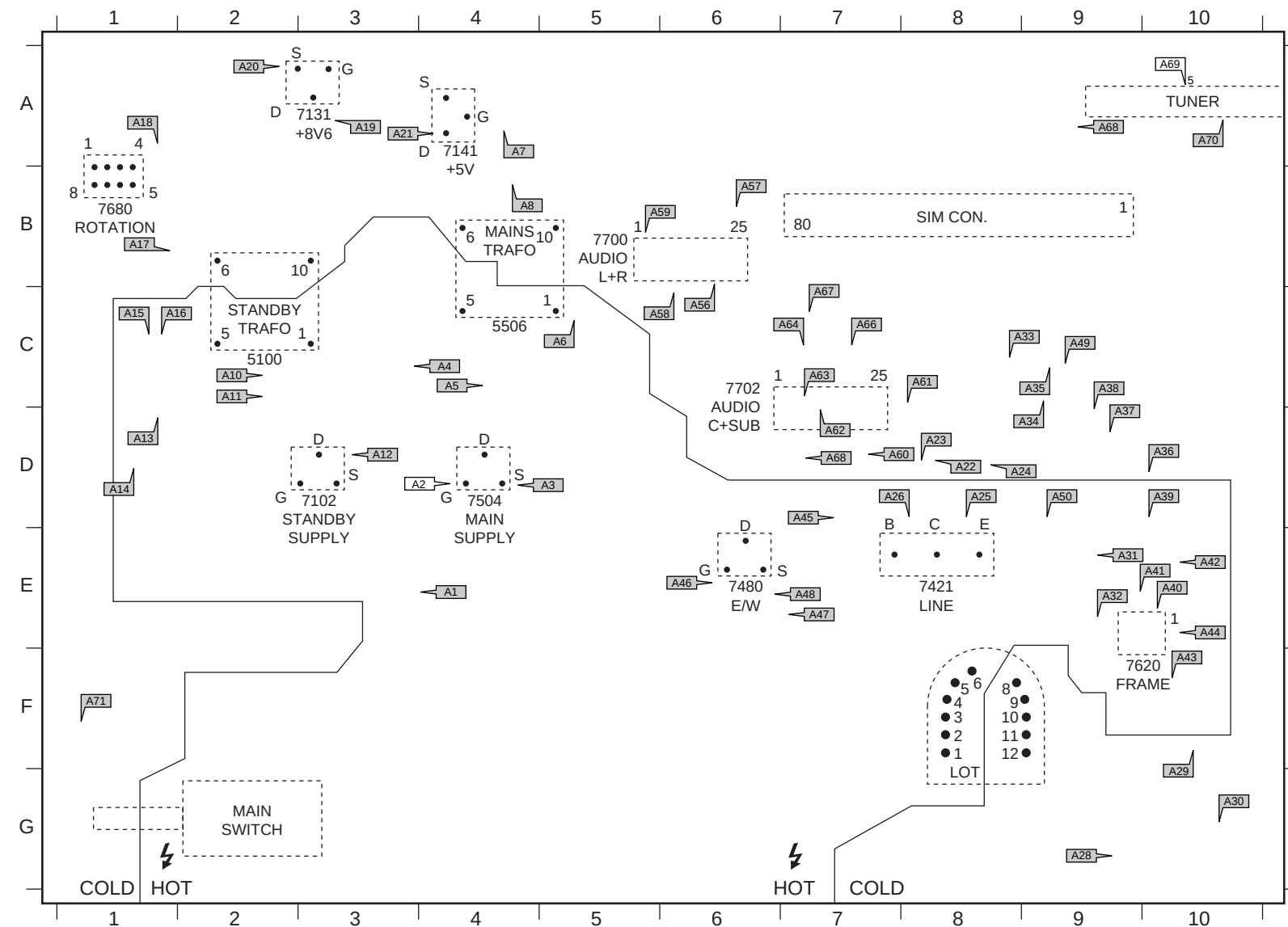


SUPPLY



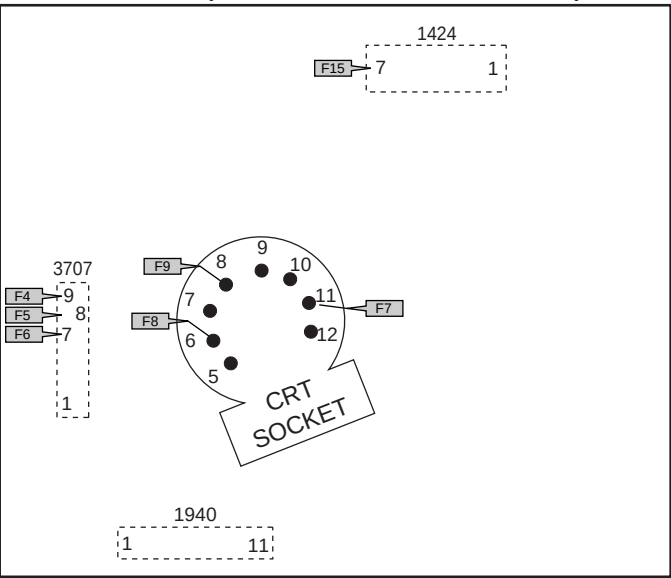
Testpoint Overview LSP and CRT Panel

LSP COPPER TRACK SIDE

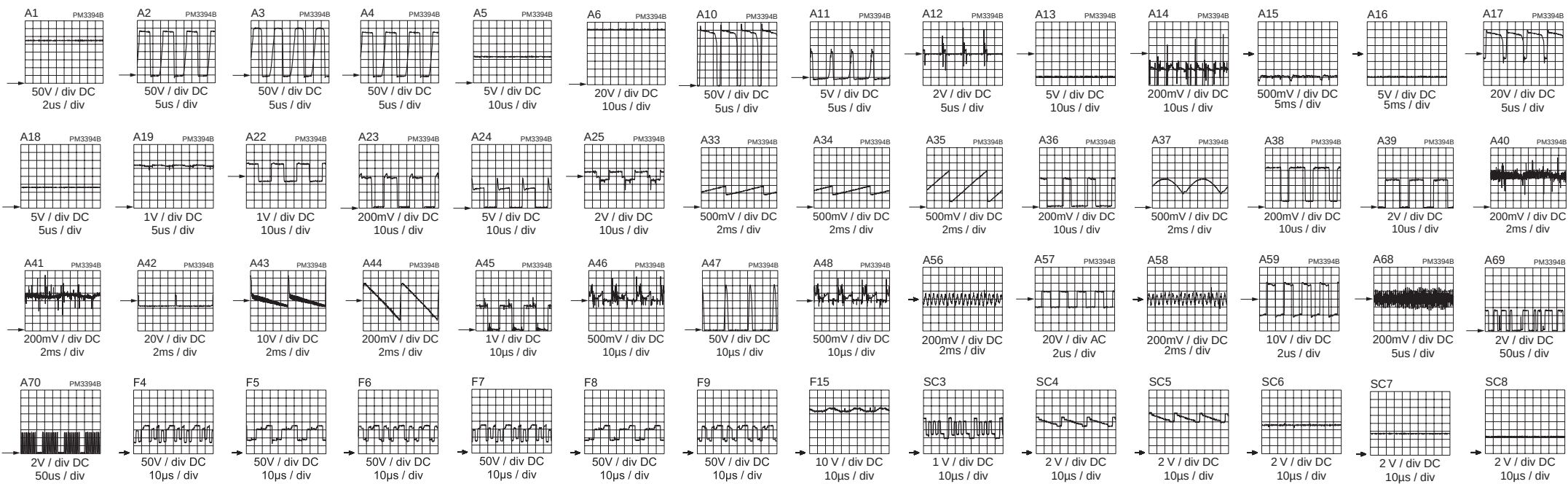
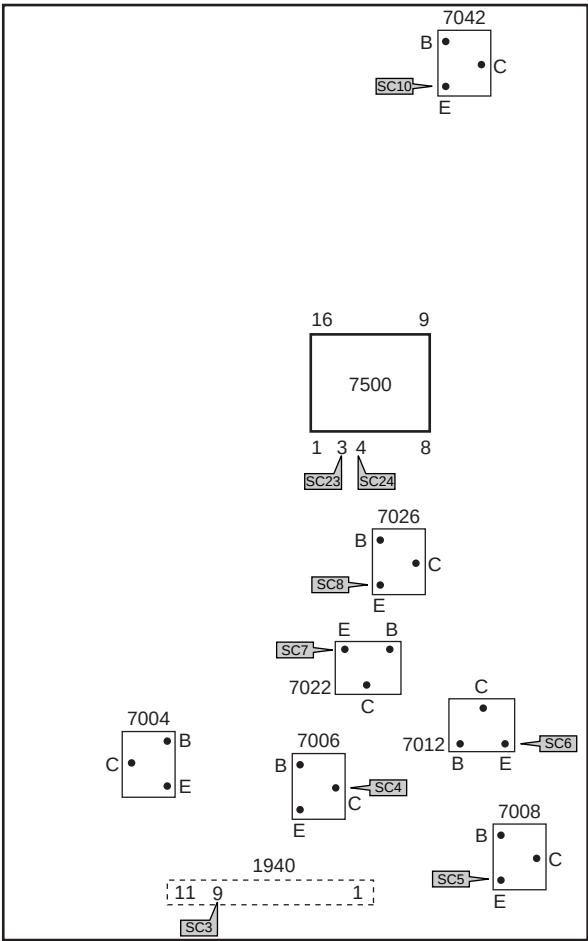


A1	E4	A58	C6
A3	D4	A59	B5
A4	C4	A60	D7
A5	C4	A61	C8
A6	C5	A62	D7
A7	A4	A63	D7
A8	B4	A64	C7
A10	C2	A66	C7
A11	C2	A67	C7
A12	D3	A70	A10
A13	D1	A71	F1
A14	D1	A88	A9
A15	C1		
A16	C1		
A17	B1		
A18	A1		
A19	A3		
A20	A2		
A21	A3		
A22	D8		
A23	D8		
A24	D8		
A25	D8		
A26	D7		
A28	G9		
A29	G10		
A30	G10		
A31	E9		
A32	E9		
A33	C8		
A34	D9		
A35	C9		
A36	D10		
A37	D9		
A38	C9		
A39	D10		
A40	E10		
A41	E10		
A42	E10		
A43	F10		
A44	E10		
A45	D7		
A46	E6		
A47	E7		
A48	E7		
A49	C9		
A50	D9		
A56	C6		
A57	B6		

CRT PANEL (COPPER TRACK SIDE)

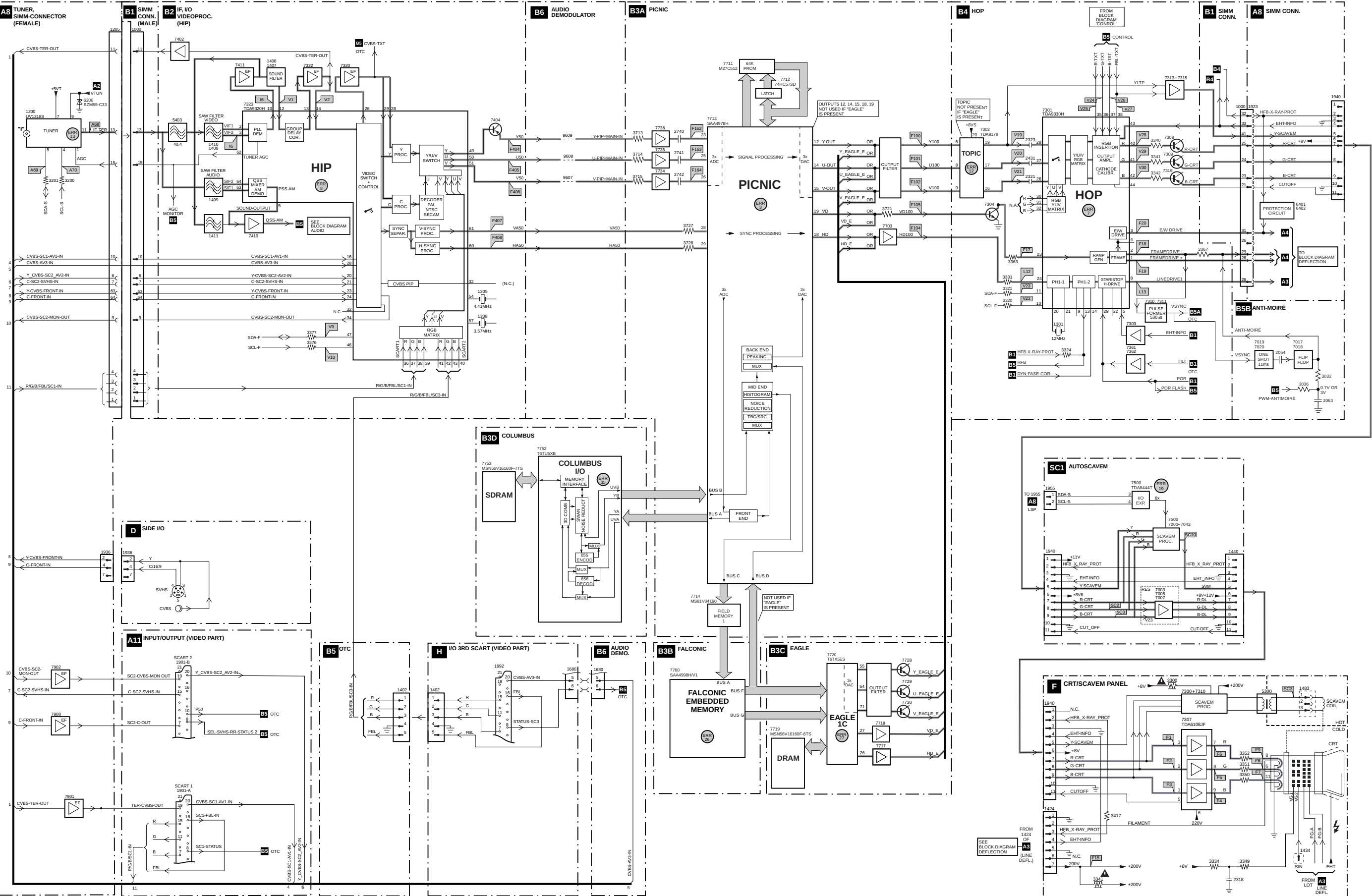


AUTO SCAVEM PANEL (COPPER TRACK SIDE)



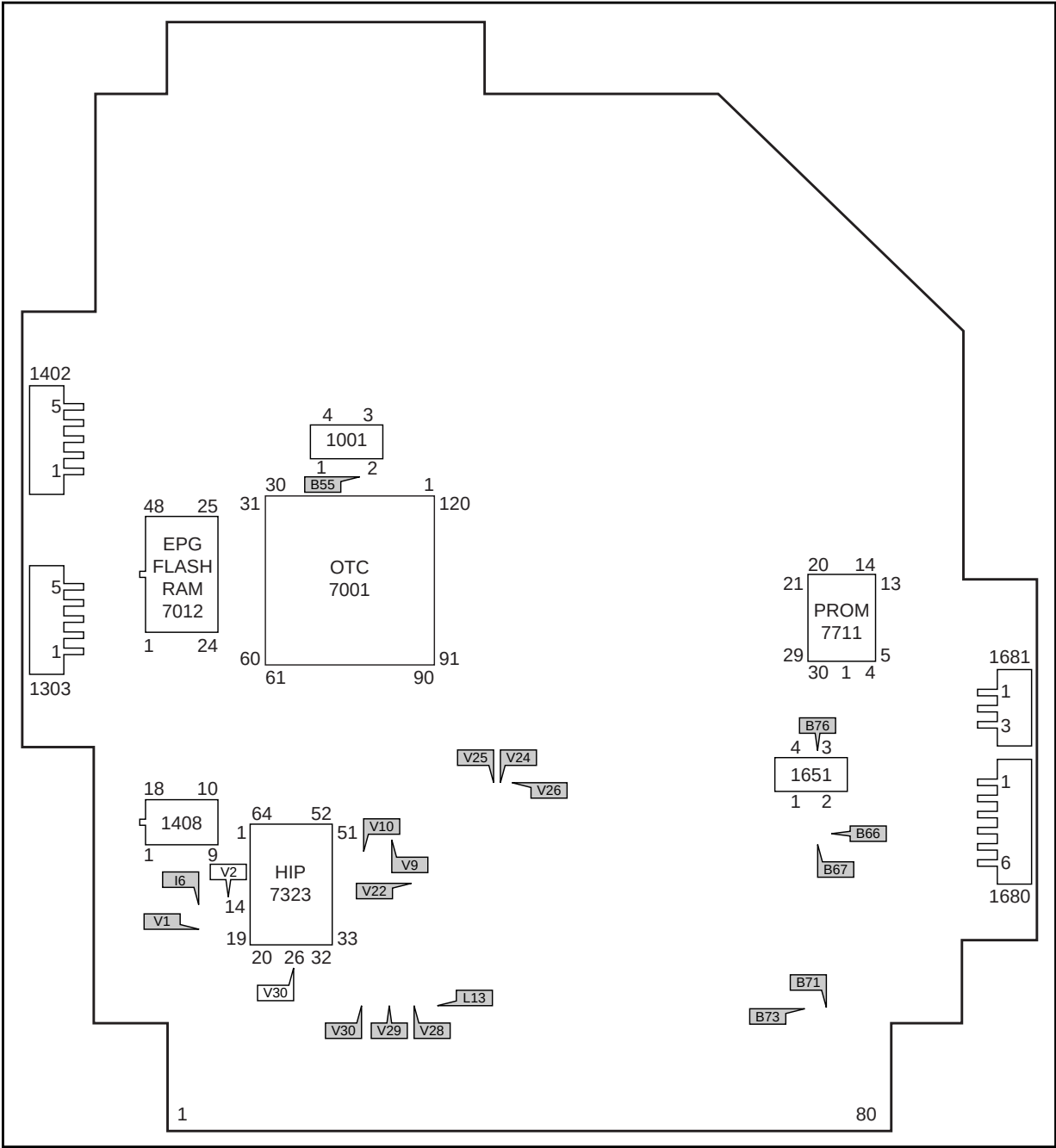
Block Diagram Video

VIDEO

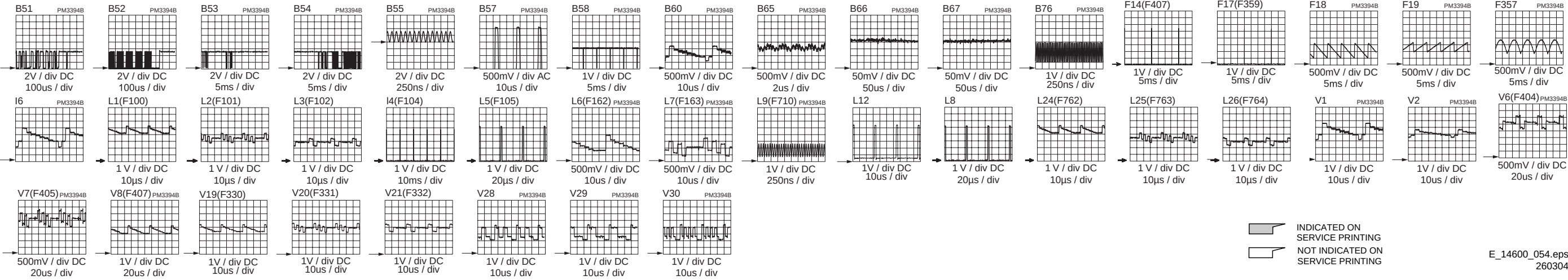
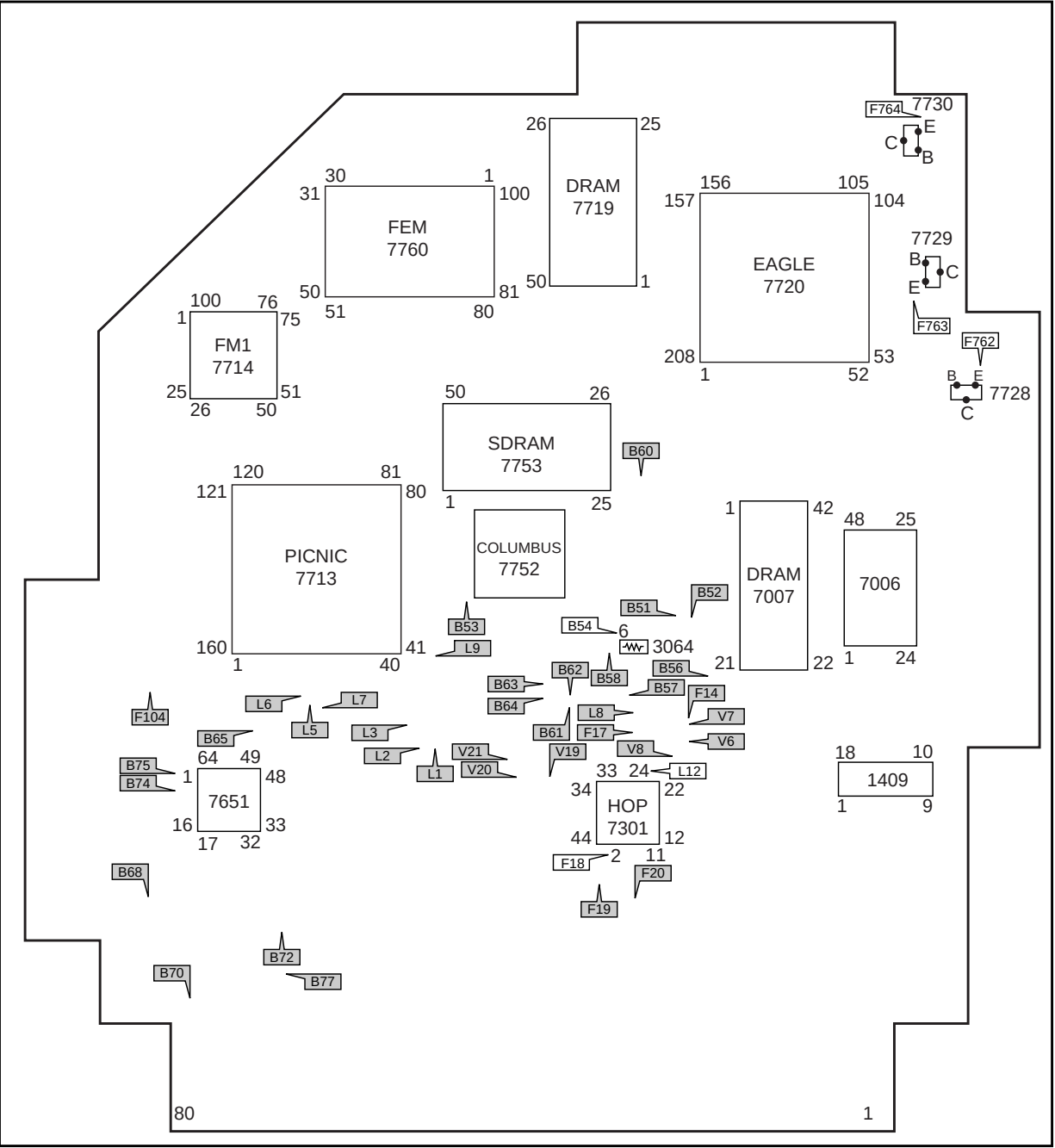


Testpoint Overview Small Signal Board

SSB SIDE A



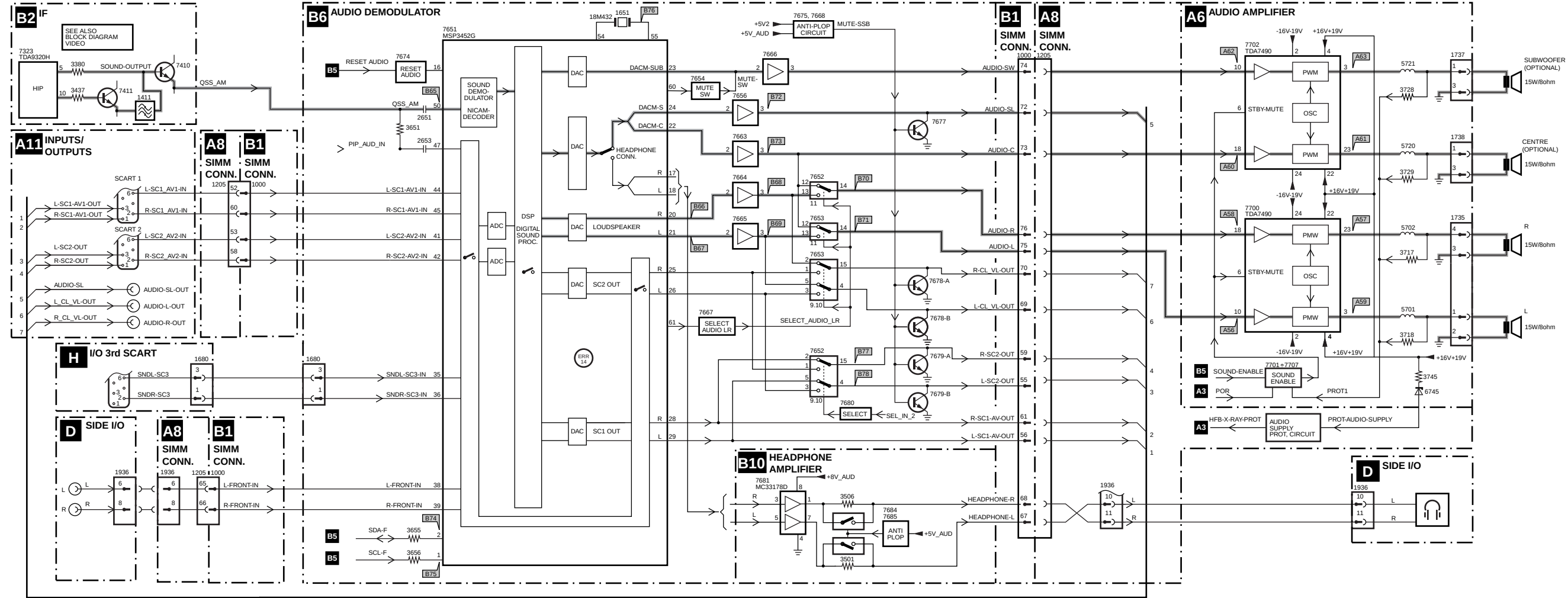
SSB SIDE Z



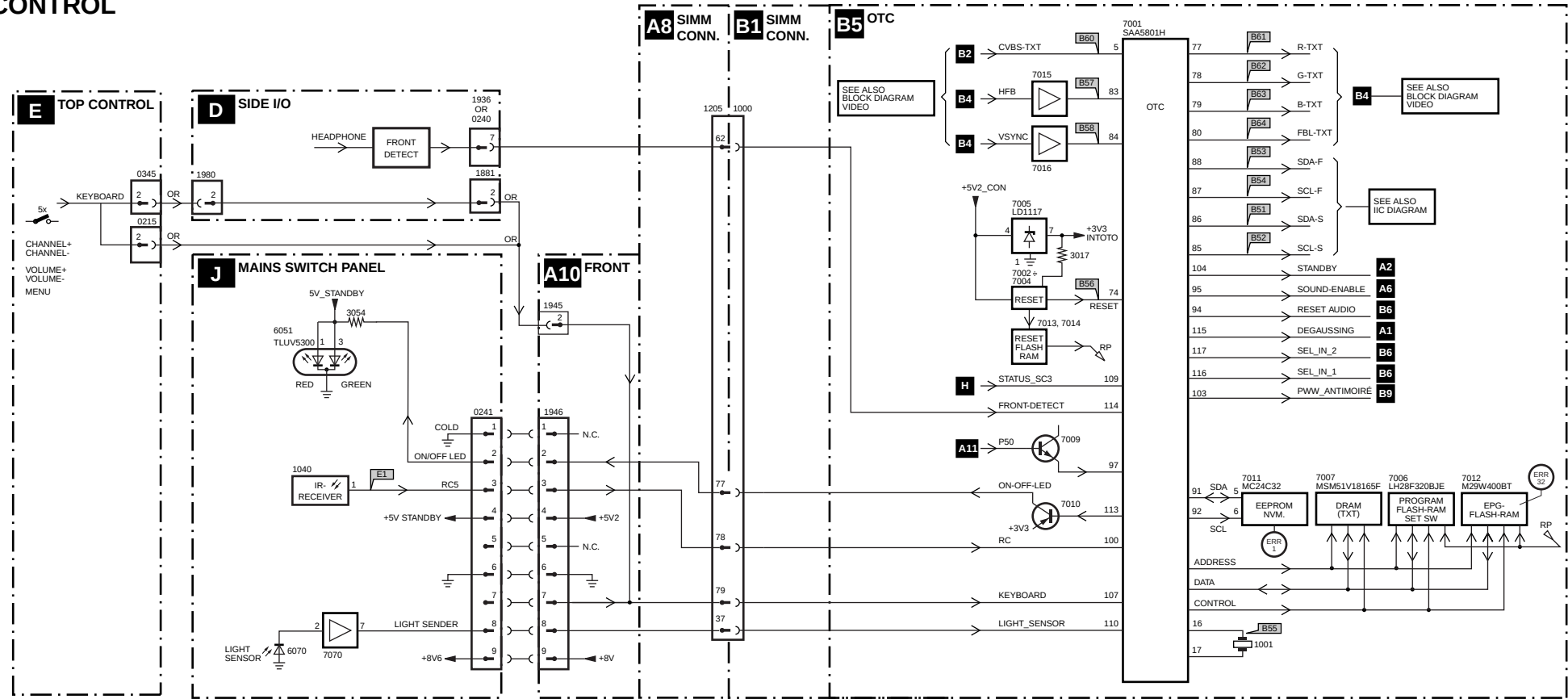
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NOT INDICATED ON SERVICE PRINTING

Block Diagram Audio 1 (Exclusive Wireless Audio Details)

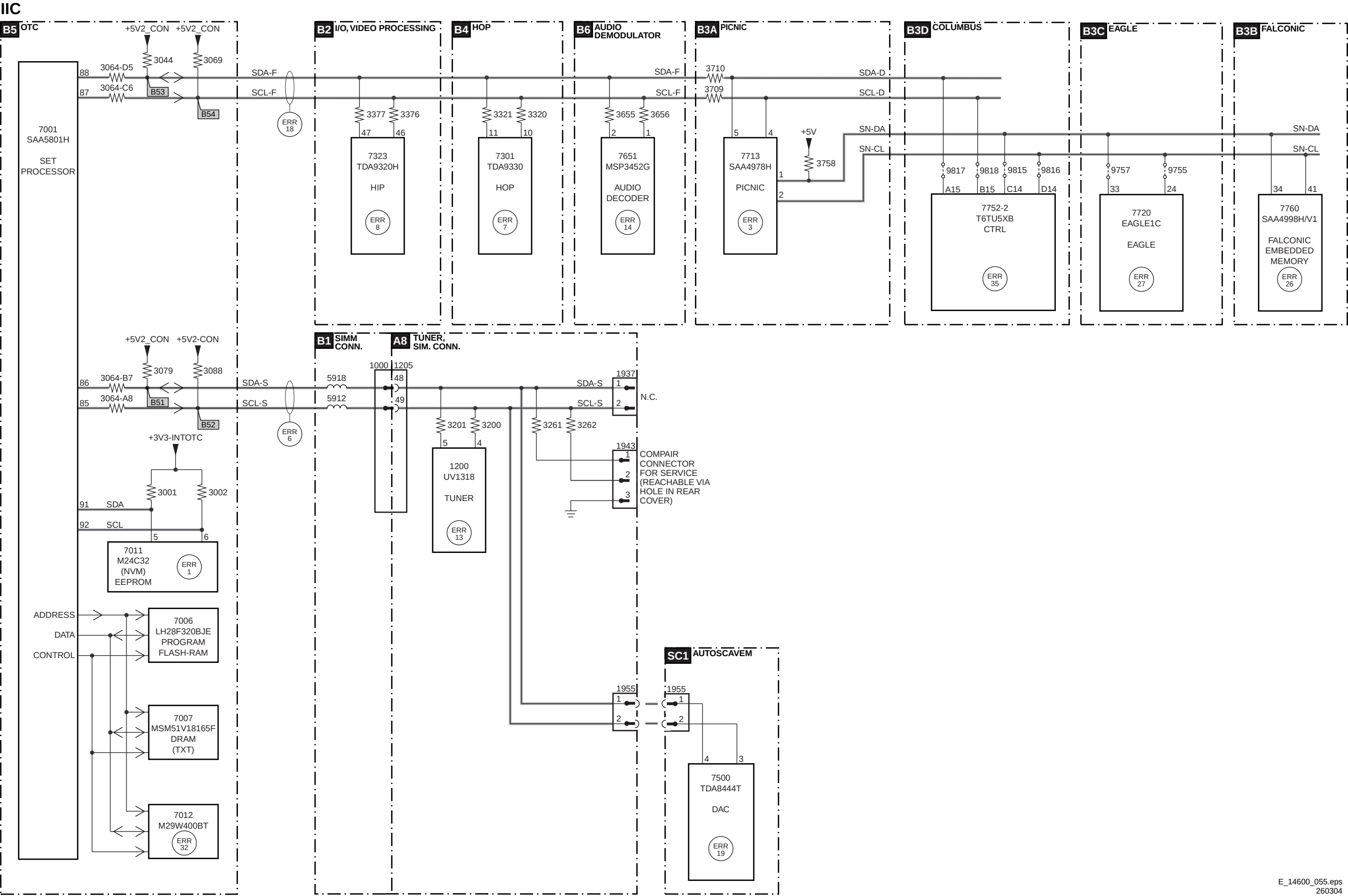
AUDIO



CONTROL

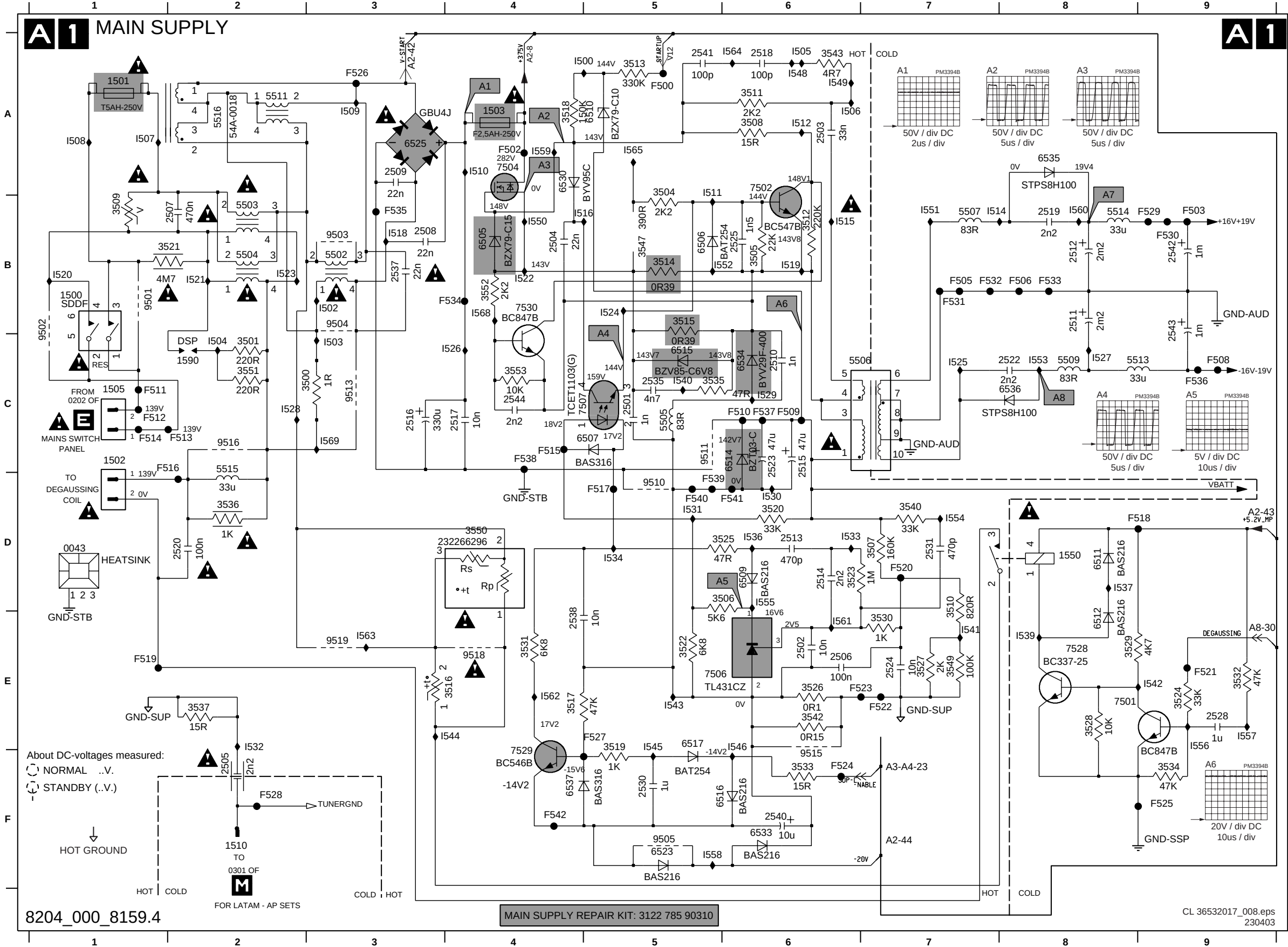


I2C IC's overview

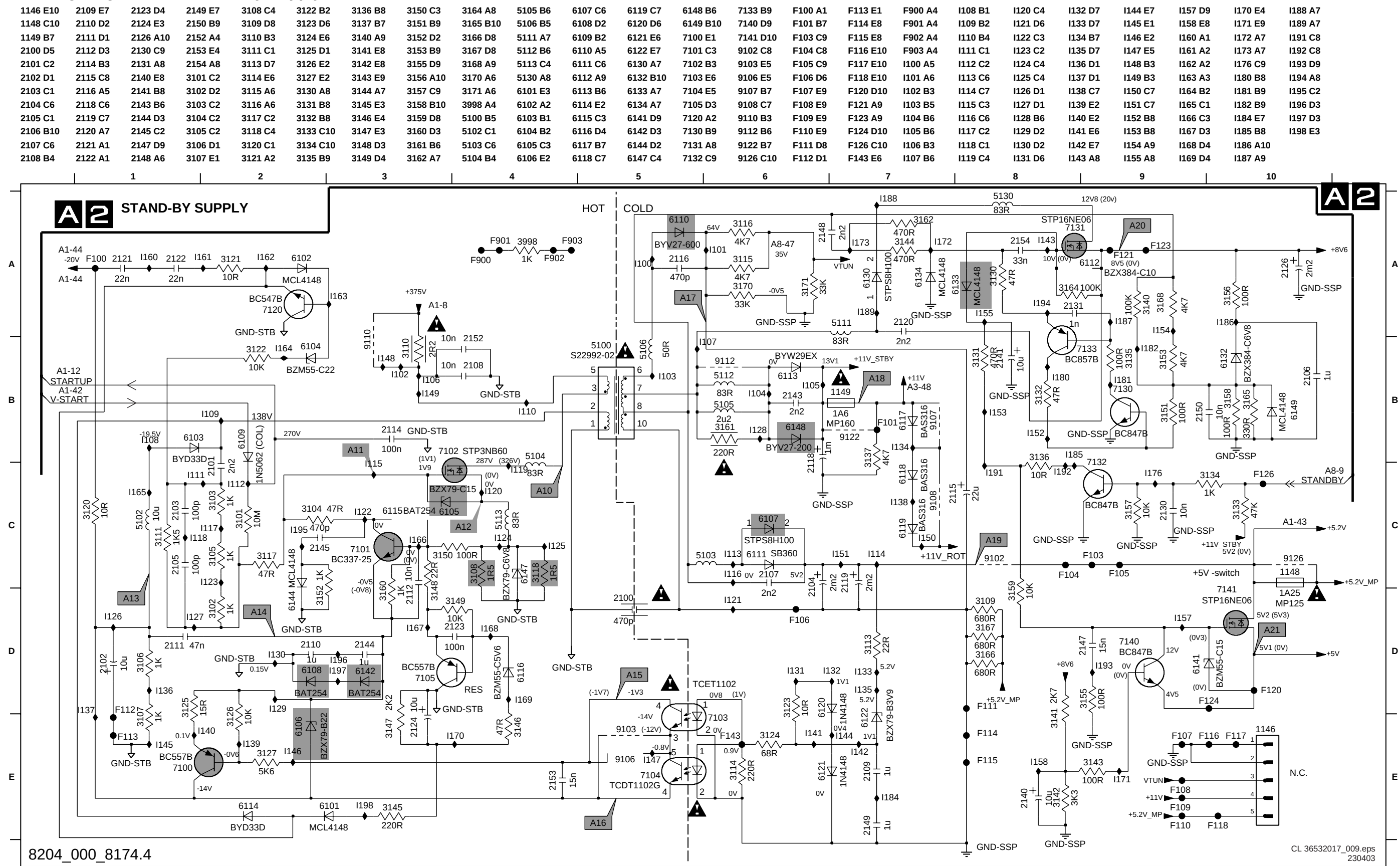


7. Circuit Diagrams and PWB Layouts

Large Signal Panel: Main Supply

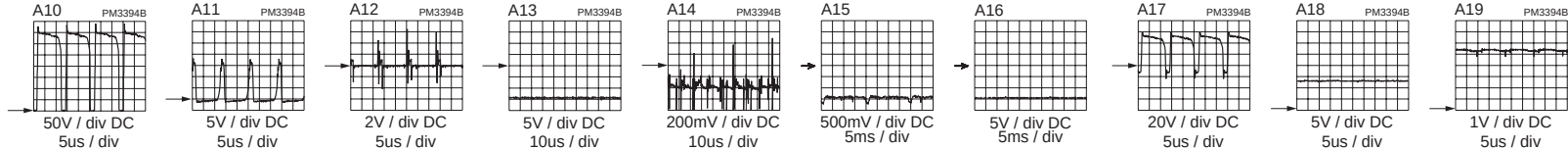


Large Signal Panel: Stand-by Supply



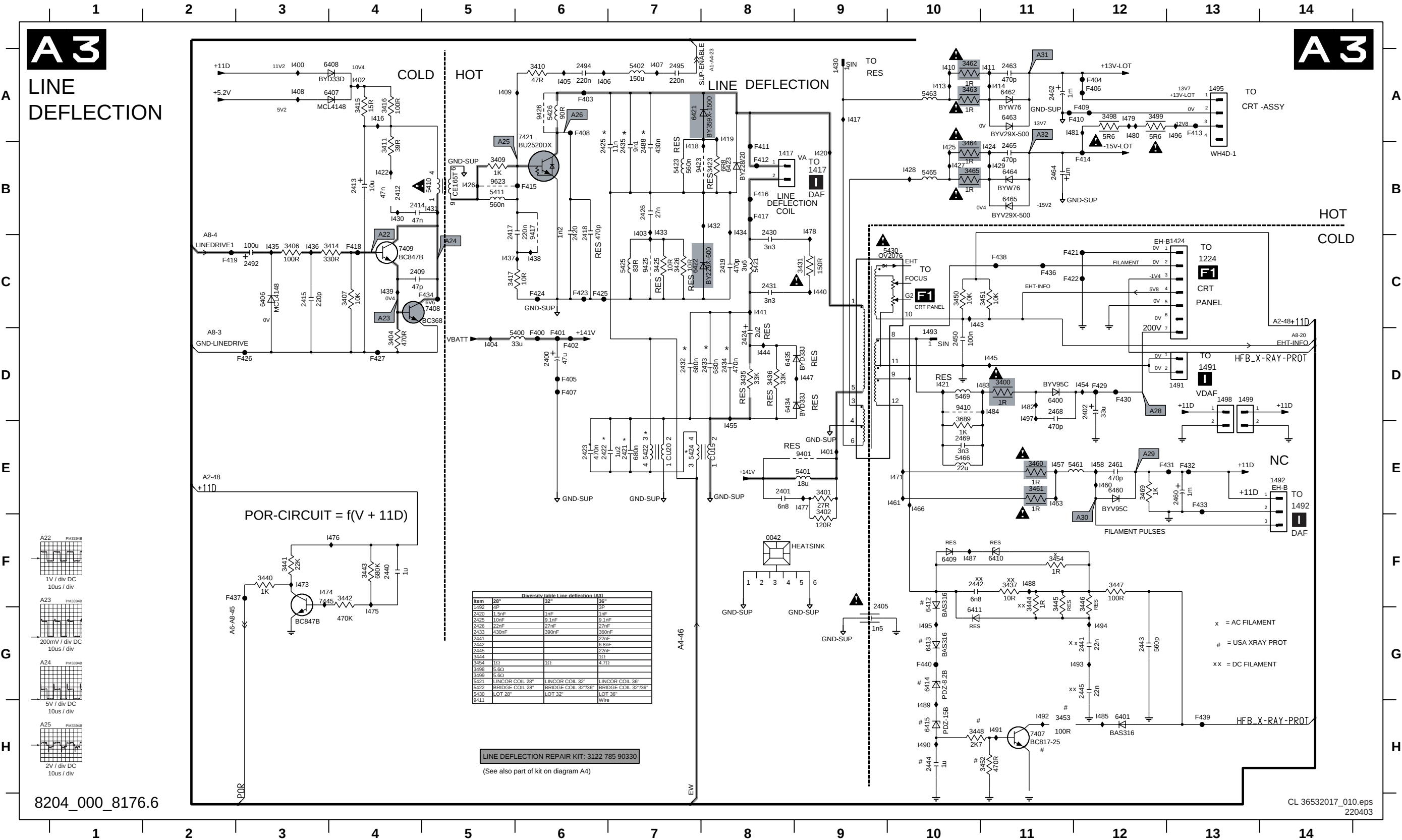
About DC-voltages measured:
○ NORMAL ..V.
⊙ STANDBY (..V.)

