

**Service
Service
Service****7644**

ServiceManual

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IMPORTANT SAFETY NOTICE

Proper service and repair is important to the safe, reliable operation of all Philips Consumer Electronics Company** Equipment. The service procedures recommended by Philips and described in this service manual are effective methods of performing service operations. Some of these service operations require the use of tools specially designed for the purpose. The special tools should be used when and as recommended.

It is important to note that this manual contains various **CAUTIONS** and **NOTICES** which should be carefully read in order to minimize the risk of personal injury to service personnel. The possibility exists that improper service methods may damage the equipment. It also is important to understand that these **CAUTIONS** and **NOTICES ARE NOT EXHAUSTIVE**. Philips could not possibly know, evaluate and advise the service trade of all conceivable ways in which service might be done, or of the possible hazardous consequences of each way. Consequently, Philips has not undertaken any such broad evaluation. Accordingly, a servicer who uses a service procedure or tool which is not recommended by Philips must first satisfy himself thoroughly that neither his safety nor the safe operation of the equipment will be jeopardized by the service method selected.


** Hereafter throughout this manual, Philips Consumer Electronics Company will be referred to as Philips.

WARNING

Critical components having special safety characteristics are identified with a  or "S" by the Ref. No. in the parts list and enclosed within a broken line* (where several critical components are grouped in one area) along with the safety symbol  on the schematics or exploded views. Use of substitute replacement parts which do not have the same specified safety characteristics may create shock, fire, or other hazards. Under no circumstances should the original design be modified or altered without written permission from Philips. Philips assumes no liability, express or implied, arising out of any unauthorized modification of design. Servicer assumes all liability.

* **Broken Line** _____

FIRE AND SHOCK HAZARD

1. Be sure all components are positioned in such a way as to avoid the possibility of adjacent component shorts. This is especially important on those chassis which are transported to and from the service shop.
2. Never release a repaired unit unless all protective devices such as insulators, barriers, covers, strain reliefs, and other hardware have been installed in accordance with the original design.
3. Soldering and wiring must be inspected to locate possible cold solder joints, solder splashes, sharp solder points, frayed leads, pinched leads, or damaged insulation (including the ac cord). Be certain to remove loose solder balls and all other loose foreign particles.
4. Check across-the-line components and other components for physical evidence of damage or deterioration and replace if necessary. Follow original layout, lead length, and dress.
5. No lead or component should touch a receiving tube or a resistor rated at 1 watt or more. Lead tension around protruding metal surfaces or edges must be avoided.
6. Critical components having special safety characteristics are identified with an 'S' by the Ref. No. in the parts list and enclosed within a broken line* (where several critical components are grouped in one area) along with the safety symbol  on the schematic diagrams and /or exploded views.
7. When servicing any unit, always use a separate isolation transformer for the chassis. Failure to use a separate isolation transformer may expose you to possible shock hazard, and may cause damage to servicing instruments.
8. Many electronic products use a polarized ac line cord (one wide pin on the plug). Defeating this safety feature may create a potential hazard to the servicer and the user. Extension cords which do not incorporate the polarizing feature should never be used.
9. After reassembly of the unit, always perform an ac leakage test or resistance test from the line cord to all exposed metal parts of the cabinet. Also, check all metal control shafts (with knobs removed), antenna terminals, handles, screws, etc., to be sure the unit may be safely operated without danger of electrical shock.

* **Broken line** _____

LEAKAGE CURRENT COLD CHECK

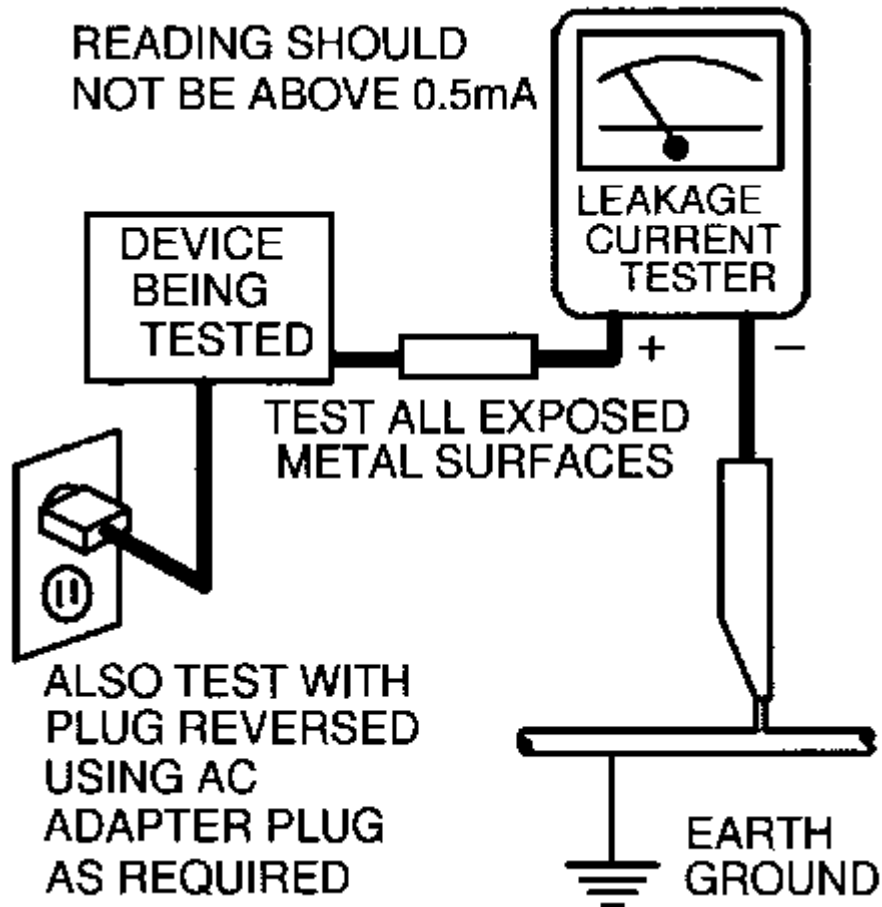
1. Unplug the ac line cord and connect a jumper between the two prongs of the plug.
2. Turn on the power switch.
3. Measure the resistance value between the jumpered ac plug and all exposed cabinet parts of the receiver, such as screw heads, antennas, and control shafts. When the exposed metallic part has a return path to the chassis, the reading should be between 1 megohm and 5.2 megohms. When the exposed metal does not have a return path to the chassis, the reading must be infinity. Remove the jumper from the ac line cord.

LEAKAGE CURRENT HOT CHECK

1. Do not use an isolation transformer for this test. Plug the completely reassembled receiver directly into the ac outlet.
2. Connect a 1.5k, 10W resistor paralleled by a 0.15uF. capacitor between each exposed metallic cabinet part and a good earth ground such as a water pipe, as shown below.
3. Use an ac voltmeter with at least 5000 ohms/volt sensitivity to measure the potential across the resistor.
4. The potential at any point should not exceed 0.75 volts. A leakage current tester may be used to make this test; leakage current must not exceed 0.5mA. If a measurement is outside of the specified limits, there is a possibility of shock hazard. The receiver should be repaired and rechecked before returning it to the customer.
5. Repeat the above procedure with the ac plug reversed. (Note: An ac adapter is necessary when a polarized plug is used. Do not defeat the polarizing feature of the plug.)

OR

With the instrument completely reassembled, plug the ac line cord directly into a 120Vac outlet. (Do not use an isolation transformer during this test.) Use a leakage current tester or a metering system that complies with American National Standards Institute (ANSI) C101.1 Leakage Current for Appliances and Underwriters Laboratories (UL) 1410, (50.7). With the instrument ac switch first in the on position and then in the off position, measure from a known earth ground (metal water pipe, conduit, etc.) to all exposed metal parts of the instrument (antennas, handle brackets, metal cabinet, screw heads, metallic overlays, control shafts, etc.), especially any exposed metal parts that offer an electrical return path to the chassis. Any current measured must not exceed 0.5mA. Reverse the instrument power cord plug in the outlet and repeat the test. See the graphic below.



TV SAFETY NOTES

SAFETY CHECKS

After the original service problem has been corrected, a complete safety check should be made. Be sure to check over the entire set, not just the areas where you have worked. Some previous servicer may have left an unsafe condition, which could be unknowingly passed on to your customer. Be sure to check all of the following:

- Fire and Shock Hazard
- Implosion
- X-Radiation
- Leakage Current Cold Check
- Leakage Current Hot Check
- Picture Tube Replacement
- Parts Replacement

WARNING: Before removing the CRT anode cap, turn the unit OFF and short the HIGH VOLTAGE to the CRT DAG ground.

SERVICE NOTE: The CRT DAG is not at chassis ground.

IMPLOSION

1. All picture tubes used in current model receivers are equipped with an integral implosion system. Care should always be used, and safety glasses worn, whenever handling any picture tube. Avoid scratching or otherwise damaging the picture tube during installation.
2. Use only replacement tubes specified by the manufacturer.

X-RADIATION

1. Be sure procedures and instructions to all your service personnel cover the subject of X-radiation. Potential sources of X-rays in TV receivers are the picture tube and the high voltage circuits. The basic precaution which must be exercised is to keep the high voltage at the factory recommended level.
2. To avoid possible exposure to X-radiation and electrical shock, only the manufacturer's specified anode connectors must be used.
3. It is essential that the service technician has an accurate HV meter available at all times. The calibration of this meter should be checked periodically against a reference standard.
4. When the HV circuitry is operating properly there is no possibility of an X-radiation problem. High voltage should always be kept at the manufacturer's rated value - no higher - for optimum performance. Every time a color set is serviced, the brightness should be run up and down while monitoring the HV with a meter to be certain that the HV is regulated correctly and does not exceed the specified value. We suggest that you and your technicians review test procedures so that HV and HV regulation are always checked as a standard servicing procedure, and the reason for this prudent routine is clearly understood by everyone. It is important to use an accurate and reliable HV meter. It is recommended that the HV reading be recorded on each customer's invoice, which will demonstrate a proper concern for the customer's safety.

5. When troubleshooting and making test measurements in a receiver with a problem of excessive high voltage, reduce the line voltage by means of a Variac to bring the HV into acceptable limits while troubleshooting. Do not operate the chassis longer than necessary to locate the cause of the excessive HV.
6. New picture tubes are specifically designed to withstand higher operating voltages without creating undesirable X-radiation. It is strongly recommended that any shop test fixture which is to be used with the new higher voltage chassis be equipped with one of the new type tubes designed for this service. Addition of a permanently connected HV meter to the shop test fixture is advisable. The CRT types used in these new sets should never be replaced with any other types, as this may result in excessive X-radiation.
7. It is essential to use the specified picture tube to avoid a possible X-radiation problem.
8. Most TV receivers contain some type of emergency "Hold Down" circuit to prevent HV from rising to excessive levels in the presence of a failure mode. These various circuits should be understood by all technicians servicing them, especially since many hold down circuits are inoperative as long as the receiver performs normally.

PICTURE TUBE REPLACEMENT

The primary source of X-radiation in this television receiver is the picture tube. The picture tube utilized in this chassis is specially constructed to limit X-radiation emissions. For continued X-radiation protection, the replacement tube must be the same type as the original, including suffix letter, or a Philips approved type.

PARTS REPLACEMENT

Many electrical and mechanical parts in Philips television sets have special safety related characteristics. These characteristics are often not evident from visual inspection nor can the protection afforded by them necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. The use of a substitute part which does not have the same safety characteristics as the Philips recommended replacement part shown in this service manual may create shock, fire, or other hazards.

PRODUCT SAFETY GUIDELINES FOR ALL PRODUCTS

CAUTION: Do not modify any circuit. Service work should be performed only after you are thoroughly familiar with all of the following safety checks. Risk of potential hazards and injury to the user increases if safety checks are not adhered to.

USE A SEPARATE ISOLATION TRANSFORMER FOR THIS UNIT WHEN SERVICING.

PREVENTION OF ELECTROSTATIC DISCHARGE (ESD)

Some semiconductor solid state devices can be damaged easily by static electricity. Such components commonly are called Electrostatically Sensitive (ES) Devices, Examples of typical ES devices are integrated circuits and some field-effect transistors and semiconductor "chip" components. The following techniques should be used to help reduce the incidence of component damage caused by electrostatic discharge (ESD).

1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any ESD on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging ESD wrist strap, which should be removed for potential shock reasons prior to applying power to the unit under test.
2. After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
3. Use only a grounded-tip soldering iron to solder or unsolder ES devices.
4. Use only an anti-static solder removal device. Some solder removal devices not classified as "antistatic (ESD protected)" can generate an electrical charge sufficient to damage ES devices.
5. Do not use Freon propelled chemicals. These can generate electrical charges sufficient to damage ES devices.
6. Do not remove a replacement ES device from its protective package until immediately before you are ready to install it (most replacement ES devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive material).
7. Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device will be installed.

CAUTION: Be sure no power is applied to the chassis or circuit and observe all other safety precautions.

8. Minimize bodily motions when handling unpackaged replacement ES devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your feet from a carpeted floor can generate static electricity (ESD) sufficient to damage an ES device.)

NOTE to CATV system Installer:

This reminder is provided to call the CATV system installer's attention to article 820-22 of the NEC that provides guidelines for proper grounding and, in particular, specifies that the cable ground shall be connected to the grounding system of the building, as close to the point of cable entry as practical.

PRACTICAL SERVICE PRECAUTIONS

IT MAKES SENSE TO AVOID EXPOSURE TO ELECTRICAL SHOCK. While some sources are expected to have a possible dangerous impact, others of quite high potential are of limited current and are sometimes held in less regard.

ALWAYS RESPECT VOLTAGES. While some may not be dangerous in themselves, they can cause unexpected reactions – reactions that are best avoided. Before reaching into the powered color TV set, it is best to test the high voltage insulation. It is easy to do, and is just a good service precaution.

BEFORE POWERING UP THE TV WITH THE BACK OFF (or on a test fixture), attach a clip lead to the CRT DAG ground and to a screwdriver blade that has a well insulated handle. After the TV is powered on and high voltage has developed, probe the anode lead with the blade, starting at the bottom of the High Voltage Transformer (flyback – IFT). Move the blade to within two inches of the connector of the CRT. **IF THERE IS AN ARC, YOU FOUND IT THE EASY WAY, WITHOUT GETTING A SHOCK!** If there is an arc to the screwdriver blade, replace the High Voltage Transformer or the lead, (if removable) whichever is causing the problem.

PICTURE TUBE REPLACEMENT PROCEDURE

Note: a. Two (2) people are required to handle this picture tube.
b. Safety Glasses must be worn during this procedure or whenever directly handling a picture tube.
c. Take care in each step not to damage the CRT or the cabinet.

1. Remove the Chassis and the CRT Socket Board Module from the cabinet.
2. A furniture pad or blanket should be positioned on the floor to support only the CRT Face. This pad or blanket should be high enough to keep the CRT Face approximately 12 to 14 inches off the floor.
3. Using two people, place the cabinet in a front down position with the CRT Face on the pad or blanket.
4. Place padded blocks under each corner of the cabinet to keep it from rocking.
5. Remove the four screws, at the corners of the CRT.
6. With two people lowering the cabinet to the floor, leave the CRT elevated by the pad or blanket.

Note: Take care not to grasp the neck of the CRT during this procedure, as it is extremely fragile.

7. Two (2) people may then lift the CRT from the cabinet.
8. Remove the degaussing coil from the defective CRT and mount on the replacement. Take care to maintain the exact shape and fit.

To install the new CRT, reverse steps 1 to 7.

Technical Specifications, Connections and Chassis Overview

Technical Specifications

Reception

Feature	Data
Tuning system	: PLL
Color systems (off-air)	: NTSC M
Sound systems :	: BTSC DBX
A/V connections	: NTSC M, : NTSC Playback
Channel selections	: 181 channels, : Full-cable, UHF
IF frequency	: 45.75MHz
Aerial input	: 75 ohm, Coax

Miscellaneous

Feature	Data
Set stroke numbers	: /17
AC voltage	: 120V ($\pm 10\%$),
AC frequency	: 50 / 60Hz ($\pm 5\%$)
Ambient temperature	: + 5 to + 45 deg. C.
Standby Power consumption	: 0.7W

Connections

Front and Top Controls / Side Connections

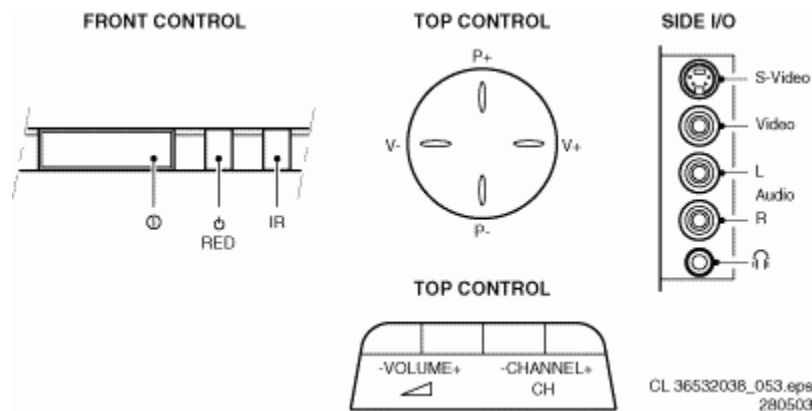










Figure: Front and top controls / side connections

S-Video

Connector	Kind	Value	Symbol
1		Gnd	
2		Gnd	
3	Y	1Vpp / 75 ohm	
4	C	0.3Vpp / 75 ohm	

Audio / video

Connector	Kind	Value	Symbol
1	Video	1Vpp / 75 ohm	
2	Audio	L (0.5Vrms / 10k)	
3	Audio	R (0.5Vrms / 10k)	
4	Headphone	(32 - 2000 ohm / 10mW)	 6.3mm / i / i

Rear Connections

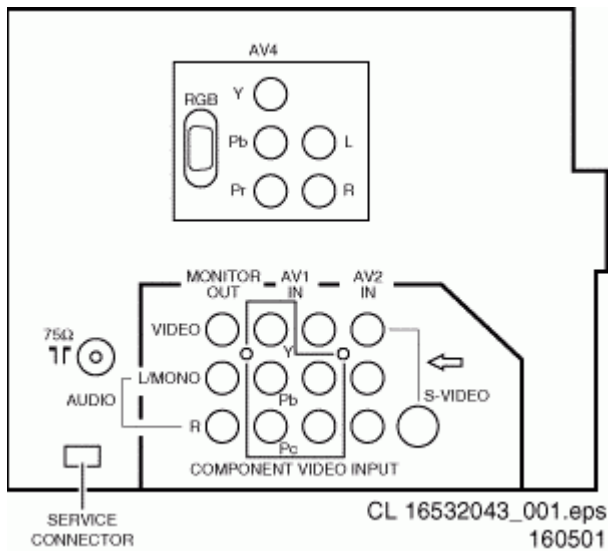


Figure: Rear connections




Monitor out

Connector	Kind	Value	Symbol
1	Video	1Vpp / 75 ohm	$\ominus \rightarrow \odot$
2	Audio	L (0.5Vrms / 10k)	$\ominus \rightarrow \odot$
3	Audio	R (0.5Vrms / 10k)	$\ominus \rightarrow \odot$




AV1 in

Connector	Kind	Value	Symbol
1	Y	0.7Vpp / 75 ohm	$\oplus \rightarrow \odot$
2	Pb	0.7Vpp / 75 ohm	$\oplus \rightarrow \odot$
3	Pr	0.7Vpp / 75 ohm	$\oplus \rightarrow \odot$





AV1 in

Connector	Kind	Value	Symbol
4	Video	1Vpp / 75 ohm	
5	Audio	L (0.5Vrms / 10k)	
6	Audio	R (0.5Vrms / 10k)	






AV2 in

Connector	Kind	Value	Symbol
1	Video	1Vpp / 75 ohm	
2	Audio	L (0.5Vrms / 10k)	
3	Audio	R (0.5Vrms / 10k)	




AV2 in (SVHS)

Connector	Kind	Value	Symbol
1		Gnd	
2		Gnd	
3	Y	1Vpp / 75 ohm	
4	C	0.3Vpp / 75 ohm	



AV4 in (D-sub connector)

Connector	Kind	Value	Symbol
1	Pr/R	0.35 Vpp/0.7 Vpp / ohm	
2	Y/G	0.7 Vpp/0.7 Vpp / 75 ohm	
3	Pb/B	0.35 Vpp/0.7 Vpp / 75 ohm	
4	H	5 Vpp / 1 kohm	
5	V	5 Vpp / 1 kohm	

AV4 in (cinches)

Connector	Kind	Value	Symbol
1	Y/G	0.7 Vpp/0.7 Vpp / 75 ohm	
2	Pb/B	0.35 Vpp/0.7 Vpp / 75 ohm	
3	Pr/R	0.35 Vpp/0.7 Vpp / 75 ohm	

AV4 in

Connector	Kind	Value	Symbol
1	Audio	L (0.5 Vrms / 10 kohm)	
2	Audio	R (0.5 Vrms / 10 kohm)	

Mechanical Instructions

Rear Cover Removal

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

Service Positions

Large Signal Panel (LSP) Service Positions

Service Position 1:

To gain better access to the LSP, do the following:

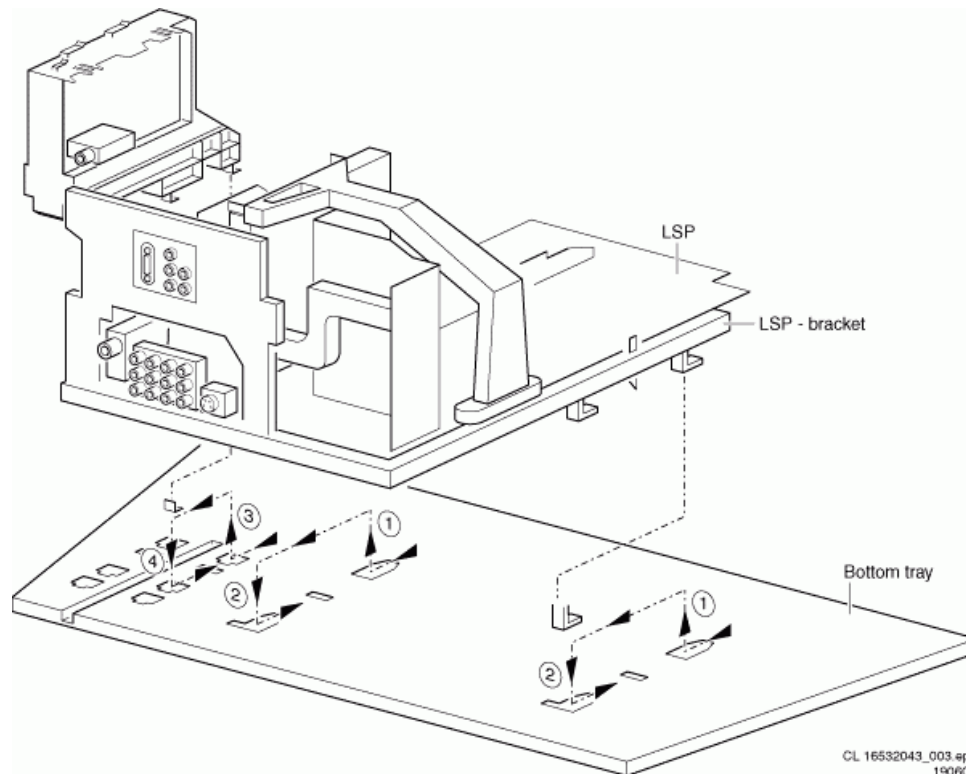


Figure:

1. To remove the LSP assembly from the bottom tray, release the 2 locks in the middle on each side rail by moving the tab backward and at the same time pull the complete assembly backward.
2. Hook the bracket in the first row of holes in the cabinet bottom (in other words, reposition the bracket from [1] to [2]).
3. Do the same with the 'DW/3D comb' module (reposition from [3] to [4]).

Service Position 2:

To make the copper side of the LSP accessible, follow these steps:

1. Disconnect the degaussing cable and rotation coil cable (cable between mains assembly and LSP must be long enough, otherwise this mains assembly must also be removed from the cabinet).
2. Remove the DAF panel assembly (see explanation later in this chapter), and remove the DAF panel out of the assembly.
3. Remove the Side I/O panel from its assembly and place it on the bottom tray.
4. Remove the 3D comb filter panel and DW panel out of the mechanical bracket, and reconfigure the cabling.
5. Remove the HD jack panel assembly. The HD jack panel itself must stay connected to the LSP.
6. Release the cables from their cable ties.
7. Carefully shift the LSP panel backward, and shift it a bit to the left (as seen from the back).
8. Turn the LSP assembly clockwise, and position the hook of the LSP assembly in the groove of the bottom tray. This is not a true service position, but the LSP assembly position is stable, assuming a big enough table is used.
9. Position the DW panel and 3D comb panel carefully on top of the LSP and also position the HD jack panel and DAF panel on the bottom, guarding against short-circuiting the panels.

10. The LSP is now serviceable (all functions should work, except for degaussing and picture rotation).

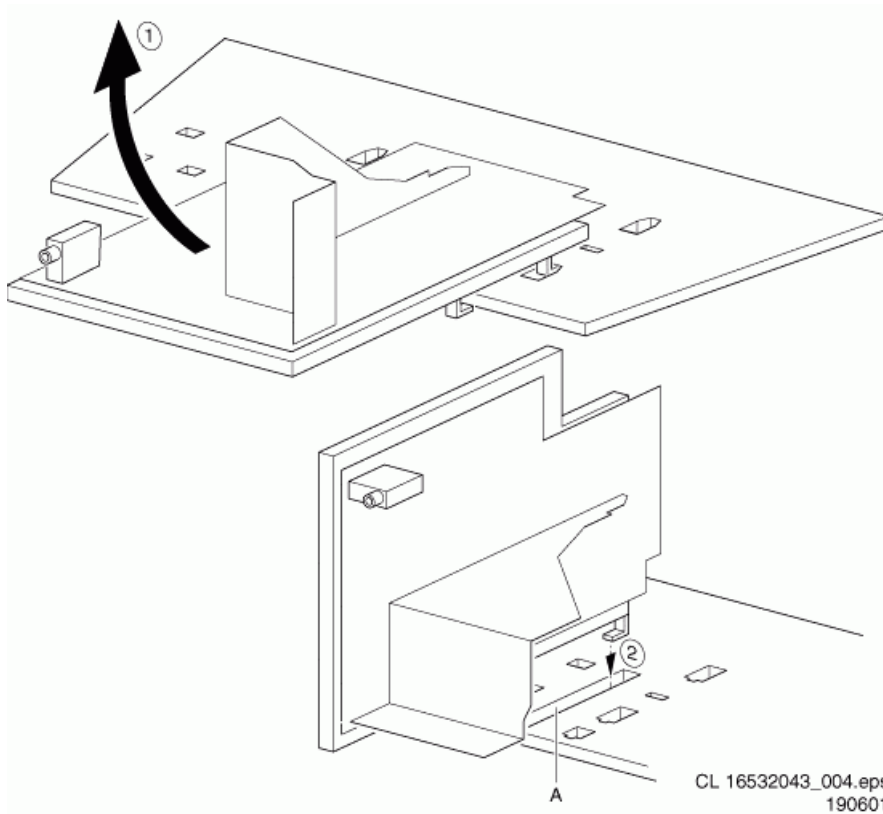


Figure:

Small Signal Board (SSB) Service Position

All relevant test points are accessible with the SSB in its original position, but for ease of use an 'SSB extension board' is available under number 9965 000 05769.

Note: Test points on the side of the SSB pointed to the middle (hot) heatsink could more easily be accessed with an extension board).

To make the SSB accessible on both sides, follow these steps:

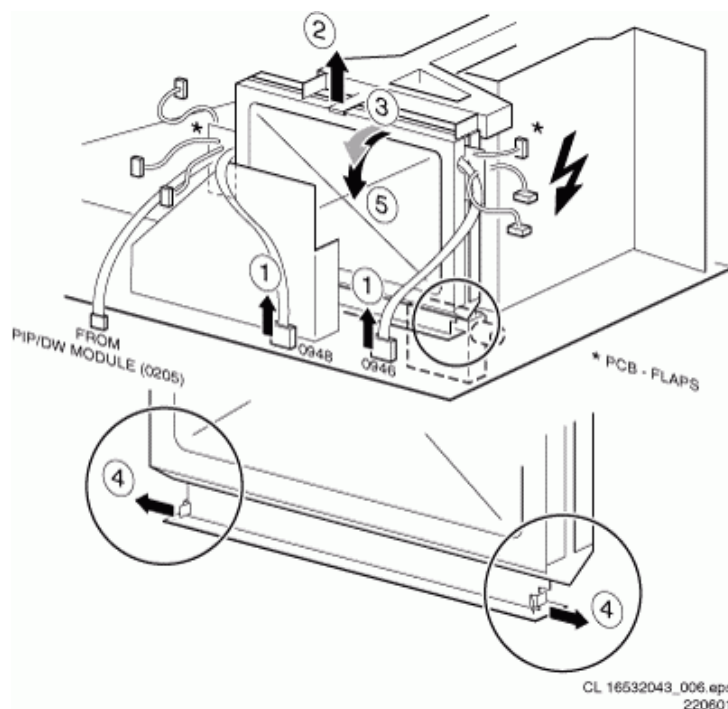


Figure:

1. Put the LSP, dependent on the size of the picture tube, a bit to the left of service position 1 (as described above). Otherwise the extension panel will conflict with the CRT panel.
2. Release the 'top fixation clamp' that holds the SSB [2], and pull the SSB slightly toward the Tuner [3]. At the same time, release the 2 metal clamps at both sides of the SIMM connector [4]. Pull the top side of the SSB toward the Tuner [5], and take the complete SSB out now (it 'hinges' in the SIMM connector).

3. Remove/lift the 'LSP top bracket' after removing the 2 screws that hold the bracket at the right side.
4. Remove the shielding of the SSB, and release the coax cable (the one going to connector 0946 on LSP) from the metal groove. In this way this coax cable is long enough to connect to the LSP (see figure below).
5. Organize/reorganize the cabling when you put the SSB on the extension panel. The only cable not necessarily needed is the longest coax cable. You do not have DW/PIP functionality then, but in that case you can localize the fault to the DW module. (If necessary, you can order a longer coax cable under number 3104 311 00351).
6. Both sides of the SSB are now accessible for servicing.

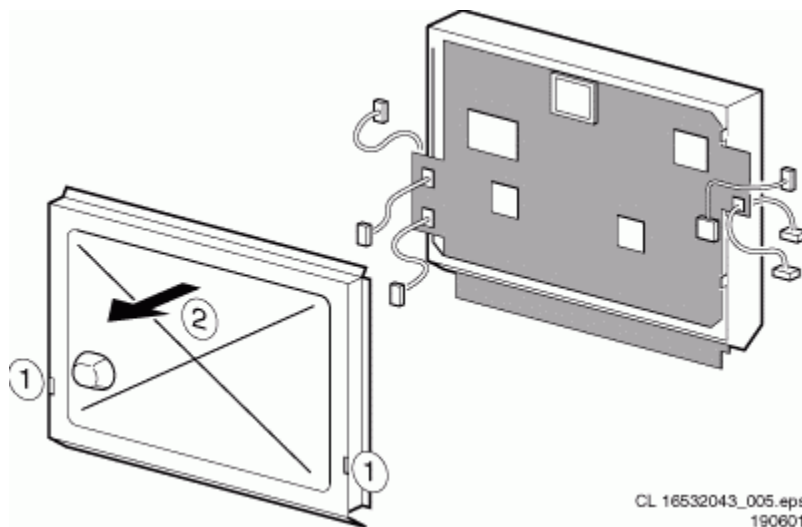


Figure:

Double Window (DW) Panel Removal

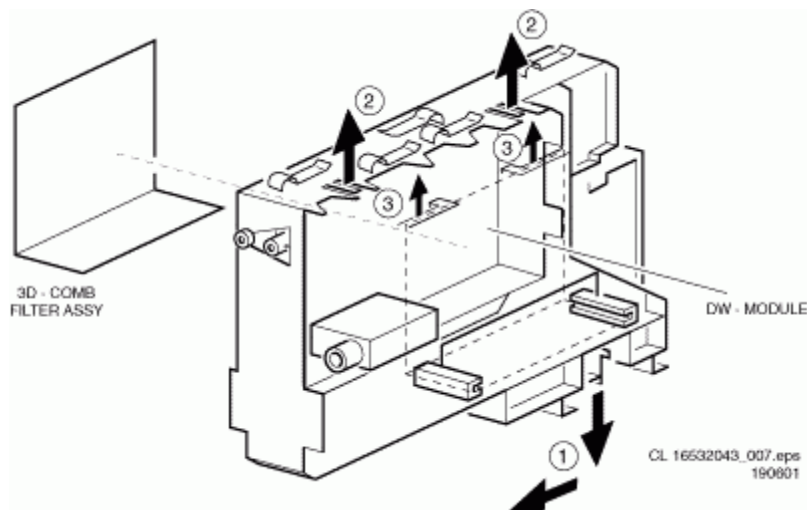


Figure:

1. Remove the 'DW panel/3D comb filter panel' bracket from the bottom tray by pulling the release handle [1] backwards. The release catch is lifted by this.
2. The board can easily be lifted out of the bracket after releasing the 2 securing clamps [2].
3. Both sides of the panel are easily accessible.

3D-Comb Filter Panel Removal

1. Pull the release handle [1] backward and remove the 'DW panel/3D comb filter panel' bracket from the bottom tray.
2. Remove the 3D comb filter panel from the guiding slots, while with releasing the 2 securing clamps [3].
3. The smallest PWB is easily accessible. The biggest PWB is a panel that must be replaced if it is defective. For that reason, accessibility is less important (the interfacing connection is sufficient).

Dynamic Astigmatic Focus (DAF) Panel Removal

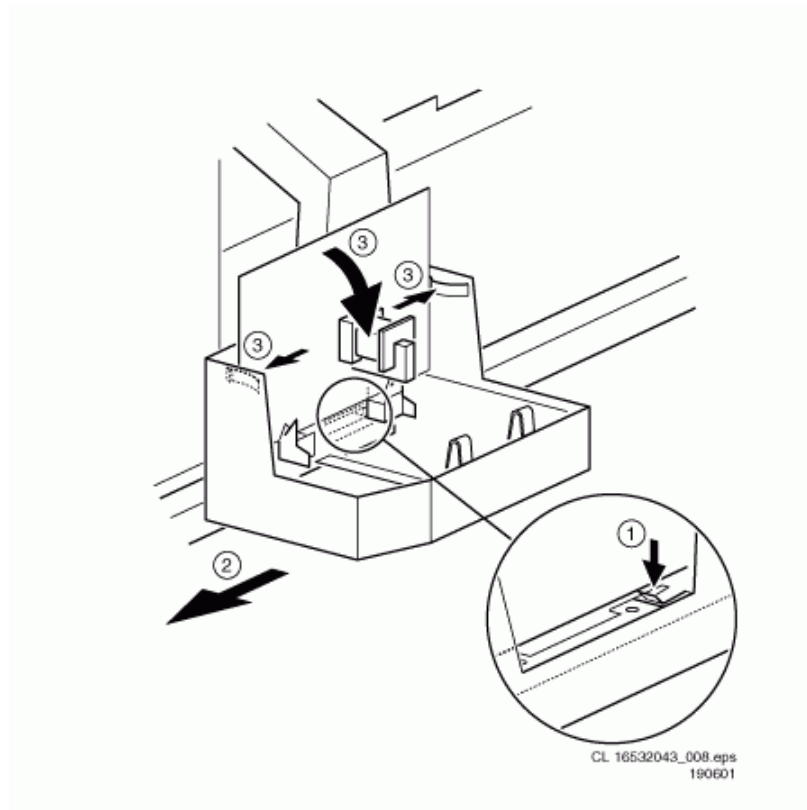


Figure:

1. Release a release catch [1] (on the LSP bracket between the LSP and DAF panel) by pushing it down, while pulling the DAF panel assembly backward [2].
2. The DAF panel can easily be lifted from its bracket after releasing the 2 securing clamps [3].

Top Control Panel Removal

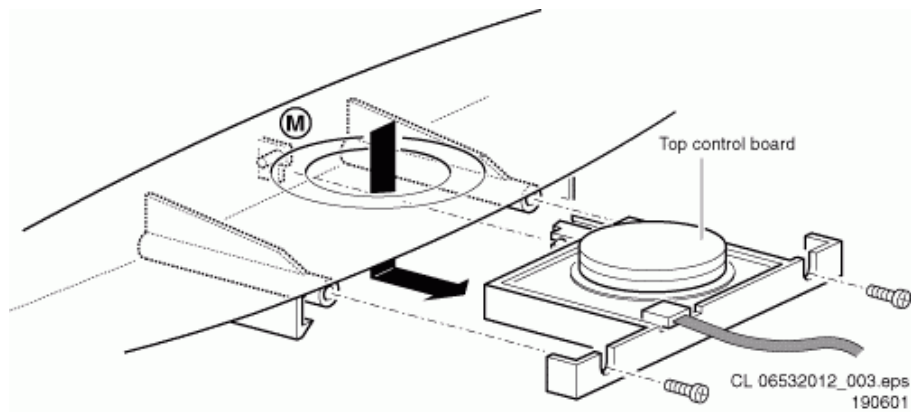


Figure:

1. Remove the two screws which hold the panel.
2. Pull the top control panel backward (release it from its front hinge [M]).
3. Release the 2 securing clamps and lift the panel from its bracket.

Side I/O Panel Removal

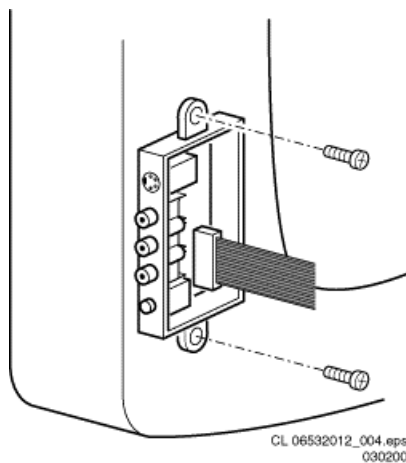


Figure:

1. Release the 2 securing clamps and lift the panel from its bracket.

Mains Switch Panel Removal

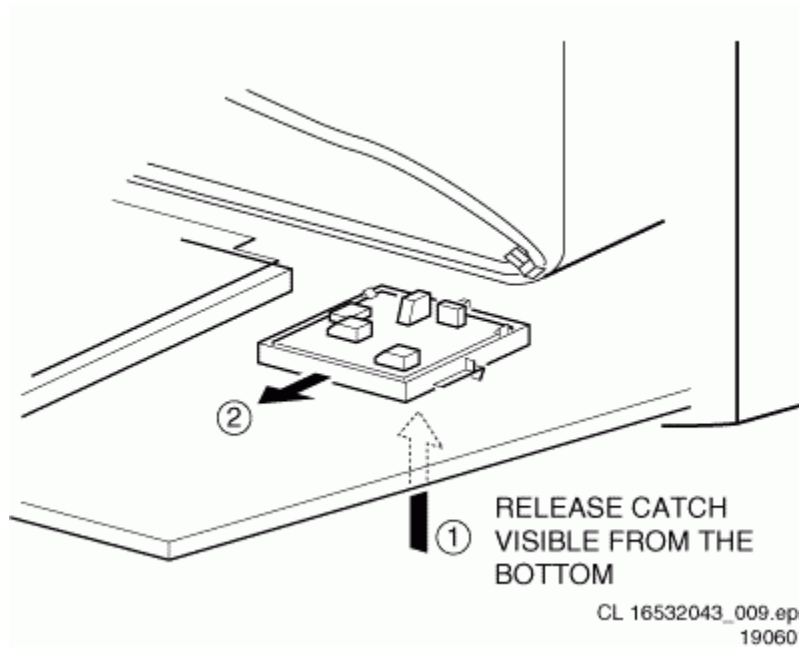


Figure:

The easiest way to access this module is with the LSP in service position 2.

1. Position the cabinet a bit over the edge of a table, and push the release catches up from the bottom side of the set [1].
2. At the same time pull the Mains Panel assembly backward and remove it [2].

Rear Cover Mounting

Before you mount the Rear Cover, perform the following checks:

- Confirm that the AC Power Cord is mounted correctly in its guiding brackets.
- Confirm that all cables are replaced in their original positions. This is very important due to the large 'hot' area of the set.

Service Modes, Error Codes and Faultfinding

Contents 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.

Test Points

The chassis is equipped with test points in the service printing. These test points refer to the functional blocks:

- A1-A2-A3, etc., for the audio processing circuitry [diagrams A5, A6, A7 and B6]
- C01-C02-C03, etc., for the 3D comb interface panel [C0]
- C1-C2-C3, etc., for the control circuitry [B7]
- F1-F2-F3, etc., for the frame drive and frame output circuitry [A4, B4]
- F1F-F2F, etc., for the RGB signals on the CRT panel [F]
- I1-I2-I3, etc., for the intermediate frequency circuitry [A7, B2]
- L1-L2-L3, etc., for the line drive and line output circuitry [A3, B4] and Double Window [C]
- N1-N2-N3, etc., for the Jack high definition interface panel [N]
- P1-P2-P3, etc., for the power supply [A1, A2]
- S1-S2-S3, etc., for the feature box circuitry [B3]

- SC1-SC2, etc., for the SCAVEM circuitry on the CRT panel [F]
- V1-V2-V3, etc., for the video processing circuitry [B2, B3, B4, B5, B6] and Double Window [C]

The numbering is done in a logical sequence for diagnostics; always start diagnosing within a functional block in the sequence of the relevant test points for that functional block.

Perform measurements under the following conditions:

- Service mode: SDM.
- Video: color bar signal.
- Audio: 1kHz, mono.

Service Modes

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

There is also the option of using ComPair, a hardware interface between a computer (see requirements), and the TV chassis. It offers the ability of structured troubleshooting, error code reading, and software version readout for all EM1.1U chassis.

Minimum requirements: a 486 processor, Windows 3.1 and a CD-ROM drive (see also paragraph 5.4).

Service Default Mode (SDM)

Purpose

- Provide a situation with predefined settings in order to retrieve the same measurement results as published in this manual.
- Start the 'blinking LED' sequence procedure.
- Have the possibility to override the 5V protection.

Specifications

- Tuning frequency: 61.25MHz (Channel 3).
- Color system: NTSC.
- All picture settings at 50% (brightness, color, picture).
- All sound settings at 50% except volume at 25% (i.e., bass, treble, and balance at 50%, volume at 25%).
- All service-unfriendly modes (if present) are disabled, such as:
 - (sleep) timer,
 - child/parental lock,
 - blue mute,
 - hotel/hospitality mode,
 - auto switch-off (when no 'IDENT' video signal is received for 15 minutes),
 - skip/blank of non-favorite presets/channels,
 - auto store of personal presets,
 - auto user menu time-out.

How to enter

Use one of the following methods:

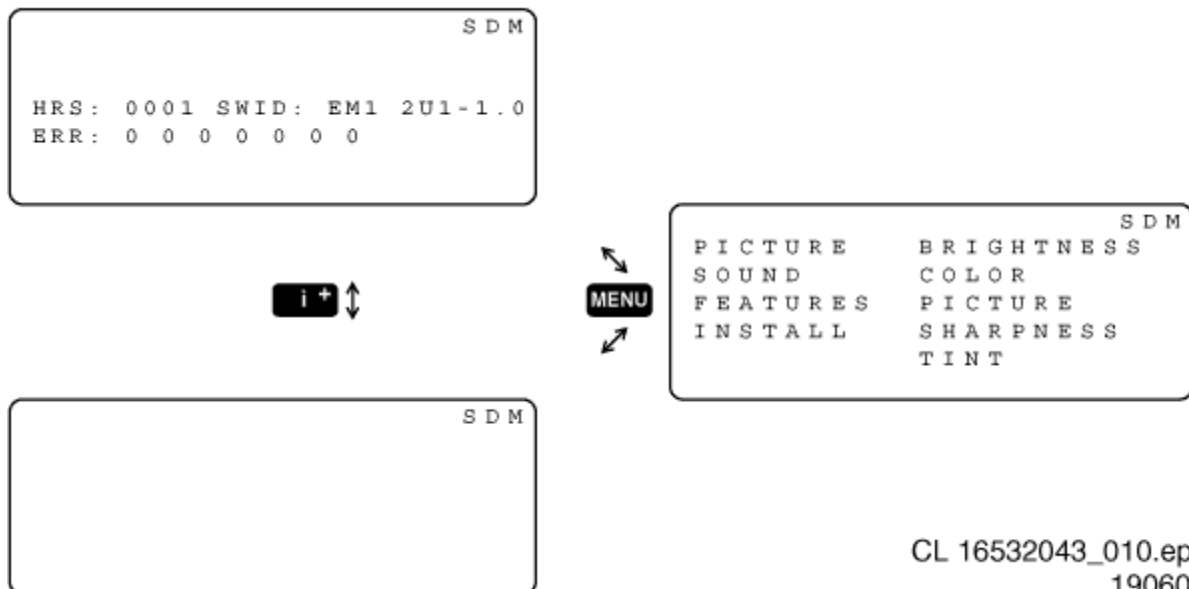
- Via a standard RC transmitter: key in the code '062596' directly followed by the 'MENU/SELECT' button.
- Via ComPair (simulating the DST).
- Via grounding the 'Front Detect' line (pins 1 and 7 of connector 0240) on the Side I/O panel while disconnecting and reconnecting the AC power cord.

CAUTION: Entering SDM by grounding the 'Front Detect' line will override the 5V protection. This should only be done for a short period. In case of SW protections (errors 1 - 4 and 8), the set will shut down in 15s.

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

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

SDM Menu



CL 16532043_010.eps
190601

Figure: SDM Menu

How to navigate

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

When you press the 'STATUS/EXIT' button on the RC transmitter, the set shows/hides the error buffer. To prevent interference with oscilloscope measurements, it is possible to hide the OSD.

How to exit

Switch the set to STANDBY by pressing the power button on the remote control transmitter or via the 'POWER' switch of the set.

Service Alignment Mode (SAM)

Purpose

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

Specifications

- Software alignments (see chapter 8).
- Option settings (see chapter 8).
- Error buffer reading and erasing. The most recent error code is displayed on the left side.
- Hours counter (in hexadecimal format)
- Software version.

How to enter

Use one of the following methods:

- Via a standard RC transmitter by entering the code '062596' followed by the 'STATUS/EXIT' button.
- Via ComPair (simulating the dealer remote).
- By the 'ALIGN' button on the dealer remote, while the set is in the normal operation mode.
- Coming from SDM mode, via pressing the 'VOLUME -' and 'VOLUME+' buttons on the local keyboard **simultaneously** (for a few seconds), the set toggles from SDM to SAM.

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

SAM Menu

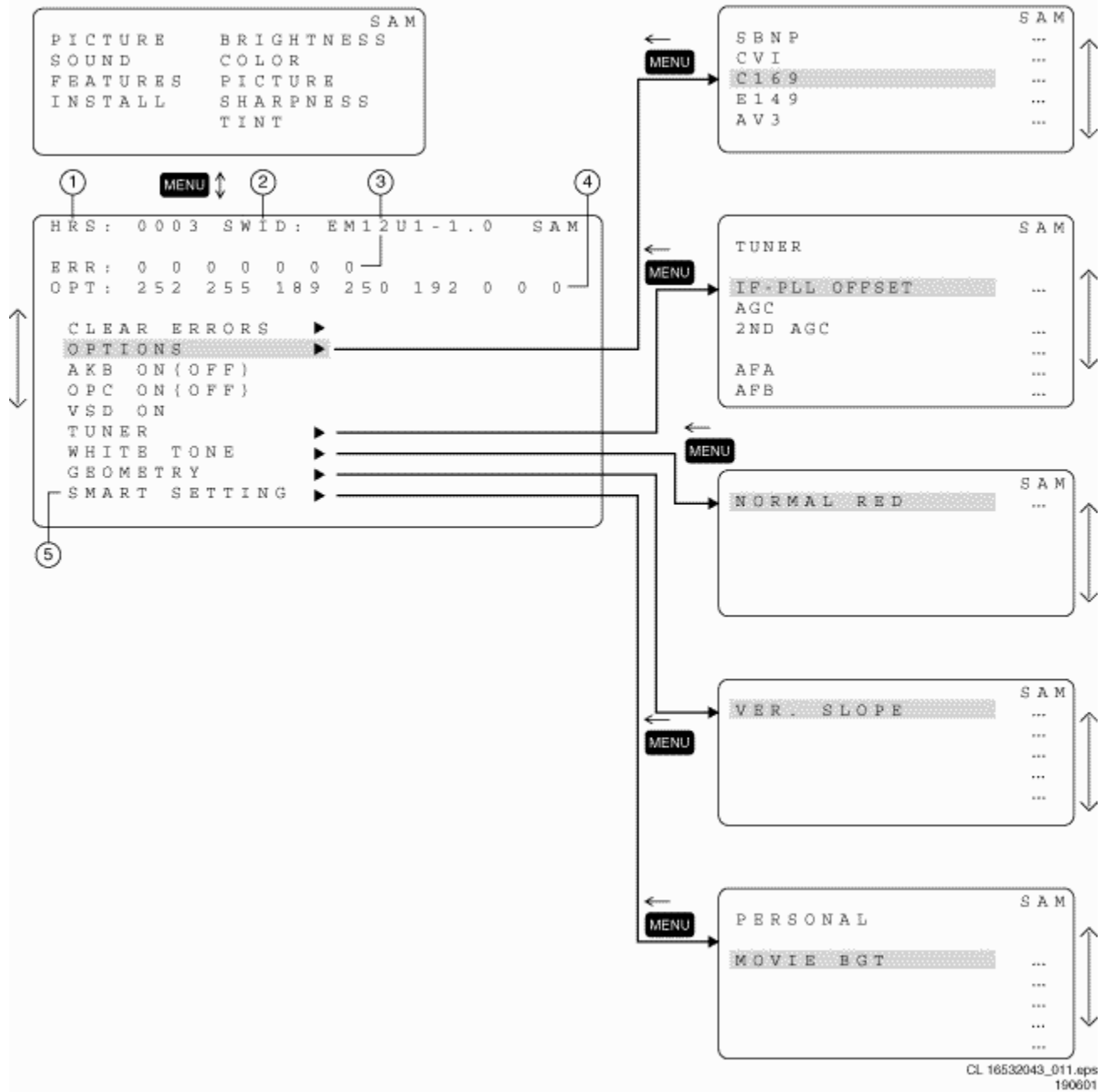


Figure: SAM Menu

Explanation

The Service Alignment Mode menu will now appear on the screen. The following information is displayed:

1. Operation hours timer (hexadecimal)
2. Software identification of the main microcontroller (AA BBB-X.Y, **example:** EM11U1-1.0)
 - AAA is the chassis name (EM1 = Painter processor, EM2 = OTC processor).
 - BBB = Software code belonging to a certain stroke number, in this case 1U1 (USA version).
 - X = main version number.
 - Y = sub-version number.
3. Error buffer (7 errors possible).
4. Option bytes (8 codes possible), summary of options are explained below.
5. Sub menus are listed in a scroll menu.

How to navigate

Select menu items with the 'CURSOR UP/DOWN' key. This will highlight the selected item. 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 (e.g., SERV-BLK).
- Change the value of the selected menu item (e.g., VER-SLOPE).
- Activate the selected submenu (e.g., GEOMETRY).

Pressing the 'MENU/SELECT' button on the RC transmitter switches between the SAM and the normal user menus (with the SAM mode still active in the background).

Pressing the 'MENU/SELECT' key in a submenu will go to the previous menu.

How to exit

Switch the set to STANDBY by pressing the power button on the remote control transmitter or via the 'POWER' switch of the set.

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

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

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

```

CSM Menu
1 HRS: 0005 SWID: EM1 2U1 - 1.0 CSM
2 CODES: 0 0 0 0 0 0 0
3 OPT: 252 255 189 250 192 0 0 0
4
5 NO SIGNAL          11 SOUND: MONO
6 TIMER ON           12 VOLUME: ...
7 CHANNEL BLOCKED   13 BALANCE: +/- ...
8 NOT PREFERRED      14 HUE: +/- ...
9 HOTELMODE ON       15 COLOUR: ...
10 SOURCE: 1         16 BRIGHTNESS: ...
                    17 CONTRAST: ...

```

HIDDEN MODES {

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190601

Figure: CSM Menu

Line 1:

HRS : Hexadecimal counter of operating hours. **Example:** 1B (hex)= 0001 1011 (bin)= 27 (dec.).

Standby hours are not counted as operating hours. **Note:** at each turn on, the counter will advance one hour.

SWID : Software identification of the main microcontroller (see paragraph 5.2.2).

Line 2:

Error code buffer (for more details see paragraph 5.3). Displays the last 7 errors of the error code buffer.

Line 3:

Option bit setting controls the software and hardware functionality. An option byte or option number represents 8 of those bits. Each option number is displayed as a decimal number between 0 and 255. The set may not work correctly when an incorrect option code is set. See chapter 8 for more information on correct option settings.

Line 4:

Not valid in this set. No message here.

Line 5:

Indicates that the set is not receiving an 'ident' signal on the selected source.

Note: On some models, BLUE MUTE is displayed (if the BLMU option is ON) when no signal is received.

In case there is no signal, 'NO SIGNAL' is displayed.

Line 6:

Indicates whether the SLEEPTIMER function is ON/OFF. This is displayed by 'TIMER ON.'

Line 7:

Indicates whether the CHILD LOCK function is ON/OFF. This is displayed by 'CHANNEL BLOCKED.'

Line 8:

Indicates whether the current channel is defined as SKIPPED or NON-PREFERRED.

Line 9:

Not valid.

Line 10:

Indicates which SOURCE is installed for this channel: AV1, CVI, AV2, AV4, or chosen 'off air' channel number.

Line 11:

Indicates which sound mode is installed for this channel: Mono, Stereo, or SAP.

Line 12 to 17:

Values indicate parameter levels of volume, balance, hue, color, brightness, and picture at CSM entry.

How to exit

The Customer Service Mode will switch off after pressing any (except channel + or channel - key) key of the RC transmitter (with the exception of the 'P+' and 'P-' keys) and switching off the TV set with the 'POWER' switch.

Problems and Solving Tips

Picture Problems

TV switches off or changes channel without any user action

The TV set switches off after 'TV SWITCHING OFF' was displayed.

Auto standby switched the set off because:

- There was no signal identification signal for more than 15 minutes.
- There was no RC transmitter signal received or local key pressed for > 2 hours.

See chapter 8 for a description of the options to enable/disable auto standby (option SBNP).

Picture too dark or too bright

- Press the 'Smart Picture' button on the RC transmitter. In case the picture improves, increase/decrease the brightness value or increase/decrease the contrast value.
- After switching on the Customer Service Mode the picture is OK. Increase/decrease the brightness value or increase/decrease the contrast value.

White line around picture elements and text

- Press the 'Smart Picture' button on the RC transmitter. If the picture improves, decrease the sharpness value.
- After switching on the Customer Service Mode the picture is OK. Decrease the sharpness value.

Snowy picture

Check CSM line 5. If this line indicates 'NO SIGNAL', check the following:

- no or bad antenna signal; connect a proper antenna signal
- antenna not connected; connect the antenna
- no channel preset is stored at this program number; go to the 'INSTALL' menu and store a proper channel at this program number
- the tuner is faulty (in this case the 2: CODES line will contain number 13 (Main Tuner 'A') or 16 (DW Tuner 'B')); check the tuner and replace/repair if necessary

Snowy picture and/or unstable picture

- A scrambled or decoded channel is received.

Black and white picture

- Press the 'Smart Picture' button on the RC transmitter. If the picture improves, increase the color value.
- After switching on the Customer Service Mode the picture is OK. Increase the color value.

Menu text not sharp enough

- Press the 'Smart Picture' button on the RC transmitter. If the picture improves, decrease the contrast value.
- After switching on the Customer Service Mode the picture is OK. Decrease the contrast value.

Sound Problems

- No sound or sound too loud (after channel change/switching on)
- After switching on the Customer Service Mode the volume is OK. Increase/decrease the volume level.

ComPair

Introduction

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

- ComPair helps you to quickly get an understanding how to repair the EM1.1U in 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 Force/ EM1.1U electronic manual, schematics and PWBs are only a mouse-click away.

Specifications

ComPair consists of a Windows based faultfinding program and an interface box between PC and the (defective) product. The ComPair interface box is connected to the PC via a serial or RS232 cable. In case of the EM1.1U chassis, the ComPair interface box and the TV communicate via a bi-directional service cable via the service connector at the rear side of the set (located at the left side of the rear cinch connectors, see also figure 1-2).

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

- Automatic (by communication with the television):

ComPair can automatically read out the contents of the entire error buffer. Diagnosis is done on I²C level. ComPair can access the I²C bus of the television. ComPair can send and receive I²C commands to the micro controller of the television. In this way, it is possible for ComPair to communicate (read and write) to devices on the I²C busses of the TV-set.

- Manually (by asking questions to you):

Automatic diagnosis is only possible if the micro controller of the television is working correctly and only to a certain extend. When this is not the case, ComPair will guide you through the faultfinding tree by asking you questions (e.g. Does the screen 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 waveform 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:

- Emulation of the (European) Dealer Service Tool (DST).
- If both ComPair and SearchMan / Force (Electronic Service Manual) are installed, all the schematics and the PWBs of the set are available by clicking on the appropriate hyperlink.

Example: Measure the DC-voltage on capacitor C2568 (Schematic/Panel) at the Monocarrier.

Click on the 'Panel' hyperlink to automatically show the PWB with a highlighted capacitor C2568.

Click on the 'Schematic' hyperlink to automatically show the position of the highlighted capacitor.

How to Connect

1. First install the ComPair Browser software (see the Quick Reference Card for installation instructions).
2. Connect the RS232 interface cable between a free serial (COM) port of your PC and the PC connector (marked with 'PC') of the ComPair interface.
3. Connect the AC power adapter to the supply connector (marked with 'POWER 9V DC') on the ComPair interface.
4. Switch the ComPair interface OFF.
5. Switch the television set OFF (remove the AC power).
6. Connect the ComPair interface cable between the connector on the rear side of the ComPair interface (marked with 'I² C') and the ComPair connector on the mono carrier (see figure 5-6).

7. Plug the AC power adapter in the AC power outlet and switch on the interface. The green and red LEDs light up together. The red LED extinguishes after approx. 1 second while the green LED remains lit.
8. Start ComPair and select 'File' menu, 'Open...' select 'EM1.1U Fault finding' and click 'OK'.
9. Click on the icon to switch 'ON' the communication mode (the red LED on the ComPair interface will light up).
10. Apply AC power to TV-set with the 'POWER' switch.
11. When the set is in STANDBY, click on 'Start-up in ComPair mode from standby' in the ComPair EM1.1U faultfinding tree, otherwise continue.

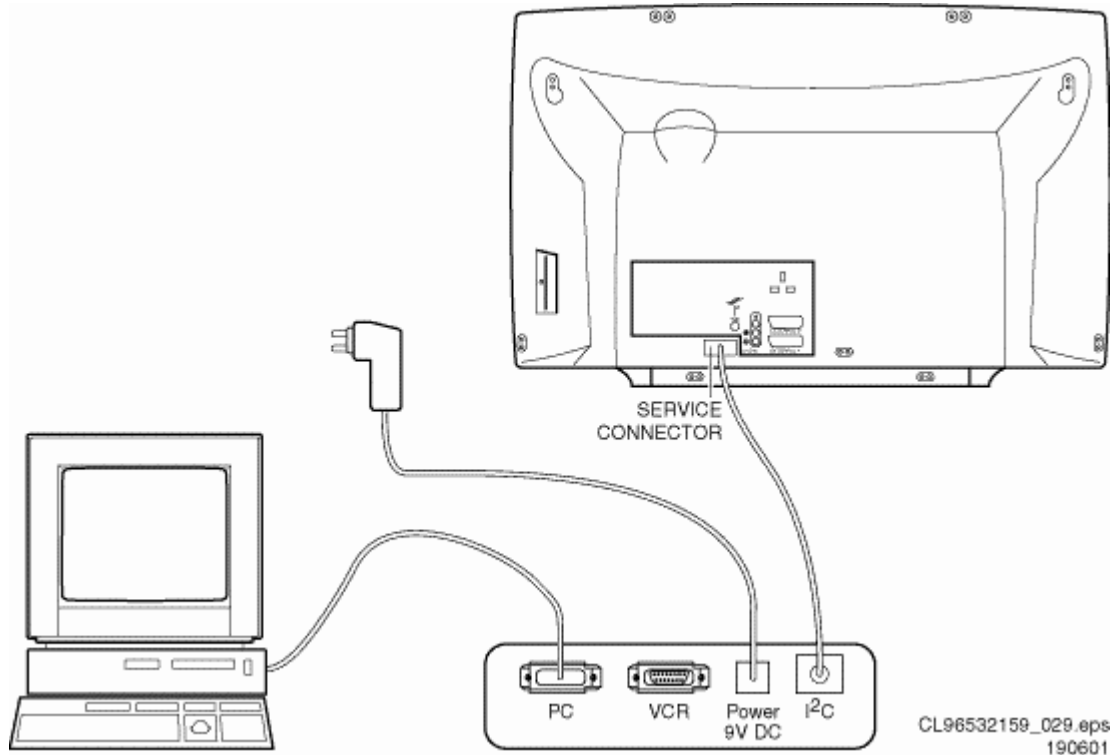


Figure: ComPair Interface connection

The set has now started up in ComPair mode. Follow the instruction in the EM1.1U faultfinding tree to diagnose the set. Note that the OSD works but that the actual user control is disabled.

Error Buffer

Introduction

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

How to Read the Error Buffer

Use one of the following methods:

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

How to Clear the Error Buffer

The error code buffer is cleared in the following cases:

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

Error Codes

In case of non-intermittent faults, clear the error buffer before starting the repair. This is to ensure that 'old' error codes are not present.

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

Table: Error Code Table

Error	Device	Description	Def. item	Diagram
1	FBX 3V3 prot	FBX 3V3 protection	5703	B3
2	No HFB	No Horizontal Flyback	3323	B4
3	X-Ray protection	X-Ray protection	3310	B4
4	5V protection	5V protection	1200/7651	A7/B6
5	No HOP POR	Startup failure		B4
6	General I2C bus error	General I2C bus error	1943	A7
7	Mains Dip error	HW error		
8	3D comb prot	3D comb prot	Black box	C0/C1
10	MC24C32	NVM communication error	7012	B7
11	MC24C32	NVM identification error	7012	B7
12	SAA5667	Main uP, int. RAM test failure	7001	B7

Error	Device	Description	Def. item	Diagram
13	TEDE9	Main Tuner	1200	A7
14	MSP3415D	MSP34xx	7651	B6
15	NA	NA	NA	NA
16	TELE9	PIP Tuner	1900	L1
17	M65669	Multi PIP IC	7803	L2
18	TEA6425	PIPVideo Matrix IC	7910	L1
30	TDA9320	HIP I/O video processing	7323	B2
31	SAA4978	PICNIC	7709	B3
32	TDA9330	HOP video control/geometry	7301	B4
35	M62320	IO expander HD Jack	7106	N1

Explanation of error codes:

Error 0

No errors

Error 1

This protection is activated when the PICNIC (pos. 7709 on diagram B3) cannot communicate via I²C for a certain time. This could mean that stabilizer 7009 or 7713 on SSB is defective (dependent of variant). When there is a short circuit to ground behind the stabilizer, 7009 or 7713 could become very hot. For safety reasons, the set will be switched to protection mode.

Error 2

The HOP (pos. 7301 on diagram B4 detects the absence of an HFB pulse (pin 4 of connector 0324 on LSP, diagram A3)). A bit will be set in the HOP. After filtering by the software, the set will switch to protection mode.

Error 3

This protection is activated when the high-tension voltage of the set is too high. It is called X-ray protection. This protection is triggered by circuitry around 3475 on diagram A3.

Error 4

When the +5V protection is active, the set is switched to protection and error code 4 is placed in the error buffer. The LED will blink 4 times (repeatedly).

A 5V failure can cause a drop in the 5V supply output, resulting in an undefined behavior of the set. Therefore, some I² C devices (Tuner and MSP) connected to the 5V supply are constantly monitored. When none of these devices responds to the microcontroller for a prolonged time, the microcontroller assumes that there is a failure in the 5V supply.

By starting up (disconnecting/reconnecting the AC power cord) the set via grounding of the 'FRONT-DETECT' line (on the side I/O), the +5V protection will be overruled, and it will be easier to determine the cause. The +5V protection will be activated when these I² C devices fail (no I² C communication): Main Tuner (pos. 1200 on the LSP), MSP3452 sound processor (pos. 7651 on the SSB).

The following tips are useful to isolate the problem area, after overriding the +5V protection. Determine whether:

The MSP sound processor is loading the +5V; isolate 3650 and/or 4604 (see diagram B6).

The main Tuner is loading the +5V source; isolate coil 5200.

Error 5

See startup flow chart (figure 5.7).

When POR bit is not communicated during startup, the processor will generate 'HOP POR not successful.'

Error 6

This will occur in the following cases:

- SCL or SDA is shorted to ground.
- SCL is shorted to SDA.
- SDA or SCL connection at the microcontroller is open.

Error 7

Flash detection: From the EHT info, via D6303 and T7303, a flash will stop the H-drive and line output stage immediately. The FLS bit in the status register of the HOP is set to 'high.' As the duration of a flash is very short, the FLS bit will be reset to 'low' again after the flash refresh, so via a slow start the set will be started again.

If this interrupt occurs 5 times within an interval of 10 seconds (indicating an AC power interruption), the set will go into protection and will generate error 7.

Also HW protections (bridge_prot (see diagram A3), non-Vertical Flyback (measured with circuitry 7641 on diagram A4)), lead via 'DEFL-prot' line to a 'Standby' situation, while the processor thinks the set is 'on.' Also here after retrying 5 times, error 7 will be generated.

Error 8

This protection is activated when the Comb filter circuitry (diagrams C0 and C1) cannot communicate via I²C for a certain time.

Error 10

Non Volatile Memory (EEPROM - pos. 7012) does not respond to the microcontroller.

Error 11

During the last startup, the NVM and the microcontroller did not recognize each other (e.g., one of them was replaced or the NVM memory has been changed/adapted or lost), therefore the NVM was loaded with default values.

Error 12

Microprocessor (Painter - pos. 7001) internal RAM test failure.

Error 13

Tuner (pos. 1200) is corrupted, the I² C line to the tuner is low, or there is no supply voltage at pins 7, 4, and 5 of the tuner.

Error 14

Sound controller MSP34xx (pos. 7651) does not respond to the microcontroller.

Error 16

The Tuner (pos. 1900) on the PIP panel does not respond to the microcontroller.

Error 17

Multi PIP IC M65669 I² C communication failure (pos. 7803 on the PIP panel).

Error 18

I/O expander IC TEA6425 I² C communication failure (pos. 7910 on the PIP panel).

Error 30

TDA 9320 HIP I/O video processing (pos. 7323 on the SSB).

Error 31

SAA4978 PICNIC error (pos. 7709 on the SSB).

Error 32

TDA 9330 HOP video control/geometry error (pos. 7301 on the SSB).

Error 35

I/O expander IC M62320P I²C communication failure (pos. 7106 on the High Definition Jack panel).

Note: Error codes 1, 2, 4, and 8 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.

The 'Blinking LED' Procedure

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

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

Error codes = 10 are shown as follows:

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

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

After entering SDM:

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

Note : If errors 1, 2, 4 or 8 occur, the LED **always** gives the most recent error, even if the set is NOT in service mode.

Protections

General

The EM1.1U has only one microprocessor (Painter) which remains active during Standby. This is because power for the microprocessor and the memories comes 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 will be put in the protection mode. The protection mode is indicated by blinking of the red LED (at a frequency of 3Hz). In some error cases, the microprocessor does not put the set in the protection mode. The error codes of the error buffer can be read via the service menu (SAM), the blinking LED procedure or via DST/ComPair.

To get a quick diagnosis the EM1.1U has 3 service modes implemented:

- The Customer Service Mode (CSM).
- The Service Default Mode (SDM). Startup of the set in a predefined way.
- The Service Alignment Mode (SAM). In this mode, items of the set can be adjusted via a menu and with the help of test patterns.

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

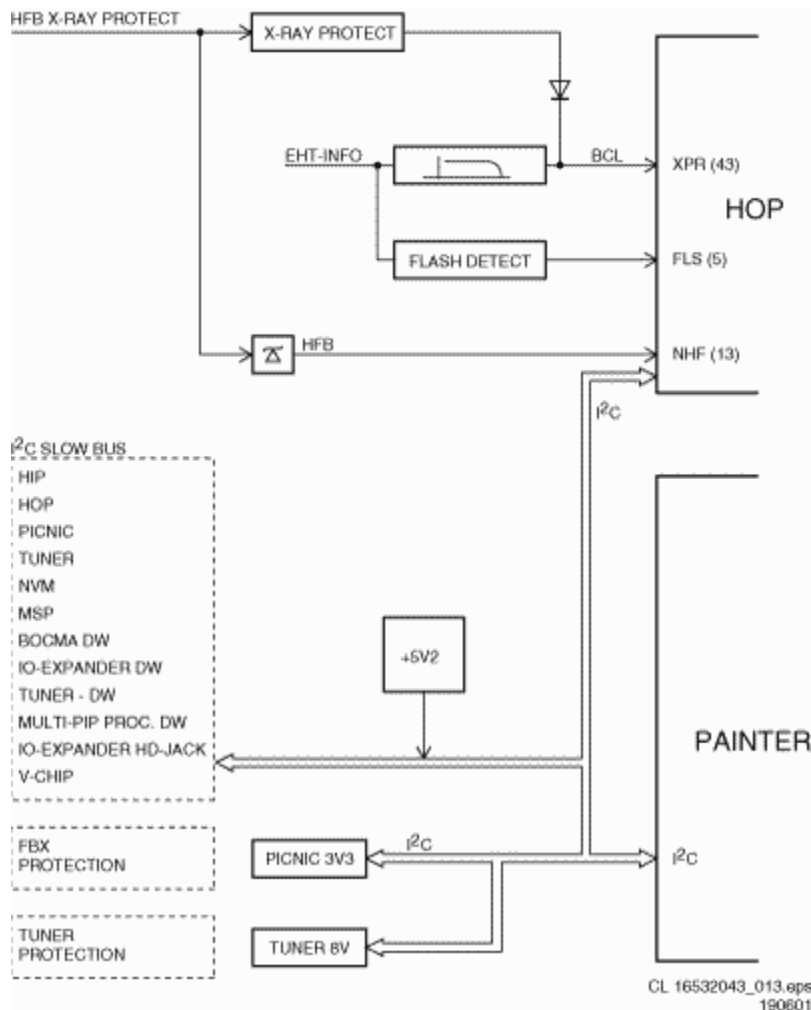


Figure: Protection diagram

There are several types of protections:

- I² C related protections (e.g., +5V supply check).
- HOP related protections (mainly for deflection items).
- Hardware errors which are not sensed by the Painter (e.g., BRIDGE_PROT)

I² C Related Protections

In normal operation some registers of the I² C controlled ICs will be refreshed every 200ms. During this sequence, the I² C busses and the I² C ICs as well will be checked. The I² C protection will take place if the SDA and SCL are short-circuited to ground or to each other. An I² C error can also occur if the power supply of the IC is missing (e.g., FBX_PROT: error 1).

HOP Related Protections

Every 200ms, the status register of the HOP is read by the Painter via I² C. 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 the error bit is still 'high' after 1s, the Painter will store the error code in the error buffer (NVM) and, depending on the relevance of the error bit, the set will either go into the protection mode or not.

- HFB: Horizontal Flyback.

If the horizontal flyback is not present, then this is detected via the HOP (HFB_X-RAY_PROT). One status bit is set to 'high.' The error code is stored in the error buffer and the set will go into the protection mode.

- Flash detection.

