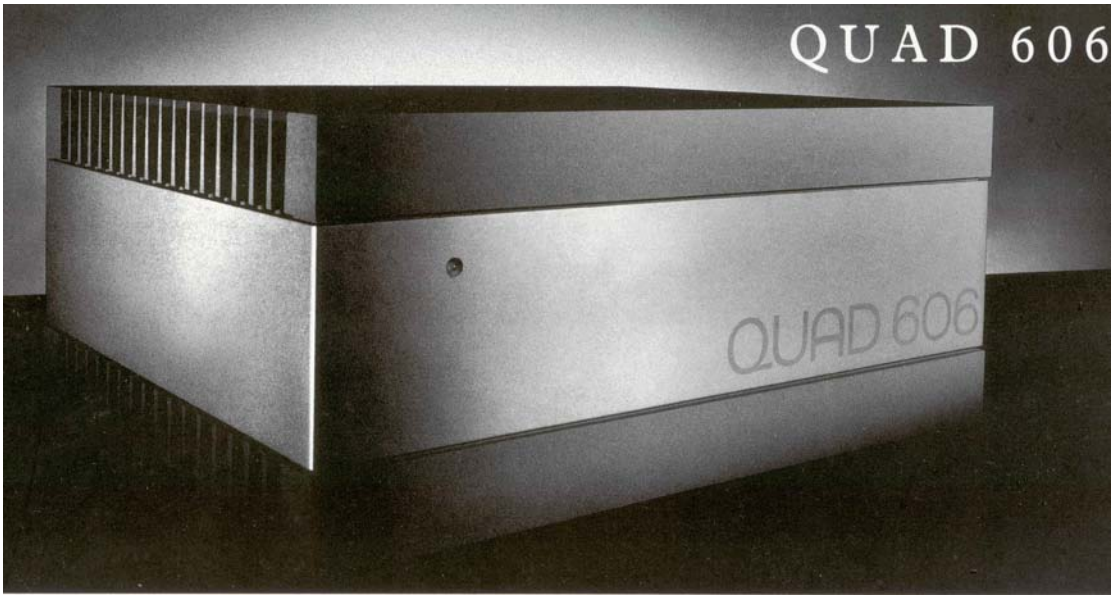
Quad 606 MK I and II DIY upgrade illustrated guidelines version 1.41

These are the illustrated step-by-step guidelines for upgrading your Quad 606 MK I or 606 MK II with the Dada Electronics upgrade-kit. This kit can also be used for the 707and 909, the 707 and 909 is basically a 606 MKII with the extra Quad Bus input circuit. The 606 MKI has a square casing; the 606 MKII has beveled edges like the 707 and 909.



This kit is based on the highly successful one we developed for the 306 range of amplifiers.
We will replace all electrolytic capacitors on the amplifier modules, input connectors, some resistors and capacitors in the input- and feedback circuit like Quad did in the 909. Low quality capacitors are replaced by Silvered-mica capacitors. All the cabling will be replaced by Hi Q cabling in the original colors.

We will also adapt the input-sensitivity (as an option) by increasing the local feedback in the input-circuit. This further increases the signal-to-noise ratio and makes the amplifier better adapted to modern sources.

We strongly advise to replace the power supply capacitors, but these are depending on the type of 606.

Replacing the output transistors and drivers is an extra option; it will increase the output peak current at difficult loads.

In some 606 amplifiers there is a mechanical hum. This is generated by the transformer. Although Quad tried to solve this with a special suspension kit, there is only one solution, replacing the transformer with a toroidal, like Quad did in the 606 MKII, 707 and 909. We can do this kind of work, but only in one of our shops.

We will do the upgrade step-by-step. For every step these guidelines will tell you what to do (in Underline) and give you some tips, tricks and advice (in Italics). You should have some soldering-experience for bringing this project to a good end but you don't have to be an electronics-expert.

When there are any problems, send an e-mail to info@dadaelectronics.eu with a good description of the problem. Some pictures may help us understand the problem better. We will do our best to answer within 24 hours 7/7. When the project is a success you will be listening to one of the best high-end, high-powered, current-dumping amplifiers ever made with a better-than-original Quad-sound. For indentifying your 606 and additional information, download the service manual.