STANDBY SUPPLY REPAIR KIT: 3122 785 90460



Large Signal Panel: Line Deflection

0042 F8	1498 D13	2413 B4	2422 E6	2433 D8	2445 G12	2468 D11	3402 F9	3415 A4	3436 D8	3446 F12	3460 E11	3499 A12	5422 E7	5465 B10	6409 F10	6422 C7	6465 B11	9417 B6	F403 A6	F411 B8	F419 C2	F429 D12	F438 C11	I405 A6	I414 A11	I424 B11	I432 B8	I440 C9	I457 E11	I474 F3	I482 D11	I491 H11
1417 B8	1499 D13	2414 B4	2423 E6	2434 D8	2450 D10	2469 E10	3404 D4	3416 A4	3437 F11	3447 F12	3461 E11	3689 E10	5423 B7	5466 E10	6410 F11	6423 B8	7407 H11	9423 B7	F404 A12	F412 B8	F421 C11	F430 D12	F439 H13	I406 A6	I416 A4	I425 B10	I433 B7	I441 C8	I458 E12	I475 G4	I483 D11	I492 H11
1424 C13	2400 D6	2415 C3	2424 D8	2435 B7	2460 E13	2488 B7	3406 C3	3417 C5	3440 F3	3448 H10	3462 A10	5400 D6	5424 E7	5469 D10	6411 G10	6434 D8	7408 C5	9425 C7	F405 D6	F413 A13	F422 C11	F431 E13	F440 G10	I407 A7	I417 A9	I426 B5	I434 B8	I443 C10	I460 E12	I476 F4	I484 D11	I493 G12
1430 A9	2401 E8	2417 B5	2425 B6	2440 F4	2461 E12	2492 C3	3407 C4	3423 B8	3441 F3	3450 C10	3463 A10	5401 E9	5425 C7	6400 D11	6412 F10	6435 D8	7409 C4	9426 A6	F406 A12	F414 B12	F423 C6	F432 E13	I400 A3	I408 A3	I418 B7	I427 B10	I435 C3	I444 D8	I461 E10	I477 E9	I485 H12	I494 G12
1491 D13	2402 D12	2418 B6	2426 B7	2441 G12	2462 A11	2494 A6	3409 B5	3425 C7	3442 F4	3451 C11	3464 B10	5402 A7	5426 A6	6401 H12	6413 G10	6460 E12	7421 A6	9623 B5	F407 D6	F415 B6	F424 C6	F433 E13	I401 E9	I409 A5	I419 A8	I428 B10	I436 C3	I445 D11	I463 E11	I478 B9	I487 F10	I495 G10
1492 E14	2405 G9	2419 C8	2430 B8	2442 F10	2463 A11	2495 A7	3410 A6	3426 C7	3443 F4	3452 H11	3465 B10	5410 B5	5430 C10	6406 C3	6414 G10	6462 A11	7445 F3	F400 D6	F408 A6	F416 B8	F425 C6	F434 C5	I402 A4	I410 A10	I420 B9	I429 B11	I437 C5	I447 D9	I466 E10	I479 A12	I488 F11	I496 A13
1493 D10	2409 C4	2420 B6	2431 C8	2443 G12	2464 B11	3400 D11	3411 B4	3431 C9	3444 F11	3453 H11	3469 E12	5411 B5	5461 E12	6407 A4	6415 H10	6463 A11	9401 E9	F401 D6	F409 A12	F417 B8	F426 D3	F436 C11	I403 B7	I411 A11	I421 D10	I430 B4	I438 C6	I445 D12	I471 E10	I480 A12	I489 H10	I497 D11
1495 A13	2412 B4	2421 E7	2432 D7	2444 H10	2465 B11	3401 E9	3414 C4	3435 D8	3445 F11	3454 F11	3498 A12	5421 C8	5463 A10	6408 A4	6421 A7	6464 B11	9410 D10	F402 D6	F410 A12	F418 C4	F427 D4	F437 F2	I404 D5	I413 A10	I422 B4	I431 B5	I439 C4	I455 E8	I473 F3	I481 A11	I490 H10	



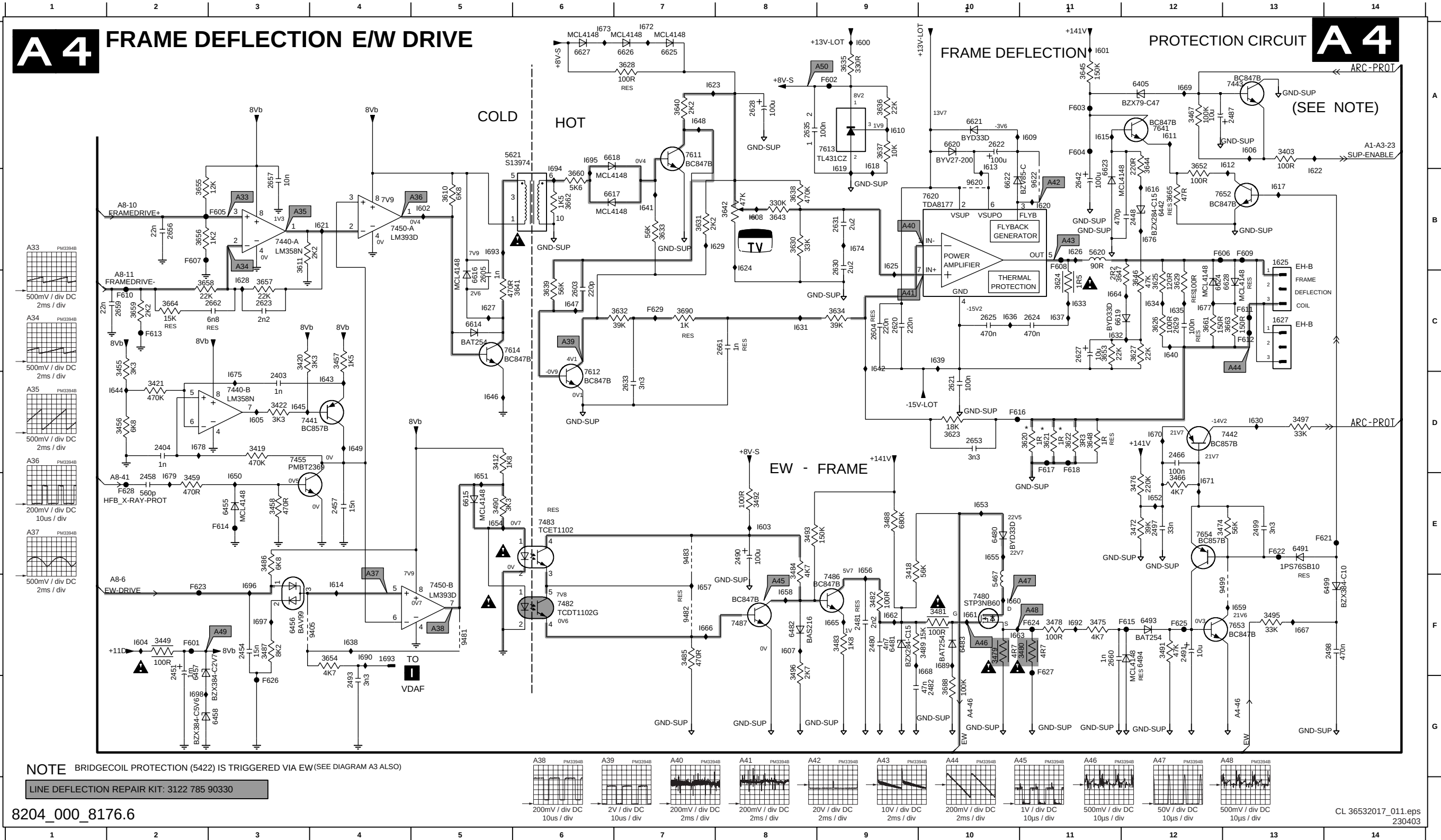
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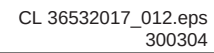
Large Signal Panel: Frame Deflection E/W Drive

2480 F9	2404 D2	2628 A8	3419 D3	3490 E5	3627 C12	3422 D3	3664 C2	3611 B3	6627 A6	7612 D6	6481 F9	6264 F11	7483 E6	I619 A9	F613 C2	I607 F8	I672 A7	I673 A6	I649 D4
2481 F9	2448 B12	2629 C12	3472 E12	3491 F12	3628 A7	3449 F2	7654 E12	3620 D11	6628 C13	7613 A9	6482 F8	F625 F12	7486 F9	I620 B11	I636 C10	I608 B8	I625 B9	I674 B9	I650 E3
2631 B9	3478 F11	2630 B9	3474 E13	3492 E8	6619 C11	3455 C2	9405 F4	3621 D11	7440-A B3	7614 C5	6483 F10	F626 G3	7487 F8	I621 B4	I637 C11	I609 A11	I626 B11	I675 D3	I651 E5
2451 F2	3482 F9	3629 C12	3475 F11	2498 F14	3630 B8	3456 D2	9481 F5	3622 D11	7440-B D3	I615 A11	6491 E13	F627 F11	I611 A12	I622 B13	I638 F4	I610 A9	I627 C5	I676 B12	I652 E12
2454 F3	3483 F9	2633 D7	3476 E12	2499 E13	3631 B7	3457 C4	9482 F7	3623 D10	3643 B8	7641 A12	6493 F12	F628 E2	I612 A13	I623 A7	I639 C10	I654 E5	I628 C3	I677 C12	I653 E10
2457 E4	3484 E8	2635 A8	3661 C12	2603 C6	3632 C7	3458 E3	5620 B11	3624 C11	3644 A12	7652 B13	6494 F12	F629 C7	I613 A10	I624 B8	I698 G2	I655 E10	I629 B8	I678 D2	
2458 E2	3485 F7	2642 B11	3479 F10	2604 C9	6623 A11	3459 E2	5621 A5	6615 E5	3645 A11	7653 F13	6499 F14	7441 D3	I614 F4	F603 A11	I641 B7	I656 E9	I630 D13	I679 E2	
2466 D12	3486 E3	3633 B7	3480 F11	2605 C5	6624 C12	3466 E12	6405 A12	6616 C5	3646 C12	9483 E7	6614 C5	7442 D13	I658 F8	F604 A11	I642 C9	I657 F7	I631 C8	I689 F10	
2653 D10	2482 G10	3634 C9	3481 F10	2620 C9	3637 A9	3467 A12	6442 B12	6617 B6	3647 C12	9499 F13	F614 E3	7443 A13	I616 B12	F605 B3	I643 D4	I659 F13	I632 C11	I690 F4	
2656 B2	2487 A13	3635 A9	3665 B12	2621 D10	3638 B8	3657 C3	6455 E3	6618 A6	3648 D11	9620 B10	F615 F12	7450-A	I617 B13	F606 B12	I600 A9	I660 F10	I633 C11	I692 F11	
2657 B3	2490 E8	3636 A9	3688 G10	2622 A10	3639 C6	3658 C2	6456 F3	F618 D11	3652 A12	9622 B11	F616 D10	B4	I618 A9	F607 B2	I601 A11	I661 F10	I634 C12	I693 B5	
2659 C2	2491 F12	2661 C8	3690 C7	2623 C3	3640 A7	3659 C2	3493 E8	6620 A10	3653 C11	F601 F2	F617 D11	7450-B	I662 F9	F608 B11	I602 B5	I667 F13	I635 C12	I644 D2	
2660 F11	2493 G4	2662 C3	5467 F10	2624 C11	3641 C6	3660 B6	3495 F13	6621 A10	3654 F4	F602 A9	I640 C12	F5	I663 F10	F609 B13	I603 E8	I668 F10	I694 A6	I645 D3	
1627 C13	2497 E12	3403 A13	3487 F3	2625 C10	3642 B8	7620 B10	3496 F8	6622 B10	3655 B2	6457 F2	F621 E13	7455 D3	I664 C11	F610 C2	I604 F2	I669 A12	I695 A6	I646 D5	
1693 F4	1625 B13	3412 D5	3488 E9	3625 C12	3420 C3	3662 B6	3497 D13	3656 B2	3656 B2	6458 G3	F622 E13	7480 F10	I665 F9	F611 C13	I605 D3	I670 D12	I696 F3	I647 C6	
2403 D3	2627 C11	3418 E9	3489 F10	3626 C12	3421 D2	3663 C13	3610 B5	6626 A7	7611 A7	6480 E10	F623 F2	7482 F6	I666 F7	F612 C13	I606 A13	I671 E12	I697 F3	I648 A7	

Diversity table Frame deflection [A4]			
Item	28"	32"	36"
1693			1P
2493			3.3nF
3480		6.8k	
3488	1M	680k	1M
3621	1	1.5k	1
3622	1.5k	1.8k	1
3625	120k	220k	56k
3626	100k	220k	56k
3654			4.7k
3661		470k	120k
6499	BZX384-C10	PD291B	BZX384-C10
6624		BAS316	BAS316

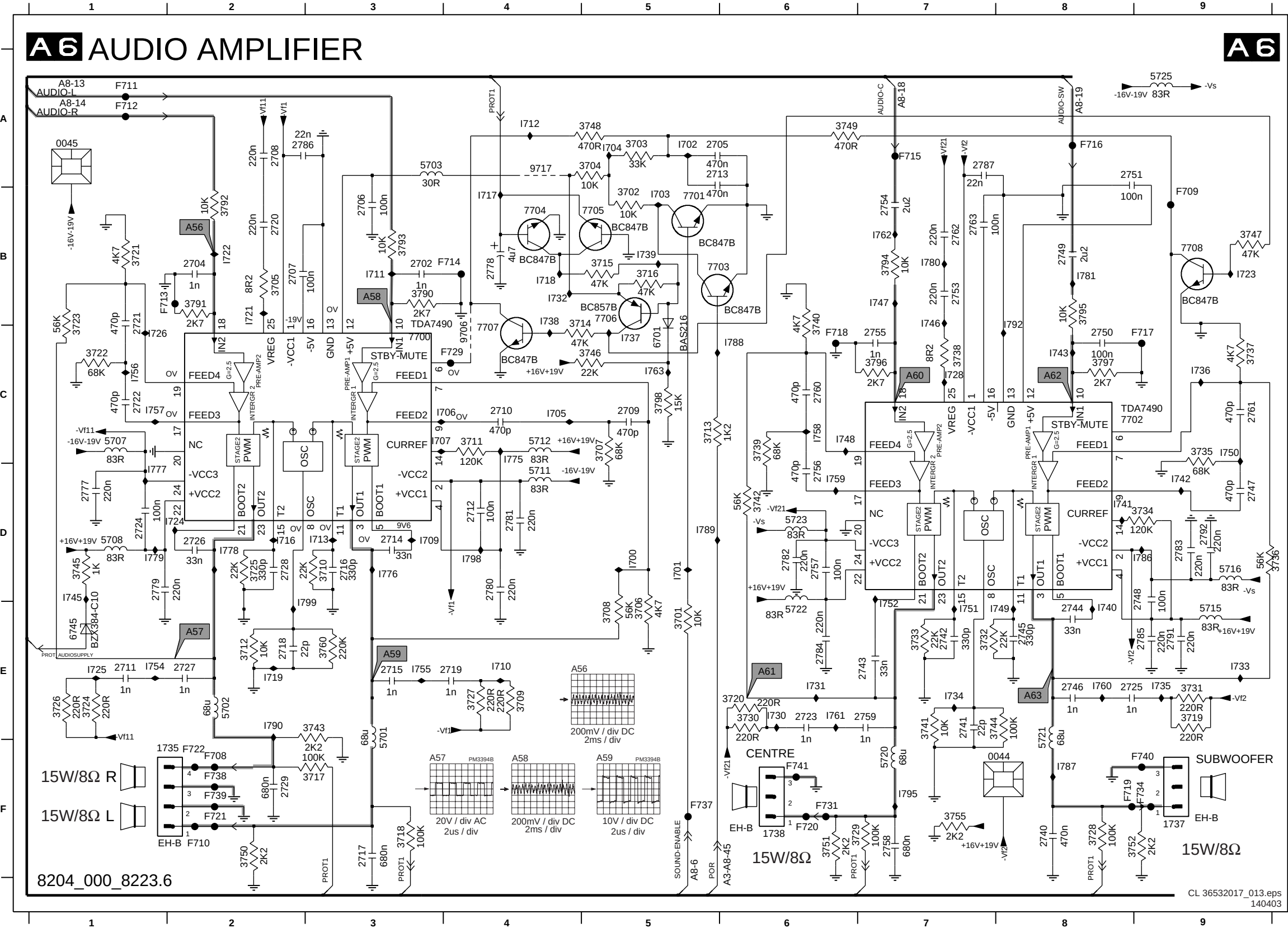


1601 A2	3649 D1	3683 D1	3686 B1	6081 B3	6084 C1	7682 D3	F632 C2	I680 C1	I683 B3	I687 C2	I699 D1
1620 C4	3681 D2	3684 B2	3687 C3	6082 B2	7680 B2	F630 B4	F633 E2	I681 D2	I684 D1	I688 E2	
2601 B2	3682 E2	3685 C1	6080 C2	6083 C4	7681 D2	F631 C4	F634 B1	I682 D2	I685 B2	I691 C1	



This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Large Signal Panel: Audio Amplifier



0044 F7	2783 D9	3790 B3	I702 A5	I786 D9
0045 A1	2784 E6	3791 B2	I703 B5	I787 F8
1735 F2	2785 E9	3792 B2	I704 A5	I788 C6
1737 F9	2786 A2	3793 B3	I705 C4	I789 D5
1738 F6	2787 A7	3794 B7	I706 C4	I790 E2
2702 B3	2791 E9	3795 B8	I707 C3	I792 B8
2704 B2	2792 D9	3796 C7	I709 D3	I795 F7
2705 A5	3701 E5	3797 C8	I710 E4	I798 D4
2706 B3	3702 B5	3798 C5	I711 B3	I799 E3
2707 B2	3703 A5	5701 E3	I712 A4	
2708 A2	3704 A5	5702 E2	I713 D3	
2709 C5	3705 B2	5703 A3	I716 D2	
2710 C4	3706 E5	5707 C1	I717 B4	
2711 E1	3707 C5	5708 D1	I718 B4	
2712 D4	3708 E5	5711 D4	I719 E2	
2713 A5	3709 E4	5712 C4	I721 B2	
2714 D3	3710 D3	5715 E9	I722 B2	
2715 E3	3711 C4	5716 D9	I723 B9	
2716 D3	3712 E2	5720 F7	I724 D2	
2717 F3	3713 C5	5721 E8	I725 E1	
2718 E2	3714 C4	5722 E6	I726 C1	
2719 E4	3715 B5	5723 D6	I728 C7	
2720 B2	3716 B5	5725 A9	I730 E6	
2721 B1	3717 F3	6701 C5	I731 E6	
2722 C1	3718 F3	6745 E1	I732 B4	
2723 E6	3719 E9	7700 C3	I733 E9	
2724 D1	3720 E6	7701 B5	I734 E7	
2725 E8	3721 B1	7702 C8	I735 E9	
2726 D2	3722 C1	7703 B5	I736 C9	
2727 E2	3723 B1	7704 B4	I737 C5	
2728 D2	3724 E1	7705 B5	I738 B4	
2729 F2	3725 D2	7706 B5	I739 B5	
2740 F8	3726 E1	7707 C4	I740 E8	
2741 E7	3727 E4	7708 B9	I741 D8	
2742 E7	3728 F8	9706 C4	I742 D9	
2743 E7	3729 F7	9717 A4	I743 C8	
2744 E8	3730 E6	F708 F2	I745 D1	
2745 E8	3731 E9	F709 B9	I746 B7	
2746 E8	3732 E7	F710 F2	I747 B7	
2747 D9	3733 E7	F711 A1	I748 C6	
2748 D8	3734 D9	F712 A1	I749 E8	
2749 B8	3735 C9	F713 B2	I750 C9	
2750 C8	3736 D9	F714 B4	I751 E7	
2751 A8	3737 C9	F715 A7	I752 E7	
2753 B7	3738 C7	F716 A8	I754 E1	
2754 B7	3739 C6	F717 C9	I755 E3	
2755 C7	3740 B6	F718 C6	I756 C1	
2756 D6	3741 E7	F719 F8	I757 C1	
2757 D6	3742 D6	F720 F6	I758 C6	
2758 F7	3743 E3	F721 F2	I759 D6	
2759 E7	3744 E8	F722 F2	I760 E8	
2760 C6	3745 D1	F729 C4	I761 E6	
2761 C9	3746 C5	F731 F6	I762 B7	
2762 B7	3747 B9	F734 F9	I763 C5	
2763 B7	3748 A5	F737 F5	I775 C4	
2777 D1	3749 A6	F738 F2	I776 D3	
2778 B4	3750 F2	F739 F2	I777 D1	
2779 D1	3751 F6	F740 F9	I778 D2	
2780 D4	3752 F9	F741 F6	I779 D1	
2781 D4	3755 F7	I700 D5	I780 B7	
2782 D6	3760 E3	I701 D5	I781 B8	

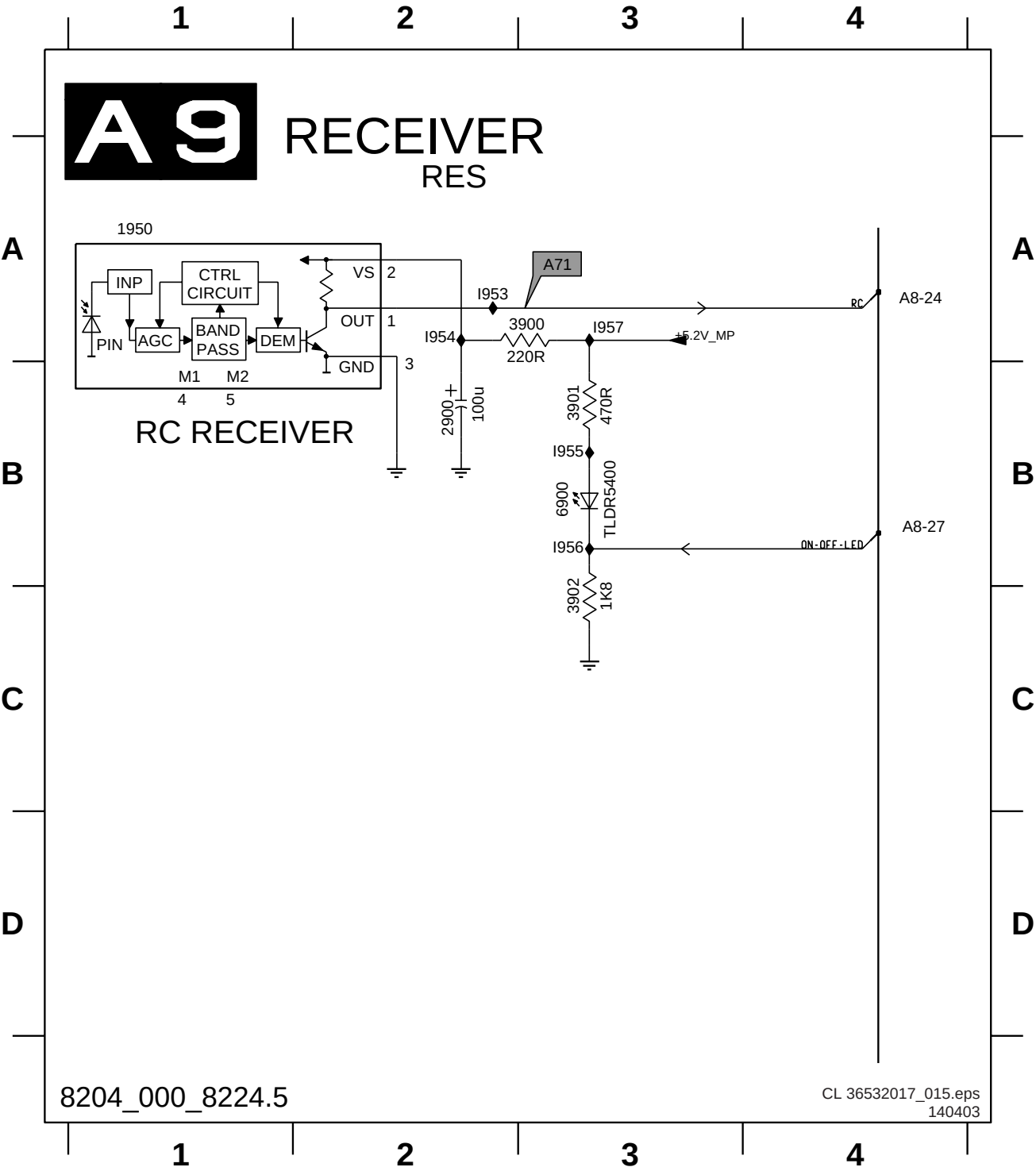
A8 TUNER SIM CONNECTOR (FEMALE)



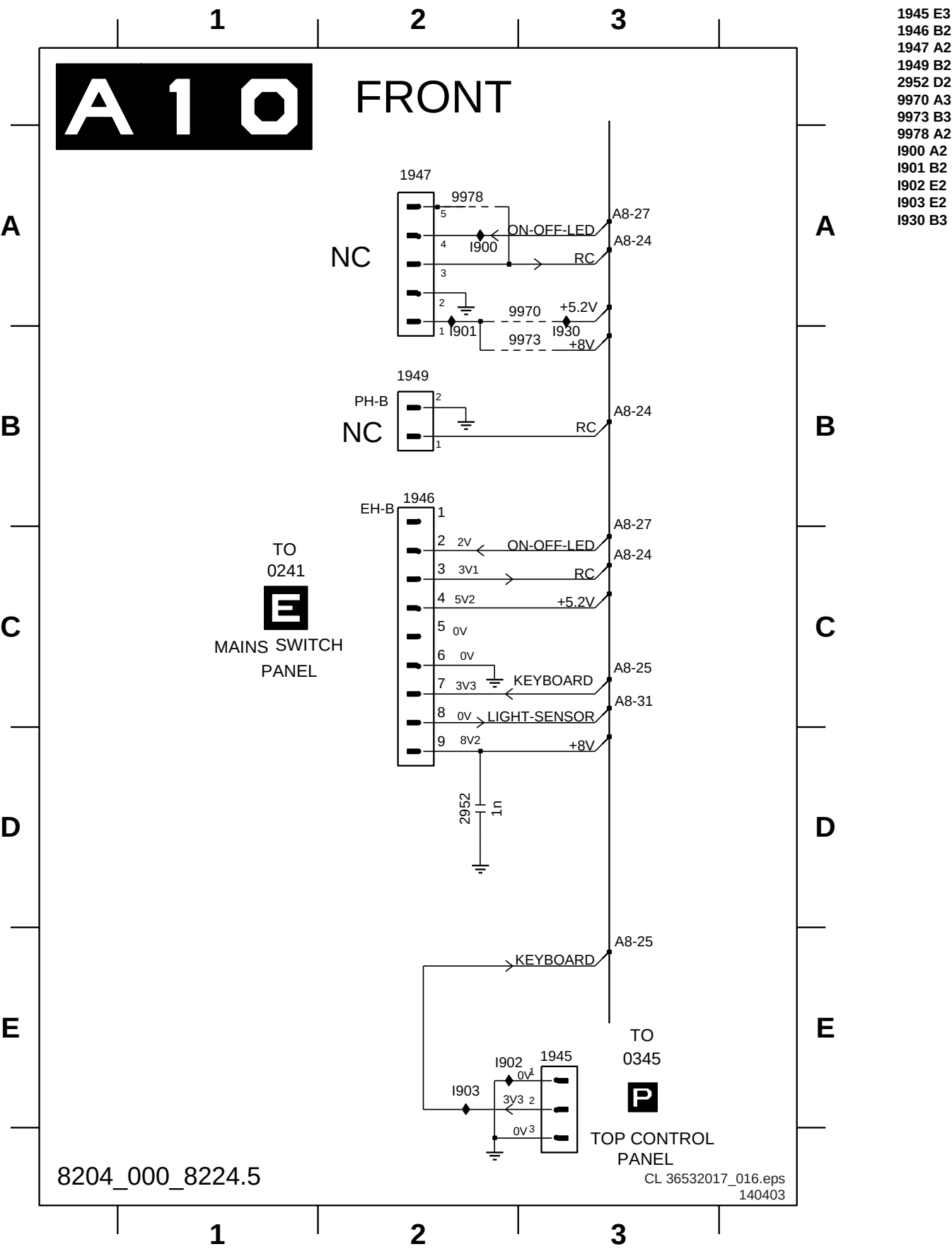
1200 G2	9988 B6
1201 F1	9989 B1
1205 I2	9990 B5
1932 F9	9990 B5
1933 B6	F904 D6
1934 A6	F904 A6
1935 E9	F906 E6
1936 D6	F907 F6
1937 F9	F908 F6
1940 F6	F909 F6
1943 E5	F911 G5
1948 D13	F914 E4
1951 A13	F915 A4
1952 E9	F916 E4
1953 D9	F917 E2
1955 F5	F918 F1
1961 C9	F919 G3
1965 D6	F920 H2
1966 E12	F921 A2
1997 E3	F922 A3
2200 D2	F924 D6
2201 F1	F927 G2
2202 G2	F928 B3
2203 G3	F929 C2
2455 I7	F930 F12
2483 B9	F931 E1
2496 B8	D201 D6
2914 E2	D202 D6
2915 D2	D203 E6
2916 E12	D205 E6
2917 E12	D206 E6
2918 F11	D207 E6
2929 E10	D209 I6
2930 F8	D208 I3
2931 D9	D209 G5
2940 B3	D210 H4
2941 B8	D211 I4
2942 H8	D213 C12
2943 H8	D215 B2
2946 E12	D216 H3
2945 H13	D225 I3
2946 H13	D226 I3
2947 I7	D230 D10
2948 H12	D231 D11
2949 I2	D232 D11
2950 G3	D233 D10
2951 G2	I904 G4
3200 F3	I905 G4
3201 F3	I906 C3
3202 D10	I907 B6
3211 D10	I908 A6
3212 D11	I909 B6
3213 C11	I910 B6
3250 H3	I911 B6
3261 E4	I912 C6
3262 F4	I913 C6
3427 A7	I914 C6
3428 B8	I915 C6
3429 B8	I916 E8
3430 E8	I917 E8
3432 A8	I918 E9
3903 F11	I919 F9
3904 E1	I920 F9
3907 C1	I921 C2
3910 C1	I922 E11
3920 C4	I923 E11
3929 D4	I924 E11
3930 D3	I925 E12
3938 F10	I926 F11
3938 I11	I928 F11
3940 G12	I929 F11
3941 E2	I929 H7
3942 E11	I931 F1
3943 E11	I932 C11
3945 F11	I933 G1
3999 A3	I934 F3
5901 C2	I935 F3
5902 A1	I936 D12
5903 A1	I937 C1
5904 B3	I938 F9
6201 G3	I939 F11
6202 G3	I940 B12
6202 G3	I941 F11
6402 B9	I942 D12
6901 A8	I943 C11
7210 D10	I944 B13
7211 D11	I945 E8
7901 C3	I946 D12
7902 F11	I947 B2
7908 E11	I948 D2
7909 E11	I949 F9
7911 D1	I950 E12
7912 C1	I951 D1
9201 C12	I952 D5
9202 C12	I953 G1
9205 E8	I959 F6
9206 D8	I960 E2
9215 G2	I961 E3
9225 E8	I962 G5
9228 D9	c001 I2
9228 D9	c002 I2
9250 E6	
9251 E6	
9901 C12	
9902 C12	
9903 D12	
9904 C12	
9905 F8	
9906 E3	
9907 I11	
9908 C2	
9909 B1	
9980 B1	
9982 F6	
9983 B11	
9987 B6	

Large Signal Panel: Receiver

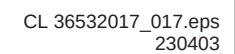
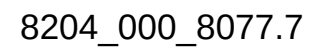
1950 A1 2900 B2 3900 A3 3901 B3 3902 C3 6900 B3 I953 A2 I954 A2 I955 B3 I956 B3 I957 A3



Large Signal Panel: Front



A 1 1 INPUTS/OUTPUTS



1901-A A6	3997 A5
1901-B A2	6950 A1
1902-A D2	6951 C1
1902-B D1	6953 B4
1902-C D2	6954 C3
1910 B3	6955 C4
1911 B7	6956 C3
2985 C5	6957 A5
2987 E2	6958 B5
2988 E2	6959 C5
2989 D3	6960 B8
2990 B7	6961 C8
2991 B4	6962 C8
2992 B3	F976 D2
2993 A7	F977 D1
2994 A5	F978 D1
2995 A6	F979 C3
2996 A2	F980 C2
2997 A1	F981 C7
2998 A7	F982 C6
2999 A3	F983 C3
3959 A2	F984 B7
3960 A1	F985 B3
3961 E3	F986 B6
3962 E2	F987 B6
3963 E3	F988 B3
3964 E2	F989 B2
3965 D3	F990 A3
3966 D2	F991 A7
3967 C7	F992 A7
3968 C3	F993 A3
3969 C7	F994 A6
3970 C3	F995 A3
3971 C5	F996 A2
3972 C1	F997 A6
3973 C3	F998 A7
3974 C3	F999 A2
3975 C7	I986 A1
3976 C4	I987 C5
3977 B7	I988 E2
3978 B3	I989 E2
3979 B3	I990 E2
3980 B3	I991 D3
3981 B8	I992 B3
3982 B7	I993 A2
3983 B6	I994 A1
3984 B4	I995 A3
3985 B2	I996 A6
3986 A3	I997 A2
3987 A1	I998 A6
3988 A7	I999 A5
3989 A3	
3990 A6	
3992 A2	
3991 A5	
3993 A1	
3994 A7	
3995 A3	
3996 A6	

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Mapping Large Signal Panel (Top Side)

0042	C8	2420	C8	3137	G1	3749	D7	6130	F3	9411	A10	9932	G9
0043	D3	2421	B6	3141	G3	3755	E6	6147	D3	9412	E8	9933	F10
0044	E7	2422	A5	3144	F2	3904	E9	6148	F2	9413	E9	9934	F9
0045	F5	2423	A6	3161	F2	3941	F10	6400	A9	9414	E9	9935	G9
1146	G2	2424	C5	3162	F2	3967	F10	6405	A7	9415	E9	9936	G9
1148	G3	2425	C7	3170	G2	3968	F10	6408	E8	9423	C7	9937	G8
1149	F2	2426	C6	3171	G2	3971	F10	6421	D8	9425	C6	9938	G9
1200	G10	2430	B7	3213	F7	3972	F10	6422	D7	9426	C8	9939	F8
1201	G6	2431	B7	3400	A9	3973	F10	6423	C7	9501	A2	9940	G9
1205	F8	2432	B6	3401	A7	3974	E10	6434	B6	9502	A2	9942	F7
1417	B8	2433	B6	3402	A7	3975	F10	6435	C6	9503	B4	9943	G8
1424	A10	2434	B6	3403	A7	3979	E10	6460	A10	9504	B5	9944	G8
1430	C9	2435	C8	3409	C9	3983	E10	6462	C9	9510	D4	9945	G8
1491	A7	2450	A10	3411	D8	3985	E10	6463	C9	9511	C4	9946	G9
1492	A10	2451	D10	3415	D8	3986	E10	6464	C9	9513	B5	9947	G8
1493	A8	2460	A10	3416	E8	3987	E10	6465	C9	9515	E5	9948	F8
1495	C10	2461	A10	3417	C8	3989	E10	6480	C7	9516	A3	9949	F7
1498	A10	2462	C10	3418	C6	3993	D10	6505	D4	9517	E4	9950	F7
1499	D9	2463	C9	3423	C7	3998	C1	6510	C3	9518	C3	9951	G1
1500	A2	2464	C10	3425	C6	5100	E2	6514	D5	9519	B4	9952	G6
1501	B2	2465	C9	3426	C6	5102	D1	6515	D5	9551	C4	9953	G6
1502	A3	2468	A9	3431	B7	5103	F3	6525	C5	9552	F4	9954	F8
1503	C3	2469	A8	3435	B6	5104	E2	6530	D3	9554	C4	9955	G6
1505	A2	2487	A7	3436	B5	5105	F2	6534	D3	9556	E5	9956	G6
1510	E5	2488	C8	3449	E9	5106	E1	6535	F3	9557	E4	9957	B1
1550	B3	2490	D6	3450	A10	5111	F2	6536	G4	9558	E3	9958	B1
1590	A3	2491	A6	3451	B10	5112	F2	6619	B10	9563	E5	9959	F9
1601	G1	2492	E8	3460	A10	5113	D2	6620	C10	9564	C3	9961	F8
1620	F1	2501	D4	3461	A10	5130	F2	6621	C10	9566	E4	9963	G10
1625	B10	2503	E3	3462	C9	5400	C5	6622	C10	9567	B4	9964	G4
1627	B10	2505	D5	3463	C9	5401	A7	6900	B1	9570	F5	9965	G4
1693	D9	2506	E5	3464	C9	5402	B8	7100	D1	9571	F5	9967	G6
1735	G5	2507	A2	3465	C9	5410	D9	7101	C2	9620	C10	9968	F8
1737	E7	2508	C5	3469	A10	5411	C8	7102	D3	9622	C10	9969	F9
1738	E7	2509	B5	3476	A7	5421	B7	7103	E1	9623	C9	9971	G10
1901	E10	2510	D3	3478	C6	5422	A6	7104	E1	9650	C10	9972	G10
1902	F10	2511	G5	3479	C6	5423	C7	7105	C1	9651	C10	9974	G6
1932	E8	2512	G4	3480	C6	5424	A6	7120	E2	9652	A10	9975	G4
1933	E10	2515	D4	3488	C5	5425	C7	7131	F3	9655	A10	9976	B1
1934	F10	2516	B4	3492	D7	5426	C8	7141	G4	9656	A10	9977	E9
1935	F9	2517	C4	3493	C6	5430	B10	7408	D8	9658	C8	9980	G6
1936	F7	2518	D3	3495	A6	5461	A10	7421	D8	9659	B6	9982	F8
1937	G7	2519	F4	3498	C10	5463	C9	7440	D9	9660	B6	9996	F7
1940	F9	2520	A3	3499	C10	5465	C8	7480	D6	9661	B5		
1943	G10	2522	F4	3500	A4	5466	A8	7482	D8	9663	B5		
1945	G5	2523	D4	3501	A4	5467	C6	7483	D8	9664	C10		
1946	G5	2531	E4	3505	E3	5469	A8	7502	E3	9665	C8		
1947	G4	2537	B4	3507	E5	5502	A5	7504	D4	9666	C8		
1948	G8	2540	F4	3508	D4	5503	A3	7506	E4	9667	C7		
1949	G2	2541	C3	3509	B2	5504	A3	7507	E4	9669	D7		
1950	B1	2542	G5	3511	D3	5505	D4	7528	B2	9670	C7		
1951	G7	2543	F5	3513	C3	5506	E5	7529	F4	9671	B6		
1952	G9	2622	C10	3514	E4	5507	F4	7613	D9	9674	A8		
1953	E7	2624	B10	3515	D5	5509	F5	7620	C10	9675	A10		
1955	G8	2625	B10	3516	C3	5511	A4	7680	F1	9701	E6		
1961	G7	2627	B10	3518	C3	5513	G5	7682	G1	9703	E6		
1965	E9	2628	D10	3520	E4	5514	G4	7700	F6	9708	D7		
1966	F8	2642	A6	3521	A2	5515	A3	7702	E6	9709	F6		
1997	G10	2717	G5	3526	E5	5516	A5	7910	G7	9712	E6		
2100	E3	2729	G6	3533	F4	5620	B10	7911	G9	9715	D6		
2101	D2	2740	E7	3536	A4	5621	D10	7912	G9	9718	E6		
2102	E2	2758	E7	3537	D5	5701	F6	9101	C2	9719	E6		
2104	F3	2778	D6	3540	E4	5702	F6	9102	F3	9720	E6		
2107	F3	2900	B1	3542	E5	5707	G6	9110	C2	9721	D6		
2108	C2	2914	F10	3543	D3	5708	F6	9112	F2	9901	G7		
2111	D1	2915	E9	3550	C4	5711	G5	9114	D2	9902	G8		
2114	C2	2940	F7	3551	A3	5712	F6	9117	E2	9903	G8		
2115	E2	2947	G2	3620	C10	5715	E7	9118	G2	9906	G10		
2116	F1	2948	F7	3621	C10	5716	E6	9119	G2	9907	G7		
2118	F2	2949	F7	3622	C10	5720	E7	9120	G2	9909	G6		
2119	F3	3101	C2	3623	C10	5721	E6	9121	G3	9910	E8		
2120	F2	3102	D2	3624	B10	5722	D7	9122	F1	9911	E8		
2121	E2	3103	D2	3625	C10	5723	D7	9123	E3	9912	E8		
2122	E2	3104	D2	3626	C10	5725	E5	9124	F2	9913	E8		
2124	C2	3105	E2	3628	D9	5901	G9	9125	G2	9914	E8		
2126	G2	3106	E1	3634	C10	5902	G3	9126	G3	9915	E9		
2140	G3	3107	E2	3635	C9	5903	G1	9127	E2	9916	E8		
2141	F2	3108	C2	3641	D10	5904	G8	9223	G7	9917	E8		
2143	F2	3110	C2	3642	B10	6103	D2	9224	G7	9918	E10		
2148	F1	3111	D2	3645	A7	6105	D2	9227	G6	9919	E9		
2152	E3	3113	E2	3648	D10	6106	D1	9260	F10	9920	E9		
2200	G9	3114	E1	3661	C10	6107	F3	9401	B7	9921	E9		
2203	G9	3115	G1	3663	C10	6109	C2	9402	B5	9922	E10		
2400	B6	3116	G2	3681	G1	6110	E2	9403	C5	9923	E10		
2401	A7	3117	D2	3687	G1	6111	F3	9404	C5	9924	E10		
2402	A10	3118	C2	3689	A8	6113	F2	9405	E9	9925	E10		
2405	A7	3124	F1	3711	F6	6114	D2	9406	B7	9926	F10		
2413	D8	3125	D1	3713	E6	6120	F1	9408	C10	9929	G9		
2418	C8	3126	E1	3728	F6	6121	E1	9409	A10	9930	G8		
2419	C7	3127	E1	3747	E6	6122	F1	9410	A8	9931	F9		

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Mapping Large Signal Panel (Bottom Side)

0042	C3	2147	G8	2514	E7	2757	D4	3141	G8	3460	A1	3629	B1	3746	E6	5411	C3	6406	D3	7130	G9	9209	B10	9566	E7	9942	F4
0043	D8	2148	F10	2515	D7	2758	E4	3142	G8	3461	A1	3630	C1	3747	D5	5421	B4	6407	E3	7131	F8	9210	F4	9567	B7	9943	G3
0044	E4	2149	F10	2516	C7	2759	E4	3143	G8	3462	C2	3631	D1	3748	D5	5422	A5	6408	E3	7132	G8	9211	F4	9570	F6	9944	G3
0045	F6	2150	G9	2517	C7	2760	E4	3144	F9	3463	C2	3632	D1	3749	D4	5423	C4	6409	B2	7133	F9	9212	G2	9571	F6	9945	G3
1146	G9	2152	E8	2518	D8	2761	E5	3145	D9	3464	C2	3633	D1	3750	G6	5424	A5	6410	B2	7140	G7	9214	G2	9620	B1	9946	G2
1148	G8	2153	E10	2519	F7	2762	E4	3146	C9	3465	C2	3634	C1	3751	E4	5425	C5	6411	B2	7141	G7	9215	G2	9621	G10	9947	G3
1149	F9	2154	F9	2520	A8	2763	E4	3147	D9	3466	A5	3635	C2	3752	E4	5426	C4	6412	B2	7210	G5	9216	G1	9622	C1	9948	F3
1200	G1	2200	G2	2522	F7	2777	F5	3148	C9	3467	A4	3636	D2	3755	E5	5430	B2	6413	B2	7211	F5	9217	G1	9623	C3	9949	F4
1201	G5	2201	G1	2523	D7	2778	D5	3149	C10	3469	A1	3637	D1	3760	F5	5461	A1	6414	B2	7407	B1	9218	G1	9624	D5	9950	F4
1205	F3	2202	G1	2524	E7	2779	F5	3150	C9	3472	A5	3638	C1	3790	E5	5463	C2	6415	B1	7408	D3	9219	F1	9650	C1	9951	G10
1417	B4	2203	G2	2525	E7	2780	F6	3151	G9	3474	A5	3639	D1	3791	F5	5465	C3	6421	D4	7409	D3	9221	G9	9651	C1	9952	G5
1424	A1	2204	F3	2528	B9	2781	F6	3152	C9	3475	A6	3640	D1	3792	E5	5466	A3	6422	D4	7421	C3	9222	G9	9652	A1	9953	G5
1430	C2	2400	B5	2530	E7	2782	E4	3153	F9	3476	A4	3641	D1	3793	F5	5467	C4	6423	C4	7440	D2	9223	G4	9655	A1	9954	F3
1491	A3	2401	A4	2531	E7	2783	E5	3155	G8	3478	C5	3642	B1	3794	D4	5469	A3	6434	B5	7441	D2	9224	G4	9656	A1	9955	G5
1492	A1	2402	A2	2535	D6	2784	E4	3156	G9	3479	C5	3643	C1	3795	D4	5502	B7	6435	C5	7442	A5	9225	F2	9658	C3	9956	G5
1493	A3	2403	D2	2537	B7	2785	E5	3157	G8	3480	C5	3644	A4	3796	D4	5503	B8	6442	B1	7443	A4	9226	F2	9659	B5	9957	B10
1495	C2	2404	D2	2538	E7	2786	F6	3158	G9	3481	D5	3645	A4	3797	E4	5504	B8	6455	D3	7445	D2	9227	G5	9660	B5	9958	B10
1498	A1	2405	A4	2540	F7	2787	E5	3159	G8	3482	D5	3646	B1	3798	E6	5505	D7	6456	E1	7450	D1	9228	G9	9661	B6	9959	F2
1499	E2	2409	D3	2541	D8	2791	E5	3160	C9	3483	D5	3647	B1	3900	B10	5506	F6	6457	E2	7455	E3	9229	G7	9663	B6	9960	G6
1500	A9	2412	D3	2542	G7	2792	E5	3161	F9	3484	D4	3648	D1	3901	B10	5507	F7	6458	E2	7480	D5	9250	F4	9664	C1	9961	F3
1501	B9	2413	D3	2543	F6	2900	B10	3162	F9	3485	D3	3649	F10	3902	B10	5509	F7	6460	A1	7482	D3	9251	F4	9665	C3	9962	G6
1502	A8	2414	D3	2544	D7	2914	F1	3164	G9	3486	D2	3652	A5	3903	F2	5511	A6	6462	C2	7483	D3	9260	F1	9666	C3	9963	G1
1503	C8	2415	D3	2601	F10	2915	E2	3165	G9	3487	E2	3653	B1	3904	E2	5513	F6	6463	C2	7486	D5	9261	E1	9667	C4	9964	G7
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1955	G3	2462	C1	2710	F6	2998	D1	3419	D2	3522	E7	3710	F5	3978	E1	6104	E9	6616	D2	7902	G1	9433	D3	9905	E3	9998	F4
1961	G4	2463	C2	2711	F5	2999	D1	3420	D2	3523	E7	3711	F5	3979	E1	6105	D9	6617	D1	7908	F2	9434	D2	9906	G1		
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1966	F3	2465	C2	2713	D5	3102	D9	3422	D2	3525	E7	3713	E6	3981	E1	6107	F8	6619	B1	7911</							