From the EHT info, via D6303 and T7303, a flash will stop the H-drive and line output stage immediately. The FLS bit in the status register of the HOP is set to 'high.' As the duration of a flash is very short, the FLS bit will be reset to 'low' again after the flash refresh and via a slow start the set will be started again.

Hardware Related Protections

Due to the architecture (with 'hot' deflection) there are two protections that are 'unknown' to the microprocessor, namely the 'BRIDGE_PROT' (coming from the line stage) and the 'DEFL_PROT' protection (coming from the frame deflection stage). If one of these protections is triggered, the set is positioned in 'Standby' mode. The Painter will now try to restart the set. If this does not succeed after 5 times (after 30 - 60s.), the Painter will generate error 7 (this error can have several causes, such as repeating flashes, BRIDGE_PROT/Non VFB leading to DEFL_PROT or a serious AC power dip). A red LED will start blinking.

2. Now the HOP is driving the line circuitry with 50kHz pulses. At the base of the line transistor this is sensed via the 'STANDBY' line.
3. This signal triggers the Main supply to operate. Now the line stage has 'BAT' voltage (141 V); it will also start.
4. After the 5V and 8V supply lines are sensed by the Painter (via I² C), it will read the POR bit from the HOP via the I² C bus.
5. Now the HOP is switched into 'on' mode and the set will start up further with normal drive (31.468kHz for NTSC).
6. The last step will be the unblanking of the picture.

Note: So standby is not controlled via a standby line from the microprocessor, but is achieved indirectly via the HOP circuitry.

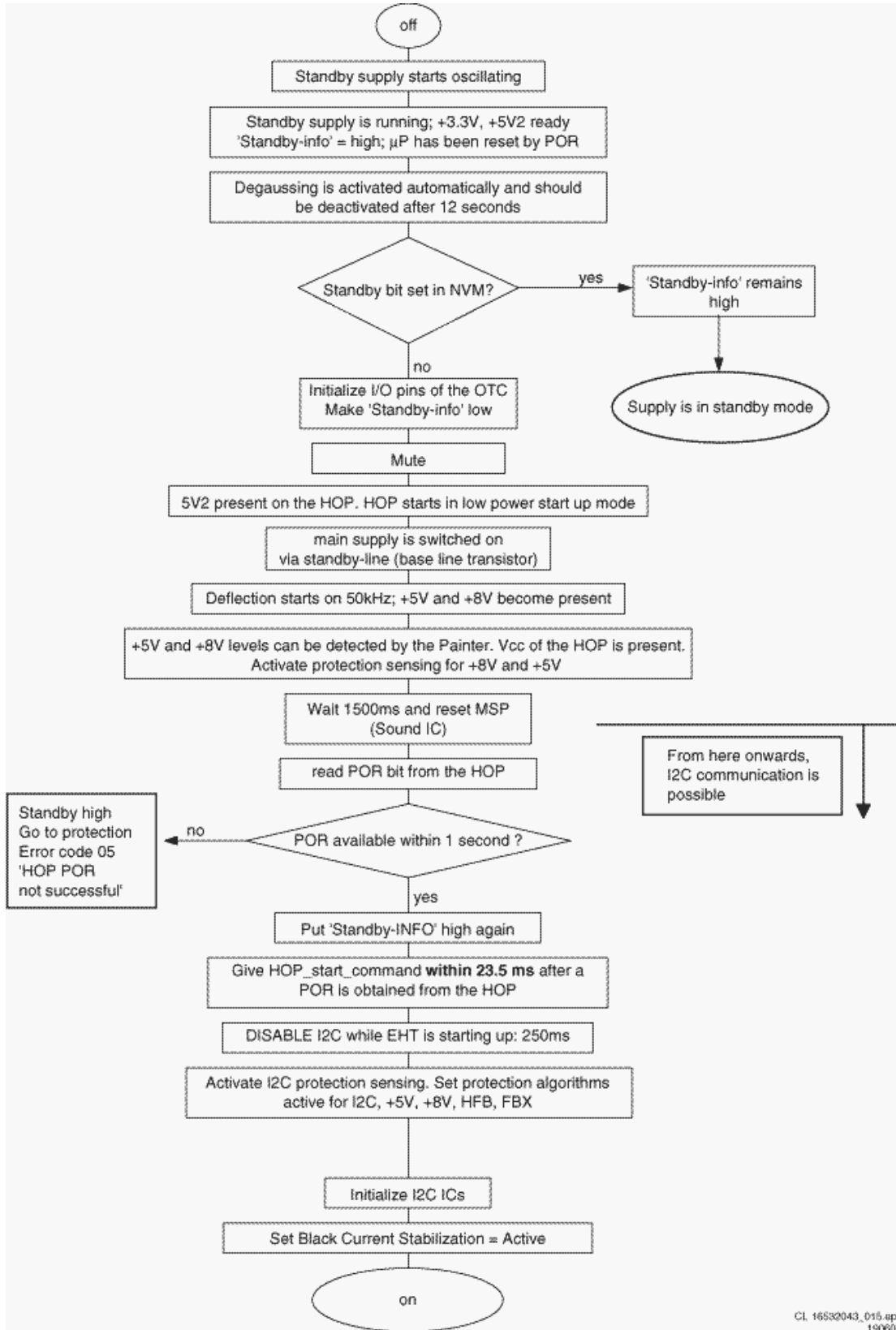


Figure: Start-up diagram

Notice that a very big part of the set (Large Signal Panel) is 'hot,' meaning the primary part of the Standby supply, the whole Main supply (except for the secondary Audio supply), and the complete deflection circuit.

So notice that the deflection-coil is hot.

This set is not equipped with an IR transmitting LED. Instead, a Service (ComPair) connector is implemented at the rear of the set, which is directly accessible (not necessary to remove the rear cover).

In addition to this, there is a blinking LED procedure to show the contents of the error buffer.

The relay you hear during switching 'on' (via the power switch) is from the degaussing circuitry. So it is not used for switching the supply as in the MG chassis.

When there is a menu on the screen, it is not possible to enter a service mode. So see to it that there is no menu on the screen when attempting to enter a service mode.

Main Power Supply

The simplest way to replace components of the Main supply is with repair kit: 3122 785 90340.

More detailed way:

1. Replace FET 7504 and zener 6505.
2. Remove SSB panel.
3. Short circuit BE of TS7529 in order to put supply in 'on' mode (TS7529 is blocking then).
4. Load capacitor C2515 (VBAT) with a 500 ohm power resistor (supply cannot work without a minimum load).

5. Use a variac to slowly increase the AC power. Measure over sensing resistors R3514/15, to confirm a nice sawtooth voltage becomes available. Also measure the VBAT output.
6. VBAT may never exceed 141V. If so, there is something wrong in the feedback circuitry (e.g., regulator 7506).

Caution:

Be careful measuring the gate of FET 7504. Circuitry is very high impedance and can easily be damaged (first connect ground to measuring equipment, then measure the gate).

Do not try to measure on side of SSB directed to the hot heatsink. This is dangerous. Most relevant service test points are guided to the Tuner side and are pointed out by service printing. Where the circuitry was too crowded to place this service printing, it has been explained on the Test Point Overviews in this manual. It is also possible to use the SSB extension panel (part number: 9965 000 05769), so that all test points are easily accessible.

Standby Power Supply

The simplest way to replace components of the Standby supply is with repair kit: 3122 785 90350.

Horizontal Deflection

The simplest way to replace components of the Horizontal Deflection circuitry is with repair kit: 3122 785 90120.

Vertical Deflection

Caution: When you suspect the Vertical Deflection circuitry, please be careful. Because there is a DC voltage on the vertical deflection, the beam current can damage the CRT neck, leading to a defective CRT.

The best thing to do is:

1. Interrupt pin 3 of connector 0224 on the CRT panel (diagram F), in order to remove the 'filament' voltage from the tube (no beam current, so no chance of destroying the CRT).
2. Measure with a multimeter, or better with an oscilloscope, the functionality of the Frame stage.
3. After you have found the cause, exchange the defective component (e.g., TDA8177), and re-solder the interrupted pin 3.

Problem	Possible Cause	Repair Tip
No picture, no LED	Standby Supply defective.	Measure circuitry (see diagram A2). Start at test point P16. Regardless of the mode of the set, this voltage should always be available.
No picture, red LED, while expectation was the set should be 'on' (LED off). After some time LED will start blinking.	There is a protection (called defl-prot on diagram A4) (which is not 'seen' by the processor) that forces the set into protection (after 5 restart attempts)	Defl-prot can be triggered by: <ul style="list-style-type: none"> - Non-VFB. Can be measured on F10 - Bridge-prot (diagram A3) triggers circuitry around 7652/7641/7407 on diagram A4. (reason can be a short circuit of coil 5422 or excessive horizontal amplitude) - Big mains interrupts measured via 141V (3645) on diagram A4 If after 5 restart attempts, set does not function adequately, error 7 will be generated. The standby LED will blink at 3Hz (= protection).
Set going into protection after 5 restarts (error 7), taking about 30 - 60s	180V missing on CRT panel (diagr. F). Most probably R3341 is interrupted, or RGB amplifier IC7307 is defective.	Measure 180V behind R3341 (diagr. F) while operating, or measure resistance of R3341 while set is off
No picture, red LED blinking (3Hz)	Set is in protection due to various causes. For error codes see error code list.	You have no picture, so: <ul style="list-style-type: none"> - Read out the error buffer via ComPair. (Simulate dealer remote and trigger blinking LED procedure via diagnose <x> <ok>. (x is error code position of the error buffer) When error is known, check circuitry related to supply voltage and I ² C - communication.
No picture, red LED blinking (code 6, 6, 6)	No communication on I ² C bus ('devices' bus) to processor. Set is in protection mode	Measure, dependent of the error, on the I ² C bus which device is loading the bus. This protection can be overruled via SDM entry (via short circuiting 'FRONT DETECT' to GND on Side I/O, while switching on the set with mains cord disconnected/connected
No picture, red LED blinking (code 10, 10, 10)	No communication on I ² C NVM bus to processor. Set is in protection mode	No contact of processor with the NVM. A lot of settings will therefore be wrong.
No picture, no sound, set is making audible squeaking sound	Supply could be in hiccup mode which can be heard via supply transformer squeaking	This could be caused by: <ul style="list-style-type: none"> - Short circuited V_{BAT} (caused by short circuited line transistor 7421) or - Short circuited sound winding (amplifier is short circuiting 28V) or - Short circuited D6514 (due to excessive V_{BAT}). Delete excessive load to see where failure is being caused or check feedback circuit. See main power supply repair tip (supply needs a minimal load).
No picture, no sound, LED works fine	Supply does not work correctly	If, e.g., V _{BAT} is only about 90V, regulator IC 7506 could be damaged.
No RC5 reception. Red LED does not echo RC commands	Processor circuitry or RC receiver is faulty.	If the set functions with local keyboard operation, the fault must be in the IR receiver circuitry (diagram J).
Relay activation (degaussing) not audible when switch set 'on' from 'off'	Processor not working correctly.	Check RESET circuitry on diagram B5. When switching on the set all I/O pins of processor should become high for a moment. Degauss input signal must be activated for 12 seconds. (so controlled by processor)
No sound, but picture	Measure P7 on diagram A1. Possible sound amplifier is defect (but not short circuited), or sound enable line is high (see diagram A5). Further the audio signal path must be measured (HIP, MSP, switch ICs, amplifier).	Measure and repair. With ComPair there is a beep-test that can determine where the signal stops (use loudspeakers, headphone).
No sound at headphone output	Discrete amplifiers or supply could be damaged.	Measure A12, A13, A14, A15 and supply line on diagram A6.
Picture is rotated	Rotation circuitry or supply could be damaged (if present).	Measure test points F3, R1, R2 on diagram A4.
No picture	Check functionality and cabling of Tuner to SSB.	Check cable 1946.
Picture looks like cushion, further OK	NVM content is overwritten or E/W MOSFET is short circuited	First, check in Service Alignment Mode whether geometry can be restored. If not, check test point L4 and diagram A3, or measure with an ohmmeter whether TS7480 is defective.
Very white picture, with flyback lines visible	180V is missing on CRT panel	Probably R3468 on LSP (diagram A3) is interrupted, or there is a bad connection from plug 0324 to 0224 (CRT panel).
Picture out of focus	Focus could be misaligned or SCAVEM circuitry does not work correctly	Align focus potmeter of Line Transformer; check SCAVEM circuitry on CRT panel [F].
Loss of sync	Sync is derived in HIP IC from crystal 1318	Confirm the crystal is making good contact.
Picture distorted	Check video path, service default mode.	Investigate whether there is an error code in the error buffer. If there is an error code, check I ² C bus and/or supply lines (see overview of supply lines). Measure and check the signal path of the Tuner, HIP, DW panel, 3D comb filter circuitry, PICNIC, HOP, RGB amplifier. If it is a geometry issue, check Frame circuitry, alignments or possibly corrupted NVM (7012)
No menu, OSD.	The processor is probably defective.	Measure test points C7, C8, C9, C10 on diagram B7.
No DW/PIP	Bad connection, or malfunctioning DW panel	First check whether coax cable 1681 of SSB to 1948 of LSP is connected correctly. Without this connection, there is no picture
Small magenta block at bottom of picture in 1080i mode	Blanking of set top box active in the middle of the picture	Delete 7110 or 7713 of HD jack panel

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Figure: Repair Tips

Alignments

Contents of this chapter:

- General Alignment Conditions
- Hardware Alignments
- Software Alignments and Settings

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

General Alignment Conditions

All electrical adjustments should be performed under the following conditions:

- AC voltage and frequency: 110V ($\pm 10\%$); 60Hz ($\pm 5\%$)
- Connect the set to AC power via an isolation transformer.
- Allow the set to warm up for approximately 20 minutes.
- Measure the voltages and waveforms in relation to the chassis ground (with the exception of the voltages on the primary side of the power supply). Never use the cooling fins/plates as ground.
- Test probe: $R_i > 10M$; $C_i < 2.5pF$.
- Use an isolated trimmer/screwdriver for the alignments.
- The following default settings are needed to start the alignment:
 - set color enhancement to NATURAL or MOVIE mode,
 - switch "off" dynamic contrast,
 - switch "off" active control,
 - set brightness to 42 and contrast (named picture) on 99,
 - external video pattern generator on system NTSC M, 61.25MHz (channel 3).

Hardware Alignments

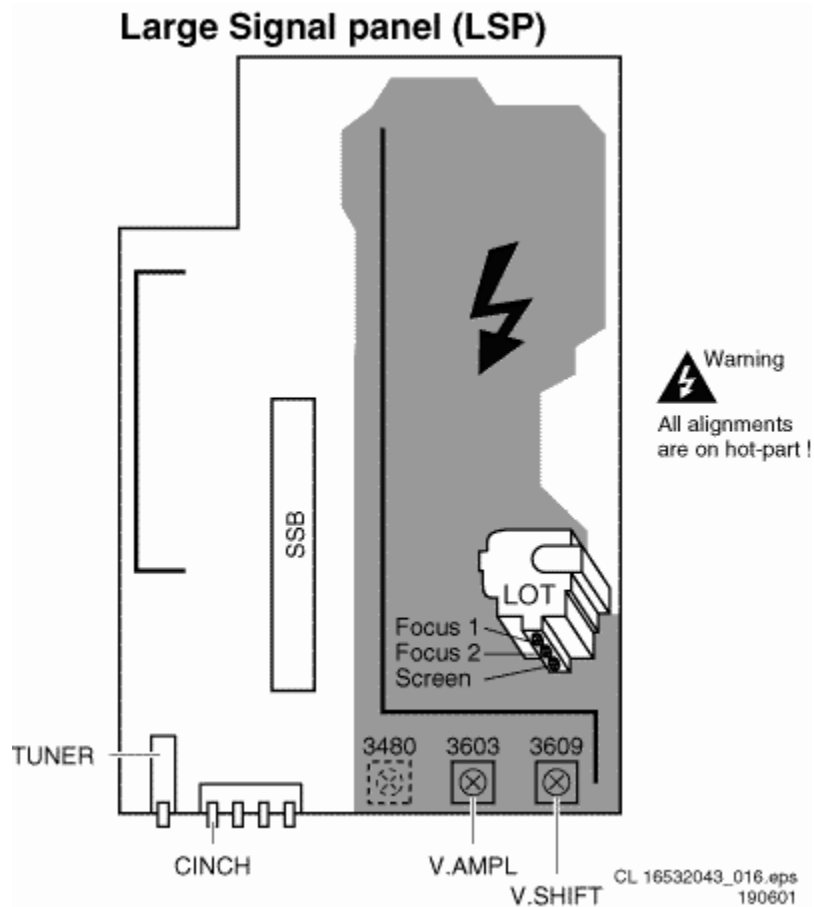


Figure: Large Signal panel (LSP)

Vg2 Adjustment

Method 1 (without oscilloscope)

1. Connect a video pattern generator to the set with a "black pattern" signal.
2. First, adjust the Vg2 potmeter to the middle of the adjustment range.
3. Adjust the Vg2 potmeter of LOT (item 5430) to obtain a normal picture (without visible flyback lines).

Method 2 (with oscilloscope)

1. Connect the RF output (channel 3) of the pattern generator to the antenna input of the TV. Test pattern is a "black pattern" (blank screen on CRT without any OSD info).
2. Set Normal Red, Normal Green and Normal Blue to 32.
3. Set contrast to 0 and brightness to a minimum (with OSD still visible).
4. Set the channel of the oscilloscope to 50V/div. and the time base to 0.2ms. Select "external triggering" on the vertical pulse (pin 1 of optocoupler 7610, located near connector 0325 to frame deflection coil).

Caution: be aware that the frame deflection is "hot" and CRT circuit is "cold".

1. Measure the black level pulse during the vertical flyback (1st full line after the frame blanking) at the R, G, and B cathodes of the CRT (pin 8, 6 and 11 of the CRT socket). Select the cathode with the highest VDC value for adjusting.
2. Adjust this gun with the Vg2 (SCREEN) potmeter of the LOT to $160V \pm 2VDC$ for the 27 inch sets and to $165V \pm 2VDC$ for the 32 inch sets.

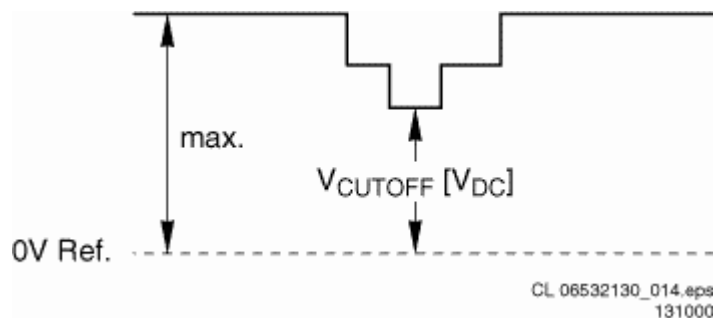


Figure: Waveform Vg2 alignment

Focus

1. Tune the set to a circle or crosshatch test pattern (use an external video pattern generator).
2. Adjust the first Focus potmeter (upper LOT potmeter, see figure 8-1) until the horizontal and vertical lines at 1/4 from east and west, at the height of the centerline, are of minimum width without visible haze.
3. Adjust the second Focus potmeter (middle LOT potmeter, see figure 8-1) until the horizontal and vertical lines at 1/4 from north and south, at the height of the centerline, are of minimum width without visible haze.

PIP AGC adjustment

The Automatic Gain Correction adjustment prevents overdriving of the PIP-tuner if the aerial signal is too strong. Overdriving is visible as a loss of color and synchronization in the PIP picture. Amplification has to be adjusted to minimum level, but the PIP-picture should be as free of noise as possible.

Adjustment

1. Connect a pattern generator to the PIP tuner.
2. Select color bar without sound and apply a strong aerial signal of 4mV (72dB μ V) and set frequency for NTSC to 61.25MHz.
3. Connect an oscilloscope to the output of the PIP tuner (pin 11).
4. Adjust potentiometer R3942 so that the oscilloscope indicates 0.5Vpp.
5. If an aerial signal is not available, adjust R3942 to 30% of its total travel (100% is fully left).

PIP AFC adjustment

Set the pattern generator (e.g., PM5418) to a color bar video signal and connect the RF output to aerial input. Set amplitude to at least 1mV.

1. Connect a multimeter to the AFC output on pin 15 of IC 7914 (TDA9801).
2. Use potentiometer R3944 to adjust the AFC output to 2V6.

Software Alignments and Settings

General

With the software alignments of the Service Alignment Mode, the Geometry, White tone and Tuner (IF) can be aligned. Put the set in the SAM mode (see chapter 5). The SAM menu will now appear on the screen. Menu navigation is done with the 'CURSOR UP, DOWN, LEFT or RIGHT' keys of the RC transmitter.

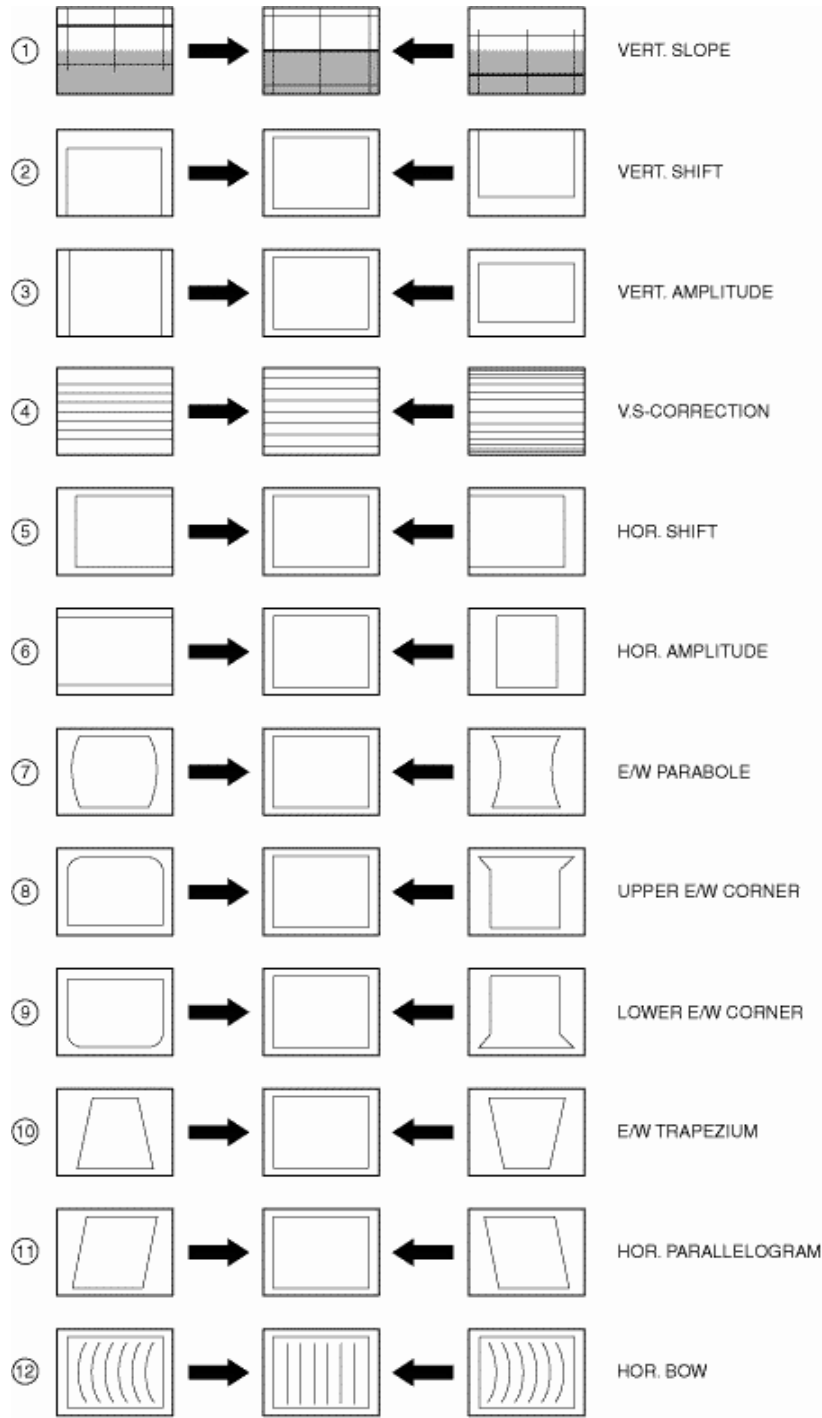
Geometry

Introduction

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

For all geometry alignments, use an external pattern generator with a geometry pattern (e.g., crosshatch).

See figure below for the correct alignments.



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Figure: Geometry alignments

Alignments

1. Connect an external video pattern generator to the aerial input of the TV set with a crosshatch test pattern.
2. Use default settings as mentioned in paragraph 8.1.
3. Activate the SAM menu (see chapter 5).
4. Go to sub menu GEOMETRY. Now the following alignments can be performed:
 - **Vertical slope (VER. SLOPE)** Align the vertical center of the picture to the vertical center of the CRT. This is the first alignment to be performed of the vertical alignments. For an easy alignment set SERV.BLK to on.
 - **Service blanking (SERV. BLK)** Switch the blanking of the lower half of the screen on/off (to be used in combination with the vertical slope alignment).
 - **Vertical amplitude alignment** Align the vertical amplitude with potentiometer R3603 on the LSP (see Fig. 8-1) so that the complete test pattern is visible.
 - **Vertical shift alignment.** Align the vertical centering with potentiometer R3609 on the LSP (see Fig. 8-1) so that the test pattern is located vertically in the middle. Repeat the "vertical amplitude" alignment if necessary.
 - **Horizontal shift (HOR. SHIFT) [*]** Align the horizontal center of the picture to the horizontal center of the CRT.
 - **Horizontal bow (HOR. BOW).** Align straight horizontal lines in the top and the bottom, horizontal rotation around the center.
 - **Horizontal parallelogram (HOR. PARALLEL)** . Align straight vertical lines in the top and the bottom, vertical rotation around the center.
 - **East West width (EW. WIDTH) [*]** Align the picture width until the complete test pattern is visible (similar to Horizontal Amplitude).
 - **East West parabola (EW. PARA) [*]** Align straight vertical lines at the sides of the screen.

- **East West Trapezium (EW. TRAP)** Align straight vertical lines in the middle of the screen.
- **East West Upper Corner (EW. UCORN) [*]** Align straight vertical lines in the upper corners of the screen.
- **East West Lower Corner (EW. LCORN) [*]** Align straight vertical lines in the lower corners of the screen.

[*] Note: Perform these alignments also in 480p and 1080i mode (AV4). Use a 1080i pattern generator (e.g., Sencore VP300). When you leave the geometry menu, the values are stored.

Use a kind of crosshatch pattern, in which you can recognize a vertical line, which is placed on a horizontal amplitude of about 87% (as seen from the center of the CRT). This line is used as a reference, to adjust the overscan situation in 1080i and 480p mode on the edge of the phosphor.

Black cut off Alignment

You can adjust the values of the "black cut off" level in the WHITE TONE sub menu. The color temperature mode (NORMAL, DELTA COOL, and DELTA WARM) or the color (R, G, B) can be selected with the "UP/DOWN RIGHT/LEFT" cursor keys. Change the value with the "RIGHT/LEFT" cursor keys.

First, select the values for the NORMAL color temperature. Then select the (offset) values for the DELTA COOL and DELTA WARM mode. The alignment values are non-linear:

- +1 to +63 represent a positive offset (63 is the maximum positive offset).
- -63 to -1 represent a negative offset (-63 is the minimum negative offset).

Set the pattern generator (e.g., PM5418) to a white spot (chessboard) pattern and connect RF output with aerial input. Set amplitude to 1mV and use default settings as mentioned in paragraph 8.1.

Alignment procedure:

1. NORMAL settings
 - NORMAL RED = 32
 - NORMAL GREEN = 32
 - NORMAL BLUE = 32
2. COOL settings
 - DELTA COOL RED = -4
 - DELTA COOL GREEN = 0
 - DELTA COOL BLUE = +10
3. WARM settings
 - DELTA WARM RED = +10
 - DELTA WARM GREEN = 0
 - DELTA WARM BLUE = -6
4. CUT OFF (default) settings
 - BLACK LEVEL R = 7
 - BLACK LEVEL G = 7
5. Measure with a color analyzer (calibrated with the spectra) on the center of a white square on the screen. Adjust the values of BLACK LEVEL R and BLACK LEVEL G to get the right XY coordinates for Tint = Normal

Table: Xy coordinates

Tint	Temperature (deg. K)	X	Y
Warm	6500	313	324
Normal	9300	285	293
Cool	12000	270	275

Note: When there is no color analyzer available, use the default settings mentioned above.

Peak-White Alignment

You can adjust the light output of the CRT in the WHITE TONE sub menu. In this case, a color analyzer is necessary.

1. Set the pattern generator to a pattern having a white (100 % video) area and connect RF output to aerial input. Set amplitude to 1mV.
2. Set the default settings as mentioned in the start of this chapter.
3. Measure with a color analyzer (calibrated with the spectra) on the center of the white square on the screen. Adjust the levels of NORMAL RED, NORMAL GREEN and NORMAL BLUE so that you retrieve a 390 cd light output for the 27 inch sets and 400 cd light output for the 32 inch sets.

Tuner (Large Signal Panel)

Note: Described alignments are only necessary when HIP or NVM is changed.

IF PLL OFFSET

Set the pattern generator (e.g., PM5418) to a color bar video signal and connect the RF output to aerial input. Set amplitude to at least 1mV.

Alignment procedure:

1. Choose a known good channel.
2. Enter SAM mode and select TUNER
3. Align the IF AFC parameter so that you come into the AFC window, meaning that the AFB value must be on the transient of going from 1 to 0 (see table below, which explains the best way of aligning).
4. After this alignment, store the value by returning to the former menu (via "MENU/SELECT" key).
5. Exit the SAM mode via the "Standby" button on the RC transmitter.

Table: IF PLL offset

AFA	AFB	IF PLL offset
0	0	Decrease offset value
0	1	Increase offset value
1	0	Correct
1	1	Correct

AGC

Set the pattern generator (e.g., PM5418) to a color bar video signal and connect the RF output to aerial input. Set amplitude to at least 1mV.

Alignment procedure:

1. Enter SAM mode, select TUNER and activate the AGC line in the sub menu.
2. Connect a DC multimeter to pin 1 of the tuner (item 1200 on LSP).
3. Adjust the AGC until the voltage at pin 1 of the Tuner is just below 3.8V.
4. Increase/decrease the value by pressing the "CURSOR LEFT/RIGHT" button on the RC transmitter.
5. Store by pushing "MENU/SELECT".
6. Switch the set to "STANDBY".

2ND AGC

Set the pattern generator (e.g., PM5418) to a color bar video signal and connect the RF output to aerial input. Set amplitude to at least 1mV.

Alignment procedure:

1. Enter SAM mode, select TUNER and activate the 2ND AGC line in the sub menu.
2. Connect a DC multimeter to pin 1 of the tuner (7201 on DW panel).
3. Adjust the 2ND AGC line until the voltage at pin 1 of the Tuner is just below 3.8V.
4. Increase/decrease the value by pressing the "CURSOR LEFT/RIGHT" button on the RC transmitter.
5. Store by pushing "MENU/SELECT".
6. Switch the set to "STANDBY".

Option Settings

Options are used to control the presence/absence of certain features and hardware. There are two ways to change the option settings (see also figure 8-6):

Changing a single option

An option can be selected with the "MENU UP/DOWN" keys and its setting can be changed with the "MENU LEFT/RIGHT" keys.

Changes in the option settings are saved by leaving the OPTION submenu. Some changes will only take effect after the set has been switched off by breaking the AC mains supply (cold start).

Changing multiple options by changing option byte values

Changing the option bytes directly makes it possible to set all options very fast. An option byte (OB1..8) can be selected with the "MENU UP/DOWN" keys and its setting can be changed with the "MENU LEFT/RIGHT" keys. An option byte represents a number of different options. All options of the N8 are controlled via 8 option bytes. Select the option byte (OB1..OB8) and key in the new value.

Changes in the option byte settings are saved by leaving the OPTION submenu. Some changes will only take effect after the set has been switched off by breaking the AC mains supply (cold start).

Option bits/bytes

An option byte value is calculated in the following way:

Value 'option bit 1' x 1 =

Value 'option bit 2' x 2 =

Value 'option bit 3' x 4 =

Value 'option bit 4' x 8 =

Value 'option bit 5' x 16 =

Value 'option bit 6' x 32 =

Value 'option bit 7' x 64 =

Value 'option bit 8' x 128 =

=====

Total: value 'option byte' =

Table: Option code settings

Model Number	OB1	OB2	OB3	OB4	OB5	OB6	OB7	OB8
27PT830H37C	254	123	222	94	0	0	0	0
32PT740H37A	254	123	223	94	0	0	0	0
32PT830H37A	254	123	223	94	0	0	0	0
32PT842H37A	254	127	250	251	32	0	0	0
36PT842H37D	254	127	250	251	32	0	0	0

Software version used: 2U1. Below are the option definitions for both type numbers.

Table: Option overview for type number 842

Byte	Bit	Abbr.	Feature	Description (OFF = 0, ON = 1)
OB1	1	IPIX	Incredible Picture	OFF = function disabled / ON= function enabled
OB1	2	CBFL	Comb filter	OFF = no comb filter on the SSB / ON = comb filter present on the SSB
OB1	3	AV3	External 3 (Side I/O)	OFF = side AV source not available / ON = available
OB1	4	SMCK	Smart clock	OFF = AUTOCHRON is not available / ON = available
OB1	5	E149	Picture setting for expand 14:9	OFF = not available in FORMAT menu / ON = available
OB1	6	C169	Picture setting for compress 16:9	OFF = not available in FORMAT menu / ON = available
OB1	7	CVI	External source selection for PiP	OFF = function disabled / ON= function enabled
OB1	8	SBNP	Auto standby with no picture	OFF = no switch to Stby / ON= switch to Stby after 10m when no ident
OB2	1	PIPF	PiP Functionality (excl. YPbPr decoding)	OFF = function disabled / ON= function enabled

OB2	2	PIPT	PiP Tuner	OFF = function disabled / ON= function enabled
OB2	3	PIPC	PiP Control (hue control)	OFF = function disabled / ON= function enabled
OB2	4	BLMU	BLue MUte	OFF = function disabled / ON= function enabled
OB2	5	SOSD	Smart OSD	OFF = full display of OSD not available / ON = available
OB2	6	PLST	Program LiST	OFF = access to command is ignored / ON = access is processed
OB2	7	VDBY	Virtual DoIBY	OFF = Virtual Dolby not available / ON = Virtual Dolby is available
OB2	8	IPMU	Incredible Picture	OFF = INCR. PICT/CONSTRAS+ menu item is not available / ON = available
OB3	1	VCBK	VChip Block unrated	OFF = function disabled / ON= function enabled
OB3	2	SPKC	SPeaKer Control	OFF = function disabled / ON= function enabled
OB3	3	FUNN	Fine tUNiNg	OFF = function disabled / ON= function enabled
OB3	4	AAVL	Automatic Volume Level	OFF = menu item 'AVL' not available / ON = menu item available
OB3	5	TIME	TIMEr	OFF = function disabled / ON= function enabled

OB3	6	CCAP	Close Caption	OFF = function disabled / ON= function enabled
OB3	7	SURF	Surf	OFF = function disabled / ON= function enabled
OB3	8	VSLC	Vertical slicing	OFF = function disabled / ON= function enabled
OB4	1	PAGC	Picnic	OFF = function disabled / ON= function enabled
OB4	2	APC	Auto Picture Control	OFF = Time Window is set to 2s / ON = Time window is set to 5s
OB4	3	INCF	Selection color delay line	OFF = function disabled / ON= function enabled
OB4	4	AOUT	Audio OUT	OFF = function disabled / ON= function enabled
OB4	5	TMWIN	Time WINDOW	OFF = Time Window is set to 2s / ON = Time window is set to 5s
OB4	6	ROTI	Picture ROTation	OFF = menu item 'ROTATION' not available / ON = available
OB4	7	BNUM	Bar NUMeric items	OFF = function disabled / ON= function enabled
OB4	8	VBNR	Vchip Block No Rating	OFF = function disabled / ON= function enabled

OB5	1	---	---	N/A
OB5	2	---	---	N/A
OB5	3	---	---	N/A
OB5	4	---	---	N/A
OB5	5	LTI	Luminance Transient Improvement	OFF = function disabled / ON= function enabled
OB5	6	AKBL	AKB Line	OFF = function disabled / ON= function enabled
OB5	7	CTSP	Centre SPeaker	OFF = function disabled / ON= function enabled
OB5	8	VSR	Vertical Scan Reference	OFF = function disabled / ON= function enabled
OB6	1..8	N/A	(RESERVED)	N/A
OB7	1..8	N/A	(RESERVED)	N/A
OB8	1..8	N/A	(RESERVED)	N/A

Table: Option overview for type number 830

Byte	Bit	Abbr.	Feature	Description (OFF = 0, ON = 1)
OB1	1	IPIX	Incredible Picture	OFF = function disabled / ON= function enabled
OB1	2	CBFL	Comb filter	OFF = no comb filter on the SSB / ON = comb filter present on the SSB
OB1	3	AV3	External 3 (Side I/O)	OFF = side AV source not available / ON = available

Byte	Bit	Abbr.	Feature	Description (OFF = 0, ON = 1)
OB1	4	SMCK	Smart clock	OFF = AUTOCHRON is not available / ON = available
OB1	5	E149	Picture setting for expand 14:9	OFF = not available in FORMAT menu / ON = available
OB1	6	C169	Picture setting for compress 16:9	OFF = not available in FORMAT menu / ON = available
OB1	7	CVI	External source selection for PiP	OFF = function disabled / ON= function enabled
OB1	8	SBNP	Auto standby with no picture	OFF = no switch to Stby / ON= switch to Stby after 10m when no ident
OB2	1	CCAP	Close Caption	OFF = function disabled / ON= function enabled
OB2	2	SURF	Surf	OFF = function disabled / ON= function enabled
OB2	3	VSLC	Vertical slicing	OFF = function disabled / ON= function enabled
OB2	4	BLMU	BLue MUte	OFF = function disabled / ON= function enabled
OB2	5	SOSD	Smart OSD	OFF = full display of OSD not available / ON = available
OB2	6	PLST	Program LiST	OFF = access to command is ignored / ON = access is processed

Byte	Bit	Abbr.	Feature	Description (OFF = 0, ON = 1)
OB2	7	VDBY	Virtual DolBY	OFF = Virtual Dolby not available / ON = Virtual Dolby is available
OB2	8	IPMU	Incredible Picture	OFF = INCR. PICT/CONSTRAS+ menu item is not available / ON = available
OB3	1	ROTI	Picture ROTatlon	OFF = menu item 'ROTATION' not available / ON = available
OB3	2	BNUM	Bar NUMeric items	OFF = function disabled / ON= function enabled
OB3	3	VBNR	Vchip Block No Rating	OFF = function disabled / ON= function enabled
OB3	4	VCBK	VChip Block unrated	OFF = function disabled / ON= function enabled
OB3	5	SPKC	SPEaKer Control	OFF = function disabled / ON= function enabled
OB3	6	FUNN	Fine tUNiNg	OFF = function disabled / ON= function enabled
OB3	7	AAVL	Automatic Volume Level	OFF = menu item 'AVL' not available / ON = menu item available
OB3	8	TIME	TIMEr	OFF = function disabled / ON= function enabled
OB4	1	---	---	---

Byte	Bit	Abbr.	Feature	Description (OFF = 0, ON = 1)
OB4	2	AKBL	AKB Line	OFF = function disabled / ON= function enabled
OB4	3	VSR	Vertical Scan Reference	OFF = function disabled / ON= function enabled
OB4	4	PAGC	Picnic	OFF = function disabled / ON= function enabled
OB4	5	APC	Auto Picture Control	OFF = Time Window is set to 2s / ON = Time window is set to 5s
OB4	6	INCF	Selection color delay line	OFF = function disabled / ON= function enabled
OB4	7	AOUT	Audio OUT	OFF = function disabled / ON= function enabled
OB4	8	TMWIN	Time Window	OFF = Time Window is set to 2s / ON = Time window is set to 5s
OB5	1..8	N/A	(RESERVED)	N/A
OB6	1..8	N/A	(RESERVED)	N/A
OB7	1..8	N/A	(RESERVED)	N/A
OB8	1..8	N/A	(RESERVED)	N/A

Circuit Descriptions and Abbreviation List

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1. Introduction.
2. Block diagram.
3. Power Supply.
4. Control and Teletext.
5. Tuner and IF.
6. Video: HD Jack Interface (AV4, 1080i/480p).
7. Video: High-end Input Processor (HIP).
8. Video: Feature Box (FBX).
9. Video: High-end Output Processor (HOP).
10. Video: 3D-Comb filter.
11. Synchronization.
12. Horizontal Deflection.
13. Vertical Deflection.
14. Audio.
15. CRT and SCAVEM.
16. Double Window (DW).

Introduction

The EM1.1U is a lower specified EMG-chassis. The global name of the set is EM1U. EM stands for Eco-MG, 1 for the used processor (Painter) and U stands for USA. It is similar to N8 chassis. Therefore in this chapter if N8 is mentioned, it is also applicable for EM1.1U.

The user interface and micro controller are the same as used in the H8 set. In the N8 however, a HIP, PICNIC, and HOP are used for the '100 Hz' function i.s.o. the BOCMA in the H8.

The HIP and HOP have about the same functionality as the BOCMA.

This chip set however, sees to it that line frequency and YUV-signals are doubled (2 fh), while the vertical frequency stay 60 Hz (1fh). The set runs in progressive scan (an interlaced picture at 60 Hz, in stead of at 30 Hz in normal NTSC)

The PICNIC is used for video features like AutoTV and Freeze.

The architecture consists of a conventional Large Signal Panel (LSP) a Picture In Picture (PIP) and a Small Signal Board (SSB) module, placed into a so-called SIMM-connector (Standard Interface, 80 pins).

The LSP is built up very conventional, with hardly any surface mounted components on the copper side. Difference with the MG3.1U-chassis is that the N8 LSP has a very large 'hot' part, including the deflection coil.

The SSB is a high tech module (two 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 will be possible. To achieve this, attention has been paid to:

- the position of service test lands (tuner side),
- accessibility (tuner side),
- clearance around surface mounted ICs (for replacing),
- diagnostics and fault finding via ComPair.

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

Note: The start-up behavior of the N8 is different than that of the MG-chassis, meaning that the 'Supply ON/Deflection OFF' situation does not exist. This means that isolating failures in the N8 must be done in a different way. See Chapter 5 of this manual.

For a good understanding of the following circuit descriptions, please use the [Block Diagram LSP Supply and Deflection](#), [Block Diagram Video + PIP](#), [Block Diagram Video no PIP](#), [Block Diagram Audio](#), [I2C Overview](#), [Supply Lines Overview](#) and Test points Overview ([LSP](#), [SSB](#) and [CRT Panel](#)) and [Wiring Diagram](#). Where necessary, you will find a separate drawing for clarification.

Block Diagram

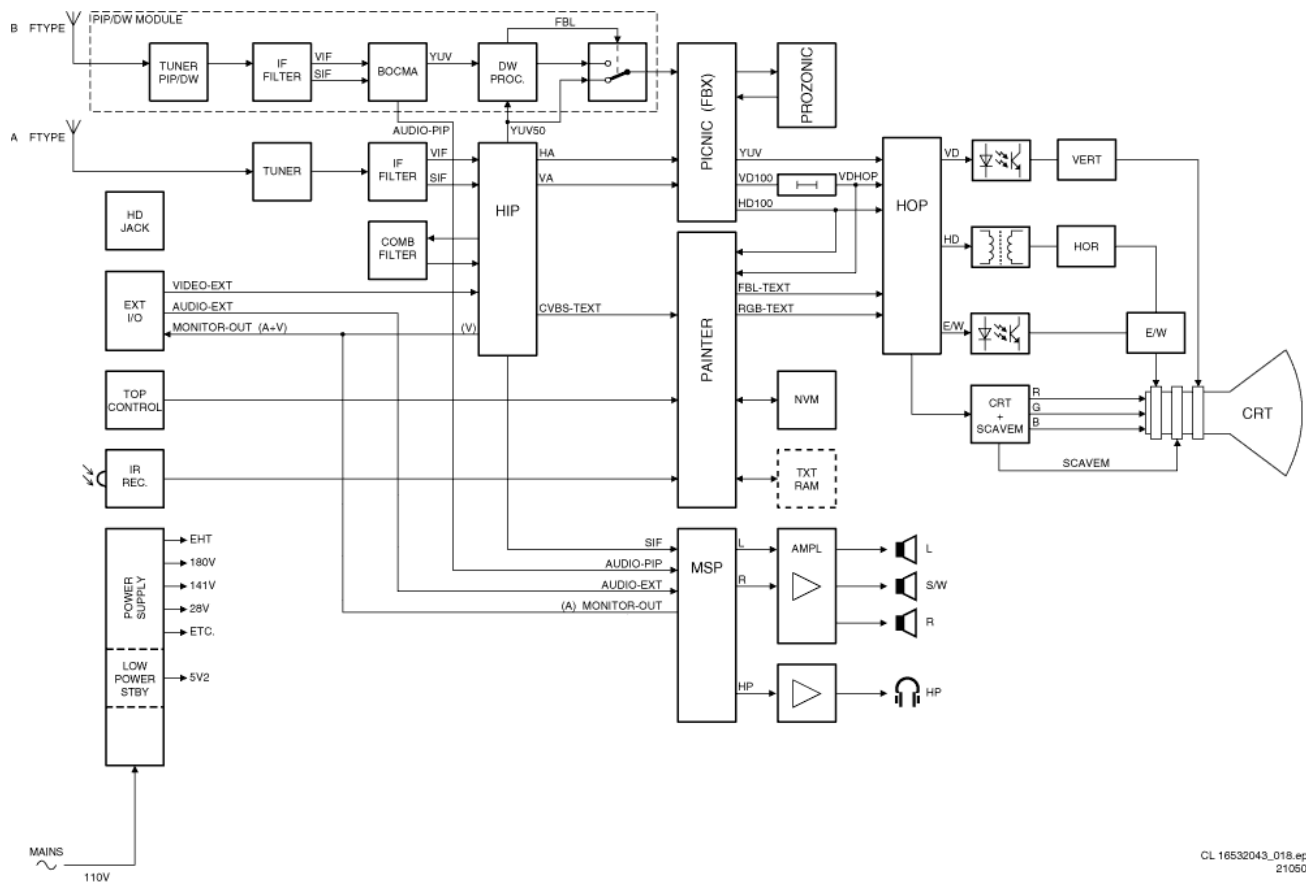


Figure: Block diagram

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

- IF modulation.
- Video source - and record select.
- Color decoder.
- Synchronization.

Five video in/output connections (with audio connections) are available:

1. Front: interfaces CVBS
2. AV1: interfaces CVBS and YUV-input (1fH)
3. AV2: interfaces CVBS and Y/C (meant for VCR-connection)
4. AV4: interfaces YPbPr/RGB (HD) inputs (2fH).
5. Monitor out: interfaces CVBS out

The HIP delivers the signal to the PICNIC.

This IC takes care of:

- Analogue to Digital conversion and vice versa.
- 60 Hz interlaced to 60 Hz progressive scan conversion.
- Panorama mode.
- Noise reduction.
- Dynamic contrast.

For Digital Scan the PROZONIC is required, which can be connected to the PICNIC.

After the PICNIC the (now 100 Hz) YUV- and H/V-signals are fed to the HOP (High-end Output Processor). This IC handles the video control and geometry part. The RGB-

signals from CC/OSD 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 (as a variable DC-level on the V-drive signal).

Both deflection circuits are 'hot' and located on the LSP and are driven by the HOP. To make the galvanic separation, the line drive is driven via transformer 5410 and the frame drive via optocoupler 7610. The horizontal output stage generates some supply voltages, the EHT-, focus- and Vg2-voltages.

The RGB amplifiers on the CRT-panel are integrated in one IC and are supplied with 180V 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 MSP345X (Multichannel Sound Processor) for IF sound detection, sound control and source selection. Amplification is done via an integrated power amplifier IC, the TDA2616.

The microprocessor, called Painter (OSD, Closed Captioning, and Control) takes care of the analogue CC input- and output processing. The Painter processor and SRAM are supplied with 3.3 V, which is derived from the +5VSTANDBY.

The NVM (Non Volatile Memory) is used to store the settings; the Painter is an OTP (One Time Programmable) chip with programmed ROM-code.

In the N8 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 is used to switch the Degaussing circuit.

The Main Supply, a SOPS supply based on the 'down-converter' principle, generates the 141 V (VBAT) and the 28 V for the audio part.

The difference between this and former MG-sets is that VBAT is not mains isolated ('hot') and is alignment free.

Power Supply (Diagram A1 and A2)

General

The power supply has a number of main functions. These functions are dealt with in succession:

- Mains filter
- Voltage doubling circuitry
- Degaussing picture tube
- Standby power supply
- Main supply

Mains Filter (Diagram A1)

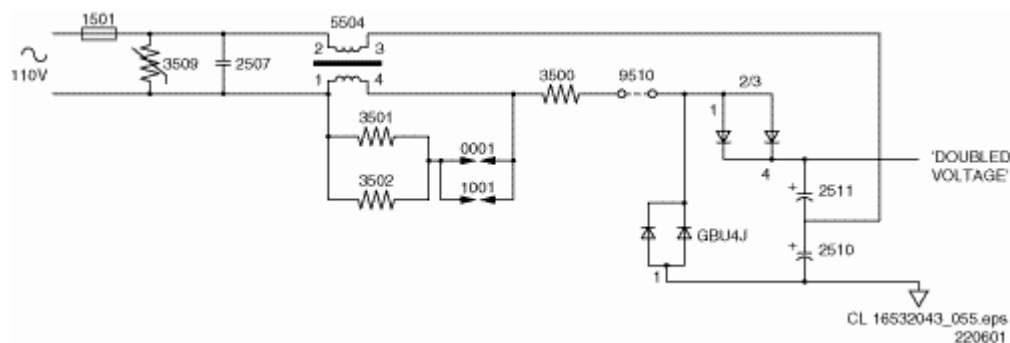


Figure: Mains Filter

The mains filter has two functions: it prevents high-frequency signals to be transferred into the mains and it protects the set from lightning damage.

C2507 prevents the high-frequency signals, generated by the set, to be conveyed into the mains by short-circuiting them.

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

In case of a lightning surge on both phases of the mains in relation to the aerial earth, the mains filter acts as a high resistance ($U_{EMK} = L \cdot di/dt$) as a result of which the voltage across coil L5504 increases. A spark gap (0001/1001) prevents the voltage from increasing too much, which would lead to a damaged coil. When ignited, the current will be discharged via this spark gap.

The two networks using R3503//0002 and R3502//0003 are also used for lightning protection. They lead the energy of a common-mode lightning surge from the 'cold' to the 'hot' side in case of insertion on the aerial or from the 'hot' to the 'cold' side in case of insertion via the mains-input.

Resistor R3500 is used for limiting the inrush-current.

Voltage Doubling Circuitry (Diagram A1)

Via diode bridge cell 6513 and capacitors 2510 and 2511, the AC power voltage is rectified two times. The sum of voltages over 2510 and 2511 is supplied to the main-supply circuitry.

Degaussing (Diagram A1)

After switching 'ON' the set with the 'POWER ON'-switch, the DEGAUSS_INPUT signal from the processor (Painter) will be made high, transistor 7528 will conduct and relay 1002 will be activated. Initially a considerable current will flow, via PTC 3532, through the degaussing coil. The PTC will heat up, resistance will rise, and the current will decay rapidly. The Painter will switch off the relay after 12 seconds.

Standby Power Supply (Diagram A2)

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

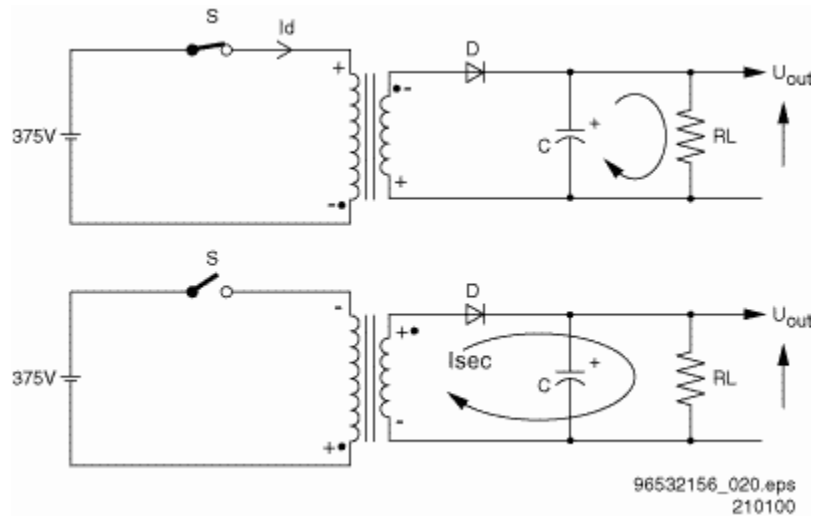


Figure: Flyback principle

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

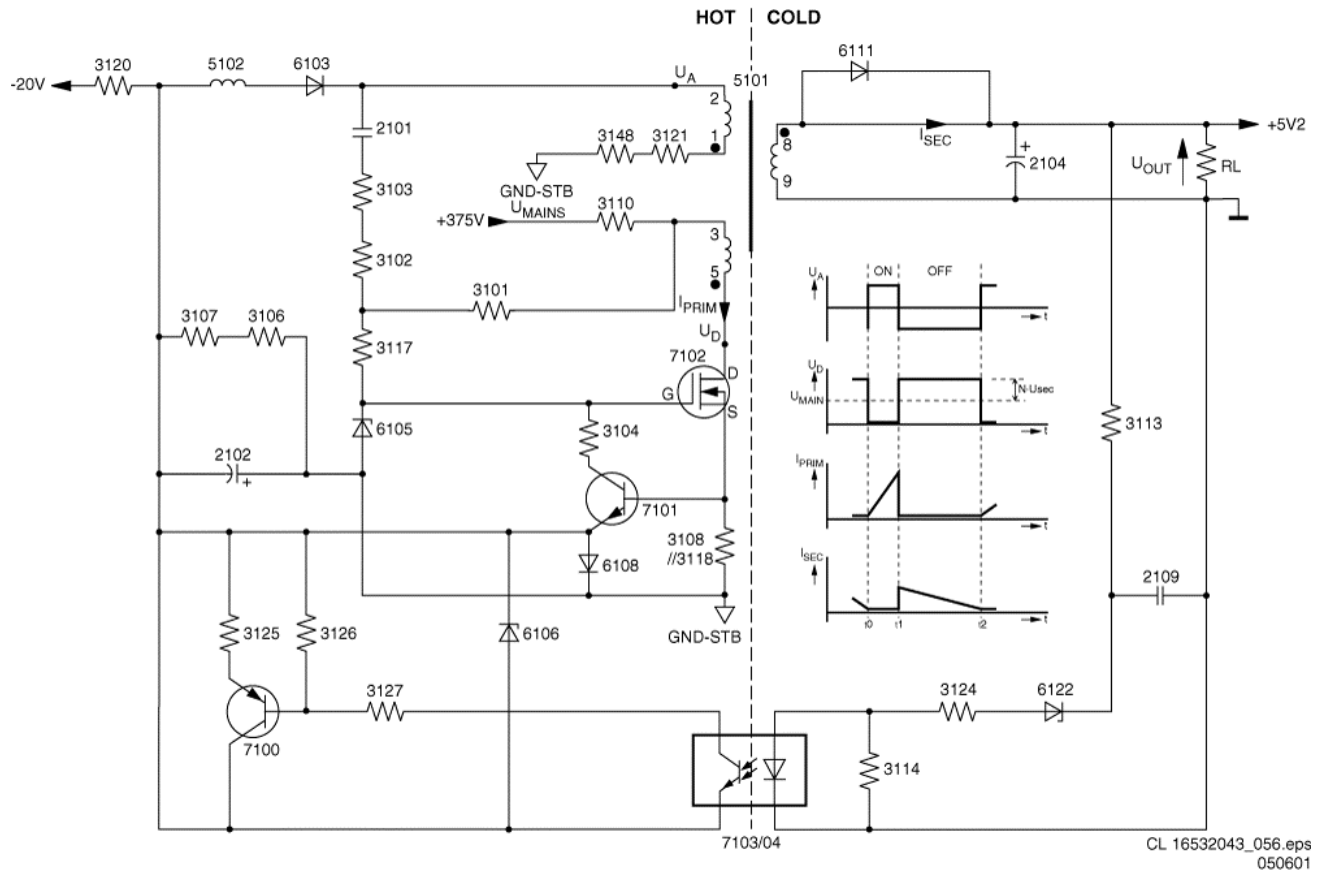


Figure: Standby supply circuitry

To apply this on the N8 (diagram A2): replace switch 'S' by FET TS7102, coil L by L5101, diode D by D6111 and C by C2104.

Time interval t0 - t1:

After switching the set on, the gate of MOSFET TS7102 will be high (max. 15V due to zener diode D6105). This will drive the FET into saturation ($U_{DS} = 0V$). The DC-voltage U_{MAINS} will be transposed across the primary winding of L5101 (Pins 3 & 5) resulting in a linearly increasing current through this coil.

The voltage across the co-coupled coil (Pins 1 & 2) is also positive and will keep the FET into conductivity via C2101, R3103, R3105, R3102 and R3117 for some time. The slope of the primary current is determined by the self-induction of the coil and on the magnitude of the supply voltage (+375 V).

The maximum current is determined by the time the FET stays into conductance ($t_0 - t_1$). This time is directly determined by the voltage across R3108//R3118. This voltage is a measure of the current and if it exceeds 1.4 V, TS7101 will be driven into conductivity and consequently connect the gate of TS7102 to ground; the FET will block.

The voltage across the secondary winding (Pins 8 & 9) will be negative, diode D6111 will block.

Time interval $t_1 - t_2$:

The sudden current interruption in the primary coil will induce a counter-e.m.f. trying to maintain the current. The voltage on the drain of the FET will increase. The secondary voltage (8, 9) will become positive and will charge C2104 via D6111. All energy that was stored in L5101 during $t_0 - t_1$ will be transferred into the load. Due to the transformer principle, a voltage will now be induced in the primary winding (3, 5) and the co-coupled winding (1, 2). This voltage will be: $N * U_{SEC}$ ($N =$ winding ratio).

The voltage across the co-coupled coil will be negative, keeping the FET blocked.

Time t_2 :

At t_2 , the current through the secondary coil will be reduced to zero, as C2104 is no longer charged. Therefore, the voltages will decay and will change polarity. The gate of the FET will be again made positive, is driven into conductivity and the cycle starts again.

Feedback, stabilization:

The Standby Power Supply always oscillates at maximum power; the only limiting factor is the maximum primary current that has been pre-set with R3108//3118//R3119. U_{OUT} is determined by R3114, R3124, and zener diode D6122. If the voltage across R3114 exceeds the threshold voltage of the diode of the optocoupler 7104 (± 1 V) or, in other words, U_{OUT} exceeds 5.2 V the transistor of the optocoupler will conduct.

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

Since there are no capacitors and there is a high amplification-factor in the feedback circuit, the feedback is ultra-fast. This is why the ripple on UOUT is minimal. The negative supply voltage (-20 V) used in the feedback circuit originates from the coupling coil and is rectified through D6103.

Stabilization is not effected through duty-cycle control but through burst-mode of TS7100.

Burst-mode is load dependent. If the power supply is less loaded, the secondary voltage will have the tendency to increase more rapidly. If the load on the power supply increases, then the oscillator stops less often, right up to the moment that the oscillator is operating continuously: maximum load. If the power supply is now loaded even more, the output voltage will decay. The maximum load is determined by the maximum primary current set by R3108//3118//3119.

Protection:

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

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

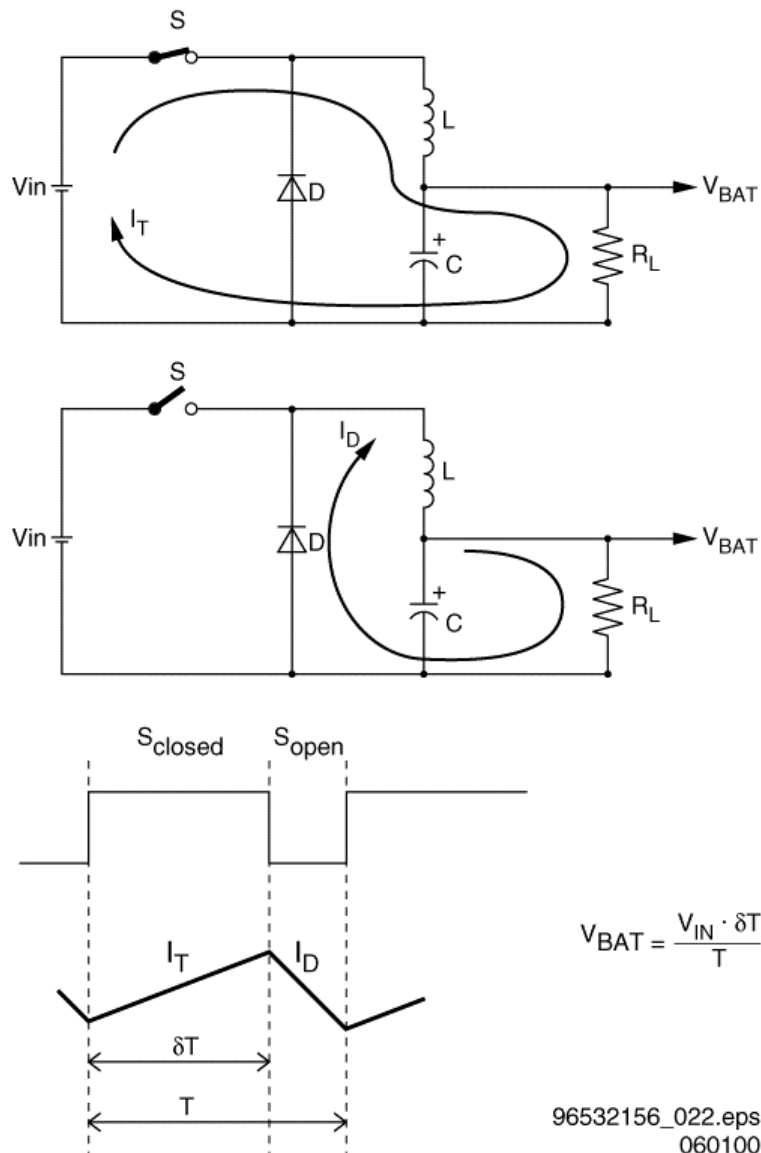
If the negative supply in the mean time reaches -30 V, D6106 will start to zener and therefore TS7101 will start conducting. D6106 will take over the stabilization task of the optocoupler, however, with a considerable spread: from -20V to -30V is a 50% increase, thus UOUT will increase from 5.2V to max. 7.5V.

Main Supply (Diagram A1)

Some important notes on beforehand:

- VBAT is not isolated from the main supply ('hot').
- VBAT is alignment free.

The Main Power Supply generates the 141 V (VBAT) and the 28 V for the audio part, and is based on the so-called 'down converter' principle.



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Figure: Down-converter principle

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

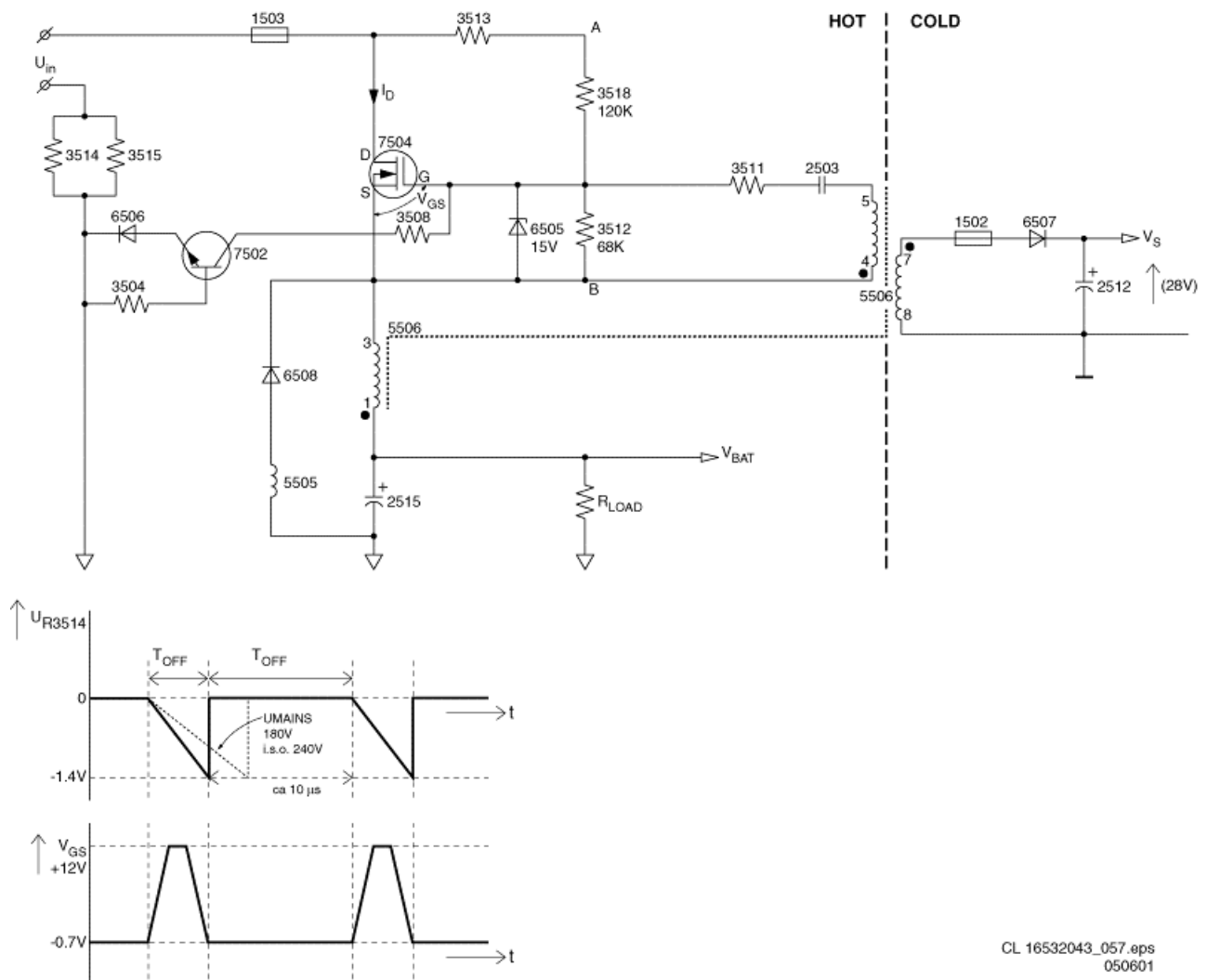


Figure: Main supply circuitry

At start-up of the main supply, C2515 can be assumed as being a short-circuit. UAB will be 15 V (R3513, D6510) and UGS of the FET will be +5.4 V (voltage division over R3512 and R3518). The FET will be driven into saturation (same as closing switch 'S'). The drain-current will increase linear in time. With other words: resistors R3513 and R3518 will start the oscillator.

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

The drain-current will also flow through R3514//R3515. The voltage on the base of TS7502 will be +0.8 V due to the stabilization circuit (which is explained further). At increasing current, the emitter-voltage of TS7502 will get more negative. When this voltage reaches -0.7 V, TS7502 will be driven into conductivity and consequently connect the gate of TS7504 to earth; the FET will block (same as opening switch 'S'). The maximum drain-current is $0.7 \text{ V} / (R3514//R3515) = 1.6 \text{ A}$.

The voltage polarities on L5506 will invert, keeping the gate of TS7504 negative via the co-coupled coil (4, 5). The voltage on the secondary winding of L5506 (7, 8) will be positive, generating the +28 V audio supply voltage via D6507 and C2512.

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

Stabilization of VBAT:

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

To stabilize the output voltage, a feedback loop is implemented, which will reduce TON when VBAT increases and vice versa.

Via a voltage divider, existing of (1 %) resistors R3507, R3510 and R3527, a voltage of 2.5 V (when VBAT = 141 V) is fed to the input of precision shunt regulator 7506. This regulator will conduct, a current will flow through R3524, and TS7505 will be driven into conductivity. The base of TS7502 will now be set at a certain positive voltage. As this transistor switches the FET TS7504 on and off, this circuit can determine the duty-cycle.

E.g. when the load increases, VBAT will decrease. Consequently, the input-voltage of regulator 7506 will decrease, resulting in a lower current. Through that, the emitter-base voltage of TS7505 will diminish.

The current through R3504 will decline, changing the base-voltage of TS7502 and through that the TON (will increase) of the FET. The output voltage VBAT will rise. If the load continues to increase, the regulator will block at a certain moment, the collector-current of TS7505 will now be zero. If no current flows through R3504, TON will now be maximum (IMAX = 1.6 A). This is the point where VBAT will be below 141 V, and at further increasing load will be switched off (The voltage across the co-coupled coil (4, 5) will decrease due to the increasing load. Therefore, the voltage on the gate of TS7504 comes below the threshold voltage. The supply switches off and an audible hiccupping can be heard).

On the other hand when the load decreases, VBAT will rise. Consequently, the input-voltage of 7506 will also rise resulting in a higher current. The current through R3504 will rise, changing the base-voltage of TS7502 and through that the TON (will decrease) of the FET. The output voltage VBAT will be reduced.

If, for instance, VIN will decrease (e.g. UMAINS is 180 V i.s.o. 240 V), the slope of the drain-current will be flattened, through which the FET will be longer into conductance, keeping VOUT constant.

If, for any reason, the stabilization circuit fails, the output voltage VBAT can never exceed 200 V (via D6514). D6514 will form a short-circuit, VBAT will drop and the set will switch off (this will result in an audible hiccupping of the supply).

Set to 'POWER OFF' (via RC):

When the set is switched to 'POWER OFF' via the Remote Control, the Main supply will be switched off.

This is done by the circuit around TS7529 (see diagram A1):

During 'ON'-state the Main supply is fed with line pulses via the STANDBY-line. They are rectified and smoothed via D6517, D6516, and C2530 and fed to TS7529. Because they are less than -20 V, this transistor will be blocked.

When these pulses are stopped (via command micro controller to HOP), TS7529 will be saturated and TS7502 will be switched off. This will switch off the Main supply.

Set to 'POWER ON' (via 'POWER' button of set):

When the set is switched 'ON', the HOP is not working (as much as possible ICs are made voltage-less during Standby mode. Therefore, it is impossible that the STANDBY-line carries line-pulses, so the main supply cannot start up. This problem is solved via the 'low power start-up' possibility of the HOP.

Via pin 22, the HOP receives, via the STANDBY_INFO line from the Painter, a voltage of 5.2V coming from the Standby supply. The result will be that the HOP will generate pulses with a nominal TOFF and TON growing from 0 to 30% of the nominal value.

This signal is unchanged until the Main supply is switched 'ON' and the HOP the correct I2C-command POR-bit) has received.

Guarding circuit:

The 11V of the line-stage is monitored.

The +28V winding (pin 6) of supply-transformer 5506 is monitored. (These pulses, when switching off the set, exist longer than the 11V-level)

When switching off the set by the 'POWER'-switch, the 11V will decrease and will generate a positive STAND-BY (POR) pulse.

At that moment the RGB-outputs will be driven such that the EHT-capacitor is heavily loaded in order to have a nice switch off spot. Therefore, when the set is 'on', T7510 is always conducting.

The switch off spot is nicer then without extra sensing of +28 V winding.

The STAND-BY (POR) signal drives via R3545 a positive pulse back to the Painter-processor. The Painter will switch off the Main Supply via the HOP IC. It will put the HOP in HOP-standby, stopping the drive pulses. The main supply will be switched off. (See diagram B4)

SSB

There are three voltages used for the SSB: +8 V, +5.2 V and +5 V.