Stefaan & Joost December 2010

Step 1 – The tools & the Components

The tools you need:

- A good quality soldering iron with a fine point (max 30) Watt or a soldering-station.
- A desoldering-pump
- A micro cutting nipper, a wire-stripper and a miniature pliers
- A Philips n° 2 and n° 1 screwdriver and a small flat screwdriver
- Tin/lead solder wire (no unleaded solder!)
- A digital multimeter

If you don't have these tools you can order them in the Dada Electronics webshop.

You should also have the 606 schematic and the corresponding Pcb layout at hand. You will find them in the appendix of this document. The versions are related to the serial number of the unit, but double check this on the amplifier modules themselves! On the Pcb the issue number is marked on the copper side. If you wish, you can order the complete Service manual, just send an e-mail to info@dadaelectronics.eu and we will reply with the document attached. Or download the document from our website.

There is one version of the 606 upgrade-kit, and two options. We strongly advise to use the basic kit and option 2 as a minimum set.

1. The **Basic version** includes the input connectors, internal cabling, capacitors for the driver-boards, PCB-connectors and other small components.
2. The **PSU Capacitor option** contains 4x BHC Aerovox 10.000µF 63 V capacitors (or 4x BHC Aerovox 15.000µF 63V for the 606 MKII).
3. The **Power transistor option** contains 12x 2N3773 transistors, four driver transistors MJE15031 and in total 16 silicon pads.

The components in the 606 **basic upgrade-kit**:

Cables, connectors & mechanical components:

- 4x 1M flexible 0,75mm² flexible cable for internal wiring (Orange for mass, Yellow for the LS-outputs, Black for – DC-current, Red for + DC current).
- Shielded audio-cable, 50cm
- 12x Silver plated Faston connectors, female
- Thermal insulation-tube, 30cm

Components to be mounted on the driver-boards:

- 2x R 560R 1% for R1 (green-blue-black-black-brown)

- 4x R 22K 1% for R2 & R6 (red-red-black-red-brown)
- 2x R 62K 1% for R5 (blue-red-black-red-brown)
- 2x R 12R 1% for R11 (brown-red-black-gold-brown) (*)
- 2x R 2M2 1% for R25 (red-red-black-yellow-brown)
- 6x C 330pF Silvered-mica for C1 / C4 / C6
- 2x C 330nF MKT for C2
- 2x C 1µF MKT for C3
- 2x C 47nF MKS4 for C10
- 6x C 100nF MKT (Additional decouple caps for the zener diodes D1,D2 and D12, not replacements!)
- 2x C 100uF 63V for C7 (Nichicon)
- 4x C 470µF 63V for C9 & C11 (Nichicon)

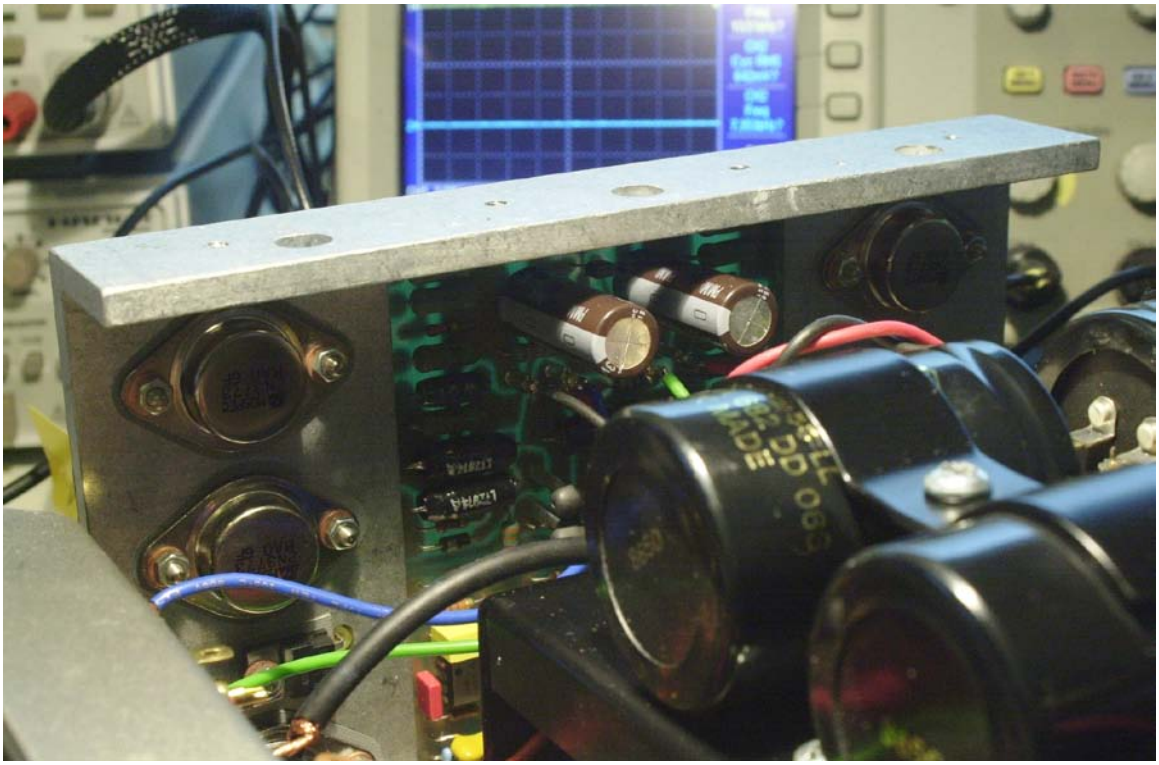
(*) Only needed if you want to change the input sensitivity!