ATTENTION : LIVE PARTS

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PART 2
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PART 3
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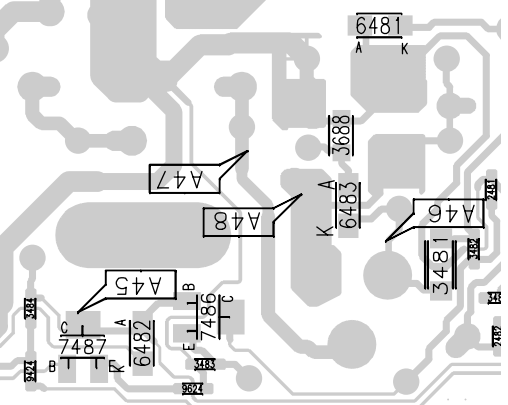
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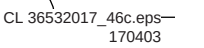
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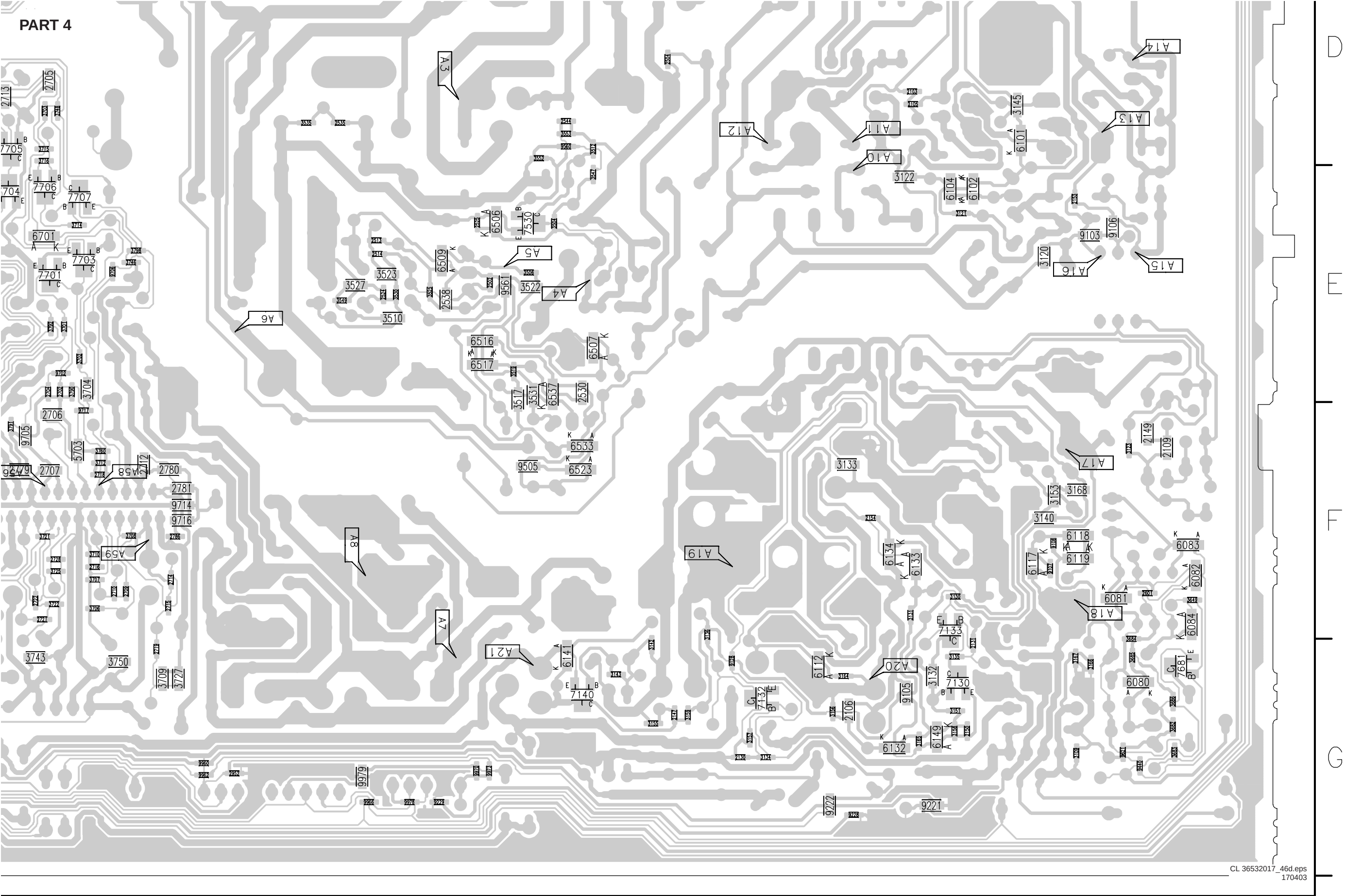
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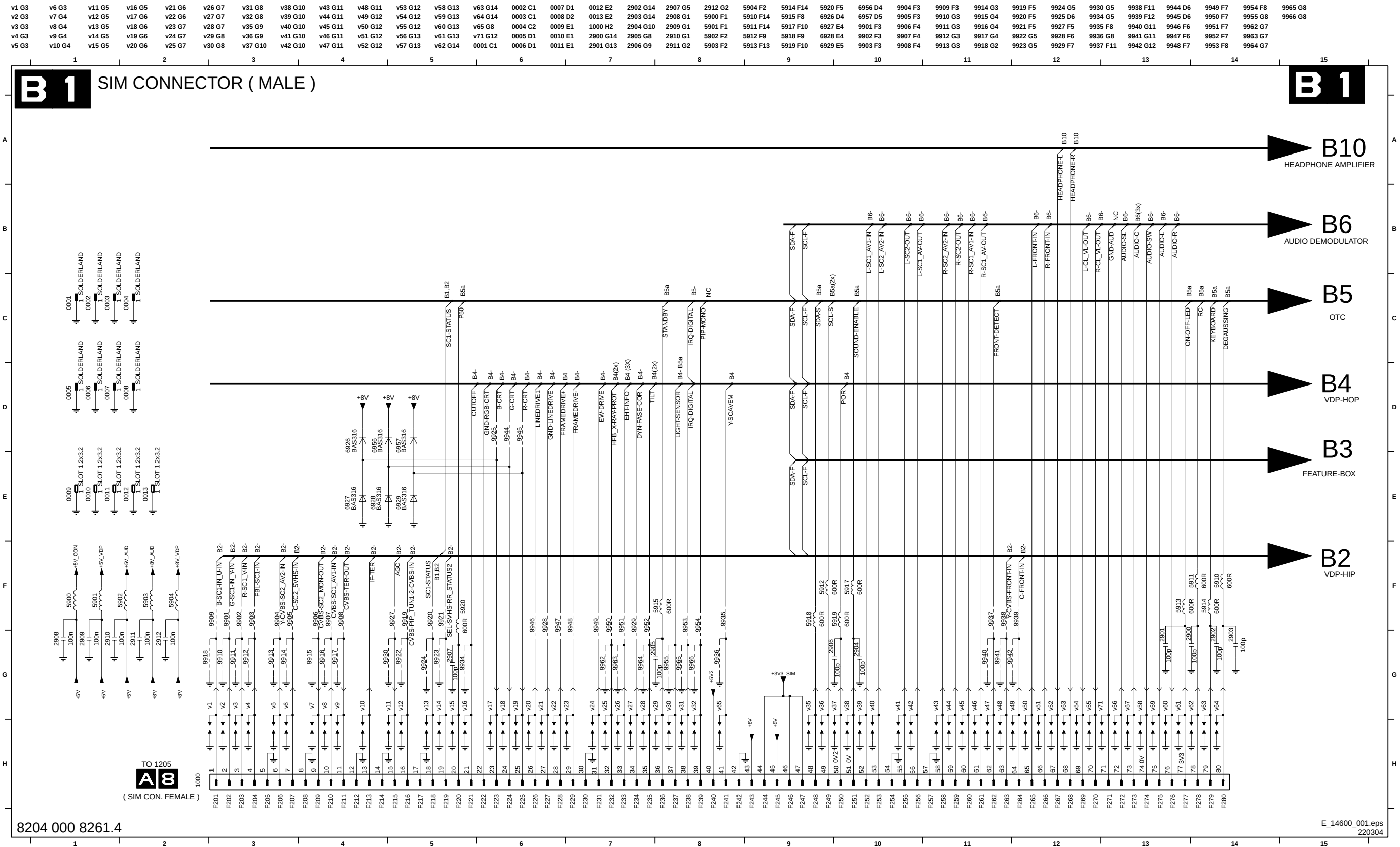
PART 3



Layout Large Signal Panel (Part 4 Bottom Side)

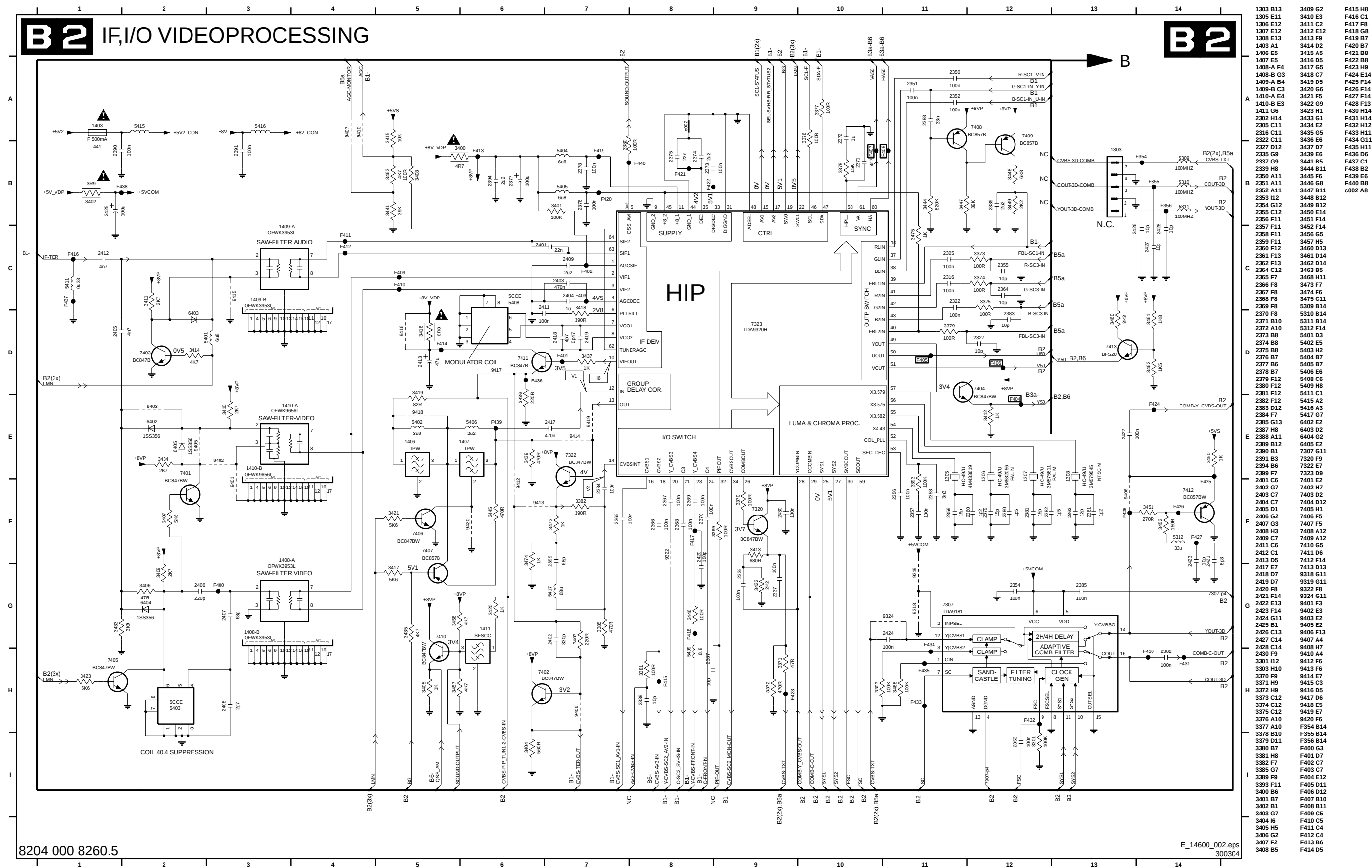


Small Signal Board: SIM Connector (Male)



8204 000 8261.4

Small Signal Board: IF. I/O Video Processing

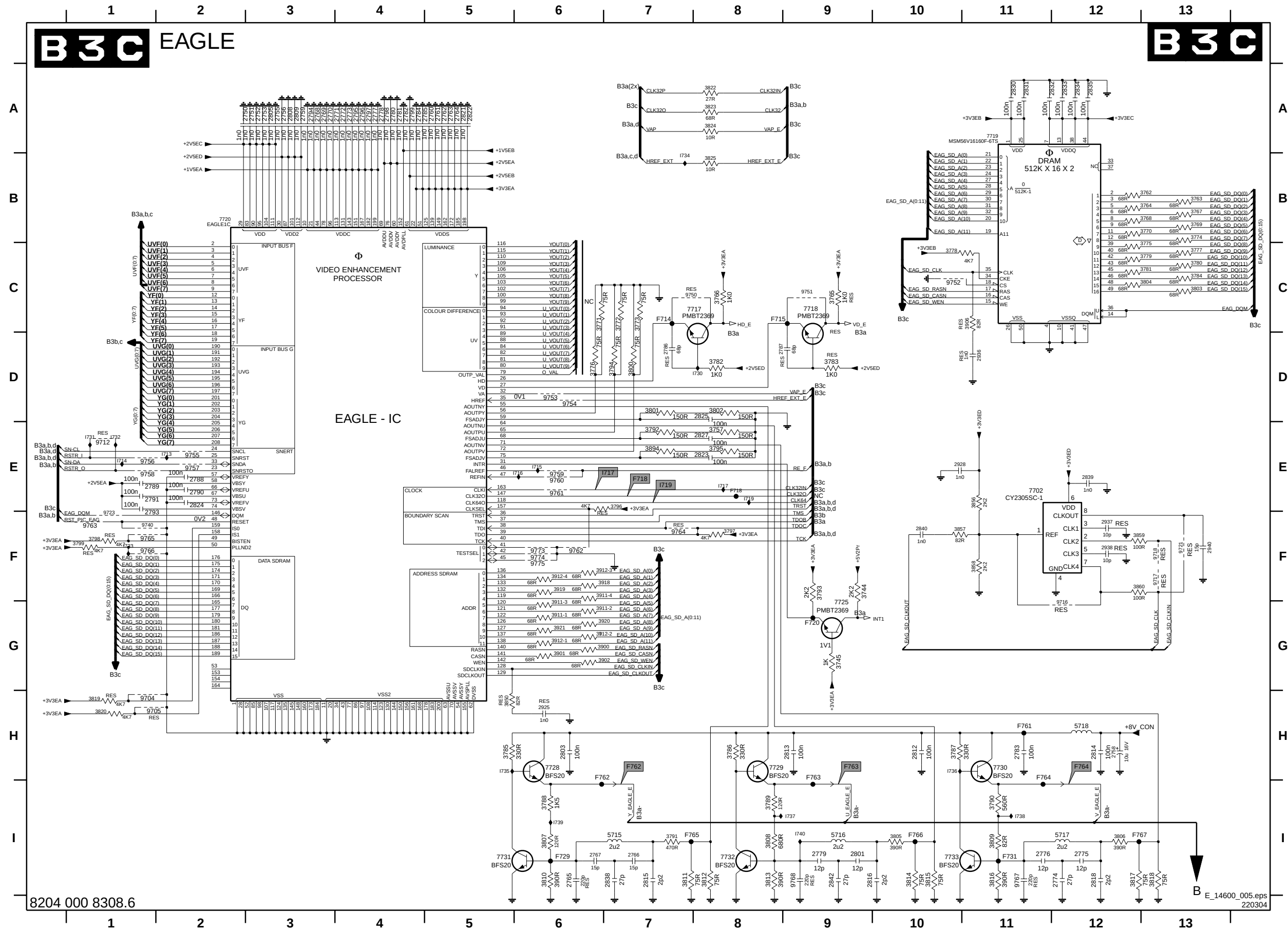


B 3 B FEM
FALCONIC EMBEDDED MEMORY



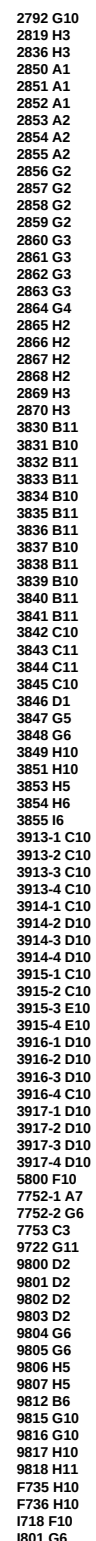
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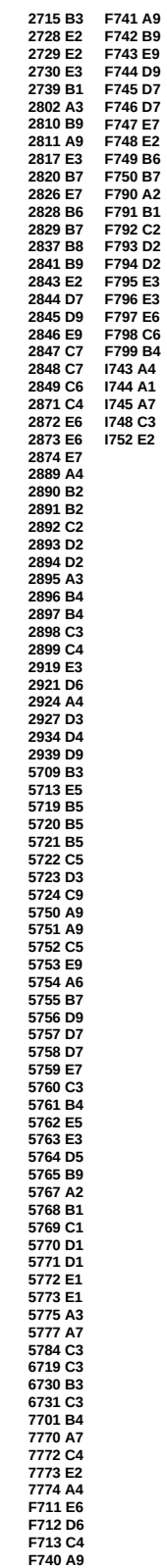
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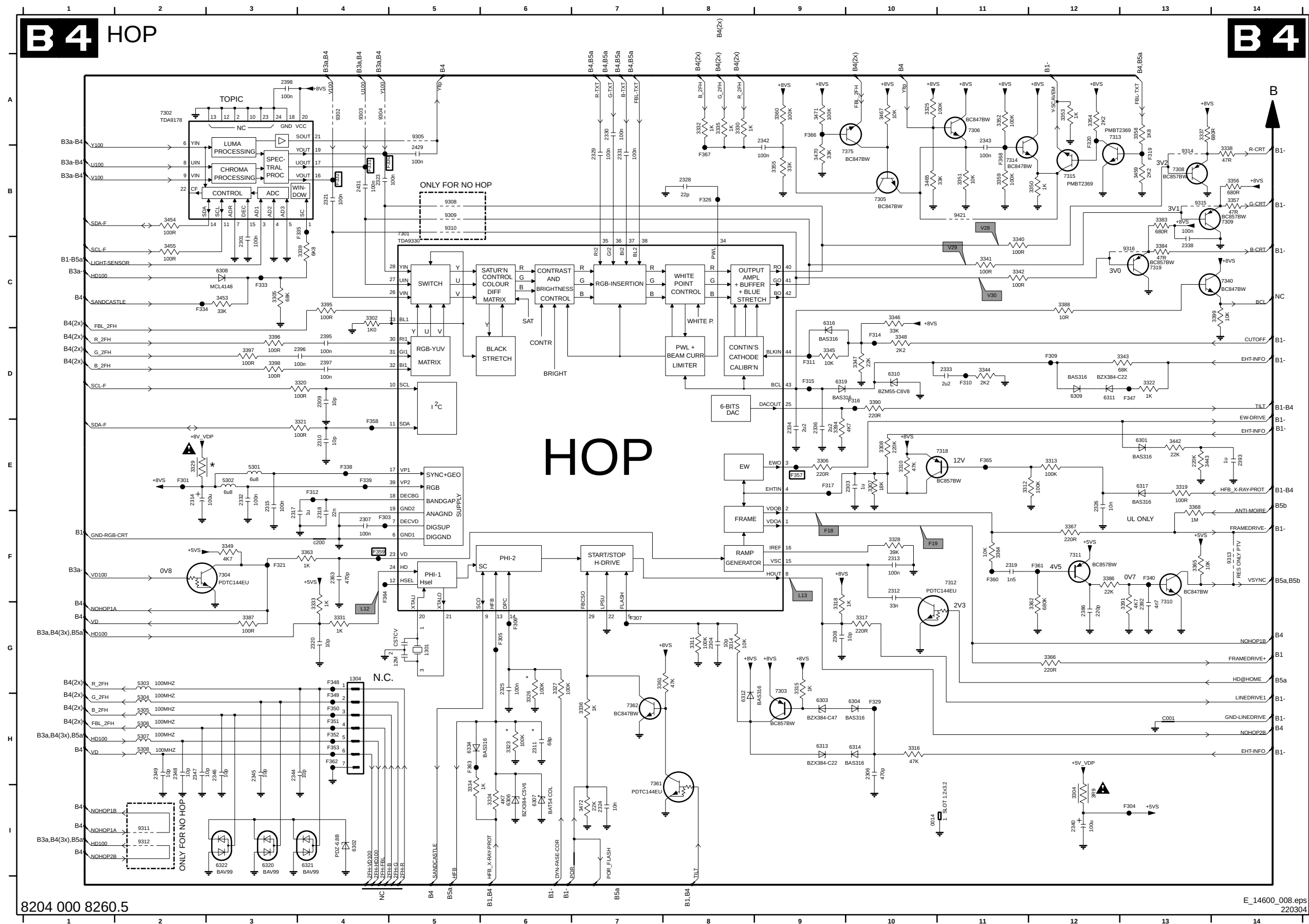
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2763 A5	3808 I8	
2764 A5	3809 I11	
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2766 I7	3811 I7	
2767 I6	3812 I8	
2768 A3	3813 I8	
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2770 A3	3815 I10	
2771 A4	3816 I11	
2772 A4	3817 I12	
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2774 I12	3819 H1	
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2779 I9	3825 B8	
2780 A4	3850 H5	
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2783 H11	3858 F11	
2784 A4	3859 F12	
2785 A4	3860 F12	
2786 D7	3861 F7	
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2795 A4	3870 F7	
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B3D COLUMBUS



B3E FBX SUPPLY

Small Signal Board: HOP



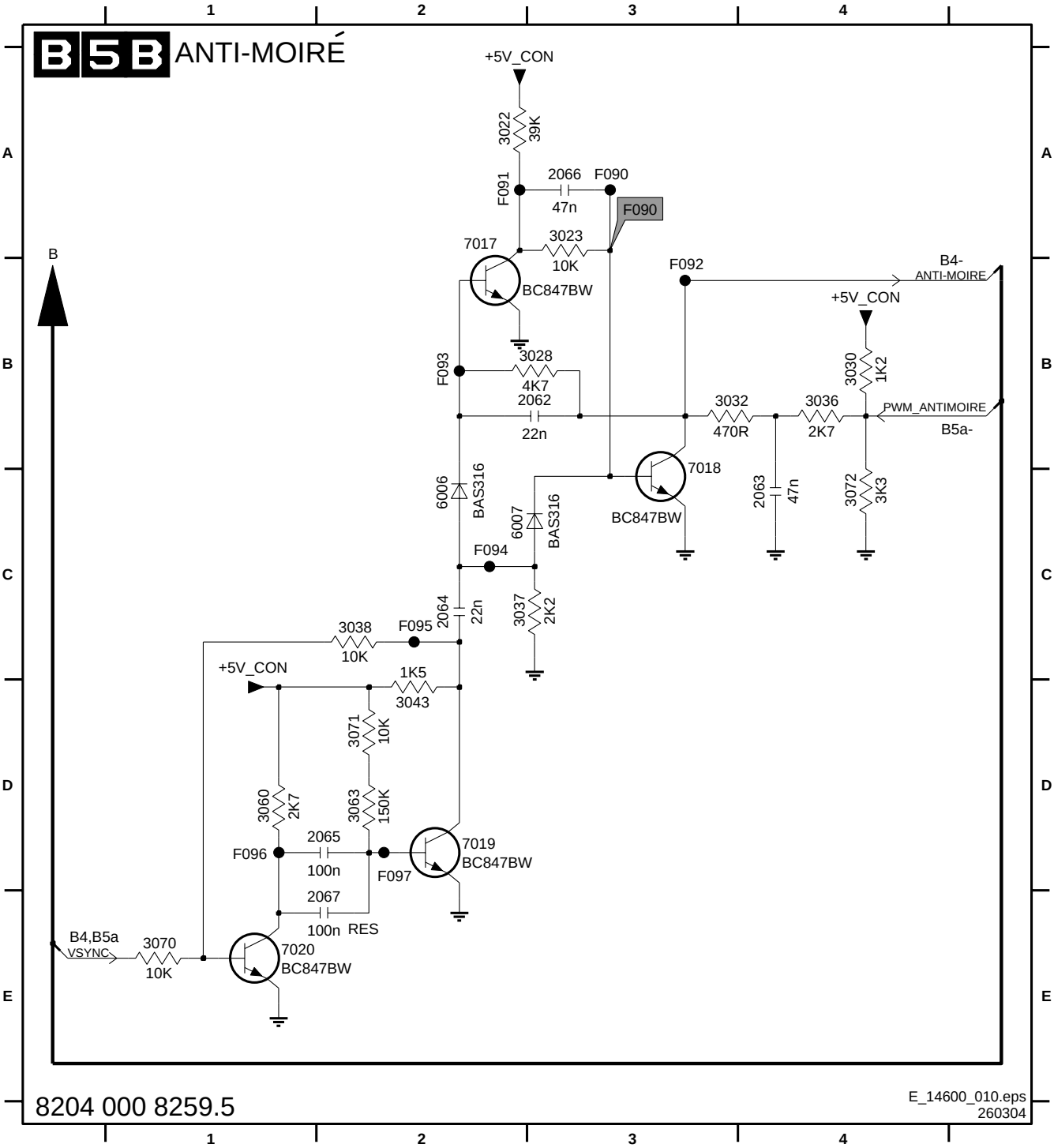
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B	2007 J3	3048-A B8	7005 E14	F068 E2
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	2012 I10	3049-B C8	7010 C4	F073 H9
	2013 F12	3049-C B8	7011 G3	F074 H10
	2014 I2	3049-D C8	7012 A13	F075 D12
	2016 F14	3050-A B8	7013 H13	F076 H13
	2017 G13	3050-B C8	7014 G14	F077 H14
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	2020 D2	3050-D C8	7016 I2	F079 J12
	2022 E3	3051-A B8	9001 H2	F080 J14
	2023 A5	3051-B C8	9002 I2	F081 D2
	2024 A5	3051-C B8	9003 F2	F082 J14
	2025 A6	3051-D C8	9004 G2	F083 I3
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	2029 A7	3052-D C8	9008 J11	F087 I3
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	2036 H9	3054-D F8	9013 J12	
	2037 H9	3055-A B8	9014 C2	
	2038 E10	3055-B E8	9015 D2	
	2039 H13	3055-C F8	9016 C3	
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	3005 H2	3064-C E4	F016 C8	
	3006 J6	3064-D E4	F017 F10	
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	3034-A H7	3093 E12	F049 G13	
	3034-B H8	3094 H2	F050 F14	
	3034-C G8	3095 I2	F051 F14	
	3034-D G7	3096 J2	F052 J7</	

Small Signal Board: Anti Moiré

2062 B3	2065 D2	3022 A2	3030 B4	3037 C2	3060 D1	3071 D2	6007 C2	7019 D2	F091 A2	F094 C2	F097 D2
2063 C4	2066 A3	3023 A3	3032 B3	3038 C2	3063 D2	3072 C4	7017 A2	7020 E1	F092 B3	F095 C2	
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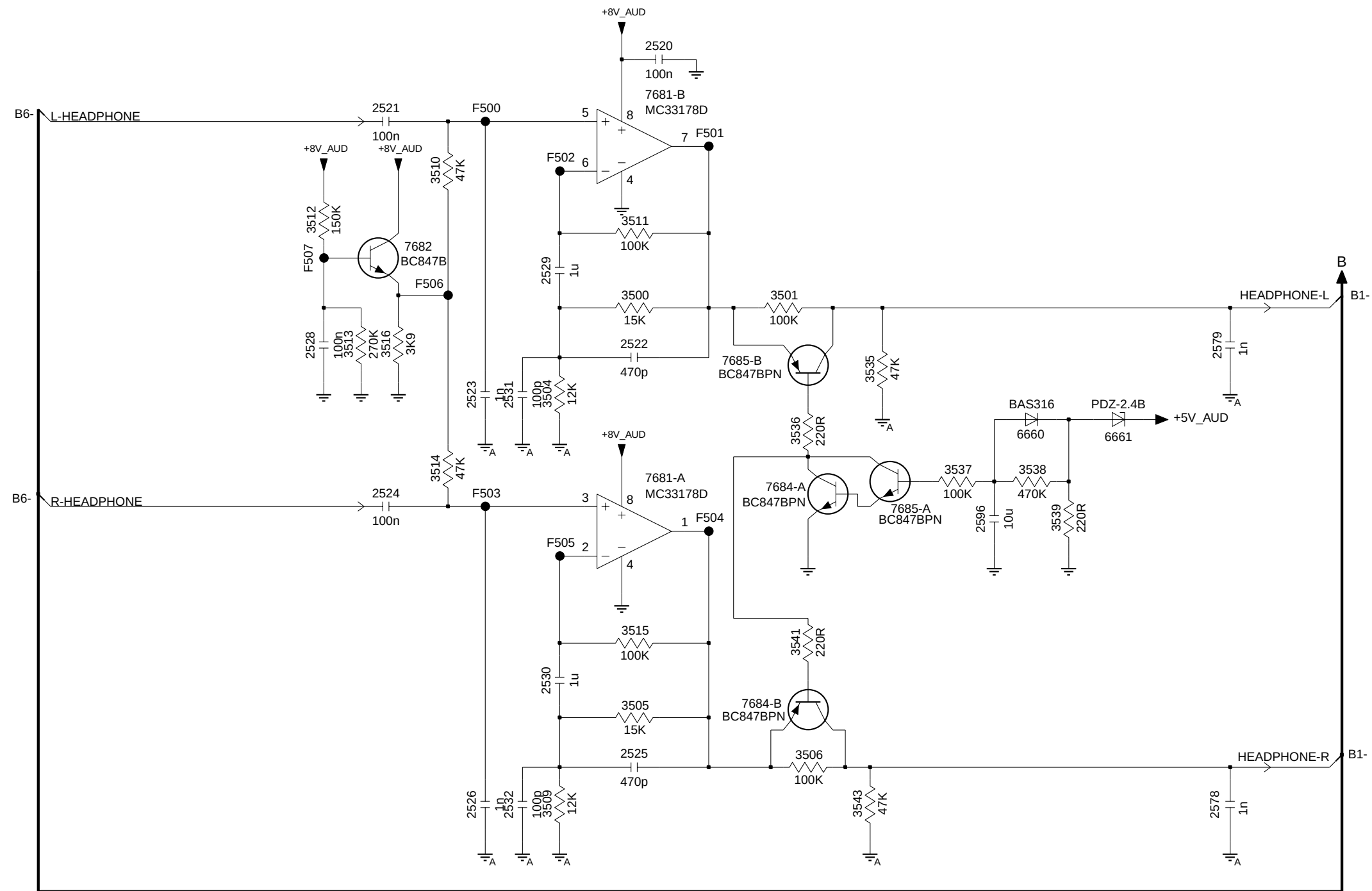


Personal Notes:

Blank area for personal notes.

B 1 Ø

HEADPHONE-AMPLIFIER

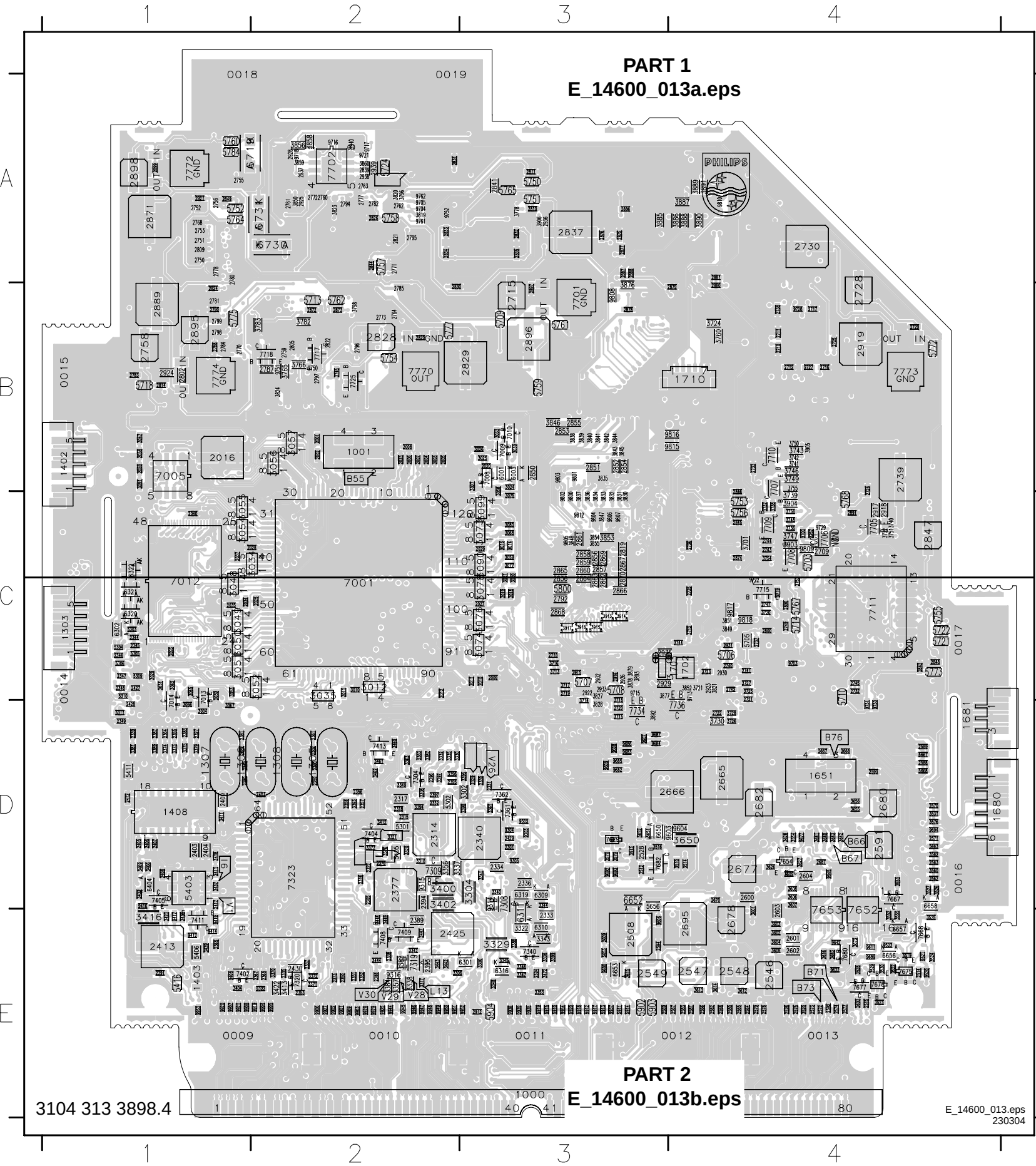


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220304

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2521 A4
2522 C5
2523 C5
2524 C4
2525 E5
2526 E5
2528 B4
2529 B5
2530 D5
2531 C5
2532 E5
2578 E9
2579 B9
2596 C7
3500 B5
3501 B6
3504 C5
3505 E5
3506 E6
3509 E5
3510 A4
3511 B5
3512 B4
3513 B4
3514 C4
3515 D5
3516 B4
3535 C7
3536 C6
3537 C7
3538 C8
3539 C8
3541 D6
3543 E7
6660 C8
6661 C8
7681-A C6
7681-B A6
7682 B4
7684-A C6
7684-B E6
7685-A C7
7685-B C6
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F502 A5
F503 C5
F504 D6
F505 D5
F506 B4
F507 B4

Layout Small Signal Board (Overview Top Side)

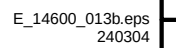


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0011	E3	2363	D2	2682	D4	2833	A2	3024	B3	3398	D2	3723	C4	3906	A3	6652	D3	9642	E4
0012	E4	2364	D1	2687	D4	2834	A2	3025	B3	3399	E3	3724	B4	3913	C3	6653	E3	9645	D4
0013	E4	2365	E1	2693	E4	2835	A3	3026	B3	3400	D2	3725	C4	3914	C3	6656	E4	9677	D4
0014	D1	2367	E2	2695	D4	2836	C3	3027	B3	3402	D2	3726	D4	3915	C3	6657	E4	9682	D3
0015	B1	2368	E2	2709	C4	2837	A3	3029	C1	3404	E1	3727	C4	3916	C3	6658	E4	9683	D3
0016	D4	2373	E2	2710	B4	2839	A2	3031	C1	3406	D1	3728	D4	3917	C3	6719	A2	9684	D3
0017	C4	2376	D2	2711	B4	2841	A3	3033	B3	3409	D1	3730	D4	5301	D2	6730	A2	9685	D3
0018	A1	2377	D2	2712	B4	2843	C4	3034	C2	3411	D1	3732	C4	5302	D2	6731	A2	9686	D3
0019	A2	2379	D1	2715	B3	2844	A2	3035	C2	3412	D2	3736	C4	5303	C1	7001	B2	9687	D3
1000	E3	2380	D1	2716	B4	2845	C4	3039	B3	3413	E2	3737	C4	5304	C1	7005	B1	9688	E3
1001	B2	2381	D1	2717	B4	2846	C4	3047	B1	3416	E1	3738	C4	5305	C1	7008	B3	9689	E4
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1305	D2	2383	D1	2719	C3	2848	C4	3049	C2	3422	E2	3740	C4	5309	C1	7010	B3	9693	D3
1306	D2	2387	D1	2720	D3	2849	A1	3050	C2	3423	E1	3741	B4	5310	C1	7012	C1	9694	D4
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2002	B2	2405	D1	2738	B4	2862	C3	3067	D1	3462	D2	3754	C4	5668	D4	7404	D2	9728	B4
2004	B2	2406	D1	2739	B4	2863	C3	3068	C3	3472	E3	3755	B4	5703	C4	7405	D1	9729	C4
2005	B2	2407	D1	2740	C4	2864	C3	3073	C3	3510	D4	3756	C4	5705	C4	7408	E2	9730	D4
2006	B2	2408	D1	2741	C4	2865	C3	3074	C3	3512	D3	3760	B4	5706	C4	7409	E2	9731	D4
2007	B2	2409	D1	2742	C4	2866	C3	3075	C3	3513	D3	3765	B2	5707	C3	7411	E1	9750	B2
2008	B2	2411	D1	2743	C4	2867	C3	3076	C3	3514	D4	3766	B2	5708	C3	7413	D2	9751	B2
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2012	C2	2425	E3	2749	C4	2871	A1	3090	C3	3523	E4	3796	A2	5714	C4	7667	D4	9800	C3
2016	B1	2427	C1	2750	A1	2872	B2	3091	B1	3524	E4	3798	B2	5718	B1	7668	E4	9801	B3
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Layout Small Signal Board (Part 1 Top Side)



PART 2



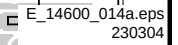
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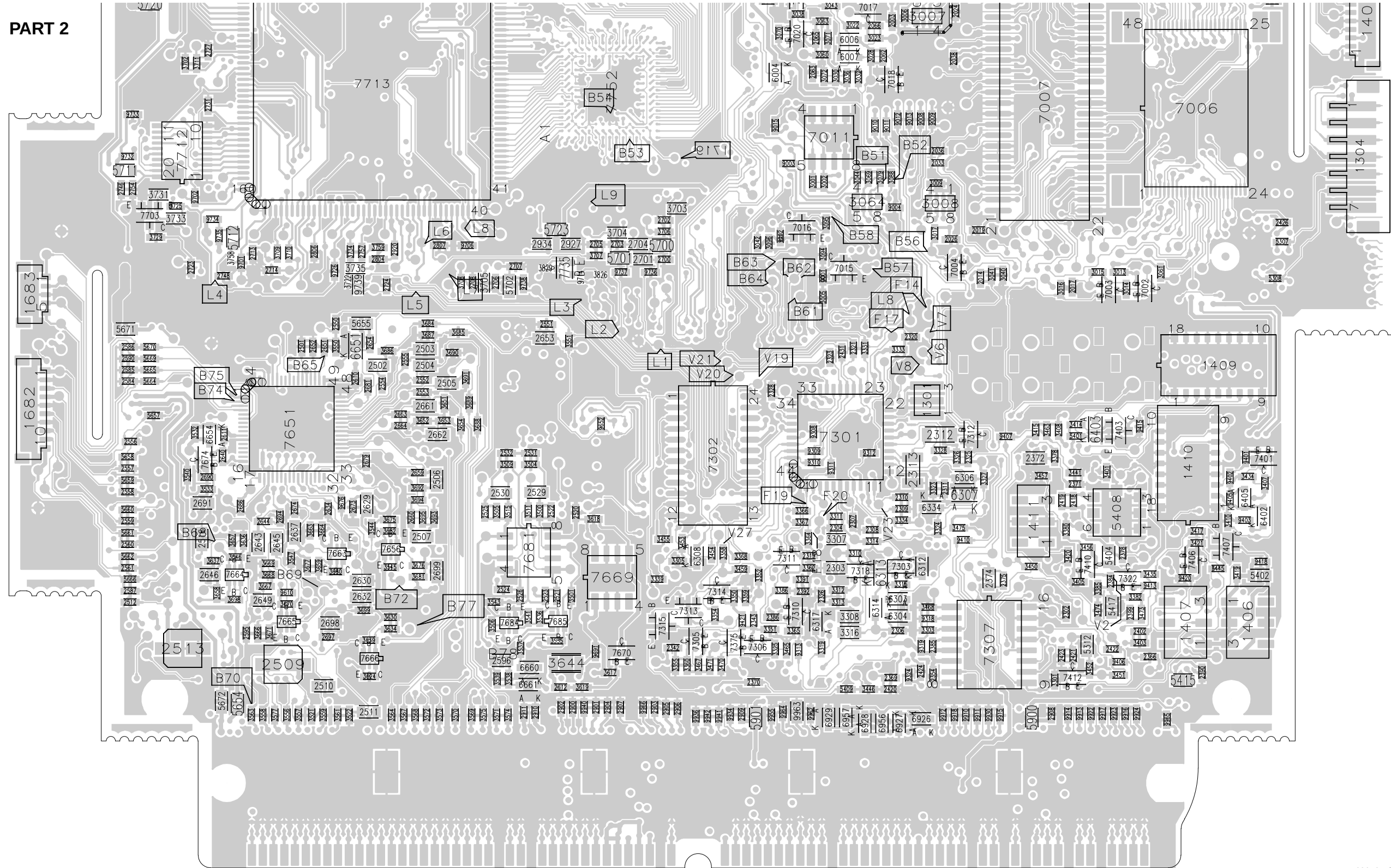
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1682	D1	2522	D2	2775	A4	3097	B4	3521	E1	3709	C1	5404	D4	7315	E2	9725	C1
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2013	B4	2525	D1	2786	B3	3303	E3	3533	D1	3722	D1	5415	E4	7375	E2	9733	C1
2014	D3	2526	E2	2789	B4	3305	D2	3535	E2	3729	C1	5417	E4	7401	D4	9734	C1
2017	D3	2529	D2	2791	B4	3307	D3	3536	E2	3731	C1	5654	E1	7403	D4	9735	C1
2019	C3	2530	D1	2793	A4	3308	E3	3537	E2	3733	C1	5655	D1	7406	D4	9736	C2
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2343	E2	2660	D1	3001	C3	3405	E3	3653	D1	3803	B2	6312	D3	9010	C3	9955	E2
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2399	E4	2699	D1	3030	C3	3450	D3	3677	D1	3818	A4	6929	E3	9402	D4		
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4

C



PART 2



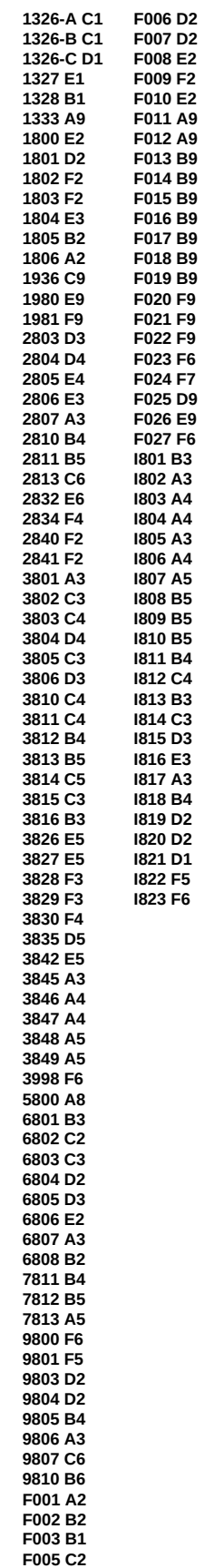
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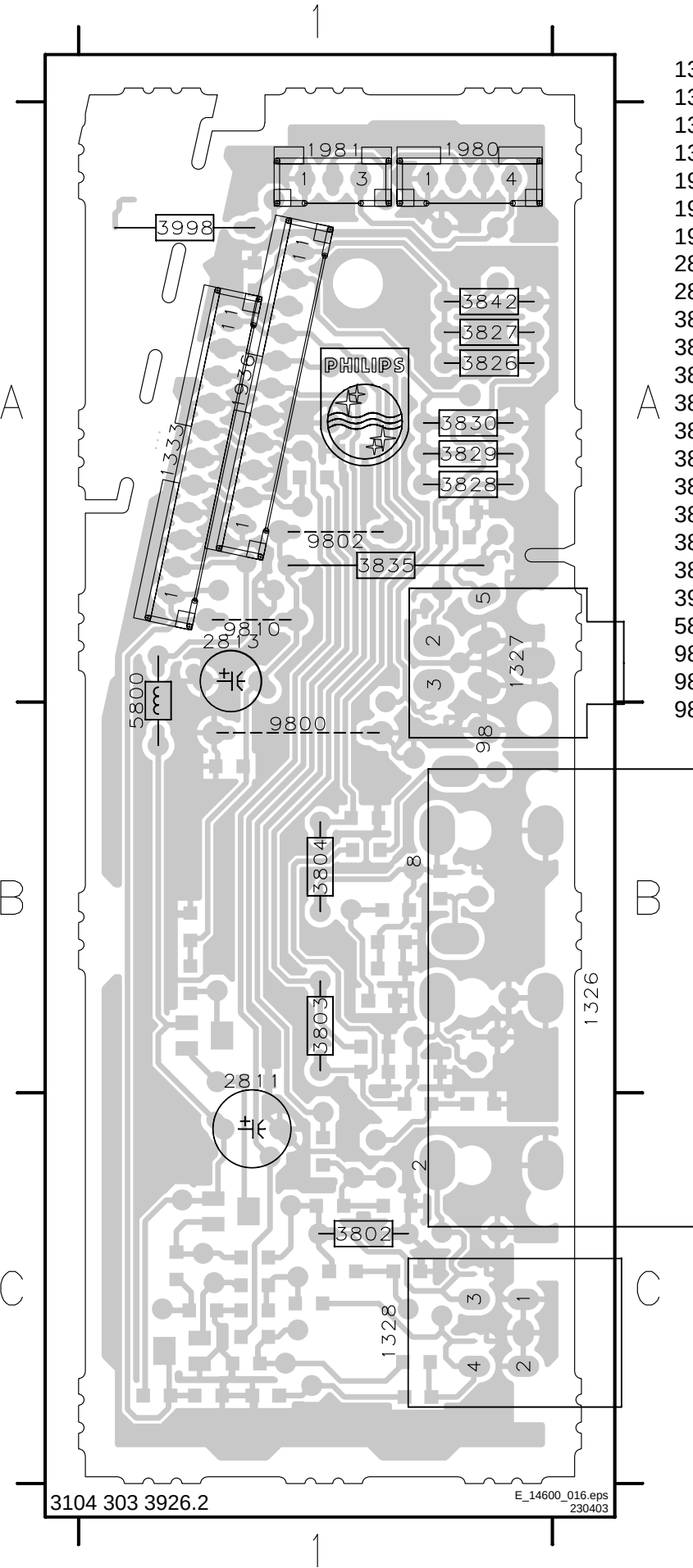
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SIDE I/O