+5.2 V is the Standby voltage; it should always be present. The 8V is derived from the 11D V with stabilizer 7906 (on LSP). This 11D voltage is only present when the line-drive pulses start the deflection.

The 8V is used to switch the +5.2 V with transistor 7905 to supply the +5 V.

Control and Closed Captioning (diagram B7)

Painter

The SAA5677/M1 (IC7001) is called the Painter (OSD, CC and Control). In this IC, the microprocessor and the Closed Captioning-decoder are integrated.

Some of its functions are:

- Set control.
- CC/OSD acquisition.
- RGB-outputs to the HOP
- I/O-ports for I2C, RC5, LED, and service modes.
- Error code generation.

The software for N8 can be 192kB.

The Non Volatile Memory IC7011 is a 4kB version M24C32.

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

When the 3.3 V is available, a POR is generated with TS7003/7004 to wake up the Painter. During the reset, all I/O pins are high. When a POR is generated, the TV-set is in Standby mode.

The HS-signal derived of HFB and VS-signal derived of Vsync are fed to the Painter for stable OSD and CC.

Closed Captioning

The painter deals with CC-decoding. The Painter gets its video signal directly on pin 31 (from the HIP).

The RGB-outputs are available on pins 46/47/48. Fast blanking is realized via pen 52.

I2C

In the N8-chassis with Painter-processor there are two I2C-busses used:

- Slow (max. 100 kHz) hardware I2C-bus (called I2C1) used for all IC communication.
- Separate short bus (called I2C 3) for the Non Volatile Memory (NVM) to avoid data corruption.

NVM

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

- Software identification.
- Operational hours.
- Error-codes.
- Option codes.
- All factory alignments.
- Last Status items for the customer + a complete factory recall.

Tuner and IF (Diagram A7 and B2)

The tuner is I2C-controlled and is capable of receiving off-air and cable channels: The tuning is done via I2C. The reference voltage on pin 9 is 33 V. This voltage is derived from the 180 V (from the LOT) via two resistors of 2.2k ohm (diagram F). The Painter together with the HIP controls the tuning procedure.

The IF-filter is integrated in a SAW (Surface Acoustic Wave) filter. Two SAW filters are used: One for filtering picture-IF and one for filtering sound-IF.

The output of the tuner is controlled via an IF-amplifier with AGC-control. This is a voltage feedback from pin 62 of the HIP to pin 1 of the tuner. AGC take-over point is adjusted via the service alignment mode 'Tuner AGC'. Too much noise in the picture could be caused from an incorrect AGC setting. There could also be a misalignment of the AGC-setting if the picture deforms with perfect signal. The IF-amplifier amplifies too much.

The video IF-signal is fed to pins 2 and 3 of the PLL-controlled IF-demodulator. The voltage controlled oscillator of the PLL is adjusted via the service menu 'IF PLL'.

The external coil L5408 connected between pins 7 and 8 is used as reference. The demodulated IF-video signal is available at pin 10 of the HIP.

On pin 10 the CVBS-signal becomes available, via TS7321 the signal is supplied the PIP-module.

Via the PIP-module, it comes back.

In this video signal, the sound carrier part is filtered by the sound trap 1407. Via TS7322 the signal goes back into the HIP (pin 14) to the I/O selection.

To realize quasi split sound, the IF-signal is fed to the HIP on pin 63 and 64 via SAW-filter 1408. The FM-modulated signal is available on emitter of 7410 and is fed to the audio demodulator MSP345x.

Video: HD Jack Interface (Diagram N)

The Jack High Definition module covers the following functions:

1. RGB output selection.
2. Matrix circuit to convert YPbPr to RGB.
3. Sync slicer for YPbPr sync on Y, RGB sync on Green.
4. Sync selection.
5. Control Function.
6. Audio feed-through of signal source.

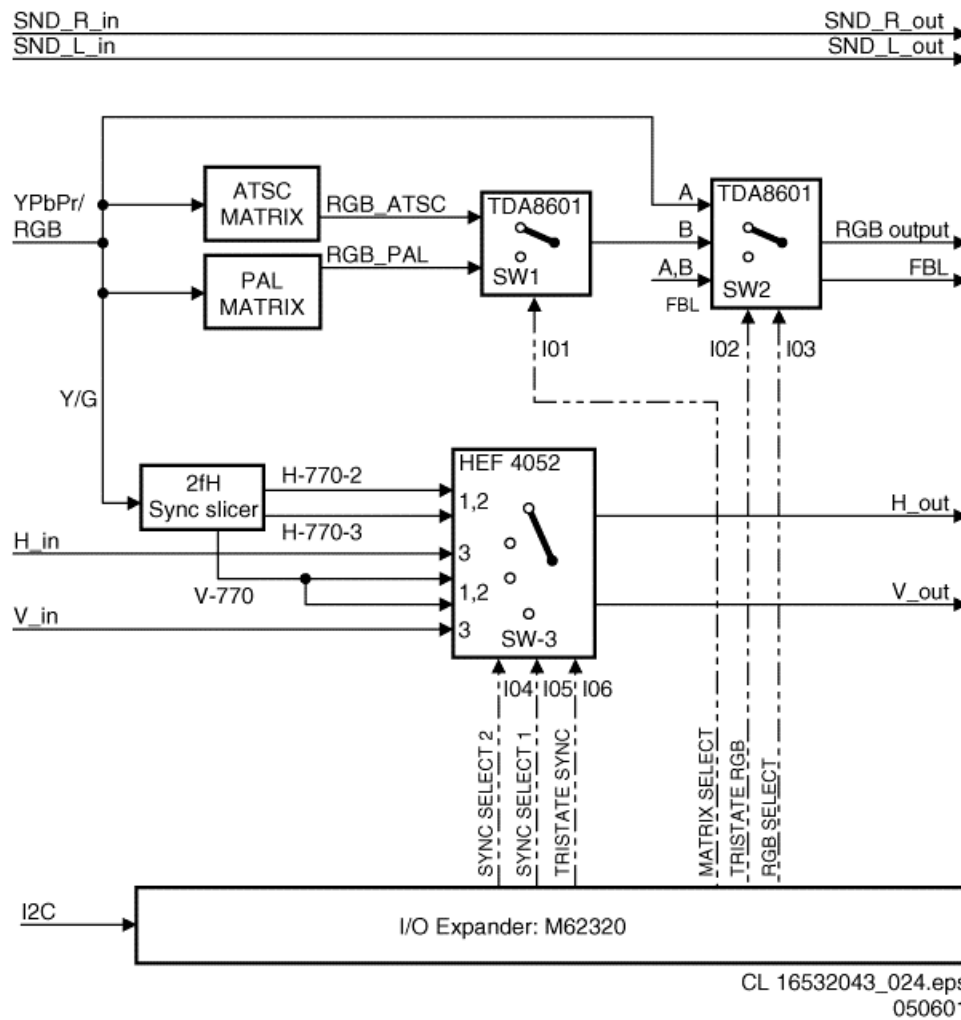


Figure: Source select

RGB Output Selection

The module has two video inputs and one RGB output (going into the set.)

The inputs can also handle 1080i-signals and 480p-signals (both in RGB format and YPbPr format.)

(This selection circuitry is also needed to cope with the various formats of the non-standardized HD set top box business.)

Video-input (3 cinches, reference number 1993-A-B-C):

- YPbPr with sync on Y.
- RGB with sync on green (note: cinch-inputs are normally used for YPbPr input.)

Video-input (D-sub, reference number 1990):

- YPbPr with sync on Y (note: D-sub input is normally used for RGB-inputs only.)
- RGB with sync on Green.
- RGB with separate H and V Sync (called VGA in 480p.)

RGB output:

This RGB output of the board is signaled into the set (HOP-section of SSB [B4].)

Matrix

The YPbPr-signal format is converted to RGB via the matrix function. In 480p-format, the PAL matrix is used, otherwise the ATSC matrix is used.

The matrix choice is made with TDA8601 (SW1, 7107.)

This switch is controlled via the command IO-1 (called MATRIX SELECT in the figure.)

Sync Slicer

The sync slicer extracts the horizontal and vertical synchronization signals for the HOP (in the set):

- From the 3-level sync pulses Y of the 1080i YPbPr
- From the 3-level sync pulses Green of the 1080i RGB
- From the normal sync pulses of the 480p signal

Explanation of 3-level sync shown in picture:

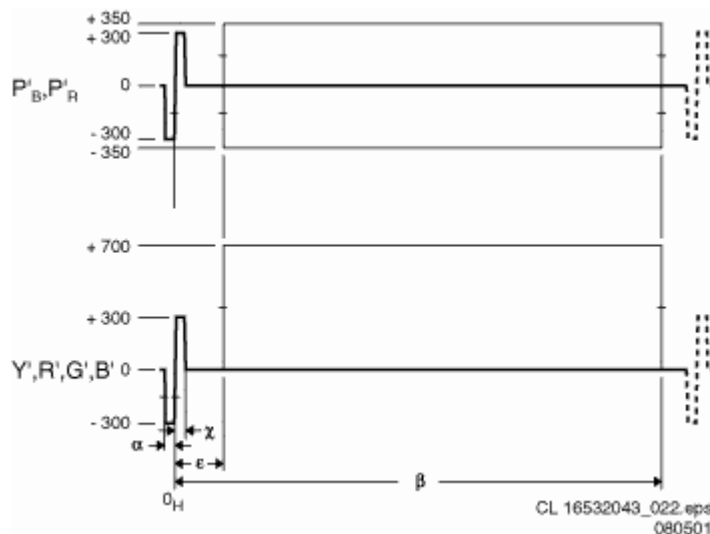


Figure: 3 level sync

Example of a 2-level sync pulse: CVBS-signal with two levels of sync (-300 mV, 0 mV)

Example of a 3-level sync pulse: ATSC-signal with three levels of sync (-300 mV, 0 mV, +300 mV)

The amplitudes of the Y, R, G, B signals are 700mV; amplitudes of the Pb and Pr signals are 350mV.

Sync Selection

If the synchronization is derived from Y or Green, the H and V sync from the sync-slicer must be selected.

- When YPbPr-signal or RGB-signal is 480p-format: sync signals will be V-770 and H-770-2 sync.
- When YPbPr-signal or RGB-signal is 1080i-format: sync signals will be V-770 and H-770-3 sync.

When the sync is separate (H and V), the sync of the source must be selected.

The IO-4, IO-5 control-lines select the sync-inputs of the HEF4052 (7102.)

In our figure, these control-lines are named SYNC SELECT 2 and SYNC SELECT 1.

Via IO-6 line (called TRISTATE SYNC), the sync output can be put in tri-state.

Control Function

The different selections are made by the I/O expander, controlled by I2C.

These selections can be made with the user interface.

Audio

Audio left and audio right are connected via the two cinches and passed through the module.

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

In the N8 the TDA932xH input processor is used, which contains the following functions:

- IF demodulation.
- AFC signal generation, used to track drifting transmitters.
- Sound carrier re-generation (SIF).
- Sync acquisition, delivering HA and VA.
- Switching off IF-filtering.

The HIP has various inputs.

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

Outputs: Three separate switchable outputs can be used:

- 1 YUV-output is fed to the PICNIC
- 2 CVBS outputs: One for CC-decoding (named CVBS-TXT) and the other for output to MONITOR OUT to have WYSIWYR (What you see is what you record)

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

AV1 is a CVBS- and a YUV input (e.g. for DVD), while AV2 is meant for CVBS and Y/C (SVHS). The third option is a MONITOR OUT-output.

Video Processing

The sandcastle-pulse of the HIP will not be used for synchronization. The HOP will generate synchronization signal derived from the feature box (PICNIC) signals. The HIP itself (no external voltage) controls the Y/C switch in the HIP.

The Chrominance decoder in the HIP is full multi-standard, but only NTSC is decoded. One crystal is connected to the pin 57 without any alignment. The crystal is also used as a reference for the synchronization. A digital control circuit that is locked to the reference signal of the color decoder determines the start-up of the sync. This crystal may only be replaced by the original one. If just a crystal is taken, the internal capacitance will be different and the effect will be that there is no color.

In the HIP, a sync separation circuit has been integrated. The HIP delivers the HA and VA (50/60 Hz) to the PICNIC and PIP/DW module. On pin 59, there is the 1fH sandcastle but this is not connected to any circuit and only used internally for the color demodulator. The 2fH-sandcastle signal is generated by the HOP.

Video: Feature Box (PICNIC, diagram B3)

Introduction

The basic function of the Feature box (FBX6) is picture improvement, and depending on the version several scan conversion methods can be applied. The PICNIC is the key component.

In the N8-chassis, the feature box is integrated on the SSB. The PICNIC is used for the 60 Hz (prog. Scan) conversion. In the PICNIC, the following functions are present:

- The ADC.
- The DAC.
- The interlaced to progressive scan conversion.
- The noise limiter (DNR).
- The contrast improvement.

All these functions are integrated in one IC: SAA4978H, a 160 pin QFP.

ADC/DAC

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

Digital to Analogue conversion uses three identical 10-bit DACs.

In the PICNIC there are three 9 bits ADCs present for Y, U and V. For digitizing the Y (luminance) 9 bits are used, to realize a more detailed picture. The nine bits are only used internally. Via dithering, the nine bits are reduced to eight bits and that data is stored in memory. The data in memory is fed back to the PICNIC and via un-dithering the data is again reproduced in nine bits for processing.

U/V (color difference signals) is also sampled with nine bits. These two nine bit data streams are multiplexed to four bit data streams. This reduction can be allowed, as the perception for colors by the human eye is less sensitive as for luminance.

Interlaced to Progressive Scan Conversion

The main task of the PICNIC is the conversion from interlaced 60 Hz to progressive scan 60 Hz for YUV and HV-sync. In order to remove 'large area flicker' (especially visible in a white picture), the field-rate of the video is doubled by the FBX6. The line frequency (16 kHz) is doubled (32 kHz). When the video input contains fields A, B etc, the conversion provides an AABB sequence on the display. The actual conversion is done in the first Field Memory by reading it twice at double speed, while writing it once.

Automatic Aspect Ratio Adaptation (AARA)

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

CTI

At CVBS video signals, the bandwidth of color signals is limited to 1/4 of the luminance bandwidth. Transients between areas of different color are therefore not very sharp. The PICNIC can increase these transients artificially with a time manipulation algorithm.

Dynamic Contrast

To make the contrast (black/white) range wider, Philips has invented Dynamic Contrast. It uses the digital memory used in digital scan sets. It measures every A-field (25 x/s) and digitally analyses where on the grayscale most of the image is located. If it is a relatively dark image, the lighter part of that image is stretched towards white, so that more contrast will become visible in that picture. If it is a relatively light image, the darker part of that image is stretched towards black, so that these darker parts will have more contrast. When the image is in the middle of the grayscale, both dark and light parts are stretched.

PROZONIC

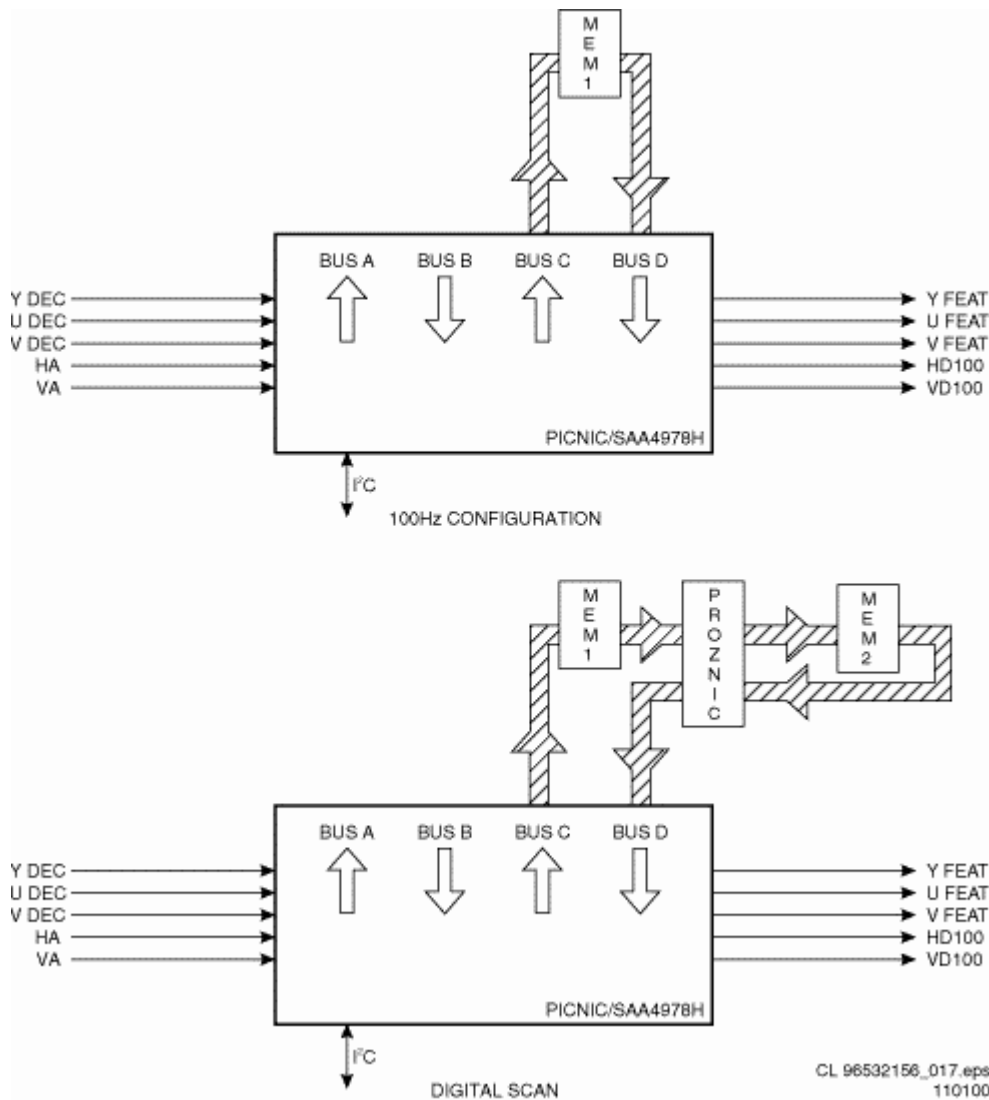


Figure: 100 Hz conversion

To the PICNIC, external ICs are connected dependent of the features.

For N8-sets with Digital Scan the PROZONIC (IC7708, SAA4990H) is placed with two memory ICs (IC7714 and 7715). It is an abbreviation for PROgressive scan ZOOM and Noise reduction IC.

When applying this, the second Field Memory has to be installed. The following functions are available:

- Line flicker reduction (Digital Scan): this is a feature to reduce the 30 Hz interlace line flicker.
- Dynamic Noise Reduction: noise affected signals can be improved by combining the pixel values of the current and past video fields. This is however only possible in areas without movement.
- Variable Vertical Sample Rate Conversion
- Synchronous No Parity Eight bit Reception and Transmission interface (SNERT-bus)

Video: High-end Output Processor (HOP, diagram B4)

General

In the HOP (High-end Output Processor, TDA9330) the video processor and digital deflection processor are integrated. The main functions of the HOP are:

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

The YUV-signals from the PICNIC are fed to the HOP. In the HOP, the video and geometry control parts are integrated. In addition, the RGB-signals from TXT/OSD are inserted via the HOP. This IC has all functions from a video processor and geometry control.

The geometry part delivers the H-drive, EW-drive, and a drive signal for rotation. The internal V-drive circuit of the HOP is not used (is explained further on).

Video Control

After conversion to RGB again, the signals can be controlled for Saturation, Contrast, and Brightness.

2nd RGB Interface for OSD/CC

On pins 35 to 38, the RGB and fast blanking from the Painter (OSD and CC) are inserted.

Peak White Limiting

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

Cut-off Control

Switching the TV to Standby:

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

In this chassis, a 'one-point' cut-off control is used:

A current of 8A (for cut-off) is fed to pin 44 of the HOP. This is done with a measurement pulse during the frame flyback. During the first frame, three pulses are generated to adjust the cut-off voltage at a current of 8A. With this measurement the black level at the RGB-outputs is adjusted. So at start-up there is no monitor pulse anymore.

At start-up, the HOP measures the pulses, which come back via pin 44. The RGB-outputs have to be between 1.5V and 3.5V. If one of the outputs is higher than 3.5V or one of them lower than 1.5V, the RGB-outputs will be blanked.

Geometry Control

All geometry control is done via I2C and the data is stored in the NVM (IC7012) of the SSB.

Line Drive (LINEDRIVE1).

Line drive is derived from an internal VCO. As a reference an external resonator is used (1301). The internal VCO is locked with the HD100-pulse, which comes from the PICNIC. The 'PHI-2' part in the HOP receives the HFB_X-RAY_PROT (pin 13) to correct the phase of the line drive. The EHT-info is supplied to pin 14 (DYN-PHASE-CORR) to compensate picture breathing depending on the beam current.

Frame Drive (FRAMEDRIVE+).

Triggered by Frame+ output of HOP-IC (pin 1), the FRAMEDRIVE+ signal is extended to 530uSec (flyback time) by the circuit around TS7309 and 7311. (Vsync signal is used to vertically sync the painter)

Note: The Frame outputs (pins 1/2) of the HOP are not used!

East/West Drive.

At pin 3, the E/W-drive is available. Pin 4 is a feedback input for the EHT-info and is used to prevent pumping of the picture. EHT varies also dependent of the beam current.

Frame Rotation.

For frame rotation, a control voltage is used from pin 25 of the HOP. This voltage can vary from 0.4V to 4V.

Guarding Protections:

Flash detection:

When a flash occurs, the EHT-info will become negative very fast. Via D6303/D6304/R3316, TS7303 starts to conduct. This makes pin 5 of HOP high. When pin 5 of HOP is high, then the output (pin 8) is immediately stopped. If the H-drive stops, then also pin 5 will be low again, which will reset the flash detection. A bit (FLS) will be set in an output status register, so via the Painter it can be seen when there was a flash. This FLS-bit will be reset when the Painter has read that register.

HFB protection:

If the HFB is not present then this will be detected via the HOP. The Painter puts the TV into protection and an error code will be generated.

3D Comb Filter (Diagram CO)

Conventional Comb filters separate the luminance (black and white picture information) from the chroma (color picture information), by comparing horizontal scanning lines within one video frame. The 3D Digital Comb Filter takes this idea two steps further by acting upon not only consecutive lines within the frame, but in the frame before and after as well. The added analysis and correction result in far sharper pictures with less noise, as well as an enhanced purity of color. The filter also compensates for any motion that occurs between fields.

The video inputs and outputs are protected from temporary overload conditions and are ESD protected for improved reliability. The module is controlled via I2C commands. The red LED on the panel indicates proper sync and color burst timing. When they are detected, the LED must be 'off.'

The input currents for the 5 V (280 mA) and 9 V (120 mA) supply are self-limiting due to the use of a PTC (R3103 and R3104).

The 3D Comb filter is integrated in one IC (type uPD64083.) The block diagram of the 3D Comb panel is indicated in the next figure.

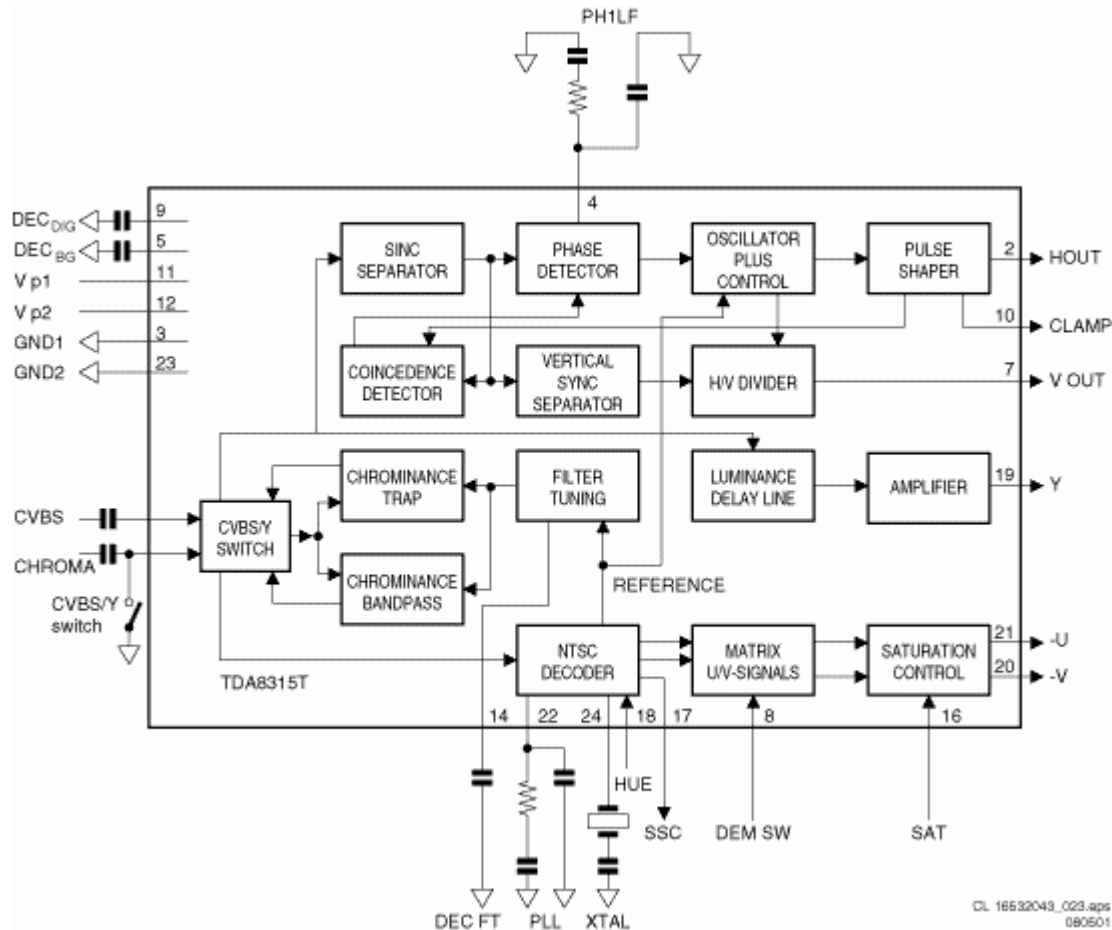


Figure: Block diagram 3D Comb panel

Synchronization (Diagram B3 and B4)

The HIP video processor provides vertical and horizontal sync pulses VA and HA, which are synchronized with the incoming CVBS signal. These pulses are fed to the PICNIC where they are doubled to be synchronous with the 100Hz picture. The outgoing pulses, VD100 (in reality 60 Hz), and HD100 are fed to the HOP that supplies the vertical and horizontal drive pulses and the 2fH sandcastle pulse.

Via a mono-stable multi-vibrator circuitry (7309/7311), a frame flyback pulse is generated of 530s. This pulse is triggered by the Frame + output of the HOP-IC. The VSYNC output of this circuitry together with 'HS' signal (retrieved from the HFB signal via TS7007 on diagram B7) synchronize the Painter for stable OSD/CC.

The 'framedrive +' line drives the frame deflection.

When no CVBS is offered to the video processor, the VA and HA pulses are switched 'off' by the HIP, and the VD and HD pulses are then generated by the PICNIC. This to assure a stable OSD.

This also counts for the AV4 input signal (HD input). When having no signal here, we still have a stable OSD.

Horizontal (Line) Deflection (Diagram A3)

Driving the Line Output Stage

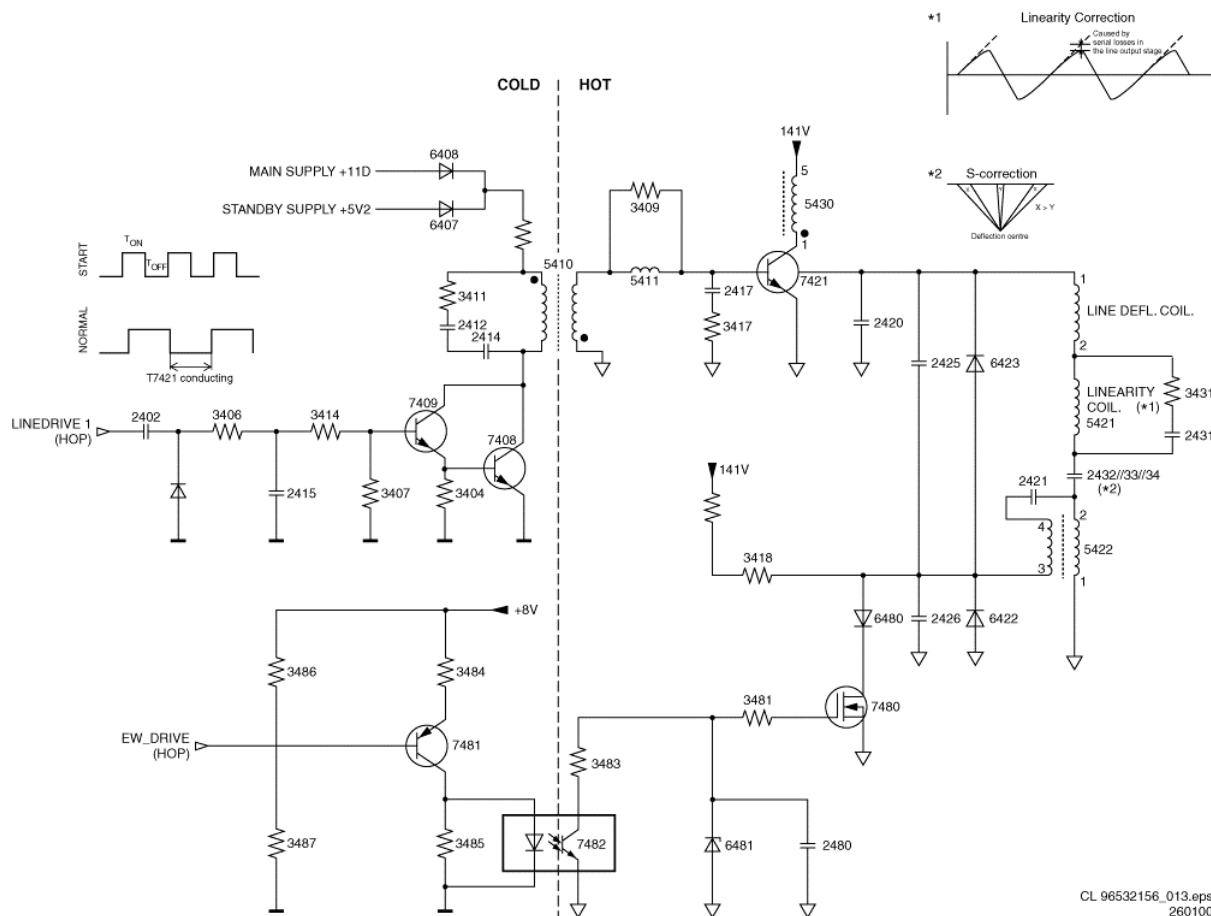


Figure: Line deflection circuitry

The HOP (located on the SSB) generates the line-drive pulses (LINEDRIVE1), which have a frequency of 31468 Hz ($T = 31.77\text{s}$).

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

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

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

The line stage will be started via the 'slow start' principle. During start-up, the HOP generates line drive pulses with a small TON and a high frequency (50 kHz); TOFF will be constant and TON will be gradually increased until the duty-cycle is 50 % (normal condition). The time interval from start to normal condition takes about 150mSec. When switching off, the same procedure is followed, but now in reverse order.

through L5422 continues to flow through C2426 and C2421. The energy stored in the line deflection coil is passed to C2425, and the energy of L5422 to C2426.

The resonance-frequencies of these two LC-circuits define the flyback time of the spot from the right side of the picture tube to the left.

On average, no current flows through C2421 and thus the voltage across this capacitor remains constant.

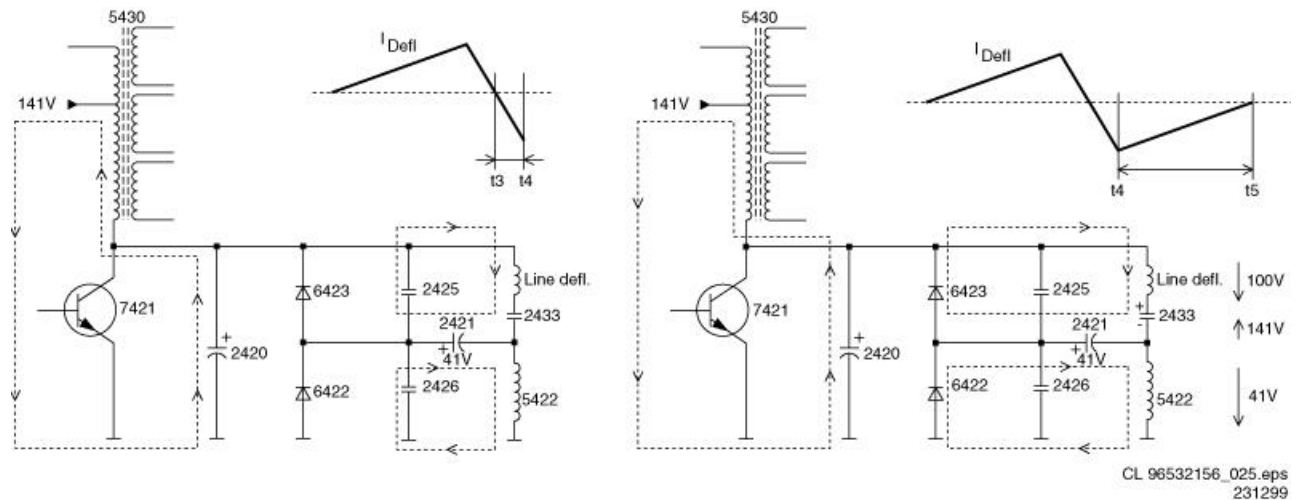


Figure: Line deflection part 2

Period t3 - t4:

As for the period t2 - t3, but now the current flows in the opposite direction, since the voltage across C2425 and C2426 is higher than the voltage across C2433 and C2421.

Period t4 - t5:

The coils try to maintain the negative current and will charge the capacitors negative. Because of this, D6422 and D6423 will conduct. The voltage is 100V across the deflection coil and 41V across L5422. As both diodes conduct, we may consider the voltage constant. A linear current flows with the same changing characteristics as in period t1 - t2. The spot now moves from the extreme left to the center of the picture tube. Before the current becomes zero, and the spot is located in the center of the frame, TS7421 reverts into conductivity. First a short negative current will flow. Then the cycle begins again.

The Linearity Correction

A constant voltage across the horizontal deflection coil should result in a linear increasing saw-tooth current. This however is not the case as the resistance of the coil is not negligible. In order to compensate for this, a pre-magnetized coil L5421 in series with the deflection coil is used. This coil ensures that during time interval $t_1 - t_3$ the circuit-resistance will be higher than during $t_4 - t_5$. L5421 is called the linearity coil. To avoid self-oscillation, R3431 and C2431 are placed parallel to L5421.

The S-Correction

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

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

C2433 is charged quadratic during time interval $t_1 - t_2$. On the left and right sides of the screen the voltage across the deflection coil decreases, causing the deflection to slow down. In the center of the screen, the voltage increases and the deflection will increase in speed.

An S-shaped current will have to be superimposed onto the saw-tooth current. This correction is called finger-length correction or S-correction. C2433 is relatively small, as a result of which the saw-tooth current will generate a parabolic voltage with negative voltage peaks. The current also results in a parabolic voltage across C2421, resulting in the finger-length correction, proportionally increasing with the picture width. The EW-DRIVE signal will ensure the largest picture width in the center of the frame. Here the largest correction is applied. The larger the picture width, the higher the deflection current through C2433.

The E/W-Correction

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

The EW-DRIVE signal is generated in the HOP and will drive FET TS7480 via TS7481 and optocoupler TS7482. TS7480 will charge capacitor C2423 more or less, increasing the deflection current when reaching the center of the screen.

Secondary Line-Voltages

During the blocking time of TS7421, the magnetic energy of coil 1 - 5 of the LOT will be transferred to electrical energy in the secondary winding. Via rectifying and smoothing, the several secondary supply voltages will be generated:

- EHT, Focus and Vg2-voltage,
- +180V for the CRT panel (pin 8 LOT),
- +11D for the line deflection (pin 12 LOT),
- +13VLOT for the frame deflection (pin 6 LOT),
- -15VLOT for the frame deflection (pin 3 LOT),
- Filament voltage (pin 9 LOT).

The EHT-INFO signal is derived via R3450//R3451. This signal decreases while the beam current increases. It is fed to the HOP to compensate for loss of picture width and picture height.

The DYN-FASE-CORR signal is fed to the HOP via C2455 and drives a dynamic phase correction necessary because of beam current variations. This is done by regulating TON of the line transistor TS7421.

East-West Circuit

The moment TS7480 is driven into saturation, C2421 will discharge during the flyback. As a consequence of which C2421 must be charged again during the scan via the conduction diode D6422 (as long as C2421 is not charged to the voltage across L5422, D6422 will conduct). The current in the deflection coil is therefore larger than the current flowing in L5422 (1-2). The voltage across the deflection coil increases, so the picture width increases. When TS7480 blocks, C2421 will not discharge anymore and the voltage across C2421 will remain constant. The result is that the voltage across the deflection coil is minimal. The voltage across coil L5422, however, is maximal. This coil (L5422) consists of a transformer:

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

The EW Drive

The EW drive signal originates in the HOP and is supplied to TS7480. The shape of this signal determines the various geometric correction parameters:

- H amplitude,
- EW-parabola,

The HOP drives the frame output stage. As the HOP is 'cold' and the frame output stage is 'hot', they must be galvanic isolated. This is done by means of an optocoupler. In the MG-chassis, the HOP generates three signals needed for the frame output stage: VDPOS, VDNEG and FRAME ROTATION. To avoid the costs of three optocouplers, the frame drive pulse and rotation DC-voltage are added together and then fed to optocoupler TS7610.

This is done as follows:

The positive frame output signal of the HOP (pin 1 of HOP, diagram B4) is extended for 16.5 lines and inverted via a mono-stable multivibrator (TS7311, TS7309 and TS7310, diagram B4). This signal is called FRAMEDRIVE+. The output signal of pin 25 of the HOP (rotation-information) is superimposed via TS7312 on this signal. The FRAMEDRIVE+ and is fed to optocoupler 7610 (diagram A4). So this signal contains info for both the frame deflection and the frame rotation (if present).

The circuit around IC7440 will amplify this signal and the output current will flow through the rotation coil. The vertical pulses on this signal are filtered by C2445 to ensure that only a DC-voltage will be supplied to the rotation coil.

The output voltage of the rotation circuit is between -8 and +8 V.

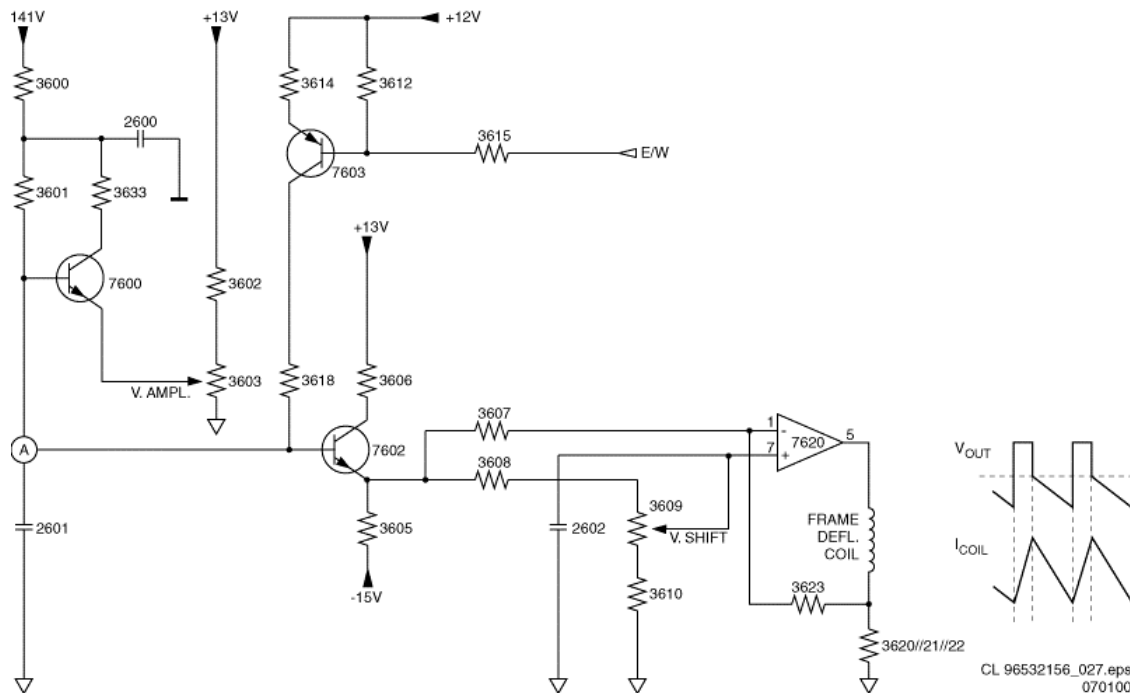


Figure: Frame deflection

The sawtooth voltage for the frame output stage is not generated by the HOP but by a discrete circuit after the optocoupler 7610 via R3600 and R3601 a linear increasing voltage over C2601 is built up with a large time constant.

The circuit around TS7603 is a current source, driving C2601 with a current value derived from the E/W modulator. This will result in an S-shaped voltage on C2601 (also known as EW-correction).

Flyback Generator

The frame output stage is supplied via the +13 V and -15 V coming from the LOT. The output of the amplifier is 0VDC, so a coupling capacitor is not required.

During the (forward) scan, a supply of +13 and -15 V is sufficient to respond to the slow changing current. The flyback generator puts a voltage of -15 V on pin 3. Because of the voltage drop over zener diode D6622 (8.2 V), C2622 will be charged to 19 V: being $13 + (15 - 8.2 - 0.7)$ V.

During the flyback scan, the change in current per time is much larger, so a higher voltage is required. The flyback generator will now generate a voltage of +13V on pin 3. Added to the charge on C2622 this will give a flyback voltage of 32 V (depending on the CRT size, this value can differ).

The IC amplifier (IC7620, pin 5) supplies the sawtooth current to the frame deflection coil. The current through this coil is measured via R3620//R3621//R3622 and fed back to the inverting input of the amplifier.

R3624 and C2624 on the output of the amplifier, form a filter for high frequencies and in that way also prevents oscillations.

Peak voltages on the output, e.g. as a result of a possible flash, are damped by the clamp circuit consisting of D6619, C2627, and R3627. The network consisting of R3625, R3629 and C2629 form an extra damping circuit.

Protection Circuit for Bridge-Coil and Frame Output Stage

The secondary voltage of bridge coil L5422 is guarded at the diode modulator (D6421/22) via a detection circuit consisting of an 8.2 V zener diode (6499 on diagram A3). When the bridge-coil is working properly, the average voltage on D6422 is such that this zener diode will conduct and will drive TS7652 into saturation via the BRIDGE_PROT signal (see diagram A4). When, for any reason, the secondary side of the bridge-coil is shorted, the average voltage on D6422 will drop below the zener-voltage and TS7652 will block. Now capacitor C2642 will be charged. Transistor TS7407 will start conducting and the DEFL-PROT (= STANDBY, see diagram A3) signal will be grounded via R3403. This will switch off the main supply (see diagram A1).

Via the circuit built around TS7641 the frame output stage is guarded. If the frame output stage is working properly, TS7641 and TS7652 will both conduct and thereby discharging C2642. TS7407 is blocked now, causing the DEFL-PROT signal to have a high resistance.

If there are frame pulses missing, TS7641 will block and capacitor C2642 can be charged. Transistor TS7407 will now start conducting and the STANDBY (=DEFL-PROT) signal will be grounded via R3403. This will switch off the main supply (see diagram A1).

Audio (Diagram B6, A5 and A6)

Introduction

All N8 sets contain one of ITT's Multistandard Sound Processing ICs for sound decoding. The USA-version uses the MSP3451G (Global decoding and Virtual Dolby). This IC takes care of the main FM sound decoding.

All MSP versions contain digital audio processing used for the basic left/right stereo sound, such as bass, treble, balance, incredible sound and spatial. In addition to that, the MSP3451 is also able to perform Virtual Dolby; a Dolby approved sound mode for surround sound reproduction with left/right speakers only.

The MSP3451 is capable of supporting four stereo inputs. Therefore, an extra input selector (HEF4052) is not needed. It has a separate headphone output, so sound control is done separate from the speakers.

Audio Decoding

The signal is fed to the AGC. After this, an ADC converts the IF-signal to a digital signal. This digital signal is processed by two demodulation channels. The first one is able to handle FM.

This channel contains a mixer to shift the incoming signal in the frequency domain. This shift is determined by the value of a DCO (Digital Controlled Oscillator).

After the down-mix, the signal is fed, via a filter, to a discriminator. From here the FM (BTSC) demodulation can be performed.

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

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

Explanation BTSC Stereo System (USA)

The standard for TV stereo audio in the USA was set by the Broadcast Television Systems Committee (BTSC). The BTSC system was designed to:

- be compatible with then current monaural TV receivers,
- present a good stereo separation and signal to noise ratio,
- make available a Second Audio Program as a separate audio channel,
- provide a technical voice/data channel to communicate within the TV stations system.

In a transmitted TV signal in the USA, the FM Audio signal is placed 4.5 MHz above the AM Video Carrier. The audio FM has a nominal deviation of ± 50 kHz. With the BTSC system this signal separation and FM deviation is maintained.

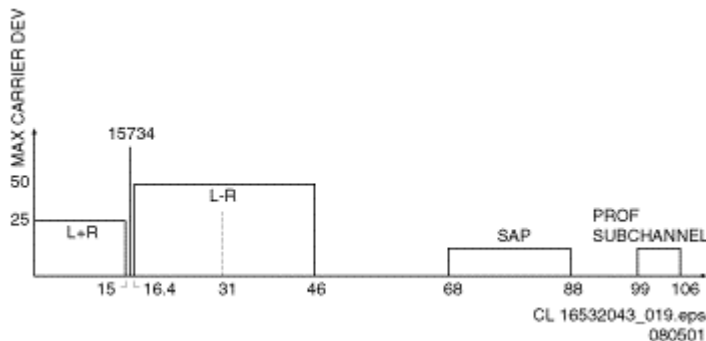


Figure: Base band audio signal spectrum

Figure above shows the detected base band audio signal spectrum. The 'L+R' signal maintains compatibility with the original (and current) monaural receivers. With Double Sideband Suppressed Carrier (DSSC) for the 'L-R' signal, there is a need for an exact re-insertion of the missing carrier. This to assure a good detection in the receiver. This is the main purpose of the pilot carrier at $1f_H$ (15,743 Hz). It also serves to alert the TV set (and the customer) to the fact that the signal is in stereo. As the pilot is at the exact horizontal scan frequency, this can lead to false indication from such sources as VCRs, Signal Amplifiers, etc. where both sound and video are present with RF energy.

The figure also shows the Second Audio Program (SAP) frequency, which is a constant carrier of an audio tone of 5fH (78,670 Hz), FM modulated by the SAP program content. SAP is always monaural.

The material on the SAP audio may, in some cases, not be related to the video content. Alternatively, it may contain a verbal description of the action in the video for those who can not view the picture.

Some stations use it to transmit background music or book reading for the blind.

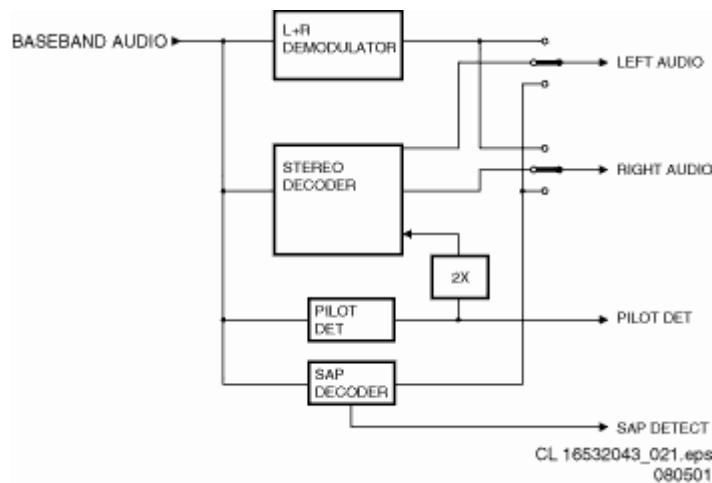


Figure: Block diagram stereo sound system

In figure above, a simplified block diagram of a stereo sound system in a TV set shows the 'L+R' audio signal combined with the detected 'L-R' audio signal to develop stereo 'L' and 'R' audio.

The 'pilot' signal is doubled in frequency (to 2fH) and re-inserted into the detection of the 'L-R'. This to complete the detection.

The pilot signal also tells the control circuit when a pilot frequency is present. The 'L-R' and 'L+R' audio are supplied to the stereo matrix. There, by addition and subtraction the single 'R' and 'L' audio signals are output. The SAP audio is detected and made available. In addition, the indication of a SAP signal is given to the control circuit.

Audio Processing

The sound processing in N8 is completely done by the MSP3451G for 'Virtual Dolby' sets:

- **Volume control** is done by the user via the SOUND menu.
- **Tone control** is done via the BASS/TREBLE control.
- **Headphone control** : In 'Virtual Dolby'-sets, the MSP has a separate Headphone output so separate sound control is possible.
- **Mute control** can be done in different ways:
 - Via the 'SOUND_ENABLE' line of the Painter. Used during start-up/switch-off conditions, in order to avoid audible pops. This line is active low (high = mute).
 - Via the decoding part of the MSP.
 - Via the processing part of the MSP.

The mute on the RC transmitter or in the User Interface (UI) is per today a combination of processing mute and 'SOUND_ENABLE' line. When a user mute is done, the processing mute will turn down the volume, after which the 'SOUND_ENABLE' line is switched. De-muting is the other way around. The reason for this is a technical problem with crosstalk of the headphone into the loudspeakers.

Automatic Volume Leveling (AVL)

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

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

Audio Amplification

The audio amplifier part is very straightforward. It uses two integrated power amplifiers (TDA2616). It delivers an output of 2 x 10WRMS to two full range speakers and/or subwoofer.

The supply voltage is +28 V, generated by the main supply via L5506.

Muting is done via the 'SOUND-ENABLE' line connected to pin 2 of the amplifier IC and coming from the Painter. This signal is inverted by TS7730, as a result of which at a high level of the 'SOUND-ENABLE' signal, current is sunk from pin 2, and the IC mutes.

CRT and SCAVEM (diagram F)

RGB Amplifiers

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

The supply voltage for the amplifier is 180 V and is derived from the LOT.

SCAVEM

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

SCAVEM will improve the slope as follows: At a positive slope, an SCAVEM-current is generated which supports the deflection current. The first half of the slope the spot is accelerated and the picture is darker, while at the second half of the slope, the spot is delayed and the slope becomes steeper.

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

During the first half of the slope, the spot is delayed and the slope becomes steeper.

During the second half the spot accelerates, the SCAVEM-current is zero at the end of the slope.

The Y-scavem signal comes from diagram B4 and is the input-signal for the scavem-circuitry on the CRT-panel. (Y-scavem enters the CRT-panel on pin 5 of 0340).

The Y-scavem circuitry has or a RGB 2fh-input via AV4-input, or Yttp-input (= cvbs) for the other signal sources

Via TS7300 this signal is fed to emitter follower TS7304. The signal is conveyed to the differentiator C2303, R3309, and R3318. Only the high frequencies are differentiated (small RC-time).

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

At the positive section of the pulse, the current flows through R3318, C2307, the SCAVEM-coil, and TS7303. At the negative section of the pulse, the current flows through R3318, C2304, the SCAVEM-coil, and TS7302.

Picture In Picture (PIP)

Introduction:

The PIP panel provides the option for viewer to see two pictures or programs on the displayed area of a TV screen. The size and position of the 'second' picture can also be selective by the viewer.

The PIP panel execution is only applicable to NAFTA only.

Key Components:

- Tuner (1900):
UV1336BL9/AGS
- SAW Filter (1901):
OFWM1962M
- IF processor (7914):
TDA9801
- PIP processor (7803):
M65669
- Switching ICs:
TDA8601 (7919), HEF4053 (7801 & 7916)
- IO expander (7403):
M62320P

Block Diagram:

There are basically two types of configurations. 2-antenna inputs or one tuner PIP, as shown in Fig. 1.

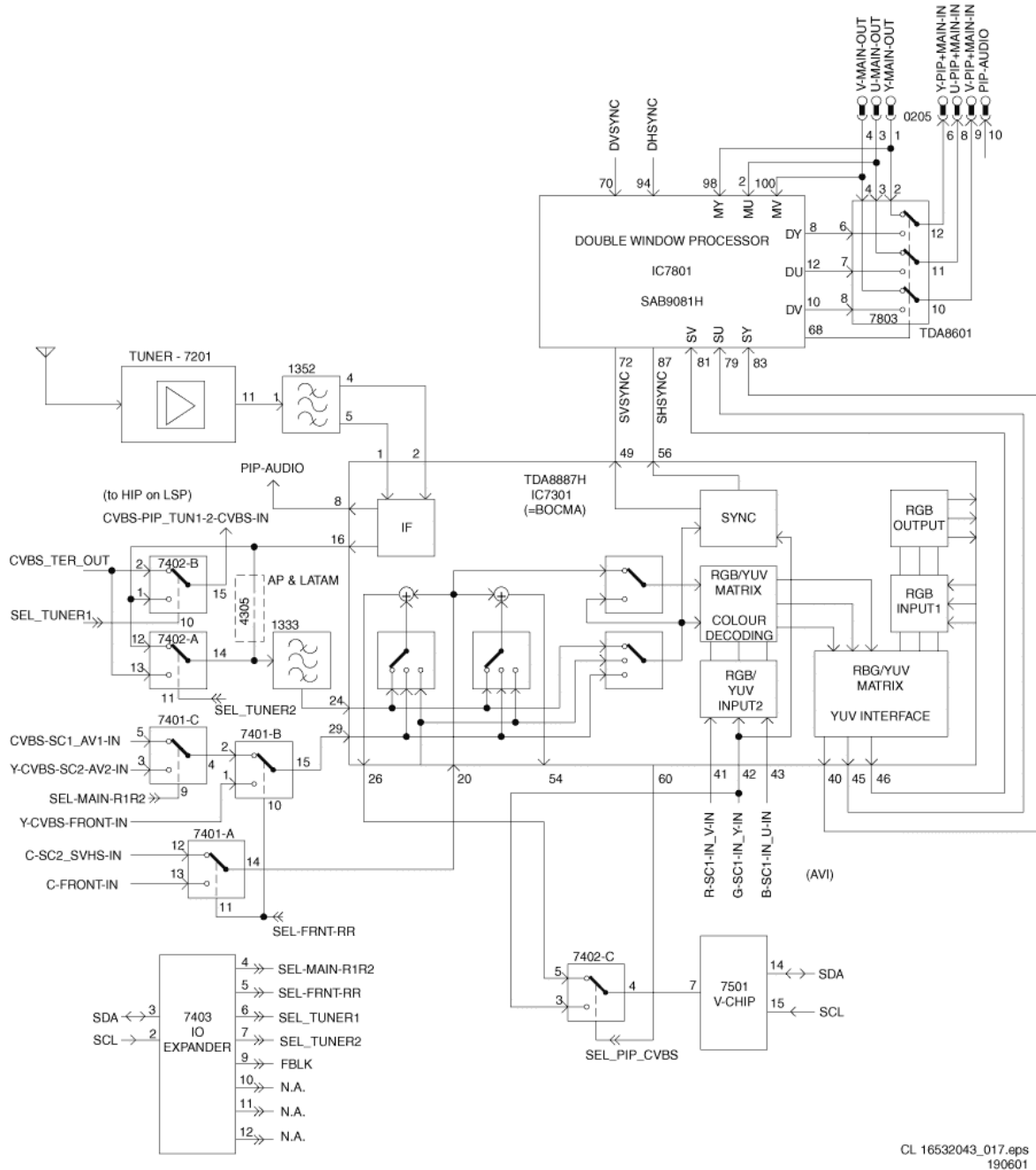


Figure: PIP panel block diagram Pip panel block diagram

Circuit Descriptions

IF section (for set with 2-antenna inputs)

Basically the IF-processing works around IC7901 TDA9801 and tuner. It demodulates the IF signal received from the tuner at pin-1 & 2 via SAW filter 1901, processes it into CVBS signal and outputted at pin-7. The AGC and phase alignments are possible on this panel.

CVBS selection (2-antenna inputs only)

Due to 2-antenna inputs construction, it is possible to provide main picture/PIP picture source either from each tuner (one for off-air and one for cable, or both off-air or cable). It was done by the switching component of IC7916. The switching logic signals, SEL_TUNER1 and SEL_TUNER2 are from IO expander IC7910 pin-6 & 7 respectively. Table-1 shows the switching logic.

Table: Switching logic between Tuner-1 and Tuner-2 for Main or PIP Picture

SEL-TUNER1 (Pin 6 of IO Expander IC7910)	SEL-TUNER2 (Pin 7 of IO Expander IC7910)	Selected CVBS signals
0	0	Main Picture = Tuner 1 PIP Picture = Tuner 2
0	1	Main Picture = Tuner 1 PIP Picture = Tuner 1
1	0	Main Picture = Tuner 2 PIP Picture = Tuner 2
1	1	Main Picture = Tuner 2 PIP Picture = Tuner 1

In order to display the external AV sources by the PIP panel, source selection circuit is incorporated on the panel. In A10 PIP execution, 3 external AV sources are possible (AV1, AV2/S-VHS1, AV3/S-VHS2). The selection between these sources is done by IC7801 HEF4053.

Note: When S-VHS is inserted from the rear, AV2 source will be disabled. Likewise when S-VHS is inserted from the side-AV.

The switching logic of AV sources is shown in Table-2.

Table: AV switching logic for PIP picture

Device IC7403	pin	Function	RF (CVBS)	AV1	AV2	AV2SVHS	AV3	AV3SVHS
IO Expander	4	S1	1	0	X	X	X	X
	5	S2	0	0	1	1	1	1
	9	S3	X	X	1	1	0	0

Since the PIP processor input needs CVBS signal, the YC from the SVHS inputs (rear & side AV) are being 'added' by TS7817 or TS7816.

PIP Processing

IC7803 M65669 is a PIP signal processor whose sub-picture is composite signal for NTSC, PAL M/N. It also has a built-in V-Chip data slicer and built-in field memory (144k-bit RAM). The PIP picture size can be 1/9 or 1/16, with picture freeze capability. The composite video signal from the PIP tuner or AV source is fed to IC7803 pin-22. Since the PIP is only NAFTA execution only one x'tal 1802 (14.3181MHz) is connected to pin-28, for decoding the CVBS into NTSC YUV signals, in the digital domain for PIP memory & output control. The compressed YUV then reconvert back to analogue by the

DACs. The YUV are output at pin-39, 37 & 35 of IC7803 respectively. In order to display the PIP sub-picture correctly on the main picture, the VFB & SANDCASTLE sync signals from the deflection are connected to IC7803 pin-33 & 32.

The sub-picture YUV signals are fed to fast switching IC7919 TDA8601 pin-6, 7 & 8. In normal operation (w/o PIP), the main picture YUV signals (at pin-2, 3 & 4) are bypassed by IC7919, and returned back to the main video processor. When PIP mode is active, the sub-picture YUV signals are used and fed to main video processor. The control is made possible by fast blanking signal from IC7803 pin-1.

Guide+ (NAFTA only)

The CVBS_TER_MAIN & CVBS_TER_PIP signals for the Guide+ decoding are routed/taken from the PIP panel along together with the switching signals (RESET, SEL_YUV_RGB & SEMI-STD-BY) derived from the IO expander IC7910.

Semi-Standby (NAFTA only)

The Semi-standby is used when Guide+ controller wants to capture the data when the set is in standby mode. Normally this is done once every night when the set is in standby mode. During this mode to reduce the load of the power supply the PIP circuitry is switch-off by TS7911 & TS7912. IO expander IC7910 pin-12 does the Semi-standby switching. Table-3 shows the Semi-standby switching logic.

Table: Semi-standby switching logic

Condition	Semi Stdby pin 12 IC7910	Stand By pin 13 on main uP	Remarks
Normal	High	High	PIP ON, TV ON, Main Front End ON
Stand By	Low	Low	PIP OFF, TV OFF, Main Front End OFF
Semi Stdby	Low	High	PIP OFF, TV OFF, Main Front End ON

Power Supply

The power supplies used by PIP panel are from the main board 5V, 8V and 33V (for tuner only). The 5V is supplied to tuner 1900, VIF IC7914 and switching circuitry of IC7801 & IC7916. +3V3 is derived from 5V and regulated by TS7891 & D6890. +3V3 voltage is mainly used by PIP processor circuitry. The 8V is mainly supplied to the fast switching IC7919 TDA8601.

Abbreviation List

Abbreviation	Description
1fh	1 time the line frequency
2fh	2 times the line frequency
480p	480 lines resolution (progressive scan)
1080i	1080 lines resolution via interlacing
AARA	Automatic Aspect Ratio Adaptation: algorithm that adapts aspect ratio to remove horizontal black bars; keeping up the original aspect ratio
ADC	Analogue Digital Converter
AFC	Automatic Frequency Control: control signal used to tune to the correct frequency
AGC	Automatic Gain Control: algorithm that controls the video input of the feature box
AI	Artificial Intelligence
AM	Amplitude Modulation
ANR	Automatic Noise Reduction: one of the algorithms of Auto TV
AR	Aspect Ratio: 4 by 3 or 16 by 9
AUDIO-C	Audio Center
AUDIO-L	Audio Left

AUDIO-R	Audio Right
AUDIO-SL	Audio Surround Left
AUDIO-SW	Audio Subwoofer
Auto TV	Name for the combination of picture features/improvements, which work automatically (ANR/Auto sharpness/Auto Histo/ambient light).
AV	Audio Video
BC-PROT	Beam current protection
BLC-INFO	Black current information
Bocma-IC	IF/video/geometry IC in DW-module
BRIDGE-PROT	Protection triggered when bridge coil is malfunctioning
B-SC1-IN	Blue EXT1 in
B-SC2-IN	Blue EXT2 in
BTSC	Broadcast Television Systems Committee
B-TXT	Blue teletext
CC	Closed Captioning
CENTER	Center speaker
C-FRONT	Chrominance front input
CL	Constant Level: audio output to connect with an external amplifier
ComPair	Computer aided rePair

CRT	Cathode Ray Tube or picture tube
CSM	Customer Service Mode
CTI	Color Transient Improvement: manipulates steepness of chroma transients
CVBS	Composite Video Blanking and Synchronization
CVBS-SC1-IN	CVBS EXT1 in
CVBS-SC2 OUT	CVBS EXT2 out
CVBS-SC2-IN	CVBS EXT2 in
CVBS-SC3-IN	CVBS EXT3 in
CVBS-SC4-IN	CVBS EXT4 IN
CVBS-TER	CVBS terrestrial
CVBS-TXT-OUT	CVBS teletext out
CVBS-Y-FRONT	CVBS luminance front input
DAC-HOP	Digital analogue converter HOP IC
DC-filament	Filament supply voltage
DEFL-PROT	Protection triggered when there something wrong in hot-side (= STANDBY)
DFU	Direction For Use: description for the end user
DRAM	Dynamic Random Access Memory
DNR	Digital Noise Reduction: noise reduction feature of the box

DSP	Digital Signal Processing
DVD	Digital Versatile Disc
DW	Double Window
DYN-FASE-COR	Dynamic phase correction
EHT	Extra High Tension
EHT-INFO	Extra High Tension information
EW	East West, related to horizontal deflection of the set
EXT	External (source), entering the set via EXT or via cinches
FBL	Fast Blanking: DC signal accompanying RGB signals
FBL-SC1-IN	Fast blanking signal for EXT1 in
FBL-SC2-IN	Fast blanking signal for EXT2 in
FBL-TXT	Fast Blanking Teletext
FBX	Feature Box: part of small signal /separate module which contains 100 Hz processing, extra featuring and AutoTV algorithms
FILAMENT	Filament of CRT
FM	Field Memory or Frequency Modulation
FRONT-C	Front input Chrominance (SVHS)
FRONT-DETECT	Front input detection
FRONT-Y_CVBS	Front input luminance or CVBS (SVHS)

G-SC1-IN	Green EXT1 in
G-SC2-IN	Green EXT2 in
H-770-2	Horizontal 2 level sync pulse (HD-sources)
H-770-3	Horizontal 3 level sync pulse (HD-sources)
HA	Horizontal Acquisition: horizontal sync pulse coming out of the HIP
HD100	Horizontal Drive: horizontal sync pulse coming out of the featurebox
HD-input	High Definition (2fh) input of AV4
HDTV	High Definition TV: highest resolution defined by the ATSC standard (1080 lines and 1920 horizontal pixels, referred to as 1080i)
HEATER	Heater (Filament)
HFB	Horizontal Flyback Pulse: horizontal sync pulse from large signal deflection
HFB_XRAY-PROT	HFB combined with X-ray protection information
HIP	High-end video Input Processor: video and chroma decoder of N8
HOP	High-end video Output Processor: video, sync and geometry controller of N8
HP	Headphone
IF	Intermediate frequency

IN-FRONT-SNDL	Sound left front in
IN-FRONT-SNDR	Sound right front in
IN-SC1-B	In EXT1 Blue
IN-SC1-G	In EXT1 Green
IN-SC1-R	In EXT1 Red
IN-SC1-SNDL	In EXT1 sound left
IN-SC1-SNDR	In EXT1 sound right
IN-SC2-B	In EXT2 Blue
IN-SC2-CVBS_Y	In EXT2 CVBS or luminance (SVHS)
IN-SC2-FBL	In EXT2 fast blanking
IN-SC2-G	In EXT2 Green
IO-BUS	In/Out - Bus
Last Status	The settings last chosen by the customer and read and stored in RAM or in the NVM. They are called at start-up of the set to configure it according the customers wishes
LED	Light Emitting Diode
LINE-DRIVE	Line drive signal
LNA	Low Noise Adapter
LSP	Large signal panel
MSP	Multi standard Sound Processor: ITT sound decoder of N8

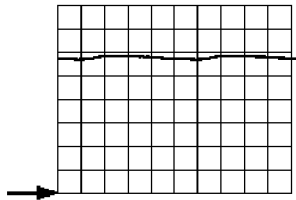
MUTE	Mute-Line
NC	Not Connected
NDF	No vertical Deflection: vertical fly back protection
NHF	No Horizontal deflection: horizontal fly back protection
NVM	Non Volatile Memory: IC containing TV related data e.g. alignments
O/C	Open Circuit
ON/OFF LED	On/Off control signal for the power-LED
OSD	On Screen Display
OTP	One Time Programmable IC (in this case the Painter)
Painter	Set micro controller, dealing with OSD, control, CC and V-chip
P50	Project 50 communication: protocol between TV and peripherals (not used in USA)
PCB	Printed Circuit board
PICNIC	Peripheral Integrated Combined Network IC: main IC for 100 Hz featuring and feature processing
PILOT	Pilot Signal
PLL	Phase locked Loop
POR_FLASH	Signal that informs micro controller (painter) that set will switch off
Progressive Scan	Scan mode where all scan lines are displayed in one

frame at the same time, creating a double vertical resolution.