Separate components and parts (you can order these from *the Dada Electronics webshop*

- 12x 2N3773 Power-transistor and 4x MJE15031 drivers
- Silicon pads TO3 (12x) and TO220 (4x)
- 4x BHC Aerovox 10.000µF 63V capacitor for the 606-I power-supply
- 4x BHC Aerovox 15.000µF 63V capacitor for the 606-II power-supply
- Velleman K4701 Loudspeaker DC-protection unit, (two needed)
- Dada Electronics DC-protection / delay, mono, the best! (two needed)
- all other 606-components are also available

See also *the Quad Spot weblog*.

Step 2 – Dismantling the 606



- *Remove the bottom-cover (Philips n°2, 8 screws including 4 feet, also two screws on the back Philips n° 1), see exploded view in the appendix*
- *Remove the wires from the 2 driver-boards (6 connectors/wires per board)*
- *Remove the driver-boards (2x 3 screws)*
- *Remove the 4 PSU-capacitors and mounting-rings.*

Step 3 - Fitting in the Power Supply capacitors and the connectors

It is important to do these steps in the right order as it makes it more practical to reach certain components. Use the exploded view as a reference; also check the T board layout. In the case of a MKII unit, make notes or photographs during the dismantling.

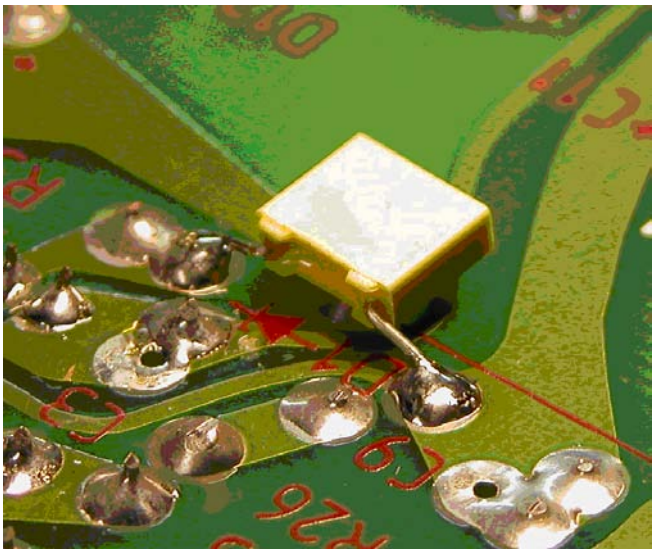
Step 4 - Upgrading the circuit boards.

If you have a stabilized power-supply (+ 57 and – 54 Volt), a function-generator and a scope you might test the boards before upgrading them. If you don't, no problem, you can upgrade the boards without them.

When you connect a dual power supply to the board (+ and – voltage to the Pcb-connectors, mass to the aluminum heat-sink (don't use the input mass for this!), you should read about 110 mA in the – power-line and 120 mA in the + power-line. This means the power- and driver-transistors are OK.

It is a good practice to upgrade the boards one by one. So we can compare between the boards if we want to see the polarity of capacitors or diode's or if something goes wrong.

Replace all the components in the above component-list, except the 6 decouple caps, these are extra components! Solder the small decouple capacitors on the copper side of the Pcb, **do not remove/replace the zeners**! See the picture below for an example. Use the Pcb layout to check the position of the components, the layouts are copper trackside, not component side! The issue number of the Pcb is also on the copper side.