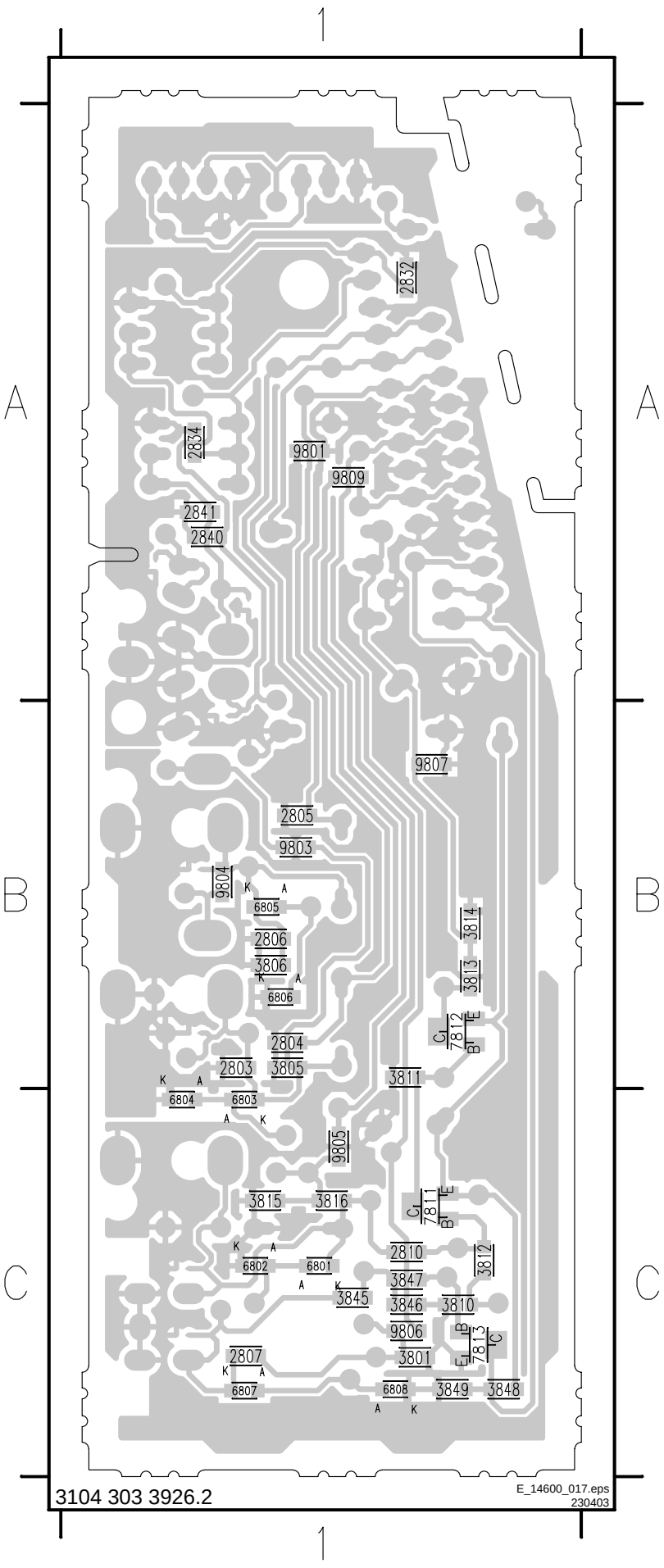


Layout Side IO Panel (Top Side)



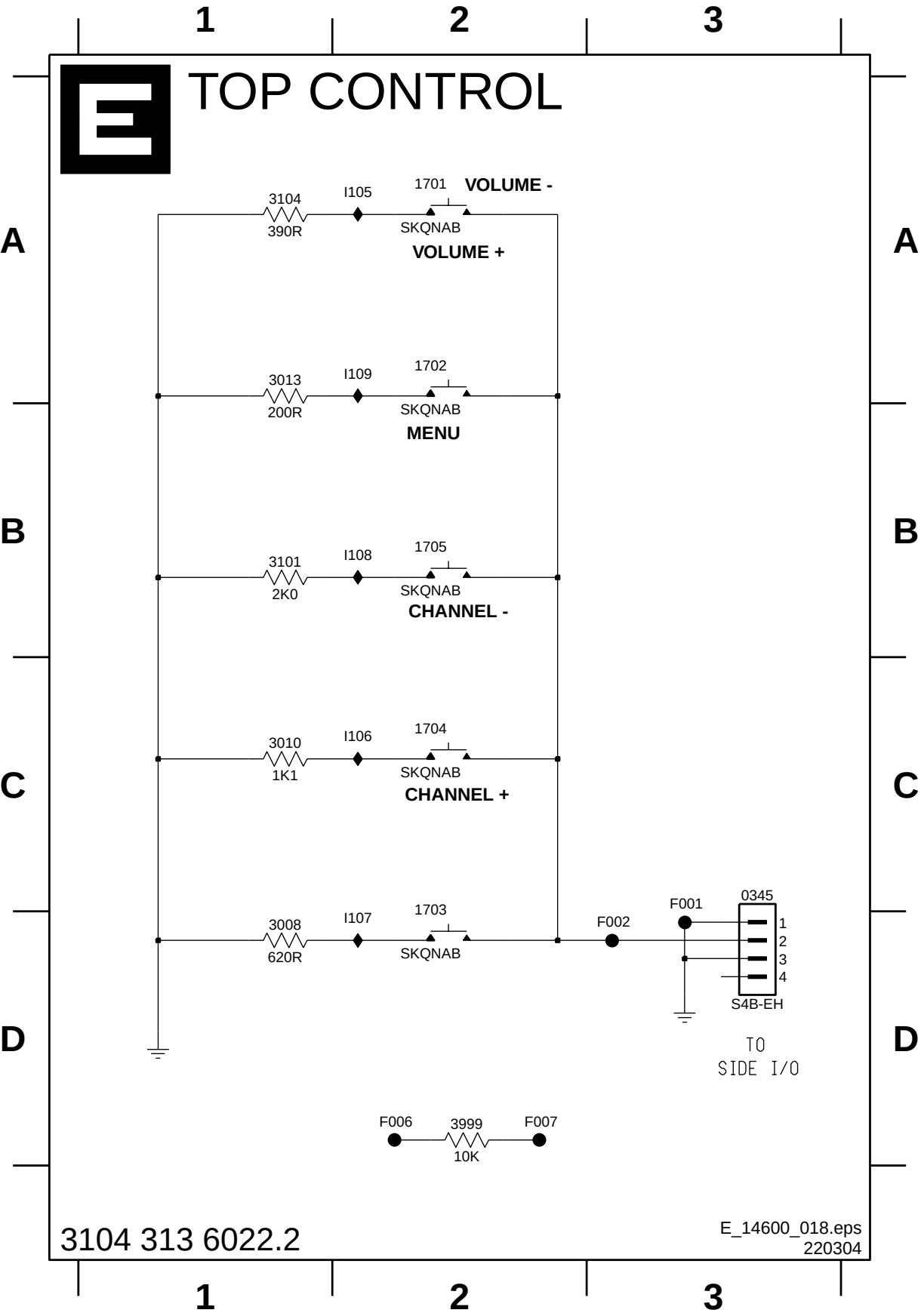
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- 1333 A1
- 1936 A1
- 1980 A1
- 1981 A1
- 2811 B1
- 2813 A1
- 3802 C1
- 3803 B1
- 3804 B1
- 3826 A1
- 3827 A1
- 3828 A1
- 3829 A1
- 3830 A1
- 3835 A1
- 3842 A1
- 3998 A1
- 5800 A1
- 9800 B1
- 9802 A1
- 9810 A1

Layout Side IO Panel (Bottom Side)



- 2803 B1
- 2804 B1
- 2805 B1
- 2806 B1
- 2807 C1
- 2810 C1
- 2832 A1
- 2834 A1
- 2840 A1
- 2841 A1
- 3801 C1
- 3805 B1
- 3806 B1
- 3810 C1
- 3811 B1
- 3812 C1
- 3813 B1
- 3814 B1
- 3815 C1
- 3816 C1
- 3845 C1
- 3846 C1
- 3847 C1
- 3848 C1
- 3849 C1
- 6801 C1
- 6802 C1
- 6803 B1
- 6804 C1
- 6805 B1
- 6806 B1
- 6807 C1
- 6808 C1
- 7811 C1
- 7812 B1
- 7813 C1
- 9801 A1
- 9803 B1
- 9804 B1
- 9805 C1
- 9806 C1
- 9807 B1
- 9809 A1

Top Control Panel (FL13B)

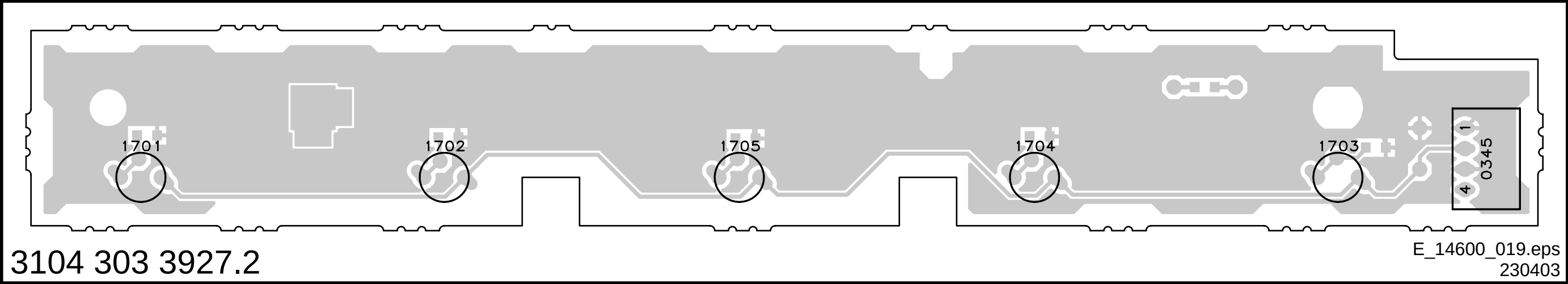


- 0345 C3
- 1701 A2
- 1702 A2
- 1703 C2
- 1704 B2
- 1705 B2
- 3008 C1
- 3010 B1
- 3013 A1
- 3101 B1
- 3104 A1
- 3999 D2
- F001 C3
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- F006 D2
- F007 D2
- I105 A2
- I106 B2
- I107 C2
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- I109 A2

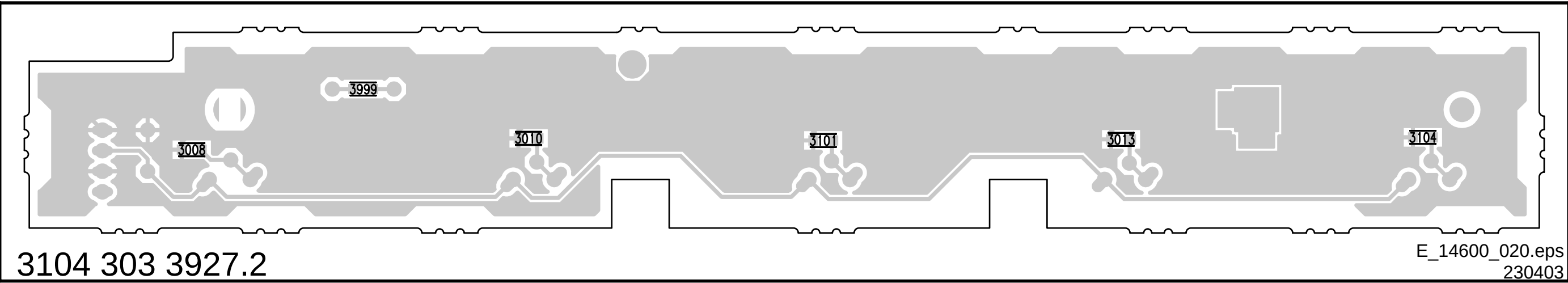
Personal Notes:

Handwritten notes area with horizontal lines.

Layout Top Control Panel (Top Side)

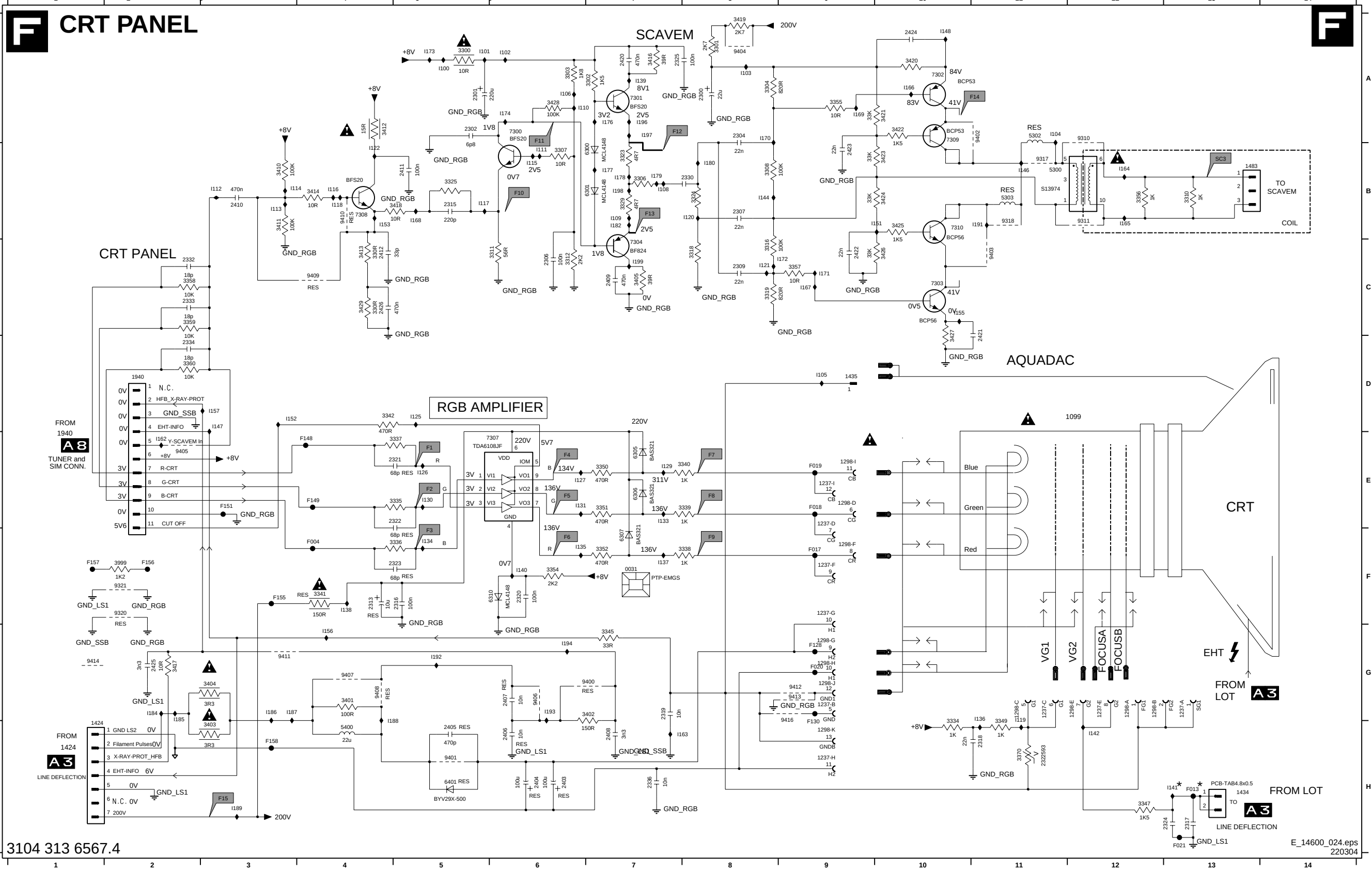


Layout Top Control Panel (Bottom Side)

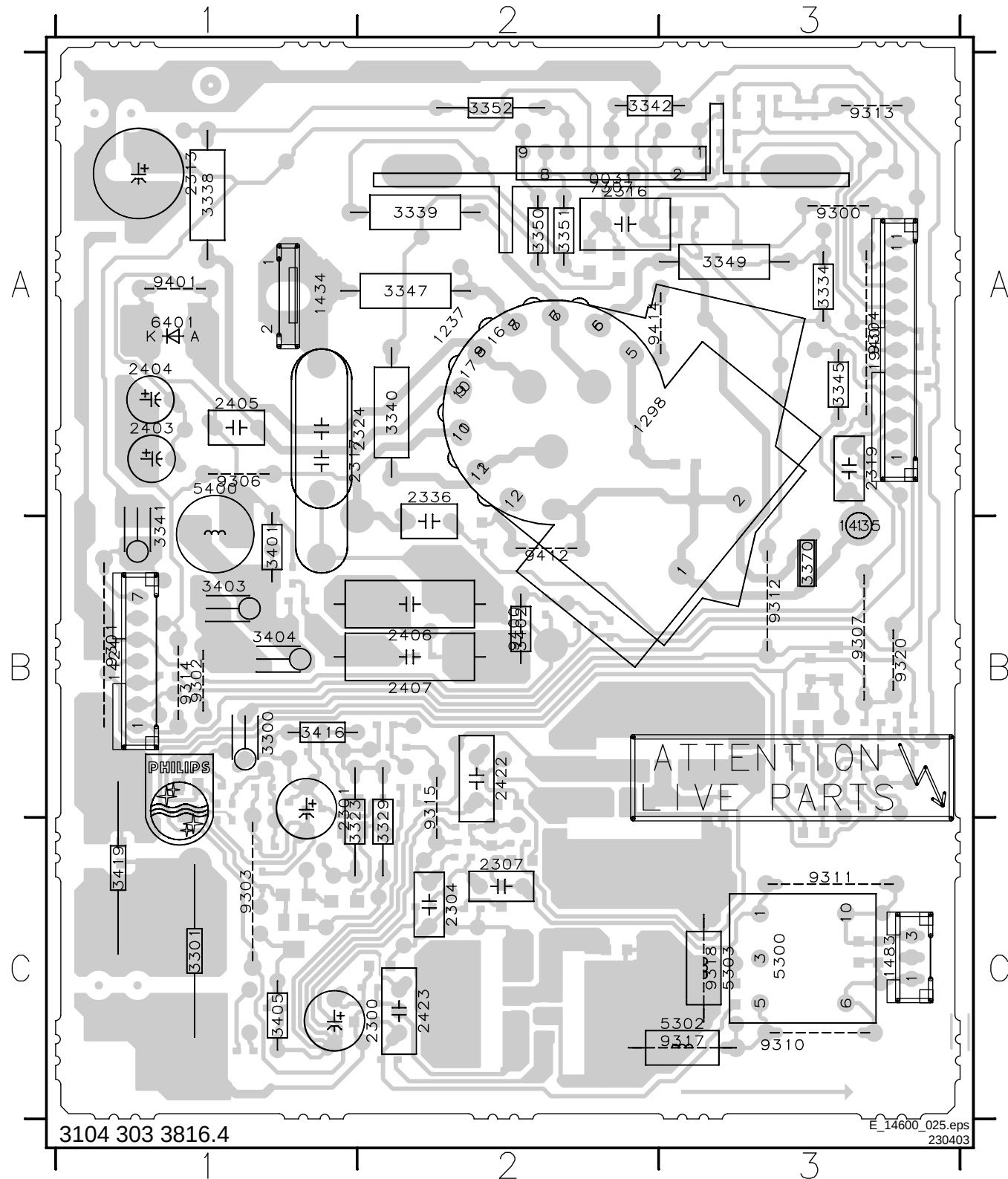


CRT Panel

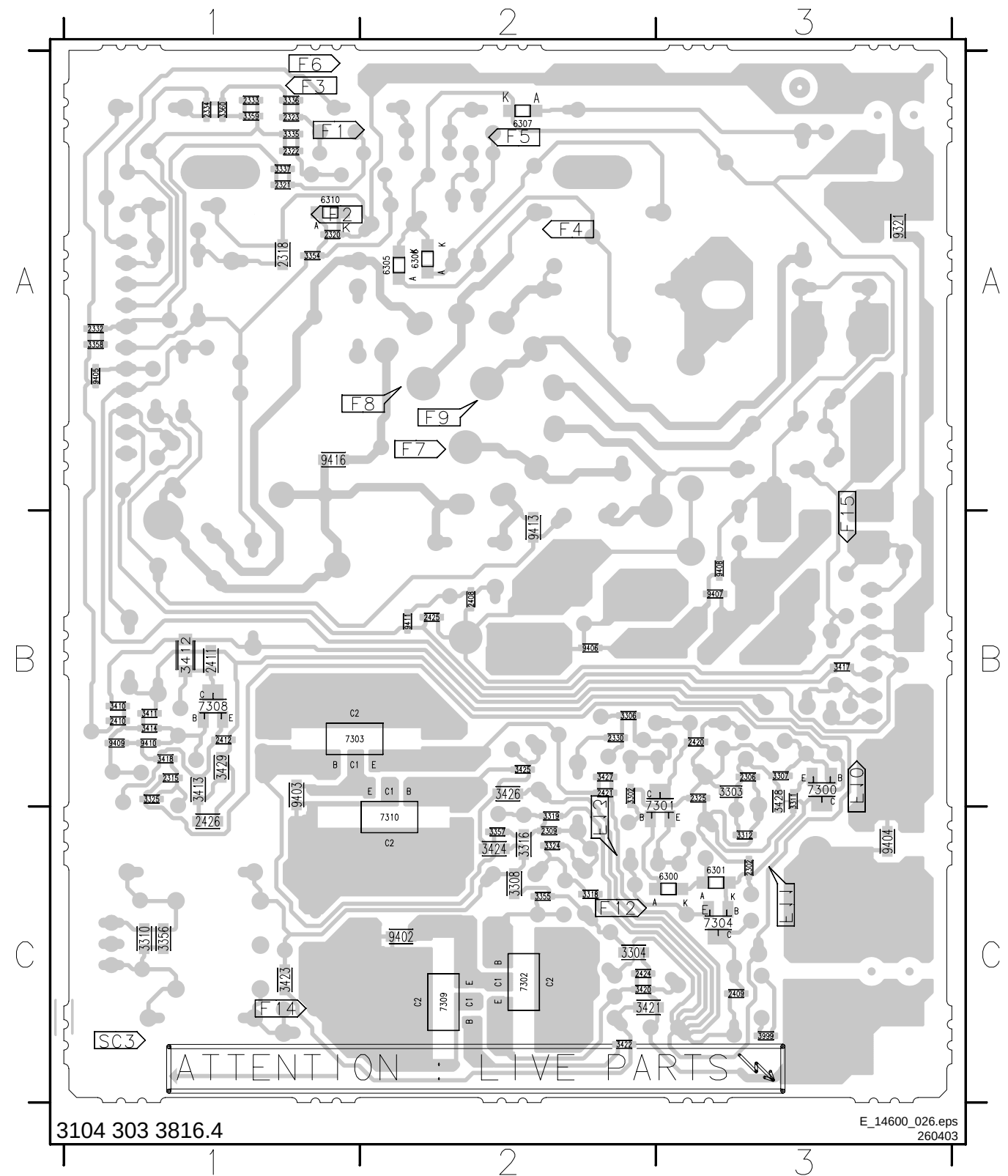
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1237-A G13	1298-C G11	1435 D9	2315 B5	2330 B8	2409 C7	3300 A5	3316 C8	3338 F8	3354 F6	3404 G3	3420 A10	5300 B11	7300 A6	9317 B11	9407 G4	F017 F9	F156 F2	I109 B7	I120 B8	I135 F6	I148 A10	I166 A10	I178 B7	I192 G5
1237-B G9	1298-D E9	1483 B13	2316 F5	2332 C2	2410 B3	3301 A8	3318 C8	3339 E8	3355 A9	3405 C7	3421 A10	5302 A11	7301 A7	9318 B11	9408 G4	F018 E9	F157 F1	I110 A6	I121 C8	I136 G11	I151 B10	I167 C9	I179 B7	I193 G6
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1237-F F9	1298-H G9	2302 A5	2320 F6	2403 H6	2421 C11	3306 B7	3325 B5	3345 G7	3359 C2	3413 C4	3425 B10	6301 B7	7307 E5	9401 H5	9412 G9	F128 G9	I102 A6	I114 B3	I127 E6	I140 F6	I156 G4	I171 C9	I185 G2	I198 B7
1237-G F9	1298-I E9	2304 A8	2321 E5	2404 H6	2422 C9	3307 B6	3329 B7	3347 H12	3360 D2	3414 B4	3426 C10	6305 E7	7308 B4	9402 A11	9413 G9	F130 H9	I103 A8	I115 B6	I129 E7	I141 H13	I157 D3	I172 C9	I186 G3	I199 C7
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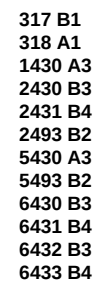


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0298	A2	2304	C2	2403	A1	3301	C1	3342	A2	3401	B1	5302	C3	9303	C1	9314	B1	9414	A2
0424	B1	2307	C2	2404	A1	3323	C1	3345	A3	3402	B2	5303	C3	9304	A3	9315	B2		
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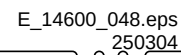
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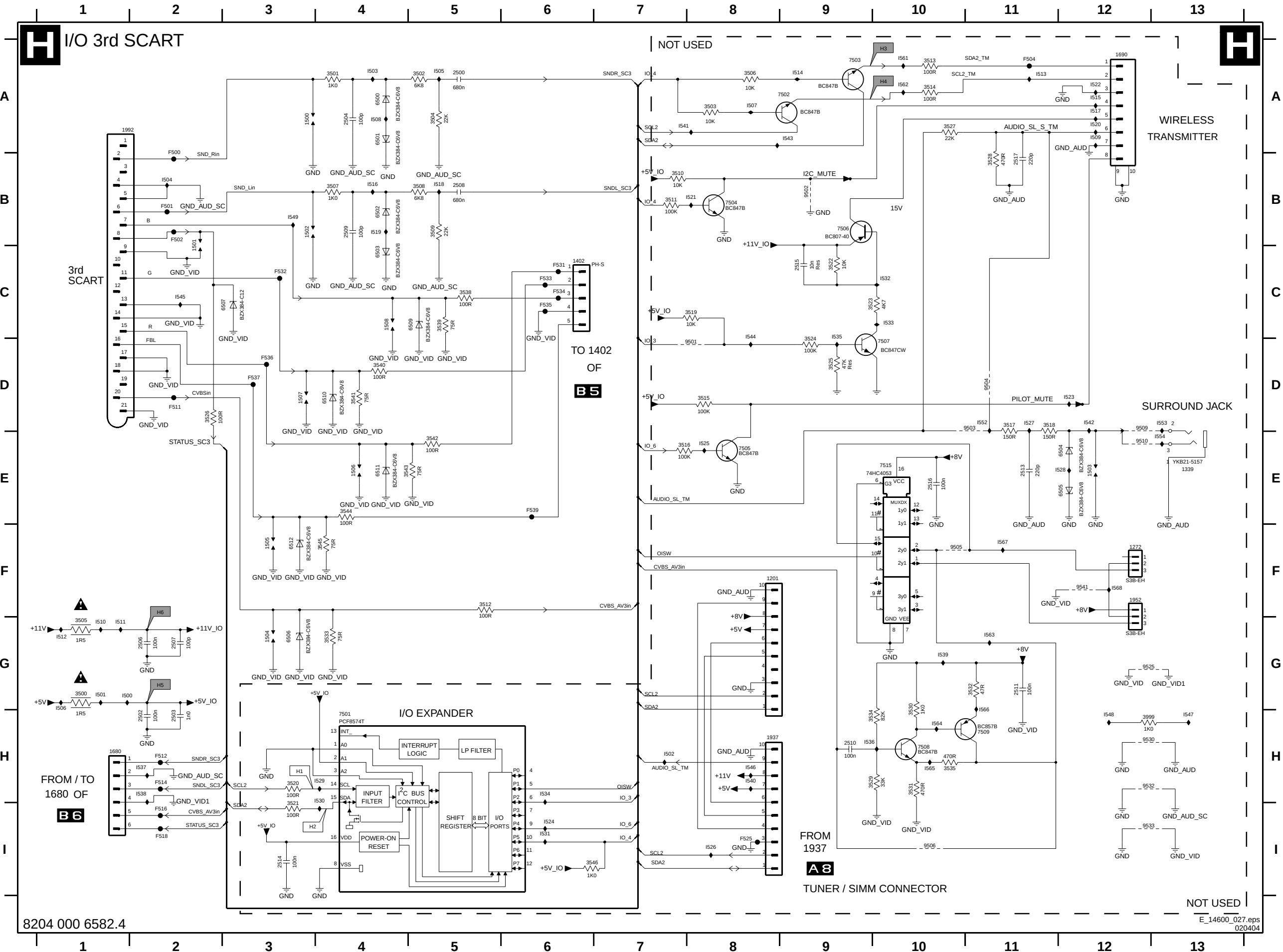


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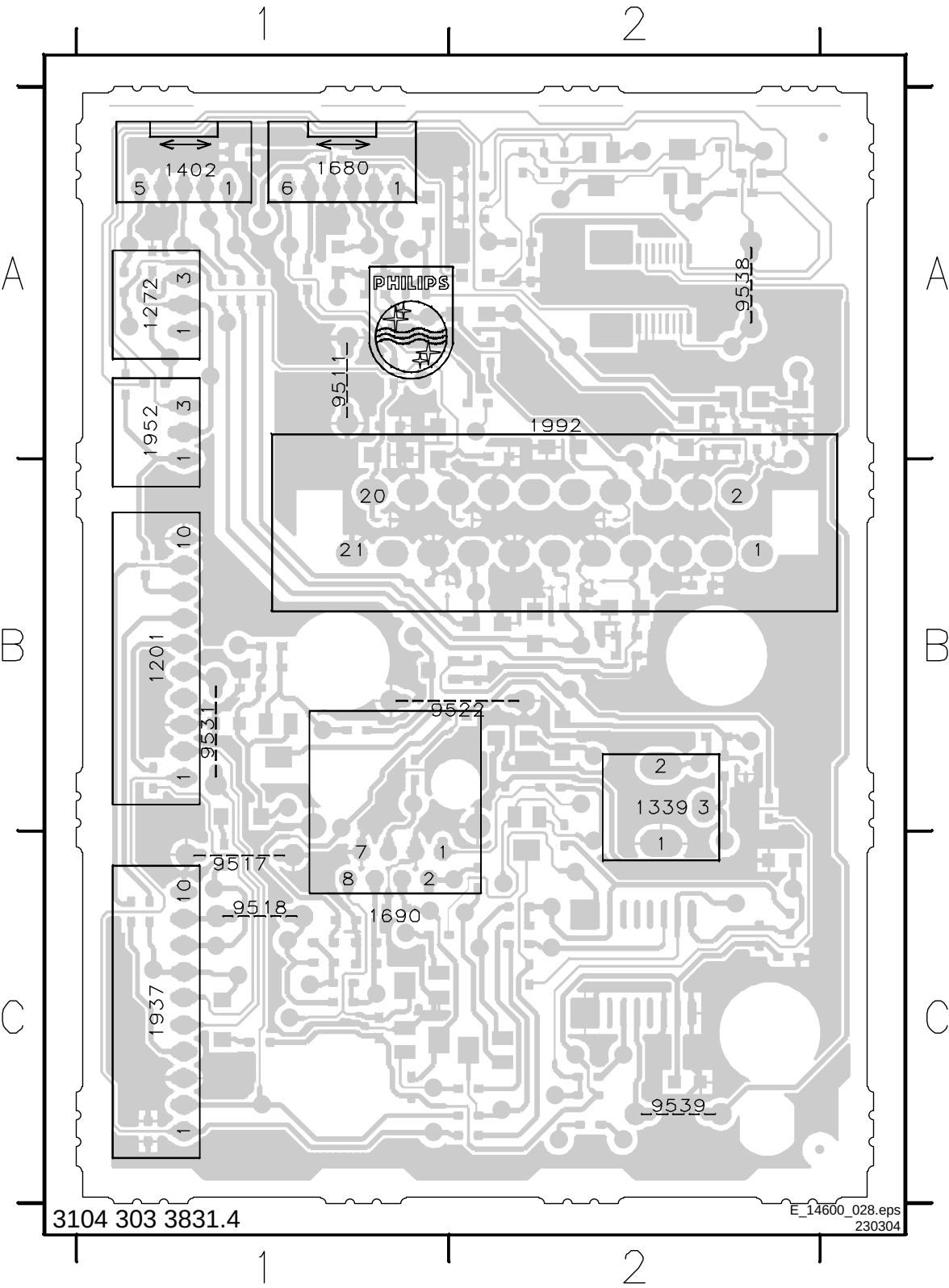
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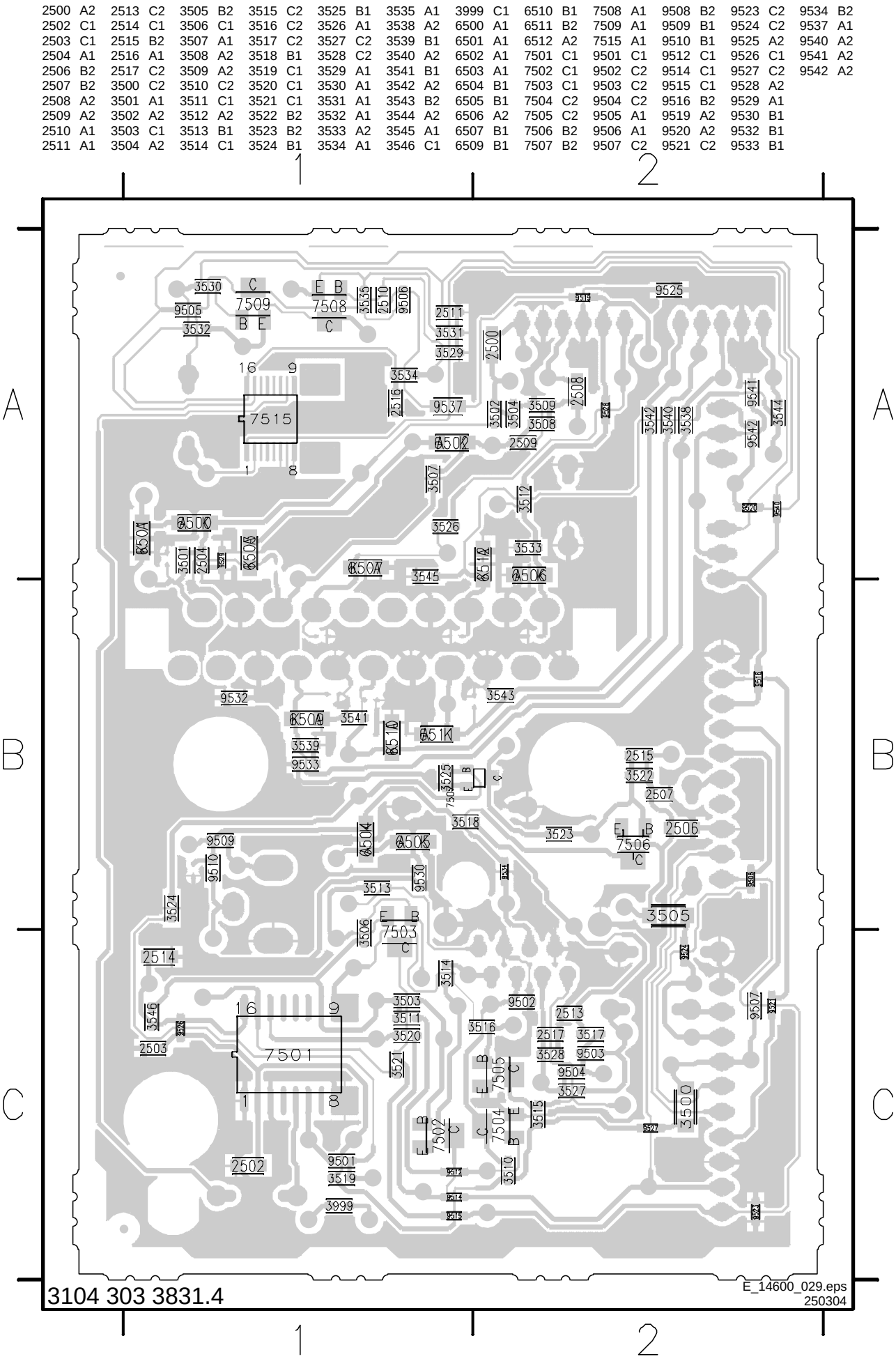
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- I530 H4
- I531 I6
- I532 C10
- I533 C10
- I534 H6
- I535 C9
- I536 H9
- I537 H2
- I538 H2
- I539 G10
- I540 H8
- I541 A7
- I542 D12
- I543 A9
- I544 C8
- I545 C2
- I546 H8
- I547 H13
- I548 H12
- I549 B3
- I552 D11
- I553 D13
- I554 E13
- I561 A10
- I562 A10
- I563 G11
- I564 H10
- I565 H10
- I566 G11
- I567 F11
- I568 F12

Layout I/O 3rd Scart (Top Side)

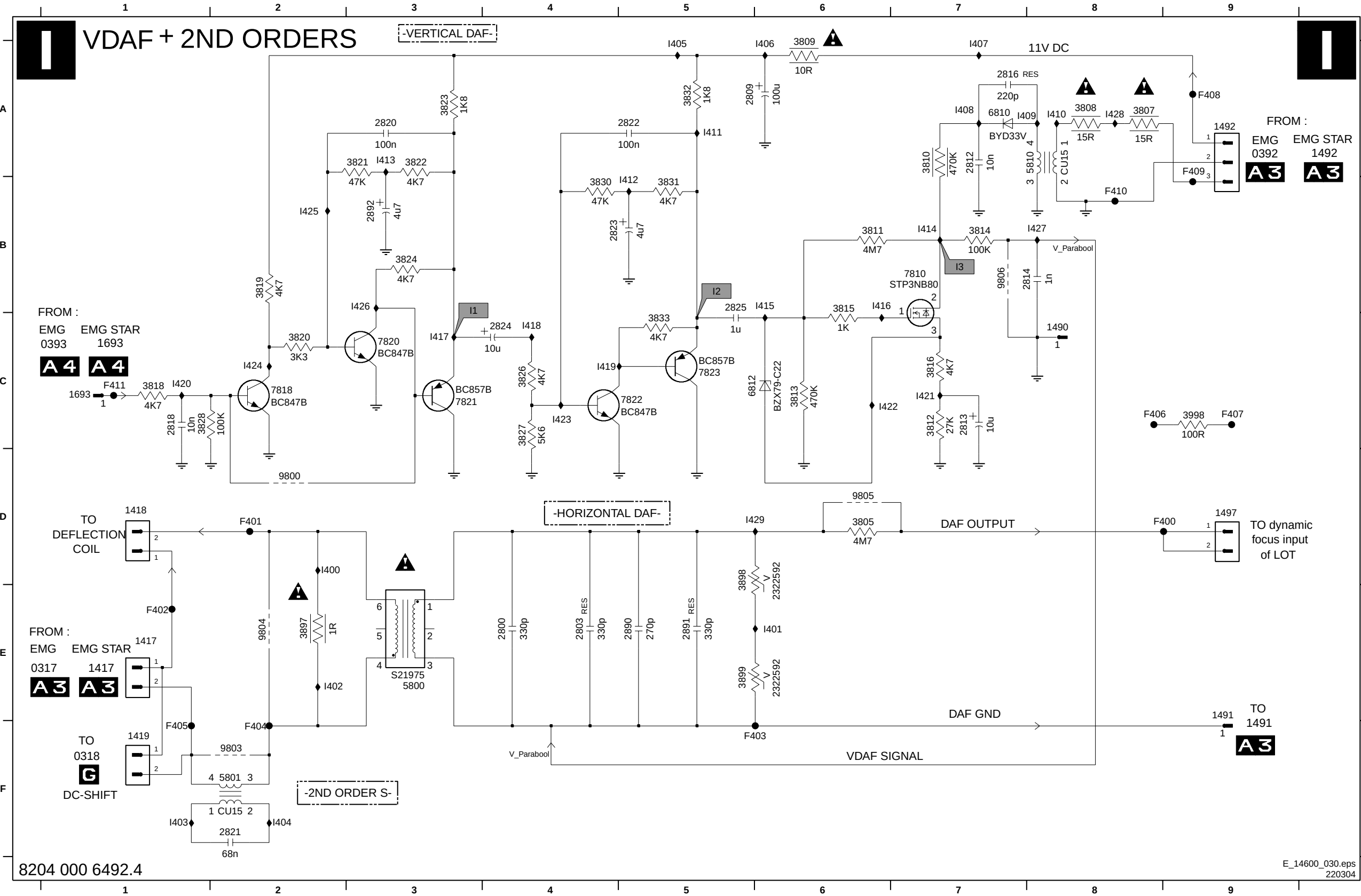


- 1201 B1
- 1272 A1
- 1339 B2
- 1402 A1
- 1680 A1
- 1690 B1
- 1937 C1
- 1952 A1
- 1992 A2
- 9511 A1
- 9517 C1
- 9518 C1
- 9522 B2
- 9531 B1
- 9538 A2
- 9539 C2

Layout I/O 3rd Scart (Bottom Side)

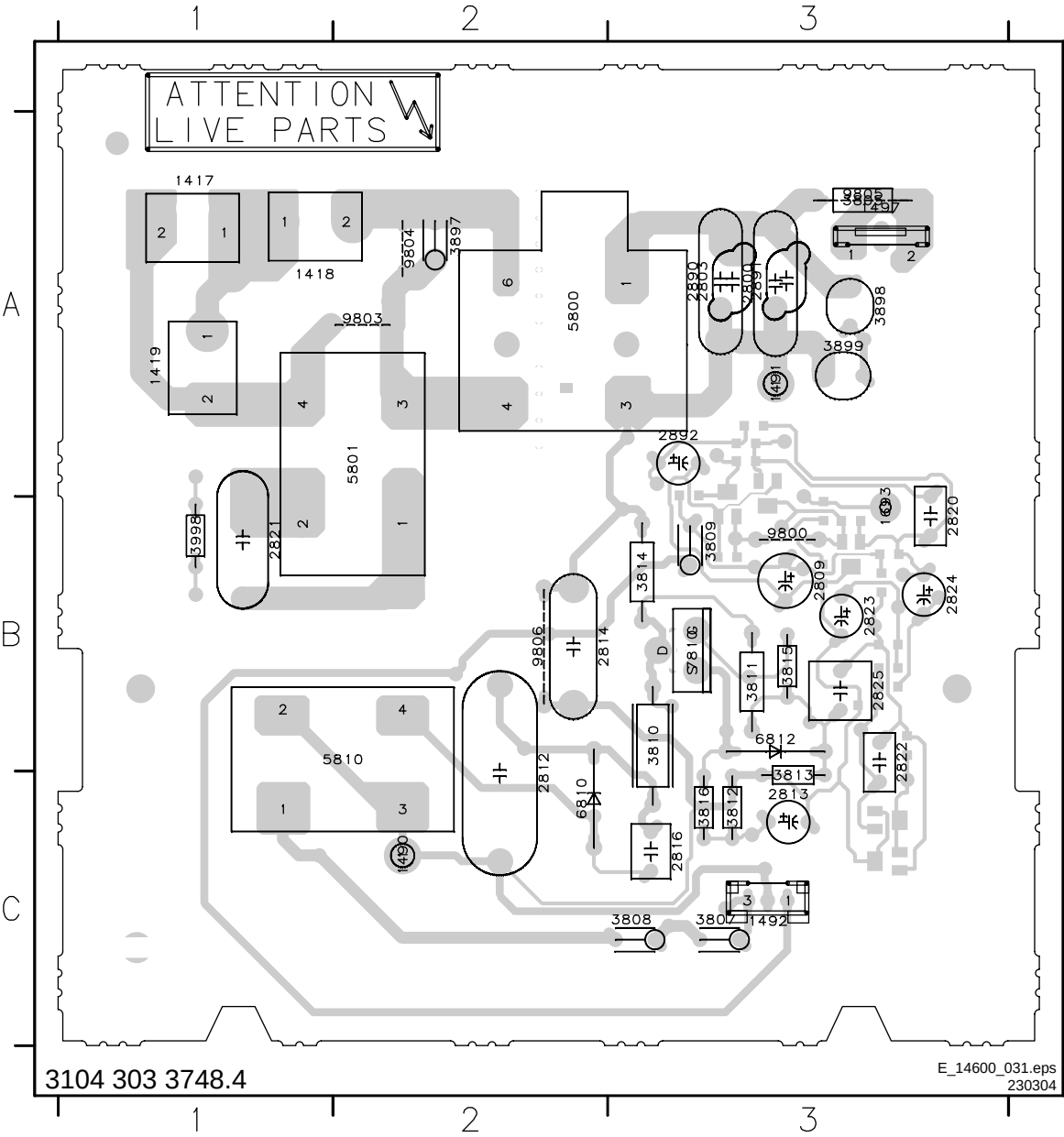


VDAF Panel + 2nd Orders



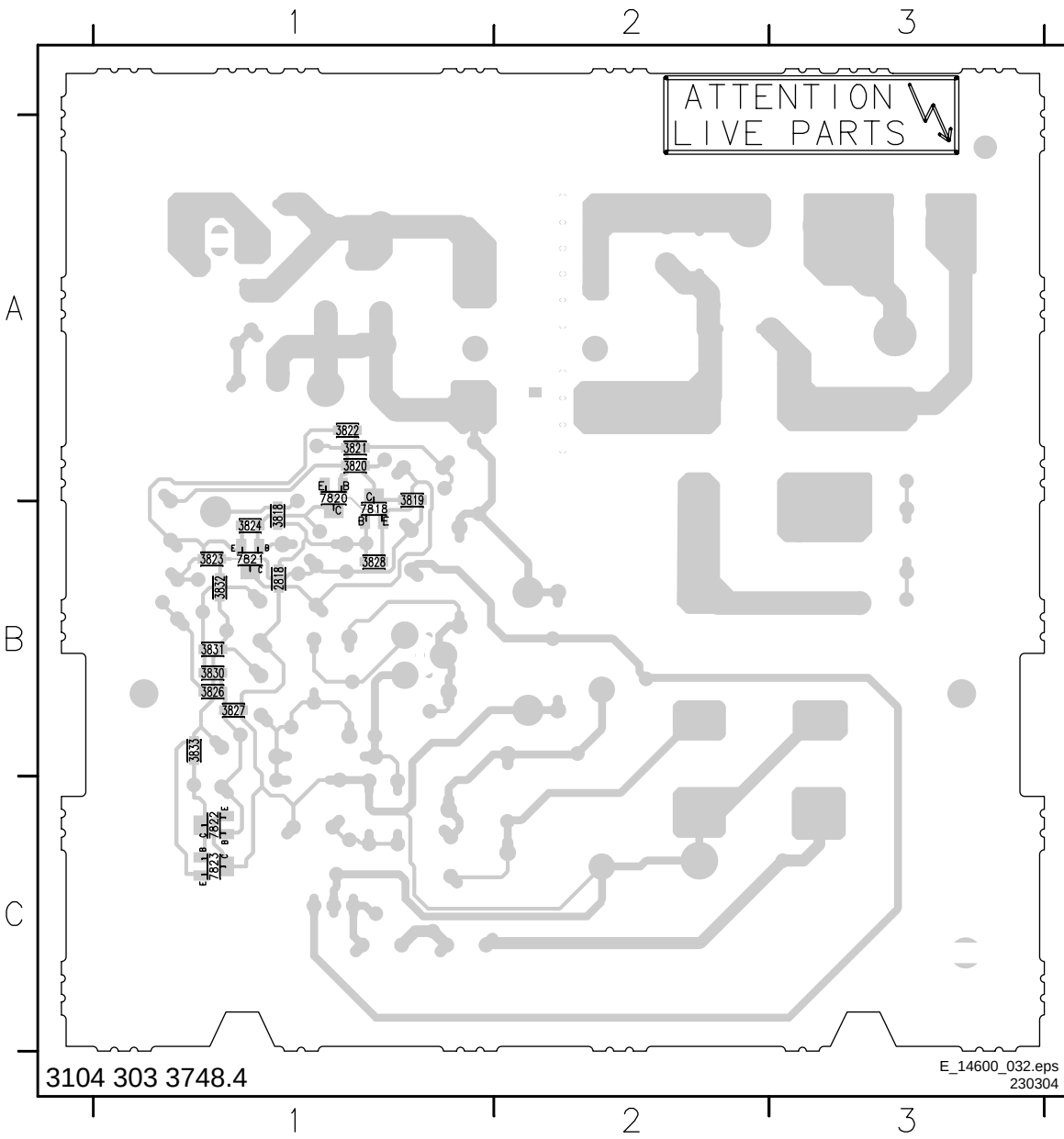
1417 E1	7818 C2
1418 D1	7820 C3
1419 F1	7821 C3
1490 C8	7822 C5
1491 E9	7823 C5
1492 A9	9800 D2
1497 D9	9803 F2
1693 C1	9804 E2
2800 E4	9805 D6
2803 E4	9806 B7
2809 A5	F400 D9
2812 A7	F401 D2
2813 C7	F402 E1
2814 B8	F403 F6
2816 A7	F404 F2
2818 C1	F405 F1
2820 A3	F406 C8
2821 F2	F407 C9
2822 A5	F408 A9
2823 B4	F409 A9
2824 C4	F410 B8
2825 B5	F411 C1
2890 E5	I400 D2
2891 E5	I401 E6
2892 B3	I402 E2
3805 D6	I403 F1
3807 A8	I404 F2
3808 A8	I405 A5
3809 A6	I406 A6
3810 A7	I407 A7
3811 B6	I408 A7
3812 C7	I409 A7
3813 C6	I410 A8
3814 B7	I411 A5
3815 B6	I412 B5
3816 C7	I413 A3
3818 C1	I414 B7
3819 B2	I415 B6
3820 C2	I416 B6
3821 A3	I417 C3
3822 A3	I418 C4
3823 A3	I419 C4
3824 B3	I420 C1
3826 C4	I421 C7
3827 C4	I422 C6
3828 C1	I423 C4
3830 B4	I424 C2
3831 B5	I425 B2
3832 A5	I426 B3
3833 C5	I427 B8
3897 E2	I428 A8
3898 D5	I429 D6
3899 E5	
3998 C9	
5800 E3	
5801 F2	
5810 A8	
6810 A7	
6812 C6	
7810 B7	