PTC	Positive Temperature Coefficient Resistor (degaussing)
PTP	Picture Tube Panel
RAM	Random Access Memory
RC	Remote Control
RC5	RC5 signal from the remote control receiver
RESET	Reset signal
RGB	Red, green, blue signal
ROM	Read Only Memory
SAM	Service Alignment Mode
SC	Sandcastle: pulse derived from sync signals
SCAVEM	Scan Velocity Modulation
S/C	Short Circuit
SC1-OUT	EXT output of the MSP audio IC
SC2-B-IN	Scart2 Blue in
SC2-C-IN	Scart2 Chrominance in
SC2-OUT	EXT output of the MSP audio IC
SIF	Sound Intermediate Frequency
SIMM	80-fold connector between LSP and SSB

SLDP	Smart Local Dooming Prevention (HW and SW)
SMC	Surface Mounted Components
SNDL-SC1-IN	Sound left EXT1 in
SNDL-SC1-OUT	Sound left EXT1 out
SNDL-SC2-IN	Sound left EXT2 in
SNDL-SC2-OUT	Sound left EXT2 out
SNDR-SC1-IN	Sound right EXT1 in
SNDR-SC1-OUT	Sound right EXT1 out
SNDR-SC2-IN	Sound right EXT2 out
SNDR-SC2-OUT	Sound right EXT2 out
SNDS-VL-OUT	Surround sound left variable level out
SNDS-VR-OUT	Surround sound right variable level out
SNERT	Synchronous No parity Eight bit Reception / Transmit
SOUND-ENABLE	Signal from micro controller controlling sound-level (anti-plop)
SSB	Small Signal Board
SRAM	Static Random Access Memory
STANDBY (POR)	Signal coming from Main Supply informing the supply is switching off
SW	Subwoofer
U-100	U from Feature Box

YPbPr	YUV-input with other naming
YUV	YUV-input
C	Micro controller
V-100	V from Feature Box
V-770	Vertical synchronization (HD-sources)
VA	Vertical Acquisition
Vbat	Main supply for deflection (mostly 141 V)
Vchip	Violence chip (used in DW-module)
VD100	Vertical Drive: vertical sync pulse from deflection
VFB	Vertical Fly back Pulse: vertical sync pulse coming from the feature box
VSYNC	Pulse derived of 530 s-circuit behind the HOP, to vertically synchronize the Painter
VL	Variable Level out: processed audio output towards external amplifier
WYSIWYR	What You See Is What You Record: record selection that follows main picture and sound
XTAL	Quartz crystal
Y-100	Y from Feature Box
Y-OUT	Luminance-signal to HOP IC
Y-scavem	Y-scavem signal needed for sharpening vertical lines via scan velocity modulation



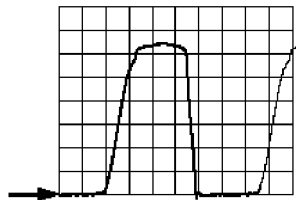
50V / div DC
2ms / div

P01



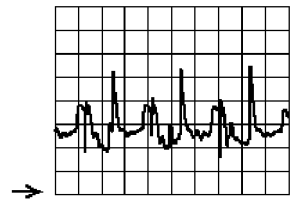
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P02



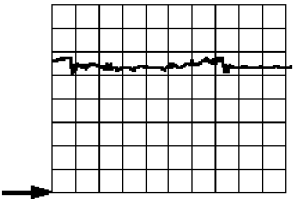
50V / div DC
2us / div

P03



200mV/div DC
5us/div

P04

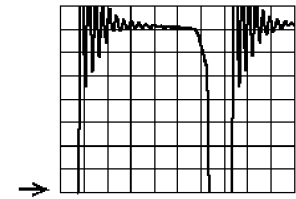


2V / div DC
2us / div

P05

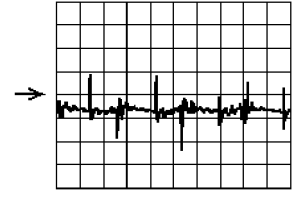
P6 VBATT=140Vdc
P7 Sound Supply =33Vdc

P06, P07



50V/div DC
2us/div

P13

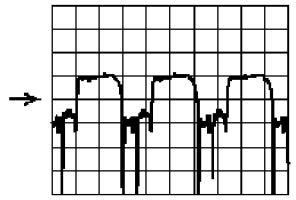


200mV/div DC
5us/div

P15

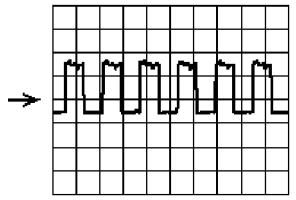
P16 = 5.2V DC

P16



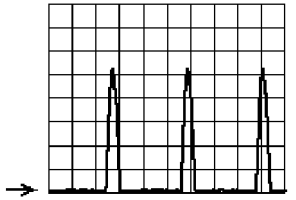
1V/div DC
10us/div

L02



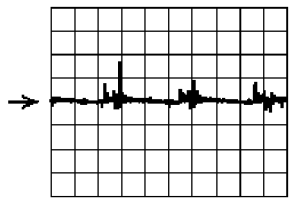
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L03



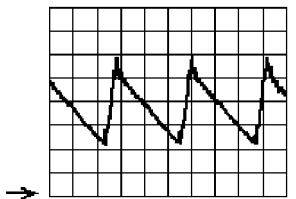
50V/div DC
10us/div

L04



1V/div DC
10us/div

L05

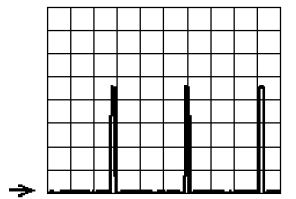


1V/div DC
10us/div

L06

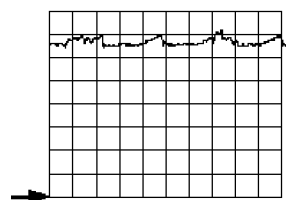
L07
+11D=11.6Vdc

L07



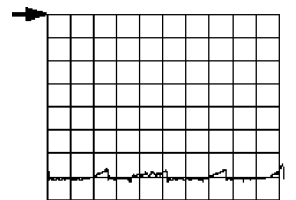
1V/div DC
20us/div

L08



2V / div AC
5us / div

L09+13V_Lot

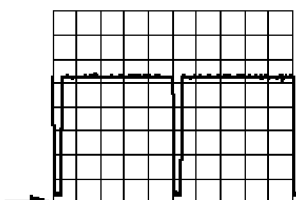


2V / div AC
5us / div

L10 - 15V_Lot

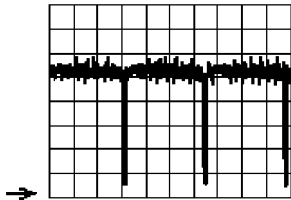
L11 = 180V DC

L11



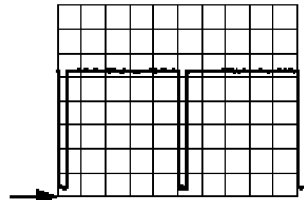
0.2V / div AC
2ms / div

F01



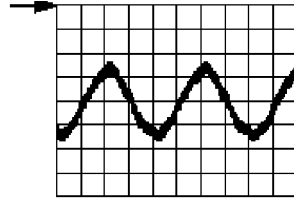
500mV/div DC
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F02



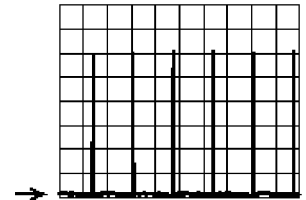
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F03



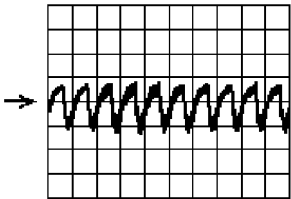
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F04



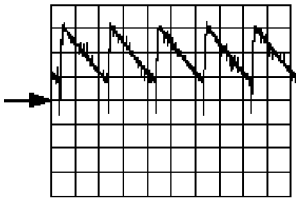
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F05



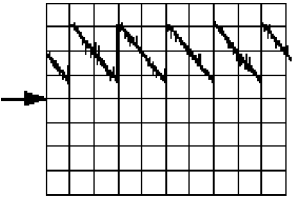
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F06



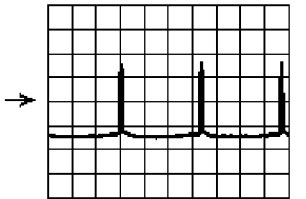
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10ms / div

F07



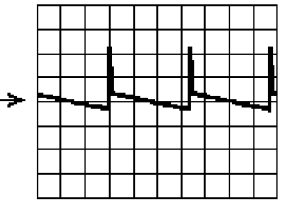
0.2V / div DC
10ms / div

F08IN+



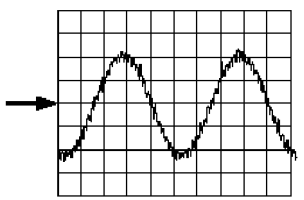
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5ms/div

F09



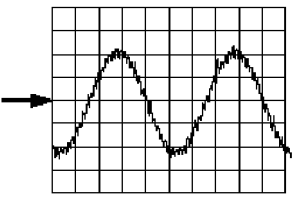
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5ms/div

F10



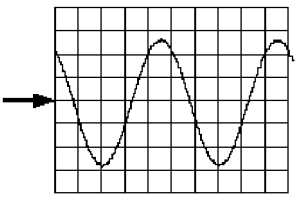
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0.2ms / div

A01



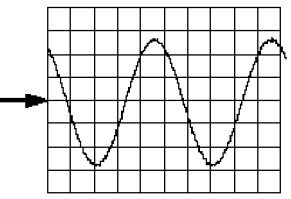
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0.2ms / div

A02



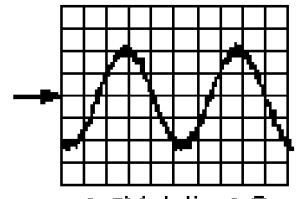
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A03



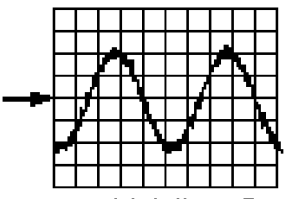
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0.2ms / div

A04



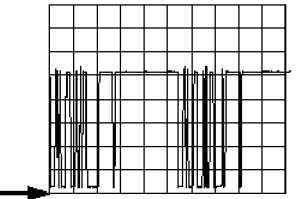
0.2V / div AC
0.2ms / div

A14



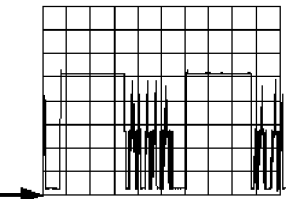
0.2V / div AC
0.2ms / div

A15



1V / div DC
0.2ms / div

I2 SCL

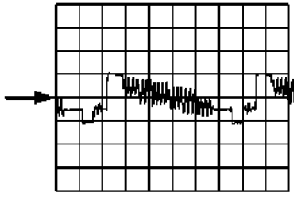


1V / div DC
0.2ms / div

I3 SDA

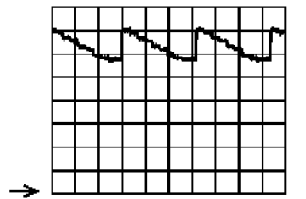
P17 = 8V DC

P17



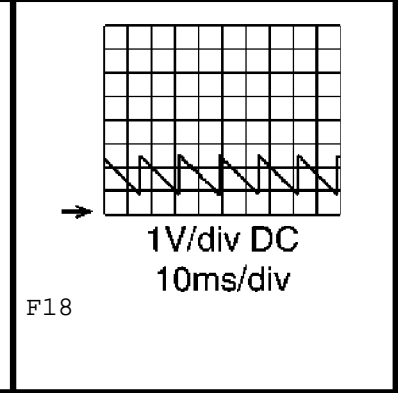
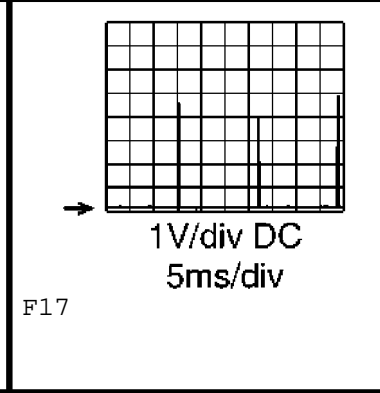
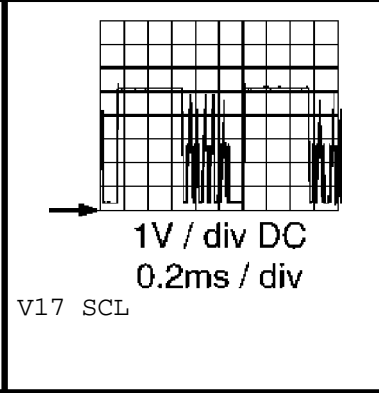
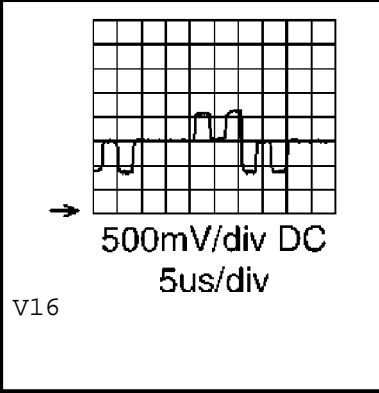
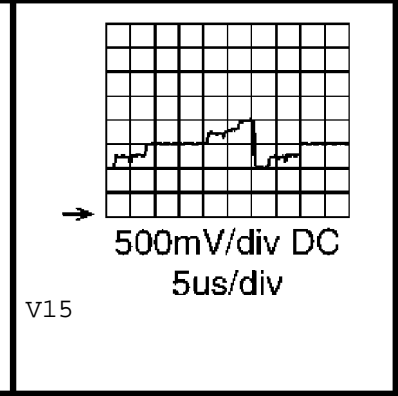
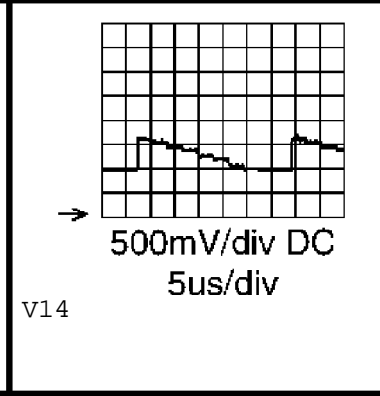
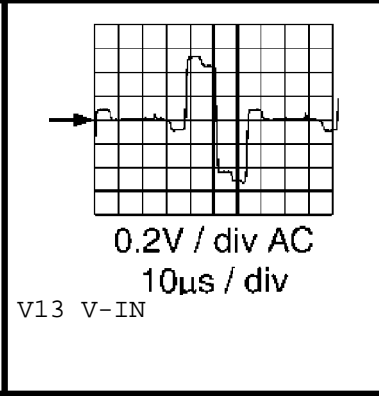
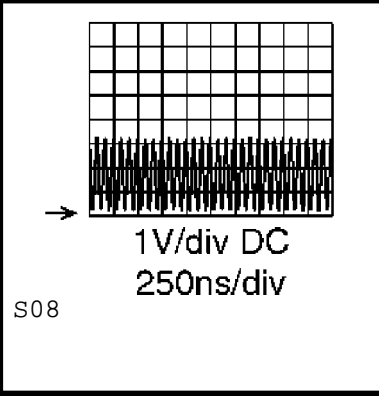
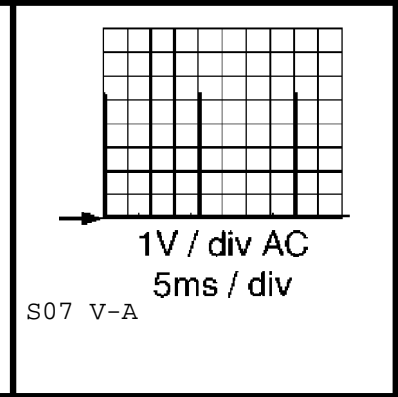
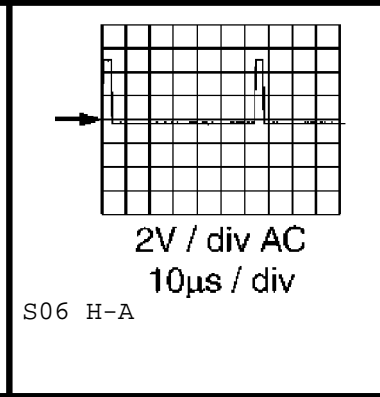
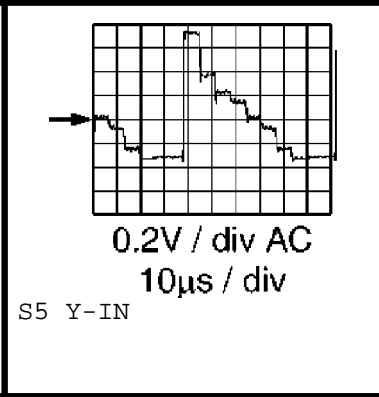
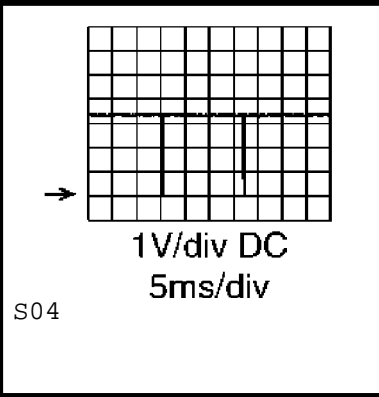
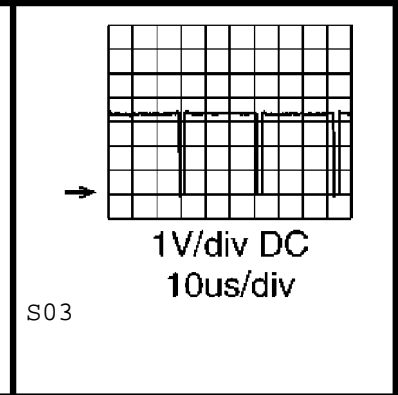
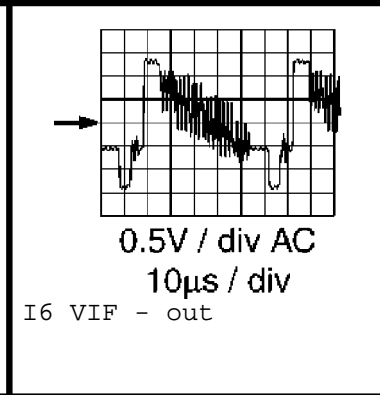
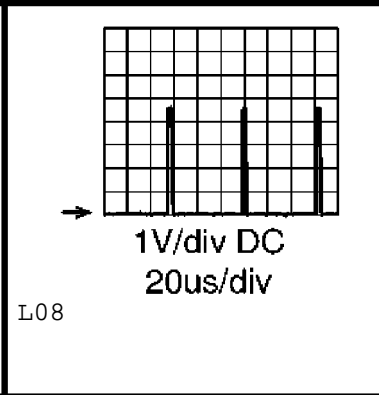
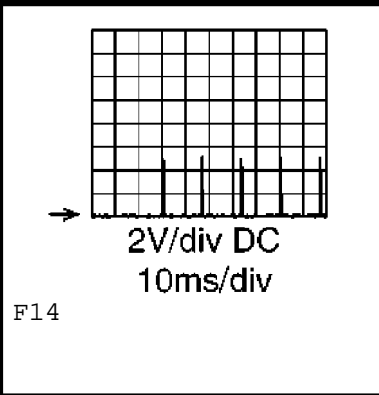
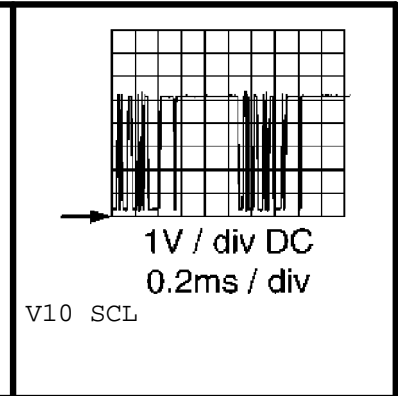
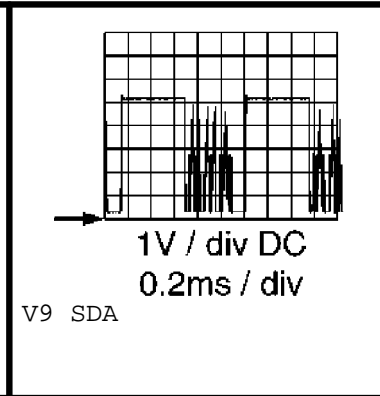
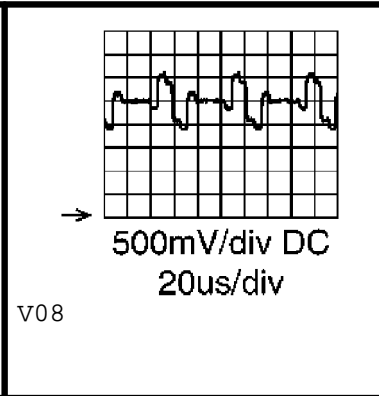
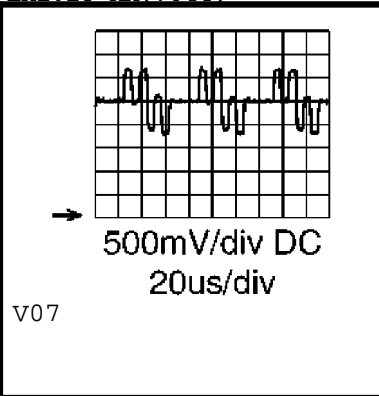
0.5V / div AC
10µs / div

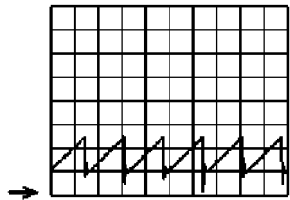
V2 CVBS_INT



500mV/div DC
20µs/div

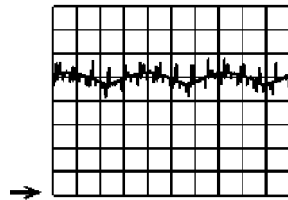
V06





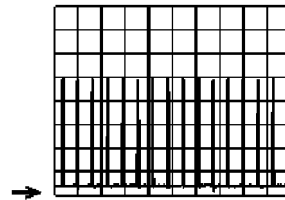
1V/div DC
10ms/div

F19



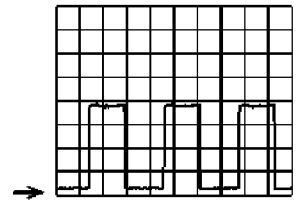
1V/div DC
5ms/div

F20



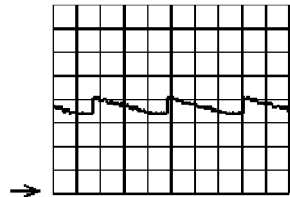
1V/div DC
50us/div

L12



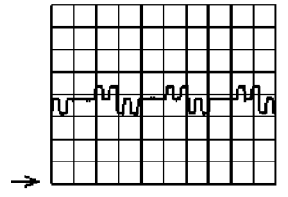
1V/div DC
10us/div

L13



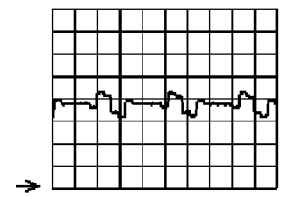
1V/div DC
10us/div

V19



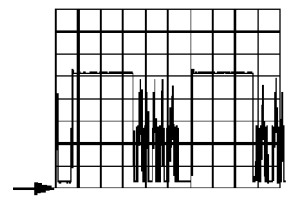
1V/div DC
10us/div

V20



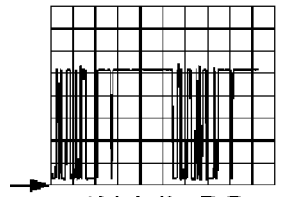
1V/div DC
10us/div

V21



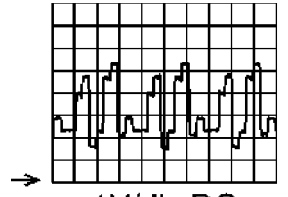
1V / div DC
0.2ms / div

V22 SCL



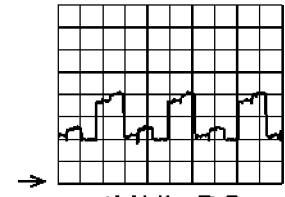
1V / div DC
0.2ms / div

V23 SDA



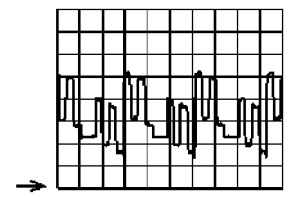
1V/div DC
10us/div

V28



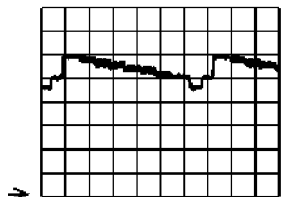
1V/div DC
10us/div

V29



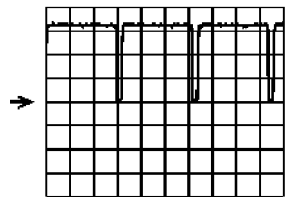
1V/div DC
10us/div

V30



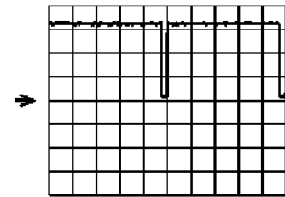
500mV/div DC
10us/div

C3



1V / div DC
20us / div

C4 HSYNC



1V / div DC
10ms / div

C5 VSYNC



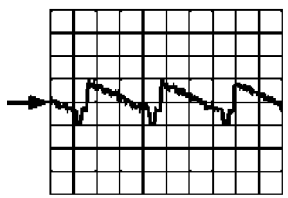
200mV/div DC
10us/div

C6



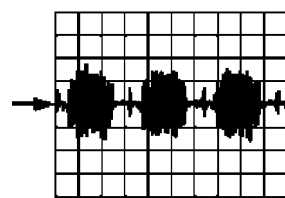
200mV/div DC
250ns/div

C11



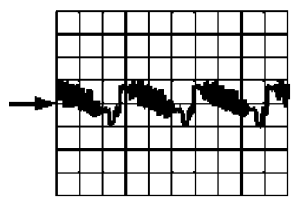
500mV / div AC
20us / div

C01



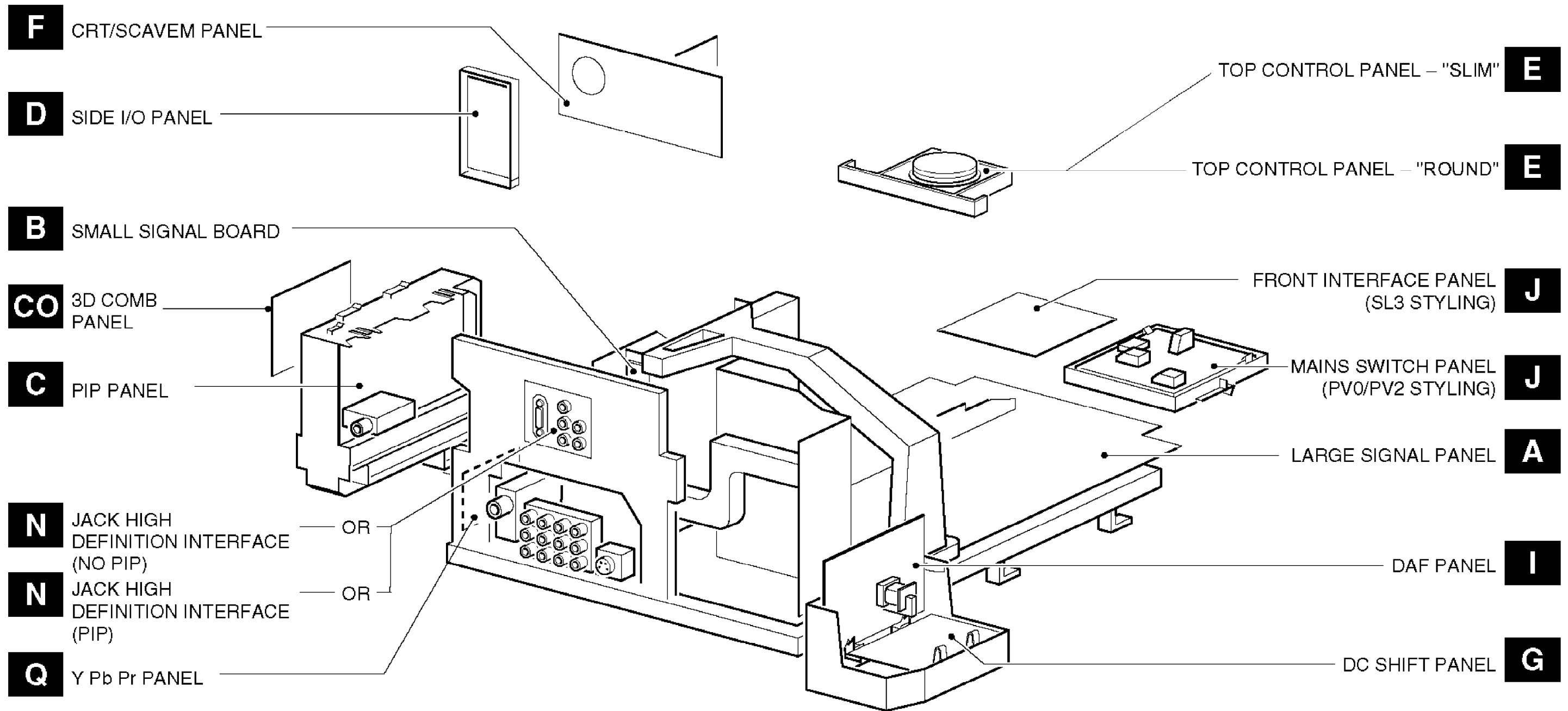
200mV / div AC
20us / div

C02



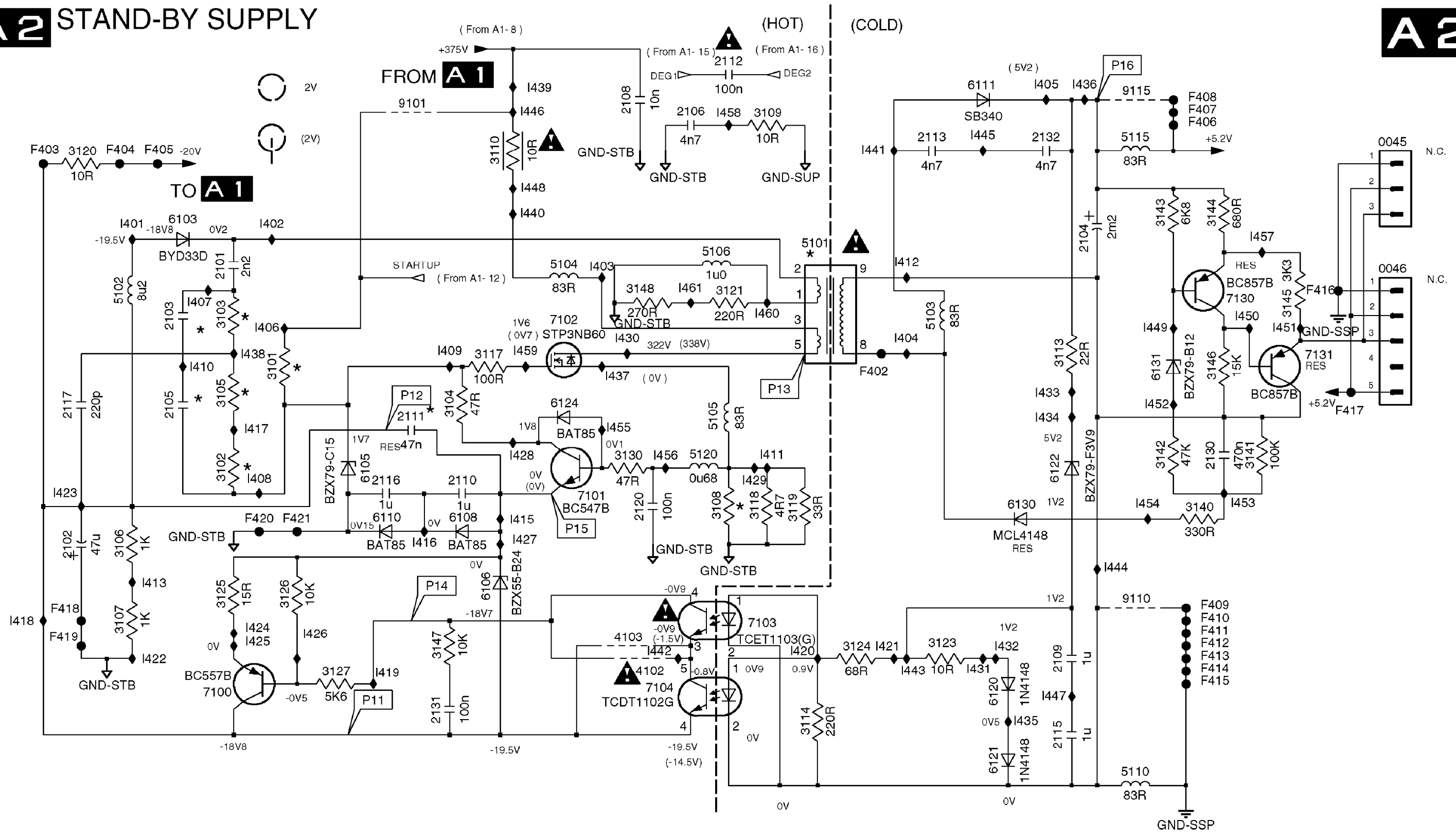
500mV / div AC
20us / div

C03



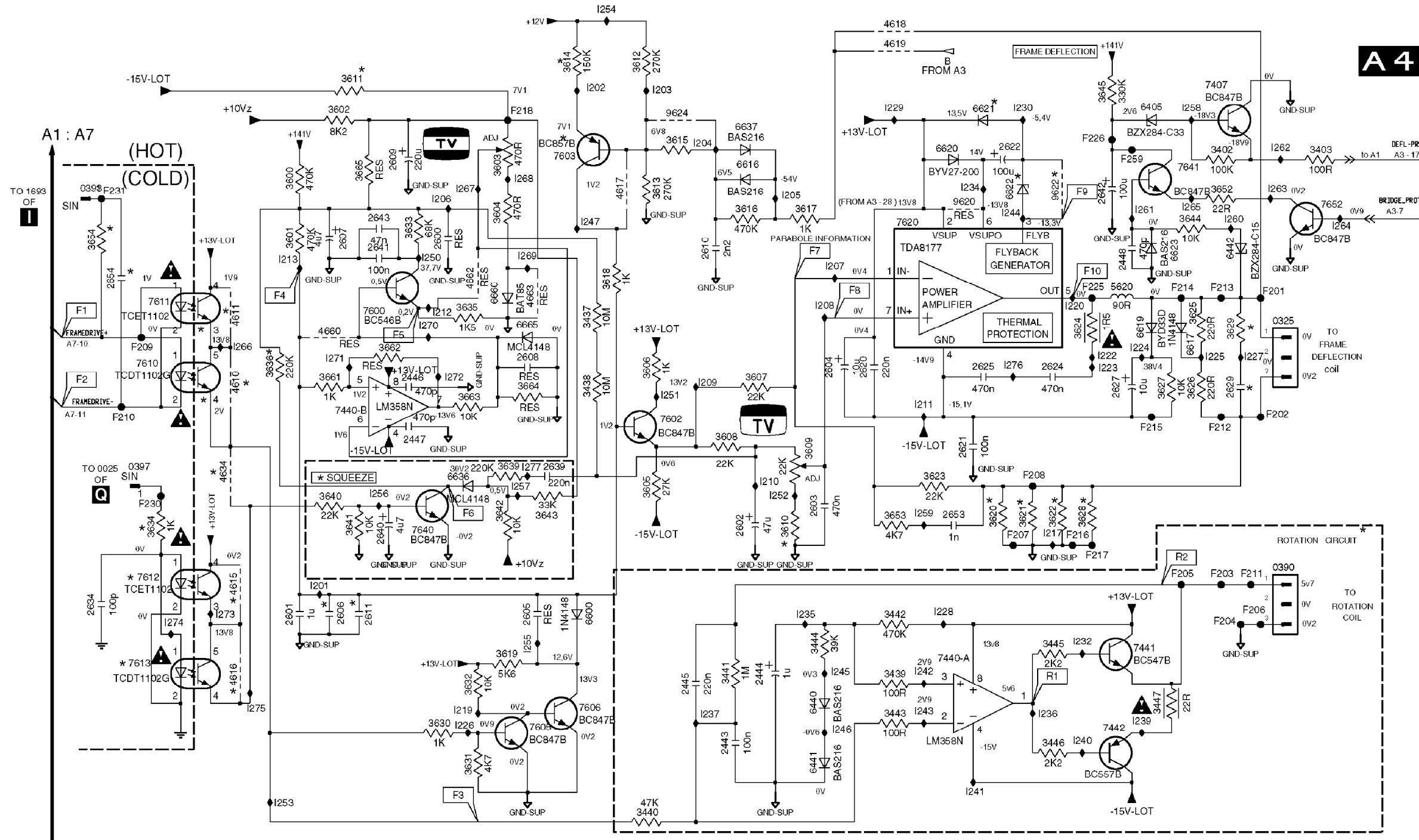
A2 STAND-BY SUPPLY

A2



A4 FRAME DEFLECTION ROTATION

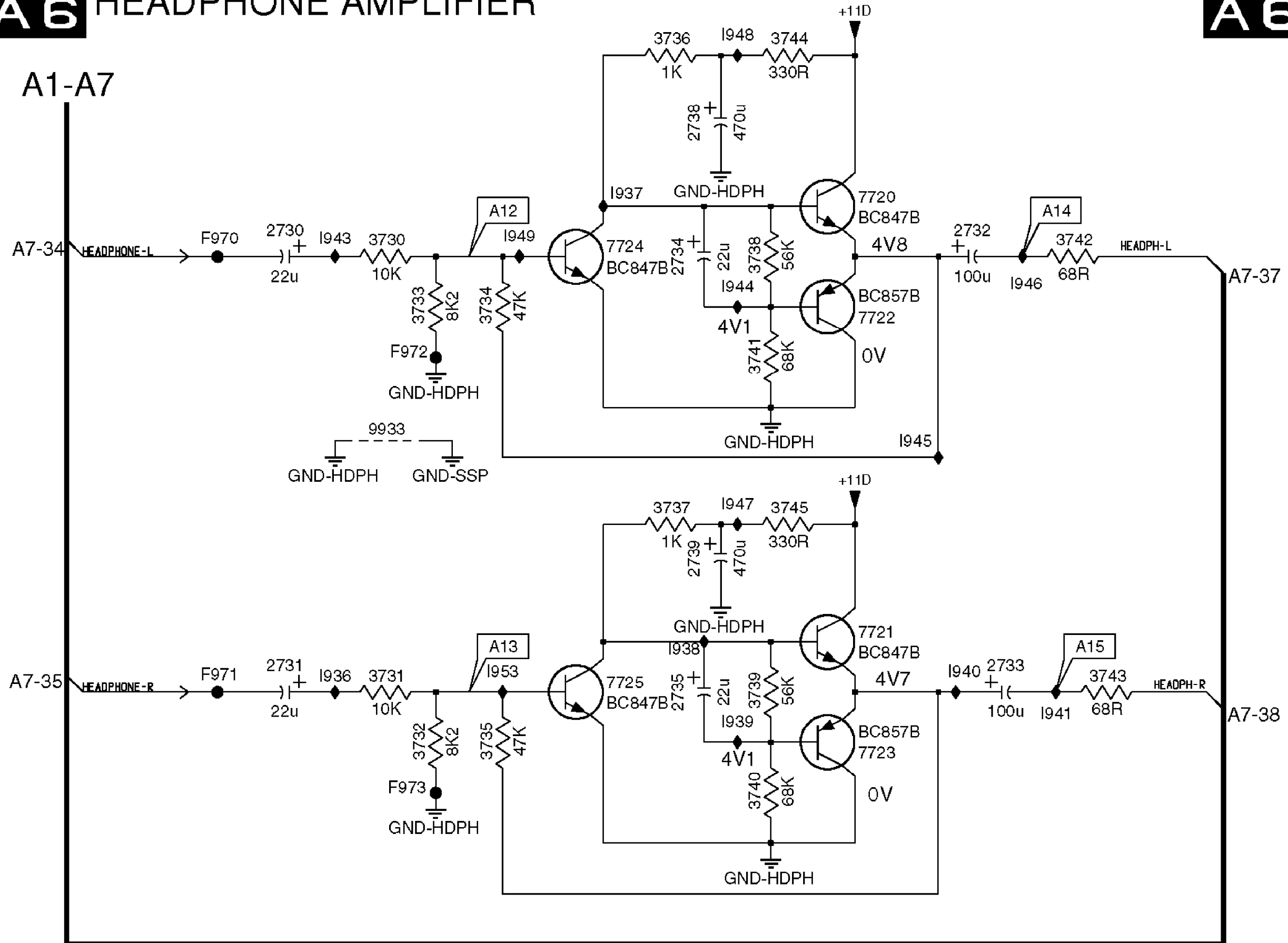
A4



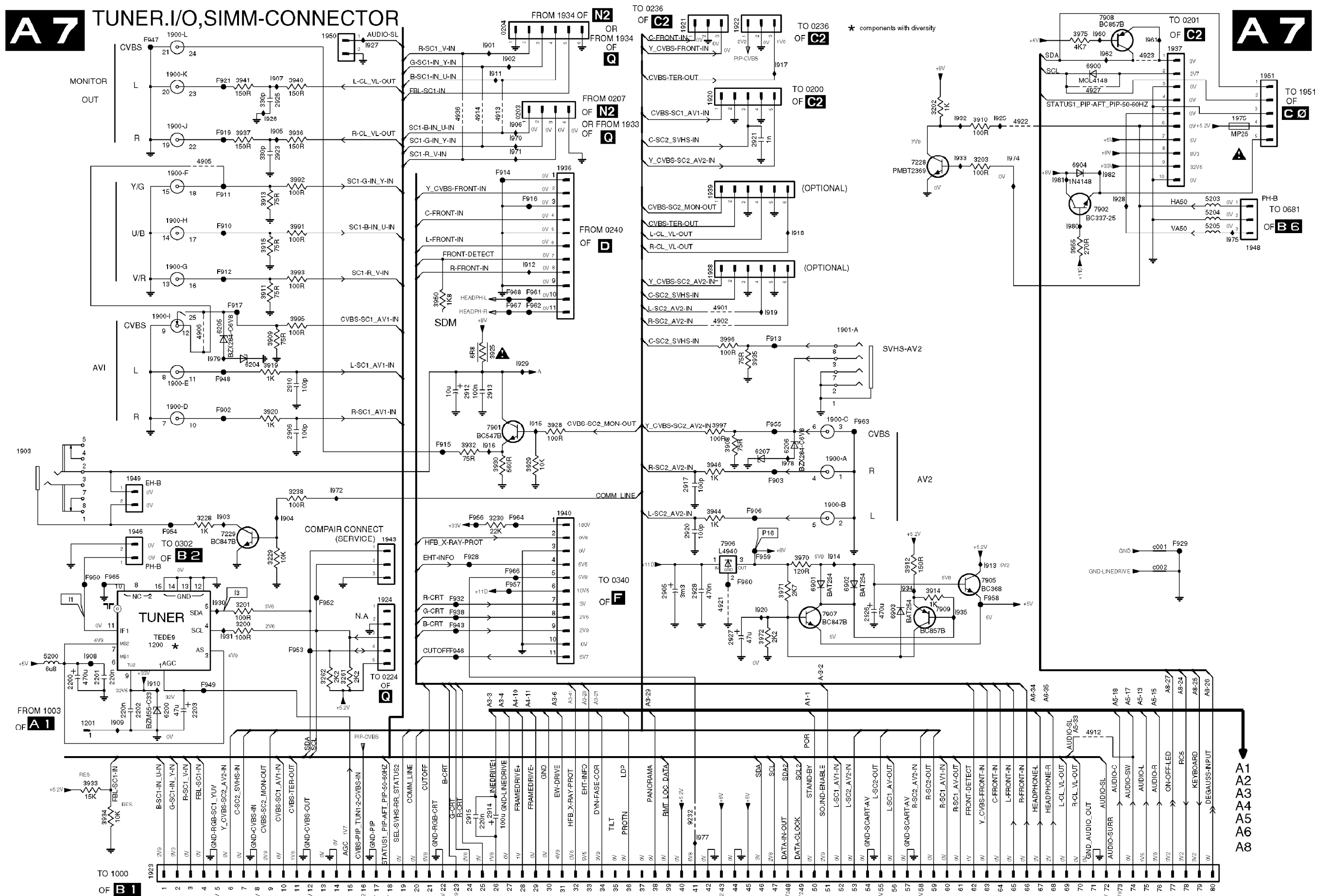
A4

A6 HEADPHONE AMPLIFIER

A6

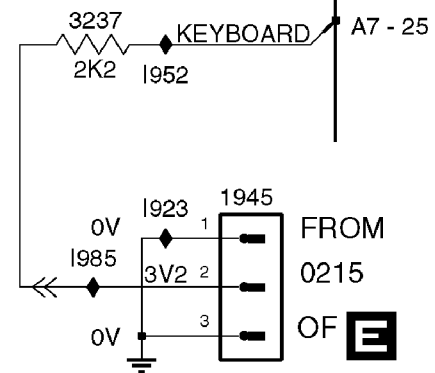
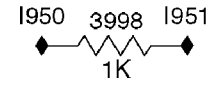
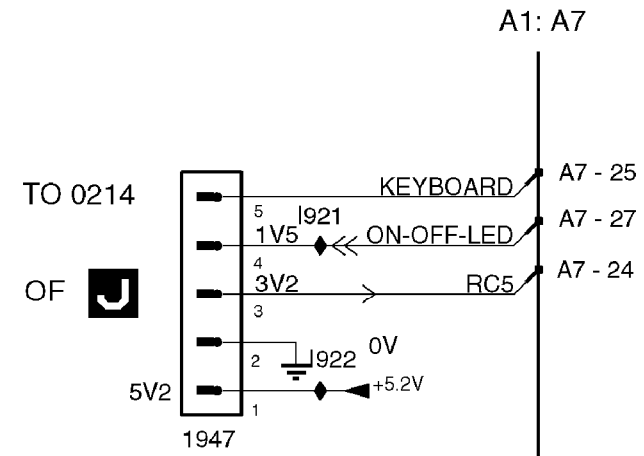


A7 TUNER, I/O, SIMM-CONNECTOR



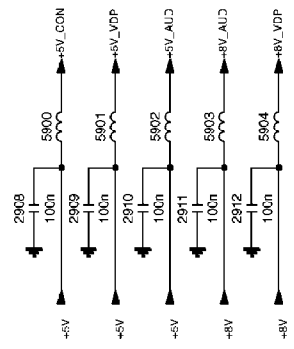
A1
A2
A3
A4
A5
A6
A7
A8

A8 FRONT

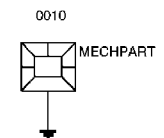
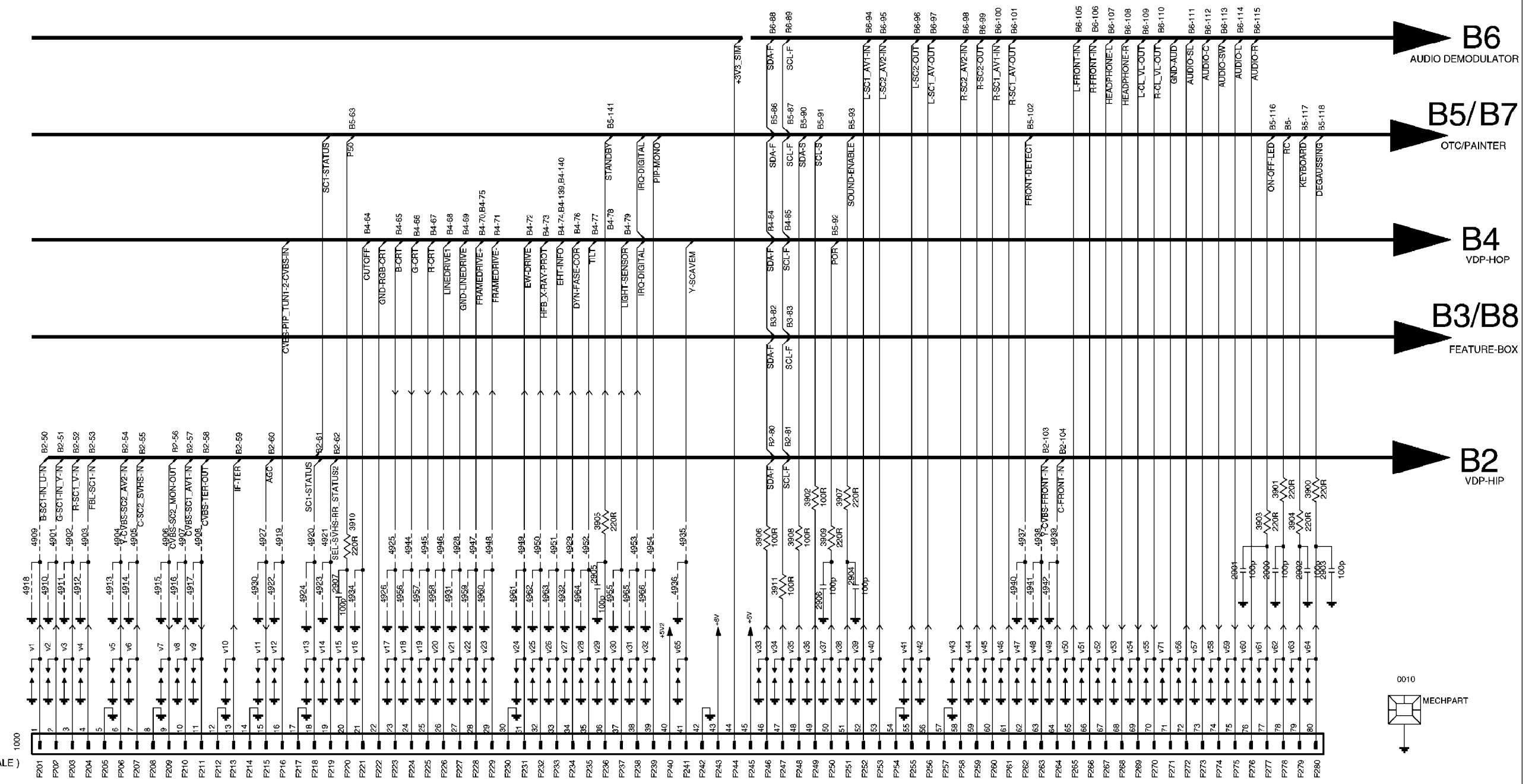


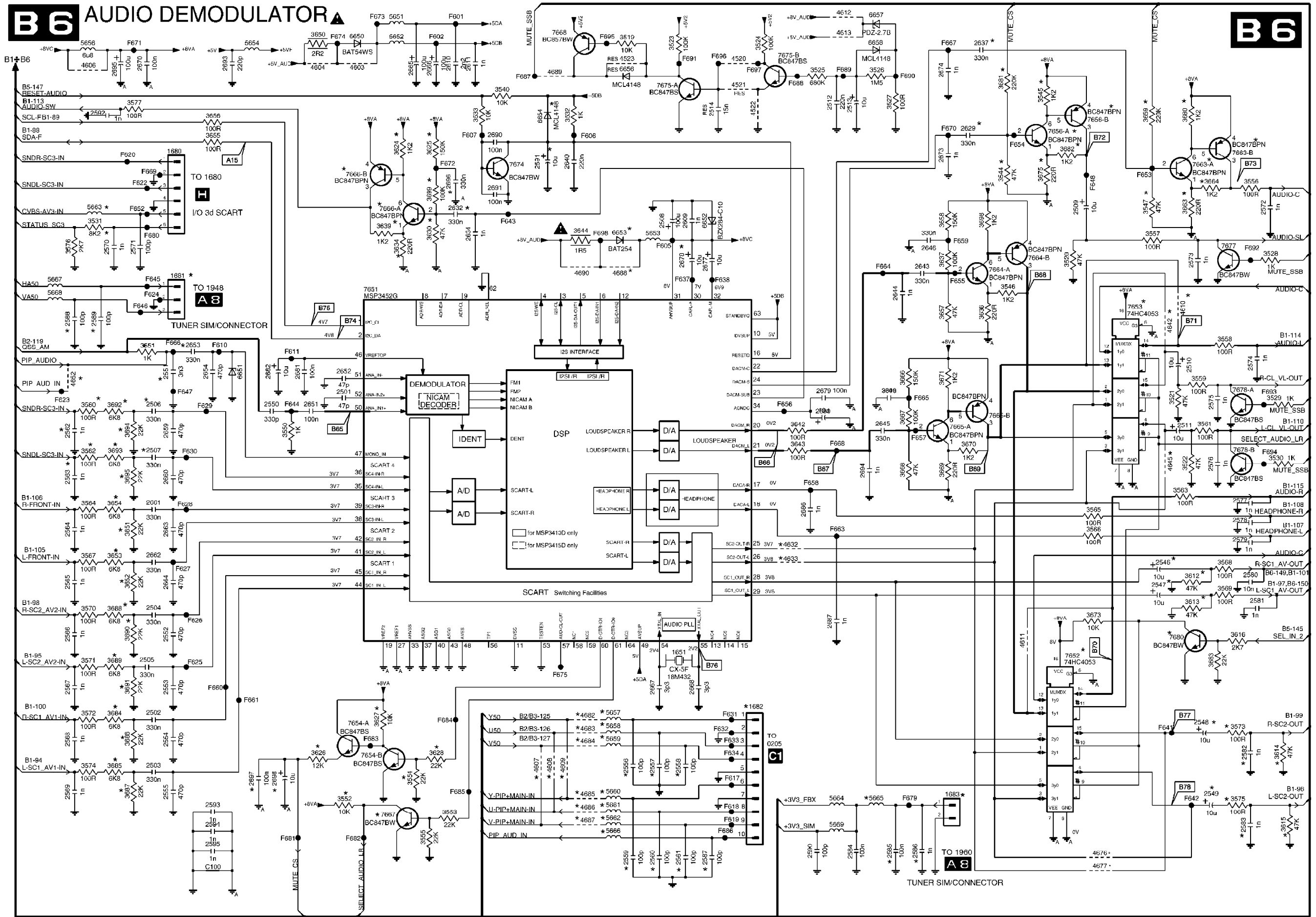
B1 SIM CONNECTOR (MALE)

B1



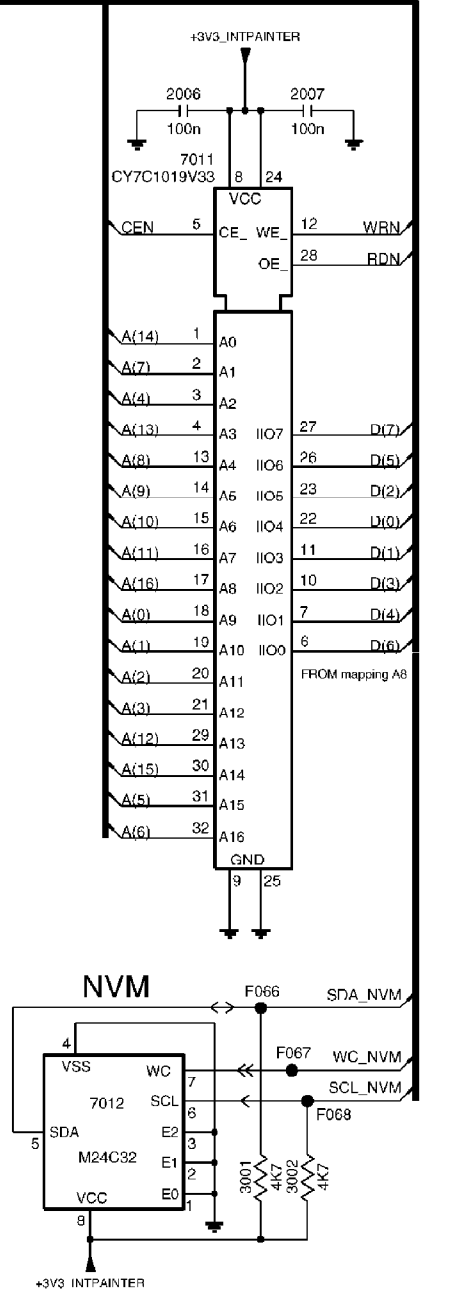
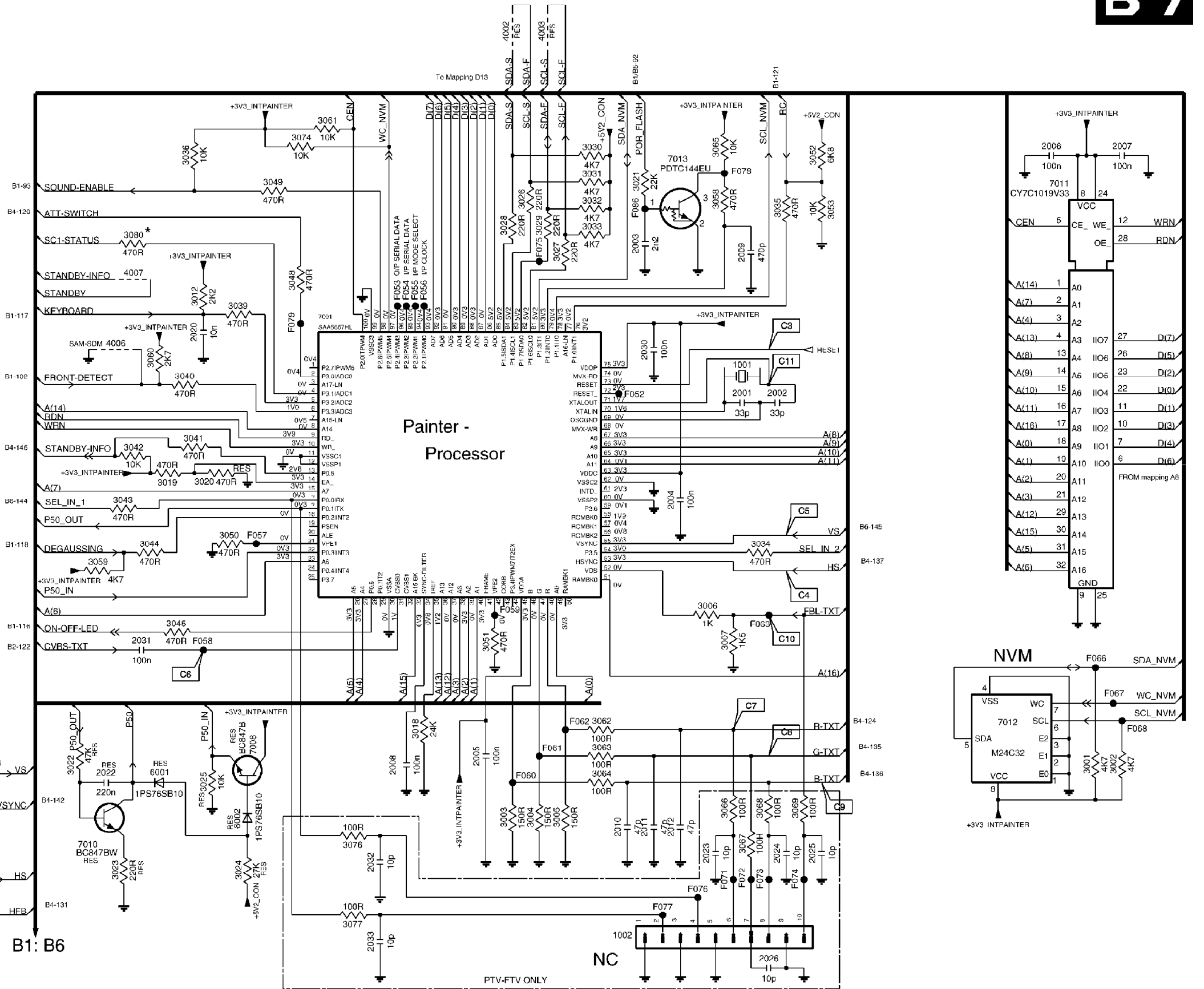
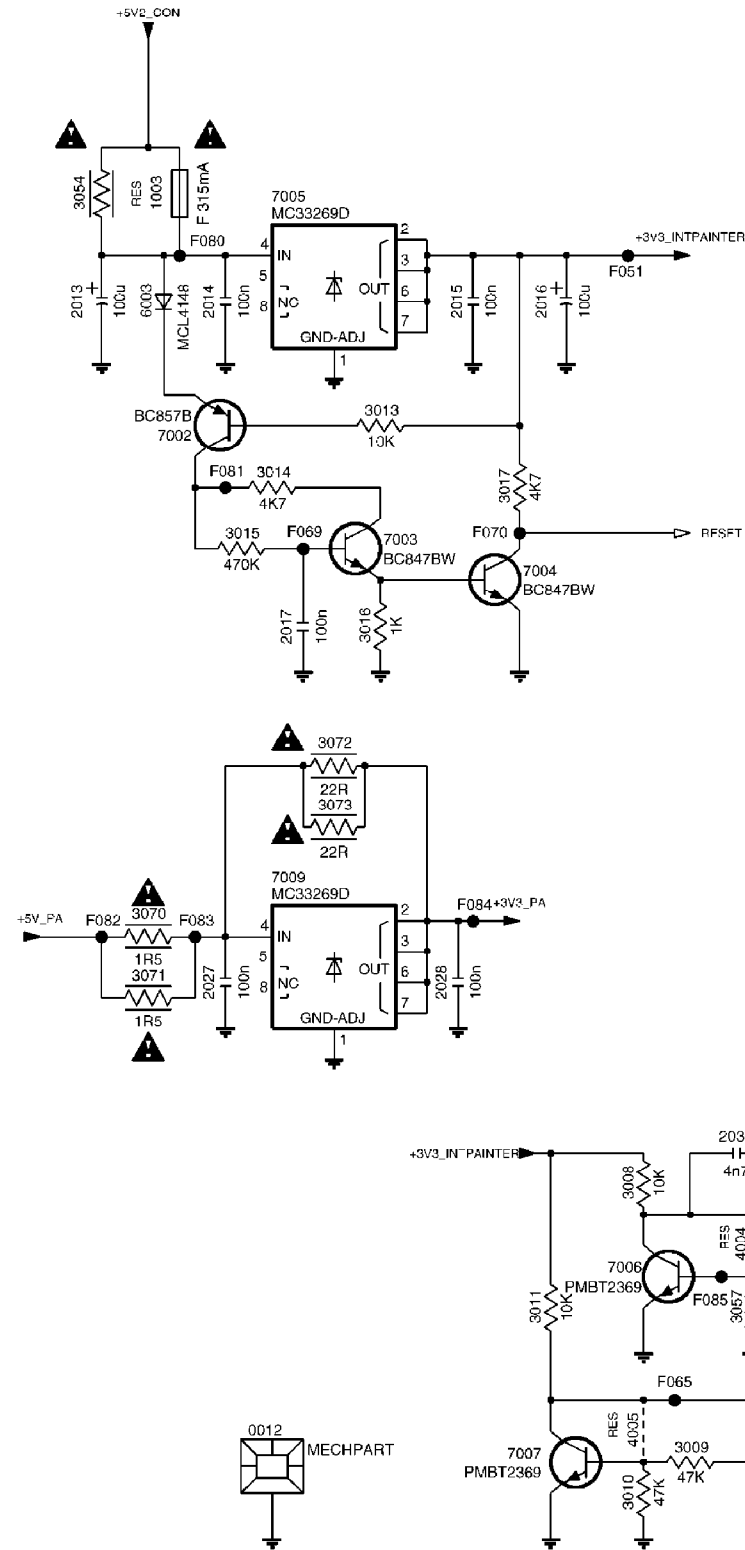
TO 1205
A6
(SIM CON. FEMALE)



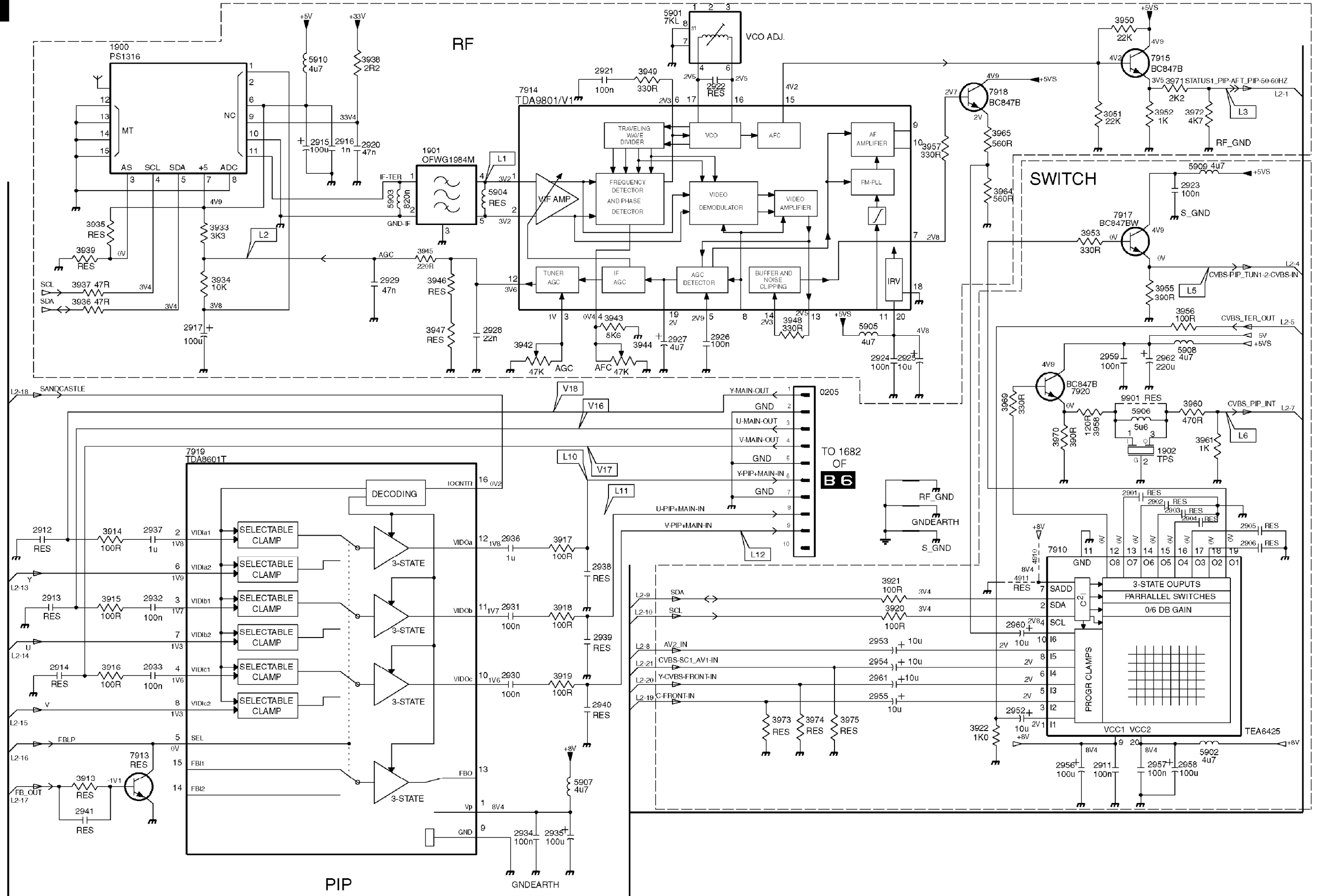


B7 PAINTER

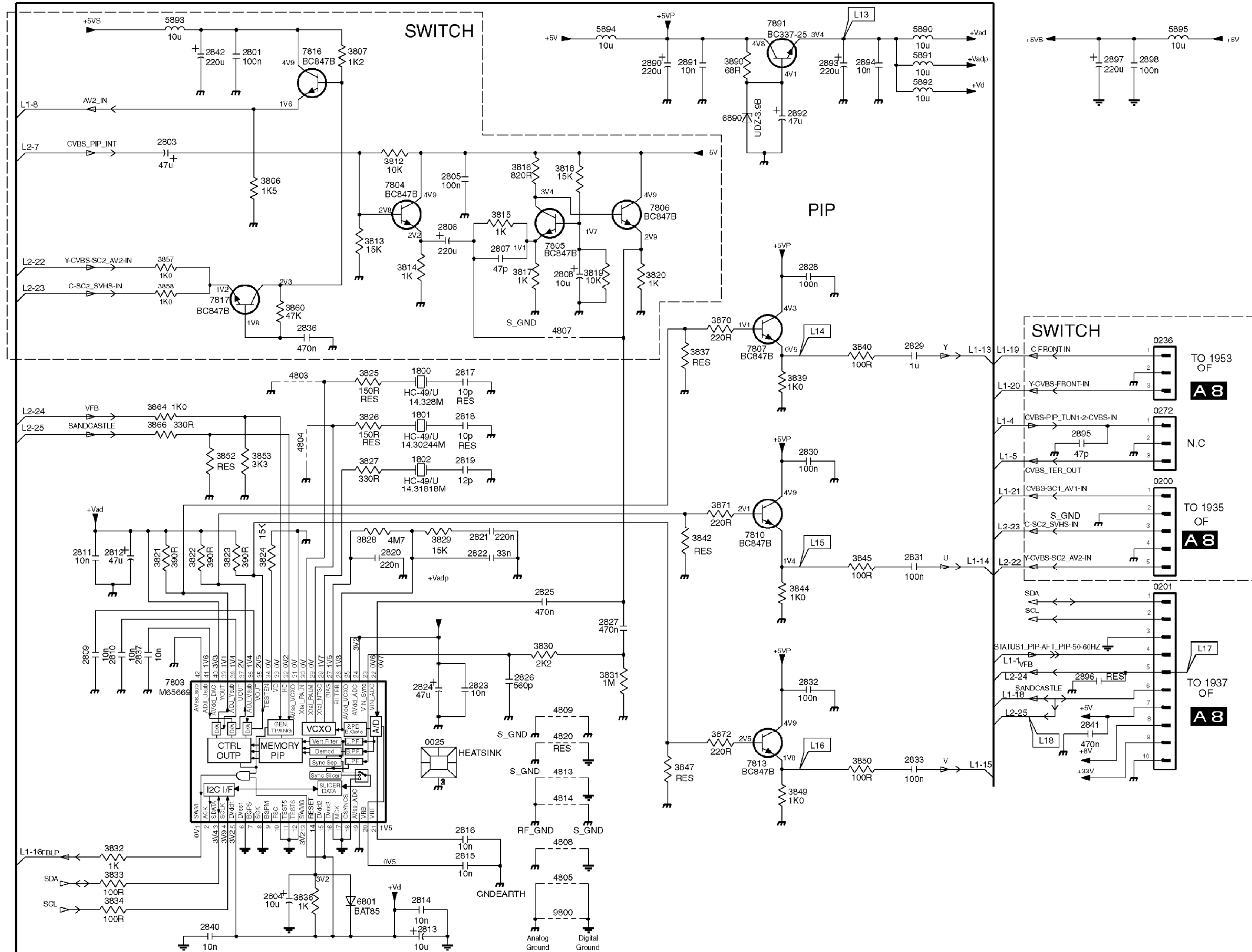
B7



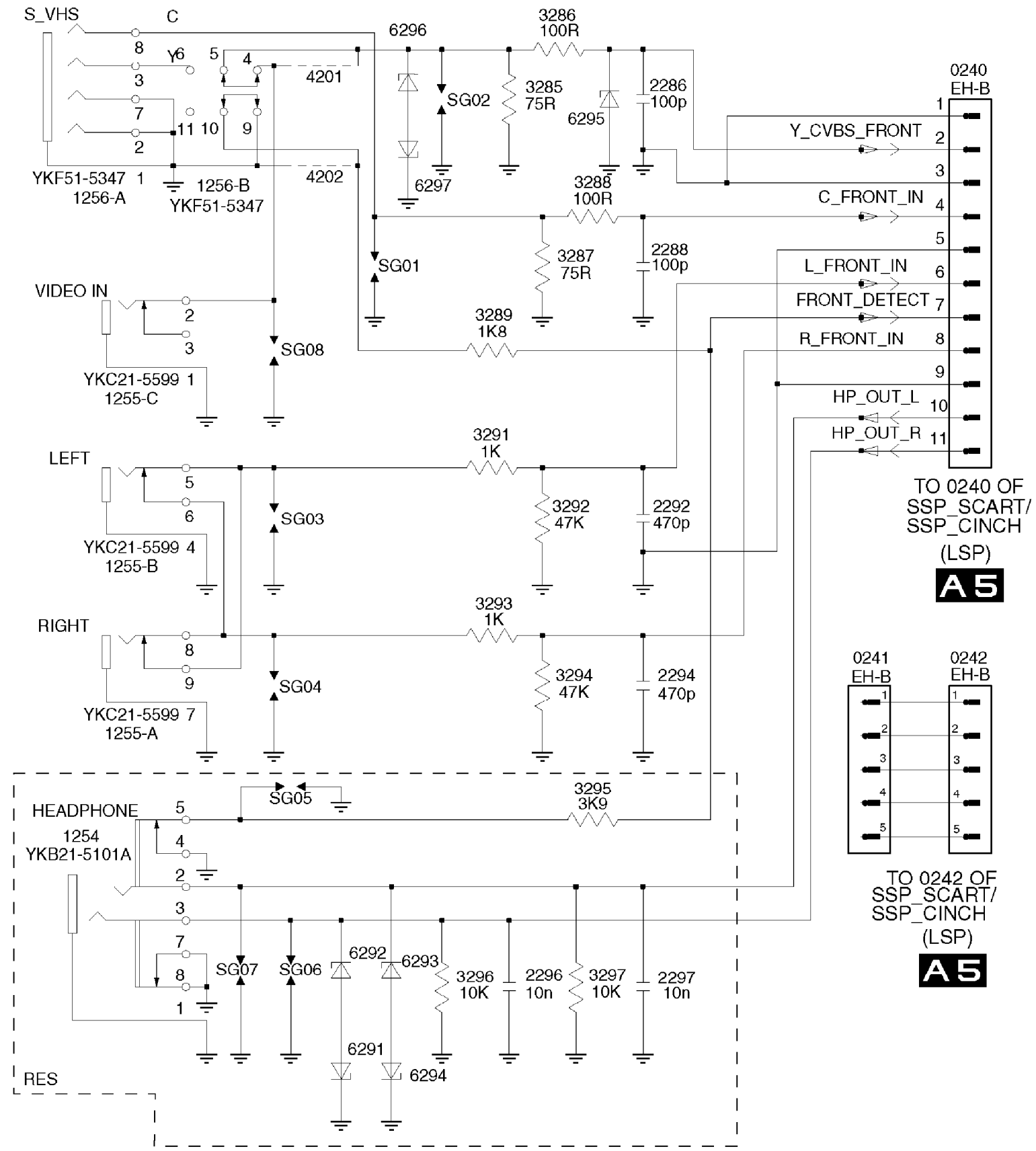
C1 PIP 2ND FRONT END



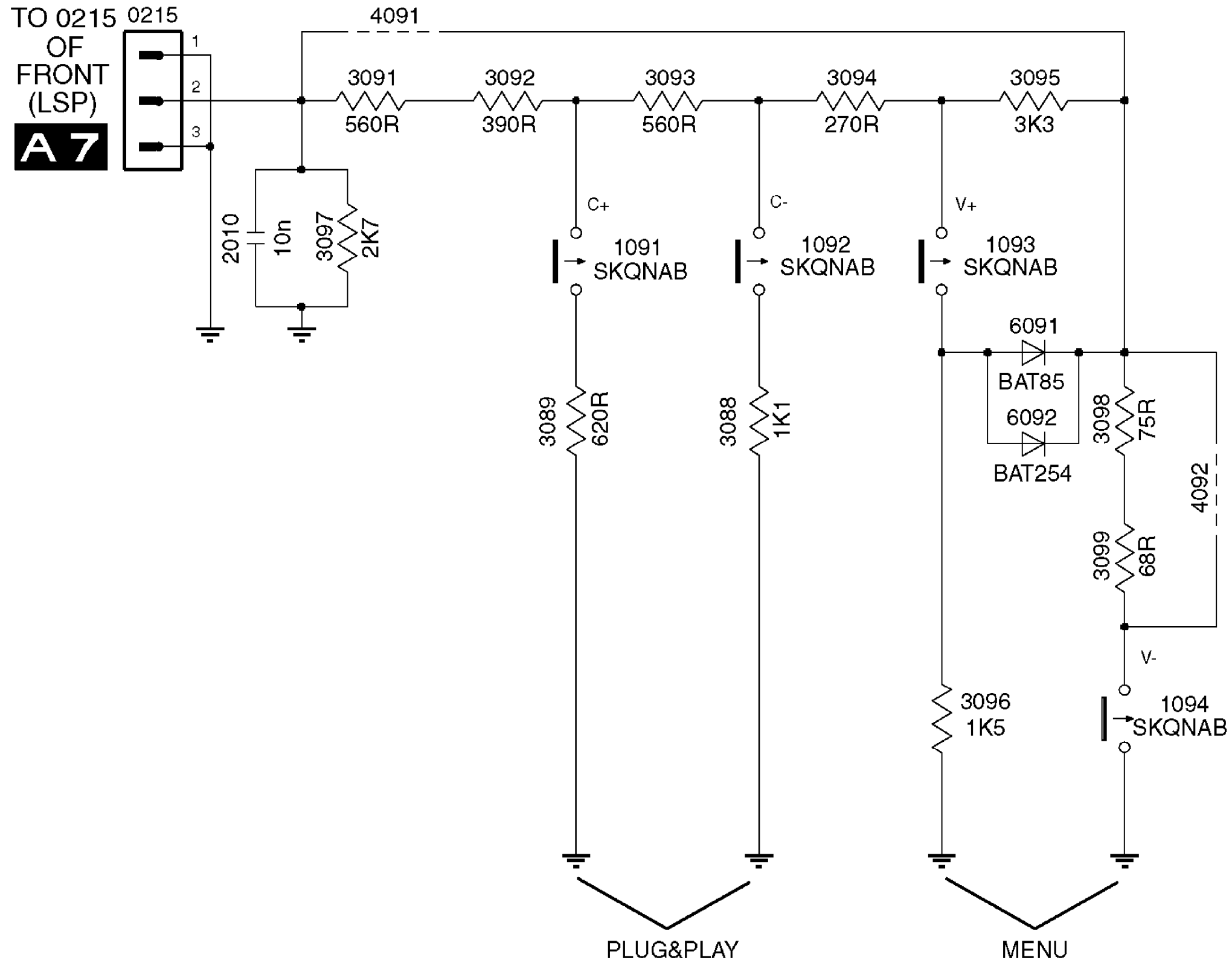
C2 PIP COLOUR



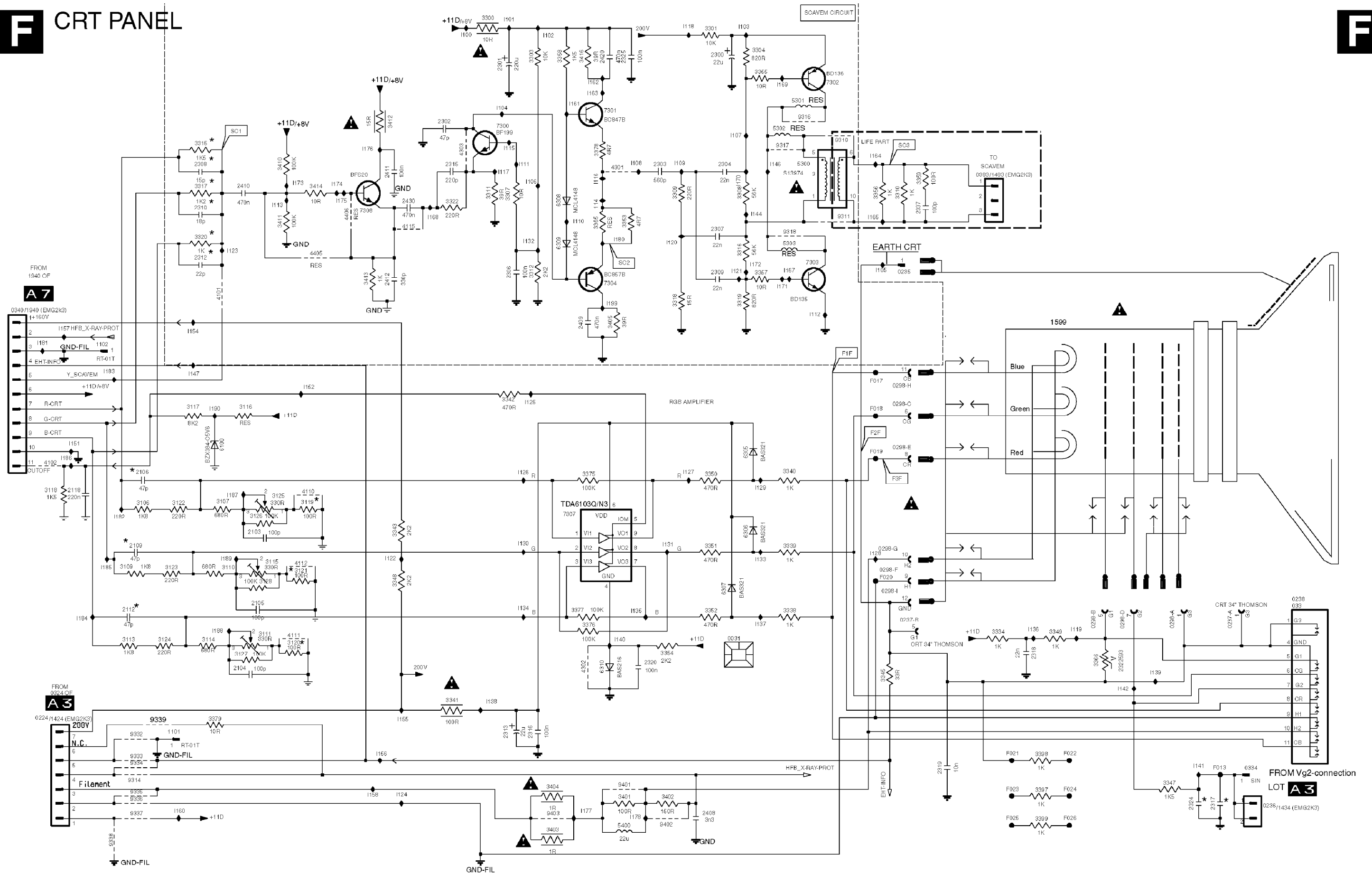
SIDE IO PANEL



TOP CONTROL PANEL (PV0)