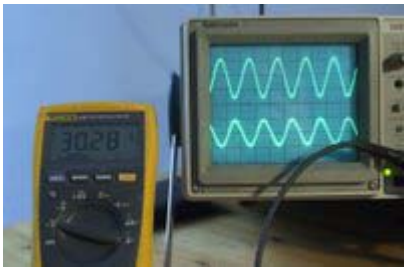
If you want an input-sensitivity of 0 dBm (0.775 mV), 1mWatt in 600 ohms, which is standard, replace R11 with 12 Ohm. If you leave R11 in place the input-sensitivity will be 0.5 Volt.

Step 5 – Replacing the output transistors (optional)

Remove the output transistors and the driver transistors. See the exploded view as a reference. Make notes or pictures for reference information. Place new silicon pads and reinstall all the components. Check with an ohm meter there is no connection between the heat sink and the casings or metal parts of the transistors. Check with an Ohm meter the contact between the case of the transistor(s) and the corresponding tracks (marked by the transistor fastening screws) on the copper side of the Pcb. The reading should be 0.1 ohm or minimal reading depending on your Ohm meter (or DMM).

Step 6 - Testing the circuit boards

When both boards are upgraded we'll connect them to a sinus-generator and to the scope. We'll connect + and - 50 Volt with our lab power-supply and connect a true-RMS multimeter to check the input- and output voltages.



Following measurements are OK:

- 0.01 Volt (max) DC on the outputs
- 32 .. 36 Volt AC on the outputs before clipping. This corresponds with 130 .. 150 Watt into 8 Ohm.
- 0.775 (or 0.5) Volt AC on the input before clipping. This corresponds with line-voltage for full power.

If you don't have all this lab-equipment, skip this step. We will make sure later that there is 0 VDC on the output and that the power-consumption in the power-lines is 120 .. 130 mA.

Re-check both sides of the boards to make sure that the polarity of the electrolytic capacitors is correct and that there are no soldering short-circuits between the Pcb tracks.

Step 7 – Cabling & Re-assembly

We start by cabling the power-supply. For internal cabling counts: the shorter the better. We'll use high-quality flexible 0.75 mm² in 4 colors for everything except the 230 Volt lines.

We'll use the following colors:

- Red for the +50 Volt line
- Black for the -50 Volt line
- Orange for the output-mass
- Yellow for the LS-output lines

For the inputs we'll use shielded cable between the RCA-connectors and the driver-circuits.
Use the heat shrink tube to cover the soldering eyelet and give them a neat appearance.
Before connecting the power, re-check the polarity of the power supply caps. Compare with the schematics and the wiring diagram in the appendix.

Warning If the polarity of the caps is wrong they will explode!

It is better to twist all cables that have to be soldered to the same point together before tinning them, it makes soldering a lot easier. Foresee cables to the boards as well.

Once the power-supply is OK, we fix in both boards adding thermal paste to ensure maximum heat-conduction with the chassis.

We can now connect the + and - power-lines to the boards (don't switch them or you'll kill the output-transistors!) as well as the LS-output cables to the red LS output-plugs.

It is no luxury to use some Raychem (or other) Heat Shrinkable Tubing for insulating the +, - and output connections, as there are large voltages between them.

- *Connect the "+" and "-" leads from the power-supply to the boards*
- *Connect the LS-outputs of the boards to the circuit-boards*
- *Connect the inputs to the RCA-plugs with shielded cable*
- *Install the boards using new Heat Sink compound*
- *Re-assemble the amplifier is reverse order*

Before connecting mains-voltage we should check all cabling again with the Ohm-meter. We should also re-check that each channel uses 120 .. 130 mA in the + and the - power-line and that there is less than 0,01 Volt DC on the outputs (typically 0.007 or less Volts).

If it passes these final tests we can rebuild the unit and finally connect the speakers and the preamp and... Enjoy the music ;-)

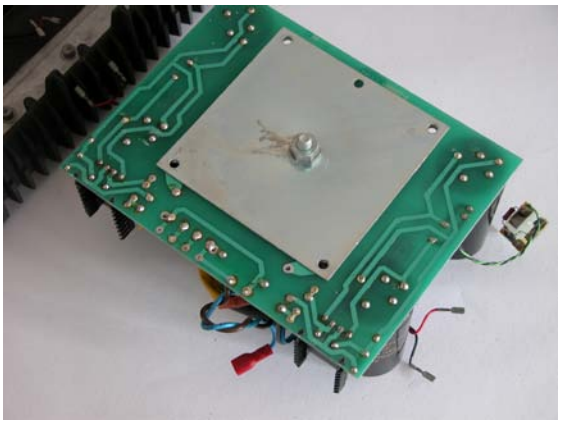
The 606 MKII, also very useful information for the 707 and 909.