Layout VDAF Panel (Top Side)



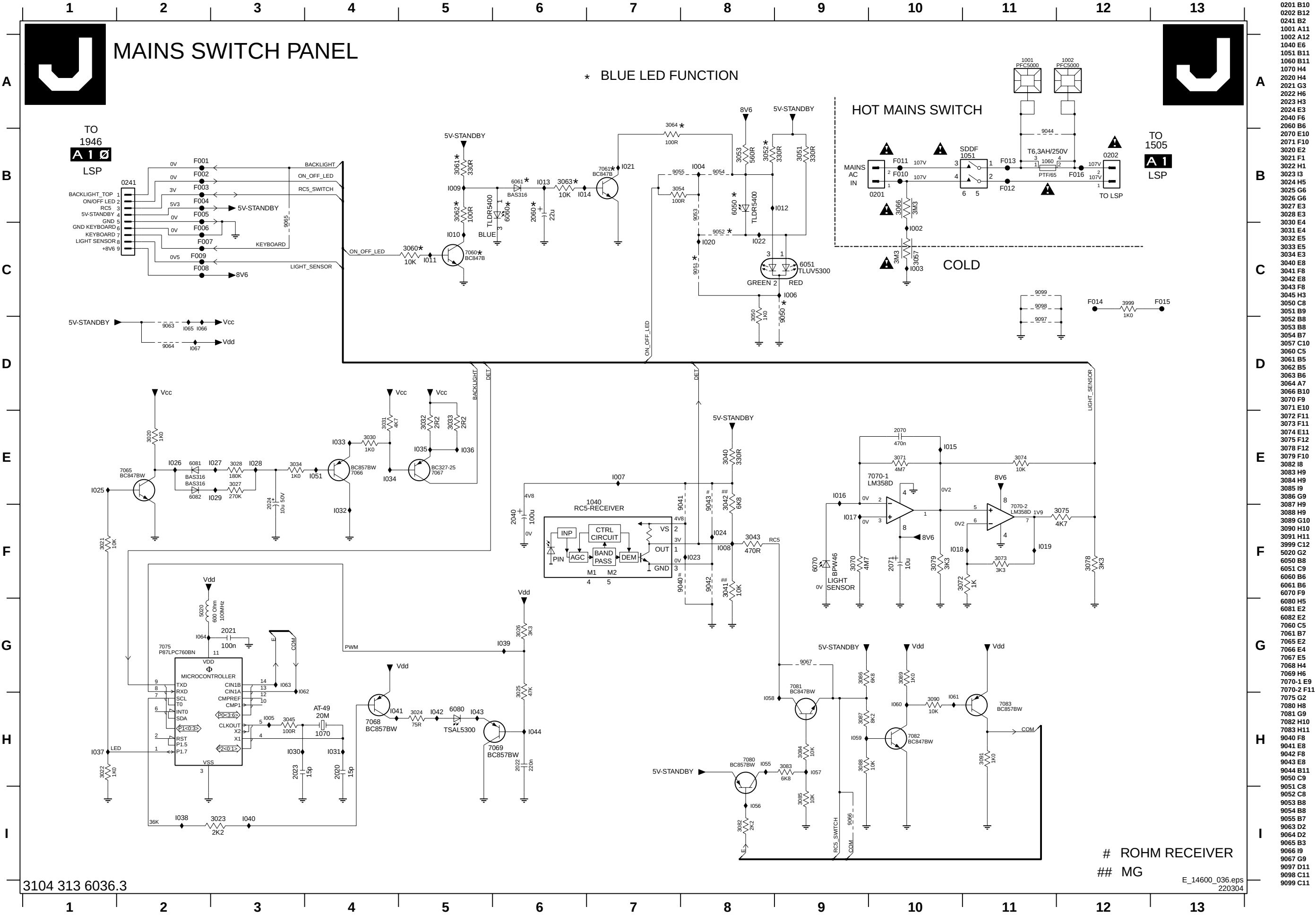
- 1417 A1
- 1418 A1
- 1419 A1
- 1490 C2
- 1491 A3
- 1492 C3
- 1497 A3
- 1693 B3
- 2800 A3
- 2803 A3
- 2809 B3
- 2812 C2
- 2813 C3
- 2814 B3
- 2816 C3
- 2820 B3
- 2821 B1
- 2822 B3
- 2823 B3
- 2824 B3
- 2825 B3
- 2890 A3
- 2891 A3
- 2892 A3
- 2899 A3
- 3805 A3
- 3807 C3
- 3808 C3
- 3809 B3
- 3810 B3
- 3811 B3
- 3812 C3
- 3813 C3
- 3814 B3
- 3815 B3
- 3816 C3
- 3897 A2
- 3898 A3
- 3899 A3
- 3998 B1
- 5800 A2
- 5801 A1
- 5810 B2
- 6810 C2
- 6812 B3
- 7810 B3
- 9800 B3
- 9803 A2
- 9804 A2
- 9805 A3
- 9806 B2

Layout VDAF Panel (Bottom Side)

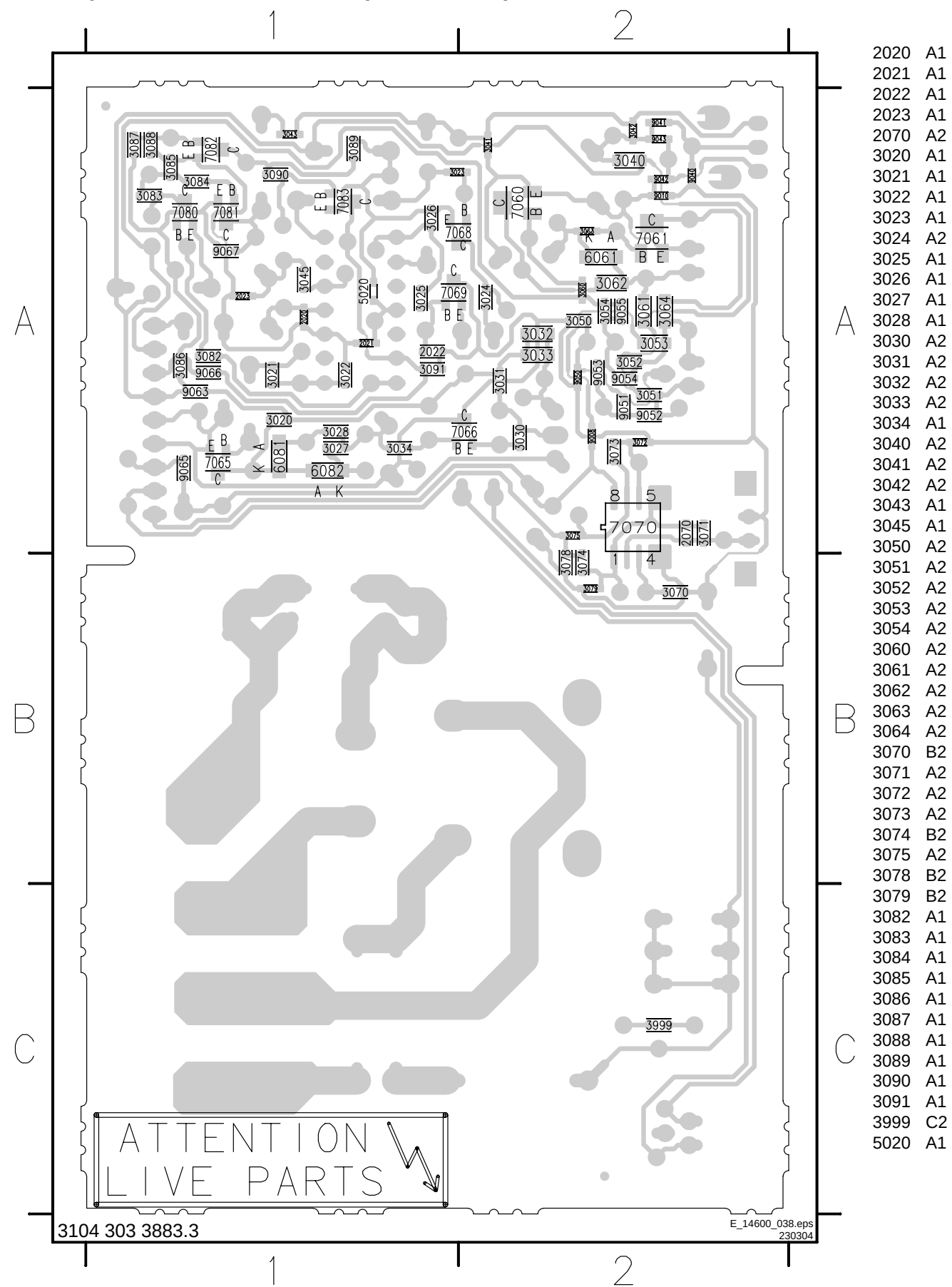


- 2818 B1
- 3818 B1
- 3819 A1
- 3820 A1
- 3821 A1
- 3822 A1
- 3823 B1
- 3824 B1
- 3826 B1
- 3827 B1
- 3828 B1
- 3830 B1
- 3831 B1
- 3832 B1
- 3833 B1
- 7818 B1
- 7820 A1
- 7821 B1
- 7822 C1
- 7823 C1

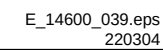
Mains Switch Panel (FL13)



Layout Mains Switch Panel (Bottom Side)

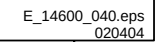


AUTOSCAVEM



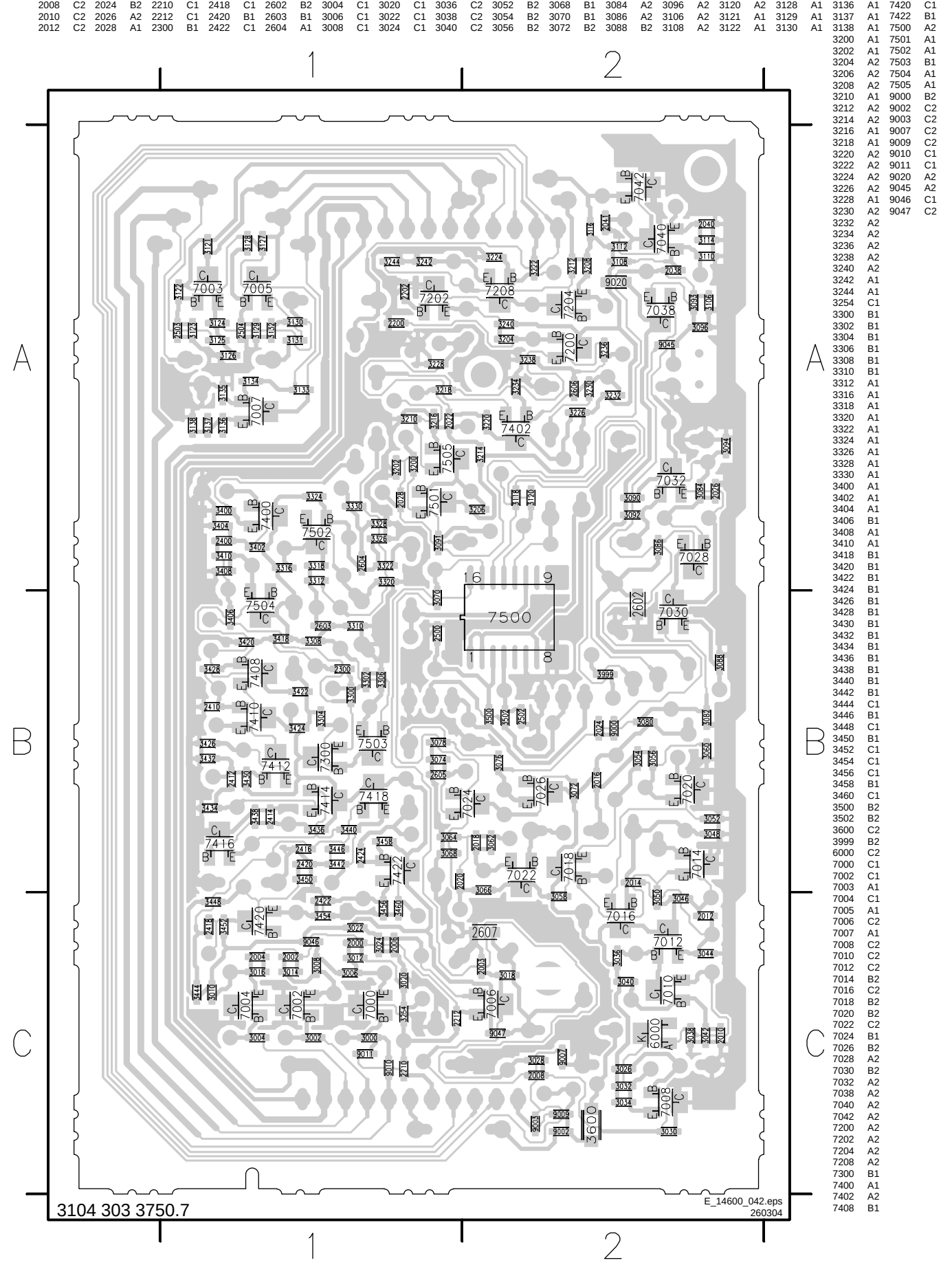
A	1400	6000 C10
	1940 B3	7000 B7
	1955 E4	7002 C7
	2000 B8	7004 C7
	2002 C8	7005 K5
B	2003 C9	7006 C8
	2004 D8	7007 M5
	2008 D9	7008 C10
	2010 C11	7012 B11
	2012 B12	7014 B13
C	2015 B14	7016 B15
	2016 B14	7018 B14
	2018 C15	7020 D14
	2020 C15	7022 C15
	2022 C15	7024 C15
D	2026 E12	7028 F13
	2028 E12	7030 F13
	2038 F15	7032 F13
	2040 F15	7038 E14
	2041 F16	7040 F16
E	2200 J14	7042 F17
	2202 J14	7200 J13
	2210 A6	7204 J14
	2212 A7	7208 J15
	2500 E7	7402 J12
F	2503 E8	7500 J10
	2504 K6	7505 J11
	2600 H3	9000 G13
	2602 J9	9003 G13
	2603 G11	9004 G13
G	2606 J13	9005 C3
	2607 J13	9006 C3
	3002 C6	9007 B2
	3004 D6	9009 H2
	3006 B7	9010 A2
H	3010 C7	F900 A5
	3012 B8	F902 A3
	3014 C8	1100 B7
	3016 C8	1102 C7
	3018 C8	1104 C7
I	3020 C8	1106 B7
	3022 B9	1108 C7
	3024 C9	1110 C7
	3026 C9	1112 C7
	3028 C9	1114 B8
J	3030 C9	1116 C9
	3032 B10	1118 C9
	3034 B10	1119 A6
	3036 B10	1120 C9
	3038 B10	1122 F12
K	3040 C11	1123 F14
	3042 C11	1124 C11
	3044 C11	1126 C12
	3046 B12	1130 D12
	3048 B12	1132 C12
L	3050 C13	1134 D13
	3052 C13	1136 B13
	3054 C14	1138 B14
	3056 C14	1140 C14
	3058 B14	1142 C14
M	3060 B14	1144 C15
	3062 B14	1146 F11
	3064 D15	1150 F11
	3066 B15	1152 F11
	3068 D15	1154 F12
N	3070 E11	1156 F12
	3072 E11	1158 F13
	3074 G11	1160 F13
	3076 F11	1162 E14
	3078 F11	1164 E14
O	3082 G12	1168 F14
	3084 G12	1178 F15
	3086 G12	1180 F15
	3088 G12	1182 F16
	3090 E13	1200 J10
P	3091 G15	1201 J11
	3092 F14	1202 J11
	3094 F14	1204 J12
	3096 F14	1205 J12
	3100 F15	1206 J14
Q	3102 E16	1208 J15
	3104 F15	1210 J15
	3106 E16	1211 J11
	3108 E16	1212 J11
	3110 F15	1214 J14
R	3112 E16	1216 J15
	3114 F15	1218 J15
	3116 E16	1219 J11
	3118 E16	1220 J12
	3120 E16	1221 J13
S	3122 E15	1214 J14
	3124 H5	1217 J13
	3125 H5	1218 F16
	3126 H5	1219 C11
	3128 H5	1220 J12
T	3128 K6	1224 J10
	3129 K6	1225 E6
	3130 K5	1226 J16
	3132 K5	1227 E6
	3133 M5	1500 E6
U	3134 M6	1502 E6
	3135 M6	1600 G02
	3136 M6	1602 G02
	3137 N5	1608 G02
	3138 N5	1609 E8
V	2000 J10	1610 E9
	2002 J10	1611 E9
	2004 H14	1612 D9
	2006 H11	1613 G7
	2008 H14	1614 D9
W	2010 J11	8900 B11
	2012 H11	
	2014 J11	
	2016 J11	
	2018 J12	
X	2216 J16	
	2218 J12	
	2220 J12	
	2222 H16	
	2224 J16	
Y	2322 J13	
	2324 J13	
	2326 J13	
	2328 J13	
	2330 J13	
Z	2340 H14	
	2342 J15	
	2344 J15	
	2346 J15	
	2348 J15	

SC3 PCR (PEAK CONTRAST REDUCTION) (NOT USED)



Layout Auto SCAVEM Panel (Bottom Side)

2000	C1	2014	B2	2038	A2	2400	A1	2524	B1	2605	B1	3010	C1	3026	C2	3042	C2	3058	C2	3074	B1	3090	A2	3110	A2	3123	A1	3131	A1	7410	B1
2002	C1	2016	B2	2040	A2	2410	B1	2500	B1	2606	A2	3012	C1	3028	C2	3044	C2	3060	B2	3076	B2	3091	A1	3112	A2	3124	A1	3132	A1	7412	B1
2003	C2	2018	B2	2041	A2	2412	B1	2502	B2	2607	C2	3014	C1	3030	C2	3046	C2	3062	B2	3078	B1	3092	A2	3114	A2	3125	A1	3133	A1	7414	B1
2004	C1	2020	B1	2200	A1	2414	B1	2503	A1	3000	C1	3016	C1	3032	C2	3048	B2	3064	B1	3080	B2	3093	A2	3116	A2	3126	A1	3134	A1	7416	B1
2006	C1	2022	A1	2202	A1	2416	B1	2504	A1	3002	C1	3018	C2	3034	C2	3050	C2	3066	B2	3082	B2	3094	A2	3118	A2	3127	A1	3135	A1	7418	B1
2008	C2	2024	B2	2210	C1	2418	C1	2602	B2	3004	C1	3020	C1	3036	C2	3052	B2	3068	B1	3084	A2	3096	A2	3120	A2	3128	A1	3136	A1	7420	C1
2010	C2	2026	A2	2212	C1	2420	B1	2603	B1	3006	C1	3022	C1	3038	C2	3054	B2	3070	B1	3086	A2	3106	A2	3121	A1	3129	A1	3137	A1	7422	B1
2012	C2	2028	A1	2300	B1	2422	C1	2604	A1	3008	C1	3024	C1	3040	C2	3056	B2	3072	B2	3088	B2	3108	A2	3122	A1	3130	A1	3138	A1	7500	A2



8. Alignments

Index of this chapter

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

8.1 General Alignment Conditions

8.1.1 Start Conditions

Perform all electrical adjustments under the following conditions:

- Power supply voltage: 230 V_{ac} / 50 Hz ($\pm 10\%$).
- Connect the set to the mains via an isolation transformer with low internal resistance.
- Allow the set to warm up for approximately 20 to 30 minutes.
- Measure the voltages and waveforms in relation to chassis ground (with the exception of the voltages on the primary side of the power supply).

Caution: never use the cooling fins/plates as ground.

- Test probe: $R_i > 10\text{ Mohm}$, $C_i < 20\text{ pF}$.
- Use an isolated trimmer/screwdriver to perform the alignments.

Perform all electrical adjustments with the following start settings (for all CRTs):

- Set LIGHT SENSOR "off", by setting ACTIVE CONTROL to "off" with the remote control.
- Set CONTRAST to "75", BRIGHTNESS to "42" and COLOUR to "54" (via PICTURE menu).
- Set COLOUR ENHANCEMENT to "off" (via PICTURE menu).
- Set DIGITAL OPTIONS to "Pixel Plus" (via PICTURE menu), unless otherwise stated (for sets without "Pixel Plus" (= Eagle), set to "Natural Motion").
- Set DYNAMIC CONTRAST to "off" (via PICTURE menu).
- Set CATHODE DRIVE at "15" (via SAM - Alignments - General - Drive - Cathode).

8.1.2 Adjustment Sequence

Use the following adjustment sequence:

1. Set the correct TV-set "options" (after storing, restart the set!).
2. Rough adjustment of "Vg2".
3. Rough adjustment of "Focus".
4. Rough adjustment of "Geometry".
5. Allow the set to warm up.
6. Accurate adjustment of "Vg2" and "Focus".
7. Accurate adjustment of "Geometry".
8. Software alignments (cut-off, cathode drive, peak white, white drive, etc).

8.2 Hardware Alignments

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

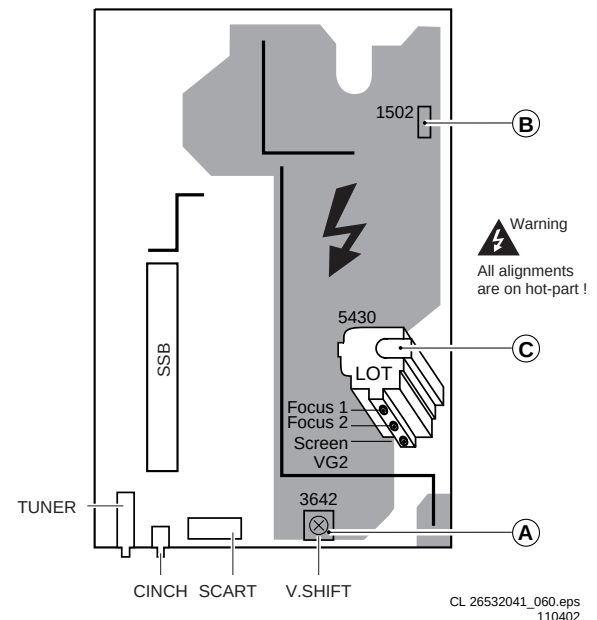


Figure 8-1 Top-view LSP

8.2.1 Vg2 Adjustment

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

1. Go, via the MENU key, to the normal user menu, select "PICTURE", and set "CONTRAST" and "BRIGHTNESS" to "0".
2. Activate the SAM.
3. Connect the RF output of a pattern generator to the antenna input. Test pattern is a "black" picture (blank screen on CRT without any OSD info).
4. Set the channel of the oscilloscope to 20 V/div and the time base to 20 μ s/div. Use external triggering on the vertical pulse (**caution:** use a trigger point at the "cold" side!).
5. Ground the scope at the CRT panel ("cold" side) and connect a 10:1 probe to one of the cathodes of the picture tube socket (see diagram F).
6. Measure the cut-off pulse during first full line after the frame blanking. You will see two pulses, one being the cut-off pulse and the other being the white drive pulse. Choose the one with the lowest value; this is the cut-off pulse.
7. Select the cathode with the highest V_{dc} value for the alignment. Adjust the V_{CUTOFF} of this gun with the SCREEN (lower) potentiometer on the LOT to the correct DC-value, tolerance is $\pm 3\text{ V}_{dc}$ (align the Vg2 potmeter first till the flyback lines are just visible and then slowly turn back until they are gone).
 - 28 inch (16:9):
 - Philips (LPD): 160 V.
 - 29 inch (4:3):
 - Philips (LPD): 160 V.
 - Samsung: 160 V.
 - 32 inch (16:9):
 - Philips (LPD): 160 V.

- Panasonic (MEC): 170 V.
- 36 inch (16:9):
 - Philips (LPD): 160 V.
 - Panasonic (MEC): 170 V.
- 8. Restore "CONTRAST" to "75" and "BRIGHTNESS" to "42".

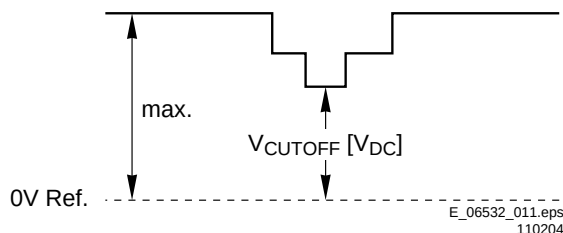


Figure 8-2 Waveform Vg2 alignment

8.2.2 Focus alignment

Notes:

- Tune the set to a "circle with crosshatch" test pattern (use an external video pattern generator).
- Choose picture mode "NATURAL" with the "SMART PICTURE" button on the remote control transmitter.
- **ELDOR LOT outline:**
 - Focus 1 (F1) = Static alignment (black wire).
 - Focus 2 (F2) = Dynamic alignment (red wire).

Focus method for Philips 32 inch tube with bleeder gun

You can recognize a CRT with bleeder gun by its type number.

Example:

- W76ERF052X044= with bleeder gun
- W76ERF042X044= with standard gun.

You can also recognize it by the **ceramic** rectangular plate (this is the bleeder resistance) you will see inside the gun (viewed from above).

1. Start the alignment with the STATIC focus (upper potmeter) turned to the **left** and the DYNAMIC focus (middle potmeter) to the **right**.
2. Adjust the DYNAMIC focus until the horizontal lines at the centre of the screen have minimum width, without introducing a visible haze.
3. Adjust the STATIC focus until the vertical lines at the sides of the screen have minimum width, without introducing a visible haze.
4. Adjust the DYNAMIC focus until the horizontal lines at the centre of the screen have minimum width, without introducing a visible haze.
5. Check overall spot performance and repeat steps 3 and 4 to achieve the best result.

Focus method for all other tubes

1. Start with the STATIC and DYNAMIC focus potentiometers on the LOT at **midway**.
2. Adjust the STATIC focus until the vertical lines at the sides of the screen have minimum width, without introducing a visible haze.
3. Adjust the DYNAMIC focus until the horizontal lines at the centre of the screen have minimum width, without introducing a visible haze.
4. Check overall spot performance and repeat steps 2 and 3 to achieve the best result: a compromise between minimal visible haze at the middle of the screen and sharp lines at the edges of the screen.

8.3 Software Alignments

8.3.1 Introduction

With the software alignments, it is possible to align the Geometry, White Tone, and Tuner IF settings.

Put the set in the SAM (see chapter 5). The SAM menu will now appear on the screen. Select, via **ALIGNMENTS**, one of the sub-menus. They are explained below in the sequence of the sub-menus.

Notes:

- All changes to menu items and alignments are stored automatically, except the option codes. They must be stored manually.
- If the OPTION CODES have been changed **and stored**, the set has to be switched "OFF" and "ON" using the mains switch to activate the new settings (when switching via Standby, the option code settings are NOT read by the microprocessor).
- If an empty EAROM (permanent memory) is detected, all settings are set to pre-programmed default values.

8.3.2 GENERAL

VG2 TEST PATTERN

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

ADJUST PEAK WHITE LIMITER

Fixed setting: "9".

EHT COMPENSATION

Enter value "9" for the 28, 29 and 32 inch picture tubes
Enter value "10" for the 36 inch picture tubes.

SOFT CLIPPER

Fixed setting: "Pwl + 0%"

LUMA GAIN

Fixed setting is "1".

IF AFC

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

Alignment procedure:

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

Table 8-1 OSD feedback of AFC alignment

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

1. The first item (IN or OUT) informs you whether you are in or out the AFC-window.
2. The second item (HIGH or LOW) informs you about whether the AFC-frequency is too high or too low.
3. First, you must align the IF AFC parameter such that you come into the AFC-window (= IN).
4. Then you must look for the point where the IF AFC parameter changes from HIGH to LOW. This level is the value you are looking for.
5. After adjustment, STORE the value.
6. Now return to the user "Installation" menu.
7. Select "Manual Installation" - "Search" - "475" - "OK" and "Store". This will set the AFC "ON" again.

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

IF LPRIME AFC

Use the same procedure as for the IF AFC alignment, but set the video generator to SECAM L/L' (only necessary for countries that have or can receive this system).

TUNER AGC

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

TUNER AGC TUNER 2 (only for sets with DW/PIP)

Use the same procedure as described above (under TUNER AGC) with the set switched to the DW source. Measure on pin 1 of the DW Tuner (this is only applicable for sets with 2-tuner DW execution).

BLEND INTENSITY

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

Position the "BRIGHTNESS", "CONTRAST", and "COLOUR" setting in the middle position (via the user PICTURE menu).

1. Apply a signal with a 100 % white video-pattern.
2. Connect an oscilloscope to pin 8 of connector 1298 of the CRT panel and measure the Red output level.
3. Align the BLEND INTENSITY parameter such, that the blended signal is 65 % of the black-white amplitude. In practice, this is about 1.3 V (blended signal) versus 2 V (full white signal).
4. The parameter can be adjusted in between "0" and "31".

8.3.3 DRIVE (Colour Alignments)

Note: Switch off all (available) colour-influencing features (e.g. set the TV in ECO-mode).

Method 1 (with colour analyser):

1. Set, via the user menu, the "Contrast" to "100".
2. In SAM, select TEST PATTERN and turn it ON. During the following alignments, you will see a white block in the

middle of the screen. Measure with the colour analyser on this area.

3. Set, via the user menu, the "Brightness" to a value between 3.0 and 5.0 Nit (rough setting).
4. Select CATHODE and enter the value "15" (for all picture tubes).
5. Set the RED, GREEN and BLUE default values to "32".
6. RED BL OFFSET: the Black Level can be aligned very precisely here. The default value is "7".
7. GREEN BL OFFSET: the Black Level can be aligned very precisely here. The default value is "7".
8. Select a COLOR TEMPERATURE (e.g. COOL, NORMAL, or WARM).
9. Adjust the white level via RED, GREEN, and BLUE, according to the values in table "White levels".

Table 8-2 White levels

Colour Temp.(K)	Cool (18300)	Normal (13100)	Warm (6500)
X	256	264	314
Y	264	279	324

Method 2 (without colour analyser):

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 (statistics).

1. Set, via the user menu, the "Contrast" to "100".
2. Select CATHODE and enter the value "15" (for all picture tubes).
3. RED BL OFFSET: the Black Level can be aligned very precisely here. The default value is "7".
4. GREEN BL OFFSET: the Black Level can be aligned very precisely here. The default value is "7".
5. Select a COLOUR TEMPERATURE (e.g. COOL, NORMAL, or WARM).
6. Set the RED, GREEN and BLUE default values according to the values in the "Tint settings" table.

Table 8-3 Tint settings

	Δ Cool	Normal	Δ Warm
R	0	37	+ 12
G	0	30	0
B	+ 5	31	- 14

8.3.4 LUM. DEL. (Luminance Delay)

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

- **LUM. DELAY PAL BG:** Apply a PAL BG colour bar/grey scale pattern as a test signal. Adjust this parameter until the transients of the colour part and black and white part of the test pattern are at the same position. Default value = "8".
- **LUM. DELAY PAL I:** Apply a PAL I colour bar/grey scale pattern as a test signal. Adjust this parameter until the transients of the colour part and black and white part of the test pattern are at the same position. Default value = "10".
- **LUM. DELAY SECAM:** Apply a SECAM colour bar/grey scale pattern as a test signal. Adjust this parameter until the transients of the colour part and black and white part of the test pattern are at the same position. Default value = "9".
- **LUM. DELAY BYPASS:** apply a NTSC colour bar/greyscale pattern as a test signal. Adjust this value until the transients of the colour and black & white part of the test area are at the same position. Default value = "7".

8.3.5 GEO-NOR (Normal Geometry)

Note: Use for all geometry alignments an **external** pattern generator with a geometry pattern (e.g. crosshatch).

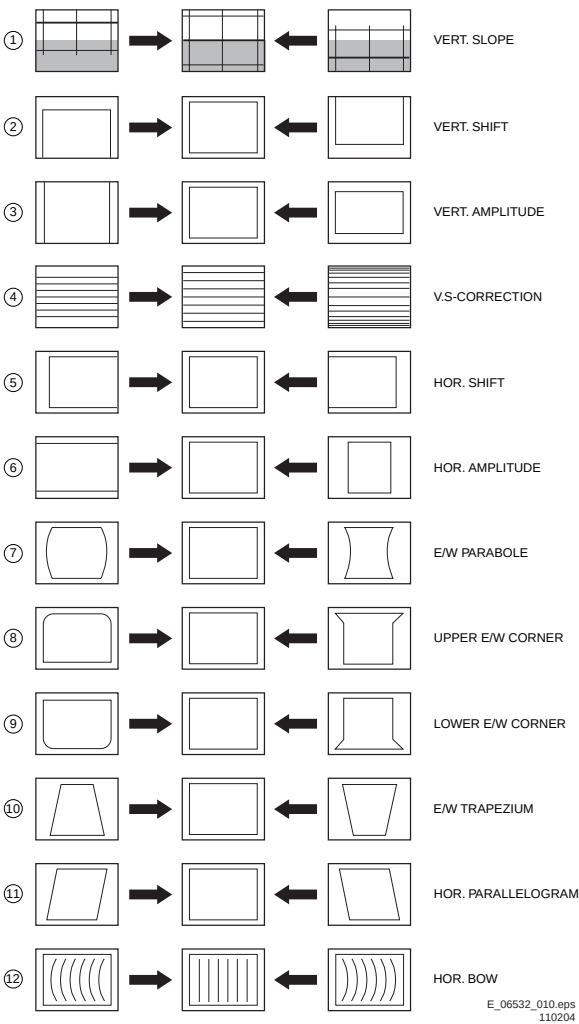


Figure 8-3 Geometry Alignments

Service tip: When the set is equipped with a rotation coil, use this menu item to check its correct alignment. If alignment is not correct, go to the INSTALLATION menu, choose SETUP, press OK, and choose PICTURE TILT. With the use of a crosshatch test pattern, align it to a correct horizontal picture.

V. SLOPE

- Align the zero crossing of the frame deflection to the mechanical middle of the picture tube.
- First, set the start conditions for 16:9 sets according to the table "Vertical S-Correction default value". Position the boundary-stripes of the test pattern on the edges of the picture tube.
 - Align V. SLOPE (during alignment, the lower half of the picture is blanked) such, that the middle line of the test pattern is matched with the edge of the pattern transient in the middle of the picture.
 - Repeat the alignment if necessary.

Table 8-4 Vertical S-Correction default value

Picture Tube	V. S-Correction default value
28" RF 16:9 Mk2	16
29" RF 4:3	32
32" RF 16:9	16
32" RF 16:9 Bleeder	16
32" RF 16:9 EMEC	27
32" RF 16:9 DOD-2	20
34" RF 4:3 Toshiba / LG.Philips	31 / 28
36" RF 16:9	20

V. SHIFT AND V. AMPLITUDE (vertical alignment)

- Align the vertical centre and height of the picture.
- Use V. AMPLITUDE to align the vertical amplitude so that the entire test pattern is visible.
 - Set V. SHIFT to value "32".
 - Connect a voltmeter (V_{dc}) between R3624 and "hot" ground.
 - Adjust the DC voltage to "0" with potmeter R3642 (see figure 8-1).
 - Use V. SHIFT again to align the test pattern roughly vertically in the middle.
 - Repeat the alignment if necessary.

V. S-CORRECTION

Align for equal blocks on top, middle, and bottom of the picture tube.
Align V. S-CORRECTION such that a block at the top (or bottom) of the picture has the same height as a block in the middle of the picture.

H. SHIFT AND H. AMPLITUDE (horizontal alignment)

- Use H. AMPLITUDE to align the horizontal amplitude so that the entire test pattern is visible.
- Use H. SHIFT to align the picture horizontally in the middle.
- Repeat the H. AMPLITUDE alignment if necessary.

Note: In case the horizontal linearity in wide-screen mode is out of tolerance, add a "DC-shift correction" panel (3104 328 06230) to connector 1419 of the DAF-panel [diagram I]. On the DC-shift panel, cut diode **6433** for correction to the right or diode **6432** for correction to the left.

Caution: Be sure to switch "OFF" the set first. Never plug in a not pre-aligned module in a playing set!

EAST/WEST ALIGNMENT

- Use EAST/WEST PARABOLA to align the vertical lines until straight.
 - Use UPPER EAST/WEST CORNER to align the vertical lines in the upper corners until straight.
 - Use LOWER EAST/WEST CORNER to align the vertical lines in the lower corners until straight.
 - Use EAST/WEST TRAPEZIUM to align for a rectangular.
 - Use HORIZONTAL BOW to correct the E/W parabola such, that it becomes symmetrical.
 - Use HORIZONTAL PARALLELOGRAM to align for straight vertical lines if necessary.
- Repeat steps 1 to 6 if necessary.

8.3.6 GEO-4:3 (4:3 geometry alignment in 16:9 sets)

- Use EAST/WEST PARABOLA to align the vertical lines until straight.
- Use UPPER EAST/WEST CORNER to align the vertical lines in the upper corners until straight.
- Use LOWER EAST/WEST CORNER to align the vertical lines in the lower corners until straight.

8.3.7 GEO-SW (Super Wide geometry alignment in 16:9 sets)

You only need to set the following values (if the normal geometry alignment has been performed correctly):

1. V. S-CORRECTION: enter value of the NORMAL GEOMETRY alignment.
2. H. AMPLITUDE: enter value of the NORMAL GEOMETRY alignment subtracted by "1".
3. EAST/WEST PARABOLA: enter value of the NORMAL GEOMETRY alignment.

8.3.8 GEO-100HZ (Digital Scan geometry alignment)

As all alignments are done in Pixel Plus mode (at 75 Hz), the 100 Hz mode needs an extra alignment:

- Select GEO-100HZ. The set automatically switches to 100 Hz mode.
- V. SLOPE: match the middle line of the test pattern with the upper edge of this blanking picture.
- After the alignment, return to the previous menu. The set automatically returns to "Pixel Plus" mode.

8.4 Option Settings

8.4.1 Introduction

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

- You can set the "hardware related" options via the SAM - ALIGNMENTS - OPTIONS or OPTION NUMBERS menu.
- You can set the "software related" options via the SAM - DEALER OPTIONS menu.

Notes:

- After changing the option(s), save them with the STORE command.
- The new option setting is only active after the TV is switched "off" and "on" again with the AC power switch (the EAROM is then read again).

8.4.2 DEALER OPTIONS

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

Table 8-5 Dealer options overview

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

8.4.3 SERVICE OPTIONS

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

Table 8-6 Option overview

Menu-item	Subjects	Options	Description
Dual screen	PIP/Dual Screen	Yes	Feature present.
		No	Feature not present.
	Text/EPG	Yes	Feature present.
		No	Feature not present.
	DS/PIP Tuner	Yes	Only selectable if Dual Screen option is "on"
		No	Feature not present.
Teletext	Flash RAM	Yes	Feature present.
		No	Feature not present.
	NexTView	None	Feature not present.
		Textguide only	Feature present, but only as text guide.
Picture Tube	CRT Type	4 by 3	4:3 picture tube.
		16 by 9	16:9 picture tube.
	Picture Rotation	Yes	Frame rotation circuitry present.
		No	Frame rotation circuitry not present .
	CRT size	28 / 32 / 36	CRT size (in inches).MEC= Panasonic, II= Mark 2
		29 / 34 / 38	
	Anti MoirE filter	Yes	Feature present.
		No	Feature not present.
	Featurebox type	1050i/1250i	HD input
		Eagle 1B	Eagle present (Pixel Plus).
		Eagle 1C	Eagle present (Pixel Plus 2).
Video repro	Lightsensor	Yes	Feature present.
		No	Feature not present.
	3D Combfilter	Yes	Feature present.
		No	Feature not present.
	Picture improvement	Yes	LTP (TOPIC) present.
		No	LTP (TOPIC) not present.
	Auto Scavem	Yes	Feature present.
		No	Feature not present.
	Signalling bits	Yes	For 16:9 sets
		No	For 4:3 sets
	Impr. Noise Red.	Yes	Columbus present
		No	Columbus not present
	Pixel Plus version	1	Sets without Columbus but with Eagle (1B)
		2	Sets with Columbus and Eagle (1C)
Source Selection	AV3 2fH	Yes	Not selectable yet
		No	Feature not present.
	AV4 2fH	Yes	Not selectable yet
		No	Feature not present.
	EXT4 1fH	Yes	Not selectable yet
		No	Feature not present.
	EXT3 1fH	Yes	Feature present.
		No	Feature not present.
Audio Repro	Dolby	None	Set without Dolby
		Pro Logic	Set with Dolby ProLogic
		Virtual	Sets with Virtual Dolby
	Rear speakers	Speakerless	Virtual Dolby (without rear speakers)
		Cordless	Wireless active surroundbox present
	Subwoofer present	Yes	Feature present
		No	Feature not present
	Acoustic system	None, FL9-DAS, FL11, FL12, PV02, FL13, Soft Designline, Tech Designline.	Indicates the cabinet styling
		AVL	Automatic Volume Limiter 'on'
	AVL	On	Automatic Volume Limiter 'on'
		Off	Automatic Volume Limiter 'off'

Menu-item	Subjects	Options	Description
Miscellaneous	Home Cinema	Yes	Set with Home Cinema Link (EU only)
		No	Set without Home Cinema Link
	Integrated RC	Yes	Feature present.
		No	Feature not present.
	Tuner type	UV1316	Set with Philips tuner.
		TEDE9	Set with Alps tuner.
	Integrated Radio	Yes	Feature present.
		No	Feature not present.
	P50 DVD menu line	Yes	Feature present (only in sets with Home Cinema).
		No	Feature not present.
Option no.	Group 1		Group 1 option code overview (see CRT sticker).
	Group 2		Group 2 option code overview (see CRT sticker).

8.4.4 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 fast. All options are controlled via eight option numbers.

When the EARAM is replaced, all options will require a re-setting. To be certain that the factory settings are reproduced exactly, you must set both option number lines. You can find the correct option numbers on a CRT sticker inside the TV set.

Example: The CRT sticker in the 28PW9502/12 gives the following option numbers (**Note:** this is just an example):

12660 16672 49984 00000

04118 00001 00032 18250

The first line (group 1) indicates options 1 to 4, the second line (group 2) options 5 to 8 (see tables below).

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

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

9. Circuit Descriptions, Abbreviation List, and IC Data Sheets

Index of this chapter

1. Introduction
2. Block Diagram
3. Feature Box
4. PICNIC
5. Columbus
6. FEM
7. Eagle
8. Proximity Sensor
9. Abbreviation List
10. IC Data Sheets

Note:

- Only **new** circuits, compared to its predecessor the EM5.1E, are described. For the other circuit descriptions, see the EM5.1E manual (available under order code 3122 785 13420).
- 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 diagrams in chapter 6 and 7. Where necessary, you will find a separate drawing for clarification.

9.1 Introduction

This chassis contains the following new features/components:

- FEM (Falconic Embedded Memories): is a new Falconic with internal Field memories and jagged line removal.
- Improved 2D/3D Comb filter: The new key components are Columbus and SDRAM. When SDRAM is used, a 3D comb filter (or temporal comb filtering) is possible. Without SDRAM, only 2D comb filtering, (or spatial comb filtering) is possible. This is improved with respect to the previous 2D comb filter.
- Improved noise reduction: This is a second function of the Columbus and SDRAM. Noise reduction is possible without SDRAM (2D) and with SDRAM (3D).
- Pixel Plus 2: Eagle 1B is replaced by Eagle 1C.
 - Algorithms for Horizontal LTI and Vertical LTI are improved.
 - Thin Line Control as part of the sharpness control.
 - Face Depending Peaking should allow less sharpness in faces different from the rest of the picture. This could be used to anti age faces versus the rest of the picture.
 - Vivid Colours 1 will result in more saturated colours.
 - The range/amount of Blue Stretch is extended.
 - More steps of Green Enhancement.
 - Improved Colour Dependent Sharpness.
 - Increased range of skin gain and skin tone.

The chassis consists of a full sized LSP/SSP combination and a smaller double sided four layer SSB, which is mounted on the SSP using a 80-fold SIMM connector. The main functionalities are:

- LSP: supply, deflection, and sound amplification.
- SSP: tuner input, SIMM interface, I/O, and interface provisions for extended functions such as PIP.
- SSB: core TV functionalities, being TXT/control, video and audio decoding, feature box, video featuring, and sync/ geometry control.

The LSP (single sided) is built up very conventional, with hardly any surface mounted components on the copper side. Similar with the EM3 (but different as with the MG-chassis), the EM5 LSP has a very large "hot" part, including both deflection coils.

The SSB is a high tech module (four layer, 2 sides reflow technology, full SMC) with very high component density and complete shielding for EMC-reasons. Despite this, it is

designed in such a way, that repair on component level is possible. To achieve this, attention was paid to:

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

The availability of Double Window (DW) or Picture In Picture (PIP) depends on the model range. There are two different executions, depending on the number of tuners:

- One Tuner: The TV has only one tuner (on the LSP), so the PIP-picture can be either from this tuner or from an external AV-source.
- Two Tuners: In this case there are two separate tuners, so the main picture and the DW picture are independently selectable. The IF signal from the main tuner is processed on the SSB, while the IF signal from the second tuner is processed by a second BOCMA video processor on the DW-panel. The source selection is done via an I/O expander.