F CRT PANEL

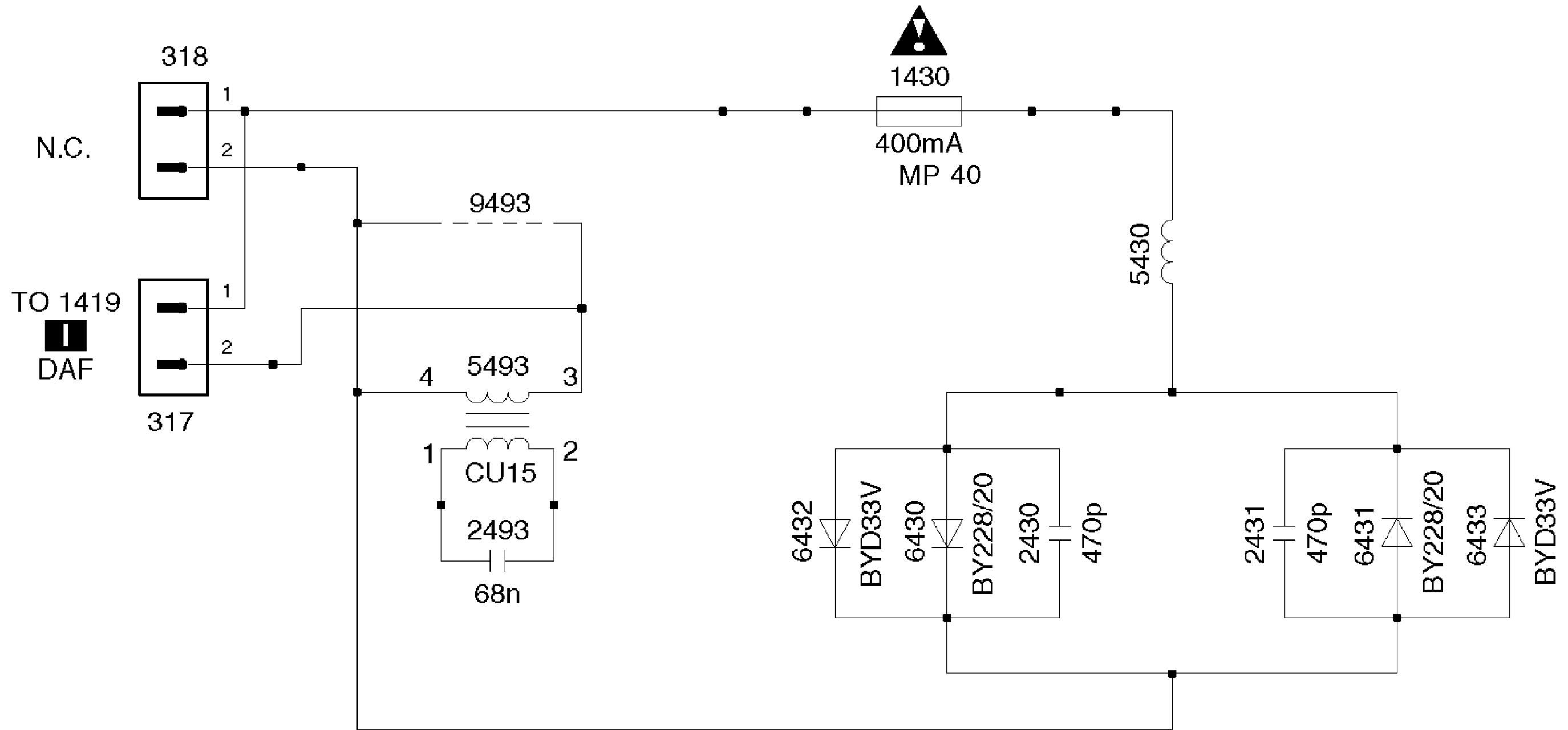


A7

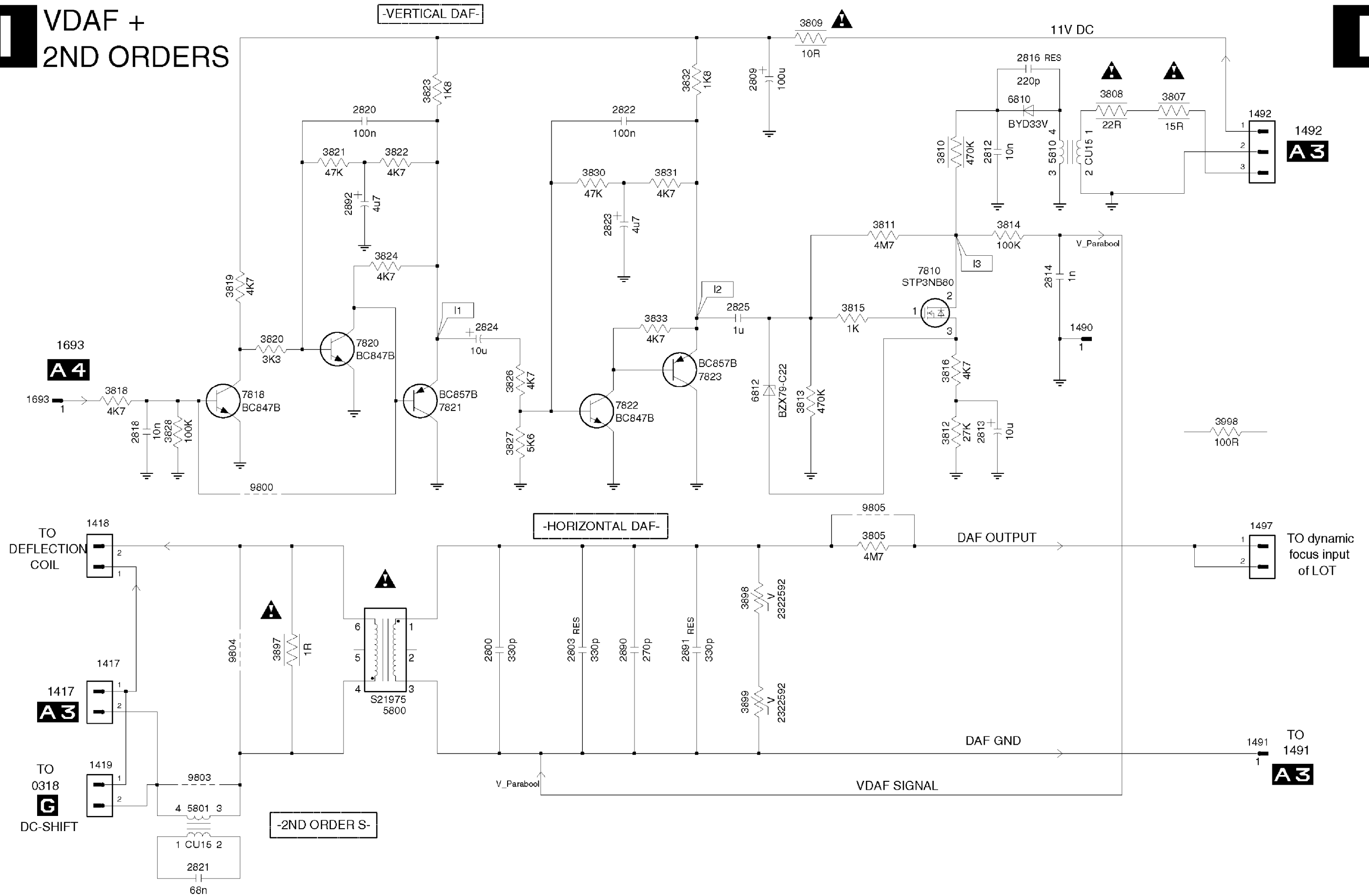
A3

FROM Vg2-connection LOT A3

G DC-SHIFT

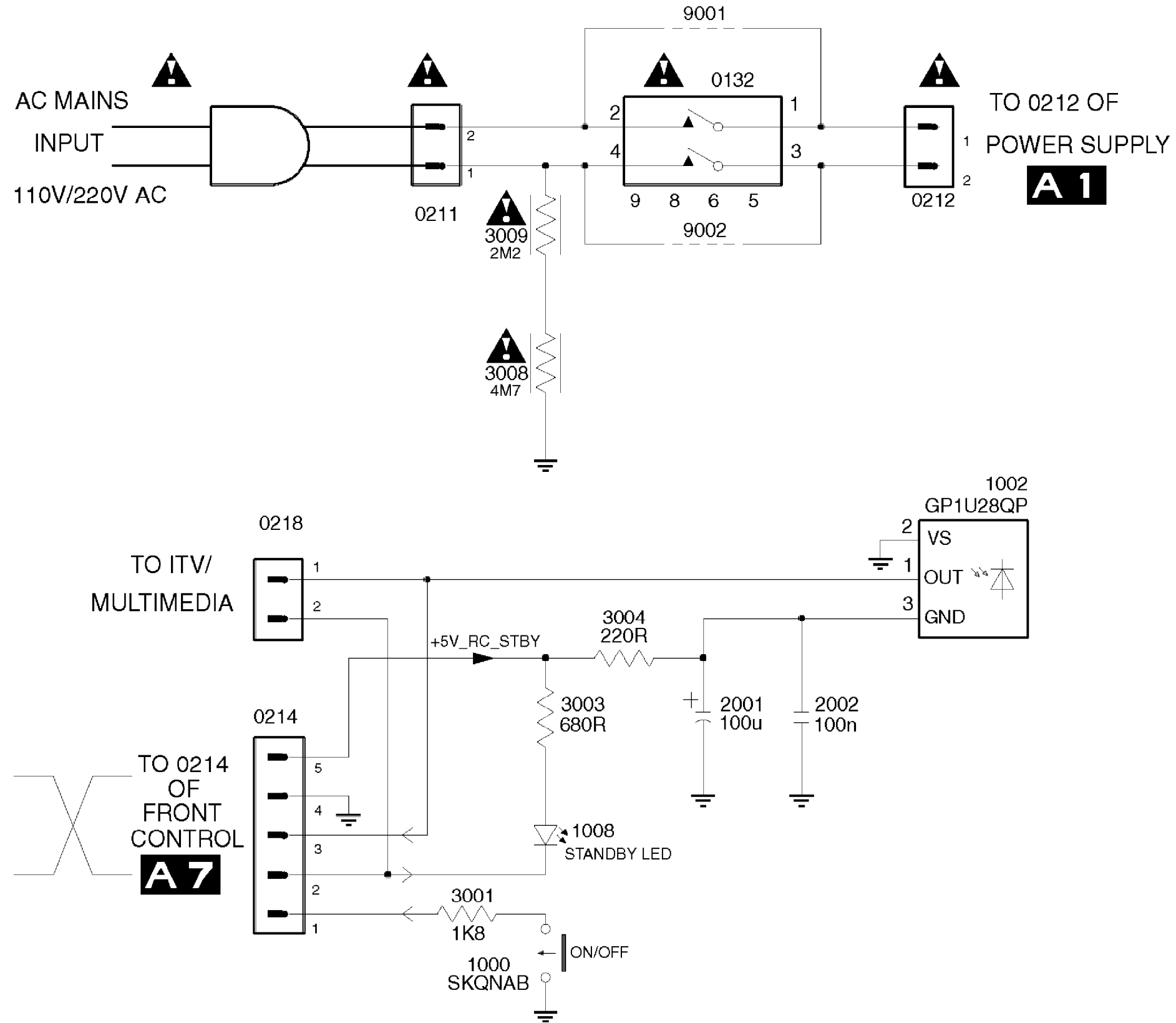


VDAF + 2ND ORDERS



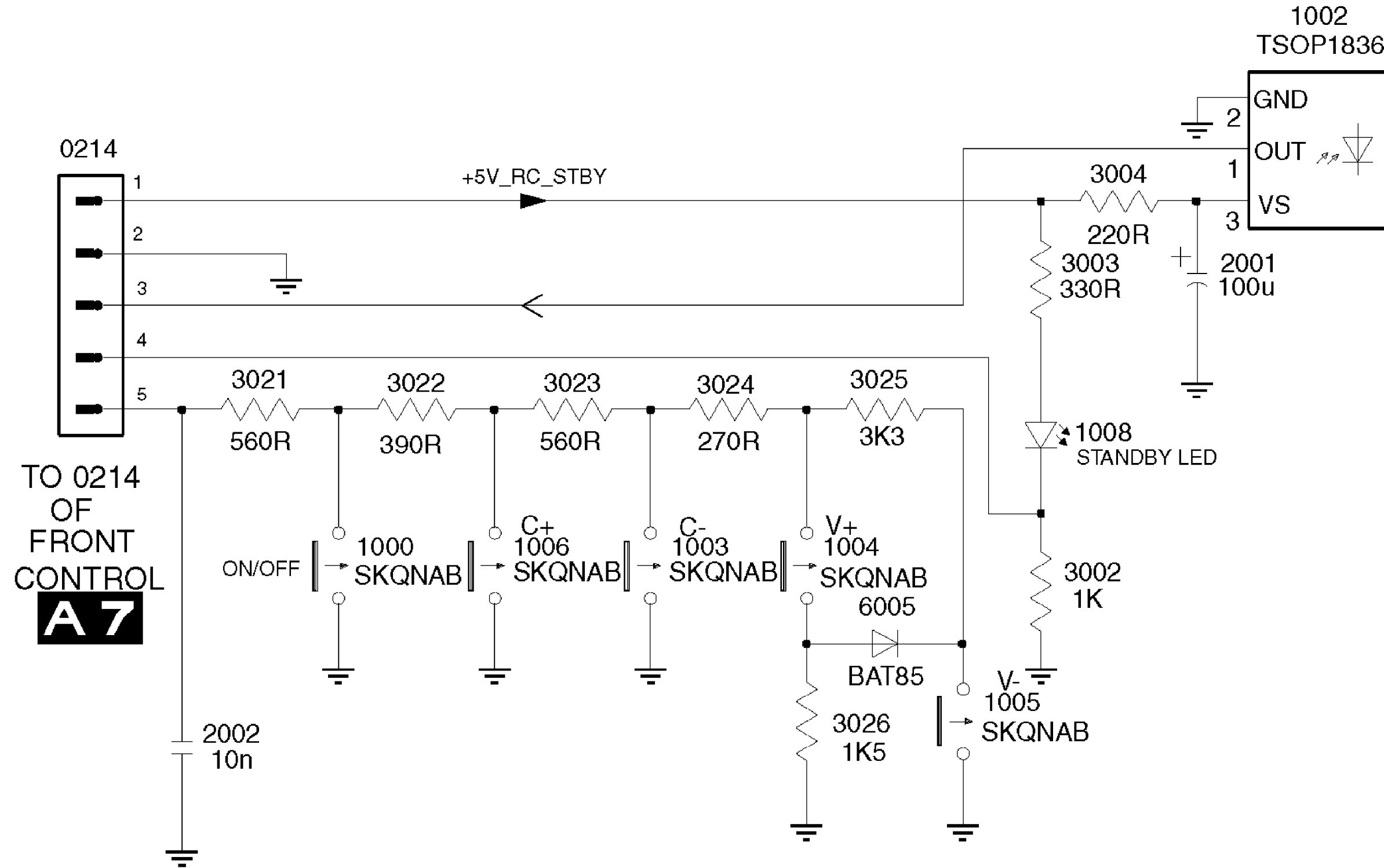


FRONT INTERFACE PANEL (FOR PV0/PV2 STYLING)

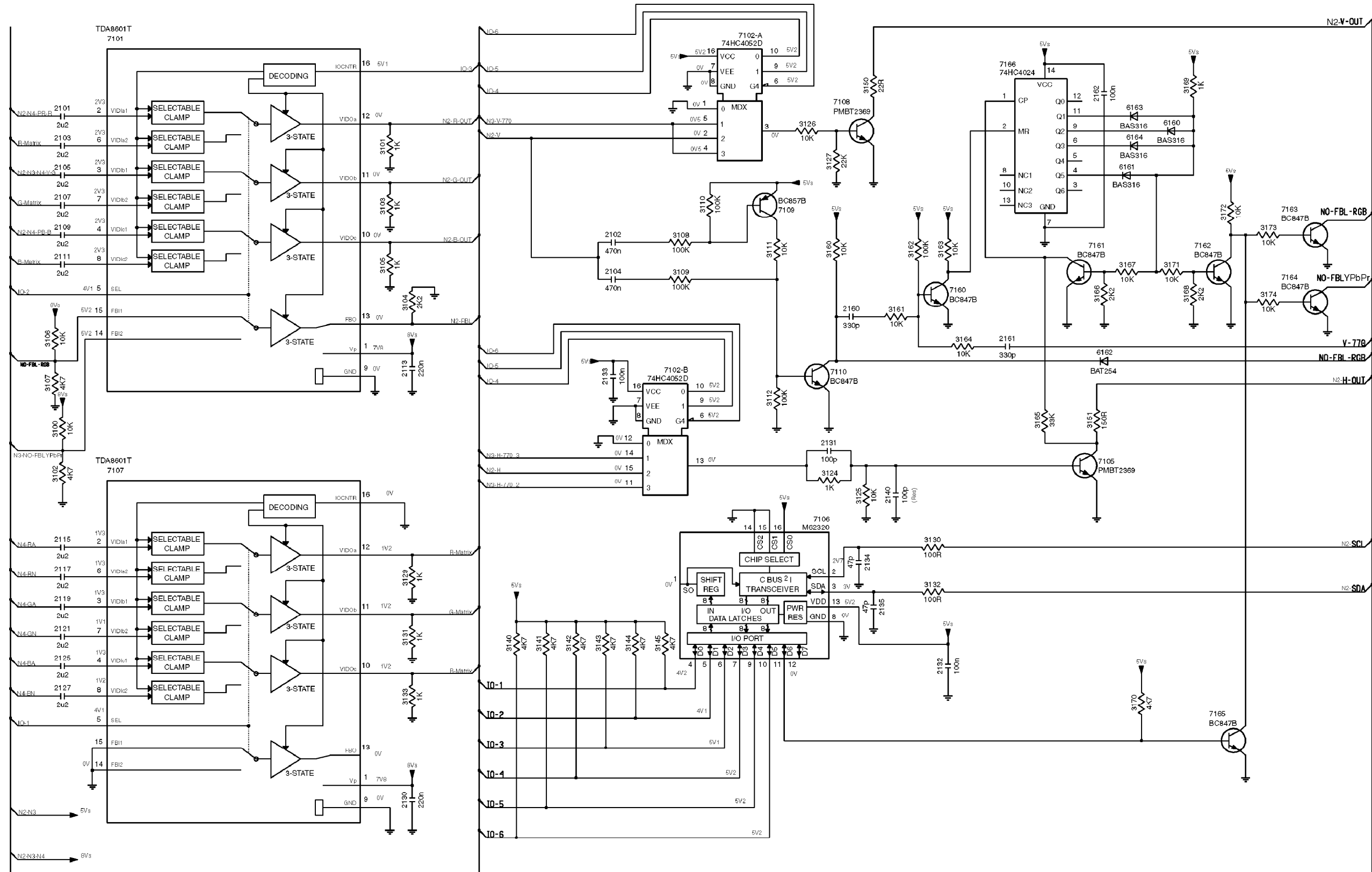




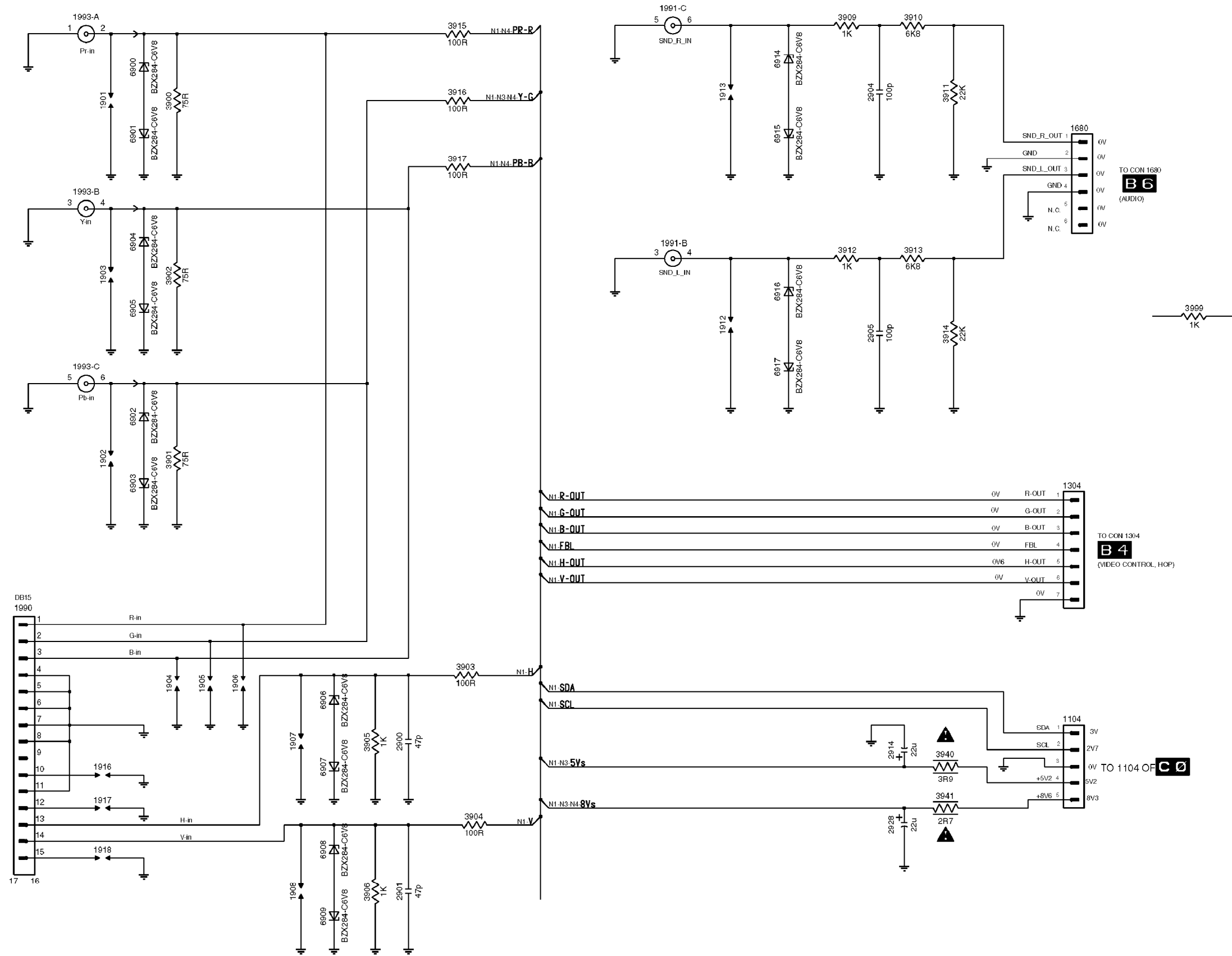
FRONT INTERFACE PANEL (FOR SL3 STYLING)



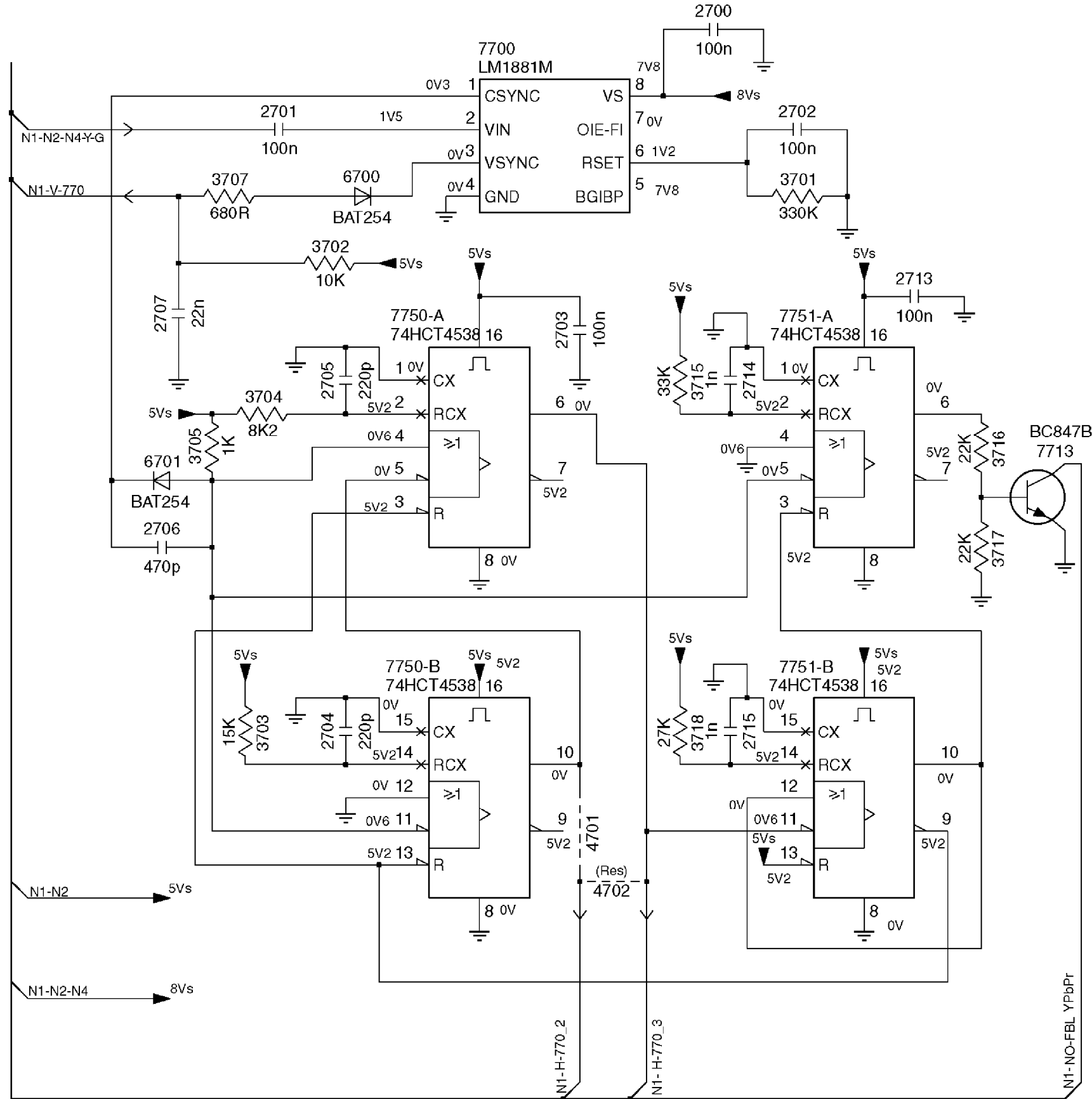
N1 CONTROL JACK-HIGH DEFINITION INTERFACE (FOR NO PIP)



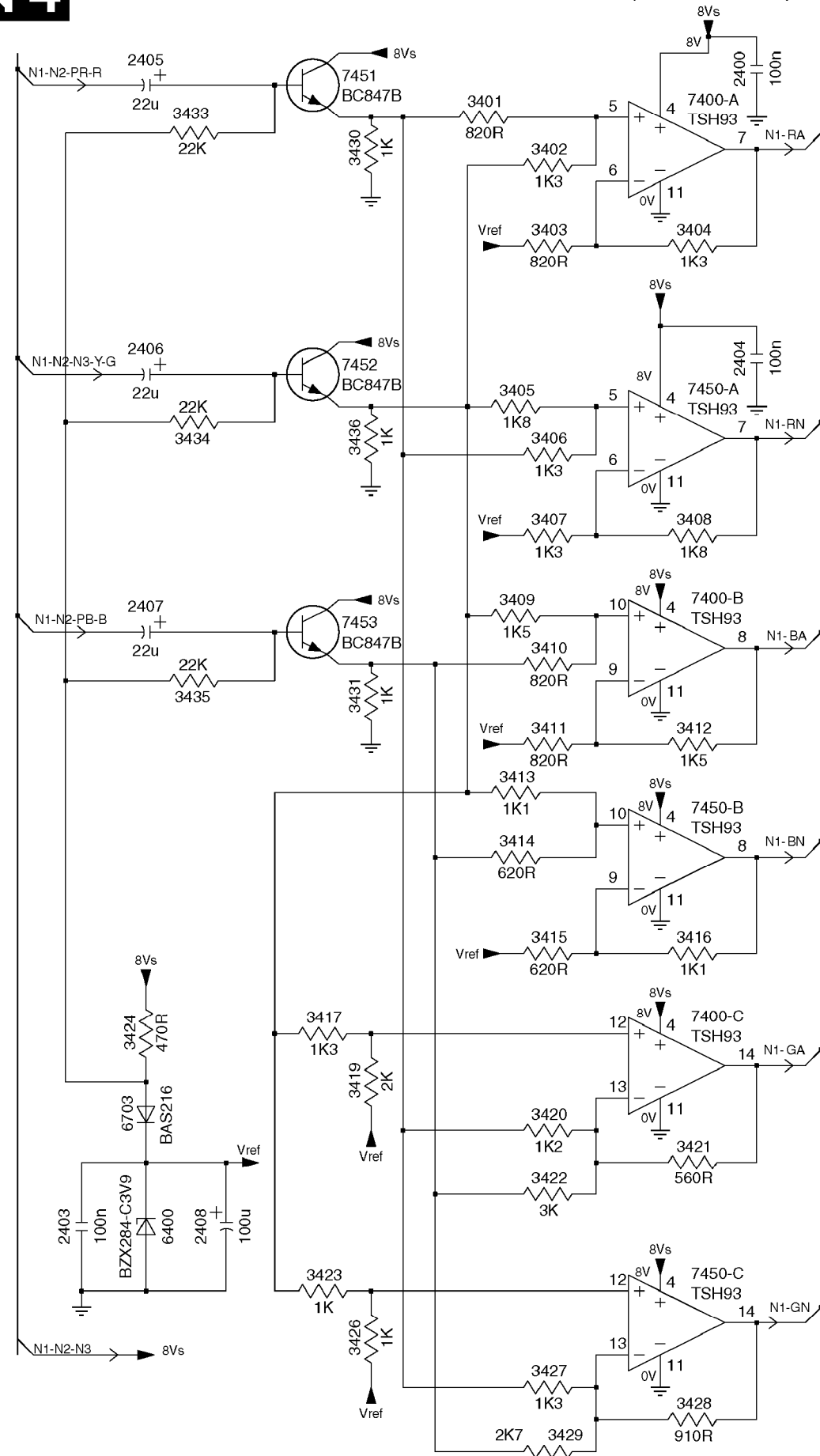
N2 INPUTS/OUTPUTS JACK-HIGH DEFINITION INTERFACE (FOR NO PIP)



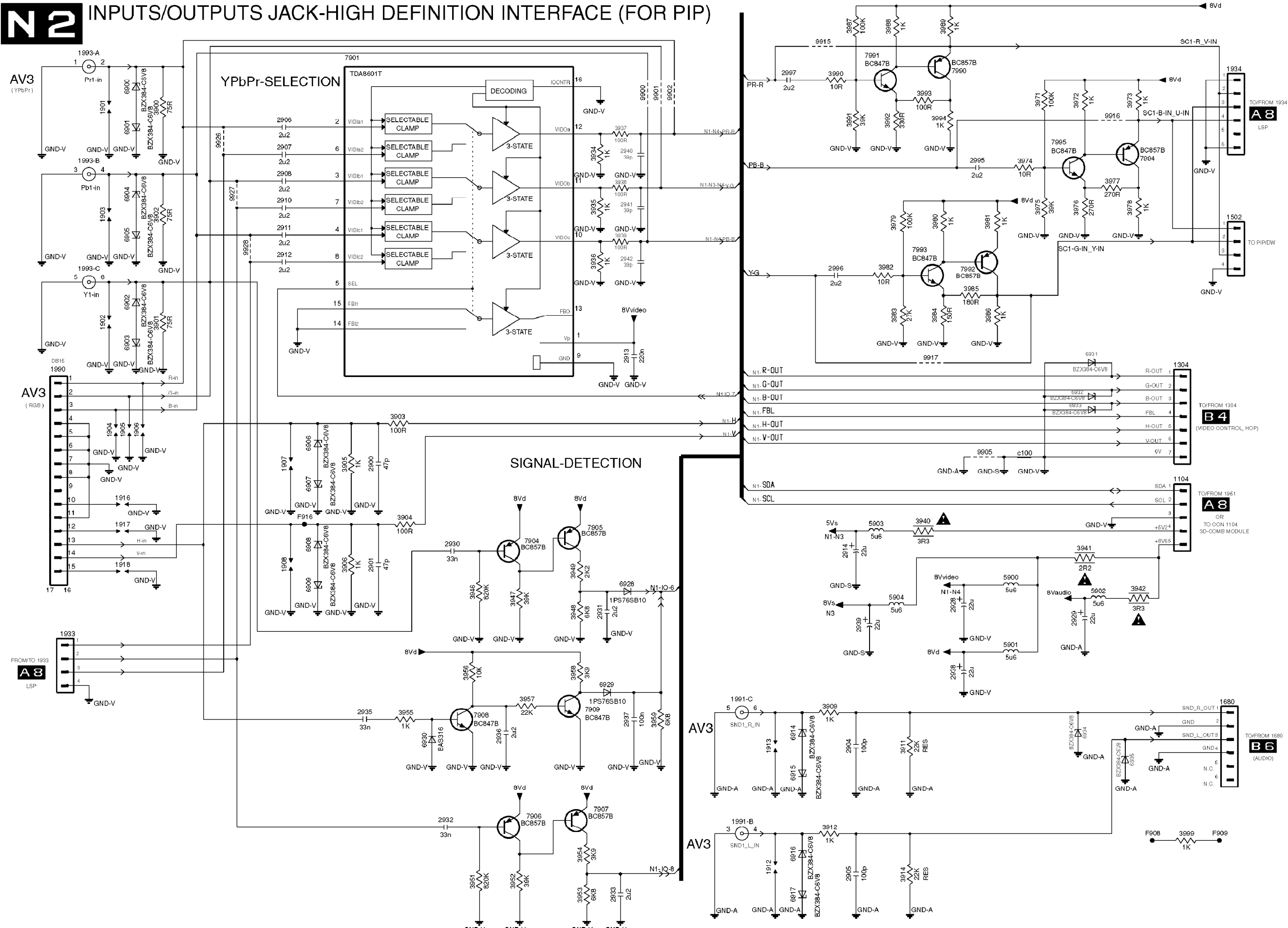
N3 SYNC SLICER JACK-HIGH DEFINITION INTERFACE (FOR NO PIP)



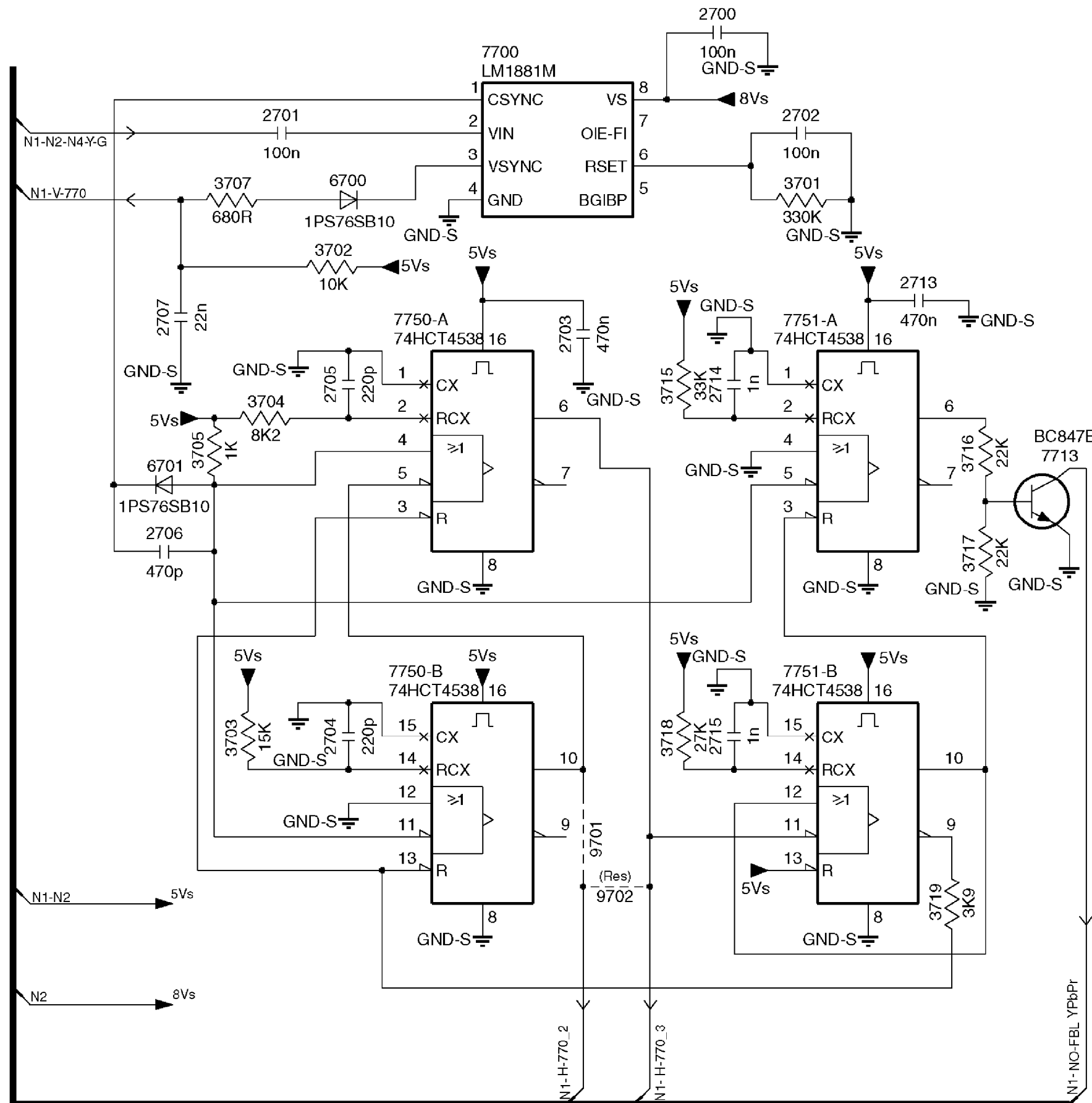
N4 MATRIX JACK-HIGH DEFINITION INTERFACE (FOR NO PIP)



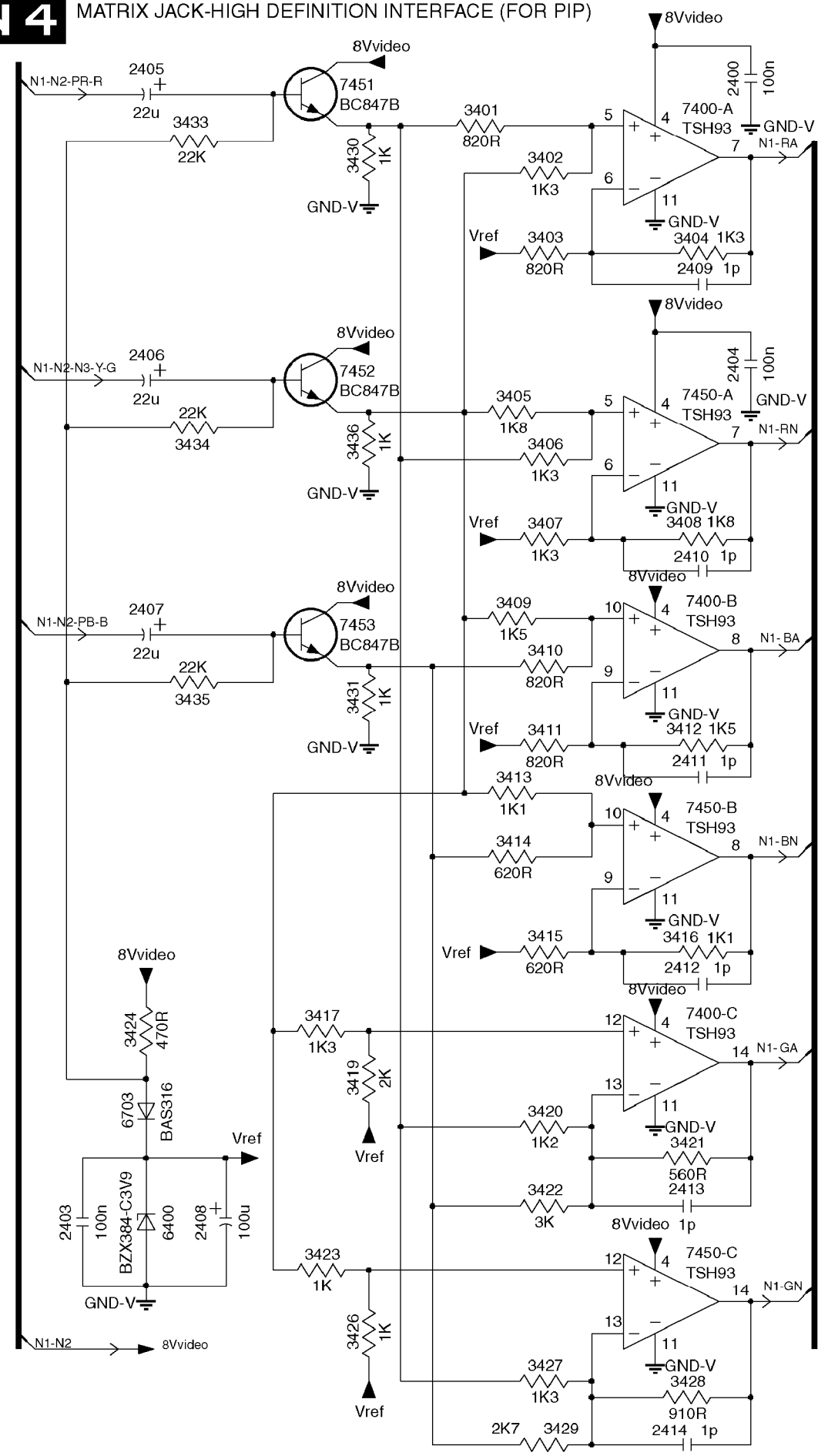
N2 INPUTS/OUTPUTS JACK-HIGH DEFINITION INTERFACE (FOR PIP)



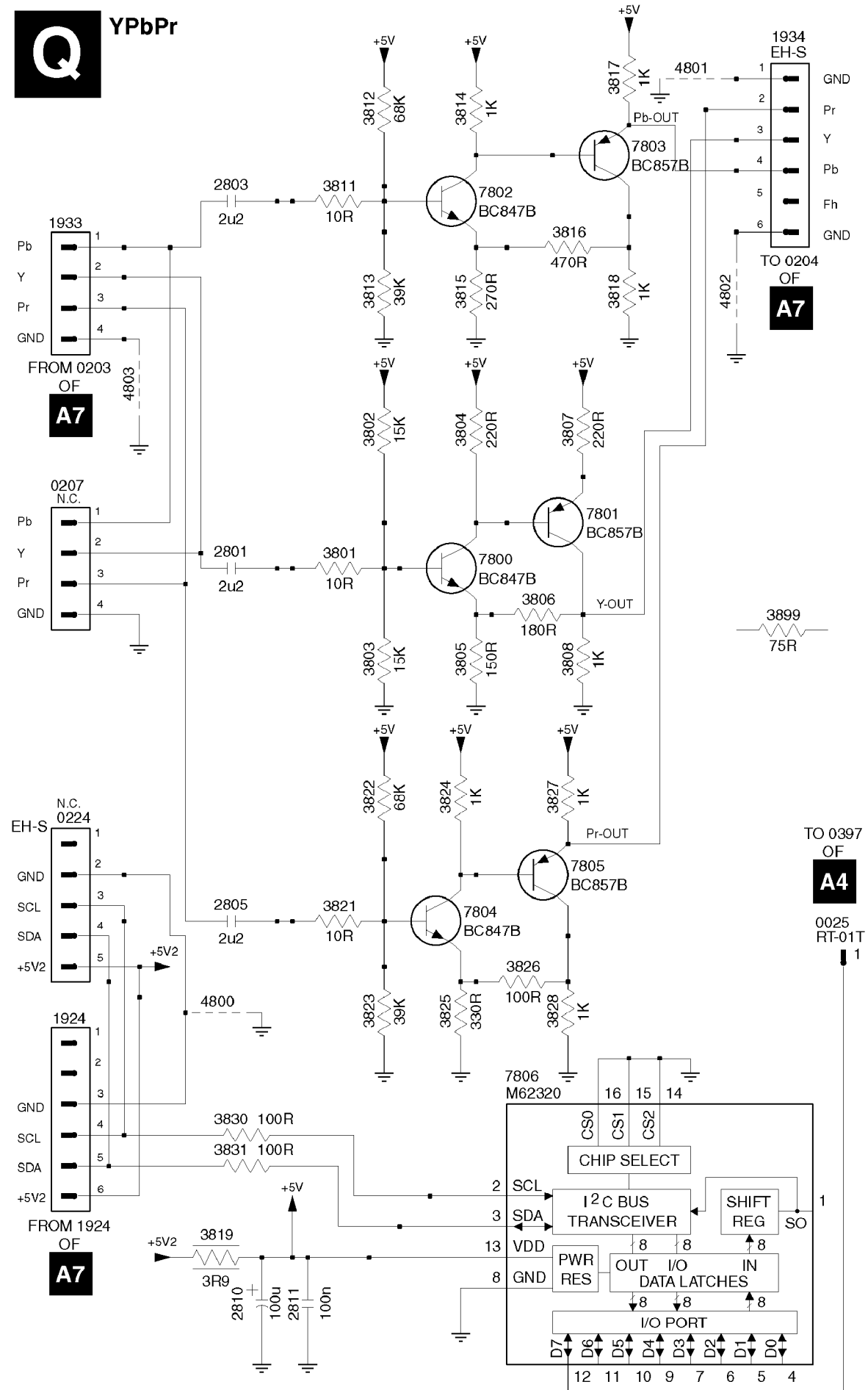
N3 SYNC SLICER JACK- HIGH DEFINITION INTERFACE (FOR PIP)

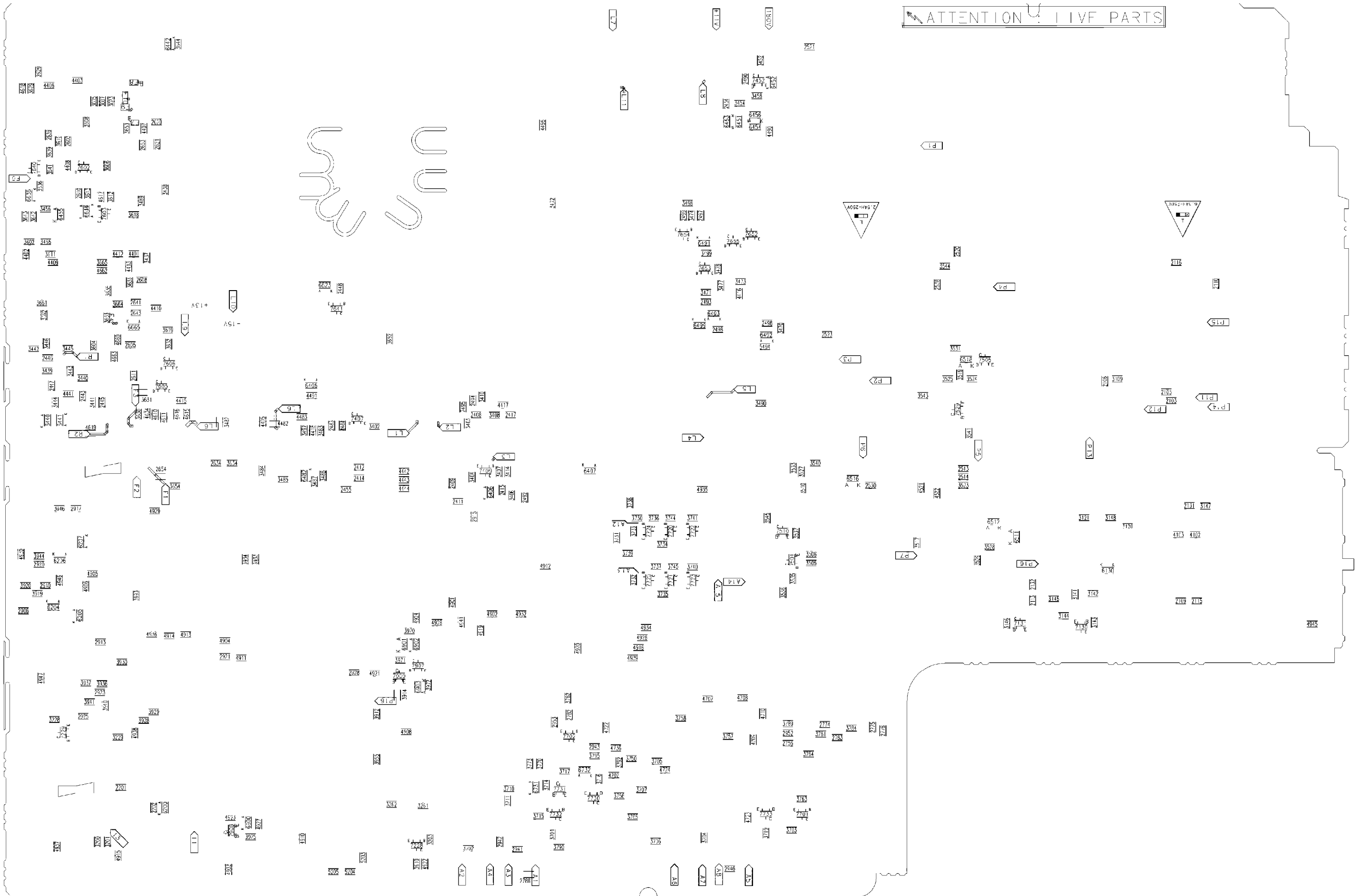


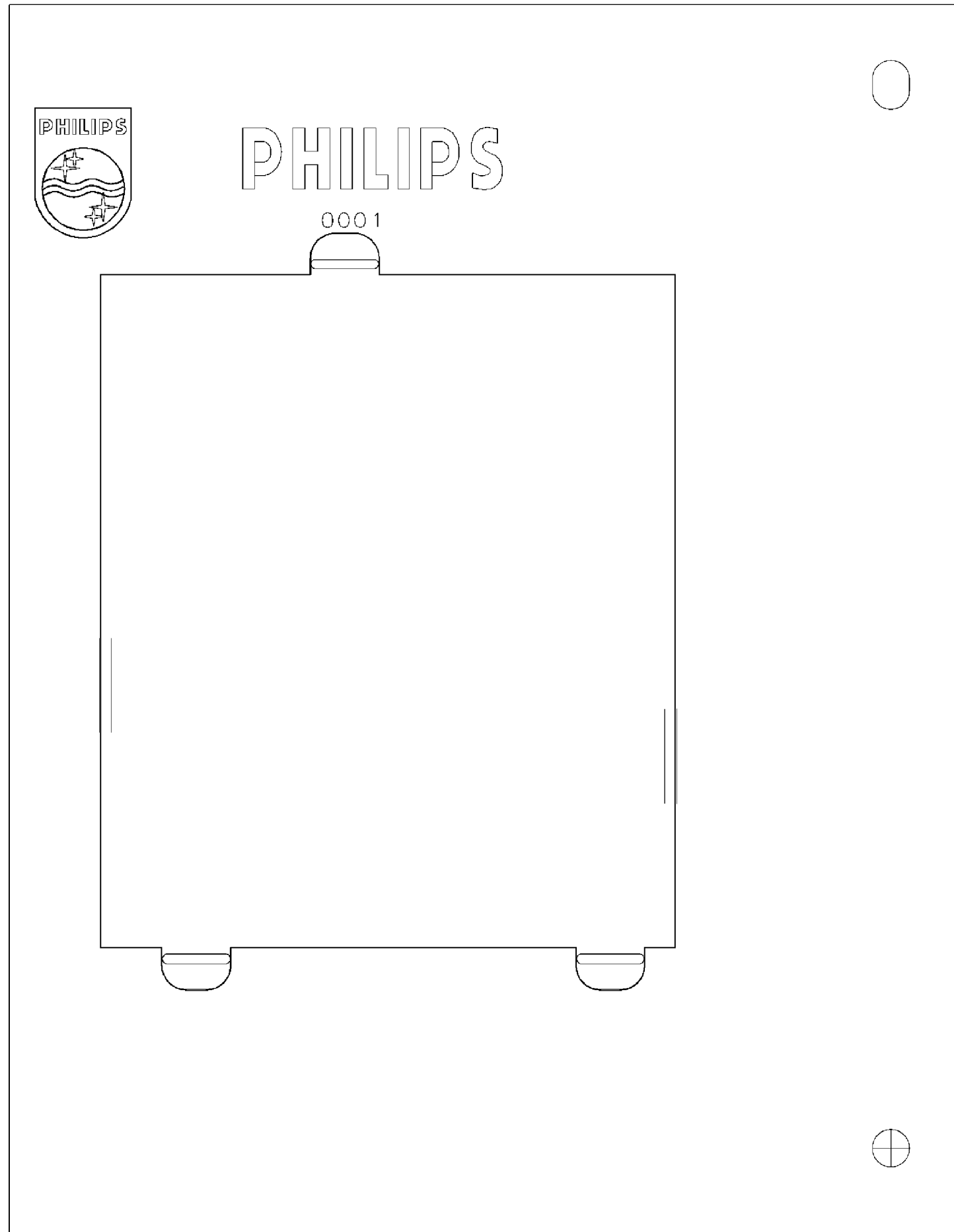
N4 MATRIX JACK-HIGH DEFINITION INTERFACE (FOR PIP)