Remove the 8 screws on the bottom and the 4 screws from the rear panel. Remove the bottom and the U shaped chassis part.

The unit will looks like this. Remove the amplifier boards with a long Philips (posidriv) screwdriver; be careful not to make contact with the components on the boards. Remove (loosen) the connectors on the boards with small pliers. Make notes, or pictures.

Remove the led circuit board from the front of the amplifier

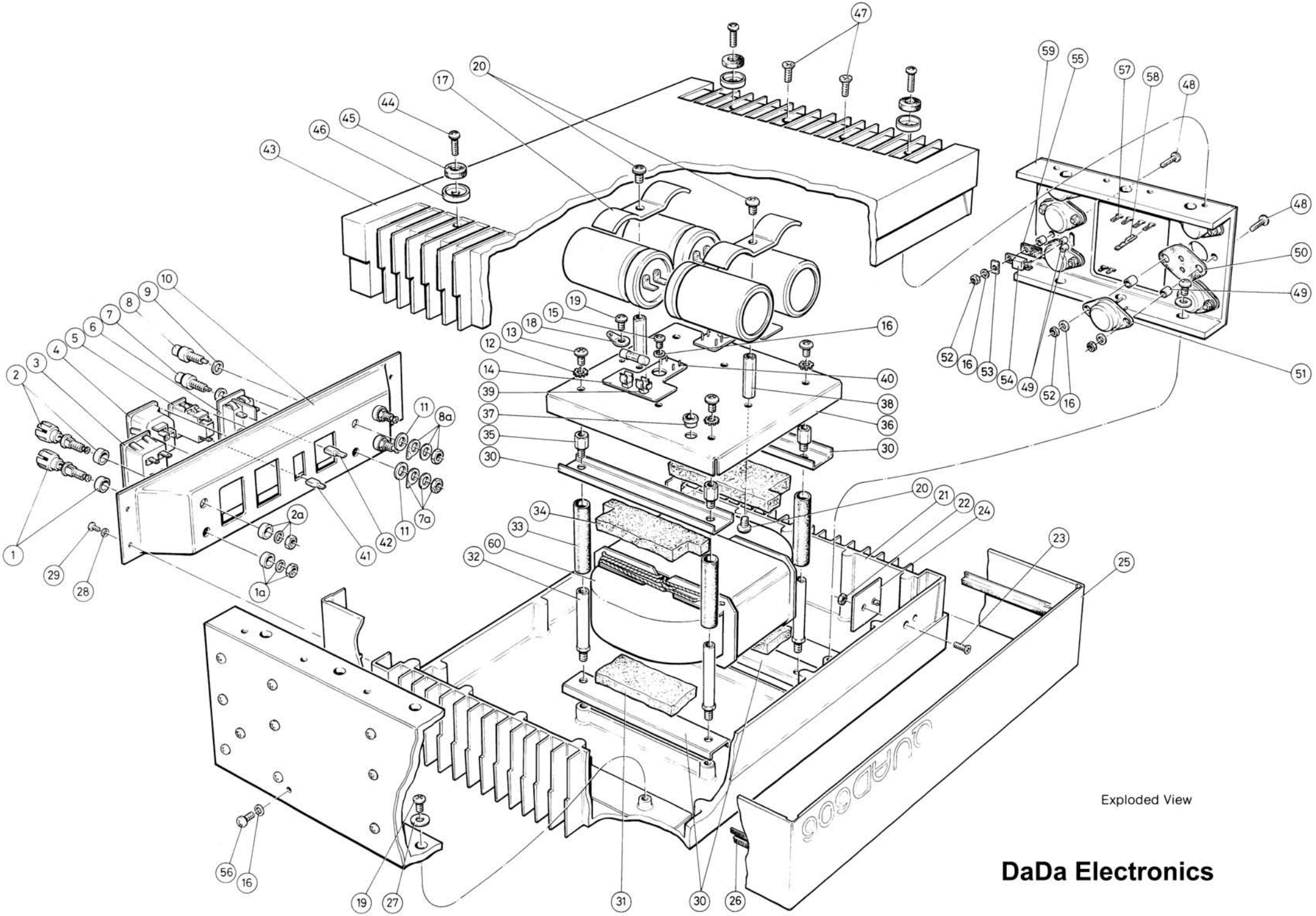
Remove the connectors from the PSU, make notes, or pictures! There is no need for soldering here. There are four large posidriv screws around the transformer, remove those. Be careful, sometimes they are a little bit covered by the transfo, lift the Psu Pcb to loosen those screws.