9.2 Block Diagram

For the block diagram see chapter 6 "Wiring Diagram, Block Diagrams, and Overviews".

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

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

Three SCART-connectors are available:

- SCART1 is fully equipped,
- SCART2 is meant for VCR. Pin 10 is used for Easylink (P50) and there is a possibility for Y/C in. The CVBS-out on pin 19 is meant for WYSIWYR (What You See Is What You Record).
- SCART3 is a RGB/CVBS and audio L/R input. It can be used as second tuner input, in case of a 1-Tuner DW/PIP set.

After the HIP, we come to the part that is called the Feature box (diagram B3x):

- For Digital Scan, the PICNIC is required.
- For Natural Motion, the FALCONIC (or FEM) is required.
- For Pixel Plus, the EAGLE is required.

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

- Analogue to Digital conversion and vice versa.
- 50 to 100 Hz conversion.
- Panorama mode.
- Noise reduction (or via Columbus when present).
- Dynamic contrast.

Attached to the PICNIC is the Columbus chip. This 2D/3D Comb filter is used to separate chroma and luminance components out of a CVBS signal. Second function is noise reduction. It replaces the Comb filter that was attached to the HIP in the former chassis.

After the PICNIC, the (now 2fH) YUV-signals are fed to the FALCONIC (or FEM) for "Natural Motion" followed by the Eagle for "Pixel Plus" enhancement. The processed YUV signals

(from Eagle or PICNIC) are, together with the sync-signals from the PICNIC, then fed to the HOP (High-end Output Processor). This IC handles the video control and geometry part. The RGB-signals for TXT/OSD (from the microprocessor) are also inserted via the HOP. The video part delivers the RGB signals to the CRT-panel and the geometry part delivers the H-drive, V-drive, and a drive-signal for rotation.

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

The RGB amplifiers on the CRT-panel are supplied with 200 V from the LOT.

The Scavem circuit modulates transitions of the Luminance (Y) signal on the horizontal deflection current, giving a sharper picture.

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

The microprocessor, called OTC (OSD, Teletext and Control) takes care of the analogue TXT input- and output processing. The OTC, ROM, and RAM are supplied with 3.3 V, which is derived from the +5V2.

The NVM (Non Volatile Memory) is used to store the settings, one Flash-RAM contains the set software, the other Flash-RAM (7012) is for EPG, and the DRAM is used for storing the Teletext pages.

There is a separate Standby Supply, in order to reduce the Standby power consumption. During Standby, the Main Supply is switched "off" (via TS7529).

A relay (1550) is used to switch the degaussing circuit. It is switched "on" after set start-up and switched "off" by the uP after 12 s.

The Main Supply, an SMPS based on the "down-converter" principle, generates the 141 V (V_BAT) and the +/- 16 V for the audio part.

Note: Voltage V_BAT is not mains isolated ("hot"), but is alignment free.

9.3 Feature Box

The key components of the FBX are the following ICs:

1. PICNIC.
2. Columbus.
3. FEM.
4. Eagle.

9.4 PICNIC

All FBX versions have the PICNIC as basic IC. All functions located in the PICNIC are therefore basic functions, and will be described briefly. These functions are completely controlled by the built-in microprocessor.

- **Clamp.** In the PICNIC, three analogue clamp circuits are integrated that assure a well defined DC level for the luminance (Y) and colour-difference (U, V) input signals.
- **AGC.** The AGC in the PICNIC consists of a digital controlled analogue variable gain amplifier with a gain range of 9.3 dB, and an algorithm that uses input derived from histogram data and the overflow detection. It is designed to assure an optimal ADC input range, for all input signals, and so having minimal quantisation noise.
- **Analogue pre and post filters.** The pre filters of the Feature Box are always the integrated filters of the PICNIC. The internal post filters of the PICNIC are never used.

- **ADC/DAC.** Analogue to Digital conversion is done with three identical 9-bit ADCs, and the Digital to Analogue conversion uses three identical 10-bit DACs. The Y signal is mapped on 9 bits for black-to-white range and has room for over- and undershoots by means of the 10th bit at the output DACs. The U and V channels are processed in 9-bit accuracy up to the CTI circuit that has a gain of 2, resulting in a 10-bit output that suits the 10 bit DACs.
- **Time Base Correction.** The Time Base Correction circuit simulates a fast acquisition line locked clock, while the actual system clock is locked to the input line frequency with a very large time constant. In this way the typical VCR problems linked to a one clock Feature Box can be solved, particularly the deflection circuit (in case of CRT) driven by the Feature Box can profit from this feature.
- **VCR detection.** The VCR detection of the PICNIC is an algorithm that detects the phase jumps (which occurs for instance with VCRs) to be able to correct the picture deviations. This detection is done by monitoring the PLL circuit in the PICNIC by the on-board microprocessor on several parameters.
- **Peaking.** The two dimensional peaking can boost or attenuate higher frequencies in both vertical and horizontal direction. The lowest setting is a 2D low pass. The higher settings make sharpening, but the resulting overshoots can clip relatively fast compared to the dynamic peaking, because there is no room for overshoot above white and under black. This peaking is done on field base.
- **Digital Noise Reduction (DNR).** The PICNIC accommodates three noise reduction circuits:
 - **Clinic.** This "clamp noise reduction" circuit consists of an adaptive temporal field recursive filter. It corrects the DC level of each line, when it is varying from field to field in the line segments with likely the least movement. It can be used to correct clamp errors that cannot be restored by conventional clamp circuits. The filter is completely autonomous for the user, who can only switch it "on" or "off".
 - **Limeric** (this part is not used in case of Columbus). This spatial noise reduction circuit is targeted for reduction of the mid frequency noise spectrum, where adaptive filtering combines pixels around the centre pixel and pixels from the lines above in a recursive way. The quantity of noise reduction is user defined.
 - **2D Coring.** This circuit attacks spatial noise in a very drastic way without distinguishing noise from wanted resolution. It shaves away small details of any kind, depending on the amplitude of the detail and the user setting. So, it is advised to use this feature only at the lowest settings.
- **Histogram Modification.** Using histogram modification techniques in PICNIC, the contrast of the overall picture may be improved. From a TV scene, the distribution of all luminance values is taken (histogram). This histogram is used to calculate an optimal transfer curve for the particular scene, which is used to process the video digitally resulting in a picture with improved contrast (called "Dynamic Contrast").
- **Auto Picture Control.** The PICNIC is prepared to make several APC functions in co-operation with the main software. This is made by giving relevant video quality data to main, and by giving several control 'handles' to main microprocessor. In this way, automatic picture quality settings depending on customer settings and video data can be made. The following items are prepared in the AutoTV:
 - **Automatic Picture Control.** This feature controls the settings for DNR, Limeric, coring, sharpness and histogram modification as a function of the noise figure and signal steepness information extracted from the PICNIC and from external information such as ambient light.
 - **Automatic Aspect Ratio Adaptation.** This AARA feature uses data from the black bar detection circuit to adapt vertical and horizontal amplitude to an aspect

ratio belonging to the display and does not show black bars. This is done by the control software. Auto Format is controlled via main software by reading out the black bar information from the FBX.

- **Field Rate Upconversion.** In order to remove large area flicker from the TV screen, the field-rate of the video is doubled by the Feature Box. A 50/60 Hz video input is converted to 100/120 Hz. The line frequency (16 kHz) is also doubled (32 kHz). When the video input contains fields A, B etc..., the conversion provides an AABB sequence scanning on the display. The actual up-conversion is done in the first Field Memory (FM1) by reading it twice at double speed, while writing once.
- **Input Phase.** The horizontal phase of the input video acquisition can be shifted to allow compensation for processing delay of other components in front of the Feature Box.
- **Miscellaneous Features.** To be sure that On Screen Display (OSD) is always readable, even when no video signal is received, the feature box can be switched to stable OSD mode. Free running but stable horizontal and vertical deflection drive signals will be generated, so that OSD information and PIP can be displayed jitter free, and thus clearly readable on the screen. Specially for tuning purposes and smooth channel switching a stable OSD mode is implemented that uses the horizontal time base correction combined with a slow PLL, and a small vertical catch window. This mode enables undisturbed reading of OSD while the set is tuning.

9.5 Columbus

9.5.1 Introduction

The Columbus is a combination of:

- A **2D/3D Comb filter** for both PAL and NTSC, and
- A **spatial/temporal noise reduction system** for both colour and luminance signals.

The Columbus 3D Comb filter uses digitalized CVBS, U, and V (or C) signals and can be used with or without an external 16 Mbit SDRAM. Without external 16Mbit SDRAM, 3D comb filtering and temporal noise reduction are not possible.

The noise reduction part of the Columbus is controlled by the FBX software using the SNERT interface (the "Limeric" noise reduction in the PICNIC is "off" in case of a Columbus application). The 2D/3D Comb filter part is controlled by the Main software using the I2C bus.

9.5.2 2D/3D Comb Filter

Introduction

The "3D Comb filter Columbus" is a combined 2D/3D Comb filter function that is part of the Columbus chip (item 7752). It is a comb filter for both PAL and NTSC.

The 3D Comb filter is used to separate chroma and luminance components out of a CVBS signal. It is of no use when the CVBS signal is a SECAM signal (SECAM signals cannot be combed) The Columbus chip can be used with or without 16 Mbit external SDRAM (item 7753). When an external SDRAM is connected to the IC, the Comb filter function can work in combined 2D/3D processing (depending on the detected pixel based motion). When no external SDRAM is connected, only 2D Comb filtering is possible.

The Columbus can comb the following standard signals:

- PAL B, PAL G, PAL H, PAL I, PAL D, PAL K: Colour standard PAL, Colour carrier at 4.43 MHz, field frequency: 50 Hz
- PAL M: Colour standard PAL, Colour carrier at 3.58 MHz, field frequency: 60 Hz

- PAL N: Colour standard PAL, Colour carrier at 3.58 MHz, field frequency: 50 Hz
- NTSC M: Colour standard NTSC, Colour carrier at 3.58 MHz, field frequency: 60 Hz

For NTSC signals, the PAL delay line must always be bypassed.

The following signals CANNOT be combed:

- Double Window signals or Multi PIP. For these signals, only one part or even no part of the signal is in relation with the burst. The part that is not in relation with the burst can become very blurred when combed by the Columbus Comb filter. Such a signal must be bypassed. Notch mode is not even an option since e.g. in double window, one part can be a PAL signal while the other part is NTSC or SECAM.
- In cases where a SECAM signal is presented to the Columbus Comb filter; both the luminance and UV path must be bypassed. The PAL delay line inside the Columbus cannot be used for SECAM signals so it must also be bypassed. The luminance path must have luminance at its input instead of CVBS. A chroma delay line outside Columbus must be used for SECAM signals. Reason for this: the Columbus PAL delay line halves the output of the chroma signals in case of SECAM.
- Y/C, YPbPr, and RGB signals do not have to be combed. So both the luminance and UV path must be bypassed. The PAL delay line will also be bypassed.
- In cases where the Columbus Comb filter does not receive a CVBS signal with burst at the right place according to the standard (this includes black and white signals without burst), phase correction results become unpredictable and the Comb filter must be set in bypass (= luminance path bypassed, UV path bypassed, PAL delay line bypassed)
- VCR signals cannot be combed and must be processed in notch mode, or bypassed.

Columbus Modes

The several modes of the Columbus 3D Comb filter are:

- Bypass mode.
- Band-Pass-Notch mode.
- 2D Comb filter modes.
 - Simple median.
 - Median.
- Field Comb filter mode.
- Frame Comb filter mode.

Bypass Mode

The 3D Comb filter can be set in bypass mode. In this mode, the CVBS, U and V signals are just bypassed to the output.

Band-Pass-Notch Mode

This is a mode where no Comb filtering is applied. A "Band Pass Filter" is used to filter the chroma information out of the CVBS signal. A "Notch Filter" is used to subtract the sub carrier out of the CVBS in order to make a luminance signal without chroma sub carrier.

In terms of cross colour and cross luminance, this mode has the worst performance of all. It is only used on these signals where no comb filtering can be applied (non-standard signals and most VCR signals for example).

2D Comb filter modes

A Comb filter does an action on a current pixel and a delayed pixel. When the delayed pixel is a line-delayed pixel, we talk about a "Spatial or 2D Comb Filter" (for NTSC the delay must be 1 line, for PAL it must be 2 lines).

Spatial or 2D Comb filters show problems on vertical colour transients and on single coloured lines. For these situations, extra hardware is added in the Columbus chip to avoid these kinds of problems. However even with these extra measures, there are still situations where the 2D Comb filter does not perform optimally (diagonal resolution and single lines with equal luminance content). In order to restrict the working area

of the 2D Comb filter to the frequencies where the sub carrier is present, a horizontal band pass filter always precedes a 2D Comb filter.

When a 2D Comb filter has no extra hardware to avoid problems at vertical colour transients (or this extra hardware is switched “off”), the Comb filter is called a “simple median filter”. When there is extra hardware to avoid these kinds of problems, the filter is called a “median filter”.

Field Comb filter mode

A Comb filter does an action on a current pixel and a delayed pixel. When the delayed pixel is a field-delayed pixel, we talk about a “Field Comb Filter”. Field Comb filters are only for PAL of commercial interest.

Field Comb filters show also problems on vertical colour transients and on motion. For the vertical transients, a hanging dots detector has been added, however the performance on vertical transients of the field Comb filter, even with this hanging dots detector, is worse than the performance of the 2D Comb filter. On motion, the field Comb filter performs very badly. A motion detector must detect the pixels where there is motion and on these pixels, the Comb filter must be forced back to 2D Comb filter mode. This switching back is not implemented with a hard switch, but with a motion controlled fader. When there is a lot of motion, the fader will take a lot of the 2D Comb filter output, when there is less motion, more field-combed signal will be taken.

A field Comb filter is also called a “vertical-temporal filter” because it filters in the vertical and temporal direction.

Frame Comb filter mode

A Comb filter does an action on a current pixel and a delayed pixel. When the delay is a frame, we talk about a “Frame Comb Filter”. For NTSC we need a delay of one frame, for PAL however the delay must be two frames.

Frame Comb filters have the best performance, but just like the Field Comb filter, they perform very badly on motion. A motion detector will have to detect motion and on these motion pixels, 2D Comb filtering will have to be applied. A frame Comb filter is a pure “temporal filter”.

The Columbus needs an external memory connected to it, before it can do a temporal or vertical-temporal Comb filter action. When no external memory is connected, field or frame Comb filtering is impossible.

Block Diagram

The signal CVBS-TXT that used to go to the “old” Comb filter (item 7307 in EM5.1E) is here re-routed via an emitter follower (7320) to the Y and C input of the HIP. The chroma demodulator in the HIP demodulates the CVBS to U and V signals. These signals are sent to the HIP output together with the CVBS signal. So, the HIP delivers CVBS (and not Y), U, and V to the PICNIC.

Note: All these signals are not combed and have no notch filter either, so there is a lot of cross color and cross luma present.

In the next block diagram, two main parts of the Columbus 2D/3D Comb filter can be seen:

- The upper part is what is called the luminance Comb filter. It tries to make an as clean as possible luminance signal out of the CVBS signal at the input.
- The lower part receives U and V signals (sequentially) that are normally only band pass filtered in front of the 3D Comb filter. It filters all left over luminance signals out of it, in order to make an as clean as possible U and V signal.

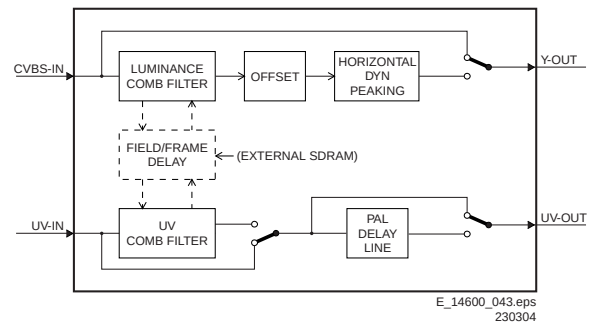


Figure 9-1 Columbus 2D/3D Comb filter block diagram

The Comb filter has two inputs. One is the CVBS where clean luminance (Y) will be extracted from; the other one is UV where a clean U and V signal will be extracted. Both input signals are **digital** signals.

The field or frame delay is used for the Field and Frame Comb filter mode. An external memory connected to the Columbus IC provides this delay.

Phase correction is done at the inputs of both the Comb filter blocks. There is a phase correction for spatial filtering (called the spatial phase corrector) and a separate phase correction on the signals used for temporal (Frame or Field) Comb filtering (called the temporal phase corrector).

The offset block receives the motion dependant 2D/3D Comb filtered signal as input. The black level of the luminance signal is restored and the result is output. The black level restoration is corrected continuously. However, on VCR signals, this restoration can become unstable. Therefore, on VCR signals, a fixed black level restoration value must be forced.

A horizontal dynamic peaking can be done on the luminance signal. This peaking is adaptive in order not to amplify any cross luminance distortion. It detects where there could be left over sub carrier in the luminance signal and reduces the peaking over there. The detection of the left over cross luminance is different depending on the pre-filter or post-filter mode.

The amount of peaking and coring can be chosen. The peaking algorithm behind it is a simplified copy of the luminance peaking of picnic. After the peaking block, the signal is output as clean luminance.

The bypass switches have the obvious purpose of bypassing the input signal, in case no Comb filtering is wanted.

A PAL delay line is added in the UV path. This is done because a delay line in front of the 3D Comb filter does need an extra vertical filter action on the UV signals. This vertical filtering deteriorates the vertical transient performance for colours. The Columbus Comb filter cannot undo this. However, this reduction in performance can be omitted by putting the PAL delay line after the 3D Comb filter block. For PAL signals, the PAL delay line in front of the Columbus 3D Comb filter is bypassed and the Columbus delay line is switched “on”. In cases where the delay line in front of Columbus cannot be bypassed, the Columbus PAL delay line is bypassed.

For NTSC signals, the PAL delay line is bypassed as usual.

9.5.3 Noise Reduction and Noise Estimator

The noise reduction function is a sophisticated successor of the noise reduction module from the PICNIC-chip, also known as "LIMERIC".

Besides the noise reduction part, the Columbus noise reduction module also comprises a noise estimator. This noise estimator (the LORE-noise estimator) is a new design with the ambition of more accuracy and with less control complexity than the existing noise estimators.

9.6 FEM (Falconic Embedded Memory)

The FEM IC (SAA4998) is the successor of the SAA4993H, and adds "jagged line removal" and "embedded field memories" as new/improved features.

9.6.1 Motion Estimation/Compensation

The FEM utilizes a high quality motion estimator. The motion estimation is applied to eliminate the motion blur of current 100 Hz TV sets and to eliminate the motion judder of movies. This judder is visible on all television sets and even in a cinema. Particularly for movies (with only 25 pictures/second), the increased number of pictures helps to smoothen the motion. These improvements a.o. lead to a picture performance improvement on a global scale, with an optimal quality independent from the received standard (50/60 Hz and/or video/film) or display mode (field doubling/de-interlaced 1fV). Especially film judder removal from a 60 Hz input source, the so-called 3-2 pull down film mode, makes the FEM globally applicable.

9.6.2 4:2:2 processing

The colour data path in the FEM is implemented in 4:2:2 bandwidth (as in PICNIC). The 4:2:2 mode requires an Field Memory (FM1) of 16 bits wide.

9.6.3 Upconversion

The FEM is always used in combination with the Eagle. Therefore, the output is always adapted to the input of the Eagle. This 2fV/4fH signal is motion compensated. Only 3 out of 4 fields are correct motion compensated. The Eagle will only use these three correct motion compensated fields.

9.6.4 Dynamic Noise Reduction

For signals that have been affected by noise, improvement can be achieved by combining of the pixel values of the current and past fields of video. This is however only possible for those picture areas in which no movement occurs. If movement occurs in some area, only the information from the current field of video may be displayed for that area to prevent smearing, so noise reduction is not effective there.

To reduce loss of detail, the high frequencies can be bypassed. This can be done because the human eye is more sensitive to noise with low frequencies. The movement detection is implemented in the luminance channel and in the colour channel to reduce artefacts such as smearing.

9.6.5 Vertical Peaking

The vertical peaking circuit in FEM works on de-interlaced data, resulting in a double resolution (compared to PICNIC) high vertical frequency enhancement.

9.6.6 EDDI

EDDI is an Edge Dependent De-Interlacer. This improved de-interlacer, results in smaller jagged lines for video input sources (not for film sources!).

9.6.7 Strobe

Having a FEM in the data path, it is easy to create a still picture or freeze feature. A frame can be frozen once, or, using the strobe feature, repetitively after a certain programmable interval of time. The Eagle is used to make "still pictures".

9.7 Eagle

The Eagle has the following features:

- **Vertical upscaler.** Two fully programmable vertical upscalers are implemented in the Eagle chip, one for the luminance signal, and one for the colour difference signals. However, the number of output lines is never allowed to exceed 1024 lines per field including blanking. This means that 1050i/1250i is still possible.
- **Vertical Zoom.** The vertical zooming is done with the vertical upscaler of the Eagle instead of using the FEM upscaling. Zoom factors varying from 1 to 8 can be selected. Vertical compression is possible in 1fV up to a factor of 2.
- **Interlacer and horizontal upscaler.** Two fully programmable horizontal upscalers are implemented in the Eagle chip, one for the luminance signal, and one for the colour difference signals.
- **Continuous horizontal zoom/compression.** The horizontal zooming is done with the interlacer and horizontal upscaler of the Eagle instead of the PICNIC upscaling. In the Eagle, a digital sample rate converter can provide horizontal video compression up to 50 %, and up to 8 times zoom. In compress mode, a part of the screen remains unused. In this case, parts of the display can be filled in with a grey value, a colour, or other signal source that bypasses the Feature Box (TXT or another compressed picture).
- **Panorama.** A panoramic horizontal distortion on the picture can be applied to make a screen-fitting picture, without having black side panels, or lost video. This is mainly used to fit 4:3 pictures in a 16:9 display with a resulting correct aspect ratio in the middle of the screen and stretched video at the left and right sides. The inverse feature is called "amaronap" and can also be applied.
- **Sub pixel Luminance Transient Improvement (LTI):** The Eagle contains a horizontal and a vertical sub pixel LTI.
- **Peaking:** In the Eagle both horizontal and vertical luminance peaking is implemented. The horizontal peaking equals the peaking of the PICNIC. The vertical peaking is an addition of two fixed and one 9-taps fully programmable peaking filters.
 - Horizontal luminance peaking: Peaking in Eagle can be used in two ways:
 - a. The first way is to give the luminance a linear boost of the higher frequency ranges, which makes no distinction between small and large details or edges.
 - b. The other way is to use the peaking dynamically, in order to boost smaller details and provide less gain on large details and edges. The effect is detail enhancement without creation of unnatural large over- and undershoots on large details and edges.
 - Vertical luminance peaking: There are three vertical peaking filters. Two fixed vertical peaking filter and one fully programmable vertical peaking filter. The three filters all have their separate gain setting before the results are added. To avoid excessive gain settings a high peak suppression can be set to avoid excessive output results.

- **Colour Dependent Sharpness (CDS):** The colour dependent sharpness circuit increases the luminance sharpness in saturated red and magenta parts. The reduction of the normal peaking can be switched "on/off".

The below given colour features are implemented in the Eagle:

- **Digital Colour Transient Improvement (DCTI):** DCTI equals the PICNIC DCTI implementation with improved control range. The DCTI is done with Eagle i.s.o. PICNIC.
- **Skin tone correction:** The idea of Skin tone correction is to correct UV components corresponding to skin towards an "ideal" skin tone axis.
- **Blue Stretch:** This feature makes it possible to shift colours near white towards more bluish coloured white.
- **Green Enhancement:** This feature makes it possible to shift low saturated green colours towards more saturated green colours.
- **Colour Dependent Peaking (CDP):** When using luminance peaking, the viewer has the impression that the colour performance is somewhat lower than in the picture generated without the luminance peaking circuit. This impression is normal because no action was done in the colour channel to compensate for the change in the luminance channel. Locally, at the edge position the contrast has been increased without increase of the saturation at this point. That is why the viewer perceives less colour. To give the viewer the same colour impression as on the original picture, a correction to the colour has to be done at the same place where a change was made in the luminance. This is CDP.
- **Skin Tone Dependent Peaking (STDP):** The horizontal and vertical peaking can be reduced in skin tone areas to avoid that people become too old. Attenuation can be applied to both horizontal and vertical peaking.

9.8 Abbreviation list

2DNR	Spatial (2D) Noise Reduction	DYN-FASE-COR	Dynamic phase correction, to correct the phase of the H-drive
3DNR	Temporal (3D) Noise Reduction	Eagle	Feature box IC performing peaking, zooming and sub pixel LTI in both horizontal and vertical direction, CTI and other colour features
AARA	Automatic Aspect Ratio Adaptation: algorithm that adapts aspect ratio to remove horizontal black bars; keeping up the original aspect ratio	EHT	Extra High Tension
ACI	Automatic Channel Installation: algorithm that installs TV sets directly from cable network by means of a predefined TXT page	EHT-INFO	Extra High Tension information, used for contrast reduction, vertical and horizontal amplitude correction, beam current protection, and flash detection.
ADC	Analogue to Digital Converter	EPG	Electronic Program Guide: system used by broadcasters to transmit TV guide information (= NexTView)
AFC	Automatic Frequency Control: control signal used to tune to the correct frequency	EW	East West, related to horizontal deflection of the set
AGC	Automatic Gain Control: algorithm that controls the video input of the feature-box	EW-DRIVE	The drive signal for the EW-transistor
AM	Amplitude Modulation	EXT	External (source), entering the set via SCART or via cinches
ANR	Automatic Noise Reduction: one of the algorithms of Auto TV	FALCONIC	SAA4992H, Feature Box IC performing Digital Natural Motion, 3DNR, and vertical zoom and vertical peaking
AR	Aspect Ratio: 4 by 3 or 16 by 9	FBL	Fast Blanking: DC signal accompanying RGB signals
Artistic	See OTC 2.5: main processor	FBL-PIP	The fast blanking signal for PIP
ASF	Auto Screen Fit: algorithm that adapts aspect ratio to remove horizontal black bars but without throwing away video information	FBL-TXT	The fast blanking signal for TXT. It has a higher priority than FBL-PIP
ATV	See Auto TV	FBSO	Fixed Beam Current Switch Off, a 140 V dip detection to activate the black switch off circuit
AUDIO_C	Audio Centre	FBX	Feature Box: part of small signal / separate module which contains 100 Hz processing, extra featuring and AutoTV algorithms (FBX6= based on PICNIC, FBX7= based on PICNIC and Eagle)
AUDIO_L	Audio Left	FDS	Full Dual Screen
AUDIO_R	Audio Right	FILAMENT	Filament of CRT
AUDIO_SL	Audio Surround Left	FLASH	Flash memory
AUDIO-SR	Audio surround right	FM	Field Memory or Frequency Modulation
AUDIO_SW	Audio Subwoofer	G-TXT	Green teletext
Auto TV	A hardware and software control system that measures picture content, and adapts image parameters in a dynamic way	GND-DRIVE	A separate ground for the line drive towards the line driver
BC-PROT	Protection signal to the uP for a too high Beam Current.	HA50	Horizontal Acquisition 1fh: horizontal sync pulse coming out of the HIP
BG	System B and G	HD100	Horizontal Drive 2fh: horizontal sync pulse coming out of the feature-box
BLC-INFO	Black Current Info	HD at HOME	A signal from the OTC, to switch the HOP to the Pixel Plus standard (75 Hz frame)
B-SC1-IN	Blue SCART1 in	HFB	Horizontal Flyback Pulse: horizontal sync pulse from large signal deflection
B-SC2-IN	Blue SCART2 in	HIP	High-end video Input Processor (TDA9320): video and chroma decoder of EM5E
B-TXT	Blue teletext	HOP	High-end video Output Processor (TDA9330): video, sync, and geometry controller of EM5E
BOCMA	BiMOS One Chip Mid-end Architecture: integrated video and chroma decoder	HP	Headphone
CL	Constant Level: audio output to connect with an external amplifier	Interlaced	Scan mode where two fields are used to form one frame. Each field contains half the number of the total amount of lines. The fields are written in 'pairs', causing line flicker
ComPair	Computer aided rePair	Last Status	The settings last chosen by the customer, read, and stored in RAM or in the NVM. They are called at start-up of the set to configure it according the customers wishes
CRT	Cathode Ray Tube or picture tube	LDP	Line Deflection Protection signal, derived from the EW-current and voltage
CSM	Customer Service Mode	LED	Light Emitting Diode
CTI	Colour Transient Improvement: manipulates steepness of chroma transients		
CVBS	Composite Video Blanking and Synchronisation		
CVBS-TER	CVBS terrestrial		
DAC	Digital to Analogue Converter		
DBE	Dynamic Bass Enhancement: extra low frequency amplification		
DC-filament	Filament supply voltage		
DFU	Direction For Use: description for the end user		
DNR	Digital Noise Reduction: noise reduction feature of the box		
DPL	Dolby ProLogic		
DSP	Digital Signal Processing		
DST	Dealer Service Tool: special remote control designed for dealers to enter e.g. service mode		
DVD	Digital Versatile Disc		

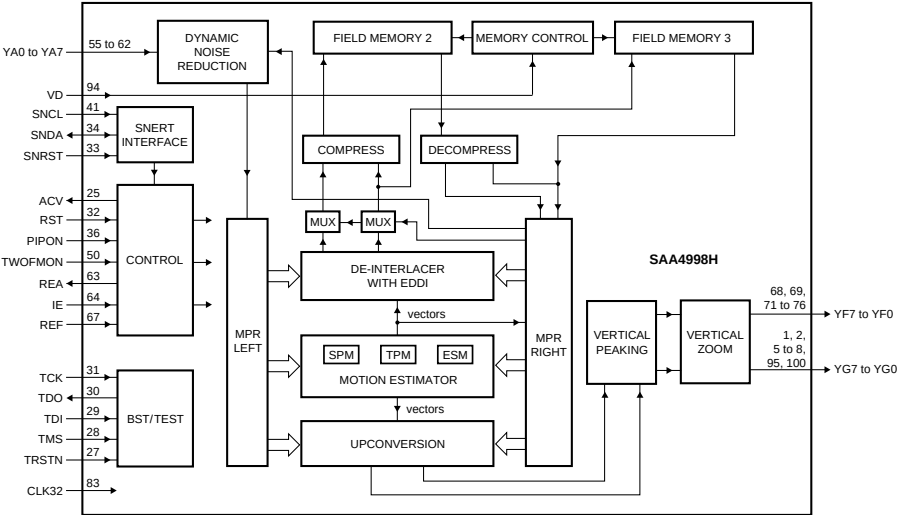
LINE DRIVE	Line drive signal (for the Line transistor)	VDS	Virtual Dolby Surround
LNA	Low Noise Adapter	VFB	Vertical Flyback Pulse: vertical sync pulse coming from the Feature Box
LORE	LOcal REgression based noise reduction	VL	Variable Level out: processed audio output towards external amplifier
LSP	Large signal panel	WYSIWYR	What You See Is What You Record: record selection that follows main picture and sound
MSP	Multi-standard Sound Processor: ITT sound decoder of EM5E	X-RAY-PROT	A protection signal for too high X-ray radiation
MUTE	Mute-Line	XTAL	Quartz crystal
NC	Not Connected	Y100	Y from Feature Box
NVM	Non Volatile Memory: IC containing TV related data e.g. alignments	Y-OUT	Luminance-signal to HOP IC
O/C	Open Circuit	YUV-Feat	The YUV input for the main picture, coming from the Feature box or the HIP
ON/OFF LED	On/Off control signal for the LED		
OSD	On Screen Display		
OTC	On screen display Teletext and Control; also named Artistic (SAA5800)		
P50	Project 50 communication: protocol between TV and peripherals		
PCB	Printed Circuit Board		
PICNIC	Peripheral Integrated Combined Network IC (SAA4978): main IC for 100 Hz featuring and feature processing		
PIP	Picture In Picture		
Progressive Scan	Scan mode where all scan lines are displayed in one frame at the same time, creating a double vertical resolution.		
PTP	Picture Tube Panel		
RAM	Random Access Memory		
R-TXT	Red teletext		
RC	Remote Control		
RC5 / RC6	Signal protocol from the remote control receiver		
RESET	Reset signal		
RGB-PIP	RGB-input for PIP		
RGB-TXT	RGB-input for Teletext and OSD		
RGB-VC	RGB-input to the Picture Tube Panel		
ROM	Read Only Memory		
SAM	Service Alignment Mode		
SC	Sandcastle: two-level pulse derived from sync signals		
S/C	Short Circuit		
SCAVEM	Scan Velocity Modulation		
SCL-F	Clock signal on fast I2C bus		
SD	Standard Definition		
SDA-F	Data signal on fast I2C bus		
SIF	Sound Intermediate Frequency		
SIMM	80-fold connector between LSP and SSB		
SNERT	Synchronous No parity Eight bit Reception and Transmit		
SSB	Small Signal Board		
STBY	Standby		
SW	Subwoofer		
SWAN	Spatial Weighted Averaging Noise reduction		
TXT	Teletext		
TXT-DS	Teletext Dual Screen		
TXT-KILL	To kill the TXT picture to insert a PIP. It has a higher priority than FBL-TXT.		
uP	Microprocessor		
U100	U from Feature Box		
V100	V from Feature Box		
VA50	Vertical Acquisition 1Fh		
VBAT	Main supply for deflection (mostly 141 V)		
VD100	Vertical Drive 2fh: vertical sync pulse from deflection		
VDPOS	One of the symmetrical drive signals for the DC frame output stage.		
VDNEG	One of the symmetrical drive signals for the DC frame output stage.		

9.9 IC Data Sheets

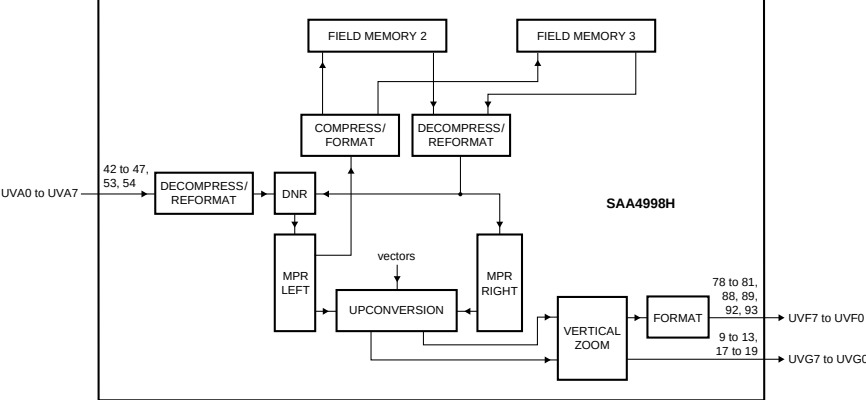
In this paragraph, the internal block diagrams and pinning are given of ICs that are drawn as a 'black box' in the electrical diagrams (with the exception of 'memory' and 'logic' ICs).

9.9.1 Diagram B3B, SAA4998 (IC7760)

Block diagram of the luminance part in full FALCONIC mode.



Block diagram of the chrominance part in full FALCONIC mode.



Pin configuration

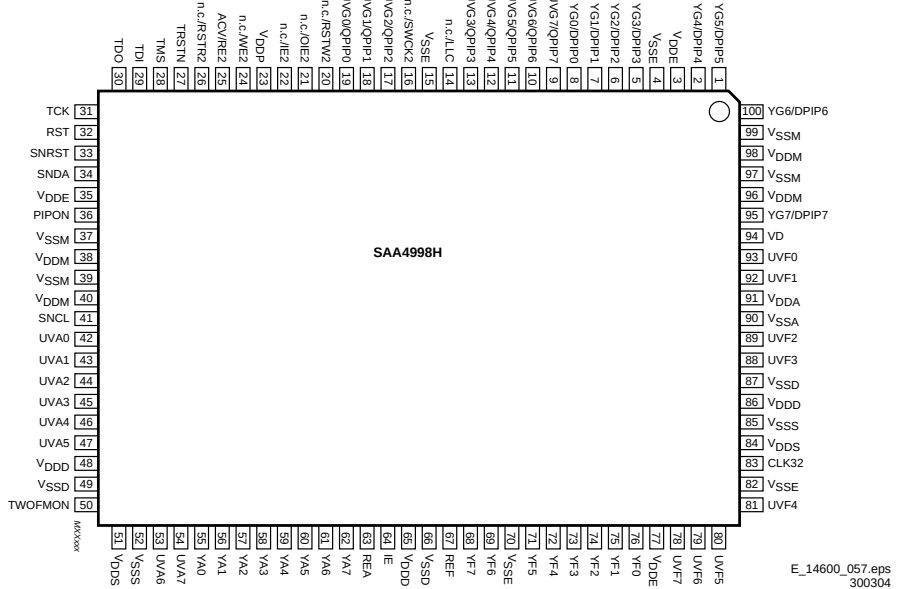
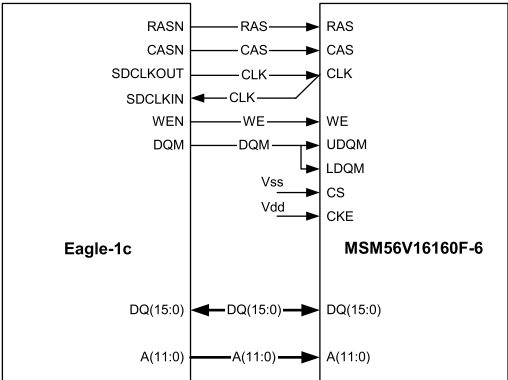


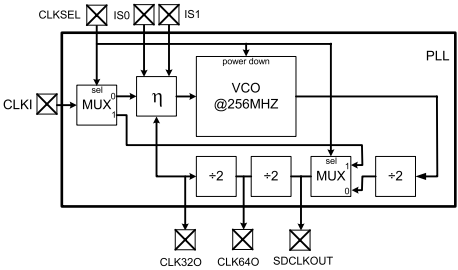
Figure 9-2 Internal Block Diagram and Pin Configuration.

9.9.2 Diagram B3C, T6TU5EF (IC7720)

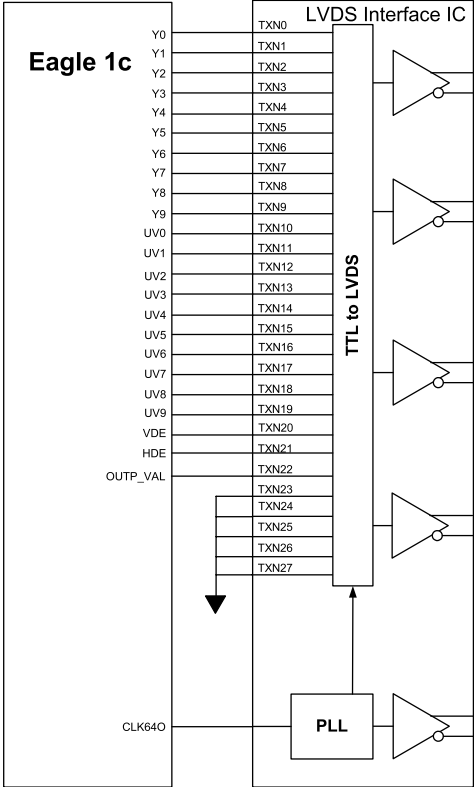
Interface between Eagle and External SDRAM



Internal Clock generation



EAGLE IC digital output interface to LVDS device



208	Y07	156	VSS2
207	Y06	155	AVSPLL
206	Y05	154	NC
205	Y04	153	NC
204	Y03	152	AVDPLL
203	Y02	151	VDDC
202	Y01	150	VSS2
201	Y00	149	VDD5
200	VSS2	148	VSS
199	VDDC	147	CLK320
198	VDD5	146	DQM
197	UVF7	145	VSS
196	UVF6	144	VSS2
195	UVF5	143	VDDC
194	UVF4	142	WEN
193	UVF3	141	CASN
192	UVF2	140	RASN
191	UVF1	139	VDD5
190	UVF0	138	ADDR11
189	DQ15	137	ADDR10
188	DQ14	136	ADDR9
187	DQ13	135	VSS
186	DQ12	134	ADDR1
185	DQ11	133	ADDR2
184	DQ10	132	ADDR3
183	DQ9	131	VDDC
182	DQ8	130	VSS2
181	DQ7	129	SDCLKOUT
180	DQ6	128	SDCLKIN
179	DQ5	127	ADDR9
178	DQ4	126	ADDR8
177	DQ3	125	VDD5
176	DQ2	124	VSS
175	DQ1	123	VSS2
174	DQ0	122	ADDR7
173	VSS	121	ADDR6
172	VDD5	120	ADDR5
171	VDDC	119	ADDR4
170	DQ27	118	CLK640
169	DQ26	117	VSS
168	DQ25	116	Y0
167	DQ24	115	Y1
166	DQ23	114	VSS2
165	DQ22	113	VDDC
164	DQ21	112	VDD2
163	DQ20	111	VDD
162	DQ19	110	Y2
161	DQ18	109	Y3
160	DQ17	108	VSS2
159	DQ16	107	VSS
158	DQ15	106	Y4
157	DQ14	105	Y5
156	DQ13	104	VDD2
155	DQ12	103	VDD1
154	DQ11	102	VDD0
153	DQ10	101	VDD0
152	DQ9	100	VDD0
151	DQ8	99	VDD0
150	DQ7	98	VDD0
149	DQ6	97	VDD0
148	DQ5	96	VDD0
147	DQ4	95	VDD0
146	DQ3	94	VDD0
145	DQ2	93	VDD0
144	DQ1	92	VDD0
143	DQ0	91	VDD0
142	VSS	90	VDD0
141	VDD5	89	VDD0
140	VDDC	88	VDD0
139	VSS2	87	VDD0
138	VSS	86	VDD0
137	VSS2	85	VDD0
136	VSS	84	VDD0
135	VSS2	83	VDD0
134	VSS	82	VDD0
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71	VSS2	19	VDD0
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69	VSS2	17	VDD0
68	VSS	16	VDD0
67	VSS2	15	VDD0
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62	VSS	10	VDD0
61	VSS2	9	VDD0
60	VSS	8	VDD0
59	VSS2	7	VDD0
58	VSS	6	VDD0
57	VSS2	5	VDD0
56	VSS	4	VDD0
55	VSS2	3	VDD0
54	VSS	2	VDD0
53	VSS2	1	VDD0
52	VSS	0	VDD0

Eagle 1C

Figure 9-3 Internal Block Diagrams

9.9.3 Diagram B3D, T6TU5XB (IC7752)

Figure 1 Package outline (top view)

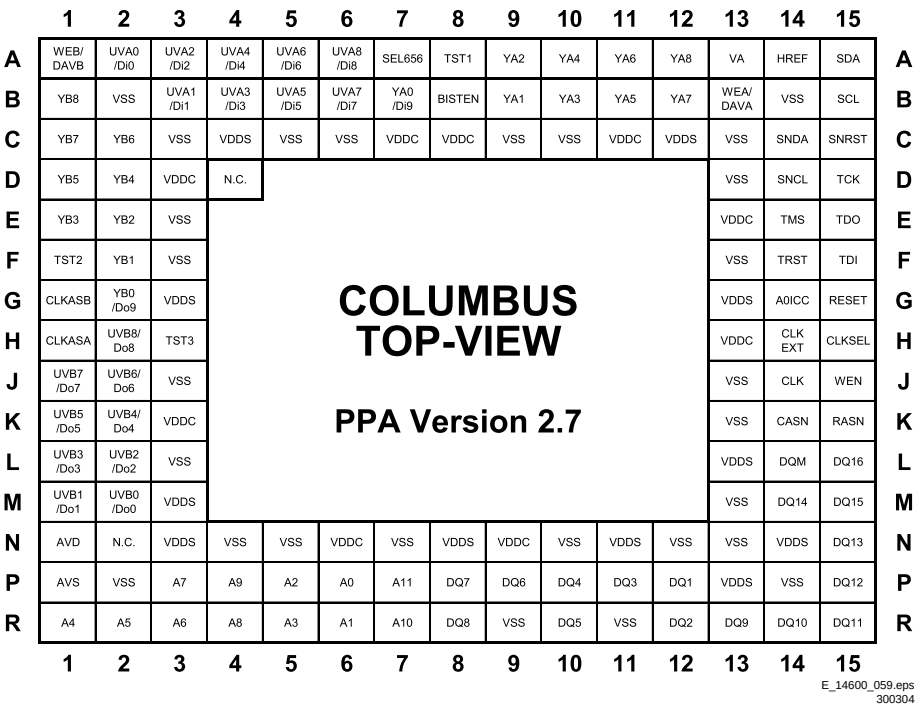


Figure 9-4 Pin Configuration

10. Spare Parts List

Set Level

Various

0005	3104 328 27731	Cabinet 32" assy
0005	3104 328 27771	Cabinet 28" assy
0010	3104 308 11221	Back cover assy 32"
0010	3104 308 11231	Back cover assy 28"
0020	3104 304 21091	Corner coil bracket
0020	3104 304 25712	Corner bracket deg.coil
0021	3104 304 21091	Corner coil bracket
0021	3104 304 25712	Corner bracket deg.coil
0022	3104 304 21031	Rot. coil bracket
0024	4822 404 31341	Coil clamp
0032	3104 304 26161	Bottomplate
0038	3104 304 24911	SSB bracket top
0062	3104 301 24021	PTP spring
0108	4822 404 31443	Relief
0290	3111 254 23481	Coil & clamp
1099▲	9301 899 90301	W66ERF042X044
1099▲	9322 173 93682	W76EKW10X73
1116	3104 328 30551	Side I/O assy
1180	3104 328 12141	DC-shift assy
8190	4622 007 51632	Mainscord UK 2mtr.
8190	4622 009 50531	Mainscord EU 2mtr.