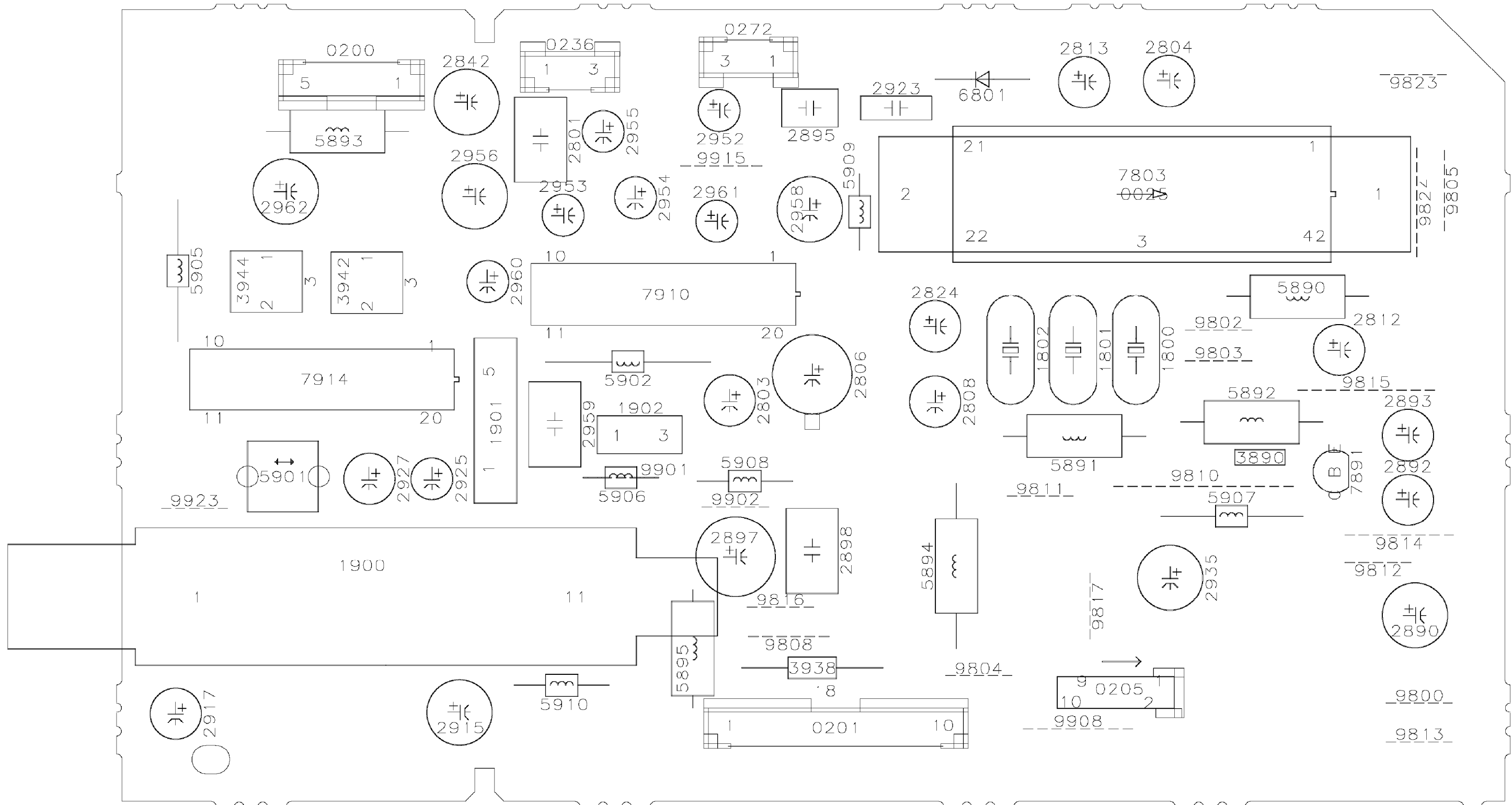


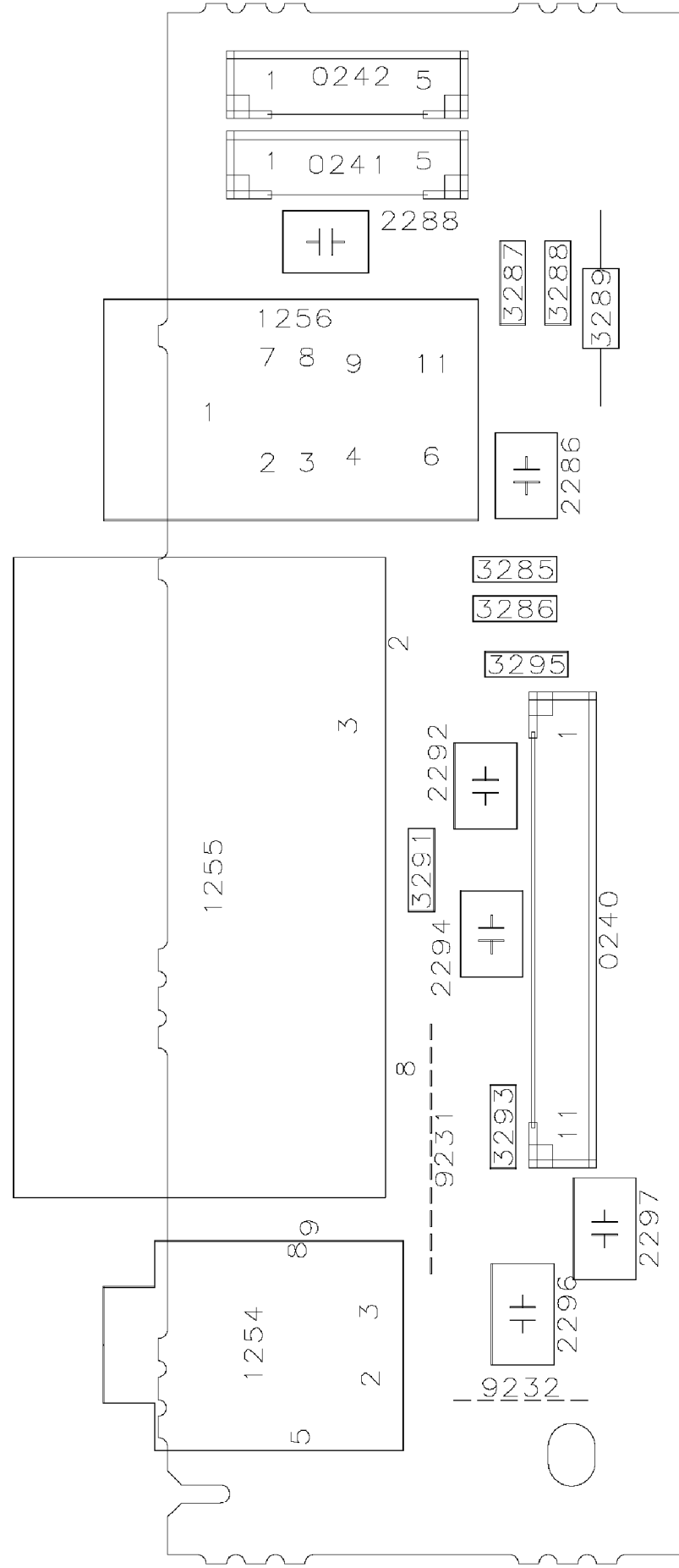
Q YPbPr

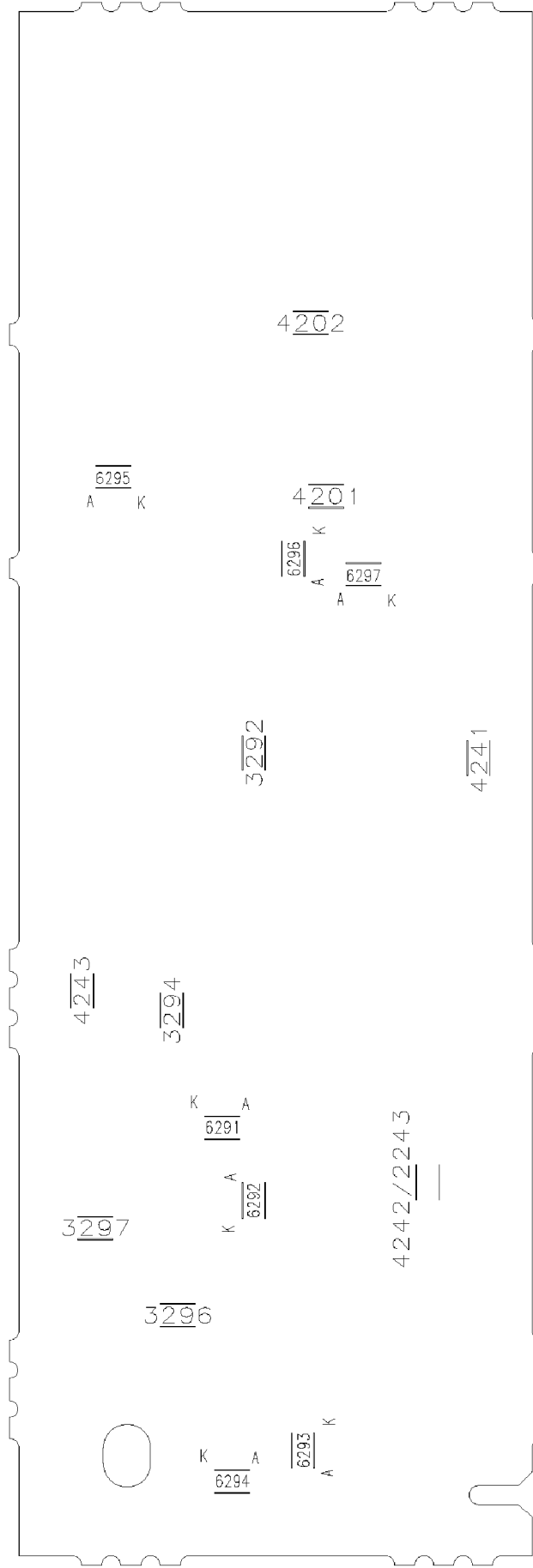


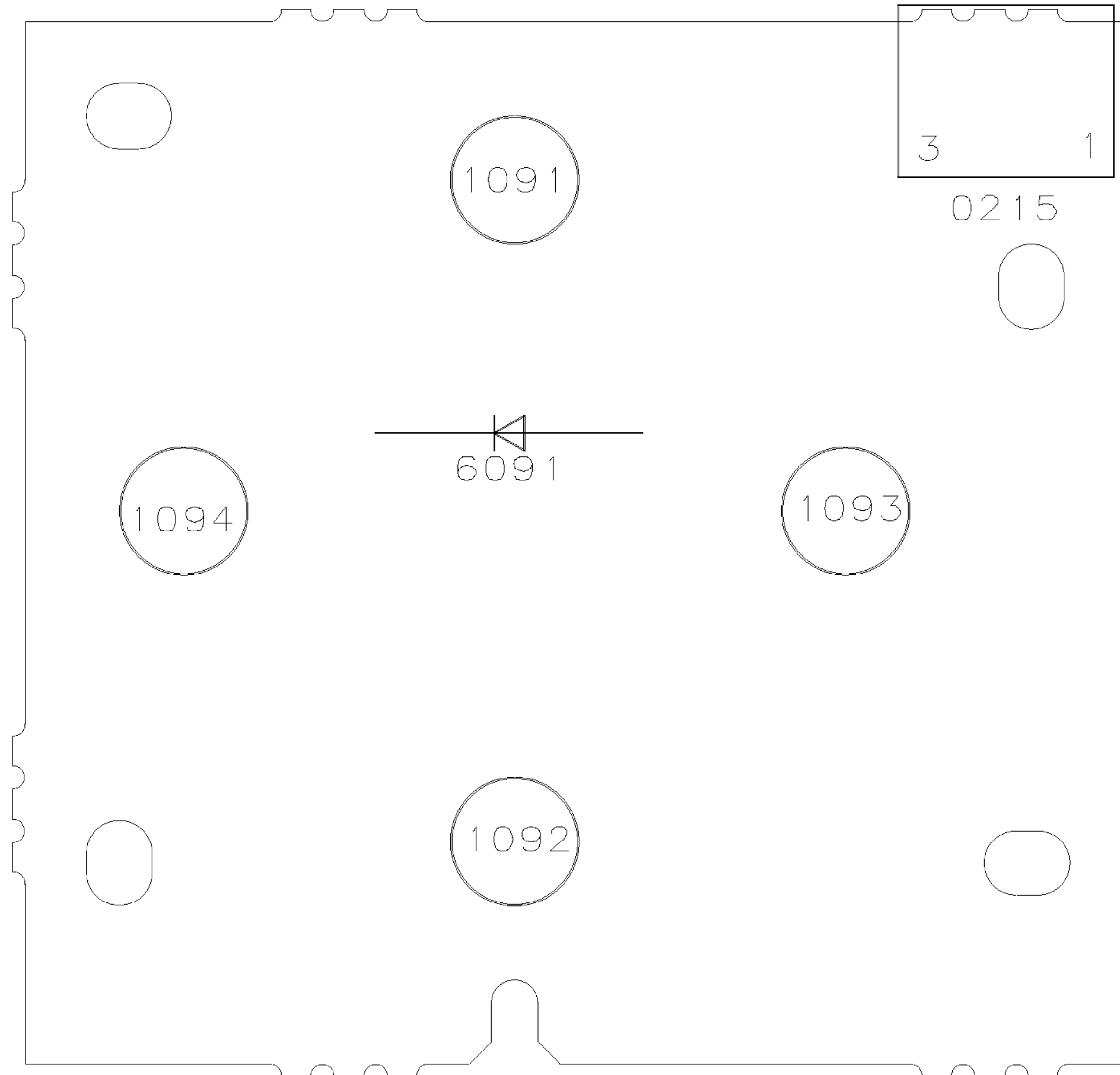


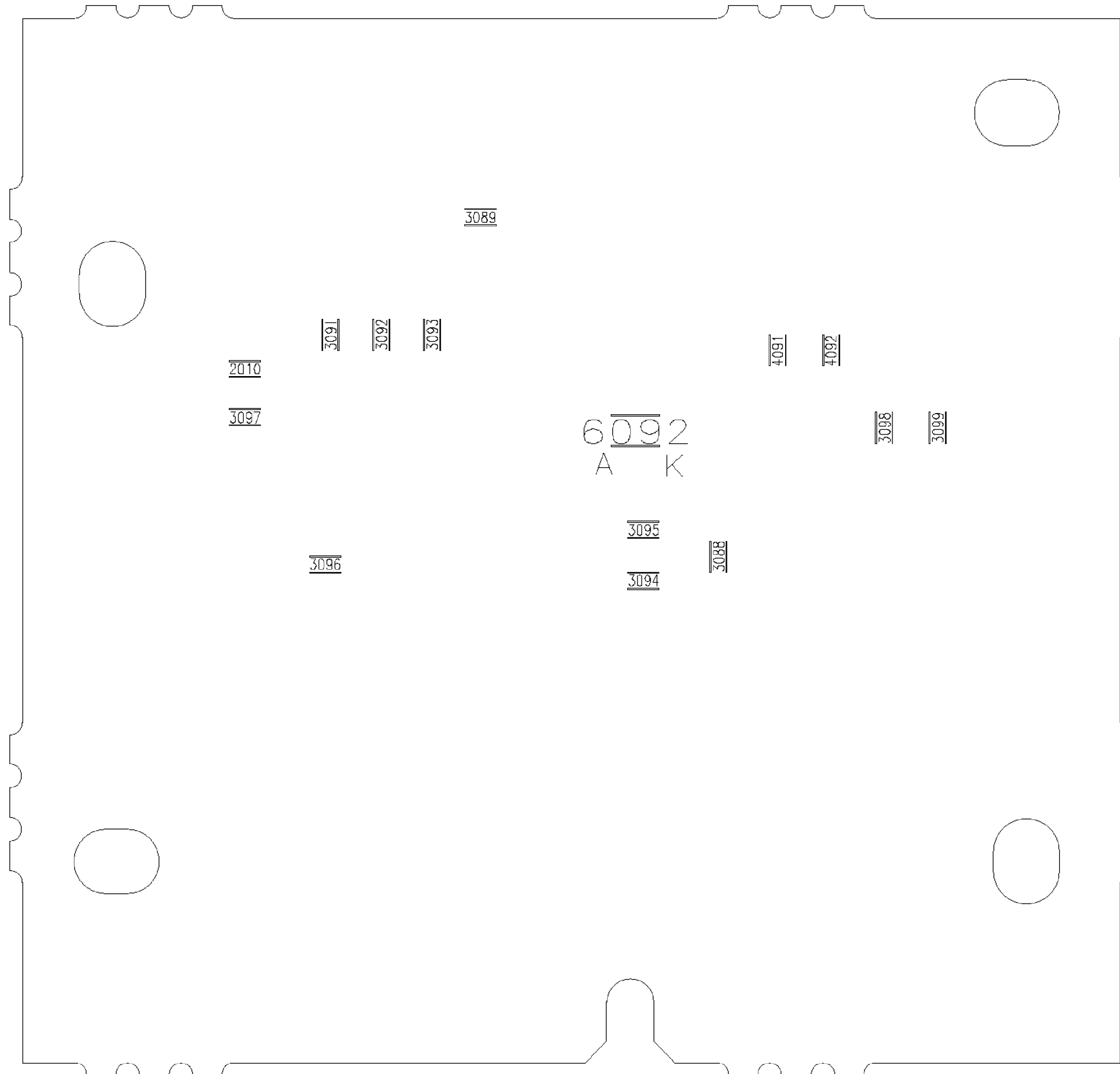


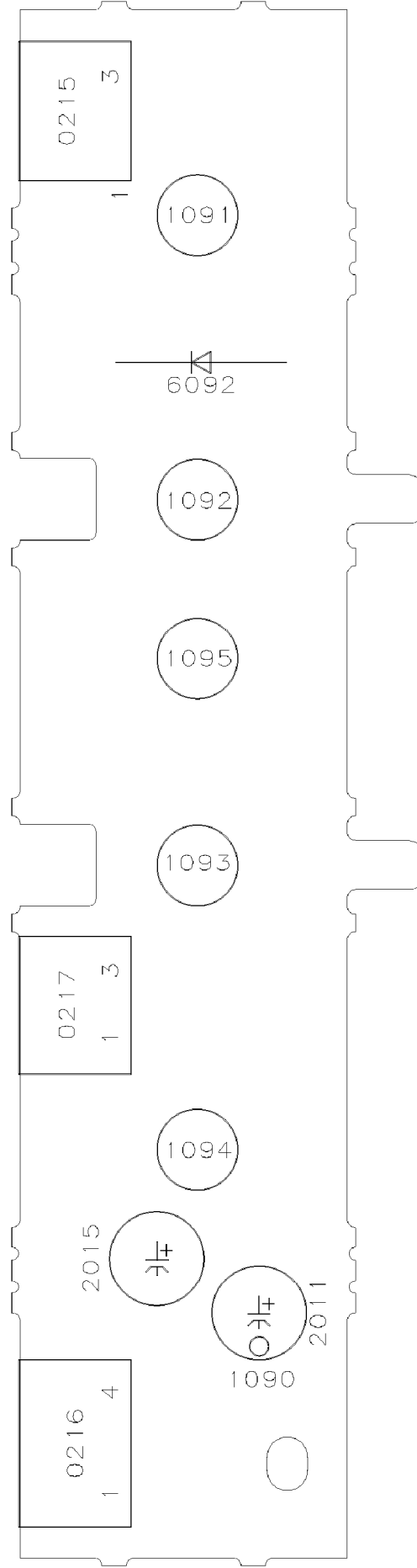


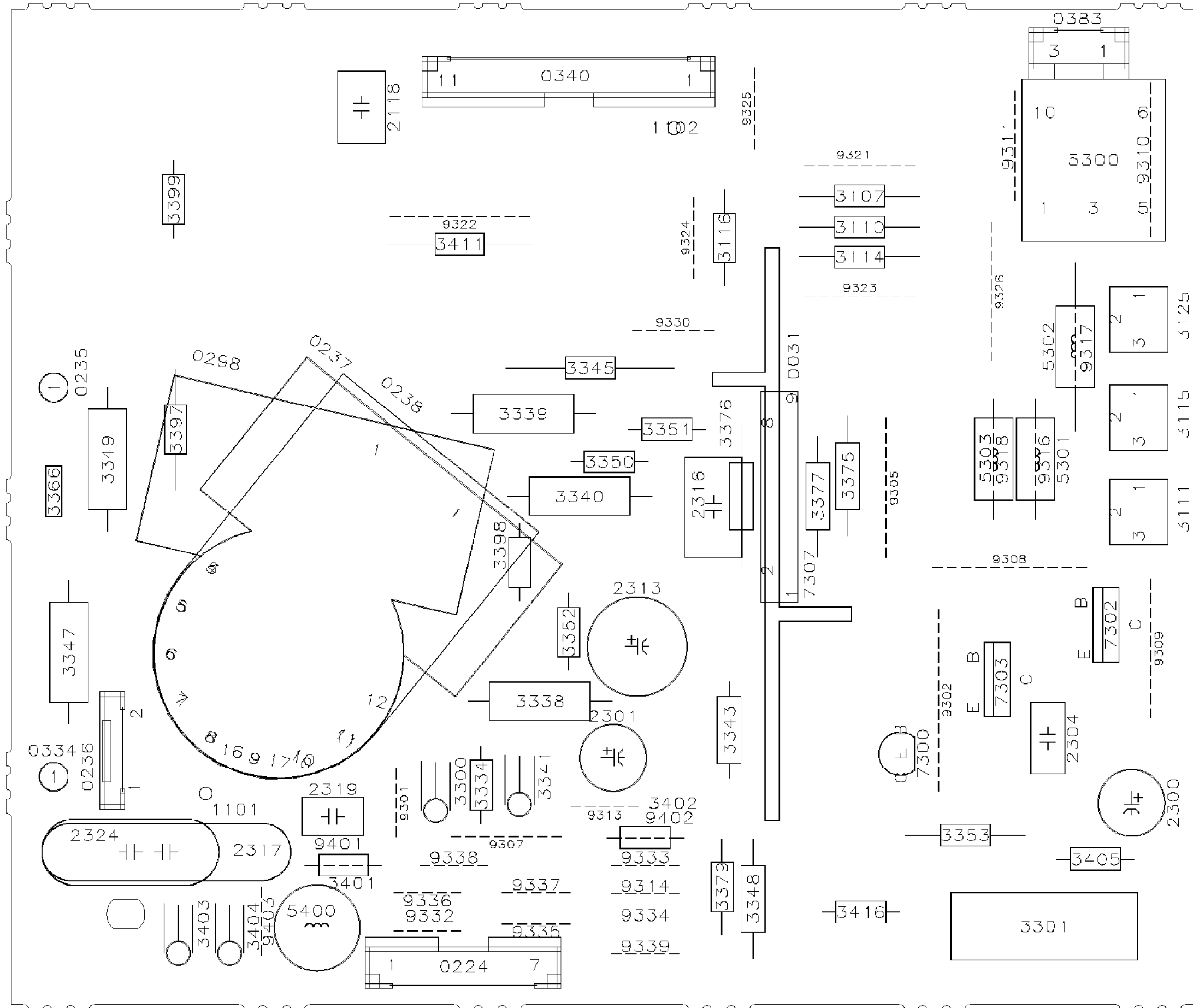


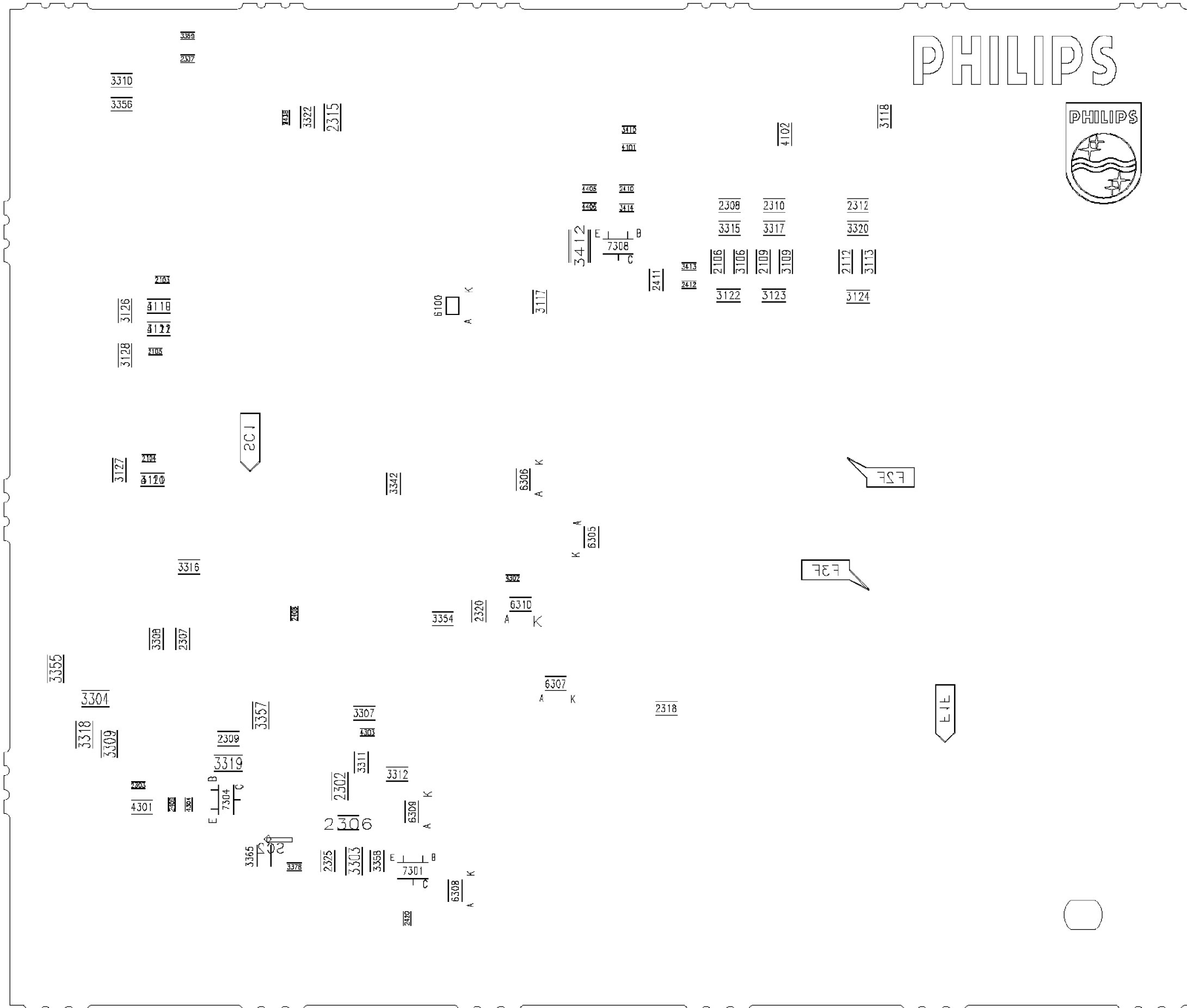






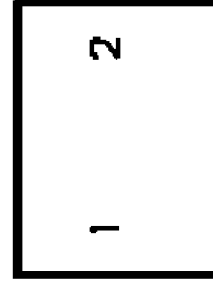
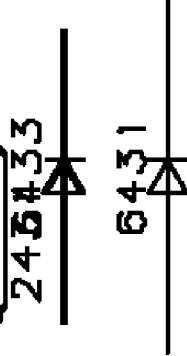
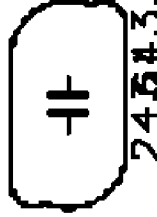
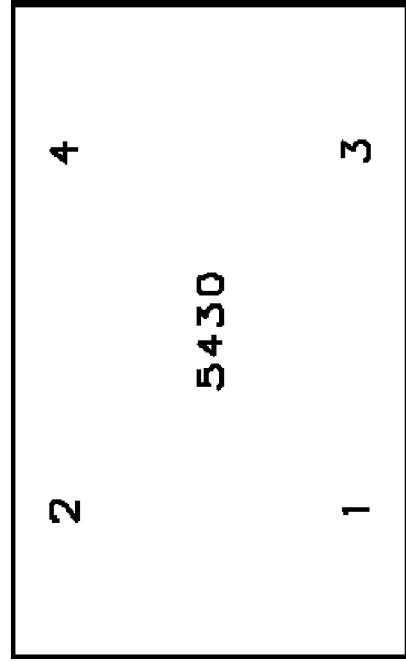




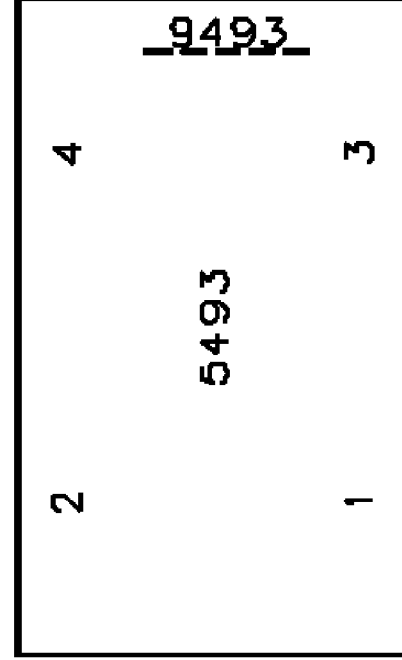
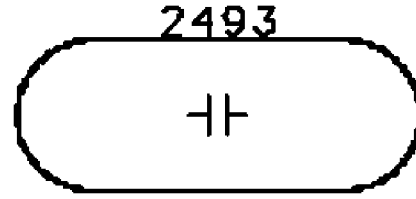
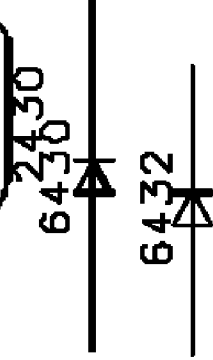




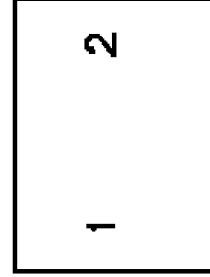
PHILIPS



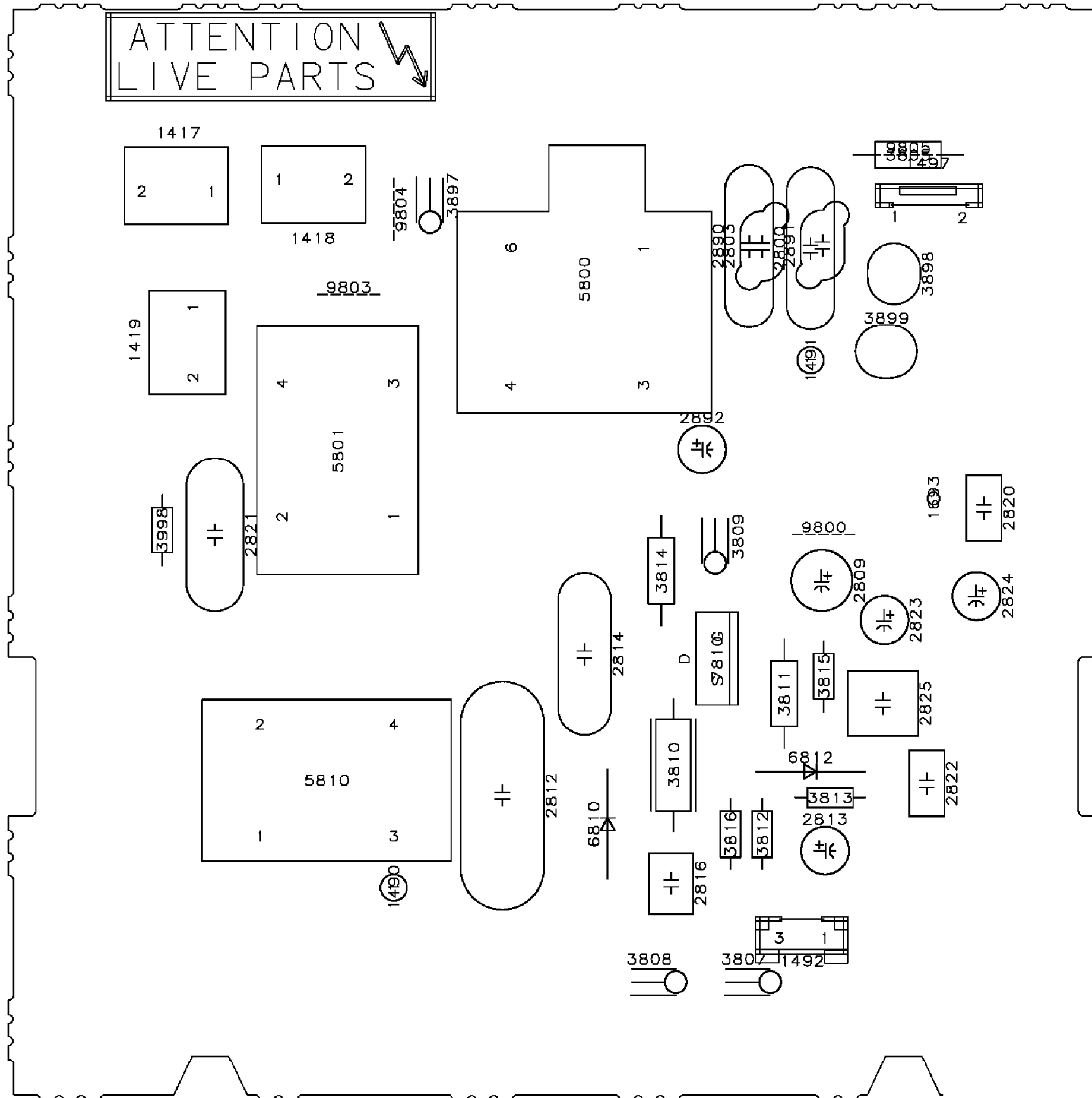
318




9493

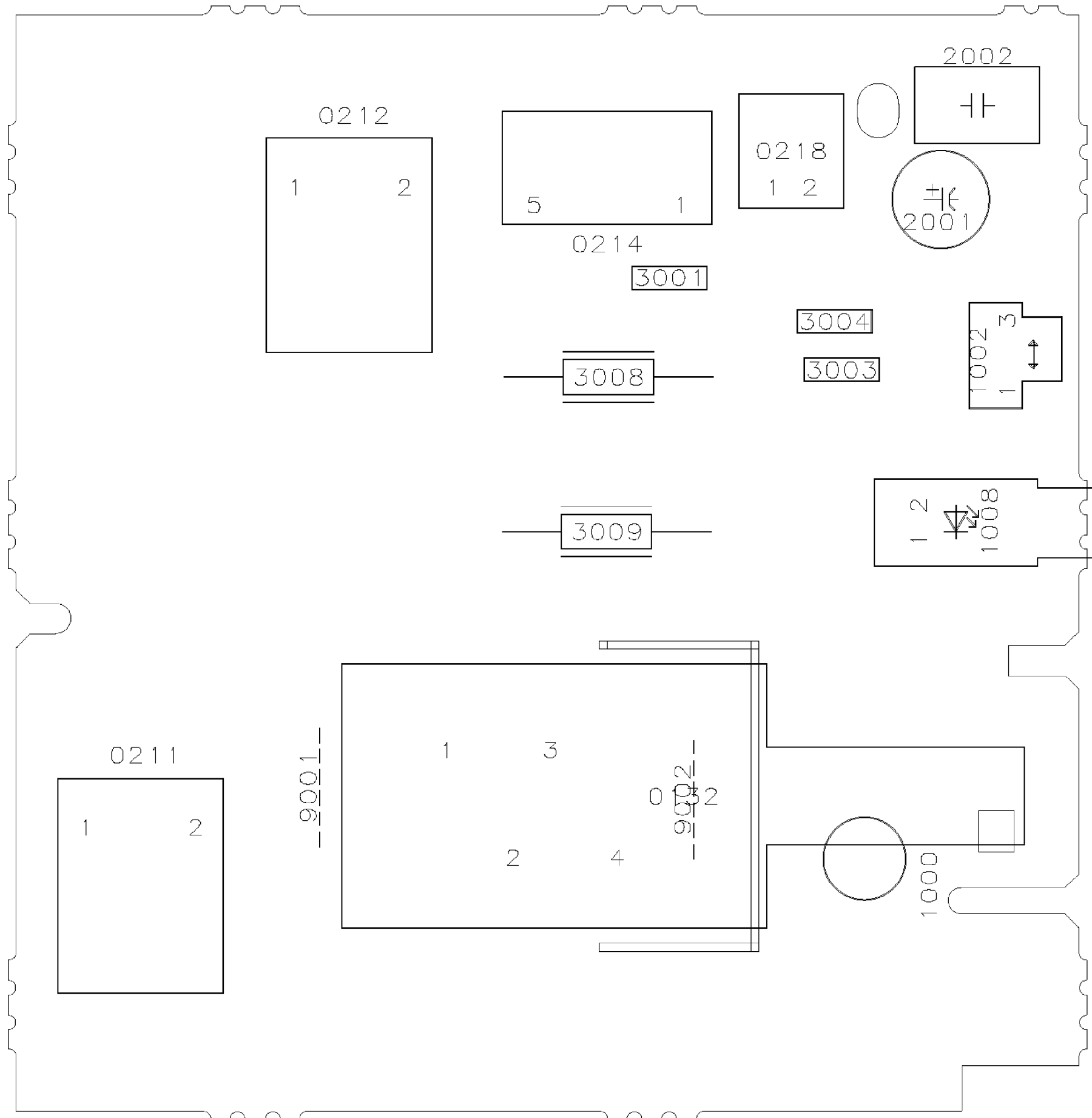


317

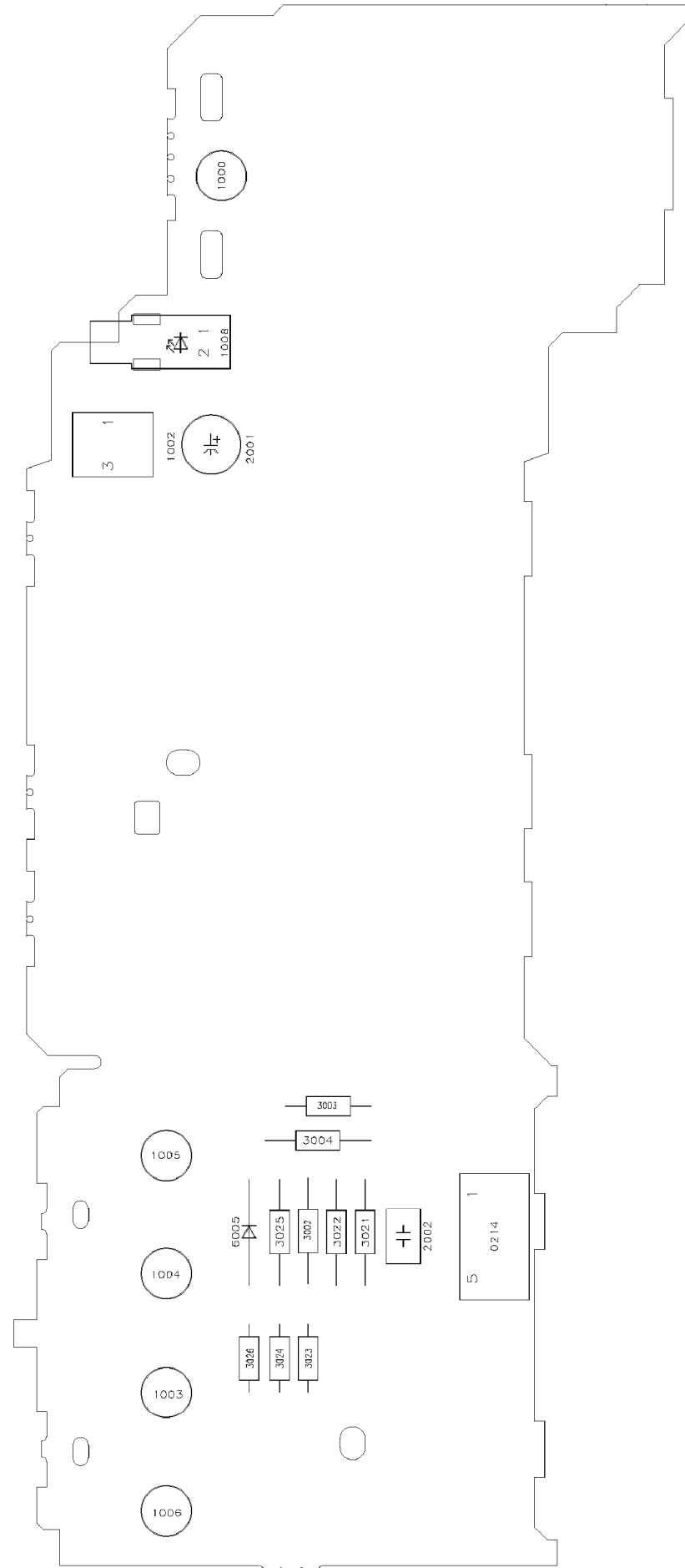


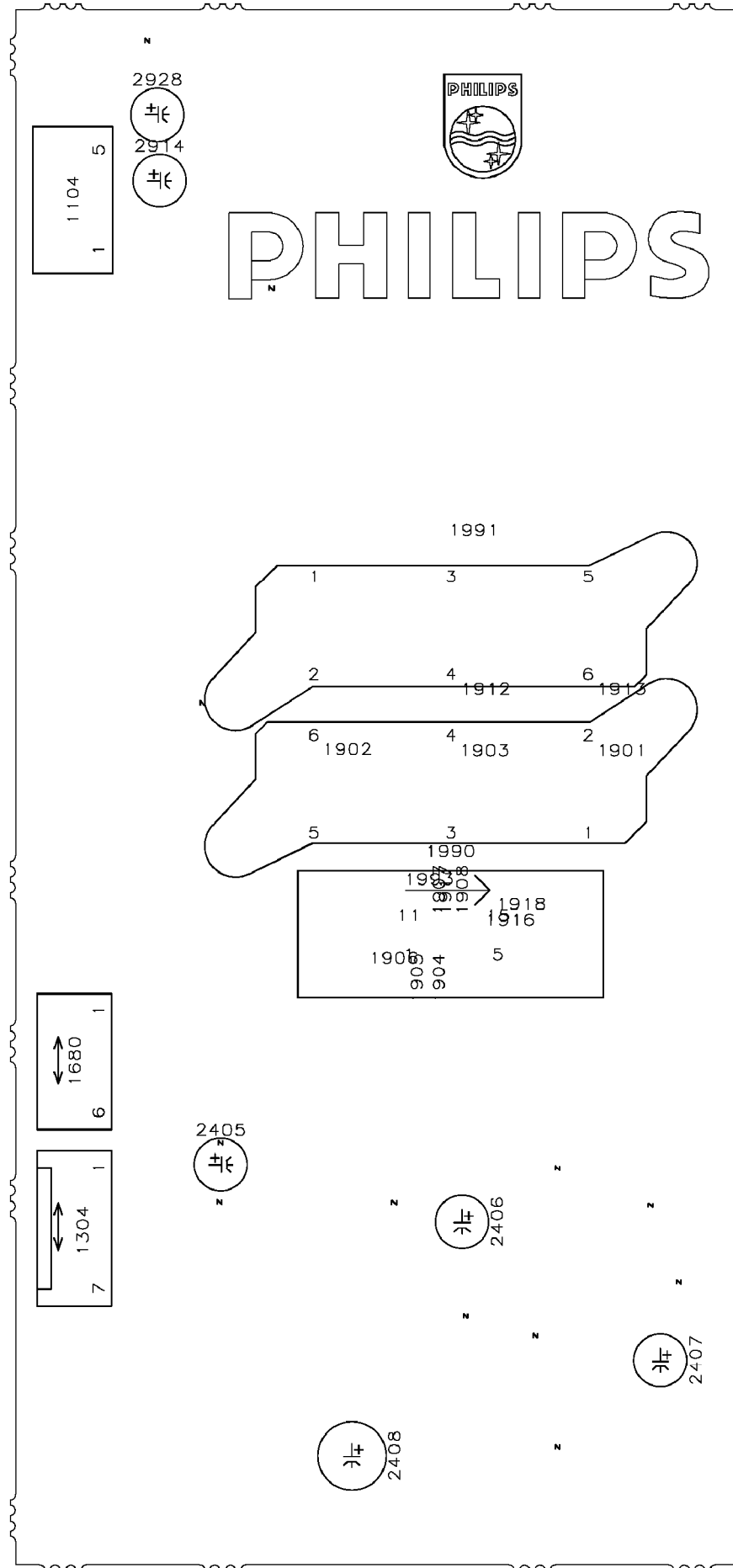
ATTENTION
LIVE PARTS 

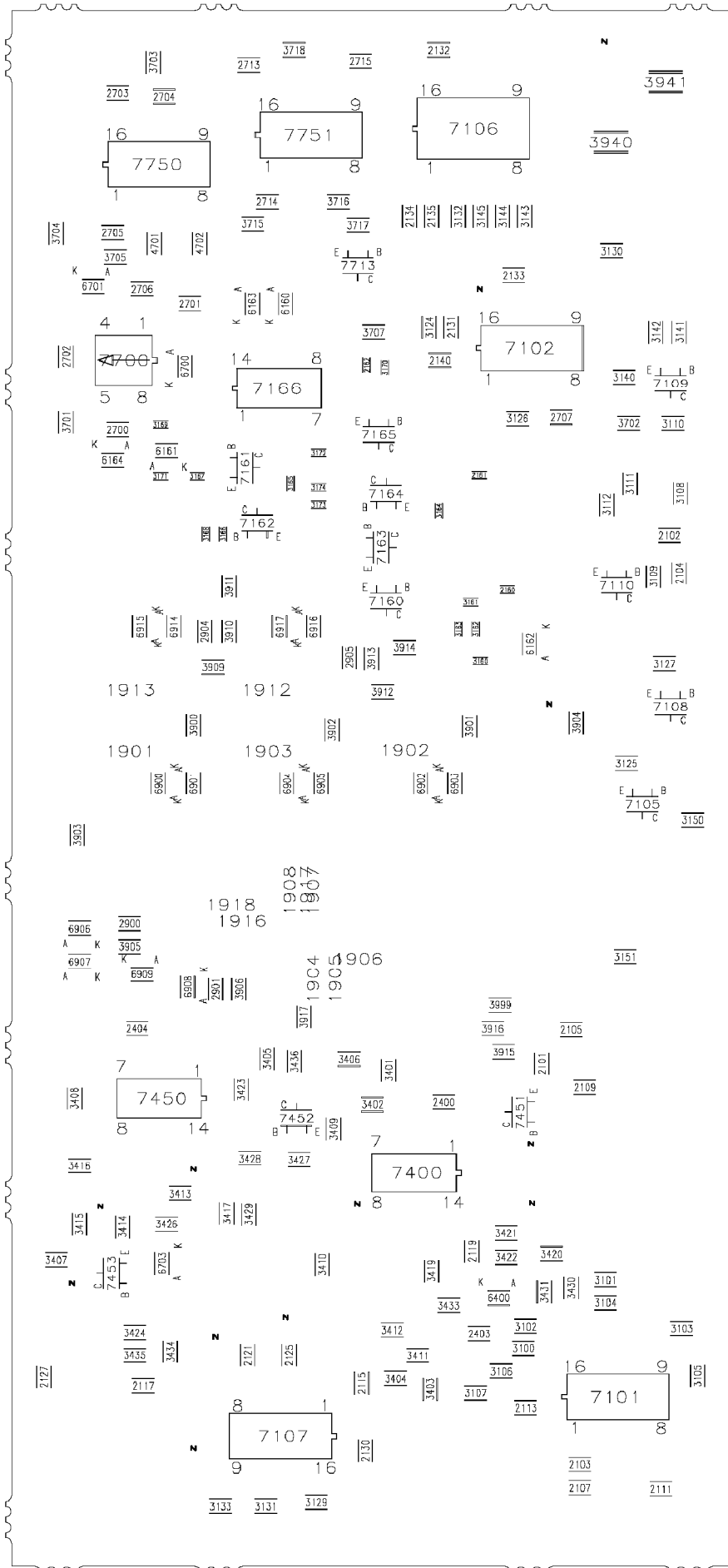
3822
3821
3820
7820^E_C 7818^B_C 3819
3824 3818
3823 7821^E_C 7818^B_E 3828
3832 2818
3831
3830
3826
3827
3833
7823^E_C 7822^B_E

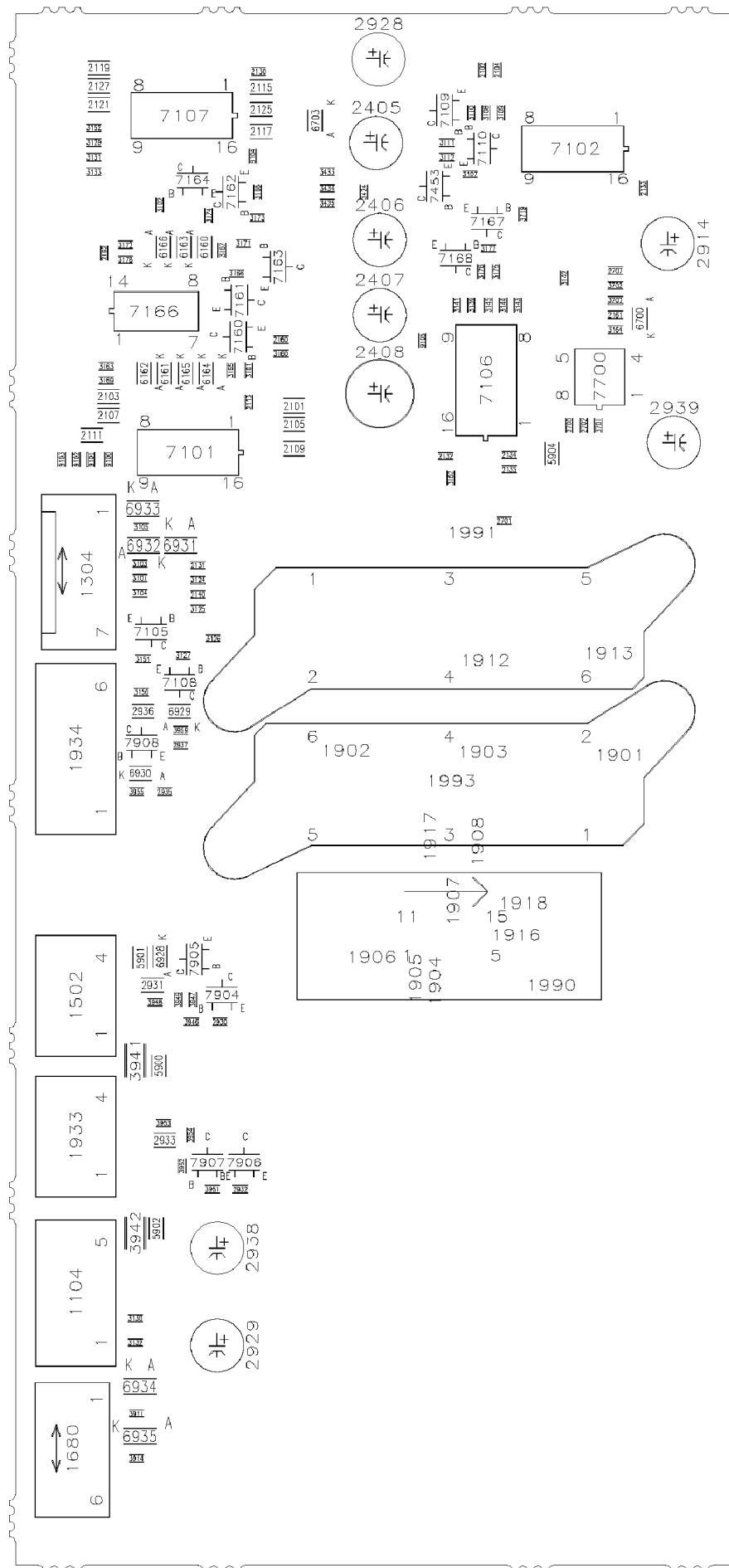


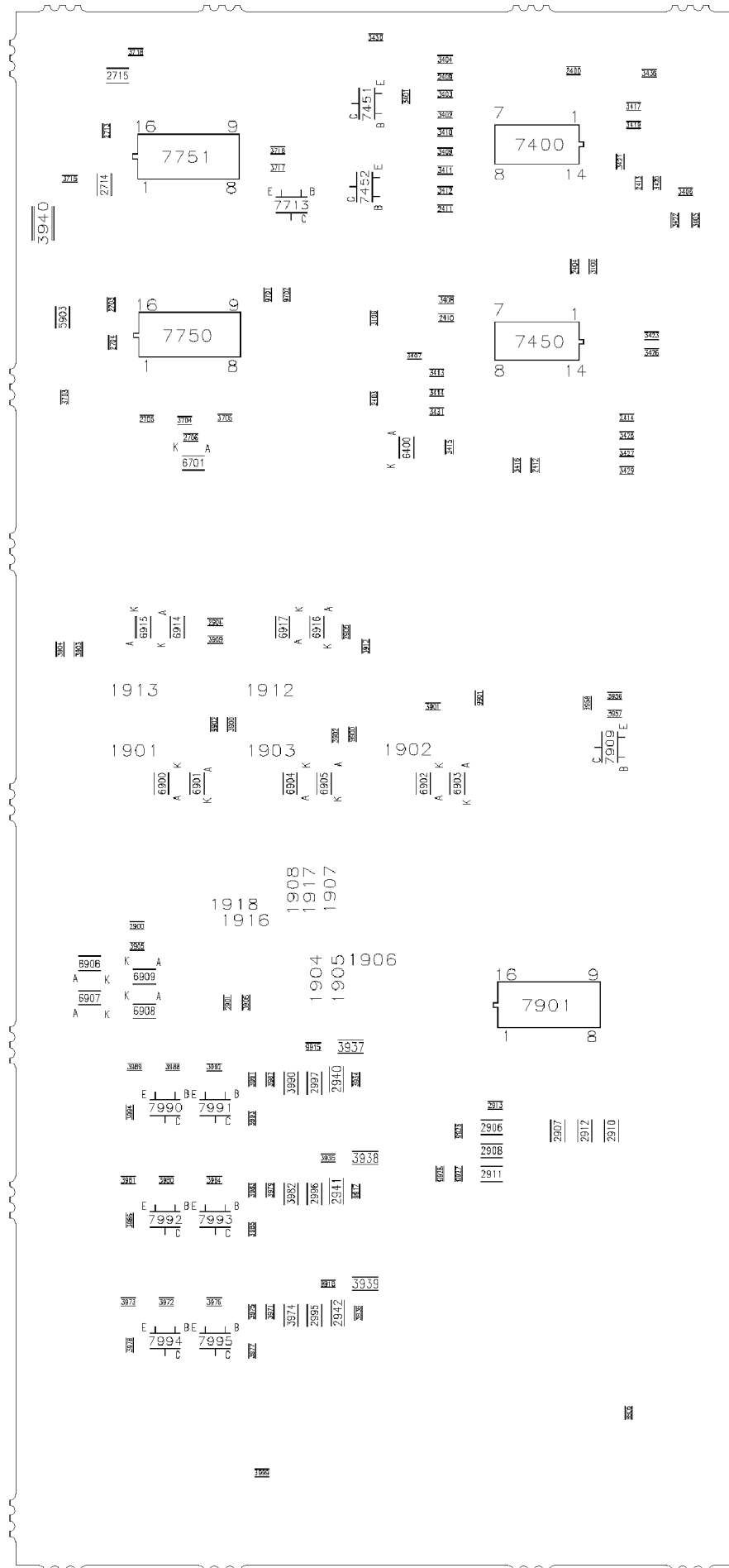
USED ONLY IN MODELS: 32PT740H37A (7644) - Layout Front Interface Panel (For SL3 Styling) (Top Side)

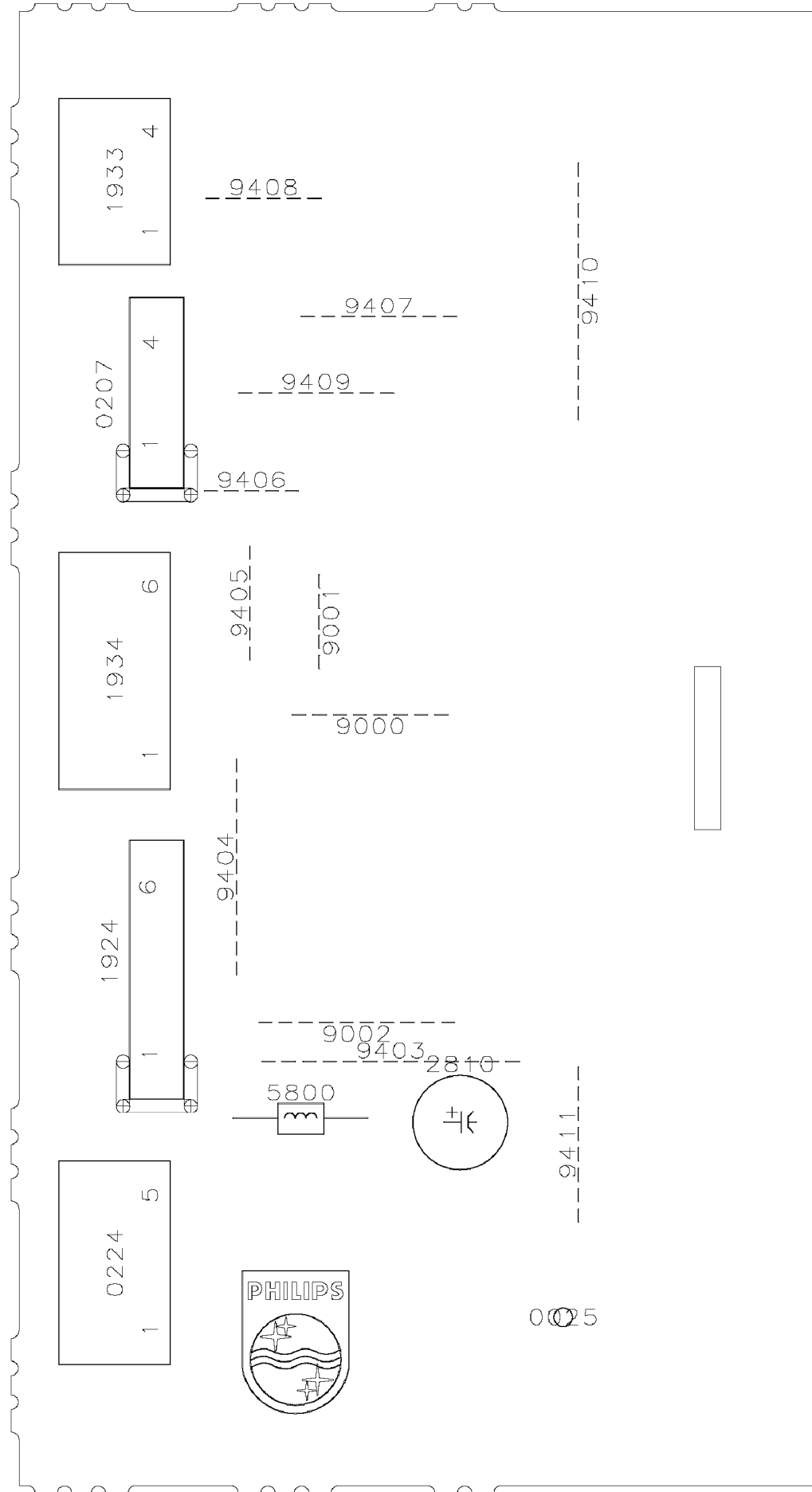


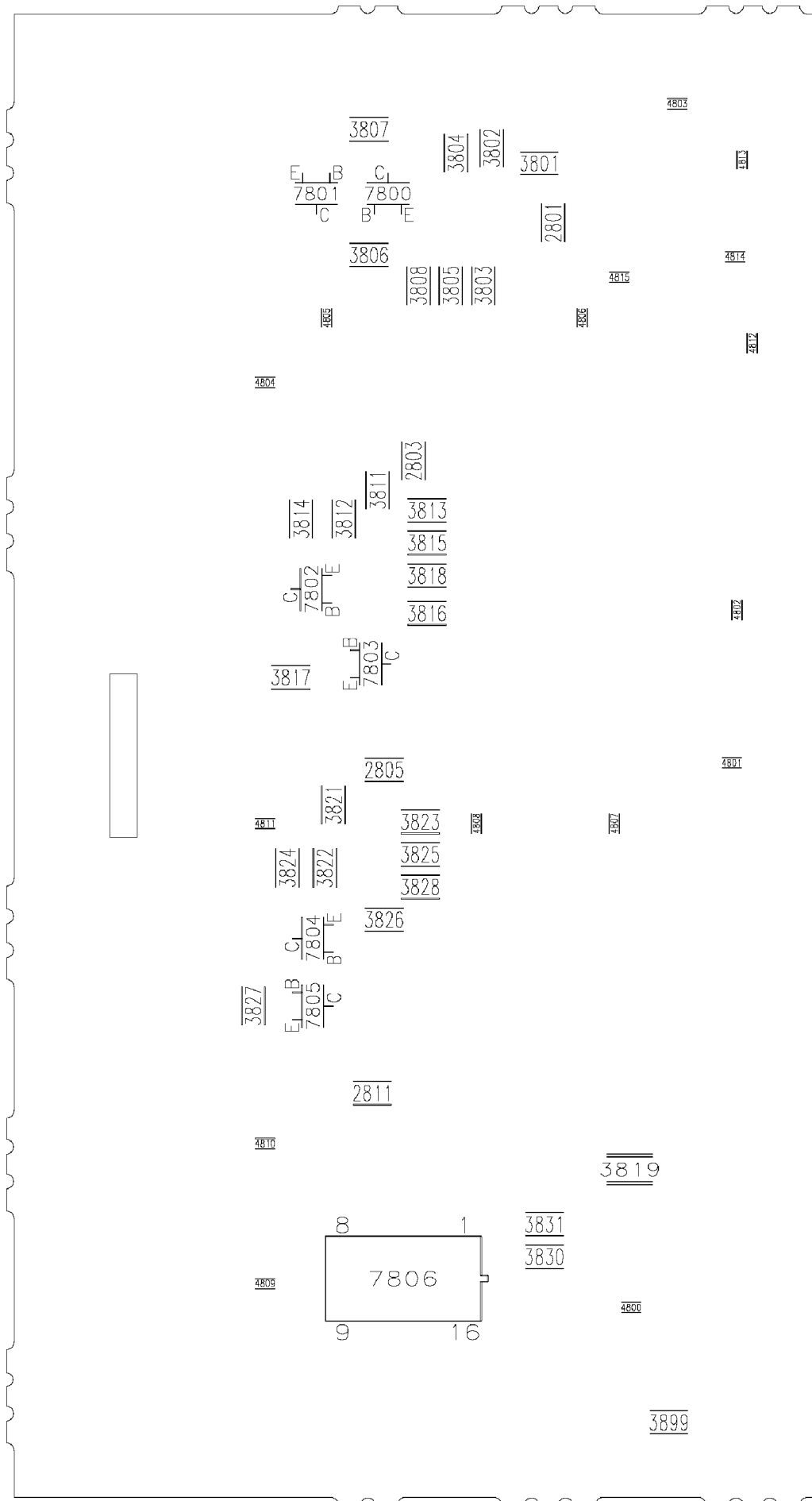


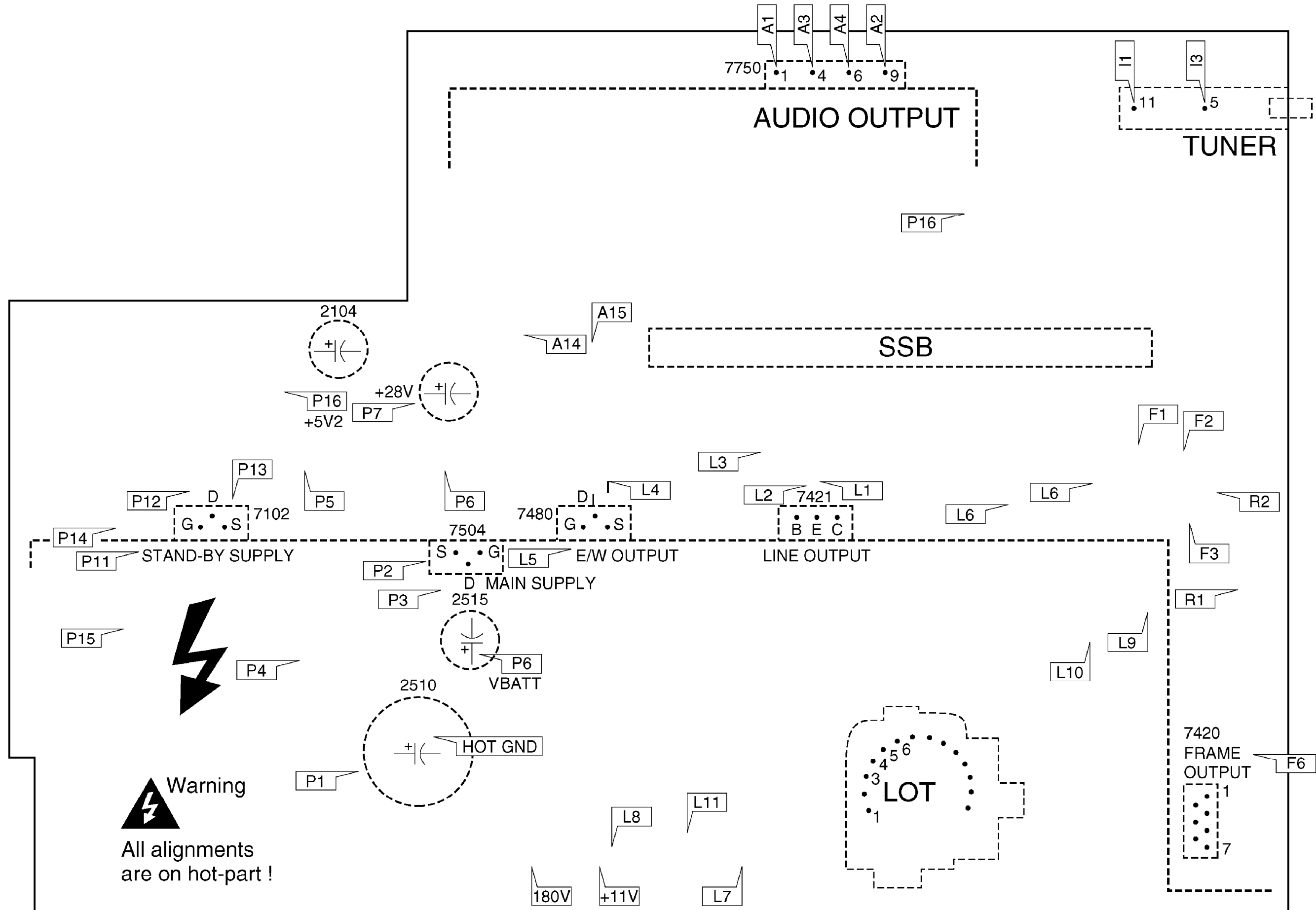






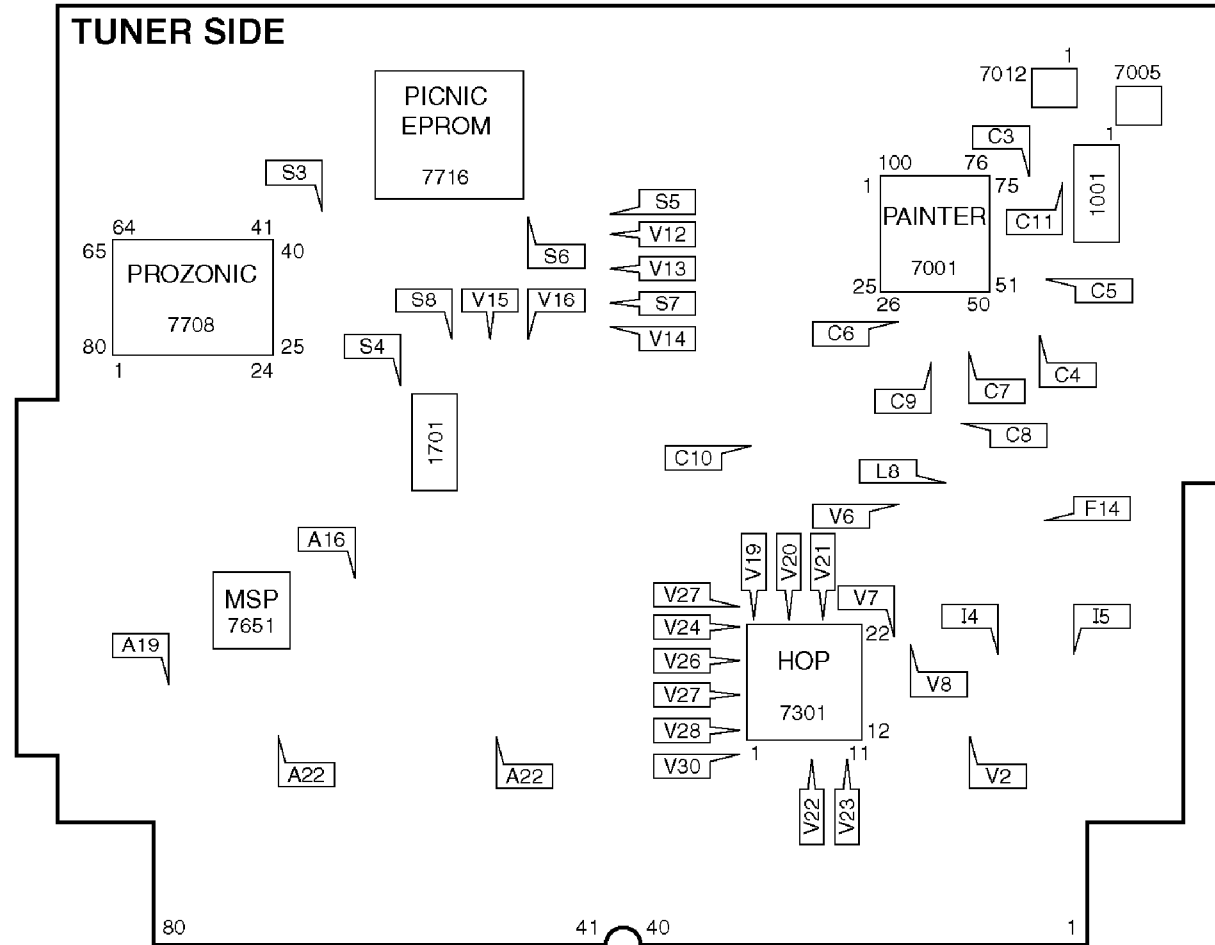




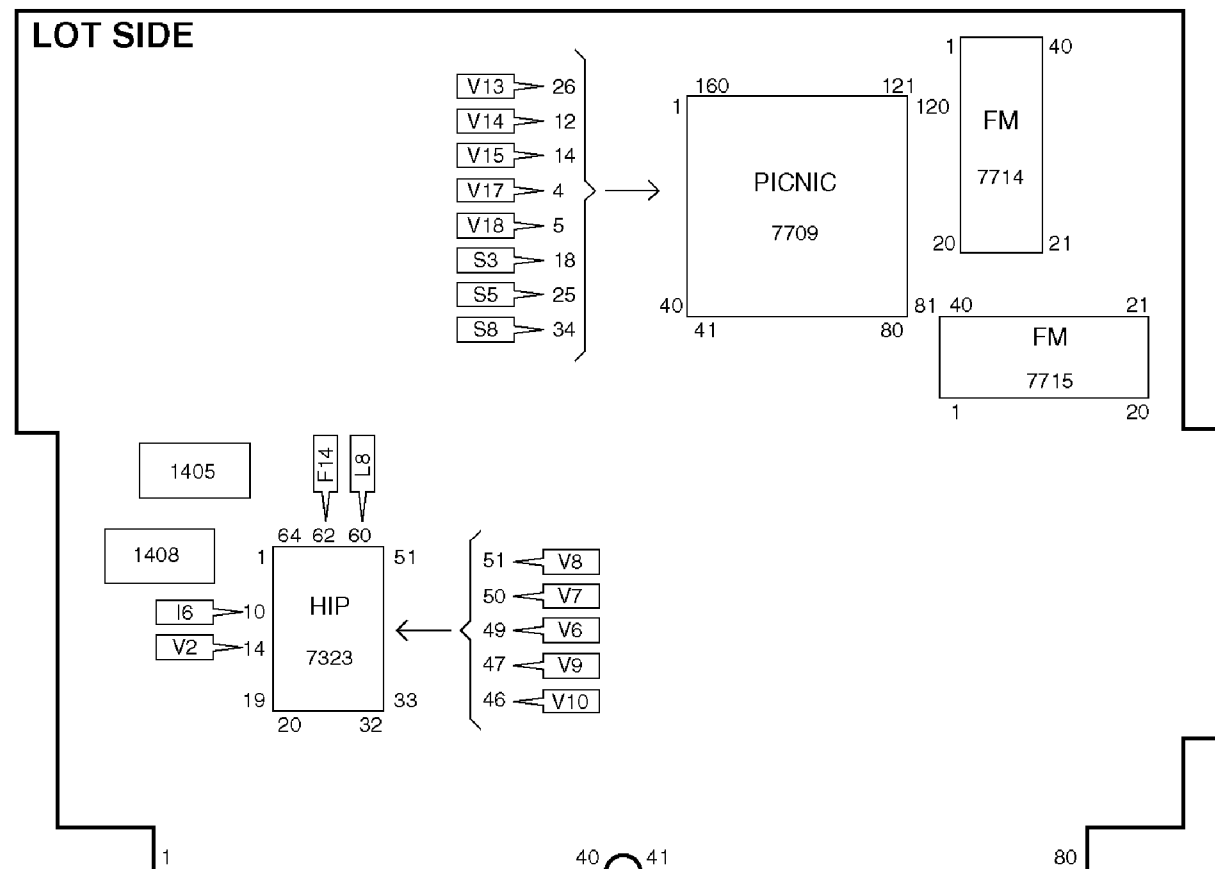


SSB

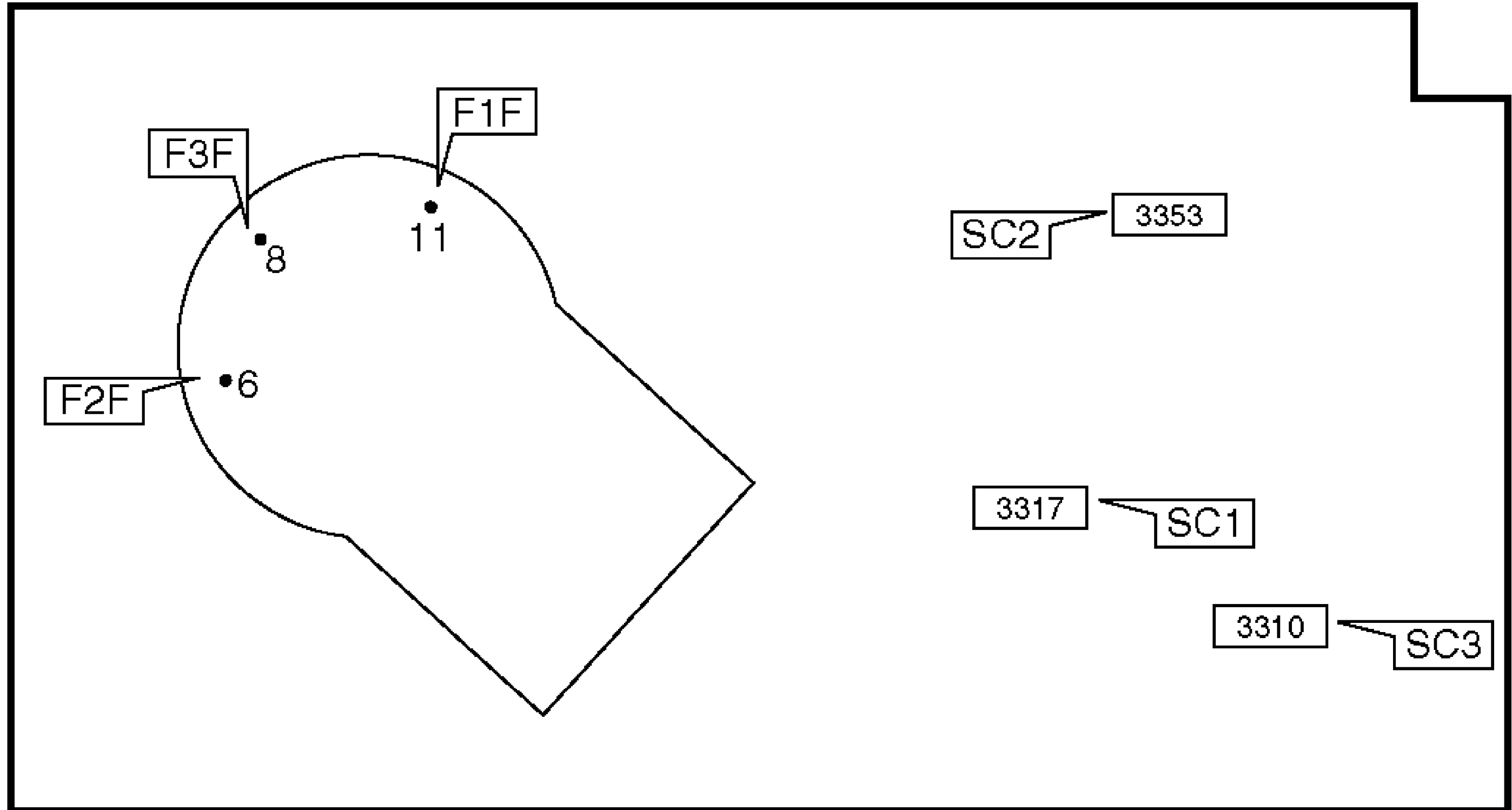
TUNER SIDE



LOT SIDE

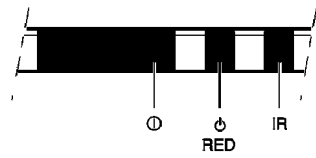


CRT PANEL (COPPER TRACK SIDE)

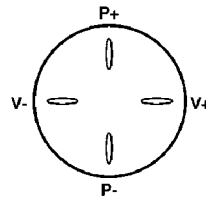


Typical Exploded View

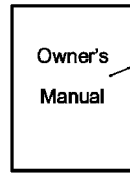
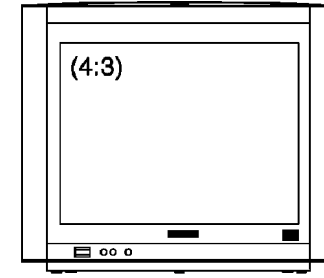
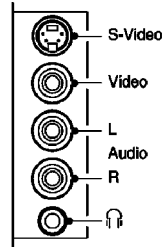
FRONT CONTROL



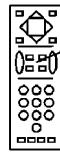
TOP CONTROL



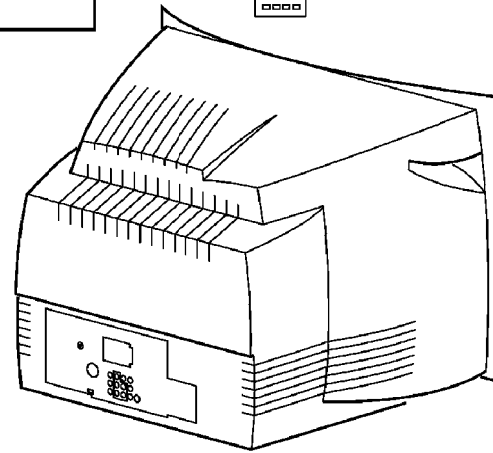
SIDE I/O



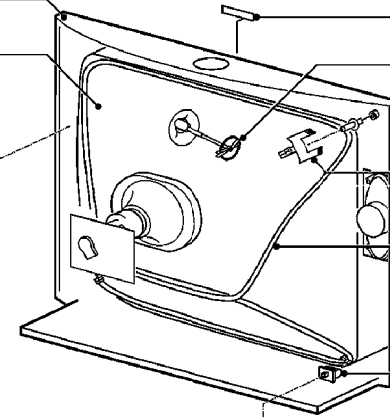
Owner's Manual AC32



REMOTE



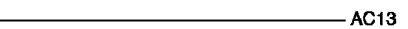
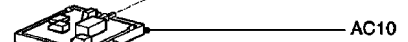
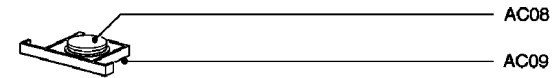
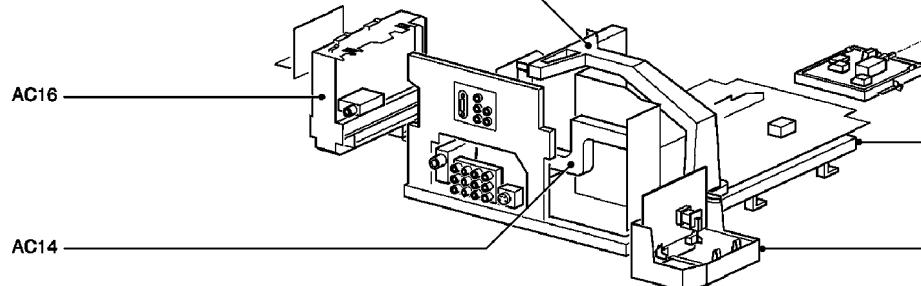
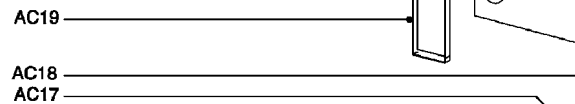
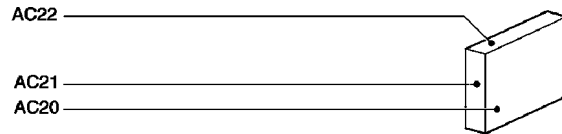
AC27
AC26
AC25
AC24



AC01
AC02
AC04
AC05
AC06
AC07

COMPONENTS NOT PICTURED

- AC29 Insulator Plate
- AC30 SSB Snap
- AC33 AC Power Cord
- AC34 Batteries for Remote Control Transmitter
- AC35 Quick Use Guide
- AC36 Cabinet Back Screw Cover
- AC37 Power Button / Control Buttons Assembly
- AC38 Cabinet Front Assembly (Shown Exploded)
- AC39 Torx Driver - T10, 7" Length
- AC40 Torx Driver - T10, 10" Length



27PT830H37C (continued)

2926	Cap, 470u, 20%, 6.3v, Electrolytic . . .	3198 025 04710	S 3501	Res, 220 ohm, 20%, 1/2W, Carbon Film . . .	3198 013 02210
2927	Cap, 47u, 20%, 50v, Electrolytic . . .	3198 025 54790	S 3502	Res, 4M7, 5%, 1/2W, Metalized Glass . . .	2322 242 13475
2928	Cap, 2u2, +80/-20%, 10v, Ceramic . . .	3198 017 22250	S 3503	Res, 4M7, 5%, 1/2W, Metalized Glass . . .	2322 242 13475
2941	Cap, 6n8, 10%, 50v, Ceramic	3198 017 06820	3504	Res, 470 ohm, 5%, 1/6W, Carbon Film . . .	3198 011 04710
2942	Cap, 6n8, 10%, 50v, Ceramic	3198 017 06820	3505	Res, 68K, 5%, 1/10W, Metalized Glass . . .	3198 021 56830
2951	Cap, 1u, 20%, 50v, Electrolytic	3198 025 51080	3506	Res, 47K, 5%, 1/10W, Metalized Glass . . .	3198 021 54730
2952	Cap, 47n, 10%, 25v, Ceramic	3198 023 04730	3507	Res, 160K, 1%, 3/5W, Metal Film	2312 915 11604
2953	Cap, 47n, 10%, 25v, Ceramic	3198 023 04730	S 3508	Res, 68K, 5%, 1W, Metal Film	3198 012 16820
3101	Res, 3M3, 5%, 1/4W, Metalized Glass . . .	2322 241 53335	S 3509	VDR, 800V	2322 595 90025
3102	Res, 680 ohm, 1%, 3/5W, Metal Film . . .	2312 915 16801	3510	Res, 2K, 1%, 1/8W, Metalized Glass . . .	2322 734 62002
3103	Res, 680 ohm, 1%, 3/5W, Metal Film . . .	2312 915 16801	3511	Res, 3K9, 5%, 1/6W, Carbon Film	3198 011 03920
3104	Res, 47 ohm, 5%, 1/6W, Carbon Film . . .	3198 011 04790	3512	Res, 68K, 5%, 1/6W, Carbon Film	3198 011 06830
3105	Res, 680 ohm, 1%, 3/5W, Metal Film . . .	2312 915 16801	3513	Res, 330K, 5%, 1W, Metal Film	2322 193 53334
3106	Res, 1K, 5%, 1/6W, Carbon Film	3198 011 01020	3514	Res, 1R2, 5%, 1W, Metal Film	2322 193 53128
3107	Res, 1K, 5%, 1/6W, Carbon Film	3198 011 01020	3515	Res, 0R68, 5%, 3/5W, Metal Film	3198 012 16870
3108	Res, 10 ohm, 5%, 1/6W, Carbon Film . . .	3198 011 01090	3517	Res, 4K7, 5%, 1/10W, Metalized Glass . . .	3198 021 54720
3109	Res, 10 ohm, 5%, 1/10W, Metalized Glass .	3198 021 51090	3518	Res, 100K, 5%, 1/6W, Carbon Film	3198 011 01040
S 3110	Res, 10 ohm, 5%, 1/3W, Metal Film	2306 204 03109	3519	Res, 22K, 5%, 1/10W, Metalized Glass . . .	3198 021 52230
3113	Res, 22 ohm, 5%, 1/6W, Carbon Film . . .	3198 011 02290	S 3520	Res, 33K, 5%, 2 1/2W, Metal Film	3198 012 33330
3114	Res, 220 ohm, 5%, 1/6W, Carbon Film . . .	3198 011 02210	S 3521	Res, 1M, 5%, 1/2W, Metalized Glass	2322 242 13105
3117	Res, 100 ohm, 5%, 1/6W, Carbon Film . . .	3198 011 01010	3522	Res, 6K8, 5%, 1/6W, Carbon Film	3198 011 06820
3118	Res, 4R7, 5%, 1/6W, Carbon Film	3198 011 04780	3523	Res, 1M, 5%, 1/10W, Metalized Glass . . .	3198 021 51050
3119	Res, 33 ohm, 5%, 1/6W, Carbon Film . . .	3198 011 03390	3524	Res, 1K, 5%, 1/10W, Metalized Glass . . .	3198 021 51020
3120	Res, 10 ohm, 5%, 1/10W, Metalized Glass .	3198 021 51090	3525	Res, 47 ohm, 5%, 1/10W, Metalized Glass .	3198 021 54790
3121	Res, 220 ohm, 5%, 1/10W, Metalized Glas	3198 021 52210	3526	Res, 0R1, 5%, 3/5W, Metal Film	3198 012 11070
3123	Res, 10 ohm, 5%, 1/6W, Carbon Film . . .	3198 011 01090	3527	Res, 820 ohm, 1%, 1/8W, Metalized Glass .	2322 734 68201
3124	Res, 68 ohm, 5%, 1/6W, Carbon Film . . .	3198 011 06890	3528	Res, 10K, 5%, 1/10W, Metalized Glass . . .	3198 021 51030
3125	Res, 15 ohm, 5%, 1/6W, Carbon Film . . .	3198 011 01590	3529	Res, 680 ohm, 5%, 1/10W, Metalized Glas	3198 021 56810
3126	Res, 10K, 5%, 1/6W, Carbon Film	3198 011 01030	3530	Res, 68K, 5%, 1/6W, Carbon Film	3198 011 06830
3127	Res, 5K6, 5%, 1/6W, Carbon Film	3198 011 05620	3531	Res, 10K, 5%, 1/10W, Metalized Glass . . .	3198 021 51030
3130	Res, 47 ohm, 5%, 1/6W, Carbon Film . . .	3198 011 04790	S 3532	Res, PTC, 3R5, Degaussing	2322 662 96757
3148	Res, 270 ohm, 5%, 1/10W, Metalized Glas	3198 021 52710	3533	Res, 15 ohm, 5%, 1/10W, Metalized Glass .	3198 021 51590
3200	Res, 100 ohm, 5%, 1/10W, Metalized Glas	3198 021 51010	3535	Res, 27K, 5%, 1/10W, Metalized Glass . . .	3198 021 52730
3201	Res, 100 ohm, 5%, 1/10W, Metalized Glas	3198 021 51010	3536	Res, 680K, 5%, 1/10W, Metalized Glass . . .	3198 021 56840
3202	Res, 1K, 5%, 1/6W, Carbon Film	3198 011 01020	3537	Res, 22K, 5%, 1/10W, Metalized Glass . . .	3198 021 52230
3203	Res, 1K, 5%, 1/10W, Metalized Glass . . .	3198 021 51020	3540	Res, 47K, 5%, 1/10W, Metalized Glass . . .	3198 021 54730
S 3230	Res, 22K, 5%, 1 1/3W, Metal Film	3198 012 22230	3541	Res, 2K2, 5%, 1/10W, Metalized Glass . . .	3198 021 52220
3237	Wire Jumper	3198 036 90010	3542	Res, 0R15, 5%, 3/5W, Metal Film	3198 012 11570
3402	Res, 100K, 5%, 1/10W, Metalized Glass . .	3198 021 51040	3543	Res, 270 ohm, 5%, 1/10W, Metalized Glas	3198 021 52710
3403	Res, 100 ohm, 5%, 1/10W, Metalized Glas	3198 021 51010	3544	Res, 47 ohm, 5%, 1/10W, Metalized Glass .	3198 021 54790
3404	Res, 470 ohm, 5%, 1/10W, Metalized Glas	3198 021 54710	3545	Res, 470 ohm, 5%, 1/10W, Metalized Glas	3198 021 54710
3406	Res, 100 ohm, 5%, 1/10W, Metalized Glas	3198 021 51010	3550	Res, 220 ohm, 20%, 1/2W, Carbon Film . . .	3198 013 02210
3407	Res, 10K, 5%, 1/10W, Metalized Glass . . .	3198 021 51030	3600	Res, 470K, 1%, 3/5W, Metal Film	2312 915 14704
3408	Res, 270 ohm, 5%, 1/10W, Metalized Glas	3198 021 52710	3601	Res, 470K, 1%, 3/5W, Metal Film	2312 915 14704
3409	Res, 1K, 5%, 1/6W, Carbon Film	3198 011 01020	3602	Res, 8K2, 5%, 1/10W, Metalized Glass . . .	3198 021 58220
3410	Res, 47 ohm, 5%, 1/10W, Metalized Glass .	3198 021 54790	3603	Trim Pot, 470 ohm	2120 368 90118
3411	Res, 39 ohm, 5%, 1/4W, Carbon Film	2120 101 74399	3604	Res, 470 ohm, 5%, 1/10W, Metalized Glas	3198 021 54710
3414	Res, 330 ohm, 5%, 1/10W, Metalized Glas	3198 021 53310	3605	Res, 27K, 5%, 1/10W, Metalized Glass . . .	3198 021 52730
S 3415	Res, 15 ohm, 5%, 2 1/2W, Metal Film . . .	3198 012 31590	3606	Res, 1K, 5%, 1/10W, Metalized Glass . . .	3198 021 51020
3417	Res, 10 ohm, 5%, 1/6W, Carbon Film	3198 011 01090	3607	Res, 22K, 5%, 1/10W, Metalized Glass . . .	3198 021 52230
3418	Res, 33K, 1%, 3/5W, Metal Film	2312 915 13303	3608	Res, 22K, 5%, 1/10W, Metalized Glass . . .	3198 021 52230
S 3431	Res, 330 ohm, 5%, 1/3W, Metal Film	2306 204 03331	3609	Trim Pot, 22k	2120 368 90124
S 3436	Res, 22K, 5%, 1 1/3W, Metal Film	3198 012 22230	3610	Res, 22K, 5%, 1/10W, Metalized Glass . . .	3198 021 52230
3450	Res, 12K, 5%, 1/6W, Carbon Film	3198 011 01230	3612	Res, 270K, 5%, 1/8W, Metalized Glass . . .	2322 730 61274
3451	Res, 8K2, 5%, 1/6W, Carbon Film	3198 011 08220	3613	Res, 270K, 5%, 1/8W, Metalized Glass . . .	2322 730 61274
3452	Res, 100 ohm, 5%, 1/10W, Metalized Glas	3198 021 51010	3614	Res, 150K, 1%, 3/5W, Metal Film	2312 915 11504
3454	Res, 2K7, 5%, 1/10W, Metalized Glass . . .	3198 021 52720	3615	Res, 560K, 5%, 1/4W, Carbon Film	2120 101 74564
3455	Res, Zero ohm, "Chip" Jumper	3198 021 90020	3616	Res, 470K, 5%, 1/6W, Carbon Film	3198 011 04740
3458	Res, 470 ohm, 5%, 1/10W, Metalized Glas	3198 021 54710	3617	Res, 1K, 5%, 1/6W, Carbon Film	3198 011 01020
S 3459	Res, 1R5, 5%, 1/2W, Metal Film	2306 207 03158	3618	Res, 1K, 5%, 1/10W, Metalized Glass . . .	3198 021 51020
S 3460	Res, 1R5, 5%, 1/2W, Metal Film	2306 207 03158	3619	Res, 5K6, 5%, 1/10W, Metalized Glass . . .	3198 021 55620
S 3461	Res, 1R5, 5%, 1/2W, Metal Film	2306 207 03158	3620	Res, 1 ohm, 5%, 1/6W, Carbon Film	3198 011 01080
S 3462	Res, 1 ohm, 5%, 1/2W, Metal Film	2306 207 03108	3621	Res, 1 ohm, 5%, 1/6W, Carbon Film	3198 011 01080
S 3463	Res, 1 ohm, 5%, 1/2W, Metal Film	2306 207 03108	3622	Res, 1 ohm, 5%, 1/6W, Carbon Film	3198 011 01080
S 3464	Res, 1 ohm, 5%, 1/2W, Metal Film	2306 207 03108	3623	Res, 22K, 5%, 1/10W, Metalized Glass . . .	3198 021 52230
S 3465	Res, 1 ohm, 5%, 1/2W, Metal Film	2306 207 03108	S 3624	Res, 1R5, 5%, 1/3W, Metal Film	2306 204 03158
S 3466	Res, 2R2, 5%, 1/3W, Metal Film	2306 204 03228	3625	Res, 220 ohm, 5%, 1/6W, Carbon Film . . .	3198 011 02210
S 3467	Res, 2R2, 5%, 1/3W, Metal Film	2306 204 03228	3626	Res, 220 ohm, 5%, 1/6W, Carbon Film . . .	3198 011 02210
S 3468	Res, 6R8, 5%, 1/2W, Metal Film	2306 207 03688	3627	Res, 12K, 5%, 1/6W, Carbon Film	3198 011 01230
3470	Res, 4K7, 5%, 1/10W, Metalized Glass . . .	3198 021 54720	3628	Res, 3R3, 5%, 1/4W, Carbon Film	2120 101 74338
3471	Res, 6K8, 5%, 1/10W, Metalized Glass . . .	3198 021 56820	3630	Res, 1K, 5%, 1/10W, Metalized Glass . . .	3198 021 51020
3472	Res, 39K, 5%, 1/10W, Metalized Glass . . .	3198 021 53930	3631	Res, 4K7, 5%, 1/10W, Metalized Glass . . .	3198 021 54720
3473	Res, 47K, 5%, 1/10W, Metalized Glass . . .	3198 021 54730	3632	Res, 10K, 5%, 1/10W, Metalized Glass . . .	3198 021 51030
3474	Res, 10K, 5%, 1/10W, Metalized Glass . . .	3198 021 51030	3633	Res, 150K, 5%, 1/10W, Metalized Glass . . .	3198 021 51540
3475	Res, 100 ohm, 5%, 1/6W, Carbon Film . . .	3198 011 01010	3635	Res, 1K5, 5%, 1/10W, Metalized Glass . . .	3198 021 51520
3476	Res, 220K, 5%, 1/6W, Carbon Film	3198 011 02240	3636	Res, 330K, 5%, 1/10W, Metalized Glass . . .	3198 021 53340
3477	Res, 10K, 5%, 1/10W, Metalized Glass . . .	3198 021 51030	3639	Res, 470K, 5%, 1/10W, Metalized Glass . . .	3198 021 54740
3478	Res, 220 ohm, 5%, 1/10W, Metalized Glas	3198 021 52210	3640	Res, 22K, 5%, 1/6W, Carbon Film	3198 011 02230
S 3479	Res, 100 ohm, 5%, 1 1/3W, Metal Film . . .	3198 012 21010	3641	Res, 10K, 5%, 1/10W, Metalized Glass . . .	3198 021 51030
3481	Res, 100 ohm, 5%, 1/6W, Carbon Film . . .	3198 011 01010	3642	Res, 10K, 5%, 1/10W, Metalized Glass . . .	3198 021 51030
3484	Res, 1K, 5%, 1/10W, Metalized Glass . . .	3198 021 51020	3643	Res, 33K, 5%, 1/10W, Metalized Glass . . .	3198 021 53330
3485	Res, 1K, 5%, 1/10W, Metalized Glass . . .	3198 021 51020	3644	Res, 10K, 5%, 1/10W, Metalized Glass . . .	3198 021 51030
3486	Res, 4K7, 5%, 1/10W, Metalized Glass . . .	3198 021 54720	3645	Res, 330K, 5%, 1/6W, Carbon Film	3198 011 03340
3487	Res, 22K, 5%, 1/10W, Metalized Glass . . .	3198 021 52230	3652	Res, 100 ohm, 5%, 1/10W, Metalized Glas	3198 021 51010
3489	Res, 2K2, 5%, 1/10W, Metalized Glass . . .	3198 021 52220	3653	Res, 4K7, 5%, 1/10W, Metalized Glass . . .	3198 021 54720
3490	Res, 22K, 5%, 1/10W, Metalized Glass . . .	3198 021 52230	3654	Res, 1K, 5%, 1/10W, Metalized Glass . . .	3198 021 51020
3495	Res, 33K, 1%, 3/5W, Metal Film	2312 915 13303	3654	LED	
3496	Res, 1K, 5%, 1/6W, Carbon Film	3198 011 01020	3654	LED	
3497	Res, 100 ohm, 5%, 1/10W, Metalized Glas	3198 021 51010	3661	Res, 1K, 5%, 1/10W, Metalized Glass . . .	3198 021 51020
3498	Res, 1K, 5%, 1/10W, Metalized Glass . . .	3198 021 51020	3663	Res, 10K, 5%, 1/10W, Metalized Glass . . .	3198 021 51030
3499	Res, 100 ohm, 5%, 1/10W, Metalized Glas	3198 021 51010	3701	Res, 10K, 5%, 1/10W, Metalized Glass . . .	3198 021 51030
S 3500	Res, 0R47, 10%, 7W, Wire Wound	2322 252 41477	3702	Res, 10K, 5%, 1/10W, Metalized Glass . . .	3198 021 51030

S = Safety Part Be sure to use exact replacement part.

27PT830H37C (continued)

6422	Diode, Rect, BY229X-600	9340 380 20127	7730	Transistor, NPN, BC847B(COL)	3198 010 42030
6436	Diode, Rect, BYD33J	9337 234 20133	7731	Transistor, PNP, BC857B(COL)	3198 010 42150
6437	Diode, Rect, BYD33J	9337 234 20133	7732	Transistor, NPN, BC847B(COL)	3198 010 42030
6442	Zener Diode, 15 volt	3198 020 51590	7750	IC, TDA2616.	9350 403 20112
6451	Diode, BAS316.	3198 010 10630	7901	Transistor, NPN, BC547B(COL)	3198 020 40030
6452	Diode, BAS316.	3198 010 10630	7902	Transistor, NPN, BC337-25(COL)	3198 020 43530
6453	Diode, BAS316.	3198 010 10630	7905	Transistor, NPN, BC368	9332 592 40126
6454	Zener Diode, 33 volt	9340 548 71115	7906	IC, L4940V85	9322 005 46687
6456	Zener Diode, 33 volt	9340 548 71115	7907	Transistor, NPN, BC847B(COL)	3198 010 42030
6461	Diode, Rect, BYV29X-500	9340 555 59127	7908	Transistor, PNP, BC857B(COL)	3198 010 42150
6463	Diode, Rect, BYV29X-500	9340 555 59127	7909	Transistor, PNP, BC857B(COL)	3198 010 42150
6465	Diode, Rect, BYV29X-500	9340 555 59127	8203	Cable, 4 Pin, 340mm.	3104 311 05481
6466	Diode, Rect, BYV29X-500	9340 555 59127	8204	Cable, 6 Pin, 220mm.	3104 311 05471
6468	Diode, Rect, BYD33D	9337 234 00133	8317	Cable, 2 Pin, 340mm.	3104 311 01431
6480	Diode, Rect, BYD33D	9337 234 00133	8324	Cable, 7 Pin, 560mm.	3104 311 05411
6481	Zener Diode, 18 volt	3198 010 21890	8340	Cable, 11 Pin 480mm.	3104 311 05431
6482	Diode, BAS316.	3198 010 10630	8392	Cable, 3 Pin, 220mm.	3104 311 04171
6492	Diode, BAS316.	3198 010 10630	8924	Cable, 5 Pin, 280mm.	3104 311 02511
6493	Zener Diode, 47 volt	9340 389 00115	8936	Cable, 11 Pin, 680mm	3104 311 05421
6499	Zener Diode, 8.2 volt.	3198 020 58280	8951	Cable, 5 Pin, 340mm.	3104 311 03491
6505	Zener Diode, 15 volt	3198 010 21590	9101	Wire Jumper.	3198 036 90010
6506	Diode, 1N4148.	3198 010 10010	9102	Wire Jumper.	3198 036 90010
6507	Diode, Rect, BYV28-200/24	9340 550 66112	9113	Wire Jumper.	3198 036 90010
6508	Diode, Rect, BYV28-400/20	9340 549 39112	9203	Wire Jumper.	3198 036 90010
6510	Zener Diode, 15 volt	3198 010 51590	9204	Wire Jumper.	3198 036 90010
6511	Diode, BAS316.	3198 010 10630	9206	Wire Jumper.	3198 036 90010
6512	Diode, BAS316.	3198 010 10630	9210	Wire Jumper.	3198 036 90010
6513	Diode, Bridge Rect, REC GBU4K.	3198 010 10640	9212	Wire Jumper.	3198 036 90010
6514	Zener Diode, 200 volt.	9336 018 20133	9217	Wire Jumper.	3198 036 90010
6515	Zener Diode, 5.6 volt.	9335 005 90133	9219	Wire Jumper.	3198 036 90010
6516	Diode, BAS316.	3198 010 10630	9221	Wire Jumper.	3198 036 90010
6517	Diode, BAT85	9336 247 60133	9222	Wire Jumper.	3198 036 90010
6518	Diode, BAS316.	3198 010 10630	9224	Wire Jumper.	3198 036 90010
6519	Diode, Rect, BYD33D	9337 234 00133	9226	Wire Jumper.	3198 036 90010
6600	Diode, 1N4148.	3198 010 10010	9228	Wire Jumper.	3198 036 90010
6616	Diode, BAS316.	3198 010 10630	9229	Wire Jumper.	3198 036 90010
6619	Diode, Rect, BYD33D	9337 234 00133	9230	Wire Jumper.	3198 036 90010
6620	Diode, Rect, BYV27-200.	9322 126 72673	9231	Wire Jumper.	3198 036 90010
6623	Diode, BAS316.	3198 010 10630	9232	Wire Jumper.	3198 036 90010
6636	Diode, BAS316.	3198 010 10630	9302	Wire Jumper.	3198 036 90010
6660	Diode, BAT85	9336 247 60133	9401	Wire Jumper.	3198 036 90010
6665	Diode, BAS316.	3198 010 10630	9402	Wire Jumper.	3198 036 90010
6731	Diode, BAS316.	3198 010 10630	9403	Wire Jumper.	3198 036 90010
6732	Diode, BAS316.	3198 010 10630	9404	Wire Jumper.	3198 036 90010
6900	Diode, BAS316.	3198 010 10630	9405	Wire Jumper.	3198 036 90010
6901	Diode, 1PS76SB10	9340 453 90115	9406	Wire Jumper.	3198 036 90010
6902	Diode, 1PS76SB10	9340 453 90115	9407	Wire Jumper.	3198 036 90010
6903	Diode, 1PS76SB10	9340 453 90115	9412	Wire Jumper.	3198 036 90010
6904	Diode, 1N4148.	3198 010 10010	9414	Wire Jumper.	3198 036 90010
7100	Transistor, PNP, BC557B(COL)	3198 020 40110	9418	Wire Jumper.	3198 036 90010
7101	Transistor, NPN, BC547B(COL)	3198 020 40030	9419	Wire Jumper.	3198 036 90010
7102	Power FET, STP3NB60FP.	9322 129 71687	9421	Wire Jumper.	3198 036 90010
7103	Optical Coupler, TCET1103G	9322 140 14667	9423	Wire Jumper.	3198 036 90010
S 7104	Optical Coupler, TCDT1102G	9319 002 76682	9424	Wire Jumper.	3198 036 90010
7228	Transistor, NPN, PMBT2369(UAW)	3198 010 43360	9425	Wire Jumper.	3198 036 90010
7407	Transistor, NPN, BC847B(COL)	3198 010 42030	9428	Wire Jumper.	3198 036 90010
7408	Transistor, NPN, BC368	9332 592 40126	9429	Wire Jumper.	3198 036 90010
7409	Transistor, NPN, BC847B(COL)	3198 010 42030	9430	Wire Jumper.	3198 036 90010
7421	Transistor, POW, BU2520DX.	9340 210 30127	9431	Wire Jumper.	3198 036 90010
7440	IC, LM358N	9339 848 90682	9435	Wire Jumper.	3198 036 90010
7452	Transistor, NPN, BC847B(COL)	3198 010 42030	9436	Wire Jumper.	3198 036 90010
7480	Power FET, STP3NB60FP.	9322 129 71687	9505	Wire Jumper.	3198 036 90010
7481	Transistor, PNP, BC557B(COL)	3198 020 40110	9510	Wire Jumper.	3198 036 90010
S 7482	Optical Coupler, TCDT1102G	9319 002 76682	9512	Wire Jumper.	3198 036 90010
7501	Transistor, PNP, BC857B(COL)	3198 010 42150	9513	Wire Jumper.	3198 036 90010
7502	Transistor, NPN, BF487	9337 626 60126	9515	Wire Jumper.	3198 036 90010
7504	Power FET, STP5NB40FP.	9322 136 37687	9516	Wire Jumper.	3198 036 90010
7505	Transistor, PNP, BC857B(COL)	3198 010 42150	9518	Wire Jumper.	3198 036 90010
7506	IC TL431ACZ-AP S (ST00) A	9322 086 97676	9519	Wire Jumper.	3198 036 90010
7510	Transistor, NPN, BC847B(COL)	3198 010 42030	9520	Wire Jumper.	3198 036 90010
7528	Transistor, NPN, BC337-25(COL)	3198 020 43530	9523	Wire Jumper.	3198 036 90010
7529	Transistor, NPN, BC847B(COL)	3198 010 42030	9524	Wire Jumper.	3198 036 90010
7600	Transistor, NPN, BC546B.	9332 377 80126	9525	Wire Jumper.	3198 036 90010
7602	Transistor, NPN, BC847B(COL)	3198 010 42030	9528	Wire Jumper.	3198 036 90010
7603	Transistor, PNP, BC857B(COL)	3198 010 42150	9622	Wire Jumper.	3198 036 90010
7605	Transistor, NPN, BC847B(COL)	3198 010 42030	9623	Wire Jumper.	3198 036 90010
7606	Transistor, NPN, BC847B(COL)	3198 010 42030	9705	Wire Jumper.	3198 036 90010
S 7610	Optical Coupler, TCDT1102G	9319 002 76682	9706	Wire Jumper.	3198 036 90010
7620	IC, TDA8177.	9322 066 43687	9707	Wire Jumper.	3198 036 90010
7640	Transistor, NPN, BC847B(COL)	3198 010 42030	9712	Wire Jumper.	3198 036 90010
7641	Transistor, NPN, BC847B(COL)	3198 010 42030	9713	Wire Jumper.	3198 036 90010
7652	Transistor, NPN, BC847B(COL)	3198 010 42030	9714	Wire Jumper.	3198 036 90010
7653	Transistor, NPN, BC847B(COL)	3198 010 42030	9715	Wire Jumper.	3198 036 90010
7654	Transistor, PNP, BC857B(COL)	3198 010 42150	9718	Wire Jumper.	3198 036 90010
7655	Transistor, NPN, BC847B(COL)	3198 010 42030	9720	Wire Jumper.	3198 036 90010
7702	Transistor, NPN, BC847B(COL)	3198 010 42030	9721	Wire Jumper.	3198 036 90010
7720	Transistor, NPN, BC847B(COL)	3198 010 42030	9723	Wire Jumper.	3198 036 90010
7721	Transistor, NPN, BC847B(COL)	3198 010 42030	9724	Wire Jumper.	3198 036 90010
7722	Transistor, PNP, BC857B(COL)	3198 010 42150	9726	Wire Jumper.	3198 036 90010
7723	Transistor, PNP, BC857B(COL)	3198 010 42150	9901	Wire Jumper.	3198 036 90010
7724	Transistor, NPN, BC847B(COL)	3198 010 42030	9902	Wire Jumper.	3198 036 90010
7725	Transistor, NPN, BC847B(COL)	3198 010 42030	9903	Wire Jumper.	3198 036 90010

S = Safety Part Be sure to use exact replacement part.

27PT830H37C (continued)

3791	Resistor Network, 4 X 100 ohm, 5% . . .	3198 031 11010	4951	Res, Zero ohm, "Chip" Jumper	3198 021 90030
3792	Resistor Network, 4 X 100 ohm, 5% . . .	3198 031 11010	4952	Res, Zero ohm, "Chip" Jumper	3198 021 90030
3793	Resistor Network, 4 X 100 ohm, 5% . . .	3198 031 11010	4953	Res, Zero ohm, "Chip" Jumper	3198 021 90030
3794	Resistor Network, 4 X 100 ohm, 5% . . .	3198 031 11010	4954	Res, Zero ohm, "Chip" Jumper	3198 021 90030
3795	Resistor Network, 4 X 100 ohm, 5% . . .	3198 031 11010	5301	Coil, 6u8.	3198 018 36880
3796	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 021 31010	5302	Coil, 6u8.	3198 018 36880
3797	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 021 31010	5303	Res, Zero ohm, "Chip" Jumper	3198 021 90030
3900	Inductor, 100MHz, 600 ohm.	3198 018 90040	5304	Res, Zero ohm, "Chip" Jumper	3198 021 90030
3901	Inductor, 100MHz, 600 ohm.	3198 018 90040	5305	Res, Zero ohm, "Chip" Jumper	3198 021 90030
3902	Inductor, 100MHz, 600 ohm.	3198 018 90040	5306	Res, Zero ohm, "Chip" Jumper	3198 021 90030
3903	Inductor, 100MHz, 600 ohm.	3198 018 90040	5307	Res, Zero ohm, "Chip" Jumper	3198 021 90030
3904	Inductor, 100MHz, 600 ohm.	3198 018 90040	5308	Res, Zero ohm, "Chip" Jumper	3198 021 90030
3905	Inductor, 100MHz, 600 ohm.	3198 018 90040	5309	Res, Zero ohm, "Chip" Jumper	3198 021 90030
3906	Inductor, 100MHz, 600 ohm.	3198 018 90040	5401	Coil, 390n	3198 018 33970
3907	Inductor, 100MHz, 600 ohm.	3198 018 90040	5406	Coil, 15u.	3198 018 31590
3908	Inductor, 100MHz, 600 ohm.	3198 018 90040	5407	Ferrite Bead, 100MHz	2422 535 95427
3909	Inductor, 100MHz, 600 ohm.	3198 018 90040	5408	Variable Coil.	2422 549 44875
3910	Inductor, 100MHz, 600 ohm.	3198 018 90040	5409	Ferrite Bead, 100MHz	2422 535 95427
3911	Inductor, 100MHz, 600 ohm.	3198 018 90040	5410	Coil, lu	3198 018 51080
4302	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5412	Res, Zero ohm, "Chip" Jumper	3198 021 90030
4303	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5413	Res, Zero ohm, "Chip" Jumper	3198 021 90030
4304	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5414	Res, Zero ohm, "Chip" Jumper	3198 021 90030
4322	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5651	Ferrite Bead, 100MHz	2422 549 43769
4326	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5652	Ferrite Bead, 100MHz	2422 549 43769
4369	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5653	Ferrite Bead, 100MHz	2422 549 43769
4401	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5654	Inductor, 100MHz, 30 ohm	3198 018 90060
4406	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5656	Coil, 6u8.	3198 018 36880
4407	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5663	Res, Zero ohm, "Chip" Jumper	3198 021 90030
4409	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5664	Inductor, 100MHz, 30 ohm	3198 018 90060
4520	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5665	Inductor, 100MHz, 30 ohm	3198 018 90060
4522	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5701	Inductor, 100MHz, 600 ohm.	3198 018 90080
4603	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5702	Ferrite Bead, 100MHz	2422 535 95427
4604	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5703	Inductor, 100MHz, 30 ohm	3198 018 90060
4607	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5705	Ferrite Bead, 100MHz	2422 535 95427
4608	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5706	Coil, 5u6.	3198 018 35680
4609	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5707	Inductor, 100MHz, 600 ohm.	3198 018 90040
4610	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5711	Inductor, 100MHz, 600 ohm.	3198 018 90040
4611	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5713	Inductor, 100MHz, 600 ohm.	3198 018 90040
4613	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5718	Coil, 330n	3198 018 33370
4632	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5720	Inductor, 100MHz, 600 ohm.	3198 018 90040
4633	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5798	Inductor, 100MHz, 30 ohm	3198 018 90060
4642	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5799	Inductor, 100MHz, 30 ohm	3198 018 90060
4645	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5900	Inductor, 100MHz, 30 ohm	3198 018 90060
4652	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5901	Inductor, 100MHz, 30 ohm	3198 018 90060
4682	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5902	Inductor, 100MHz, 30 ohm	3198 018 90060
4683	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5903	Inductor, 100MHz, 30 ohm	3198 018 90060
4684	Res, Zero ohm, "Chip" Jumper	3198 021 90030	5904	Inductor, 100MHz, 30 ohm	3198 018 90060
4685	Res, Zero ohm, "Chip" Jumper	3198 021 90030	6003	Diode, BAS316.	3198 010 10630
4686	Res, Zero ohm, "Chip" Jumper	3198 021 90030	6303	Zener Diode, 47 volt	9322 150 18685
4687	Res, Zero ohm, "Chip" Jumper	3198 021 90030	6304	Diode, MCL4148	9322 128 15685
4688	Res, Zero ohm, "Chip" Jumper	3198 021 90030	6306	Zener Diode, 5.6 volt.	3198 020 55680
4689	Res, Zero ohm, "Chip" Jumper	3198 021 90030	6307	Diode, 1PS76SB10	9340 453 90115
4712	Res, Zero ohm, "Chip" Jumper	3198 021 90030	6309	Diode, MCL4148	9322 128 15685
4713	Res, Zero ohm, "Chip" Jumper	3198 021 90030	6310	Zener Diode, 6.8 volt.	3198 020 56880
4714	Res, Zero ohm, "Chip" Jumper	3198 021 90030	6311	Zener Diode, 22 volt	3198 020 52290
4715	Res, Zero ohm, "Chip" Jumper	3198 021 90030	6312	Diode, MCL4148	9322 128 15685
4716	Res, Zero ohm, "Chip" Jumper	3198 021 90030	6313	Zener Diode, 22 volt	3198 020 52290
4717	Res, Zero ohm, "Chip" Jumper	3198 021 90030	6314	Diode, MCL4148	9322 128 15685
4723	Res, Zero ohm, "Chip" Jumper	3198 021 90030	6315	Diode, MCL4148	9322 128 15685
4724	Res, Zero ohm, "Chip" Jumper	3198 021 90030	6316	Diode, MCL4148	9322 128 15685
4726	Res, Zero ohm, "Chip" Jumper	3198 021 90030	6317	Diode, MCL4148	9322 128 15685
4732	Res, Zero ohm, "Chip" Jumper	3198 021 90030	6319	Diode, MCL4148	9322 128 15685
4734	Res, Zero ohm, "Chip" Jumper	3198 021 90030	6652	Zener Diode, 10 volt	3198 020 51090
4792	Res, Zero ohm, "Chip" Jumper	3198 021 90030	6654	Diode, BAS316.	3198 010 10630
4793	Res, Zero ohm, "Chip" Jumper	3198 021 90030	6657	Zener Diode, 2.7 volt.	9340 548 43115
4901	Res, Zero ohm, "Chip" Jumper	3198 021 90030	6658	Diode, BAS316.	3198 010 10630
4902	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7001	IC, SAA5677/HL/M1.	9352 692 99557
4903	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7002	Transistor, PNP, BC857B(COL)	3198 010 42150
4904	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7003	Transistor, NPN, BC847BW(COL)	3198 010 42310
4905	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7004	Transistor, NPN, BC847BW(COL)	3198 010 42310
4906	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7005	IC, LD1117D33.	9322 116 74668
4907	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7006	Transistor, NPN, PMBT2369(UAW)	3198 010 43360
4908	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7007	Transistor, NPN, PMBT2369(UAW)	3198 010 43360
4909	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7009	IC, LD1117D33.	9322 116 74668
4919	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7012	IC, M24C32	9322 124 74668
4920	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7013	Transistor, NPN, PDMT2369(UAW)	3198 010 44330
4921	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7301	IC, TDA9330H/N2/S2	9352 685 88518
4925	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7303	Transistor, NPN, BC857BW(COL)	3198 010 42320
4927	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7304	Transistor, NPN, PDMT2369(UAW)	3198 010 44330
4928	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7305	Transistor, NPN, BC847BW(COL)	3198 010 42310
4929	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7306	Transistor, NPN, BC847BW(COL)	3198 010 42310
4935	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7308	Transistor, NPN, PDMT2369(UAW)	3198 010 44330
4937	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7309	Transistor, NPN, PDMT2369(UAW)	3198 010 44330
4938	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7310	Transistor, NPN, PDMT2369(UAW)	3198 010 44330
4939	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7311	Transistor, NPN, BC847BW(COL)	3198 010 42310
4944	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7312	Transistor, NPN, BC847BW(COL)	3198 010 42310
4945	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7313	Transistor, NPN, PMBT2369(UAW)	3198 010 43360
4946	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7314	Transistor, NPN, BC847BW(COL)	3198 010 42310
4947	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7315	Transistor, NPN, PMBT2369(UAW)	3198 010 43360
4948	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7318	Transistor, NPN, BC857BW(COL)	3198 010 42320
4949	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7320	Transistor, NPN, BC847BW(COL)	3198 010 42310
4950	Res, Zero ohm, "Chip" Jumper	3198 021 90030	7322	Transistor, NPN, BC847BW(COL)	3198 010 42310

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27PT830H37C (continued)

7323	IC, TDA9321H/N2.	9352 625 24518	2065	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
7324	Transistor, NPN, BC847CW	9340 217 80115	2066	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
7375	Transistor, NPN, BC847BW(COL).	3198 010 42310	2067	Cap, 22p, 5%, 50v, Ceramic	3198 016 32290
7410	Transistor, NPN, BC847B(COL).	3198 010 42310	2068	Cap, 22p, 5%, 50v, Ceramic	3198 016 32290
7411	Transistor, NPN, BC847B(COL).	3198 010 42030	2069	Cap, 22p, 5%, 50v, Ceramic	3198 016 32290
7413	Transistor, NPN, BFS20	9330 921 11215	2070	Cap, 22p, 5%, 50v, Ceramic	3198 016 32290
7651	IC, MSP3451G-FH-B8-V3.	9322 183 41702	3000	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
7664	Transistor, NPN, BC847BPN.	9340 425 30115	3001	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 021 34790
7665	Transistor, NPN, BC847BPN.	9340 425 30115	3002	Res, 120 ohm, 5%, 1/16W, Metalized Glas	3198 021 31210
7668	Transistor, NPN, BC857BW(COL).	3198 010 42320	3003	Res, 120 ohm, 5%, 1/16W, Metalized Glas	3198 021 31210
7675	Transistor, NPN, BC847BS	9340 425 20115	3004	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 021 34790
7678	Transistor, NPN, BC847BS	9340 425 20115	3005	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 021 33310
7701	Transistor, NPN, BC857BW(COL).	3198 010 42320	3006	Res, 120 ohm, 5%, 1/16W, Metalized Glas	3198 021 31210
7702	Transistor, NPN, BC847BW(COL).	3198 010 42310	3007	Res, 120 ohm, 5%, 1/16W, Metalized Glas	3198 021 31210
7704	Transistor, NPN, PMBT2369(UAW)	3198 010 43360	3008	Res, 120 ohm, 5%, 1/16W, Metalized Glas	3198 021 31210
7708	IC, SAA4990H	9352 067 50557	3009	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 021 33310
7709	IC, SAA4978H/V204.	9352 688 09557	3010	Res, 5K6, 5%, 1/16W, Metalized Glass .	3198 021 35620
7714	IC, MSM54V12222B-25JS.	9322 183 81668	3011	Res, 560 ohm, 5%, 1/16W, Metalized Glas	3198 021 35610
7715	IC, MSM54V12222B-25JS.	9322 183 81668	3012	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
7716	32 Pin IC Socket	2422 486 80938	3013	Res, 2K7, 5%, 1/16W, Metalized Glass .	3198 021 32720
7716	IC, M87C257-90C1	9322 130 45668	3014	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
7717	IC, ROM, M87C257	3104 317 03241	3015	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
7799	Software Package, FBX PICNIC	3104 317 43241	3016	Res, 33 ohm, 5%, 1/16W, Metalized Glass	3198 021 33390
8302	Cable, 2 Pin, 180mm.	3104 311 03031	3017	Res, 270 ohm, 5%, 1/16W, Metalized Glas	3198 021 32710
8303	Cable, 5 Pin, 400mm.	3104 311 05381	3018	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 021 31010
8304	Cable, 7 Pin, 280mm.	3104 311 03241	3019	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 021 34790
8680	Cable, 6 Pin, 340mm.	3104 311 03231	3020	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 021 33310
			3021	Res, 180 ohm, 5%, 1/16W, Metalized Glas	3198 021 31810
			3022	Res, 120 ohm, 5%, 1/16W, Metalized Glas	3198 021 31210
			3023	Res, 120 ohm, 5%, 1/16W, Metalized Glas	3198 021 31210
			3024	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 021 33310
			3025	Res, 5K6, 5%, 1/16W, Metalized Glass .	3198 021 35620
			3026	Res, 560 ohm, 5%, 1/16W, Metalized Glas	3198 021 35610
			3027	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
			3028	Res, 2K7, 5%, 1/16W, Metalized Glass .	3198 021 32720
			3029	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
			3030	Res, 820 ohm, 5%, 1/16W, Metalized Glas	3198 021 38210
			3031	Res, 12K, 5%, 1/16W, Metalized Glass .	3198 021 31230
			3032	Res, 12K, 5%, 1/16W, Metalized Glass .	3198 021 31230
			3033	Res, 150 ohm, 5%, 1/16W, Metalized Glas	3198 021 31510
			3034	Res, 180 ohm, 5%, 1/16W, Metalized Glas	3198 021 31810
			3035	Res, 180 ohm, 5%, 1/16W, Metalized Glas	3198 021 31810
			3036	Res, 270 ohm, 5%, 1/16W, Metalized Glas	3198 021 32710
			3037	Res, 470 ohm, 5%, 1/16W, Metalized Glas	3198 021 34710
			3038	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
			3039	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
			3040	Res, 470 ohm, 5%, 1/16W, Metalized Glas	3198 021 34710
			3041	Res, 820 ohm, 5%, 1/16W, Metalized Glas	3198 021 38210
			3042	Res, 3K3, 1%, 1/16W, Metalized Glass .	2322 704 73302
			3043	Res, 1K5, 5%, 1/16W, Metalized Glass .	3198 021 31520
			3044	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
			3055	Res, 220 ohm, 5%, 1/16W, Metalized Glas	3198 021 32210
			3056	Res, 1K, 5%, 1/16W, Metalized Glass .	3198 021 31020
			3057	Res, 2K2, 5%, 1/16W, Metalized Glass .	3198 021 32220
			3058	Res, 220K, 5%, 1/16W, Metalized Glass .	3198 021 32240
			3059	Res, 27K, 5%, 1/16W, Metalized Glass .	3198 021 32730
			3060	Res, 470 ohm, 5%, 1/16W, Metalized Glas	3198 021 34710
			3061	Res, 4K7, 5%, 1/16W, Metalized Glass .	3198 021 34720
			3065	Res, 560 ohm, 5%, 1/16W, Metalized Glas	3198 021 35610
			3067	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 021 34790
			3068	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 021 34790
			3069	Res, 100K, 5%, 1/16W, Metalized Glass .	3198 021 31040
			3071	Res, 1K5, 5%, 1/16W, Metalized Glass .	3198 021 31520
			3072	Res, 2K7, 5%, 1/16W, Metalized Glass .	3198 021 32720
			3073	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 021 33310
			3074	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 021 33310
			3076	Res, 1K, 5%, 1/16W, Metalized Glass .	3198 021 31020
			3077	Res, 220 ohm, 5%, 1/16W, Metalized Glas	3198 021 32210
			3082	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 021 34790
			3083	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 021 34790
			3085	Res, 470 ohm, 5%, 1/16W, Metalized Glas	3198 021 34710
			3088	Res, 1K, 5%, 1/16W, Metalized Glass .	3198 021 31020
			3089	Res, 150 ohm, 5%, 1/16W, Metalized Glas	3198 021 31510
			3091	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
			3095	Res, 100K, 5%, 1/16W, Metalized Glass .	3198 021 31040
			3096	Res, 180 ohm, 5%, 1/16W, Metalized Glas	3198 021 31810
			3097	Res, 1K8, 5%, 1/16W, Metalized Glass .	3198 021 31820
			3098	Res, 5K6, 5%, 1/16W, Metalized Glass .	3198 021 35620
			3099	Res, 470 ohm, 5%, 1/16W, Metalized Glas	3198 021 34710
			3100	Res, 1K, 5%, 1/16W, Metalized Glass .	3198 021 31020
			3101	Res, 1K, 5%, 1/16W, Metalized Glass .	3198 021 31020
			3102	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 021 31010
			S 3103	Res, PTC, Overload Protection.	2122 662 00139
			S 3104	Res, PTC, Overload Protection.	2122 662 00139
			3105	Res, 560 ohm, 5%, 1/16W, Metalized Glas	3198 021 35610
			5000	Coil, 100MHz, 120 ohm.	3198 018 90070
			5001	Coil, 100MHz, 120 ohm.	3198 018 90070
			5003	Filter, 14.3MHz.	2422 549 44784
			5004	Filter, 14.3MHz.	2422 549 44784
			5005	Coil, 10u.	3198 018 41090
			5006	Filter, 14.3MHz.	2422 549 44785
			5007	Coil, 10u.	3198 018 41090

S = Safety Part Be sure to use exact replacement part.

27PT830H37C (continued)

5008	Coil, 22u.	3198 018 72290
5009	Coil, 22u.	3198 018 72290
5010	Coil, 15u.	2422 535 94758
5011	Coil, 100MHz, 120 ohm.	3198 018 90070
5012	Coil, 100MHz, 120 ohm.	3198 018 90070
5013	Coil, 100MHz, 120 ohm.	3198 018 90070
5014	Inductor, 100MHz, 30 ohm.	3198 018 90060
5015	Inductor, 100MHz, 30 ohm.	3198 018 90060
5017	Coil, 100MHz, 120 ohm.	3198 018 90070
5019	Coil, 10u.	3198 018 41090
5020	Coil, 10u.	3198 018 41090
5021	Coil, 100MHz, 120 ohm.	3198 018 90070
5022	Coil, 100MHz, 120 ohm.	3198 018 90070
5024	Coil, 100MHz, 120 ohm.	3198 018 90070
5025	Coil, 100MHz, 120 ohm.	3198 018 90070
5027	Coil, 100MHz, 120 ohm.	3198 018 90070
5028	Coil, 100MHz, 120 ohm.	3198 018 90070
5029	Coil, 100MHz, 120 ohm.	3198 018 90070
5030	Coil, 100MHz, 120 ohm.	3198 018 90070
6000	Diode, BAV99	3198 010 10620
6001	Diode, BAV99	3198 010 10620
6002	Diode, BAV99	3198 010 10620
6003	LED, TLMH3100.	9322 072 71685
6004	Diode, Rect, SM SID	9322 128 69685
6005	Diode, Rect, SM SID	9322 128 69685
6006	Diode, 1PS76SB10	9340 453 90115
6007	Diode, BAS17	9335 262 30215
7000	Transistor, NPN, BC847B.	9335 895 90215
7001	Transistor, PNP, BC857B.	9335 897 60215
7002	Transistor, NPN, BF570	9338 144 20215
7003	Transistor, PNP, BC857B.	9335 897 60215
7004	Transistor, NPN, BC847B.	9335 895 90215
7005	Transistor, PNP, BC857B.	9335 897 60215
7006	Transistor, NPN, BF570	9338 144 20215
7007	Transistor, PNP, BC857B.	9335 897 60215
7008	Transistor, NPN, BC847B.	9335 895 90215
7009	Transistor, PNP, BC857B.	9335 897 60215
7010	Transistor, NPN, BC847B.	9335 895 90215
7011	Transistor, NPN, BC847B.	9335 895 90215
7012	Transistor, PNP, BF550	9334 509 00215
7015	Transistor, NPN, BC847B.	9335 895 90215
7016	Transistor, PNP, BC857B.	9335 897 60215
7017	Transistor, NPN, BC847B.	9335 895 90215
7019	IC, LM809M3X	9322 163 48668
7020	Transistor, NPN, BC847B.	9335 895 90215
7021	IC, LD1117DT33	9322 134 45668
7022	IC, LD1117DT25	9322 160 50668
7023	IC, UPD64083GF	9322 170 65671

Side A/V Panel

CBA	Side A/V Panel	3139 137 26291
0240	11 Pin Board Connector	2422 025 12485
1254	Headphone Jack	2422 026 04747
1255	3 Pin Cinch Jack	2422 026 04815
1256	SVHS Jack	2422 026 04926
2286	Cap, 150p, 10%, 50v, Ceramic	3198 019 11510
2288	Cap, 150p, 10%, 50v, Ceramic	3198 019 11510
2292	Cap, 470p, 10%, 50v, Ceramic	3198 019 14710
2294	Cap, 470p, 10%, 50v, Ceramic	3198 019 14710
2296	Cap, 4n7, +80/-20%, 50v, Ceramic	3198 019 24720
2297	Cap, 4n7, +80/-20%, 50v, Ceramic	3198 019 24720
3285	Res, 75 ohm, 5%, 1/6W, Carbon Film	3198 011 07590
3286	Res, 10 ohm, 5%, 1/6W, Carbon Film	3198 011 01090
3287	Res, 75 ohm, 5%, 1/6W, Carbon Film	3198 011 07590
3288	Res, 10 ohm, 5%, 1/6W, Carbon Film	3198 011 01090
3289	Res, 1K8, 5%, 1/6W, Carbon Film	3198 011 01820
3291	Res, 1K, 5%, 1/6W, Carbon Film	3198 011 01020
3292	Res, 47K, 5%, 1/10W, Metalized Glass	3198 021 54730
3293	Res, 1K, 5%, 1/6W, Carbon Film	3198 011 01020
3294	Res, 47K, 5%, 1/10W, Metalized Glass	3198 021 54730
3295	Res, 3K9, 5%, 1/6W, Carbon Film	3198 011 03920
3296	Res, 10K, 5%, 1/10W, Metalized Glass	3198 021 51030
3297	Res, 10K, 5%, 1/10W, Metalized Glass	3198 021 51030
4241	Res, Zero ohm, "Chip" Jumper	3198 021 90020
4243	Res, Zero ohm, "Chip" Jumper	3198 021 90020
6291	Zener Diode, 12 volt	3198 020 51290
6292	Zener Diode, 12 volt	3198 020 51290
6293	Zener Diode, 12 volt	3198 020 51290
6294	Zener Diode, 12 volt	3198 020 51290
6296	Zener Diode, 12 volt	3198 020 51290
6297	Zener Diode, 12 volt	3198 020 51290
9231	Wire Jumper	3198 036 90010
9232	Wire Jumper	3198 036 90010

Top Control Panel

CBA	Top Control Panel	3139 178 60461
0215	3 Pin Board Connector	2422 025 09191
1091	Switch	2422 128 02742
1092	Switch	2422 128 02742
1093	Switch	2422 128 02742

1094	Switch	2422 128 02742
3088	Res, Zero ohm, "Chip" Jumper	3198 021 90030
3089	Res, Zero ohm, "Chip" Jumper	3198 021 90030
3091	Res, 560 ohm, 5%, 1/16W, Metalized Glas	3198 021 35610
3092	Res, 390 ohm, 5%, 1/16W, Metalized Glas	3198 021 33910
3093	Res, 560 ohm, 5%, 1/16W, Metalized Glas	3198 021 35610
3094	Res, 270 ohm, 5%, 1/16W, Metalized Glas	3198 021 32710
3095	Res, 3K3, 5%, 1/16W, Metalized Glass	3198 021 33320
3096	Res, 1K5, 5%, 1/16W, Metalized Glass	3198 021 31520
4092	Res, Zero ohm, "Chip" Jumper	3198 021 90030
6092	Diode, BAT254	9340 393 00115

Top Control Panel

Top Control Panel

DC Shift Panel

CBA	DC Shift Panel	3104 328 12141
0317	2 Pin Board Connector	4822 265 20723
0318	2 Pin Board Connector	4822 265 20723
S 1430	Fuse, 400MA, 65V	2422 086 10581
2430	Cap, 470p, 10%, 500V, Ceramic	4822 122 31177
2431	Cap, 470p, 10%, 500V, Ceramic	4822 122 31177
5430	DC Shift Coil	3128 138 38911
6432	Diode, Rect, BYD33V	9340 317 00133
6433	Diode, Rect, BYD33V	9340 317 00133

DAF Panel

CBA	DAF Panel	3104 328 21212
1417	2 Pin Board Connector	2422 025 16269
1418	2 Pin Board Connector	2422 025 16374
1419	2 Pin Board Connector	2422 025 16269
1492	3 Pin Board Connector	2422 025 16382
1497	Contact Pin	2422 015 18552
1693	Contact Pin	2422 034 20021
2800	Cap, 330p, 5%, 2000v, Polypropylene	2222 375 90495
2809	Cap, 100u, 20%, 25v, Electrolytic	3198 025 31010
2812	Cap, 10n, 5%, 2000v, Polypropylene	2222 375 90175
2813	Cap, 10u, 20%, 50v, Electrolytic	3198 025 51090
2814	Cap, 1n, 5%, 2000v, Polypropylene	2222 375 90225
2818	Cap, 10n, 10%, 50v, Ceramic	3198 017 01030
2820	Cap, 220n, 10%, 50v, Polyester	3198 014 02240
2821	Cap, 68n, 5%, 400v, Metalized Polypropylene	2222 479 90166
2822	Cap, 220n, 10%, 50v, Polyester	3198 014 02240
2823	Cap, 4u7, 20%, 50v, Electrolytic	3198 025 54780
2824	Cap, 10u, 20%, 50v, Electrolytic	3198 025 51090
2825	Cap, 1u, 10%, 50v, Polyester	3198 014 01050
2890	Cap, 270p, 5%, 2000v, Polypropylene	2222 375 90493
2892	Cap, 4u7, 20%, 50v, Electrolytic	3198 025 54780
S 3807	Res, 15 ohm, 5%, 1/3W, Metal Film	2306 204 03159
S 3808	Res, 15 ohm, 5%, 1/3W, Metal Film	2306 204 03159
S 3809	Res, 10 ohm, 5%, 1/3W, Metal Film	2306 204 03109
3810	Res, 470K, 5%, 1/2W, Metalized Glass	2322 242 13474
3811	Res, 4M7, 5%, 1/4W, Metalized Glass	2322 241 53475
3812	Res, 27K, 5%, 1/6W, Carbon Film	3198 011 02730
3813	Res, 470K, 5%, 1/6W, Carbon Film	3198 011 04740
3814	Res, 100K, 5%, 1/4W, Metalized Glass	2322 241 53104
3815	Res, 1K, 5%, 1/6W, Carbon Film	3198 011 01020
3816	Res, 4K7, 5%, 1/6W, Carbon Film	3198 011 04720
3818	Res, 1K, 5%, 1/10W, Metalized Glass	3198 021 51020
3819	Res, 1K, 5%, 1/10W, Metalized Glass	3198 021 51020
3820	Res, 3K3, 5%, 1/10W, Metalized Glass	3198 021 53320
3821	Res, 47K, 5%, 1/10W, Metalized Glass	3198 021 54730
3822	Res, 4K7, 5%, 1/10W, Metalized Glass	3198 021 54720
3823	Res, 1K8, 5%, 1/10W, Metalized Glass	3198 021 51820
3824	Res, 4K7, 5%, 1/10W, Metalized Glass	3198 021 54720
3826	Res, 12K, 5%, 1/10W, Metalized Glass	3198 021 51230
3827	Res, 5K6, 5%, 1/10W, Metalized Glass	3198 021 55620
3830	Res, 47K, 5%, 1/10W, Metalized Glass	3198 021 54730
3831	Res, 4K7, 5%, 1/10W, Metalized Glass	3198 021 54720
3832	Res, 1K8, 5%, 1/10W, Metalized Glass	3198 021 51820
3833	Res, 4K7, 5%, 1/10W, Metalized Glass	3198 021 54720
S 3898	VDR, 1100V	2322 592 14217
S 3899	VDR, 1100V	2322 592 14217
3998	Res, 120 ohm, 5%, 1/6W, Carbon Film	3198 011 01210
S 5800	Transformer, DAF, S21975-03	2422 531 02437
5801	Transformer, Self Correction	3128 138 38881
5810	Bridge Coil	3128 138 40042
6810	Diode, Rect, BYD33V	9340 317 00133
6812	Zener Diode, 22 volt	3198 010 22290
7810	Power FET, STP3NB80FP	9322 136 03687
7818	Transistor, NPN, BC847B(COL)	3198 010 42030
7820	Transistor, NPN, BC847B(COL)	3198 010 42030
7821	Transistor, PNP, BC857B(COL)	3198 010 42150
7822	Transistor, NPN, BC847B(COL)	3198 010 42030
7823	Transistor, PNP, BC857B(COL)	3198 010 42150
9805	Wire Jumper	3198 036 90010

Mains/Front Interface Panel

Mains/Front Interface Panel

27PT830H37C (continued)

3310	Res, 1K, 5%, 1/10W, Metalized Glass . .	3198	021	51020
3311	Res, 47 ohm, 5%, 1/10W, Metalized Glass	3198	021	54790
3312	Res, 2K2, 5%, 1/10W, Metalized Glass .	3198	021	52220
3315	Res, 10K, 5%, 1/10W, Metalized Glass .	3198	021	51030
3316	Res, 56K, 5%, 1/10W, Metalized Glass .	3198	021	55630
3317	Res, 10K, 5%, 1/10W, Metalized Glass .	3198	021	51030
3318	Res, 15 ohm, 5%, 1/10W, Metalized Glass	3198	021	51590
3319	Res, 820 ohm, 5%, 1/10W, Metalized Glas	3198	021	58210
3320	Res, 10K, 5%, 1/10W, Metalized Glass .	3198	021	51030
3322	Res, 150 ohm, 5%, 1/10W, Metalized Glas	3198	021	51510
3334	Res, 1K, 5%, 1/6W, Carbon Film	3198	011	01020
3338	Res, 1K, 20%, 1/2W, Carbon Film. . . .	3198	013	01020
3339	Res, 1K, 20%, 1/2W, Carbon Film. . . .	3198	013	01020
3340	Res, 1K, 20%, 1/2W, Carbon Film. . . .	3198	013	01020
S 3341	Res, 100 ohm, 5%, 1/3W, Metal Film . .	2306	204	03101
3342	Res, Zero ohm, "Chip" Jumper	3198	021	90020
3343	Res, 2K2, 1%, 3/5W, Metal Film	2312	915	12202
3345	Res, 33 ohm, 5%, 1/6W, Carbon Film . .	3198	011	03390
3347	Res, 1K5, 20%, 1/2W, Carbon Film . . .	3198	013	01520
3348	Res, 2K2, 1%, 3/5W, Metal Film	2312	915	12202
3349	Res, 1K, 20%, 1/2W, Carbon Film. . . .	3198	013	01020
3350	Res, 470 ohm, 5%, 1/6W, Carbon Film. .	3198	011	04710
3351	Res, 470 ohm, 5%, 1/6W, Carbon Film. .	3198	011	04710
3352	Res, 470 ohm, 5%, 1/6W, Carbon Film. .	3198	011	04710
3353	Res, 4R7, 5%, 1/6W, Carbon Film. . . .	3198	011	04780
3355	Res, 10 ohm, 5%, 1/10W, Metalized Glass	3198	021	51090
3356	Res, 1K, 5%, 1/10W, Metalized Glass. .	3198	021	51020
3357	Res, 10 ohm, 5%, 1/10W, Metalized Glass	3198	021	51090
3358	Res, 390 ohm, 5%, 1/10W, Metalized Glas	3198	021	53910
3359	Res, 220 ohm, 5%, 1/16W, Metalized Glas	3198	021	32210
3366	Voltage Dependent Resistor	2322	593	13507
3375	Res, 100K, 1%, 3/5W, Metal Film. . . .	2312	915	11004
3376	Res, 100K, 1%, 3/5W, Metal Film. . . .	2312	915	11004
3377	Res, 100K, 1%, 3/5W, Metal Film. . . .	2312	915	11004
3378	Res, 4R7, 5%, 1/16W, Metalized Glass .	3198	021	34780
3379	Res, 4R7, 5%, 1/6W, Carbon Film. . . .	3198	011	04780
3398	Res, 4K7, 5%, 1/6W, Carbon Film. . . .	3198	011	04720
3405	Res, 39 ohm, 5%, 1/4W, Carbon Film . .	2120	101	74399
3410	Res, 100K, 5%, 1/16W, Metalized Glass. .	3198	021	31040
3411	Res, 100K, 5%, 1/6W, Carbon Film . . .	3198	011	01040
S 3412	Res, 15 ohm, 5%, 1/8W, Metalized Glass	2322	750	61509
3413	Res, 1K, 5%, 1/16W, Metalized Glass. .	3198	021	31020
3414	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198	021	31090
3416	Res, 39 ohm, 5%, 1/4W, Carbon Film . .	2120	101	74399
4115	Res, Zero ohm, "Chip" Jumper	3198	021	90030
4301	Res, Zero ohm, "Chip" Jumper	3198	021	90020
4302	Res, Zero ohm, "Chip" Jumper	3198	021	90030
6100	Zener Diode, 5.6 volt.	3198	020	55680
6305	Diode, BAS321.	9340	553	52115
6306	Diode, BAS321.	9340	553	52115
6307	Diode, BAS321.	9340	553	52115
6308	Diode, MCL4148	9322	128	15685
6309	Diode, MCL4148	9322	128	15685
7300	Transistor, NPN, BF199	9330	634	20126
7301	Transistor, NPN, BFS20	9330	921	11215
7302	Transistor, PNP, 2SA1358	9322	166	55682
7303	Transistor, NPN, 2SC3421	9322	166	56682
7304	Transistor, PNP, BF824	9337	223	50215
7307	IC, TDA6103Q/N3.	9352	079	80112
7308	Transistor, NPN, BFS20	9330	921	11215
9301	Wire Jumper.	3198	036	90010
9302	Wire Jumper.	3198	036	90010
9305	Wire Jumper.	3198	036	90010
9307	Wire Jumper.	3198	036	90010
9308	Wire Jumper.	3198	036	90010
9309	Wire Jumper.	3198	036	90010
9310	Wire Jumper.	3198	036	90010
9311	Wire Jumper.	3198	036	90010
9313	Wire Jumper.	3198	036	90010
9314	Wire Jumper.	3198	036	90010
9316	Wire Jumper.	3198	036	90010
9317	Wire Jumper.	3198	036	90010
9318	Wire Jumper.	3198	036	90010
9321	Wire Jumper.	3198	036	90010
9322	Wire Jumper.	3198	036	90010
9323	Wire Jumper.	3198	036	90010
9324	Wire Jumper.	3198	036	90010
9325	Wire Jumper.	3198	036	90010
9326	Wire Jumper.	3198	036	90010
9330	Wire Jumper.	3198	036	90010
9333	Wire Jumper.	3198	036	90010
9336	Wire Jumper.	3198	036	90010
9337	Wire Jumper.	3198	036	90010
9401	Wire Jumper.	3198	036	90010
9403	Wire Jumper.	3198	036	90010

32PT740H37A (continued)

7314	Transistor, NPN, BC847BW(COL)	3198 010 42310	2059	Cap, 22p, 5%, 50v, Ceramic	3198 016 32290
7315	Transistor, NPN, PMBT2369(UAW)	3198 010 43360	2061	Cap, 22p, 5%, 50v, Ceramic	3198 016 32290
7318	Transistor, NPN, BC857BW(COL)	3198 010 42320	2062	Cap, 150p, 5%, 50v, Ceramic	3198 016 31510
7320	Transistor, NPN, BC847BW(COL)	3198 010 42310	2063	Cap, 22p, 5%, 50v, Ceramic	3198 016 32290
7322	Transistor, NPN, BC847BW(COL)	3198 010 42310	2064	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
7323	IC, TDA9321H/N2	9352 625 24518	2065	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
7324	Transistor, NPN, BC847CW	9340 217 80115	2066	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
7375	Transistor, NPN, BC847BW(COL)	3198 010 42310	2067	Cap, 22p, 5%, 50v, Ceramic	3198 016 32290
7410	Transistor, NPN, BC847BW(COL)	3198 010 42310	2068	Cap, 22p, 5%, 50v, Ceramic	3198 016 32290
7411	Transistor, NPN, BC847B(COL)	3198 010 42030	2069	Cap, 22p, 5%, 50v, Ceramic	3198 016 32290
7413	Transistor, NPN, BFS20	9330 921 11215	2070	Cap, 22p, 5%, 50v, Ceramic	3198 016 32290
7651	IC, MSP3421G-FH-B8V3	9322 183 23671	3000	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
7664	Transistor, NPN, BC847BPN	9340 425 30115	3001	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 021 34790
7665	Transistor, NPN, BC847BPN	9340 425 30115	3002	Res, 120 ohm, 5%, 1/16W, Metalized Glas	3198 021 31210
7668	Transistor, NPN, BC857BW(COL)	3198 010 42320	3003	Res, 120 ohm, 5%, 1/16W, Metalized Glas	3198 021 31210
7675	Transistor, NPN, BC847BS	9340 425 20115	3004	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 021 34790
7678	Transistor, NPN, BC847BS	9340 425 20115	3005	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 021 33310
7701	Transistor, NPN, BC857BW(COL)	3198 010 42320	3006	Res, 120 ohm, 5%, 1/16W, Metalized Glas	3198 021 31210
7702	Transistor, NPN, BC847BW(COL)	3198 010 42310	3007	Res, 120 ohm, 5%, 1/16W, Metalized Glas	3198 021 31210
7704	Transistor, NPN, PMBT2369(UAW)	3198 010 43360	3008	Res, 120 ohm, 5%, 1/16W, Metalized Glas	3198 021 31210
7708	IC, SAA4990H	9352 067 50557	3009	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 021 33310
7709	IC, SAA4978H/V204	9352 688 09557	3010	Res, 5K6, 5%, 1/16W, Metalized Glass .	3198 021 35620
7714	IC, MSM54V12222B-25JS	9322 183 81668	3011	Res, 560 ohm, 5%, 1/16W, Metalized Glas	3198 021 35610
7715	IC, MSM54V12222B-25JS	9322 183 81668	3012	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
7716	32 Pin IC Socket	2422 486 80938	3013	Res, 2K7, 5%, 1/16W, Metalized Glass .	3198 021 32720
7716	IC, M87C257-90C1	9322 130 45668	3014	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
7717	IC, ROM, M87C257	3104 317 03241	3015	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
7799	Software Package, FBX PICNIC	3104 317 43241	3016	Res, 33 ohm, 5%, 1/16W, Metalized Glass	3198 021 33390
8302	Cable, 2 Pin, 180mm	3104 311 03031	3017	Res, 270 ohm, 5%, 1/16W, Metalized Glas	3198 021 32710
8303	Cable, 5 Pin, 400mm	3104 311 05381	3018	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 021 31010
8304	Cable, 7 Pin, 280mm	3104 311 03241	3019	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 021 34790
8680	Cable, 6 Pin, 340mm	3104 311 03231	3020	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 021 33310
			3021	Res, 180 ohm, 5%, 1/16W, Metalized Glas	3198 021 31810
			3022	Res, 120 ohm, 5%, 1/16W, Metalized Glas	3198 021 31210
			3023	Res, 120 ohm, 5%, 1/16W, Metalized Glas	3198 021 31210
			3024	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 021 33310
			3025	Res, 5K6, 5%, 1/16W, Metalized Glass .	3198 021 35620
			3026	Res, 560 ohm, 5%, 1/16W, Metalized Glas	3198 021 35610
			3027	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
			3028	Res, 2K7, 5%, 1/16W, Metalized Glass .	3198 021 32720
			3029	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
			3030	Res, 820 ohm, 5%, 1/16W, Metalized Glas	3198 021 38210
			3031	Res, 12K, 5%, 1/16W, Metalized Glass .	3198 021 31230
			3032	Res, 12K, 5%, 1/16W, Metalized Glass .	3198 021 31230
			3033	Res, 150 ohm, 5%, 1/16W, Metalized Glas	3198 021 31510
			3034	Res, 180 ohm, 5%, 1/16W, Metalized Glas	3198 021 31810
			3035	Res, 180 ohm, 5%, 1/16W, Metalized Glas	3198 021 31810
			3036	Res, 270 ohm, 5%, 1/16W, Metalized Glas	3198 021 32710
			3037	Res, 470 ohm, 5%, 1/16W, Metalized Glas	3198 021 34710
			3038	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
			3039	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
			3040	Res, 470 ohm, 5%, 1/16W, Metalized Glas	3198 021 34710
			3041	Res, 820 ohm, 5%, 1/16W, Metalized Glas	3198 021 38210
			3042	Res, 3K3, 1%, 1/16W, Metalized Glass .	2322 704 73302
			3043	Res, 1K5, 5%, 1/16W, Metalized Glass .	3198 021 31520
			3044	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
			3055	Res, 220 ohm, 5%, 1/16W, Metalized Glas	3198 021 32210
			3056	Res, 1K, 5%, 1/16W, Metalized Glass .	3198 021 31020
			3057	Res, 2K2, 5%, 1/16W, Metalized Glass .	3198 021 32220
			3058	Res, 220K, 5%, 1/16W, Metalized Glass .	3198 021 32240
			3059	Res, 27K, 5%, 1/16W, Metalized Glass .	3198 021 32730
			3060	Res, 470 ohm, 5%, 1/16W, Metalized Glas	3198 021 34710
			3061	Res, 4K7, 5%, 1/16W, Metalized Glass .	3198 021 34720
			3065	Res, 560 ohm, 5%, 1/16W, Metalized Glas	3198 021 35610
			3067	Res, 47 ohm, 5%, 1/16W, Metalized Glas	3198 021 34790
			3068	Res, 47 ohm, 5%, 1/16W, Metalized Glas	3198 021 34790
			3069	Res, 100K, 5%, 1/16W, Metalized Glass .	3198 021 31040
			3071	Res, 1K5, 5%, 1/16W, Metalized Glass .	3198 021 31520
			3072	Res, 2K7, 5%, 1/16W, Metalized Glass .	3198 021 32720
			3073	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 021 33310
			3074	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 021 33310
			3076	Res, 1K, 5%, 1/16W, Metalized Glass .	3198 021 31020
			3077	Res, 220 ohm, 5%, 1/16W, Metalized Glas	3198 021 32210
			3082	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 021 34790
			3083	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 021 34790
			3085	Res, 470 ohm, 5%, 1/16W, Metalized Glas	3198 021 34710
			3088	Res, 1K, 5%, 1/16W, Metalized Glass .	3198 021 31020
			3089	Res, 150 ohm, 5%, 1/16W, Metalized Glas	3198 021 31510
			3091	Res, 10 ohm, 5%, 1/16W, Metalized Glas	3198 021 31090
			3095	Res, 100K, 5%, 1/16W, Metalized Glass .	3198 021 31040
			3096	Res, 180 ohm, 5%, 1/16W, Metalized Glas	3198 021 31810
			3097	Res, 1K8, 5%, 1/16W, Metalized Glass .	3198 021 31820
			3098	Res, 5K6, 5%, 1/16W, Metalized Glass .	3198 021 35620
			3099	Res, 470 ohm, 5%, 1/16W, Metalized Glas	3198 021 34710
			3100	Res, 1K, 5%, 1/16W, Metalized Glass .	3198 021 31020
			3101	Res, 1K, 5%, 1/16W, Metalized Glass .	3198 021 31020
			3102	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 021 31010
			S 3103	Res, PTC, Overload Protection	2122 662 00139
			S 3104	Res, PTC, Overload Protection	2122 662 00139
			3105	Res, 560 ohm, 5%, 1/16W, Metalized Glas	3198 021 35610
			5000	Coil, 100MHz, 120 ohm	3198 018 90070
			5001	Coil, 100MHz, 120 ohm	3198 018 90070

32PT740H37A (continued)

Table with 4 columns: Part Number, Description, Price, and Quantity. Items include various filters, coils, inductors, diodes, LEDs, transistors, ICs, and capacitors.

Side A/V Panel

Table with 4 columns: Part Number, Description, Price, and Quantity. Items include various connectors, headphones, jacks, and capacitors for the side A/V panel.

Top Control Panel

Top Control Panel

S = Safety Part Be sure to use exact replacement part.

Top Control Panel

Top Control Panel

DC Shift Panel

DC Shift Panel

DAF Panel

DAF Panel

Mains/Front Interface Panel

Mains/Front Interface Panel

2 Tuner PIP Panel

2 Tuner PIP Panel

High Definition Jack Panel

High Definition Jack Panel

Table with 4 columns: Part Number, Description, Price, and Quantity. Items include various connectors, capacitors, and resistors for the high definition jack panel.