5203▲	2422 549 44621	Coil 28"
5203▲	3104 308 20401	Degaussing coil 32"
5205	3128 138 60661	Canceller coil

Large Signal Panel [A]

Various

0011	3104 308 78231	Transistor cooling clip
0020	4822 492 70789	Fix transistor
0030	3104 304 23001	LSP chassisframe
0030	3104 304 24873	LSP Chassis frame
0034	3104 304 23041	DAF bracket EMGS
0037	3104 304 24891	LOT bracket
0050	4822 466 93461	Insulating plate 20 X 25
0065	3104 304 22031	LOT spacer
0066	3104 304 23051	Conn. support EMGS
0067	3104 304 23061	Conn. part EMGS
0072	3104 304 24901	SSB bracket bot.
0080	4822 492 70789	Fix transistor
0125	3104 304 90361	Insulating plate
0320	4822 255 41371	Transistor clamp
0341	4822 492 63524	Transistor clamp
0395	4822 492 70789	Fix transistor
0396	4822 492 70789	Fix transistor
0505	4822 492 62076	Transistor clamp
1200	3139 147 19341	Tuner UV1318S/A I-3
1200	3139 147 19361	Tuner UV1318S/A I U-3
1205	2422 025 17242	Connector 80p f SIMM
1417	4822 265 20723	Connector 2p
1418	2422 025 16374	Connector 2p m
1419	4822 265 20723	Connector 2p
1424	2422 025 11244	Connector 7p m
1491	4822 267 10973	Connector 1p
1497	4822 267 10973	Connector 1p
1498	2422 025 04849	Connector 2p m
1499	2422 025 04849	Connector 2p m
1501	4822 070 35002	Fuse 5A
1502	4822 267 10774	Connector 2p male (red)
1503▲	4822 070 12502	Fuse 2.5A
1505	2422 025 16374	Connector 2p m
1511	4822 265 11253	Fuse holder
1512	4822 265 11253	Fuse holder
1520	3104 301 24181	Spring for Bracket
1521	3104 301 24181	Spring for Bracket
1522	4822 255 41371	Transistor clamp
1550▲	2422 132 07411	Relay 1p 5V 5A G5PA-1
1590	4822 252 60151	DSP-501N-A21F
1601▲	2422 086 10919	Fuse 65V 125mA
1620	4822 267 10735	Connector 3p
1625	2422 025 16382	Connector 3p m
1735	4822 267 10565	Connector 4p
1901	4822 267 10771	Socket 2 x SCART
1902	4822 267 10982	Connector 2p
1936	2422 025 12485	Connector 11p m
1940	2422 025 12485	Connector 11p m
1943	4822 267 10748	Connector 3p
1945	4822 267 10735	Connector 3p

1946	4822 265 41391	Connector 9p
1955	4822 267 10735	Connector 3p
8000	3104 311 03272	Cable 640mm EHT
8193▲	4822 320 20216	Focus cable 364 mm
8194▲	4822 320 20189	Cable HT-focus 44cm Rd
8400	2422 025 16691	Connector 3p m
8417▲	3104 311 04561	Cable 2p3/400/2p3
8424	3104 311 02991	Cable 7p/560/7p Wh
8498	3104 311 04531	Cable 2p/400/2p
8625▲	3104 311 03101	Cable 3p/560/3p Bk
8625	3104 311 04741	Cable 3p/180/3p
8940	3104 311 04651	Cable 11p/140/11p
8955	3104 311 01211	Cable 3p/140/3p Wh



2100	2252 811 95021	1nF 10% 250V
2101	4822 121 51598	2.2nF 5% 400V
2102▲	4822 124 40248	10µF 20% 63V
2103	2020 552 94427	100pF 5% 50V
2104	4822 123 14025	2200µF 20% 16V
2105	2020 552 94427	100pF 5% 50V
2106	4822 126 13751	47nF 10% 63V
2107▲	4822 121 43855	3.3nF 5% 400V
2108▲	4822 121 70162	10nF 5% 400V
2109	4822 126 14472	1µF 10% 10V 0805
2110	4822 126 14472	1µF 10% 10V 0805
2111▲	4822 121 43526	47nF 5% 250V
2112	5322 126 11583	10nF 10% 50V 0603
2114	2222 338 22104	100nF 20% 275V
2114	2222 338 23104	100nF 20% 275V
2115▲	4822 124 40764	22µF 100V
2116▲	4822 126 13682	100pF 5% 1kV
2118	4822 124 80061	1000µF 20% 25V
2119	4822 123 14025	2200µF 20% 16V
2120▲	4822 126 11524	1.5nF 10% 1kV
2126	4822 123 14025	2200µF 20% 16V
2130	5322 126 11583	10nF 10% 50V 0603
2131	4822 126 13881	470pF 5% 50V
2140▲	4822 124 40248	10µF 20% 63V
2141▲	4822 124 40248	10µF 20% 63V
2144	4822 126 14472	1µF 10% 10V 0805
2145	4822 126 13881	470pF 5% 50V
2147	3198 017 31530	15nF 20% 50V 0603
2148▲	4822 126 10206	2.2nF 10% 500V
2149	4822 126 14472	1µF 10% 10V 0805
2150	5322 126 11583	10nF 10% 50V 0603
2152▲	4822 121 70162	10nF 5% 400V
2154	3198 017 33330	33nF 20% 16V 0603
2154	4822 126 14549	33nF 16V 0603
2200▲	4822 124 40248	10µF 20% 63V
2201	4822 126 13879	220nF +80/-20% 16V
2202	4822 126 13473	220nF +80%/-20% 50V
2203▲	4822 124 80195	470µF 20% 10V
2400	2020 021 91445	47µF 20% 200V
2400	4822 124 11575	47µF 20% 160V
2401▲	4822 121 42077	6.8nF 10% 400V
2402	2020 012 93596	22µF 20% 250V
2403	2238 916 15641	22nF 10% 25V 0603
2404	2238 916 15641	22nF 10% 25V 0603
2412	3198 024 44730	47nF 50V 0603
2413▲	4822 124 12255	10µF 20% 50V
2414	3198 024 44730	47nF 50V 0603
2415	4822 126 13883	220pF 5% 50V
2417	4822 126 14076	220nF +80/-20% 25V
2419▲	4822 126 14237	470pF 10% 2kV
2420	4822 121 70581	1.5nF 5% 2kV
2420	4822 121 70595	1.2nF 5% 2kV
2421	2038 301 00312	1.2µF 5% 250V
2425▲	4822 121 10526	9.1nF 5% 2kV
2425	4822 121 70435	10nF 5% 2kV
2426	4822 121 10653	22nF 5% 630V
2430▲	4822 126 10206	2.2nF 10% 500V
2431▲	4822 126 10206	2.2nF 10% 500V
2433	2022 333 00163	360nF 5% 250V
2433	2222 479 90022	0.43µF 250V
2440	2022 552 05679	1µF 10% 16V 0805
2441	5322 122 32654	22nF 10% 63V 0805
2442	5322 122 31866	6.8nF 10% 63V
2443	9965 000 09661	470pF 50V 10%
2445	5322 122 32654	22nF 10% 63V 0805
2448	5322 122 32268	470pF 5% 50V 0805 NPO
2450▲	5322 121 42578	100nF 5% 250V
2451	2020 012 93757	1000µF 20% 10V
2454	3198 017 31530	15nF 20% 50V 0603
2455	5322 126 11578	1nF 10% 50V 0603
2457	2020 552 96804	15nF 10% 50V 0805
2458	4822 126 14241	330pF 0603 50V
2460	4822 124 81144	1000µF 16V

2461	4822 122 31169	1.5nF 10% 500V
2462	4822 124 80061	1000µF 20% 25V
2463▲	4822 122 31177	470pF 10% 500V
2464	4822 124 80061	1000µF 20% 25V
2465▲	4822 122 31177	470pF 10% 500V
2466	2238 586 59812	100nF 20% 50V 0603
2468▲	4822 122 31177	470pF 10% 500V
2480	5322 126 11582	6.8nF 10% 63V
2482	3198 017 34730	47nF 16V 0603
2483	4822 126 14238	2.2nF 50V 0603
2490	2020 021 91773	100µF 20% 10V
2490▲	9965 000 14169	100µF 10V 20%
2491▲	4822 124 81151	22µF 50V
2492▲	9965 000 14169	100µF 10V 20%
2494	2238 780 15654	220nF 10% 16V 0805
2495	2020 552 96326	220nF 10% 16V
2495	2238 780 15654	220nF 10% 16V 0805
2497	4822 126 12105	33nF 5% 50V 0805
2499	5322 126 11579	3.3nF 10% 63V
2501	4822 126 13449	1nF 10% 2kV
2501	4822 126 14053	1nF 10% 2kV
2503▲	5322 121 42489	33nF 5% 250V
2504	2238 916 15641	22nF 10% 25V 0603
2505	2252 811 95018	2.2nF 20% 250V
2506▲	5322 121 42386	100nF 5% 63V
2507	2222 338 22474	470nF 20% 275V
2508	2222 338 23223	22nF 20% 275V
2508	4822 124 11913	22nF 20% 275V
2509	2222 338 23223	22nF 20% 275V
2509	4822 124 11913	22nF 20% 275V
2510	4822 126 13449	1nF 10% 2kV
2510	4822 126 14053	1nF 10% 2kV
2511	4822 124 12417	2200µF 20% 25V
2512	4822 124 12417	2200µF 20% 25V
2513	4822 126 13881	470pF 5% 50V
2514	4822 126 14238	2.2nF 50V 0603
2515	4822 124 80096	47µF 200V
2516	2020 024 90743	220µF 20% 400V
2517▲	4822 121 70162	10nF 5% 400V
2518▲	4822 122 31211	100pF 10% 500V
2519▲	4822 126 10206	2.2nF 10% 500V
2520	2222 338 22104	100nF 20% 275V
2520	2222 338 23104	100nF 20% 275V
2522▲	4822 126 10206	2.2nF 10% 500V
2525	4822 126 14247	1.5nF 50V 0603
2528	4822 126 14472	1µF 10% 10V 0805
2530	4822 126 14472	1µF 10% 10V 0805
2531▲	4822 122 31177	470pF 10% 500V
2535	4822 126 13193	4.7nF 10% 63V
2537	2222 338 23223	22nF 20% 275V
2537	4822 124 11913	22nF 20% 275V
2538	4822 122 33177	10nF 20% 50V
2540▲	4822 124 40248	10µF 20% 63V
2541▲	4822 122 31211	100pF 10% 500V
2542	4822 124 80061	1000µF 20% 25V
2543	4822 124 80061	1000µF 20% 25V
2544	4822 126 14238	2.2nF 50V 0603
2601	2238 586 59812	100nF 20% 50V 0603
2603	4822 126 13883	220pF 5% 50V
2604	4822 126 13473	220nF +80%/-20% 50V
2605	4822 126 13883	220pF 5% 50V
2620	4822 126 13473	220nF +80%/-20% 50V
2621	2238 586 59812	100nF 20% 50V 0603
2622▲	4822 124 40255	100µF 20% 63V
2623	4822 126 14238	2.2nF 50V 0603
2624▲	4822 121 51319	1µF 10% 63V
2625▲	4822 121 51319	1µF 10% 63V
2627▲	5322 124 40641	10µF 20% 100V
2628▲	4822 124 40255	100µF 20% 63V
2630	4822 126 14491	2.2µF 10V 0805
2631	4822 126 14491	2.2µF 10V 0805
2633	5322 126 11579	3.3nF 10% 63V
2635	2238 586 59812	100nF 20% 50V 0603
2642▲	4822 124 40255	100µF 20% 63V
2653	5322 126 11579	3.3nF 10% 63V
2656	2238 916 15641	22nF 10% 25V 0603
2657	2238 916 15641	22nF 10% 25V 0603
2659	2238 916 15641	22nF 10% 25V 0603
2660	5322 126 11578	1nF 10% 50V 0603
2702	3198 016 31020	1nF 25V 0603
2704	3198 016 31020	1nF 25V 0603
2705	4822 126 13482	470nF +80%/-20% 16V
2706	4822 126 14585	100nF 10% 0805 50V
2707	4822 126 14076	220nF +80/-20% 25V
2708	4822 126 14076	220nF +80/-20% 25V
2709	4822 126 13881	470pF 5% 50V
2710	4822 126 13881	470pF 5% 50V
2711	3198 016 31020	1nF 25V 0603
2712	2020 552 96683	220nF 10% 50V

2713	4822 126 14076	220nF +80/-20% 25V	3142	4822 051 30332	3.3Ω 5% 0.062W	3487	5322 117 13056	8.2kΩ 1% 0.063W 0603
2714	3198 017 33330	33nF 20% 16V 0603	3143	4822 051 30101	100Ω 5% 0.062W	3488	4822 050 21005	1MΩ 1% 0.6W
2714	4822 126 14549	33nF 16V 0603	3144	4822 116 83883	470Ω 5% 0.5W	3489	4822 051 30103	10kΩ 5% 0.062W
2715	3198 016 31020	1nF 25V 0603	3150	4822 117 11373	100Ω 1% 0805	3490	4822 051 30332	3.3Ω 5% 0.062W
2716	4822 126 14241	330pF 0603 50V	3151	4822 051 30109	10Ω 5% 0.062W	3491	4822 117 12925	47kΩ 1% 0.063W 0603
2717▲	5322 121 42498	680nF 5% 63V	3152	4822 051 30102	1kΩ 5% 0.062W	3492	4822 116 52175	100Ω 5% 0.5W
2718	2222 867 15339	33pF 5% 50V 0603	3153	4822 051 20472	4.7kΩ 5% 0.1W	3493	4822 050 21504	150kΩ 1% 0.6W
2719	3198 016 31020	1nF 25V 0603	3155	4822 051 30101	100Ω 5% 0.062W	3496	4822 051 30272	2.7kΩ 5% 0.062W
2720	4822 126 14076	220nF +80/-20% 25V	3156	5322 117 13017	100Ω 1% 0.063W 0603	3497	4822 051 30333	33kΩ 5% 0.062W
2721	4822 126 13881	470pF 5% 50V	3157	4822 051 30103	10kΩ 5% 0.062W	3501	4822 116 83872	220Ω 5% 0.5W
2722	4822 126 13881	470pF 5% 50V	3158	2322 704 64709	47Ω 1% 0.063W 0603	3504	4822 051 30222	2.2kΩ 5% 0.062W
2724	2020 552 96683	220nF 10% 50V	3158	5322 117 13021	47Ω 1% 0.063W 0603	3505	4822 116 52257	22kΩ 5% 0.5W
2726	3198 017 33330	33nF 20% 16V 0603	3159	4822 051 30103	10kΩ 5% 0.062W	3506	4822 051 30562	5.6kΩ 5% 0.063W 0603
2726	4822 126 14549	33nF 16V 0603	3160	4822 051 30102	1kΩ 5% 0.062W	3507	4822 050 21604	160kΩ 1% 0.6W
2727	3198 016 31020	1nF 25V 0603	3161▲	4822 052 10221	220Ω 5% 0.33W	3508	4822 116 52182	15Ω 5% 0.5W
2728	4822 126 14241	330pF 0603 50V	3162	4822 116 83883	470Ω 5% 0.5W	3509	2122 550 00158	VDR 1mA 612V
2729▲	5322 121 42498	680nF 5% 63V	3164	4822 117 13632	100kΩ 1% 0603 0.62W	3510	4822 117 11454	820Ω 1% 0.1W
2777	2020 552 96684	470nF 10% 25V 0805	3165	4822 051 30331	330Ω 5% 0.062W	3511	4822 053 11222	2.2kΩ 5% 2W
2778▲	4822 124 41751	47μF 20% 50V	3168	4822 051 20472	4.7kΩ 5% 0.1W	3512	4822 117 12891	220kΩ 1%
2779	2020 552 96684	470nF 10% 25V 0805	3170	4822 116 52291	56kΩ 5% 0.5W	3513	4822 116 52272	330k 5% 0.5W
2780	2020 552 96684	470nF 10% 25V 0805	3200	4822 117 11373	100Ω 1% 0805	3514	2322 193 53397	0.39Ω 5% 0.6W
2781	2020 552 96684	470nF 10% 25V 0805	3201	4822 117 11373	100Ω 1% 0805	3515	2322 193 53397	0.39Ω 5% 0.6W
2786	2238 916 15641	22nF 10% 25V 0603	3210	4822 051 30102	1kΩ 5% 0.062W	3517	4822 117 10834	47kΩ 1% 0.1W
2800	2222 375 90188	390pF 5% 2kV	3211	4822 051 30222	2.2kΩ 5% 0.062W	3518	4822 116 52245	150kΩ 5% 0.5W
2821	2222 479 90166	68pF 5% 400V	3212	4822 051 30101	100Ω 5% 0.062W	3519	4822 051 30102	1kΩ 5% 0.062W
2890	2222 375 90188	390pF 5% 2kV	3213	4822 116 52182	15Ω 5% 0.5W	3520	4822 053 11333	33kΩ 5% 2W
2914▲	4822 124 40248	10μF 20% 63V	3250	4822 051 20223	22kΩ 5% 0.1W	3521	4822 053 21475	4.7MΩ 5% 0.5W
2915▲	4822 124 12255	10μF 20% 50V	3261	4822 117 11373	100Ω 1% 0805	3522	4822 117 11507	6.8kΩ 1% 0.1W
2917	4822 126 14585	100nF 10% 0805 50V	3262	4822 117 11373	100Ω 1% 0805	3523	4822 051 20105	1MΩ 5% 0.1W
2929	4822 126 13879	220nF +80-20% 16V	3400	4822 052 11108	1Ω 5% 0.5W	3524	4822 051 30333	33kΩ 5% 0.062W
2940▲	9965 000 14169	100μF 10V 20%	3401	2120 105 93473	27Ω 5% 3W	3525	4822 051 30479	47Ω 5% 0.062W
2941	4822 126 14585	100nF 10% 0805 50V	3402	4822 053 10121	120Ω 5% 1W	3526	4822 116 83303	0.1Ω 2W
2942	4822 126 14585	100nF 10% 0805 50V	3403	4822 116 52175	100Ω 5% 0.5W	3527	4822 117 11951	2kΩ 1% 0.1W
2943	4822 126 14585	100nF 10% 0805 50V	3404	4822 051 30471	47Ω 5% 0.062W	3528	4822 051 30103	10kΩ 5% 0.062W
2944	4822 126 13879	220nF +80-20% 16V	3406	4822 117 11373	100Ω 1% 0805	3529	4822 051 30472	4.7Ω 5% 0.062W
2945	4822 126 14491	2.2μF 10V 0805	3407	4822 051 30103	10kΩ 5% 0.062W	3530	4822 051 30102	1kΩ 5% 0.062W
2946	4822 126 14491	2.2μF 10V 0805	3409	4822 050 11002	1kΩ 1% 0.4W	3531	4822 117 11507	6.8kΩ 1% 0.1W
2947	2020 012 93843	4.7μF 20% 50V	3410	4822 051 20479	47kΩ 5% 0.1W	3532	4822 117 12925	47kΩ 1% 0.063W 0603
2947	2020 021 90141	4.7μF 20% 50V	3411	2122 101 02111	39Ω 5% 0.5W	3533	4822 116 52182	15Ω 5% 0.5W
2948	9965 000 14169	100μF 10V 20%	3412	4822 117 11817	1.2kΩ 1% 0.0625W	3534	4822 117 12925	47kΩ 1% 0.063W 0603
2949	9965 000 14169	100μF 10V 20%	3414	4822 051 30331	330Ω 5% 0.062W	3535	4822 051 30479	47Ω 5% 0.062W
2950	5322 126 11583	10nF 10% 50V 0603	3415	3198 012 31590	15Ω 5% 3W	3536	4822 052 10102	1kΩ 5% 0.33W
2951	5322 126 11583	10nF 10% 50V 0603	3417	4822 116 52176	10Ω 5% 0.5W	3537	4822 116 52182	15Ω 5% 0.5W
2952	5322 126 11578	1nF 10% 50V 0603	3418	4822 050 25603	56kΩ 1% 0.6W	3540	4822 050 23303	33kΩ 1% 0.6W
2985	4822 126 14315	390pF 5% 50V 0603	3419	4822 051 30474	470kΩ 5% 0.062W	3543	4822 050 24708	4.7Ω 1% 0.6W
2987	5322 122 31863	330pF 5% 63V 0805	3420	4822 051 30332	3.3Ω 5% 0.062W	3547	4822 051 30008	Jumper 0603
2989	5322 122 31863	330pF 5% 63V 0805	3421	4822 051 30474	470kΩ 5% 0.062W	3549	2322 704 62204	220kΩ 1% 0.063W 0603
2990	5322 122 31863	330pF 5% 63V 0805	3422	4822 051 30332	3.3Ω 5% 0.062W	3549	5322 117 13039	222kΩ 1% 0.063W 0603
2991	5322 122 32531	100pF 5% 50V	3423	4822 053 10688	6.8Ω 5% 1W	3550	2122 663 00018	PTC 4.7Ω 20%
2992	5322 122 31863	330pF 5% 63V 0805	3425	4822 116 52176	10Ω 5% 0.5W	3551	4822 116 83872	220Ω 5% 0.5W
2993	5322 122 32531	100pF 5% 50V	3426	4822 116 52176	10Ω 5% 0.5W	3552	4822 051 30222	2.2kΩ 5% 0.062W
2994	5322 122 31863	330pF 5% 63V 0805	3427	4822 051 30105	1MΩ 5% 0.062W	3553	4822 051 30103	10kΩ 5% 0.062W
2995	5322 122 31863	330pF 5% 63V 0805	3427	4822 051 30684	680kΩ 5% 0.062W	3610	4822 051 30223	22kΩ 5% 0.062W
2996	5322 122 31863	330pF 5% 63V 0805	3429	4822 051 30105	1MΩ 5% 0.062W	3611	4822 051 30222	2.2kΩ 5% 0.062W
2997	5322 122 31863	330pF 5% 63V 0805	3431	2306 207 03151	150Ω 5% 0.5W	3620	2122 101 02083	1.5Ω 5% 0.5W
2998	5322 122 32531	100pF 5% 50V	3437	4822 051 20109	10Ω 5% 0.1W	3620	4822 050 21808	1.8Ω 1% 0.6W
2999	5322 122 32531	100pF 5% 50V	3440	4822 051 30102	1kΩ 5% 0.062W	3621	4822 116 80176	1Ω 5% 0.5W
			3441	4822 051 30223	22kΩ 5% 0.062W	3622	2122 101 02083	1.5Ω 5% 0.5W
			3442	4822 051 30474	470kΩ 5% 0.062W	3622	4822 116 80176	1Ω 5% 0.5W
			3443	4822 051 30684	680kΩ 5% 0.062W	3623	4822 116 52151	18kΩ 5% 0.5W
			3444	4822 051 20108	1Ω 5% 0.1W	3624	4822 052 10158	1.5Ω 5% 0.33W
			3447	4822 117 11373	100Ω 1% 0805	3625	4822 053 10121	120Ω 5% 1W
			3449	4822 052 10101	100Ω 5% 0.33W	3625	4822 116 52219	330Ω 5% 0.5W
			3450	4822 050 21003	10kΩ 1% 0.6W	3626	4822 116 52199	68Ω 5% 0.5W
			3450	4822 116 52238	12kΩ 5% 0.5W	3626	4822 116 52219	330Ω 5% 0.5W
			3451	4822 050 21003	10kΩ 1% 0.6W	3627	4822 051 20223	22kΩ 5% 0.1W
			3454	4822 051 20108	1Ω 5% 0.1W	3630	4822 051 30333	33kΩ 5% 0.062W
			3454	4822 051 20223	22kΩ 5% 0.1W	3631	4822 051 30222	2.2kΩ 5% 0.062W
			3455	4822 117 12902	8.2kΩ 1% 0.063W 0603	3632	4822 051 30393	39kΩ 5% 0.062W
			3455	5322 117 13056	8.2kΩ 1% 0.063W 0603	3633	4822 051 30563	56kΩ 5% 0.062W
			3456	4822 117 12903	1.8kΩ 1% 0.063W 0603	3634	4822 116 83882	39kΩ 5% 0.5W
			3457	4822 051 30152	1.5Ω 5% 0.062W	3635	4822 116 52219	330Ω 5% 0.5W
			3458	4822 051 30471	47Ω 5% 0.062W	3636	4822 051 30223	22kΩ 5% 0.062W
			3459	4822 051 30272	2.7kΩ 5% 0.062W	3637	4822 051 30103	10kΩ 5% 0.062W
			3460	4822 052 10108	1Ω 5% 0.33W	3638	4822 051 30474	470kΩ 5% 0.062W
			3461	4822 052 10108	1Ω 5% 0.33W	3639	4822 051 30563	56kΩ 5% 0.062W

6457	9322 102 64685	UDZ2.7B
6458	3198 020 55680	BZX384-C5V6
6460	4822 130 41487	BYV95C
6462▲	9322 127 32682	BYW76-RAS15/10
6462	9322 192 67682	BYW76-PK1
6464▲	9322 127 32682	BYW76-RAS15/10
6464	9322 192 67682	BYW76-PK1
6480	4822 130 41601	BYV95A
6481	4822 130 11522	UDZ15B
6482	4822 130 11397	BAS316
6483	4822 130 11528	1PS76SB10
6483	4822 130 80622	BAT54
6493	4822 130 11528	1PS76SB10
6493	4822 130 80622	BAT54
6505	4822 130 34281	BZX79-B15
6506	4822 130 80622	BAT54
6509	4822 130 11397	BAS316
6510	4822 130 61219	BZX79-B10
6511	4822 130 11397	BAS316
6512	4822 130 11397	BAS316
6514	5322 130 31932	BZT03-C200
6515	4822 130 33657	BZV85-C6V8
6516	4822 130 11397	BAS316
6517	4822 130 11528	1PS76SB10
6517	4822 130 80622	BAT54
6525▲	3198 010 10640	Bridge cell GBU4K
6530	4822 130 41487	BYV95C
6534	9322 165 72687	DTV1500MFP
6535	4822 130 11572	STPS8H100F
6536	4822 130 11572	STPS8H100F
6537	4822 130 11397	BAS316
6614	4822 130 11528	1PS76SB10
6615	4822 130 11397	BAS316
6616	4822 130 11397	BAS316
6617	4822 130 11397	BAS316
6618	4822 130 11397	BAS316
6619	4822 130 41601	BYV95A
6620	5322 130 31938	BYV27-200
6621	4822 130 41601	BYV95A
6622	5322 130 32296	BZV85-C10
6622	5322 130 33635	BZV85-C8V2
6623	4822 130 11397	BAS316
6624	4822 130 11397	BAS316
6625	4822 130 11397	BAS316
6626	4822 130 11397	BAS316
6627	4822 130 11397	BAS316
6701	4822 130 11397	BAS316
6745	4822 130 11551	UDZS10B
6950	4822 130 11416	PDZ6.8B
6951	4822 130 11416	PDZ6.8B
6953	4822 130 11416	PDZ6.8B
6954	4822 130 11416	PDZ6.8B
6955	4822 130 11416	PDZ6.8B
6956	4822 130 11416	PDZ6.8B
6957	4822 130 11416	PDZ6.8B
6958	4822 130 11416	PDZ6.8B
6959	4822 130 11416	PDZ6.8B
6960	9340 548 61115	PDZ12B
6961	4822 130 11416	PDZ6.8B
6962	4822 130 11416	PDZ6.8B



7100▲	4822 130 44568	BC557B
7101▲	4822 130 40981	BC337-25
7102	4822 130 11417	STP3NB60FP
7103	9322 149 04682	TCET1102
7130	5322 130 60159	BC846B
7131	4822 130 11336	STP16NE06FP
7132	5322 130 60159	BC846B
7133	4822 130 60373	BC856B
7140	5322 130 60159	BC846B
7141	4822 130 11336	STP16NE06FP
7210	5322 130 60159	BC846B
7211	4822 130 42804	BC817-25
7408▲	5322 130 44647	BC368
7409	5322 130 60159	BC846B
7421▲	9340 210 30127	BU2520DX
7440	4822 209 70672	LM358N SEL.
7441	4822 130 60373	BC856B
7442	4822 130 60373	BC856B
7443	5322 130 60159	BC846B
7445	5322 130 60159	BC846B
7450	5322 209 61472	LM393M
7450	5322 209 70225	LM393D
7455	4822 209 73852	PMBT2369
7480	4822 130 11417	STP3NB60FP
7482	4822 130 11418	TCDT1102G
7486	5322 130 60159	BC846B
7487	5322 130 60159	BC846B
7501	5322 130 60159	BC846B
7502▲	4822 130 40959	BC547B
7504	9322 126 65687	STP5NB60FP

7504	9322 194 28687	STP5NK40ZFP
7506▲	4822 209 14933	TL431IZ
7507▲	9322 149 04682	TCET1102
7528▲	4822 130 40981	BC337-25
7529	4822 130 44461	BC546B
7530	5322 130 60159	BC846B
7611	5322 130 60159	BC846B
7612	5322 130 60159	BC846B
7613▲	4822 209 14933	TL431IZ
7613	4822 209 81397	TL431CLPST
7614	5322 130 60159	BC846B
7620▲	4822 209 90009	TDA8177
7641	5322 130 60159	BC846B
7653	5322 130 60159	BC846B
7654	4822 130 60373	BC856B
7680▲	4822 209 60956	TDA7052/N2
7681	5322 130 60159	BC846B
7682▲	5322 130 44647	BC368
7700	9322 163 86682	TDA7490L
7701	5322 130 60159	BC846B
7703	5322 130 60159	BC846B
7704	5322 130 60159	BC846B
7705	5322 130 60159	BC846B
7706	4822 130 60373	BC856B
7707	5322 130 60159	BC846B
7902	5322 130 60159	BC846B
7908	5322 130 60159	BC846B
7910	9322 166 03682	LD1085V36
7911▲	4822 209 72042	L78L05ACZ

Small Signal Panel [B]

Various

0072	3104 301 24191	Frame SSB A-side
0073	3104 301 24211	Cover SSB A-side
0074	3104 301 24221	Cover SSB Z-side
0075	3104 301 24201	Frame SSB Z-side
1001	2422 543 89022	Xtal 6MHz 20p
1301	2422 540 98456	Resonator 12MHz
1305	2422 543 01184	Xtal 4.433619MHz 20p
1308	2422 543 01183	Xtal 3.579545MHz 16p
1402	2422 025 16966	Connector 5p m SMD
1403▲	2422 086 11092	Fuse 500mA 50V F SMD
1407	2422 549 44324	Filt. 5.5/5.74MHz
1408	2422 549 44372	SAW 38.9MHz K3953L
1409	2422 549 44369	SAW 38.9MHz K9656L
1651	2422 543 89019	Xtal 18.432MHz 12p
1680	2422 025 16961	Connector 6p m SMD
1702	2422 540 98456	Resonator 12MHz
8402▲	3104 311 06411	Cable assy + ferr.
8680▲	3104 311 06421	Cable assy + ferr.



2001	2222 867 15339	33pF 5% 50V 0603
2002	4822 126 11669	27pF 5% 50V 0603
2003	4822 126 13879	220nF +80-20% 16V
2004	4822 126 13879	220nF +80-20% 16V
2005	2238 586 59812	100nF 20% 50V 0603
2006	2238 586 59812	100nF 20% 50V 0603
2007	2238 586 59812	100nF 20% 50V 0603
2008	2238 586 59812	100nF 20% 50V 0603
2010	4822 126 11785	47pF 5% 50V 0603
2011	4822 126 11785	47pF 5% 50V 0603
2012	4822 126 11785	47pF 5% 50V 0603
2013	4822 124 12095	100µF 20% 16V
2016	4822 124 12095	100µF 20% 16V
2017	2238 586 59812	100nF 20% 50V 0603
2019	2238 586 59812	100nF 20% 50V 0603
2020	4822 126 13883	220pF 5% 50V
2022	2238 586 59812	100nF 20% 50V 0603
2023	2238 586 59812	100nF 20% 50V 0603
2024	2238 586 59812	100nF 20% 50V 0603
2025	2238 586 59812	100nF 20% 50V 0603
2026	2238 586 59812	100nF 20% 50V 0603
2027	2238 586 59812	100nF 20% 50V 0603
2028	2238 586 59812	100nF 20% 50V 0603
2029	2238 586 59812	100nF 20% 50V 0603
2031	2238 586 59812	100nF 20% 50V 0603
2033	4822 126 14226	82pF 5% 50V 0603
2034	4822 126 14226	82pF 5% 50V 0603
2035	4822 126 14226	82pF 5% 50V 0603
2036	4822 126 14226	82pF 5% 50V 0603
2037	4822 126 14226	82pF 5% 50V 0603
2038	2238 586 59812	100nF 20% 50V 0603
2039	2238 586 59812	100nF 20% 50V 0603
2040	2238 586 59812	100nF 20% 50V 0603
2303	2022 552 05679	1µF 10% 16V 0805
2304	4822 122 33741	10pF 10% 50V
2305	2238 586 59812	100nF 20% 50V 0603

2306	4822 126 13881	470pF 5% 50V
2307	2238 586 59812	100nF 20% 50V 0603
2308	4822 122 33741	10pF 10% 50V
2312	2020 552 96659	33µF 5% 50V 1206 NPO
2313	2020 552 96685	100nF 5% 25V 1206
2314	4822 124 12095	100µF 20% 16V
2315	2238 586 59812	100nF 20% 50V 0603
2316	2238 586 59812	100nF 20% 50V 0603
2317	2022 552 05679	1µF 10% 16V 0805
2318	2238 916 15641	22nF 10% 25V 0603
2319	4822 126 14247	1.5nF 50V 0603
2320	4822 122 33741	10pF 10% 50V
2321	2238 586 59812	100nF 20% 50V 0603
2322	2238 586 59812	100nF 20% 50V 0603
2323	2238 586 59812	100nF 20% 50V 0603
2324	5322 126 11583	10nF 10% 50V 0603
2325	2238 586 59812	100nF 20% 50V 0603
2326	5322 126 11583	10nF 10% 50V 0603
2327	4822 051 30759	22nF 5% 0.062W
2328	4822 122 33761	22pF 5% 50V
2329	2238 586 59812	100nF 20% 50V 0603
2330	2238 586 59812	100nF 20% 50V 0603
2331	2238 586 59812	100nF 20% 50V 0603
2332	2238 586 59812	100nF 20% 50V 0603
2333	4822 126 14491	2.2µF 10V 0805
2334	4822 126 14491	2.2µF 10V 0805
2335	2238 586 59812	100nF 20% 50V 0603
2336	4822 126 14491	2.2µF 10V 0805
2337	2238 586 59812	100nF 20% 50V 0603
2338	2238 586 59812	100nF 20% 50V 0603
2340	4822 124 12095	100µF 20% 16V
2350	2238 586 59812	100nF 20% 50V 0603
2351	2238 586 59812	100nF 20% 50V 0603
2352	2238 586 59812	100nF 20% 50V 0603
2355	4822 051 30759	75Ω 5% 0.062W
2356	2238 586 59812	100nF 20% 50V 0603
2357	2238 586 59812	100nF 20% 50V 0603
2358	5322 126 11579	3.3nF 10% 63V
2359	4822 122 33752	15pF 5% 50V
2360	3198 016 31280	1.2pF 0.25pF 50V 0603
2361	3198 016 31280	1.2pF 0.25pF 50V 0603
2362	4822 126 11663	12pF 5% 50V 0603
2363	4822 126 13881	470pF 5% 50V
2364	4822 051 30759	75Ω 5% 0.062W
2365	2238 586 59812	100nF 20% 50V 0603
2366	2238 586 59812	100nF 20% 50V 0603
2367	2238 586 59812	100nF 20% 50V 0603
2368	2238 586 59812	100nF 20% 50V 0603
2369	2238 586 59812	100nF 20% 50V 0603
2370	2238 586 59812	100nF 20% 50V 0603
2371	4822 126 13193	4.7nF 10% 63V
2372	4822 126 14043	1µF +80-20% 16V 0805
2373	2238 586 59812	100nF 20% 50V 0603
2374	4822 126 14491	2.2µF 10V 0805
2375	2238 916 15641	22nF 10% 25V 0603
2376	2238 586 59812	100nF 20% 50V 0603
2377	4822 124 12095	100µF 20% 16V
2378	2238 586 59812	100nF 20% 50V 0603
2383	4822 051 30759	75Ω 5% 0.062W
2384	2238 586 59812	100nF 20% 50V 0603
2386	4822 126 13883	220pF 5% 50V
2390	2238 586 59812	100nF 20% 50V 0603
2391	2238 586 59812	100nF 20% 50V 0603
2392	4822 126 13193	4.7nF 10% 63V
2394	4822 126 14491	2.2µF 10V 0805
2404	2022 552 05679	1µF 10% 16V 0805
2405	4822 126 13193	4.7nF 10% 63V
2406	4822 126 13883	220pF 5% 50V
2407	4822 126 14221	68pF 5% 50V 0603 NPO
2408	3198 016 32780	2.7pF 10% 50V 0603
2409	4822 126 14491	2.2µF 10V 0805
2411	2238 586 59812	100nF 20% 50V 0603
2412	4822 126 13193	4.7nF 10% 63V
2417	3198 017 44740	470nF 10V 0603
2418	4822 126 13956	6.8pF 5% 63V 0603
2420	4822 122 33753	150pF 5% 50V NPO
2425	4822 124 12095	100µF 20% 16V
2431	2238 586 59812	1

2522	4822 126 13881	470pF 5% 50V	2722	2020 552 94427	100pF 5% 50V	2819	2238 586 59812	100nF 20% 50V 0603
2523	3198 016 31020	1nF 25V 0603	2723	4822 126 14225	56pF 5% 50V 0603	2820	2238 586 59812	100nF 20% 50V 0603
2524	2238 586 59812	100nF 20% 50V 0603	2724	2020 552 94427	100pF 5% 50V	2821	2238 586 59812	100nF 20% 50V 0603
2525	4822 126 13881	470pF 5% 50V	2725	2238 586 59812	100nF 20% 50V 0603	2822	2238 586 59812	100nF 20% 50V 0603
2526	3198 016 31020	1nF 25V 0603	2726	2238 586 59812	100nF 20% 50V 0603	2823	2238 586 59812	100nF 20% 50V 0603
2528	4822 126 14585	100nF 10% 0805 50V	2727	2238 586 59812	100nF 20% 50V 0603	2824	2238 586 59812	100nF 20% 50V 0603
2529	4822 126 14472	1µF 10% 10V 0805	2728	2020 021 91854	10µF 20% 16V	2825	2238 586 59812	100nF 20% 50V 0603
2530	4822 126 14472	1µF 10% 10V 0805	2729	2238 586 59812	100nF 20% 50V 0603	2826	2238 586 59812	100nF 20% 50V 0603
2546	4822 124 23002	10µF 16V	2730	2020 021 91557	100µF 20% 16V	2827	2238 586 59812	100nF 20% 50V 0603
2547	4822 124 23002	10µF 16V	2731	2238 586 59812	100nF 20% 50V 0603	2828	2020 021 91854	10µF 20% 16V
2548	4822 124 23002	10µF 16V	2732	5322 126 11578	1nF 10% 50V 0603	2829	2020 021 91557	100µF 20% 16V
2549	4822 124 23002	10µF 16V	2733	2238 586 59812	100nF 20% 50V 0603	2830	2238 586 59812	100nF 20% 50V 0603
2550	2020 552 94427	100pF 5% 50V	2734	2238 586 59812	100nF 20% 50V 0603	2831	2238 586 59812	100nF 20% 50V 0603
2552	4822 126 13881	470pF 5% 50V	2735	2238 586 59812	100nF 20% 50V 0603	2832	2238 586 59812	100nF 20% 50V 0603
2553	4822 126 13881	470pF 5% 50V	2736	2238 586 59812	100nF 20% 50V 0603	2833	2238 586 59812	100nF 20% 50V 0603
2554	4822 126 13881	470pF 5% 50V	2737	4822 126 11669	27pF 5% 50V 0603	2834	2238 586 59812	100nF 20% 50V 0603
2555	4822 126 13881	470pF 5% 50V	2738	2238 586 59812	100nF 20% 50V 0603	2835	2238 586 59812	100nF 20% 50V 0603
2562	3198 016 31020	1nF 25V 0603	2739	2020 021 91557	100µF 20% 16V	2836	2238 586 59812	100nF 20% 50V 0603
2563	3198 016 31020	1nF 25V 0603	2740	2238 916 15641	22nF 10% 25V 0603	2837	2020 021 91557	100µF 20% 16V
2564	3198 016 31020	1nF 25V 0603	2741	2238 916 15641	22nF 10% 25V 0603	2838	4822 126 11669	27pF 5% 50V 0603
2565	3198 016 31020	1nF 25V 0603	2742	2238 916 15641	22nF 10% 25V 0603	2841	2238 586 59812	100nF 20% 50V 0603
2566	3198 016 31020	1nF 25V 0603	2743	2238 586 59812	100nF 20% 50V 0603	2842	4822 126 11669	27pF 5% 50V 0603
2567	3198 016 31020	1nF 25V 0603	2744	2238 586 59812	100nF 20% 50V 0603	2844	2238 586 59812	100nF 20% 50V 0603
2568	3198 016 31020	1nF 25V 0603	2745	2238 586 59812	100nF 20% 50V 0603	2845	2238 586 59812	100nF 20% 50V 0603
2569	3198 016 31020	1nF 25V 0603	2746	2238 586 59812	100nF 20% 50V 0603	2846	2238 586 59812	100nF 20% 50V 0603
2570	3198 016 31020	1nF 25V 0603	2747	4822 126 14221	68pF 5% 50V 0603 NPO	2847	2020 021 91854	10µF 20% 16V
2571	4822 051 30759	75Ω 5% 0.062W	2748	2238 586 59812	100nF 20% 50V 0603	2848	2238 586 59812	100nF 20% 50V 0603
2574	3198 016 31020	1nF 25V 0603	2749	2238 586 59812	100nF 20% 50V 0603	2849	2238 586 59812	100nF 20% 50V 0603
2575	3198 016 31020	1nF 25V 0603	2750	2238 586 59812	100nF 20% 50V 0603	2850	2238 586 59812	100nF 20% 50V 0603
2576	3198 016 31020	1nF 25V 0603	2751	2238 586 59812	100nF 20% 50V 0603	2851	2238 586 59812	100nF 20% 50V 0603
2577	3198 016 31020	1nF 25V 0603	2752	2238 586 59812	100nF 20% 50V 0603	2852	2238 586 59812	100nF 20% 50V 0603
2578	2020 552 94427	100pF 5% 50V	2753	2238 586 59812	100nF 20% 50V 0603	2853	2238 586 59812	100nF 20% 50V 0603
2579	2020 552 94427	100pF 5% 50V	2754	5322 126 11578	1nF 10% 50V 0603	2854	2238 586 59812	100nF 20% 50V 0603
2580	3198 016 31020	1nF 25V 0603	2755	2238 586 59812	100nF 20% 50V 0603	2855	2238 586 59812	100nF 20% 50V 0603
2581	3198 016 31020	1nF 25V 0603	2756	2238 586 59812	100nF 20% 50V 0603	2856	2238 586 59812	100nF 20% 50V 0603
2582	3198 016 31020	1nF 25V 0603	2757	2238 916 15641	22nF 10% 25V 0603	2857	2238 586 59812	100nF 20% 50V 0603
2583	3198 016 31020	1nF 25V 0603	2758	2020 021 91854	10µF 20% 16V	2858	2238 586 59812	100nF 20% 50V 0603
2593	3198 016 31020	1nF 25V 0603	2759	2238 586 59812	100nF 20% 50V 0603	2859	2238 586 59812	100nF 20% 50V 0603
2594	3198 016 31020	1nF 25V 0603	2760	2238 586 59812	100nF 20% 50V 0603	2860	2238 586 59812	100nF 20% 50V 0603
2595	3198 016 31020	1nF 25V 0603	2761	2238 586 59812	100nF 20% 50V 0603	2861	2238 586 59812	100nF 20% 50V 0603
2609	3198 016 31020	1nF 25V 0603	2762	2238 586 59812	100nF 20% 50V 0603	2862	2238 586 59812	100nF 20% 50V 0603
2610	4822 126 14238	2.2nF 50V 0603	2763	2238 586 59812	100nF 20% 50V 0603	2863	2238 586 59812	100nF 20% 50V 0603
2611	3198 016 31020	1nF 25V 0603	2764	2238 586 59812	100nF 20% 50V 0603	2864	2238 586 59812	100nF 20% 50V 0603
2634	3198 016 31020	1nF 25V 0603	2766	4822 122 33752	15pF 5% 50V	2865	2238 586 59812	100nF 20% 50V 0603
2640	4822 126 13879	220nF +80/-20% 16V	2767	4822 122 33752	15pF 5% 50V	2866	2238 586 59812	100nF 20% 50V 0603
2643	4822 126 14107	330nF +80/-20% 25V	2768	2238 586 59812	100nF 20% 50V 0603	2867	2238 586 59812	100nF 20% 50V 0603
2644	3198 016 31020	1nF 25V 0603	2769	2238 586 59812	100nF 20% 50V 0603	2868	2238 586 59812	100nF 20% 50V 0603
2645	4822 126 14107	330nF +80/-20% 25V	2770	2238 586 59812	100nF 20% 50V 0603	2869	2238 586 59812	100nF 20% 50V 0603
2646	4822 126 14491	2.2µF 10V 0805	2771	2238 586 59812	100nF 20% 50V 0603	2870	2238 586 59812	100nF 20% 50V 0603
2649	4822 126 14491	2.2µF 10V 0805	2772	2238 586 59812	100nF 20% 50V 0603	2871	2020 021 91557	100µF 20% 16V
2651	2238 586 59812	100nF 20% 50V 0603	2773	2238 586 59812	100nF 20% 50V 0603	2872	2238 586 59812	100nF 20% 50V 0603
2652	4822 126 11785	47pF 5% 50V 0603	2774	4822 126 11669	27pF 5% 50V 0603	2873	2238 586 59812	100nF 20% 50V 0603
2653	4822 126 14107	330nF +80/-20% 25V	2775	4822 126 11663	12pF 5% 50V 0603	2874	2238 586 59812	100nF 20% 50V 0603
2654	4822 126 13881	470pF 5% 50V	2776	4822 126 11663	12pF 5% 50V 0603	2875	2238 586 59812	100nF 20% 50V 0603
2659	4822 126 13881	470pF 5% 50V	2777	2238 586 59812	100nF 20% 50V 0603	2876	2238 586 59812	100nF 20% 50V 0603
2660	4822 126 13881	470pF 5% 50V	2778	2238 586 59812	100nF 20% 50V 0603	2877	2238 586 59812	100nF 20% 50V 0603
2661	4822 126 14107	330nF +80/-20% 25V	2779	4822 126 11663	12pF 5% 50V 0603	2878	2238 586 59812	100nF 20% 50V 0603
2662	4822 126 14107	330nF +80/-20% 25V	2780	2238 586 59812	100nF 20% 50V 0603	2879	2238 586 59812	100nF 20% 50V 0603
2663	4822 126 13881	470pF 5% 50V	2781	2238 586 59812	100nF 20% 50V 0603	2880	2238 586 59812	100nF 20% 50V 0603
2664	4822 126 13881	470pF 5% 50V	2782	2238 586 59812	100nF 20% 50V 0603	2881	2238 586 59812	100nF 20% 50V 0603
2665	4822 124 12095	100µF 20% 16V	2783	2238 586 59812	100nF 20% 50V 0603	2882	2238 586 59812	100nF 20% 50V 0603
2666	4822 124 12095	100µF 20% 16V	2784	2238 586 59812	100nF 20% 50V 0603	2883	2238 586 59812	100nF 20% 50V 0603
2667	3198 016 33380	3.3pF 50V 0603	2785	2238 586 59812	100nF 20% 50V 0603	2884	2238 586 59812	100nF 20% 50V 0603
2668	3198 016 33380	3.3pF 50V 0603	2788	2238 586 59812	100nF 20% 50V 0603	2885	2238 586 59812	100nF 20% 50V 0603
2670	2238 586 59812	100nF 20% 50V 0603	2789	2238 586 59812	100nF 20% 50V 0603	2886	2238 586 59812	100nF 20% 50V 0603
2673	3198 016 31020	1nF 25V 0603	2790	2238 586 59812	100nF 20% 50V 0603	2887	2238 586 59812	100nF 20% 50V 0603
2674	3198 016 31020	1nF 25V 0603	2791	2238 586 59812	100nF 20% 50V 0603	2888	2238 586 59812	100nF 20% 50V 0603
2677	4822 124 23002	10µF 16V	2792	2238 586 59812	100nF 20% 50V 0603	2889	2020 021 91557	100µF 20% 16V
2678	4822 124 23002	10µF 16V	2793	2238 586 59812	100nF 20% 50V 0603	2890	2238 586 59812	100nF 20% 50V 0603
2679	2238 586 59812	100nF 20% 50V 0603	2794	2238 586 59812	100nF 20% 50V 0603	2891	2238 586 59812	100nF 20% 50V 0603
2680	4822 124 23002	10µF 16V	2795	2238 586 59812	100nF 20% 50V 0603	2892	2238 586 59812	100nF 20% 50V 0603
2681	2238 586 59812	100nF 20% 50V 0603	2796	2238 586 59812	100nF 20% 50V 0603	2893	2238 586 59812	100nF 20% 50V 0603
2682	4822 124 23002	10µF 16V	2797	2238 586 59812	100nF 20% 50V 0603	2894	2238 586 59812	100nF 20% 50V 0603
2686	3198 016 31020	1nF 25V 0603	2798	2238 586 59812	100nF 20% 50V 0603	2895	2020 021 91854	10µF 20% 16V
2687	3198 016 31020	1nF 25V 0603	2799	2238 586 59812	100nF 20% 50V 0603	2896	2020 021 91557	100µF 20% 16V
2690	2238 586 59812	100nF 20% 50V 0603	2800	2238 586 59812	100nF 20% 50V 0603	2898	2020 021 91854	10µF 20% 16V
2693	4822 126 13883	220pF 5% 50V	2801	4822 126 11663	12pF 5% 50V 0603	2899	2238 586 59812	100nF 20% 50V 0603
2694	3198 016 31020	1nF 25V 0603	2802	2238 586 59812	100nF 20% 50V 0603	2908	2238 586 59812	100nF 20% 50V 0603
2695	4822 124 12095	100µF 20% 16V	2803	2238 586 59812	100nF 20% 50V 0603	2909	2238 586 59812	100nF 20% 50V 0603
2701	4822 126 13956	6.8pF 5% 63V 0603	2804	2238 586 59812	100nF 20% 50V 0603	2910	2238 586 59812	100nF 20% 50V 0603
2704	4822 122 33752	15pF 5% 50V	2805	2238 586 59812	100nF 20% 50V 0603	2911	2238 586 5	