32PT740H37A (continued)

9326	Wire Jumper.	3198 036 90010
9330	Wire Jumper.	3198 036 90010
9333	Wire Jumper.	3198 036 90010
9336	Wire Jumper.	3198 036 90010
9337	Wire Jumper.	3198 036 90010
9401	Wire Jumper.	3198 036 90010
9403	Wire Jumper.	3198 036 90010

32PT830H37A (continued)

9707	Wire Jumper	3198 036 90010	2002	Cap, 33p, 5%, 50v, Ceramic	3198 016 33390
9712	Wire Jumper	3198 036 90010	2003	Cap, 2n2, 10%, 50v, Ceramic	3198 017 32220
9713	Wire Jumper	3198 036 90010	2004	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9714	Wire Jumper	3198 036 90010	2005	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9715	Wire Jumper	3198 036 90010	2006	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9718	Wire Jumper	3198 036 90010	2007	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9720	Wire Jumper	3198 036 90010	2008	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9721	Wire Jumper	3198 036 90010	2009	Cap, 470p, 5%, 50v, Ceramic	3198 016 34710
9723	Wire Jumper	3198 036 90010	2010	Cap, 47p, 5%, 50v, Ceramic	3198 016 34790
9724	Wire Jumper	3198 036 90010	2011	Cap, 47p, 5%, 50v, Ceramic	3198 016 34790
9726	Wire Jumper	3198 036 90010	2012	Cap, 47p, 5%, 50v, Ceramic	3198 016 34790
9901	Wire Jumper	3198 036 90010	2013	Cap, 100u, 20%, 16v, Electrolytic	3198 030 41010
9902	Wire Jumper	3198 036 90010	2014	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9903	Wire Jumper	3198 036 90010	2015	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9904	Wire Jumper	3198 036 90010	2016	Cap, 100u, 20%, 16v, Electrolytic	3198 030 41010
9906	Wire Jumper	3198 036 90010	2017	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9907	Wire Jumper	3198 036 90010	2020	Cap, 10n, 10%, 50v, Ceramic	3198 017 31030
9908	Wire Jumper	3198 036 90010	2027	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9909	Wire Jumper	3198 036 90010	2028	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9910	Wire Jumper	3198 036 90010	2030	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9911	Wire Jumper	3198 036 90010	2031	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9912	Wire Jumper	3198 036 90010	2300	Cap, 100u, 20%, 16v, Electrolytic	3198 030 41010
9914	Wire Jumper	3198 036 90010	2302	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9916	Wire Jumper	3198 036 90010	2303	Cap, 10n, 10%, 50v, Ceramic	3198 017 31030
9917	Wire Jumper	3198 036 90010	2304	Cap, 10p, 5%, 50v, Ceramic	3198 016 31090
9920	Wire Jumper	3198 036 90010	2305	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9921	Wire Jumper	3198 036 90010	2306	Cap, 470p, 10%, 50v, Ceramic	3198 017 34710
9922	Wire Jumper	3198 036 90010	2307	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9925	Wire Jumper	3198 036 90010	2308	Cap, 10p, 5%, 50v, Ceramic	3198 016 31090
9926	Wire Jumper	3198 036 90010	2313	Cap, 100n, 5%, 16v, Polypropylene	2020 319 90005
9927	Wire Jumper	3198 036 90010	2314	Cap, 100u, 20%, 16v, Electrolytic	3198 030 41010
9928	Wire Jumper	3198 036 90010	2315	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9931	Wire Jumper	3198 036 90010	2317	Cap, 2u2, +80/-20%, 10v, Ceramic	3198 017 22250
9932	Wire Jumper	3198 036 90010	2318	Cap, 22n, 10%, 25v, Ceramic	3198 017 32230
9933	Wire Jumper	3198 036 90010	2319	Cap, 10n, 10%, 50v, Ceramic	3198 017 31030
9934	Wire Jumper	3198 036 90010	2320	Cap, 10p, 5%, 50v, Ceramic	3198 016 31090
9936	Wire Jumper	3198 036 90010	2321	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9943	Wire Jumper	3198 036 90010	2322	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9944	Wire Jumper	3198 036 90010	2323	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9945	Wire Jumper	3198 036 90010	2324	Cap, 10n, 10%, 50v, Ceramic	3198 017 31030
9946	Wire Jumper	3198 036 90010	2325	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9947	Wire Jumper	3198 036 90010	2328	Cap, 22p, 5%, 50v, Ceramic	3198 016 32290
9948	Wire Jumper	3198 036 90010	2329	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9950	Wire Jumper	3198 036 90010	2330	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9951	Wire Jumper	3198 036 90010	2331	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9952	Wire Jumper	3198 036 90010	2332	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9957	Wire Jumper	3198 036 90010	2333	Cap, 2u2, +80/-20%, 10v, Ceramic	3198 017 22250
9958	Wire Jumper	3198 036 90010	2334	Cap, 2u2, +80/-20%, 10v, Ceramic	3198 017 22250
9960	Wire Jumper	3198 036 90010	2335	Cap, 100u, 20%, 16v, Electrolytic	3198 030 41010
9963	Wire Jumper	3198 036 90010	2336	Cap, 2u2, +80/-20%, 10v, Ceramic	3198 017 22250
9964	Wire Jumper	3198 036 90010	2338	Cap, 10n, 10%, 50v, Ceramic	3198 017 31030
9965	Wire Jumper	3198 036 90010	2339	Cap, 100n, 10%, 50v, Ceramic	2222 580 15649
9966	Wire Jumper	3198 036 90010	2340	Cap, 10u, 20%, 16v, Electrolytic	3198 030 41090
9967	Wire Jumper	3198 036 90010	2341	Cap, 100u, 20%, 16v, Electrolytic	3198 030 41010
9968	Wire Jumper	3198 036 90010	2342	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9969	Wire Jumper	3198 036 90010	2343	Cap, 100n, +80/-20%, 25v, Ceramic	3198 023 41040
9970	Wire Jumper	3198 036 90010	2350	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9971	Wire Jumper	3198 036 90010	2351	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9972	Wire Jumper	3198 036 90010	2352	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9975	Wire Jumper	3198 036 90010	2356	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9976	Wire Jumper	3198 036 90010	2357	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9980	Wire Jumper	3198 036 90010	2358	Cap, 3n3, 10%, 50v, Ceramic	3198 017 33320
9983	Wire Jumper	3198 036 90010	2361	Cap, 1p2, 21%, 50v, Ceramic	3198 016 31280
9984	Wire Jumper	3198 036 90010	2362	Cap, 12p, 5%, 50v, Ceramic	3198 016 31290
9987	Wire Jumper	3198 036 90010	2363	Cap, 470p, 10%, 50v, Ceramic	3198 017 34710
9988	Wire Jumper	3198 036 90010	2365	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9990	Wire Jumper	3198 036 90010	2366	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9991	Wire Jumper	3198 036 90010	2367	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9992	Wire Jumper	3198 036 90010	2368	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9993	Wire Jumper	3198 036 90010	2369	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9996	Wire Jumper	3198 036 90010	2370	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
9997	Wire Jumper	3198 036 90010	2371	Cap, 4n7, 10%, 50v, Ceramic	3198 017 34720
9998	Wire Jumper	3198 036 90010	2372	Cap, 1u, +80/-20%, 16v, Ceramic	3198 017 21050

Small Signal Board

SBA	Small Signal Board	3104 328 17762	2376	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
0302	2 Pin Board Connector	2422 025 16542	2377	Cap, 100u, 20%, 16v, Electrolytic	3198 030 41010
0601	IC, ROM, SAA5677	3104 317 04431	2378	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
1001	Crystal, 12MHz	2422 543 89018	2384	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
S 1003	Fuse, F315MA, 32V	2422 086 11013	2395	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
1301	Crystal, 12MHz	2422 540 98456	2396	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
1303	5 Pin Board Connector	2422 025 16966	2397	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
1304	7 Pin Board Connector	2422 025 17104	2401	Cap, 10n, 10%, 50v, Ceramic	3198 017 31030
1318	Crystal, 3.579545MHz	2422 543 00861	2410	Cap, 470n, 10%, 16v, Ceramic	2222 780 15658
1407	Filter, 4.5MHz	2422 549 44043	2411	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
1408	SAW Filter, 45.75MHz	2422 549 44377	2412	Cap, 4n7, 10%, 50v, Ceramic	3198 017 34720
1410	Filter, 4.5MHz	2422 549 44534	2413	Cap, 47u, 20%, 16v, Electrolytic	3198 030 44790
1651	Crystal, 18.432MHz	2422 543 89019	2418	Cap, 10p, 5%, 50v, Ceramic	3198 016 31090
1680	6 Pin Board Connector	2422 025 16961	2420	Cap, 150p, 5%, 50v, Ceramic	3198 016 31510
1701	Crystal, 12MHz	2422 543 89018	2422	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
2001	Cap, 33p, 5%, 50v, Ceramic	3198 016 33390	2429	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040

S = Safety Part. Be sure to use exact replacement part.

32PT830H37A (continued)

7304	Transistor, NPN, PDTCL44EU	3198 010 44330	2048	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
7305	Transistor, NPN, BC847BW(COL)	3198 010 42310	2049	Cap, 47u, 20%, 16v, Electrolytic	3198 030 44790
7306	Transistor, NPN, BC847BW(COL)	3198 010 42310	2051	Cap, 10u, 20%, 20v, Electrolytic	3198 032 55130
7308	Transistor, NPN, PDTCL44EU	3198 010 44330	2052	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
7309	Transistor, NPN, PDTCL44EU	3198 010 44330	2053	Cap, 10u, 20%, 20v, Electrolytic	3198 032 55130
7310	Transistor, NPN, PDTCL44EU	3198 010 44330	2054	Cap, 10u, 20%, 20v, Electrolytic	3198 032 55130
7311	Transistor, NPN, BC847BW(COL)	3198 010 42310	2055	Cap, 10u, 20%, 20v, Electrolytic	3198 032 55130
7312	Transistor, NPN, BC847BW(COL)	3198 010 42310	2056	Cap, 10u, 20%, 20v, Electrolytic	3198 032 55130
7313	Transistor, NPN, PMBT2369(UAW)	3198 010 43360	2057	Cap, 150p, 5%, 50v, Ceramic	3198 016 31510
7314	Transistor, NPN, BC847BW(COL)	3198 010 42310	2059	Cap, 22p, 5%, 50v, Ceramic	3198 016 32290
7315	Transistor, NPN, PMBT2369(UAW)	3198 010 43360	2061	Cap, 22p, 5%, 50v, Ceramic	3198 016 32290
7318	Transistor, NPN, BC857BW(COL)	3198 010 42320	2062	Cap, 150p, 5%, 50v, Ceramic	3198 016 31510
7320	Transistor, NPN, BC847BW(COL)	3198 010 42310	2063	Cap, 22p, 5%, 50v, Ceramic	3198 016 32290
7322	Transistor, NPN, BC847BW(COL)	3198 010 42310	2064	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
7323	IC, TDA9321H/N2	9352 625 24518	2065	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
7324	Transistor, NPN, BC847CW	9340 217 80115	2066	Cap, 100n, 10%, 16v, Ceramic	3198 017 31040
7375	Transistor, NPN, BC847BW(COL)	3198 010 42310	2067	Cap, 22p, 5%, 50v, Ceramic	3198 016 32290
7410	Transistor, NPN, BC847BW(COL)	3198 010 42310	2068	Cap, 22p, 5%, 50v, Ceramic	3198 016 32290
7411	Transistor, NPN, BC847B(COL)	3198 010 42030	2069	Cap, 22p, 5%, 50v, Ceramic	3198 016 32290
7413	Transistor, NPN, BFS20	9330 921 11215	2070	Cap, 22p, 5%, 50v, Ceramic	3198 016 32290
7651	IC, MSP3451G-FH-B8-V3	9322 183 41702	3000	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
7664	Transistor, NPN, BC847BPN	9340 425 30115	3001	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 021 34790
7665	Transistor, NPN, BC847BPN	9340 425 30115	3002	Res, 120 ohm, 5%, 1/16W, Metalized Glas	3198 021 31210
7668	Transistor, NPN, BC857BW(COL)	3198 010 42320	3003	Res, 120 ohm, 5%, 1/16W, Metalized Glas	3198 021 31210
7675	Transistor, NPN, BC847BS	9340 425 20115	3004	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 021 34790
7678	Transistor, NPN, BC847BS	9340 425 20115	3005	Res, 330 ohm, 5%, 1/16W, Metalized Glass	3198 021 33310
7701	Transistor, NPN, BC857BW(COL)	3198 010 42320	3006	Res, 120 ohm, 5%, 1/16W, Metalized Glas	3198 021 31210
7702	Transistor, NPN, BC847BW(COL)	3198 010 42310	3007	Res, 120 ohm, 5%, 1/16W, Metalized Glas	3198 021 31210
7704	Transistor, NPN, PMBT2369(UAW)	3198 010 43360	3008	Res, 120 ohm, 5%, 1/16W, Metalized Glas	3198 021 31210
7708	IC, SAA4990H	9352 067 50557	3009	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 021 33310
7709	IC, SAA4978H/V204	9352 688 09557	3010	Res, 5K6, 5%, 1/16W, Metalized Glass .	3198 021 35620
7714	IC, MSM54V1222B-25JS	9322 183 81668	3011	Res, 560 ohm, 5%, 1/16W, Metalized Glas	3198 021 35610
7715	IC, MSM54V1222B-25JS	9322 183 81668	3012	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
7716	32 Pin IC Socket	2422 486 80938	3013	Res, 2K7, 5%, 1/16W, Metalized Glass .	3198 021 32720
7716	IC, M87C257-90C1	9322 130 45668	3014	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
7717	IC, ROM, M87C257	3104 317 03241	3015	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
7799	Software Package, FBX PICNIC	3104 317 43241	3016	Res, 33 ohm, 5%, 1/16W, Metalized Glass	3198 021 33390
8302	Cable, 2 Pin, 180mm.	3104 311 03031	3017	Res, 270 ohm, 5%, 1/16W, Metalized Glas	3198 021 32710
8303	Cable, 5 Pin, 400mm.	3104 311 05381	3018	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198 021 31010
8304	Cable, 7 Pin, 280mm.	3104 311 03241	3019	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 021 34790
8680	Cable, 6 Pin, 340mm.	3104 311 03231	3020	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 021 33310
			3021	Res, 180 ohm, 5%, 1/16W, Metalized Glas	3198 021 31810
			3022	Res, 120 ohm, 5%, 1/16W, Metalized Glas	3198 021 31210
			3023	Res, 120 ohm, 5%, 1/16W, Metalized Glas	3198 021 31210
			3024	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 021 33310
			3025	Res, 5K6, 5%, 1/16W, Metalized Glass .	3198 021 35620
			3026	Res, 560 ohm, 5%, 1/16W, Metalized Glas	3198 021 35610
			3027	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
			3028	Res, 2K7, 5%, 1/16W, Metalized Glass .	3198 021 32720
			3029	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
			3030	Res, 820 ohm, 5%, 1/16W, Metalized Glas	3198 021 38210
			3031	Res, 12K, 5%, 1/16W, Metalized Glass .	3198 021 31230
			3032	Res, 12K, 5%, 1/16W, Metalized Glass .	3198 021 31230
			3033	Res, 150 ohm, 5%, 1/16W, Metalized Glas	3198 021 31510
			3034	Res, 180 ohm, 5%, 1/16W, Metalized Glas	3198 021 31810
			3035	Res, 180 ohm, 5%, 1/16W, Metalized Glas	3198 021 31810
			3036	Res, 270 ohm, 5%, 1/16W, Metalized Glas	3198 021 32710
			3037	Res, 470 ohm, 5%, 1/16W, Metalized Glas	3198 021 34710
			3038	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
			3039	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
			3040	Res, 470 ohm, 5%, 1/16W, Metalized Glas	3198 021 34710
			3041	Res, 820 ohm, 5%, 1/16W, Metalized Glas	3198 021 38210
			3042	Res, 3K3, 1%, 1/16W, Metalized Glass .	2322 704 73302
			3043	Res, 1K5, 5%, 1/16W, Metalized Glass .	3198 021 31520
			3044	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
			3055	Res, 220 ohm, 5%, 1/16W, Metalized Glas	3198 021 32210
			3056	Res, 1K, 5%, 1/16W, Metalized Glass .	3198 021 31020
			3057	Res, 2K2, 5%, 1/16W, Metalized Glass .	3198 021 32220
			3058	Res, 220K, 5%, 1/16W, Metalized Glass .	3198 021 32240
			3059	Res, 27K, 5%, 1/16W, Metalized Glass .	3198 021 32730
			3060	Res, 470 ohm, 5%, 1/16W, Metalized Glas	3198 021 34710
			3061	Res, 4K7, 5%, 1/16W, Metalized Glass .	3198 021 34720
			3065	Res, 560 ohm, 5%, 1/16W, Metalized Glas	3198 021 35610
			3067	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 021 34790
			3068	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 021 34790
			3069	Res, 100K, 5%, 1/16W, Metalized Glass .	3198 021 31040
			3071	Res, 1K5, 5%, 1/16W, Metalized Glass .	3198 021 31520
			3072	Res, 2K7, 5%, 1/16W, Metalized Glass .	3198 021 32720
			3073	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 021 33310
			3074	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198 021 33310
			3076	Res, 1K, 5%, 1/16W, Metalized Glass .	3198 021 31020
			3077	Res, 220 ohm, 5%, 1/16W, Metalized Glas	3198 021 32210
			3082	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 021 34790
			3083	Res, 47 ohm, 5%, 1/16W, Metalized Glass	3198 021 34790
			3085	Res, 470 ohm, 5%, 1/16W, Metalized Glas	3198 021 34710
			3088	Res, 1K, 5%, 1/16W, Metalized Glass .	3198 021 31020
			3089	Res, 150 ohm, 5%, 1/16W, Metalized Glas	3198 021 31510
			3091	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198 021 31090
			3095	Res, 100K, 5%, 1/16W, Metalized Glass .	3198 021 31040
			3096	Res, 180 ohm, 5%, 1/16W, Metalized Glas	3198 021 31810
			3097	Res, 1K8, 5%, 1/16W, Metalized Glass .	3198 021 31820
			3098	Res, 5K6, 5%, 1/16W, Metalized Glass .	3198 021 35620

S = Safety Part Be sure to use exact replacement part.

32PT830H37A (continued)

Table with 4 columns: Part Number, Description, Quantity, and Price. Includes items like Transformer, Bridge Coil, Diode, Zener Diode, Power FET, Transistor, and Wire Jumper.

Mains/Front Interface Panel

Table for Mains/Front Interface Panel components including CBA, Mains/Front Interface Panel, 5 Pin Board Connector, Switch, IR Receiver, LED, Cap, Res, and Carbon Film.

2 Tuner PIP Panel

2 Tuner PIP Panel

High Definition Jack Panel

Table for High Definition Jack Panel components including CBA, High Definition Jack Panel, 5 Pin Board Connector, 7 Pin Board Connector, 6 Pin Board Connector, 15 Pin Board Connector, 2 Pin Cinch Jack, 3 Pin Cinch Jack, and various capacitors and resistors.

Table for the right side of the bill of materials, listing components like Res, Diode, Zener Diode, and Jumper with their respective quantities and prices.

S = Safety Part Be sure to use exact replacement part.

32PT830H37A (continued)

3120	Res, 180 ohm, 1%, 1/16W, Metalized Glas	2322	704	61801				
3121	Res, 180 ohm, 1%, 1/16W, Metalized Glas	2322	704	61801				
3122	Res, 220 ohm, 1%, 1/16W, Metalized Glas	2322	704	62201				
3123	Res, 220 ohm, 1%, 1/16W, Metalized Glas	2322	704	62201				
3124	Res, 220 ohm, 1%, 1/16W, Metalized Glas	2322	704	62201				
3125	Trim Pot, 470 ohm, 25%	2120	358	90538				
S 3300	Res, 5R6, 5%, 1/3W, Metal Film	2306	204	03568				
3301	Res, 10K, 5%, 2 1/2W, Metal Film	2322	195	63103				
3303	Res, 10K, 5%, 1/10W, Metalized Glass	3198	021	51030				
3304	Res, 1K2, 5%, 1/10W, Metalized Glass	3198	021	51220				
3307	Res, 10 ohm, 5%, 1/10W, Metalized Glass	3198	021	51090				
3308	Res, 56K, 5%, 1/10W, Metalized Glass	3198	021	55630				
3309	Res, 560 ohm, 5%, 1/10W, Metalized Glas	3198	021	55610				
3310	Res, 1K, 5%, 1/10W, Metalized Glass	3198	021	51020				
3311	Res, 330 ohm, 5%, 1/10W, Metalized Glas	3198	021	53310				
3312	Res, 2K2, 5%, 1/10W, Metalized Glass	3198	021	52220				
3315	Res, 4K7, 5%, 1/10W, Metalized Glass	3198	021	54720				
3316	Res, 56K, 5%, 1/10W, Metalized Glass	3198	021	55630				
3317	Res, 4K7, 5%, 1/10W, Metalized Glass	3198	021	54720				
3318	Res, 15 ohm, 5%, 1/10W, Metalized Glass	3198	021	51590				
3319	Res, 1K2, 5%, 1/10W, Metalized Glass	3198	021	51220				
3320	Res, 4K7, 5%, 1/10W, Metalized Glass	3198	021	54720				
3334	Res, 1K, 5%, 1/6W, Carbon Film	3198	011	01020				
3338	Res, 1K, 20%, 1/2W, Carbon Film	3198	013	01020				
3339	Res, 1K, 20%, 1/2W, Carbon Film	3198	013	01020				
3340	Res, 1K, 20%, 1/2W, Carbon Film	3198	013	01020				
S 3341	Res, 100 ohm, 5%, 1/3W, Metal Film	2306	204	03101				
3342	Res, Zero ohm, "Chip" Jumper	3198	021	90020				
3343	Res, 2K2, 1%, 3/5W, Metal Film	2312	915	12202				
3345	Res, 33 ohm, 5%, 1/6W, Carbon Film	3198	011	03390				
3347	Res, 1K5, 20%, 1/2W, Carbon Film	3198	013	01520				
3348	Res, 2K2, 1%, 3/5W, Metal Film	2312	915	12202				
3349	Res, 1K, 20%, 1/2W, Carbon Film	3198	013	01020				
3350	Res, 470 ohm, 5%, 1/6W, Carbon Film	3198	011	04710				
3351	Res, 470 ohm, 5%, 1/6W, Carbon Film	3198	011	04710				
3352	Res, 470 ohm, 5%, 1/6W, Carbon Film	3198	011	04710				
3353	Res, 4R7, 5%, 1/6W, Carbon Film	3198	011	04780				
3355	Res, 10 ohm, 5%, 1/10W, Metalized Glass	3198	021	51090				
3356	Res, 1K, 5%, 1/10W, Metalized Glass	3198	021	51020				
3357	Res, 10 ohm, 5%, 1/10W, Metalized Glass	3198	021	51090				
3358	Res, 1K5, 5%, 1/10W, Metalized Glass	3198	021	51520				
3359	Res, 220 ohm, 5%, 1/16W, Metalized Glas	3198	021	32210				
3366	Voltage Dependent Resistor	2322	593	13507				
3375	Res, 100K, 1%, 3/5W, Metal Film	2312	915	11004				
3376	Res, 100K, 1%, 3/5W, Metal Film	2312	915	11004				
3377	Res, 100K, 1%, 3/5W, Metal Film	2312	915	11004				
3378	Res, 4R7, 5%, 1/16W, Metalized Glass	3198	021	34780				
3379	Res, 4R7, 5%, 1/6W, Carbon Film	3198	011	04780				
3398	Res, 18K, 5%, 1/6W, Carbon Film	3198	011	01830				
3405	Res, 39 ohm, 5%, 1/4W, Carbon Film	2120	101	74399				
S 3412	Res, 15 ohm, 5%, 1/8W, Metalized Glass	2322	750	61509				
3413	Res, 390 ohm, 5%, 1/16W, Metalized Glas	3198	021	33910				
3414	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198	021	31090				
3416	Res, 39 ohm, 5%, 1/4W, Carbon Film	2120	101	74399				
4115	Res, Zero ohm, "Chip" Jumper	3198	021	90030				
4301	Res, Zero ohm, "Chip" Jumper	3198	021	90020				
4302	Res, Zero ohm, "Chip" Jumper	3198	021	90030				
S 5300	Transformer, S13974-03	3104	308	20571				
6100	Zener Diode, 5.6 volt	3198	020	55680				
6305	Diode, BAS321	9340	553	52115				
6306	Diode, BAS321	9340	553	52115				
6307	Diode, BAS321	9340	553	52115				
6308	Diode, MCL4148	9322	128	15685				
6309	Diode, MCL4148	9322	128	15685				
7300	Transistor, NPN, BF199	9330	634	20126				
7301	Transistor, NPN, BFS20	9330	921	11215				
7302	Transistor, PNP, 2SA1358	9322	166	55682				
7303	Transistor, NPN, 2SC3421	9322	166	56682				
7304	Transistor, PNP, BF824	9337	223	50215				
7307	IC, TDA6103Q/N3	9352	079	80112				
7308	Transistor, NPN, BFS20	9330	921	11215				
9301	Wire Jumper	3198	036	90010				
9302	Wire Jumper	3198	036	90010				
9305	Wire Jumper	3198	036	90010				
9307	Wire Jumper	3198	036	90010				
9308	Wire Jumper	3198	036	90010				
9309	Wire Jumper	3198	036	90010				
9313	Wire Jumper	3198	036	90010				
9314	Wire Jumper	3198	036	90010				
9316	Wire Jumper	3198	036	90010				
9317	Wire Jumper	3198	036	90010				
9318	Wire Jumper	3198	036	90010				
9321	Wire Jumper	3198	036	90010				
9322	Wire Jumper	3198	036	90010				
9323	Wire Jumper	3198	036	90010				
9324	Wire Jumper	3198	036	90010				
9325	Wire Jumper	3198	036	90010				
9326	Wire Jumper	3198	036	90010				
9330	Wire Jumper	3198	036	90010				
9333	Wire Jumper	3198	036	90010				
9336	Wire Jumper	3198	036	90010				
9337	Wire Jumper	3198	036	90010				

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6124	Diode, BAT85	9336	247	60133	S 7610	Optical Coupler, TCDDT1102G	9319	002	76682
6200	Zener Diode, 33 volt	3198	020	53390	S 7613	Optical Coupler, TCDDT1102G	9319	002	76682
6204	Zener Diode, 6.8 volt	3198	020	56880	7620	IC, TDA8177	9322	066	43687
6205	Zener Diode, 6.8 volt	3198	020	56880	7640	Transistor, NPN, BC847B(COL)	3198	010	42030
6206	Zener Diode, 6.8 volt	3198	020	56880	7641	Transistor, NPN, BC847B(COL)	3198	010	42030
6207	Zener Diode, 6.8 volt	3198	020	56880	7652	Transistor, NPN, BC847B(COL)	3198	010	42030
6405	Zener Diode, 33 volt	3198	020	53390	7653	Transistor, NPN, BC847B(COL)	3198	010	42030
6406	Diode, BAS316	3198	010	10630	7654	Transistor, PNP, BC857B(COL)	3198	010	42150
6407	Diode, BAS316	3198	010	10630	7655	Transistor, NPN, BC847B(COL)	3198	010	42030
6408	Diode, Rect, BYD33D	9337	234	00133	7702	Transistor, NPN, BC847B(COL)	3198	010	42030
6421	Diode, Rect, BY359X-1500	9340	303	30127	7720	Transistor, NPN, BC847B(COL)	3198	010	42030
6422	Diode, Rect, BY229X-600	9340	380	20127	7721	Transistor, NPN, BC847B(COL)	3198	010	42030
6436	Diode, Rect, BYD33J	9337	234	20133	7722	Transistor, PNP, BC857B(COL)	3198	010	42150
6437	Diode, Rect, BYD33J	9337	234	20133	7723	Transistor, PNP, BC857B(COL)	3198	010	42150
6440	Diode, BAS316	3198	010	10630	7724	Transistor, NPN, BC847B(COL)	3198	010	42030
6441	Diode, BAS316	3198	010	10630	7725	Transistor, NPN, BC847B(COL)	3198	010	42030
6442	Zener Diode, 15 volt	3198	020	51590	7730	Transistor, NPN, BC847B(COL)	3198	010	42030
6451	Diode, BAS316	3198	010	10630	7731	Transistor, PNP, BC857B(COL)	3198	010	42150
6452	Diode, BAS316	3198	010	10630	7732	Transistor, NPN, BC847B(COL)	3198	010	42030
6453	Diode, BAS316	3198	010	10630	7750	IC, TDA2616	9350	403	20112
6454	Zener Diode, 33 volt	9340	548	71115	7901	Transistor, NPN, BC547B(COL)	3198	020	40030
6456	Zener Diode, 33 volt	9340	548	71115	7902	Transistor, NPN, BC337-25(COL)	3198	020	43530
6461	Diode, Rect, BYV29X-500	9340	555	59127	7905	Transistor, NPN, BC368	9332	592	40126
6463	Diode, Rect, BYV29X-500	9340	555	59127	7906	IC, L4940V85	9322	005	46687
6465	Diode, Rect, BYV29X-500	9340	555	59127	7907	Transistor, NPN, BC847B(COL)	3198	010	42030
6466	Diode, Rect, BYV29X-500	9340	555	59127	7908	Transistor, PNP, BC857B(COL)	3198	010	42150
6468	Diode, Rect, BYD33D	9337	234	00133	7909	Transistor, PNP, BC857B(COL)	3198	010	42150
6480	Diode, Rect, BYD33D	9337	234	00133	8203	Cable, 4 Pin, 340mm	3104	311	05481
6481	Zener Diode, 18 volt	3198	010	21890	8204	Cable, 6 Pin, 220mm	3104	311	05471
6482	Diode, BAS316	3198	010	10630	8317	Cable, 2 Pin, 340mm	3104	311	01431
6492	Diode, BAS316	3198	010	10630	8324	Cable, 7 Pin, 560mm	3104	311	05411
6493	Zener Diode, 47 volt	9340	389	00115	8340	Cable, 11 Pin 480mm	3104	311	05431
6499	Zener Diode, 6.8 volt	3198	020	56880	8392	Cable, 3 Pin, 220mm	3104	311	04171
6505	Zener Diode, 15 volt	3198	010	21590	8920	Cable, 5 Pin, 400mm	3104	301	07674
6506	Diode, 1N4148	3198	010	10010	8921	Cable, 3 Pin, 400mm	3104	311	03082
6507	Diode, Rect, BYV28-200/24	9340	550	66112	8936	Cable, 11 Pin, 820mm	3104	311	01181
6508	Diode, Rect, BYV28-400/20	9340	549	39112	8937	Cable, 10 Pin, 340mm	3104	301	09841
6510	Zener Diode, 15 volt	3198	010	51590	8951	Cable, 5 Pin, 340mm	3104	311	03491
6511	Diode, BAS316	3198	010	10630	9101	Wire Jumper	3198	036	90010
6512	Diode, BAS316	3198	010	10630	9102	Wire Jumper	3198	036	90010
6513	Diode, Bridge Rect, REC GBU4K	3198	010	10640	9113	Wire Jumper	3198	036	90010
6514	Zener Diode, 200 volt	9336	018	20133	9203	Wire Jumper	3198	036	90010
6515	Zener Diode, 5.6 volt	9335	005	90133	9204	Wire Jumper	3198	036	90010
6516	Diode, BAS316	3198	010	10630	9206	Wire Jumper	3198	036	90010
6517	Diode, BAT85	9336	247	60133	9210	Wire Jumper	3198	036	90010
6518	Diode, BAS316	3198	010	10630	9212	Wire Jumper	3198	036	90010
6519	Diode, Rect, BYD33D	9337	234	00133	9217	Wire Jumper	3198	036	90010
6600	Diode, 1N4148	3198	010	10010	9219	Wire Jumper	3198	036	90010
6616	Diode, BAS316	3198	010	10630	9221	Wire Jumper	3198	036	90010
6617	Diode, 1N4148	3198	010	10010	9222	Wire Jumper	3198	036	90010
6619	Diode, Rect, BYD33D	9337	234	00133	9224	Wire Jumper	3198	036	90010
6620	Diode, Rect, BYV27-200	9322	126	72673	9226	Wire Jumper	3198	036	90010
6623	Diode, BAS316	3198	010	10630	9228	Wire Jumper	3198	036	90010
6636	Diode, BAS316	3198	010	10630	9229	Wire Jumper	3198	036	90010
6660	Diode, BAT85	9336	247	60133	9230	Wire Jumper	3198	036	90010
6665	Diode, BAS316	3198	010	10630	9231	Wire Jumper	3198	036	90010
6731	Diode, BAS316	3198	010	10630	9232	Wire Jumper	3198	036	90010
6732	Diode, BAS316	3198	010	10630	9302	Wire Jumper	3198	036	90010
6900	Diode, BAS316	3198	010	10630	9401	Wire Jumper	3198	036	90010
6901	Diode, 1PS76SB10	9340	453	90115	9402	Wire Jumper	3198	036	90010
6902	Diode, 1PS76SB10	9340	453	90115	9403	Wire Jumper	3198	036	90010
6903	Diode, 1PS76SB10	9340	453	90115	9404	Wire Jumper	3198	036	90010
6904	Diode, 1N4148	3198	010	10010	9405	Wire Jumper	3198	036	90010
7100	Transistor, PNP, BC557B(COL)	3198	020	40110	9406	Wire Jumper	3198	036	90010
7101	Transistor, NPN, BC547B(COL)	3198	020	40030	9407	Wire Jumper	3198	036	90010
7102	Power FET, STP3NB60FP	9322	129	71687	9412	Wire Jumper	3198	036	90010
S 7104	Optical Coupler, TCDDT1102G	9319	002	76682	9414	Wire Jumper	3198	036	90010
7228	Transistor, NPN, PMBT2369(UAW)	3198	010	43360	9418	Wire Jumper	3198	036	90010
7407	Transistor, NPN, BC847B(COL)	3198	010	42030	9419	Wire Jumper	3198	036	90010
7408	Transistor, NPN, BC368	9332	592	40126	9421	Wire Jumper	3198	036	90010
7409	Transistor, NPN, BC847B(COL)	3198	010	42030	9423	Wire Jumper	3198	036	90010
7421	Transistor, NPN, BU2527DX	9340	496	80127	9424	Wire Jumper	3198	036	90010
7440	IC, LM358N	9339	848	90682	9425	Wire Jumper	3198	036	90010
7441	Transistor, NPN, BC547B(COL)	3198	020	40030	9428	Wire Jumper	3198	036	90010
7442	Transistor, PNP, BC557B(COL)	3198	020	40110	9429	Wire Jumper	3198	036	90010
7452	Transistor, NPN, BC847B(COL)	3198	010	42030	9430	Wire Jumper	3198	036	90010
7480	Power FET, STP3NB60FP	9322	129	71687	9431	Wire Jumper	3198	036	90010
7481	Transistor, PNP, BC557B(COL)	3198	020	40110	9435	Wire Jumper	3198	036	90010
S 7482	Optical Coupler, TCDDT1102G	9319	002	76682	9436	Wire Jumper	3198	036	90010
7501	Transistor, PNP, BC857B(COL)	3198	010	42150	9505	Wire Jumper	3198	036	90010
7502	Transistor, NPN, BF487	9337	626	60126	9510	Wire Jumper	3198	036	90010
7504	Power FET, STP5NB40	9322	174	85687	9512	Wire Jumper	3198	036	90010
7505	Transistor, PNP, BC857B(COL)	3198	010	42150	9513	Wire Jumper	3198	036	90010
7506	IC TL431ACZ-AP S (ST00) A	9322	086	97676	9515	Wire Jumper	3198	036	90010
7510	Transistor, NPN, BC847B(COL)	3198	010	42030	9516	Wire Jumper	3198	036	90010
7528	Transistor, NPN, BC337-25(COL)	3198	020	43530	9518	Wire Jumper	3198	036	90010
7529	Transistor, NPN, BC847B(COL)	3198	010	42030	9519	Wire Jumper	3198	036	90010
7600	Transistor, NPN, BC546B	9332	377	80126	9520	Wire Jumper	3198	036	90010
7602	Transistor, NPN, BC847B(COL)	3198	010	42030	9523	Wire Jumper	3198	036	90010
7603	Transistor, PNP, BC857B(COL)	3198	010	42150	9524	Wire Jumper	3198	036	90010
7605	Transistor, NPN, BC847B(COL)	3198	010	42030	9525	Wire Jumper	3198	036	90010
7606	Transistor, NPN, BC847B(COL)	3198	010	42030	9528	Wire Jumper	3198	036	90010

S = Safety Part Be sure to use exact replacement part.

32PT842H37A (continued)

9622	Wire Jumper	3198	036	90010	1680	6 Pin Board Connector	2422	025	16961
9623	Wire Jumper	3198	036	90010	1681	3 Pin Board Connector	2422	025	17103
9705	Wire Jumper	3198	036	90010	1682	10 Pin Board Connector	2422	025	16729
9706	Wire Jumper	3198	036	90010	1701	Crystal, 12MHz	2422	543	89018
9707	Wire Jumper	3198	036	90010	2001	Cap, 33p, 5%, 50v, Ceramic	3198	016	33390
9712	Wire Jumper	3198	036	90010	2002	Cap, 33p, 5%, 50v, Ceramic	3198	016	33390
9713	Wire Jumper	3198	036	90010	2003	Cap, 2n2, 10%, 50v, Ceramic	3198	017	32220
9714	Wire Jumper	3198	036	90010	2004	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9715	Wire Jumper	3198	036	90010	2005	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9718	Wire Jumper	3198	036	90010	2006	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9720	Wire Jumper	3198	036	90010	2007	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9721	Wire Jumper	3198	036	90010	2008	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9723	Wire Jumper	3198	036	90010	2009	Cap, 470p, 5%, 50v, Ceramic	3198	016	34710
9724	Wire Jumper	3198	036	90010	2010	Cap, 47p, 5%, 50v, Ceramic	3198	016	34790
9726	Wire Jumper	3198	036	90010	2011	Cap, 47p, 5%, 50v, Ceramic	3198	016	34790
9901	Wire Jumper	3198	036	90010	2012	Cap, 47p, 5%, 50v, Ceramic	3198	016	34790
9902	Wire Jumper	3198	036	90010	2013	Cap, 100u, 20%, 16v, Electrolytic	3198	030	41010
9903	Wire Jumper	3198	036	90010	2014	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9904	Wire Jumper	3198	036	90010	2015	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9906	Wire Jumper	3198	036	90010	2016	Cap, 100u, 20%, 16v, Electrolytic	3198	030	41010
9907	Wire Jumper	3198	036	90010	2017	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9908	Wire Jumper	3198	036	90010	2020	Cap, 10n, 10%, 50v, Ceramic	3198	017	31030
9909	Wire Jumper	3198	036	90010	2027	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9910	Wire Jumper	3198	036	90010	2028	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9911	Wire Jumper	3198	036	90010	2030	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9912	Wire Jumper	3198	036	90010	2031	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9914	Wire Jumper	3198	036	90010	2300	Cap, 100u, 20%, 16v, Electrolytic	3198	030	41010
9916	Wire Jumper	3198	036	90010	2302	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9917	Wire Jumper	3198	036	90010	2303	Cap, 10n, 10%, 50v, Ceramic	3198	017	31030
9920	Wire Jumper	3198	036	90010	2304	Cap, 10p, 5%, 50v, Ceramic	3198	016	31090
9921	Wire Jumper	3198	036	90010	2305	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9922	Wire Jumper	3198	036	90010	2306	Cap, 470p, 10%, 50v, Ceramic	3198	017	34710
9925	Wire Jumper	3198	036	90010	2307	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9926	Wire Jumper	3198	036	90010	2308	Cap, 10p, 5%, 50v, Ceramic	3198	016	31090
9927	Wire Jumper	3198	036	90010	2313	Cap, 100n, 5%, 16v, Polypropylene	2020	319	90005
9928	Wire Jumper	3198	036	90010	2314	Cap, 100u, 20%, 16v, Electrolytic	3198	030	41010
9931	Wire Jumper	3198	036	90010	2315	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9932	Wire Jumper	3198	036	90010	2317	Cap, 2u2, +80/-20%, 10v, Ceramic	3198	017	22250
9933	Wire Jumper	3198	036	90010	2318	Cap, 22n, 10%, 25v, Ceramic	3198	017	32230
9934	Wire Jumper	3198	036	90010	2319	Cap, 10n, 10%, 50v, Ceramic	3198	017	31030
9936	Wire Jumper	3198	036	90010	2320	Cap, 10p, 5%, 50v, Ceramic	3198	016	31090
9943	Wire Jumper	3198	036	90010	2321	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9944	Wire Jumper	3198	036	90010	2322	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9945	Wire Jumper	3198	036	90010	2323	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9946	Wire Jumper	3198	036	90010	2324	Cap, 10n, 10%, 50v, Ceramic	3198	017	31030
9947	Wire Jumper	3198	036	90010	2325	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9948	Wire Jumper	3198	036	90010	2328	Cap, 22p, 5%, 50v, Ceramic	3198	016	32290
9950	Wire Jumper	3198	036	90010	2329	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9951	Wire Jumper	3198	036	90010	2330	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9952	Wire Jumper	3198	036	90010	2331	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9957	Wire Jumper	3198	036	90010	2332	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9958	Wire Jumper	3198	036	90010	2333	Cap, 2u2, +80/-20%, 10v, Ceramic	3198	017	22250
9960	Wire Jumper	3198	036	90010	2334	Cap, 2u2, +80/-20%, 10v, Ceramic	3198	017	22250
9963	Wire Jumper	3198	036	90010	2335	Cap, 100u, 20%, 16v, Electrolytic	3198	030	41010
9964	Wire Jumper	3198	036	90010	2336	Cap, 2u2, +80/-20%, 10v, Ceramic	3198	017	22250
9965	Wire Jumper	3198	036	90010	2338	Cap, 10n, 10%, 50v, Ceramic	3198	017	31030
9966	Wire Jumper	3198	036	90010	2339	Cap, 100n, 10%, 50v, Ceramic	2222	580	15649
9967	Wire Jumper	3198	036	90010	2340	Cap, 10u, 20%, 16v, Electrolytic	3198	030	41090
9968	Wire Jumper	3198	036	90010	2341	Cap, 100u, 20%, 16v, Electrolytic	3198	030	41010
9969	Wire Jumper	3198	036	90010	2342	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9970	Wire Jumper	3198	036	90010	2343	Cap, 100n, +80/-20%, 25v, Ceramic	3198	023	41040
9971	Wire Jumper	3198	036	90010	2350	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9972	Wire Jumper	3198	036	90010	2351	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9975	Wire Jumper	3198	036	90010	2352	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9976	Wire Jumper	3198	036	90010	2356	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9980	Wire Jumper	3198	036	90010	2357	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9983	Wire Jumper	3198	036	90010	2358	Cap, 3n3, 10%, 50v, Ceramic	3198	017	33320
9984	Wire Jumper	3198	036	90010	2361	Cap, 1p2, 21%, 50v, Ceramic	3198	016	31280
9987	Wire Jumper	3198	036	90010	2362	Cap, 12p, 5%, 50v, Ceramic	3198	016	31290
9988	Wire Jumper	3198	036	90010	2363	Cap, 470p, 10%, 50v, Ceramic	3198	017	34710
9990	Wire Jumper	3198	036	90010	2365	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9991	Wire Jumper	3198	036	90010	2366	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9992	Wire Jumper	3198	036	90010	2367	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9993	Wire Jumper	3198	036	90010	2368	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9996	Wire Jumper	3198	036	90010	2369	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9997	Wire Jumper	3198	036	90010	2370	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
9998	Wire Jumper	3198	036	90010	2371	Cap, 4n7, 10%, 50v, Ceramic	3198	017	34720
					2372	Cap, 1u, +80/-20%, 16v, Ceramic	3198	017	21050
					2373	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
					2374	Cap, 2u2, +80/-20%, 10v, Ceramic	3198	017	22250
					2375	Cap, 22n, 10%, 25v, Ceramic	3198	017	32230
					2376	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
					2377	Cap, 100u, 20%, 16v, Electrolytic	3198	030	41010
					2378	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
					2384	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
					2395	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
					2396	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
					2397	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
					2401	Cap, 10n, 10%, 50v, Ceramic	3198	017	31030
					2410	Cap, 470n, 10%, 16v, Ceramic	2222	780	15658
					2411	Cap, 100n, 10%, 16v, Ceramic	3198	017	31040
					2412	Cap, 4n7, 10%, 50v, Ceramic	3198	017	34720

Small Signal Board

	Small Signal Board			
	Small Signal Board	3104	328	25221
CBA	2 Pin Board Connector	2422	025	16542
1001	Crystal, 12MHz	2422	543	89018
S 1003	Fuse, F315MA, 32V	2422	086	11013
1301	Crystal, 12MHz	2422	540	98456
1303	5 Pin Board Connector	2422	025	16966
1304	7 Pin Board Connector	2422	025	17104
1318	Crystal, 3.579545MHz	2422	543	00861
1407	Filter, 4.5MHz	2422	549	44043
1408	SAW Filter, 45.75MHz	2422	549	44377
1410	Filter, 4.5MHz	2422	549	44534
1651	Crystal, 18.432MHz	2422	543	89019

S = Safety Part Be sure to use exact replacement part.

32PT842H37A (continued)

2409	Cap, 470n, +80/-20%, 10v, Ceramic . . .	3198	017	44740	9309	Wire Jumper	3198	036	90010
2410	Res, Zero ohm, "Chip" Jumper	3198	021	90030	9313	Wire Jumper	3198	036	90010
2411	Cap, 100n, 10%, 16v, Ceramic	3198	017	01040	9314	Wire Jumper	3198	036	90010
2420	Cap, 470n, +80/-20%, 10v, Ceramic . . .	3198	017	44740	9316	Wire Jumper	3198	036	90010
3106	Res, 1K8, 1%, 1/16W, Metalized Glass . .	2322	704	61802	9317	Wire Jumper	3198	036	90010
3107	Res, 1K2, 1%, 3/5W, Metal Film	2312	915	11202	9318	Wire Jumper	3198	036	90010
3109	Res, 1K8, 1%, 1/16W, Metalized Glass . .	2322	704	61802	9321	Wire Jumper	3198	036	90010
3110	Res, 1K2, 1%, 3/5W, Metal Film	2312	915	11202	9322	Wire Jumper	3198	036	90010
3111	Trim Pot, 470 ohm, 25%	2120	358	90538	9323	Wire Jumper	3198	036	90010
3113	Res, 1K8, 1%, 1/16W, Metalized Glass . .	2322	704	61802	9324	Wire Jumper	3198	036	90010
3114	Res, 1K2, 1%, 3/5W, Metal Film	2312	915	11202	9325	Wire Jumper	3198	036	90010
3115	Trim Pot, 470 ohm, 25%	2120	358	90538	9326	Wire Jumper	3198	036	90010
3116	Res, 1K, 5%, 1/6W, Carbon Film	3198	011	01020	9330	Wire Jumper	3198	036	90010
3117	Res, 2K7, 1%, 1/16W, Metalized Glass . .	2322	704	62702	9333	Wire Jumper	3198	036	90010
3118	Res, 2K2, 1%, 1/16W, Metalized Glass . .	2322	704	62202	9336	Wire Jumper	3198	036	90010
3119	Res, 180 ohm, 1%, 1/16W, Metalized Glas	2322	704	61801	9337	Wire Jumper	3198	036	90010
3120	Res, 180 ohm, 1%, 1/16W, Metalized Glas	2322	704	61801	9401	Wire Jumper	3198	036	90010
3121	Res, 180 ohm, 1%, 1/16W, Metalized Glas	2322	704	61801	9403	Wire Jumper	3198	036	90010
3122	Res, 220 ohm, 1%, 1/16W, Metalized Glas	2322	704	62201					
3123	Res, 220 ohm, 1%, 1/16W, Metalized Glas	2322	704	62201					
3124	Res, 220 ohm, 1%, 1/16W, Metalized Glas	2322	704	62201					
3125	Trim Pot, 470 ohm, 25%	2120	358	90538					
S 3300	Res, 5R6, 5%, 1/3W, Metal Film	2306	204	03568					
3301	Res, 10K, 5%, 2 1/2W, Metal Film	2322	195	63103					
3303	Res, 10K, 5%, 1/10W, Metalized Glass . .	3198	021	51030					
3304	Res, 1K2, 5%, 1/10W, Metalized Glass . .	3198	021	51220					
3307	Res, 10 ohm, 5%, 1/10W, Metalized Glass	3198	021	51090					
3308	Res, 56K, 5%, 1/10W, Metalized Glass . .	3198	021	55630					
3309	Res, 560 ohm, 5%, 1/10W, Metalized Glas	3198	021	55610					
3310	Res, 1K, 5%, 1/10W, Metalized Glass . . .	3198	021	51020					
3311	Res, 330 ohm, 5%, 1/10W, Metalized Glas	3198	021	53310					
3312	Res, 2K2, 5%, 1/10W, Metalized Glass . .	3198	021	52220					
3315	Res, 4K7, 5%, 1/10W, Metalized Glass . .	3198	021	54720					
3316	Res, 56K, 5%, 1/10W, Metalized Glass . .	3198	021	55630					
3317	Res, 4K7, 5%, 1/10W, Metalized Glass . .	3198	021	54720					
3318	Res, 15 ohm, 5%, 1/10W, Metalized Glass	3198	021	51590					
3319	Res, 1K2, 5%, 1/10W, Metalized Glass . .	3198	021	51220					
3320	Res, 4K7, 5%, 1/10W, Metalized Glass . .	3198	021	54720					
3334	Res, 1K, 5%, 1/6W, Carbon Film	3198	011	01020					
3338	Res, 1K, 20%, 1/2W, Carbon Film	3198	013	01020					
3339	Res, 1K, 20%, 1/2W, Carbon Film	3198	013	01020					
3340	Res, 1K, 20%, 1/2W, Carbon Film	3198	013	01020					
S 3341	Res, 100 ohm, 5%, 1/3W, Metal Film . . .	2306	204	03101					
3342	Res, Zero ohm, "Chip" Jumper	3198	021	90020					
3343	Res, 2K2, 1%, 3/5W, Metal Film	2312	915	12202					
3345	Res, 33 ohm, 5%, 1/6W, Carbon Film . . .	3198	011	03390					
3347	Res, 1K5, 20%, 1/2W, Carbon Film	3198	013	01520					
3348	Res, 2K2, 1%, 3/5W, Metal Film	2312	915	12202					
3349	Res, 1K, 20%, 1/2W, Carbon Film	3198	013	01020					
3350	Res, 470 ohm, 5%, 1/6W, Carbon Film . . .	3198	011	04710					
3351	Res, 470 ohm, 5%, 1/6W, Carbon Film . . .	3198	011	04710					
3352	Res, 470 ohm, 5%, 1/6W, Carbon Film . . .	3198	011	04710					
3353	Res, 4R7, 5%, 1/6W, Carbon Film	3198	011	04780					
3355	Res, 10 ohm, 5%, 1/10W, Metalized Glass	3198	021	51090					
3356	Res, 1K, 5%, 1/10W, Metalized Glass . . .	3198	021	51020					
3357	Res, 10 ohm, 5%, 1/10W, Metalized Glass	3198	021	51090					
3358	Res, 1K5, 5%, 1/10W, Metalized Glass . .	3198	021	51520					
3359	Res, 220 ohm, 5%, 1/16W, Metalized Glas	3198	021	32210					
3366	Voltage Dependent Resistor	2322	593	13507					
3375	Res, 100K, 1%, 3/5W, Metal Film	2312	915	11004					
3376	Res, 100K, 1%, 3/5W, Metal Film	2312	915	11004					
3377	Res, 100K, 1%, 3/5W, Metal Film	2312	915	11004					
3378	Res, 4R7, 5%, 1/16W, Metalized Glass . . .	3198	021	34780					
3379	Res, 4R7, 5%, 1/6W, Carbon Film	3198	011	04780					
3398	Res, 18K, 5%, 1/6W, Carbon Film	3198	011	01830					
3405	Res, 39 ohm, 5%, 1/4W, Carbon Film	2120	101	74399					
S 3412	Res, 15 ohm, 5%, 1/8W, Metalized Glass	2322	750	61509					
3413	Res, 390 ohm, 5%, 1/16W, Metalized Glas	3198	021	33910					
3414	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198	021	31090					
3416	Res, 39 ohm, 5%, 1/4W, Carbon Film	2120	101	74399					
4115	Res, Zero ohm, "Chip" Jumper	3198	021	90030					
4301	Res, Zero ohm, "Chip" Jumper	3198	021	90020					
4302	Res, Zero ohm, "Chip" Jumper	3198	021	90030					
S 5300	Transformer, S13974-03	3104	308	20571					
6100	Zener Diode, 5.6 volt.	3198	020	55680					
6305	Diode, BAS321	9340	553	52115					
6306	Diode, BAS321	9340	553	52115					
6307	Diode, BAS321	9340	553	52115					
6308	Diode, MCL4148	9322	128	15685					
6309	Diode, MCL4148	9322	128	15685					
7300	Transistor, NPN, BF199	9330	634	20126					
7301	Transistor, NPN, BFS20	9330	921	11215					
7302	Transistor, PNP, 2SA1358	9322	166	55682					
7303	Transistor, NPN, 2SC3421	9322	166	56682					
7304	Transistor, PNP, BF824	9337	223	50215					
7307	IC, TDA6103Q/N3	9352	079	80112					
7308	Transistor, NPN, BFS20	9330	921	11215					
9301	Wire Jumper	3198	036	90010					
9302	Wire Jumper	3198	036	90010					
9305	Wire Jumper	3198	036	90010					
9307	Wire Jumper	3198	036	90010					
9308	Wire Jumper	3198	036	90010					

36PT842H37D (continued)

6205	Zener Diode, 6.8 volt.	3198 020 56880	7652	Transistor, NPN, BC847B(COL)	3198 010 42030
6206	Zener Diode, 6.8 volt.	3198 020 56880	7653	Transistor, NPN, BC847B(COL)	3198 010 42030
6207	Zener Diode, 6.8 volt.	3198 020 56880	7654	Transistor, PNP, BC857B(COL)	3198 010 42150
6405	Zener Diode, 33 volt	3198 020 53390	7655	Transistor, NPN, BC847B(COL)	3198 010 42030
6406	Diode, BAS316.	3198 010 10630	7702	Transistor, NPN, BC847B(COL)	3198 010 42030
6407	Diode, BAS316.	3198 010 10630	7720	Transistor, NPN, BC847B(COL)	3198 010 42030
6408	Diode, Rect, BYD33D	9337 234 00133	7721	Transistor, NPN, BC847B(COL)	3198 010 42030
6421	Diode, Rect, BY359X-1500.	9340 303 30127	7722	Transistor, PNP, BC857B(COL)	3198 010 42150
6422	Diode, Rect, BY229X-600	9340 380 20127	7723	Transistor, PNP, BC857B(COL)	3198 010 42150
6436	Diode, Rect, BYD33J	9337 234 20133	7724	Transistor, NPN, BC847B(COL)	3198 010 42030
6437	Diode, Rect, BYD33J	9337 234 20133	7725	Transistor, NPN, BC847B(COL)	3198 010 42030
6440	Diode, BAS316.	3198 010 10630	7730	Transistor, NPN, BC847B(COL)	3198 010 42030
6441	Diode, BAS316.	3198 010 10630	7731	Transistor, PNP, BC857B(COL)	3198 010 42150
6442	Zener Diode, 15 volt	3198 020 51590	7732	Transistor, NPN, BC847B(COL)	3198 010 42030
6451	Diode, BAS316.	3198 010 10630	7750	IC, TDA2616.	9350 403 20112
6452	Diode, BAS316.	3198 010 10630	7901	Transistor, NPN, BC547B(COL)	3198 020 40030
6453	Diode, BAS316.	3198 010 10630	7902	Transistor, NPN, BC337-25(COL)	3198 020 43530
6454	Zener Diode, 33 volt	9340 548 71115	7905	Transistor, NPN, BC368	9332 592 40126
6456	Zener Diode, 33 volt	9340 548 71115	7906	IC, L4940V85	9322 005 46687
6461	Diode, Rect, BYV29X-500	9340 555 59127	7907	Transistor, NPN, BC847B(COL)	3198 010 42030
6463	Diode, Rect, BYV29X-500	9340 555 59127	7908	Transistor, PNP, BC857B(COL)	3198 010 42150
6465	Diode, Rect, BYV29X-500	9340 555 59127	7909	Transistor, PNP, BC857B(COL)	3198 010 42150
6466	Diode, Rect, BYV29X-500	9340 555 59127	8203	Cable, 4 Pin, 340mm.	3104 311 05481
6468	Diode, Rect, BYD33D	9337 234 00133	8204	Cable, 6 Pin, 220mm.	3104 311 05471
6480	Diode, Rect, BYD33D	9337 234 00133	8317	Cable, 2 Pin, 340mm.	3104 311 01431
6481	Zener Diode, 18 volt	3198 010 21890	8324	Cable, 7 Pin, 560mm.	3104 311 05411
6482	Diode, BAS316.	3198 010 10630	8340	Cable, 11 Pin 480mm.	3104 311 05431
6492	Diode, BAS316.	3198 010 10630	8392	Cable, 3 Pin, 220mm.	3104 311 04171
6493	Zener Diode, 47 volt	9340 389 00115	8920	Cable, 5 Pin, 400mm.	3104 301 07674
6499	Zener Diode, 6.8 volt.	3198 020 56880	8921	Cable, 3 Pin, 400mm.	3104 311 03082
6505	Zener Diode, 15 volt	3198 010 21590	8936	Cable, 11 Pin, 820mm	3104 311 01181
6506	Diode, 1N4148.	3198 010 10010	8937	Cable, 10 Pin, 340mm	3104 301 09841
6507	Diode, Rect, BYV28-200/24	9340 550 66112	8951	Cable, 5 Pin, 340mm.	3104 311 03491
6508	Diode, Rect, BYV28-400/20	9340 549 39112	9101	Wire Jumper.	3198 036 90010
6510	Zener Diode, 15 volt	3198 010 51590	9102	Wire Jumper.	3198 036 90010
6511	Diode, BAS316.	3198 010 10630	9113	Wire Jumper.	3198 036 90010
6512	Diode, BAS316.	3198 010 10630	9203	Wire Jumper.	3198 036 90010
6513	Diode, Bridge Rect, REC GBU4K.	3198 010 10640	9204	Wire Jumper.	3198 036 90010
6514	Zener Diode, 200 volt.	9336 018 20133	9206	Wire Jumper.	3198 036 90010
6515	Zener Diode, 5.6 volt.	9335 005 90133	9210	Wire Jumper.	3198 036 90010
6516	Diode, BAS316.	3198 010 10630	9212	Wire Jumper.	3198 036 90010
6517	Diode, BAT85	9336 247 60133	9217	Wire Jumper.	3198 036 90010
6518	Diode, BAS316.	3198 010 10630	9219	Wire Jumper.	3198 036 90010
6519	Diode, Rect, BYD33D	9337 234 00133	9221	Wire Jumper.	3198 036 90010
6600	Diode, 1N4148.	3198 010 10010	9222	Wire Jumper.	3198 036 90010
6619	Diode, Rect, BYD33D	9337 234 00133	9224	Wire Jumper.	3198 036 90010
6620	Diode, Rect, BYV27-200.	9322 126 72673	9226	Wire Jumper.	3198 036 90010
6623	Diode, BAS316.	3198 010 10630	9228	Wire Jumper.	3198 036 90010
6636	Diode, BAS316.	3198 010 10630	9229	Wire Jumper.	3198 036 90010
6637	Diode, BAS316.	3198 010 10630	9230	Wire Jumper.	3198 036 90010
6660	Diode, BAT85	9336 247 60133	9231	Wire Jumper.	3198 036 90010
6665	Diode, BAS316.	3198 010 10630	9232	Wire Jumper.	3198 036 90010
6731	Diode, BAS316.	3198 010 10630	9302	Wire Jumper.	3198 036 90010
6732	Diode, BAS316.	3198 010 10630	9401	Wire Jumper.	3198 036 90010
6900	Diode, BAS316.	3198 010 10630	9402	Wire Jumper.	3198 036 90010
6901	Diode, 1PS76SB10	9340 453 90115	9403	Wire Jumper.	3198 036 90010
6902	Diode, 1PS76SB10	9340 453 90115	9404	Wire Jumper.	3198 036 90010
6903	Diode, 1PS76SB10	9340 453 90115	9405	Wire Jumper.	3198 036 90010
6904	Diode, 1N4148.	3198 010 10010	9406	Wire Jumper.	3198 036 90010
7100	Transistor, PNP, BC557B(COL)	3198 020 40110	9407	Wire Jumper.	3198 036 90010
7101	Transistor, NPN, BC547B(COL)	3198 020 40030	9412	Wire Jumper.	3198 036 90010
7102	Power FET, STP3NB60FP.	9322 129 71687	9414	Wire Jumper.	3198 036 90010
S 7104	Optical Coupler, TCDT1102G	9319 002 76682	9418	Wire Jumper.	3198 036 90010
7228	Transistor, NPN, PMBT2369(UAW)	3198 010 43360	9419	Wire Jumper.	3198 036 90010
7407	Transistor, NPN, BC847B(COL)	3198 010 42030	9421	Wire Jumper.	3198 036 90010
7408	Transistor, NPN, BC368	9332 592 40126	9423	Wire Jumper.	3198 036 90010
7409	Transistor, NPN, BC847B(COL)	3198 010 42030	9424	Wire Jumper.	3198 036 90010
7421	Transistor, NPN, BU2527DX.	9340 496 80127	9425	Wire Jumper.	3198 036 90010
7440	IC, LM358N	9339 848 90682	9428	Wire Jumper.	3198 036 90010
7441	Transistor, NPN, BC547B(COL)	3198 020 40030	9429	Wire Jumper.	3198 036 90010
7442	Transistor, PNP, BC557B(COL)	3198 020 40110	9430	Wire Jumper.	3198 036 90010
7452	Transistor, NPN, BC847B(COL)	3198 010 42030	9431	Wire Jumper.	3198 036 90010
7480	Power FET, STP3NB60FP.	9322 129 71687	9435	Wire Jumper.	3198 036 90010
7481	Transistor, PNP, BC557B(COL)	3198 020 40110	9436	Wire Jumper.	3198 036 90010
S 7482	Optical Coupler, TCDT1102G	9319 002 76682	9505	Wire Jumper.	3198 036 90010
7501	Transistor, PNP, BC857B(COL)	3198 010 42150	9510	Wire Jumper.	3198 036 90010
7502	Transistor, NPN, BF487	9337 626 60126	9512	Wire Jumper.	3198 036 90010
7504	Power FET, STP5NB40.	9322 174 85687	9513	Wire Jumper.	3198 036 90010
7505	Transistor, PNP, BC857B(COL)	3198 010 42150	9515	Wire Jumper.	3198 036 90010
7506	IC TL431ACZ-AP S (ST00) A	9322 086 97676	9516	Wire Jumper.	3198 036 90010
7510	Transistor, NPN, BC847B(COL)	3198 010 42030	9518	Wire Jumper.	3198 036 90010
7528	Transistor, NPN, BC337-25(COL)	3198 020 43530	9519	Wire Jumper.	3198 036 90010
7529	Transistor, NPN, BC847B(COL)	3198 010 42030	9520	Wire Jumper.	3198 036 90010
7600	Transistor, NPN, BC546B.	9332 377 80126	9523	Wire Jumper.	3198 036 90010
7602	Transistor, NPN, BC847B(COL)	3198 010 42030	9524	Wire Jumper.	3198 036 90010
7605	Transistor, NPN, BC847B(COL)	3198 010 42030	9525	Wire Jumper.	3198 036 90010
7606	Transistor, NPN, BC847B(COL)	3198 010 42030	9528	Wire Jumper.	3198 036 90010
S 7610	Optical Coupler, TCDT1102G	9319 002 76682	9622	Wire Jumper.	3198 036 90010
S 7613	Optical Coupler, TCDT1102G	9319 002 76682	9623	Wire Jumper.	3198 036 90010
7620	IC, TDA8177.	9322 066 43687	9624	Wire Jumper.	3198 036 90010
7640	Transistor, NPN, BC847B(COL)	3198 010 42030	9705	Wire Jumper.	3198 036 90010
7641	Transistor, NPN, BC847B(COL)	3198 010 42030	9706	Wire Jumper.	3198 036 90010

S = Safety Part Be sure to use exact replacement part.

36PT842H37D (continued)

Table with 3 columns: Part Number, Description, and Price. Lists various electronic components such as resistors, capacitors, transistors, and diodes for the Mains/Front Interface Panel and 2 Tuner PIP Panel.

36PT842H37D (continued)

2412	Cap, 330p, 5%, 50v, Ceramic.	3198	016	33310	9309	Wire Jumper.	3198	036	90010
2420	Cap, 470n, +80/-20%, 10v, Ceramic. . .	3198	017	44740	9310	Wire Jumper.	3198	036	90010
3106	Res, 1K8, 1%, 1/16W, Metalized Glass . .	2322	704	61802	9311	Wire Jumper.	3198	036	90010
3107	Res, 1K2, 1%, 3/5W, Metal Film	2312	915	11202	9313	Wire Jumper.	3198	036	90010
3109	Res, 1K8, 1%, 1/16W, Metalized Glass . .	2322	704	61802	9314	Wire Jumper.	3198	036	90010
3110	Res, 1K2, 1%, 3/5W, Metal Film	2312	915	11202	9316	Wire Jumper.	3198	036	90010
3111	Trim Pot, 470 ohm, 25%	2120	358	90538	9317	Wire Jumper.	3198	036	90010
3113	Res, 1K8, 1%, 1/16W, Metalized Glass . .	2322	704	61802	9318	Wire Jumper.	3198	036	90010
3114	Res, 1K2, 1%, 3/5W, Metal Film	2312	915	11202	9321	Wire Jumper.	3198	036	90010
3115	Trim Pot, 470 ohm, 25%	2120	358	90538	9322	Wire Jumper.	3198	036	90010
3116	Res, 1K, 5%, 1/6W, Carbon Film	3198	011	01020	9323	Wire Jumper.	3198	036	90010
3117	Res, 2K7, 1%, 1/16W, Metalized Glass . .	2322	704	62702	9324	Wire Jumper.	3198	036	90010
3118	Res, 2K2, 1%, 1/16W, Metalized Glass . .	2322	704	62202	9325	Wire Jumper.	3198	036	90010
3119	Res, 180 ohm, 1%, 1/16W, Metalized Glas	2322	704	61801	9326	Wire Jumper.	3198	036	90010
3120	Res, 180 ohm, 1%, 1/16W, Metalized Glas	2322	704	61801	9330	Wire Jumper.	3198	036	90010
3121	Res, 180 ohm, 1%, 1/16W, Metalized Glas	2322	704	61801	9333	Wire Jumper.	3198	036	90010
3122	Res, 220 ohm, 1%, 1/16W, Metalized Glas	2322	704	62201	9336	Wire Jumper.	3198	036	90010
3123	Res, 220 ohm, 1%, 1/16W, Metalized Glas	2322	704	62201	9337	Wire Jumper.	3198	036	90010
3124	Res, 220 ohm, 1%, 1/16W, Metalized Glas	2322	704	62201	9350	Wire Jumper.	3198	036	90010
3125	Trim Pot, 470 ohm, 25%	2120	358	90538	9401	Wire Jumper.	3198	036	90010
S 3300	Res, 5R6, 5%, 1/3W, Metal Film	2306	204	03568					
3301	Res, 10K, 5%, 2 1/2W, Metal Film	2322	195	63103					
3303	Res, 10K, 5%, 1/10W, Metalized Glass . .	3198	021	51030					
3304	Res, 820 ohm, 5%, 1/10W, Metalized Glas	3198	021	58210					
3307	Res, 10 ohm, 5%, 1/10W, Metalized Glass	3198	021	51090					
3308	Res, 56K, 5%, 1/10W, Metalized Glass . .	3198	021	55630					
3309	Res, 150 ohm, 5%, 1/10W, Metalized Glas	3198	021	51510					
3310	Res, 1K, 5%, 1/10W, Metalized Glass. . .	3198	021	51020					
3311	Res, 47 ohm, 5%, 1/10W, Metalized Glass	3198	021	54790					
3312	Res, 2K2, 5%, 1/10W, Metalized Glass . .	3198	021	52220					
3315	Res, 10K, 5%, 1/10W, Metalized Glass . .	3198	021	51030					
3316	Res, 56K, 5%, 1/10W, Metalized Glass . .	3198	021	55630					
3317	Res, 10K, 5%, 1/10W, Metalized Glass . .	3198	021	51030					
3318	Res, 15 ohm, 5%, 1/10W, Metalized Glass	3198	021	51590					
3319	Res, 820 ohm, 5%, 1/10W, Metalized Glas	3198	021	58210					
3320	Res, 10K, 5%, 1/10W, Metalized Glass . .	3198	021	51030					
3322	Res, 150 ohm, 5%, 1/10W, Metalized Glas	3198	021	51510					
3334	Res, 1K, 5%, 1/6W, Carbon Film	3198	011	01020					
3338	Res, 1K, 20%, 1/2W, Carbon Film.	3198	013	01020					
3339	Res, 1K, 20%, 1/2W, Carbon Film.	3198	013	01020					
3340	Res, 1K, 20%, 1/2W, Carbon Film.	3198	013	01020					
S 3341	Res, 100 ohm, 5%, 1/3W, Metal Film . . .	2306	204	03101					
3342	Res, Zero ohm, "Chip" Jumper	3198	021	90020					
3343	Res, 2K2, 1%, 3/5W, Metal Film	2312	915	12202					
3345	Res, 33 ohm, 5%, 1/6W, Carbon Film . . .	3198	011	03390					
3347	Res, 1K5, 20%, 1/2W, Carbon Film	3198	013	01520					
3348	Res, 2K2, 1%, 3/5W, Metal Film	2312	915	12202					
3349	Res, 1K, 20%, 1/2W, Carbon Film.	3198	013	01020					
3350	Res, 470 ohm, 5%, 1/6W, Carbon Film. . .	3198	011	04710					
3351	Res, 470 ohm, 5%, 1/6W, Carbon Film. . .	3198	011	04710					
3352	Res, 470 ohm, 5%, 1/6W, Carbon Film. . .	3198	011	04710					
3353	Res, 4R7, 5%, 1/6W, Carbon Film.	3198	011	04780					
3355	Res, 10 ohm, 5%, 1/10W, Metalized Glass	3198	021	51090					
3356	Res, 1K, 5%, 1/10W, Metalized Glass. . .	3198	021	51020					
3357	Res, 10 ohm, 5%, 1/10W, Metalized Glass	3198	021	51090					
3358	Res, 390 ohm, 5%, 1/10W, Metalized Glas	3198	021	53910					
3359	Res, 220 ohm, 5%, 1/16W, Metalized Glas	3198	021	32210					
3366	Voltage Dependent Resistor	2322	593	13507					
3375	Res, 100K, 1%, 3/5W, Metal Film.	2312	915	11004					
3376	Res, 100K, 1%, 3/5W, Metal Film.	2312	915	11004					
3377	Res, 100K, 1%, 3/5W, Metal Film.	2312	915	11004					
3378	Res, 4R7, 5%, 1/16W, Metalized Glass . .	3198	021	34780					
3379	Res, 4R7, 5%, 1/6W, Carbon Film.	3198	011	04780					
3398	Res, 10K, 5%, 1/6W, Carbon Film.	3198	011	01030					
3405	Res, 39 ohm, 5%, 1/4W, Carbon Film . . .	2120	101	74399					
3410	Res, 100K, 5%, 1/16W, Metalized Glass. .	3198	021	31040					
3411	Res, 100K, 5%, 1/6W, Carbon Film	3198	011	01040					
S 3412	Res, 15 ohm, 5%, 1/8W, Metalized Glass	2322	750	61509					
3413	Res, 1K, 5%, 1/16W, Metalized Glass. . .	3198	021	31020					
3414	Res, 10 ohm, 5%, 1/16W, Metalized Glass	3198	021	31090					
3416	Res, 39 ohm, 5%, 1/4W, Carbon Film . . .	2120	101	74399					
4115	Res, Zero ohm, "Chip" Jumper	3198	021	90030					
4301	Res, Zero ohm, "Chip" Jumper	3198	021	90020					
4302	Res, Zero ohm, "Chip" Jumper	3198	021	90030					
6100	Zener Diode, 5.6 volt.	3198	020	55680					
6305	Diode, BAS321.	9340	553	52115					
6306	Diode, BAS321.	9340	553	52115					
6307	Diode, BAS321.	9340	553	52115					
6308	Diode, MCL4148	9322	128	15685					
6309	Diode, MCL4148	9322	128	15685					
7300	Transistor, NPN, BF199	9330	634	20126					
7301	Transistor, NPN, BFS20	9330	921	11215					
7302	Transistor, PNP, 2SA1358	9322	166	55682					
7303	Transistor, NPN, 2SC3421	9322	166	56682					
7304	Transistor, PNP, BF824	9337	223	50215					
7307	IC, TDA6103Q/N3.	9352	079	80112					
7308	Transistor, NPN, BFS20	9330	921	11215					
9301	Wire Jumper.	3198	036	90010					
9302	Wire Jumper.	3198	036	90010					
9305	Wire Jumper.	3198	036	90010					
9307	Wire Jumper.	3198	036	90010					
9308	Wire Jumper.	3198	036	90010					