[illegible]

3747	4822 117 12925	47kΩ 1% 0.063W 0603	3880	4822 117 12925	47kΩ 1% 0.063W 0603	9775	4822 117 13605	Jumper 0402
3748	4822 051 30124	120kΩ 5% 0.062W	3881	4822 117 12925	47kΩ 1% 0.063W 0603	9800	4822 117 13605	Jumper 0402
3749	5322 117 13042	3.9kΩ 1% 0.063W 0603	3882	4822 117 12925	47kΩ 1% 0.063W 0603	9801	4822 117 13605	Jumper 0402
3750	3198 031 03920	3.9kΩ 5% 0402	3883	4822 117 12925	47kΩ 1% 0.063W 0603	9802	4822 117 13605	Jumper 0402
3751	3198 031 03320	3.3kΩ 5% 0402	3884	4822 117 12925	47kΩ 1% 0.063W 0603	9803	4822 117 13605	Jumper 0402
3752	4822 117 12917	1Ω 5% 0.062W	3885	4822 051 30102	1kΩ 5% 0.062W	9804	4822 117 13605	Jumper 0402
3753	4822 117 12917	1Ω 5% 0.062W	3886	4822 051 30102	1kΩ 5% 0.062W	9805	4822 117 13605	Jumper 0402
3754	4822 051 30101	100Ω 5% 0.062W	3887	4822 051 30102	1kΩ 5% 0.062W	9806	4822 117 13605	Jumper 0402
3755	3198 031 04720	4.7kΩ 5% 0402	3888	4822 051 30102	1kΩ 5% 0.062W	9808	4822 051 30008	Jumper 0603
3756	4822 051 30103	10kΩ 5% 0.062W	3889	4822 051 30102	1kΩ 5% 0.062W	9809	4822 051 30008	Jumper 0603
3757	2322 704 61501	150Ω 1% 0603	3890	4822 051 30102	1kΩ 5% 0.062W	9811	4822 117 13605	Jumper 0402
3758	3198 031 04720	4.7kΩ 5% 0402	3891	4822 051 30102	1kΩ 5% 0.062W	9812	4822 117 13605	Jumper 0402
3759	4822 051 30221	220Ω 5% 0.062W	3892	4822 117 13605	Jumper 0402	9815	4822 051 30008	Jumper 0603
3762	3198 031 06890	68Ω 5% 0402	3894	2322 704 61501	150Ω 1% 0603	9816	4822 051 30008	Jumper 0603
3763	3198 031 06890	68Ω 5% 0402	3900	3198 031 06890	68Ω 5% 0402	9817	4822 051 30008	Jumper 0603
3764	3198 031 06890	68Ω 5% 0402	3901	3198 031 06890	68Ω 5% 0402	9818	4822 051 30008	Jumper 0603
3766	4822 051 30102	1kΩ 5% 0.062W	3902	3198 031 06890	68Ω 5% 0402	9901	4822 051 30008	Jumper 0603
3767	3198 031 06890	68Ω 5% 0402	3903	4822 117 13632	100kΩ 1% 0603 0.62W	9902	4822 051 30008	Jumper 0603
3768	3198 031 06890	68Ω 5% 0402	3904	4822 117 13525	24kΩ 1% 0.62W 0603	9903	4822 051 30008	Jumper 0603
3769	3198 031 06890	68Ω 5% 0402	3905	3198 031 04720	4.7kΩ 5% 0402	9904	4822 051 30008	Jumper 0603
3770	3198 031 06890	68Ω 5% 0402	3911	2350 033 11689	4x 68Ω 5% Netw.	9905	4822 051 30008	Jumper 0603
3771	4822 051 30759	75Ω 5% 0.062W	3912	2350 033 11689	4x 68Ω 5% Netw.	9906	4822 051 30008	Jumper 0603
3772	4822 051 30759	75Ω 5% 0.062W	3913	2350 033 11229	4x 22Ω 5% Netw.	9907	4822 051 30008	Jumper 0603
3773	4822 051 30759	75Ω 5% 0.062W	3914	2350 033 11229	4x 22Ω 5% Netw.	9908	4822 051 30008	Jumper 0603
3774	3198 031 06890	68Ω 5% 0402	3915	2350 033 11229	4x 22Ω 5% Netw.	9909	4822 051 30008	Jumper 0603
3775	3198 031 06890	68Ω 5% 0402	3916	2350 033 11229	4x 22Ω 5% Netw.	9919	4822 051 30008	Jumper 0603
3776	4822 051 30759	75Ω 5% 0.062W	3917	2350 033 11229	4x 22Ω 5% Netw.	9920	4822 051 30008	Jumper 0603
3777	3198 031 06890	68Ω 5% 0402	3918	3198 031 06890	68Ω 5% 0402	9921	4822 051 30008	Jumper 0603
3778	3198 031 04720	4.7kΩ 5% 0402	3919	3198 031 06890	68Ω 5% 0402	9925	4822 051 30008	Jumper 0603
3779	3198 031 06890	68Ω 5% 0402	3920	3198 031 06890	68Ω 5% 0402	9927	4822 051 30008	Jumper 0603
3780	3198 031 06890	68Ω 5% 0402	3921	3198 031 06890	68Ω 5% 0402	9928	4822 051 30008	Jumper 0603
3781	3198 031 06890	68Ω 5% 0402	9015	4822 051 30008	Jumper 0603	9929	4822 051 30008	Jumper 0603
3782	4822 051 30102	1kΩ 5% 0.062W	9302	4822 051 30008	Jumper 0603	9935	4822 051 30008	Jumper 0603
3784	3198 031 06890	68Ω 5% 0402	9303	4822 051 30008	Jumper 0603	9937	4822 051 30008	Jumper 0603
3785	4822 051 30331	330Ω 5% 0.062W	9304	4822 051 30008	Jumper 0603	9938	4822 051 30008	Jumper 0603
3786	4822 051 30331	330Ω 5% 0.062W	9322	4822 051 30008	Jumper 0603	9939	4822 051 30008	Jumper 0603
3787	4822 051 30331	330Ω 5% 0.062W	9410	4822 051 30008	Jumper 0603	9941	4822 051 30759	75Ω 5% 0.062W
3788	5322 117 13034	1.5kΩ 1% 0.063W 0603	9413	4822 051 30008	Jumper 0603	9942	4822 051 30759	75Ω 5% 0.062W
3789	4822 051 30008	Jumper 0603	9416	4822 051 30008	Jumper 0603	9944	4822 051 30008	Jumper 0603
3790	2322 704 65601	560Ω 1% 0.063W 0603	9417	4822 051 30008	Jumper 0603	9945	4822 051 30008	Jumper 0603
3791	5322 117 13049	470Ω 1% 0.063W 0603	9418	4822 051 30008	Jumper 0603	9946	4822 051 30008	Jumper 0603
3792	2322 704 61501	150Ω 1% 0603	9419	4822 051 30008	Jumper 0603	9947	4822 051 30008	Jumper 0603
3793	4822 051 30222	2.2kΩ 5% 0.062W	9420	4822 051 30008	Jumper 0603	9948	4822 051 30008	Jumper 0603
3794	4822 051 30759	75Ω 5% 0.062W	9520	4822 051 30008	Jumper 0603	9949	4822 051 30008	Jumper 0603
3795	2322 704 61501	150Ω 1% 0603	9522	4822 051 30008	Jumper 0603	9950	4822 051 30008	Jumper 0603
3797	3198 031 04720	4.7kΩ 5% 0402	9603	4822 051 30008	Jumper 0603	9951	4822 051 30008	Jumper 0603
3800	4822 051 30759	75Ω 5% 0.062W	9604	4822 051 30008	Jumper 0603	9952	4822 051 30008	Jumper 0603
3801	2322 704 61501	150Ω 1% 0603	9607	4822 051 30008	Jumper 0603	9953	4822 051 30008	Jumper 0603
3802	2322 704 61501	150Ω 1% 0603	9608	4822 051 30008	Jumper 0603	9954	4822 051 30008	Jumper 0603
3803	3198 031 06890	68Ω 5% 0402	9609	4822 051 30008	Jumper 0603			
3804	3198 031 06890	68Ω 5% 0402	9610	4822 051 30008	Jumper 0603			
3805	5322 117 13062	390Ω 1% 0.063W 0603	9642	4822 051 30008	Jumper 0603			
3806	5322 117 13062	390Ω 1% 0.063W 0603	9645	4822 051 30008	Jumper 0603			
3807	2322 704 61201	120Ω 1% 0.063W 0603	9688	4822 051 30008	Jumper 0603			
3808	5322 117 13051	680Ω 1% 0.063W 0603	9689	4822 051 30008	Jumper 0603			
3809	5322 117 13017	100Ω 1% 0.063W 0603	9691	4822 051 30008	Jumper 0603			
3810	5322 117 13062	390Ω 1% 0.063W 0603	9692	4822 051 30008	Jumper 0603			
3811	4822 051 30759	75Ω 5% 0.062W	9694	4822 051 30008	Jumper 0603			
3812	4822 051 30759	75Ω 5% 0.062W	9702	4822 051 30008	Jumper 0603			
3813	5322 117 13062	390Ω 1% 0.063W 0603	9704	4822 117 13605	Jumper 0402			
3814	4822 051 30759	75Ω 5% 0.062W	9706	4822 051 30008	Jumper 0603			
3815	4822 051 30759	75Ω 5% 0.062W	9713	4822 117 13605	Jumper 0402			
3816	5322 117 13062	390Ω 1% 0.063W 0603	9714	4822 117 13605	Jumper 0402			
3817	4822 051 30759	75Ω 5% 0.062W	9715	4822 117 13605	Jumper 0402			
3818	4822 051 30759	75Ω 5% 0.062W	9722	4822 117 13605	Jumper 0402			
3820	3198 031 04720	4.7kΩ 5% 0402	9723	4822 117 13605	Jumper 0402			
3822	2322 705 70279	27Ω 5% 0402	9724	4822 117 13605	Jumper 0402			
3823	3198 031 06890	68Ω 5% 0402	9725	4822 051 30008	Jumper 0603			
3824	3198 031 01090	10Ω 5% 0.01W 0402	9727	4822 051 30008	Jumper 0603			
3825	3198 031 01090	10Ω 5% 0.01W 0402	9728	4822 051 30008	Jumper 0603			
3826	4822 117 13605	Jumper 0402	9731	4822 051 30008	Jumper 0603			
3827	4822 117 13605	Jumper 0402	9733	4822 051 30008	Jumper 0603			
3830	3198 031 06890	68Ω 5% 0402	9735	4822 051 30008	Jumper 0603			
3831	3198 031 06890	68Ω 5% 0402	9736	4822 051 30008	Jumper 0603			
3832	3198 031 06890	68Ω 5% 0402	9737	4822 051 30008	Jumper 0603			
3833	3198 031 06890	68Ω 5% 0402	9738	4822 051 30008	Jumper 0603			
3834	3198 031 06890	68Ω 5% 0402	9739	4822 051 30008	Jumper 0603			
3835	3198 031 06890	68Ω 5% 0402	9751	4822 117 13605	Jumper 0402			
3836	3198 031 06890	68Ω 5% 0402	9752	4822 117 13605	Jumper 0402			
3837	3198 031 06890	68Ω 5% 0402	9753	4822 117 13605	Jumper 0402			
3838	3198 031 06890	68Ω 5% 0402	9754	4822 117 13605	Jumper 0402			
3839	3198 031 06890	68Ω 5% 0402	9755	4822 117 13605	Jumper 0402			
3840	3198 031 06890	68Ω 5% 0402	9756	4822 117 13605	Jumper 0402			
3841	3198 031 06890	68Ω 5% 0402	9757	4822 117 13605	Jumper 0402			
3842	3198 031 06890	68Ω 5% 0402	9758	4822 117 13605	Jumper 0402			
3843	3198 031 06890	68Ω 5% 0402	9759	4822 117 13605	Jumper 0402			
3844	3198 031 06890	68Ω 5% 0402	9760	4822 117 13605	Jumper 0402			
3845	3198 031 06890	68Ω 5% 0402	9761	4822 117 13605	Jumper 0402			
3846	4822 051 30472	4.7Ω 5% 0.062W	9762	4822 117 13605	Jumper 0402			
3850	2322 706 78209	82Ω 1% 0.1W 0402	9763	4822 117 13605	Jumper 0402			
3853	4822 117 12925	47kΩ 1% 0.063W 0603	9765	4822 117 13605	Jumper 0402			
3855	3198 031 04720	4.7kΩ 5% 0402	9766	4822 117 13605	Jumper 0402			
3877	4822 117 13605	Jumper 0402	9773	4822 117 13605	Jumper 0402			
3878	4822 117 13605	Jumper 0402	9774	4822 117 13605	Jumper 0402			

5301	4822 157 11876	6.8μH 10% 0805
5302	4822 157 11876	6.8μH 10% 0805
5401	3198 018 56880	6.8μH 10% 0603
5403	2422 549 44461	Trimmer 40MHz 5CCE
5404	2422 535 95427	Bead 120Ω at 100MHz
5405	2422 535 95427	Bead 120Ω at 100MHz
5406	4822 157 10586	2.2μH 10% 0805
5408	2422 549 44983	Trimmer 78MHz 5CCB
5409	2422 549 42896	Bead 120Ω 100MHz
5411	3198 018 32770	0.27μH 10% 0805
5415	4822 157 11716	Bead 30Ω at 100MHz
5416	4822 157 11716	Bead 30Ω at 100MHz
5651	2422 549 43769	Bead 30Ω 100MHz
5652	2422 549 43769	Bead 30Ω 100MHz
5653	2422 549 43769	Bead 30Ω 100MHz
5654	4822 157 11716	Bead 30Ω at 100MHz
5655	4822 157 11828	22μH 20% 0805
5656	4822 157 11876	6.8μH 10% 0805
5663	4822 051 30008	Jumper 0603
5671	4822 157 11716	Bead 30Ω at 100MHz
5672	4822 157 11716	Bead 30Ω at 100MHz</

5754	4822 157 11716	Bead 30Ω at 100MHz
5755	4822 157 11716	Bead 30Ω at 100MHz
5756	4822 157 11716	Bead 30Ω at 100MHz
5757	4822 157 11716	Bead 30Ω at 100MHz
5758	4822 157 11716	Bead 30Ω at 100MHz
5759	4822 157 11716	Bead 30Ω at 100MHz
5760	4822 157 11716	Bead 30Ω at 100MHz
5761	4822 157 11716	Bead 30Ω at 100MHz
5762	4822 157 11716	Bead 30Ω at 100MHz
5763	4822 157 11716	Bead 30Ω at 100MHz
5764	4822 157 11716	Bead 30Ω at 100MHz
5765	4822 157 11716	Bead 30Ω at 100MHz
5767	4822 157 11716	Bead 30Ω at 100MHz
5768	4822 157 11716	Bead 30Ω at 100MHz
5769	4822 157 11716	Bead 30Ω at 100MHz
5770	4822 157 11716	Bead 30Ω at 100MHz
5771	4822 157 11716	Bead 30Ω at 100MHz
5772	4822 157 11716	Bead 30Ω at 100MHz
5775	4822 157 11716	Bead 30Ω at 100MHz
5800	4822 157 11506	Bead 120Ω100MHz
5900	4822 157 11716	Bead 30Ω at 100MHz
5901	4822 157 11716	Bead 30Ω at 100MHz
5902	4822 157 11716	Bead 30Ω at 100MHz
5903	4822 157 11716	Bead 30Ω at 100MHz
5904	4822 157 11716	Bead 30Ω at 100MHz
5910	2422 549 43062	Bead 600Ω at 100MHz
5911	2422 549 43062	Bead 600Ω at 100MHz
5912	2422 549 43062	Bead 600Ω at 100MHz
5913	2422 549 43062	Bead 600Ω at 100MHz
5914	2422 549 43062	Bead 600Ω at 100MHz
5915	2422 549 43062	Bead 600Ω at 100MHz
5917	2422 549 43062	Bead 600Ω at 100MHz
5918	2422 549 43062	Bead 600Ω at 100MHz
5919	2422 549 43062	Bead 600Ω at 100MHz
5920	2422 549 43062	Bead 600Ω at 100MHz



6001	4822 130 80622	BAT54
6002	4822 130 11397	BAS316
6003	4822 130 80622	BAT54
6004	4822 130 80622	BAT54
6005	4822 130 11422	PLVA2650A
6303	9322 150 18685	BZX384-C47
6304	4822 130 11397	BAS316
6306	3198 020 55680	BZX384-C5V6
6307	4822 130 80622	BAT54
6309	4822 130 11397	BAS316
6310	4822 130 11416	PDZ6.8B
6311	9340 548 67115	PDZ22B
6312	4822 130 11397	BAS316
6313	9340 548 67115	PDZ22B
6314	4822 130 11397	BAS316
6317	4822 130 11397	BAS316
6319	4822 130 11397	BAS316
6334	4822 130 11397	BAS316
6403	9340 552 30115	BA591
6652	4822 130 11551	UDZS10B
6657	4822 130 10838	UDZ3.3B
6658	4822 130 11397	BAS316
6719	9322 128 69685	S1D
6730	9322 128 69685	S1D
6731	9322 128 69685	S1D
6926	4822 130 11397	BAS316
6927	4822 130 11397	BAS316
6928	4822 130 11397	BAS316
6929	4822 130 11397	BAS316
6956	4822 130 11397	BAS316
6957	4822 130 11397	BAS316



7001	9352 684 81557	SAA5801H/015
7002	3198 010 42320	BC857BW
7003	3198 010 42310	BC847BW
7004	3198 010 42310	BC847BW
7005	9322 116 74668	LD1117D33
7007	9322 200 55668	IS41LV16100-50K
7008	3198 010 42310	BC847BW
7009	3198 010 42310	BC847BW
7010	3198 010 42320	BC857BW
7011	9322 156 81668	M24C32-WMN6TNKSA
7013	3198 010 42310	BC847BW
7014	3198 010 42320	BC857BW
7015	4822 209 73852	PMBT2369
7016	4822 209 73852	PMBT2369
7301	9352 681 65518	TDA9330N3
7303	3198 010 42320	BC857BW
7304	3198 010 42310	BC847BW
7308	3198 010 42320	BC857BW
7309	3198 010 42320	BC857BW
7310	3198 010 42310	BC847BW

7311	3198 010 42320	BC857BW
7312	9340 310 30215	PDTC144ET
7318	3198 010 42320	BC857BW
7319	3198 010 42320	BC857BW
7320	3198 010 42310	BC847BW
7322	3198 010 42310	BC847BW
7323	9352 625 24518	TDA9321H/N2
7402	3198 010 42310	BC847BW
7403	5322 130 60159	BC846B
7404	3198 010 42310	BC847BW
7407	4822 130 60373	BC856B
7410	3198 010 42310	BC847BW
7411	5322 130 60159	BC846B
7651	9322 180 61702	MSP3411G-FH-B8-V3
7652	9351 869 40118	74HC4053PW
7664	9340 425 30115	BC847BPN
7665	9340 425 30115	BC847BPN
7668	3198 010 42320	BC857BW
7674	3198 010 42310	BC847BW
7675	9340 425 20115	BC847BS
7678	9340 425 20115	BC847BS
7679	9340 425 20115	BC847BS
7680	3198 010 42310	BC847BW
7681	9322 060 73668	MC33178DR2
7682	5322 130 60159	BC846B
7703	4822 209 73852	PMBT2369
7705	3198 010 42310	BC847BW
7706	3198 010 70400	74LVC1G14GW
7707	3198 010 42310	BC847BW
7708	3198 010 42310	BC847BW
7709	3198 010 42310	BC847BW
7710	3198 010 42310	BC847BW
7711	2422 486 80938	Socket 32p f
7712	9351 870 00118	74HC573PW
7713	9352 688 09557	SAA4978H/V204
7714	9965 000 02179	MS81V04160-25TB
7715	4822 209 73852	PMBT2369
7717	4822 209 73852	PMBT2369
7719	9322 206 19672	MSM56V16160F-7T3-FG
7720	9322 207 36702	T6TX5EF-0001
7725	4822 209 73852	PMBT2369
7728	5322 130 42718	BFS20
7729	5322 130 42718	BFS20
7730	5322 130 42718	BFS20
7731	5322 130 42718	BFS20
7732	5322 130 42718	BFS20
7733	5322 130 42718	BFS20
7752	9322 202 21671	T6TU5XB-0001
7753▲	9322 206 19672	MSM56V16160F-7T3-FG
7760▲	9352 730 86557	SAA4998H/V1
7770	4822 209 17398	LD1117DT33
7772	9322 170 14668	LF15ABDT
7773	9322 179 78668	LF18ABDT
7774	9322 142 88668	LF25CDT

Side I/O Panel [D]

Various

0205	3104 304 24881	Side I/O bracket
1326	4822 267 10975	Connector 3p
1327	4822 267 31014	Socket headphone
1328	2422 026 05133	Connector SVHS 4p f
1936▲	2422 025 12485	Connector 11p m
1980	4822 267 10565	Connector 4p
1981	4822 267 10735	Connector 3p
8936▲	3104 311 05271	Cable 11p/820/11p
8981	3104 301 07761	Cable 3p/680/3p



2803	5322 126 10733	680pF 5% 50V
2804	5322 122 32531	100pF 5% 50V
2805	5322 122 32531	100pF 5% 50V
2806	5322 126 10733	680pF 5% 50V
2807	4822 126 14076	220nF +80/-20% 25V
2813	4822 124 22652	2.2μF 20% 50V
2832	5322 122 31863	330pF 5% 63V 0805
2834	5322 122 31863	330pF 5% 63V 0805
2840	4822 122 33177	10nF 20% 50V
2841	4822 122 33177	10nF 20% 50V



3803	4822 050 11002	1kΩ 1% 0.4W
3804	4822 050 11002	1kΩ 1% 0.4W
3814	4822 117 10833	10kΩ 1% 0.1W
3816	4822 051 20008	Jumper 0805
3826	4822 116 52199	68Ω 5% 0.5W
3827	4822 116 52199	68Ω 5% 0.5W
3828	4822 116 52199	68Ω 5% 0.5W

3829	4822 116 52199	68Ω 5% 0.5W
3830	4822 050 21003	10kΩ 1% 0.6W
3835	4822 116 52175	100Ω 5% 0.5W
3842	4822 050 21003	10kΩ 1% 0.6W
9801	4822 051 20008	Jumper 0805
9803	4822 051 20008	Jumper 0805
9804	4822 051 20008	Jumper 0805
9805	4822 051 20008	Jumper 0805
9806	4822 051 20008	Jumper 0805
9809	4822 051 20008	Jumper 0805



6801	4822 130 11416	PDZ6.8B
6802	4822 130 11416	PDZ6.8B
6803	4822 130 11551	UDZS10B
6804	4822 130 11551	UDZS10B
6805	4822 130 11551	UDZS10B
6806	4822 130 11551	UDZS10B
6807	4822 130 11416	PDZ6.8B
6808	4822 130 11416	PDZ6.8B

Top Control Panel [E]

Various

0345	4822 267 10567	Connector 4p
1701	4822 276 13775	Switch
1702	4822 276 13775	Switch
1703	4822 276 13775	Switch
1704	4822 276 13775	Switch
1705	4822 276 13775	Switch
8346	3104 311 06391	Cable 4p/1000/4p h Wh



3008	4822 117 10845	620Ω 1% 0.1W
3010	4822 117 11534	1.1kΩ 1% 0.1W
3013	4822 117 13528	200Ω 1% 0.125W 0805
3101	4822 117 11951	2kΩ 1% 0.1W
3104	4822 051 20391	390Ω 5% 0.1W
3999	4822 117 10833	10kΩ 1% 0.1W

CRT Panel

Various

0032	4822 492 70788	Fix IC
0034	4822 492 70788	Fix IC
0036	4822 492 70788	Fix IC
1298▲	2422 500 80063	Connector CRT 10p f
1424	2422 025 11244	Connector 7p m
1434	4822 267 10973	Connector 1p
1483	2422 025 16382	Connector 3p m
1940▲	2422 025 12485	Connector 11p m
8483▲	3104 311 03111	Cable 3p/340/3p ferrite



2312	4822 126 14585	100nF 10% 0805 50V
2313	4822 124 12373	47μF 20% 250V
2318	2238 916 15641	22nF 10% 25V 0603
2320	2020 558 90445	10nF 20% 1kV
2320	2252 648 08032	10nF 20% 500V
2324	4822 121 70594	1nF 5% 2kV
2324	5322 121 44356	4.7nF 5% 2kV
2338	2222 365 45104	100nF 10% 250V
2339	2222 365 45104	100nF 10% 250V
2340	2222 365 45104	100nF 10% 250V
2341	2238 586 59812	100nF 20% 50V 0603
2342	4822 126 14241	330pF 0603 50V
2347	4822 124 80791	470μF 20% 16V
2348	5322 126 11583	10nF 10% 50V 0603
2358	4822 124 80791	470μF 20% 16V
2359	5322 126 11583	10nF 10% 50V 0603
2403	4822 124 41584	100μF 20% 10V
2404	4822 124 41584	100μF 20% 10V
2405	4822 122 31177	470pF 10% 500V
2410	2238 916 15641	22nF 10% 25V 0603
2411	2238 916 15641	22nF 10% 25V 0603
2420	2222 930 56627	2.2nF 10% 200V 0805
2428	3198 017 42230	22nF 50V 0603
2435	2020 557 90734	22nF 10% 250V
2436	2020 012 93596	22μF 20% 250V
2437	5322 126 11578	1nF 10% 50V 0603
2438	2222 930 56627	2.2nF 10% 200V 0805
2439	2020 557 90734	22nF 10% 250V
2501	2238 586 59812	100nF 20% 50V 0603
2503	2238 586 59812	100nF 20% 50V 0603

2505	2238 586 59812	100nF 20% 50V 0603
2510	4822 126 14585	100nF 10% 0805 50V
2511	4822 126 14585	100nF 10% 0805 50V

—WW—

3301	4822 117 12517	5.6kΩ 5% 5W
3304▲	4822 052 10102	1kΩ 5% 0.33W
3305▲	4822 052 10108	1Ω 5% 0.33W
3310	4822 051 10102	1kΩ 2% 0.25W
3334	4822 050 11002	1kΩ 1% 0.4W
3338	3198 013 04710	470Ω 20% 0.5W
3339	3198 013 04710	470Ω 20% 0.5W
3340	3198 013 04710	470Ω 20% 0.5W
3341▲	4822 052 11479	47Ω 5% 0.5W
3345	4822 116 52191	33Ω 5% 0.5W
3347	3198 013 01520	1.5kΩ 20% 0.5W
3348▲	4822 117 13016	VDR 1mA/50V
3349	3198 013 01020	1kΩ 20% 0.5W
3350	4822 116 52175	100Ω 5% 0.5W
3351	4822 116 52175	100Ω 5% 0.5W
3352	4822 116 52175	100Ω 5% 0.5W
3356	4822 051 10102	1kΩ 2% 0.25W
3401	4822 053 11101	100Ω 5% 2W
3402	4822 116 52176	10Ω 5% 0.5W
3403▲	4822 052 10108	1Ω 5% 0.33W
3403▲	4822 052 11108	1Ω 5% 0.5W
3404▲	4822 052 10108	1Ω 5% 0.33W
3410	4822 051 30471	47Ω 5% 0.062W
3411	4822 117 11148	56kΩ 1% 0.1W
3412	4822 117 11148	56kΩ 1% 0.1W
3413	4822 051 30471	47Ω 5% 0.062W
3416	4822 051 20333	33kΩ 5% 0.1W
3417	4822 051 20333	33kΩ 5% 0.1W
3422	4822 051 30008	Jumper 0603
3448	4822 051 20333	33kΩ 5% 0.1W
3449	4822 117 11817	1.2kΩ 1% 0.0625W
3451	4822 051 30102	1kΩ 5% 0.062W
3453	4822 051 30103	10kΩ 5% 0.062W
3454	4822 051 20333	33kΩ 5% 0.1W
3456	4822 051 30332	3.3Ω 5% 0.062W
3458	4822 117 12139	22Ω 5% 0.062W
3459	4822 051 30101	100Ω 5% 0.062W
3460	4822 117 12139	22Ω 5% 0.062W
3465	4822 051 30008	Jumper 0603
3471	4822 117 11817	1.2kΩ 1% 0.0625W
3473	4822 116 80176	1Ω 5% 0.5W
3474	4822 051 30103	10kΩ 5% 0.062W
3478	4822 116 80176	1Ω 5% 0.5W
3488	4822 051 30008	Jumper 0603
3489	4822 051 30109	10Ω 5% 0.062W
3492	4822 051 30008	Jumper 0603
3501	4822 117 10361	680Ω 1% 0.1W
3502	4822 051 30331	330Ω 5% 0.062W
3506	4822 051 30471	47Ω 5% 0.062W
3507	4822 051 30008	Jumper 0603
3510	4822 116 52175	100Ω 5% 0.5W
3510	4822 116 52228	680Ω 5% 0.5W
3511	4822 117 10361	680Ω 1% 0.1W
3512	4822 051 30331	330Ω 5% 0.062W
3516	4822 117 13632	100kΩ 1% 0603 0.62W
3517	4822 051 30102	1kΩ 5% 0.062W
3518	4822 051 30008	Jumper 0603
3520	4822 116 52219	330Ω 5% 0.5W
3520	4822 116 52228	680Ω 5% 0.5W
3521	4822 117 10361	680Ω 1% 0.1W
3522	4822 051 30331	330Ω 5% 0.062W
3526	4822 051 30471	47Ω 5% 0.062W
3527	4822 051 30008	Jumper 0603
3530	4822 116 52219	330Ω 5% 0.5W
3530	4822 116 52228	680Ω 5% 0.5W
3532	4822 051 30471	47Ω 5% 0.062W
3533	4822 051 30008	Jumper 0603
3535	4822 051 20008	Jumper 0805
3536	4822 051 20008	Jumper 0805
3537	4822 051 20008	Jumper 0805
3539	4822 051 20561	560Ω 5% 0.1W
3541	4822 051 20561	560Ω 5% 0.1W
3543	4822 051 20561	560Ω 5% 0.1W
3544	4822 116 52285	470kΩ 5% 0.5W
3545	4822 051 30109	10Ω 5% 0.062W
3546	4822 051 30109	10Ω 5% 0.062W
3547	4822 051 30109	10Ω 5% 0.062W
3999	4822 051 30332	3.3Ω 5% 0.062W
3999	4822 117 11817	1.2kΩ 1% 0.0625W
9301	4822 051 30008	Jumper 0603
9303	4822 051 30008	Jumper 0603
9305	4822 051 30008	Jumper 0603
9306	4822 051 30008	Jumper 0603
9307	4822 051 30008	Jumper 0603
9308	4822 051 30008	Jumper 0603
9314	4822 051 30008	Jumper 0603
9323	4822 051 30008	Jumper 0603

9324	4822 051 30008	Jumper 0603
9325	4822 051 30008	Jumper 0603
9401	4822 051 20008	Jumper 0805
9402	4822 051 30008	Jumper 0603
9403	4822 051 30008	Jumper 0603
9406	4822 051 20008	Jumper 0805
9408	4822 051 30008	Jumper 0603
9409	4822 051 30008	Jumper 0603
9428	4822 051 30008	Jumper 0603
9432	4822 051 30008	Jumper 0603
9437	4822 051 30008	Jumper 0603
9450	4822 051 20008	Jumper 0805
9452	4822 051 20008	Jumper 0805
9453	4822 051 20008	Jumper 0805

5300▲	3104 308 20571	Transf. S13974-03
5304	4822 526 10704	Bead 100MHz
5305	2422 549 42896	Bead 120Ω 100MHz
5308	4822 157 11867	5.6μH 5%
5309	4822 157 11867	5.6μH 5%
5310	4822 157 50964	100μH
5400	4822 157 11869	33μH 10%
5400	4822 157 71467	39μH 10%
5500	2722 122 00337	Del line 70ns SDL-5135
5501	2722 122 00337	Del line 70ns SDL-5135
5502	2722 122 00337	Del line 70ns SDL-5135

6301	9340 553 52115	BAS321
6302	9340 553 52115	BAS321
6303	9340 553 52115	BAS321
6305	9340 553 52115	BAS321
6306	9340 553 52115	BAS321
6307	9340 553 52115	BAS321
6401	4822 130 11397	BAS316
6402	4822 130 11397	BAS316
6403	4822 130 11397	BAS316
6404	4822 130 11397	BAS316
6405	3139 120 52021	BYV29X-500
6407	4822 130 11397	BAS316
6420	5322 130 34337	BAV99
6421	5322 130 34337	BAV99
6422	5322 130 34337	BAV99
6426	4822 130 30613	BAW62
6427	4822 130 30613	BAW62
6428	4822 130 30613	BAW62
6430	9340 548 61115	PDZ12B
6431	4822 130 11397	BAS316
6432	9340 553 52115	BAS321
6500	4822 130 11397	BAS316
6501	4822 130 11397	BAS316
6502	4822 130 11397	BAS316
6503	4822 130 41601	BYV95A



7330	9352 694 46112	TDA6118JF/N1
7340	9352 694 46112	TDA6118JF/N1
7350	9352 694 46112	TDA6118JF/N1
7414	5322 130 62804	BCP53
7415	5322 130 63033	BCP56
7422	5322 130 42718	BFS20
7427	5322 130 60159	BC846B
7428	4822 130 60373	BC856B
7429	5322 130 63033	BCP56
7430	5322 130 62804	BCP53
7500	5322 130 42718	BFS20
7501	5322 130 60159	BC846B
7503	5322 130 42718	BFS20
7504	5322 130 60159	BC846B
7506	5322 130 42718	BFS20
7507	5322 130 60159	BC846B

DC Shift Panel [G]

Various

0317	4822 265 20723	Connector 2p
0318	4822 265 20723	Connector 2p
1430	2422 086 10581	Fuse 400mA 65V
8317	3104 311 01421	Cable 2p3/220/2p3 Wh

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2430	4822 122 31177	470pF 10% 500V
2431	4822 122 31177	470pF 10% 500V

5430	3128 138 38911	DC-shift coil CU15
6432	9340 317 00133	BYD33V
6433	9340 317 00133	BYD33V

3rd SCART Panel [H]

Various

0043	3104 304 21311	Coverplate SCART
1402	4822 267 10596	Connector 5p
1680	4822 265 31067	Connector 7p m
1992	2422 025 16725	Connector SCART f m Bk

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2500	2020 552 95344	680nF 20-80% 16V 0805
2504	2020 552 94427	100pF 5% 50V
2508	2020 552 95344	680nF 20-80% 16V 0805
2509	2020 552 94427	100pF 5% 50V

—WW—

3501	4822 051 30102	1kΩ 5% 0.062W
3502	4822 051 30008	Jumper 0603
3507	4822 051 30102	1kΩ 5% 0.062W
3508	4822 051 30008	Jumper 0603
3512	4822 051 30008	Jumper 0603
3526	4822 051 30101	100Ω 5% 0.062W
3538	4822 051 30008	Jumper 0603
3540	4822 051 30008	Jumper 0603
3542	4822 051 30008	Jumper 0603
3544	4822 051 30008	Jumper 0603
3999	4822 051 30392	3.9Ω 5% 0.063W 0603
9514	4822 051 30008	Jumper 0603
9515	4822 051 30008	Jumper 0603
9523	4822 051 30008	Jumper 0603
9525	4822 051 30008	Jumper 0603
9528	4822 051 30008	Jumper 0603
9529	4822 051 30008	Jumper 0603
9541	4822 051 30008	Jumper 0603
9542	4822 051 30008	Jumper 0603

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6500	4822 130 11416	PDZ6.8B
6501	4822 130 11416	PDZ6.8B
6502	4822 130 11416	PDZ6.8B
6503	4822 130 11416	PDZ6.8B
6506	4822 130 11416	PDZ6.8B
6507	9340 548 61115	PDZ12B
6509	4822 130 11416	PDZ6.8B
6510	4822 130 11416	PDZ6.8B
6511	4822 130 11416	PDZ6.8B
6512	4822 130 11416	PDZ6.8B

DAF Panel [I]

Various

1417	4822 265 20723	Connector 2p
1418	2422 025 16374	Connector 2p m
1419	4822 265 20723	Connector 2p
1491▲	3104 311 02452	Cable f-hook/340/1p
1497	4822 267 10973	Connector 1p
8418▲	3104 311 01951	Cable 2p3/560/2p4 Bk

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2800	2222 375 90498	470pF 5% 2kV
2821	2222 479 90166	68pF 5% 400V
2890	2222 375 90276	220pF 5% 2kV

—WW—

3998	4822 116 83876	270Ω 5% 0.5W
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—WW—

5800▲	4822 148 81242	Coil CU20C2
5801	3128 138 38881	Transformer CU15 B

Mains Switch Panel [J]

Various

0046	3104 304 23471	Bracket mains unit FL11
0049	3104 308 11041	Mains knob assy
0151	4822 256 91766	LED holder
0160	4822 256 91766	LED holder
0170	4822 256 10562	Photo diode holder
0201▲	2422 025 16268	Connector 2p m
0202▲	2422 025 16268	Connector 2p m
0241	2422 025 06354	Connector 9p m
1040	9322 185 95667	IR receiver TSOP4836
1051▲	2422 128 02924	Switch power 2p
8202	3104 311 02571	Cable 2p3/680/2p3 Bk
8946▲	3104 311 04981	Cable 9p/820/9p



2040	4822 124 41584	100µF 20% 10V
2060	4822 124 81151	22µF 50V
2070	3198 017 44740	470nF 10V 0603
2071	4822 124 40248	10µF 20% 63V



3040	4822 117 13577	330Ω 1% 1.25W 0805
3041	4822 051 30103	10kΩ 5% 0.062W
3042	4822 051 30682	6.8Ω 5% 0.062W
3043	4822 051 30471	47Ω 5% 0.062W
3052	4822 051 30331	330Ω 5% 0.062W
3057▲	4822 053 21335	3.3MΩ 5% 0.5W
3060	4822 051 30103	10kΩ 5% 0.062W
3061	4822 117 13577	330Ω 1% 1.25W 0805
3062	4822 117 11373	100Ω 1% 0805
3063	4822 051 30103	10kΩ 5% 0.062W
3064	4822 117 11373	100Ω 1% 0805
3066▲	4822 053 21335	3.3MΩ 5% 0.5W
3070	4822 051 30155	1.5MΩ 5% 0.062W
3071	4822 051 30155	1.5MΩ 5% 0.062W
3072	4822 051 30102	1kΩ 5% 0.062W
3073	4822 051 30332	3.3Ω 5% 0.062W
3074	4822 051 30103	10kΩ 5% 0.062W
3075	4822 051 30472	4.7Ω 5% 0.062W
3078	4822 051 30332	3.3Ω 5% 0.062W
3999	4822 051 30472	4.7Ω 5% 0.062W
9008	4822 051 30008	Jumper 0603
9010	4822 051 30008	Jumper 0603
9040	4822 051 30008	Jumper 0603
9043	4822 051 30008	Jumper 0603
9050	4822 051 30008	Jumper 0603
9051	4822 051 30008	Jumper 0603
9052	4822 051 30008	Jumper 0603
9067	4822 051 30008	Jumper 0603



6050	9322 110 34682	LED TLDR5400
6060	9322 191 72682	VS LTL353UBJ
6061	4822 130 11397	BAS316
6070	4822 130 11595	BPW46



7060	5322 130 60159	BC846B
7061	5322 130 60159	BC846B
7070	5322 209 82941	LM358D

Autoscavem Panel [SC]

Various

1440	2422 025 12485	Connector 11p m
1940	2422 025 12485	Connector 11p m
1955	4822 267 10735	Connector 3p
8440	3104 311 05882	Cable 11p/400/11p



2000	4822 126 14223	2.2pF 10% 50V 0603
2002	4822 126 13887	4.7pF 50V
2003	4822 126 13887	4.7pF 50V
2004	3198 016 31080	1pF 25% 50V 0603
2006	2238 586 59812	100nF 20% 50V 0603
2008	2238 916 15641	22nF 10% 25V 0603
2010	2238 586 59812	100nF 20% 50V 0603
2012	2238 916 15641	22nF 10% 25V 0603

2014	2238 916 15641	22nF 10% 25V 0603
2016	4822 122 33741	10pF 10% 50V
2020	2238 916 15641	22nF 10% 25V 0603
2038	2238 916 15641	22nF 10% 25V 0603
2040	4822 126 14225	56pF 5% 50V 0603
2041	3198 016 35680	5.6pF 0.5pF 50V 0603
2208	4822 124 41584	100µF 20% 10V
2600	4822 124 80791	470µF 20% 16V
2602	5322 122 32654	22nF 10% 63V 0805
2605	3198 017 41050	1µF 10V 0603
2607	5322 122 32654	22nF 10% 63V 0805



3000	4822 051 30101	100Ω 5% 0.062W
3002	4822 051 30101	100Ω 5% 0.062W
3004	4822 051 30101	100Ω 5% 0.062W
3006	4822 051 30102	1kΩ 5% 0.062W
3008	4822 051 30102	1kΩ 5% 0.062W
3010	4822 051 30102	1kΩ 5% 0.062W
3012	4822 051 30332	3.3Ω 5% 0.062W
3014	4822 117 12903	1.8kΩ 1% 0.063W 0603
3016	4822 117 12902	8.2kΩ 1% 0.063W 0603
3018	4822 051 30681	680Ω 5% 0.062W
3020	4822 051 30471	47Ω 5% 0.062W
3022	4822 051 30393	39kΩ 5% 0.062W
3024	4822 051 30273	27kΩ 5% 0.062W
3028	4822 051 30223	22kΩ 5% 0.062W
3030	4822 051 30683	68kΩ 5% 0.062W
3032	4822 117 12903	1.8kΩ 1% 0.063W 0603
3034	4822 051 30222	2.2kΩ 5% 0.062W
3036	4822 051 30332	3.3Ω 5% 0.062W
3038	4822 051 30561	560Ω 5% 0.062W
3040	4822 117 12925	47kΩ 1% 0.063W 0603
3042	4822 051 30682	6.8Ω 5% 0.062W
3044	4822 051 30102	1kΩ 5% 0.062W
3046	4822 051 30102	1kΩ 5% 0.062W
3048	4822 051 30102	1kΩ 5% 0.062W
3050	4822 051 30561	560Ω 5% 0.062W
3052	4822 051 30561	560Ω 5% 0.062W
3054	4822 051 30102	1kΩ 5% 0.062W
3056	4822 051 30102	1kΩ 5% 0.062W
3058	4822 051 30471	47Ω 5% 0.062W
3060	4822 051 30471	47Ω 5% 0.062W
3062	4822 051 30222	2.2kΩ 5% 0.062W
3064	4822 117 12971	15Ω 5% 0603 0.62W
3066	4822 117 12902	8.2kΩ 1% 0.063W 0603
3068	4822 051 30681	680Ω 5% 0.062W
3070	4822 117 12902	8.2kΩ 1% 0.063W 0603
3072	4822 051 30152	1.5Ω 5% 0.062W
3074	4822 051 30101	100Ω 5% 0.062W
3076	4822 117 11817	1.2kΩ 1% 0.0625W
3078	4822 051 30102	1kΩ 5% 0.062W
3093	4822 051 30152	1.5Ω 5% 0.062W
3106	4822 051 30472	4.7Ω 5% 0.062W
3108	4822 051 30273	27kΩ 5% 0.062W
3110	4822 051 30392	3.9Ω 5% 0.063W 0603
3112	4822 051 30222	2.2kΩ 5% 0.062W
3114	4822 051 30101	100Ω 5% 0.062W
3116	4822 051 30102	1kΩ 5% 0.062W
3118	4822 051 30103	10kΩ 5% 0.062W
3120	4822 051 30103	10kΩ 5% 0.062W
3500	4822 051 30101	100Ω 5% 0.062W
3502	4822 051 30101	100Ω 5% 0.062W
3600▲	4822 117 13574	1.5Ω 5% 1206
3999	4822 117 12903	1.8kΩ 1% 0.063W 0603
9000	4822 051 30008	Jumper 0603
9002	4822 051 30008	Jumper 0603
9010	4822 051 30008	Jumper 0603
9020	4822 051 30008	Jumper 0603
9033	4822 116 52175	100Ω 5% 0.5W
9045	4822 051 30008	Jumper 0603
9046	4822 051 30008	Jumper 0603
9047	4822 051 30008	Jumper 0603



5600	4822 157 11867	5.6µH 5%
5601	4822 157 11867	5.6µH 5%



6000	5322 130 80119	BBY40
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7000	4822 130 60373	BC856B
7002	4822 130 60373	BC856B
7004	4822 130 60373	BC856B
7006	5322 130 42718	BFS20
7008	4822 130 60373	BC856B

7010	5322 130 42718	BFS20
7012	5322 130 42718	BFS20
7014	4822 130 60383	BF824
7016	5322 130 42718	BFS20
7018	5322 130 42718	BFS20
7020	4822 130 60383	BF824
7022	5322 130 42718	BFS20
7024	5322 130 42718	BFS20
7026	5322 130 42718	BFS20
7040	5322 130 42718	BFS20
7042	4822 130 60383	BF824
7500	5322 209 90559	TDA8444T/N4

11. Revision List

First release