Now the Psu caps can be replaced. The revision of the amplifier boards is not different from the MKI, in some cases the MK II has already the input and feedback modification implemented. Rebuilt in reverse order.

Appendix

Exploded view, Circuit diagrams, Pcb layouts, Wiring diagram


Exploded View
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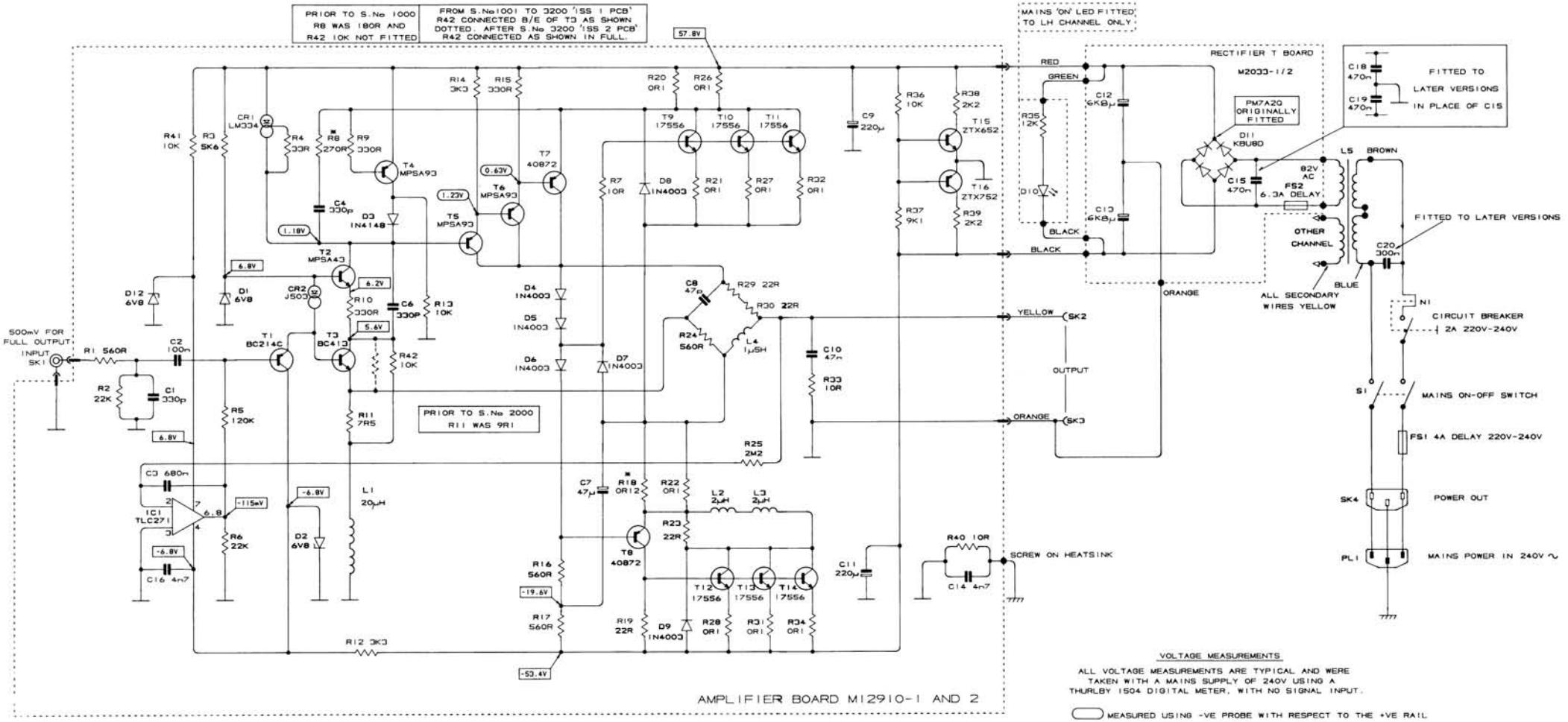
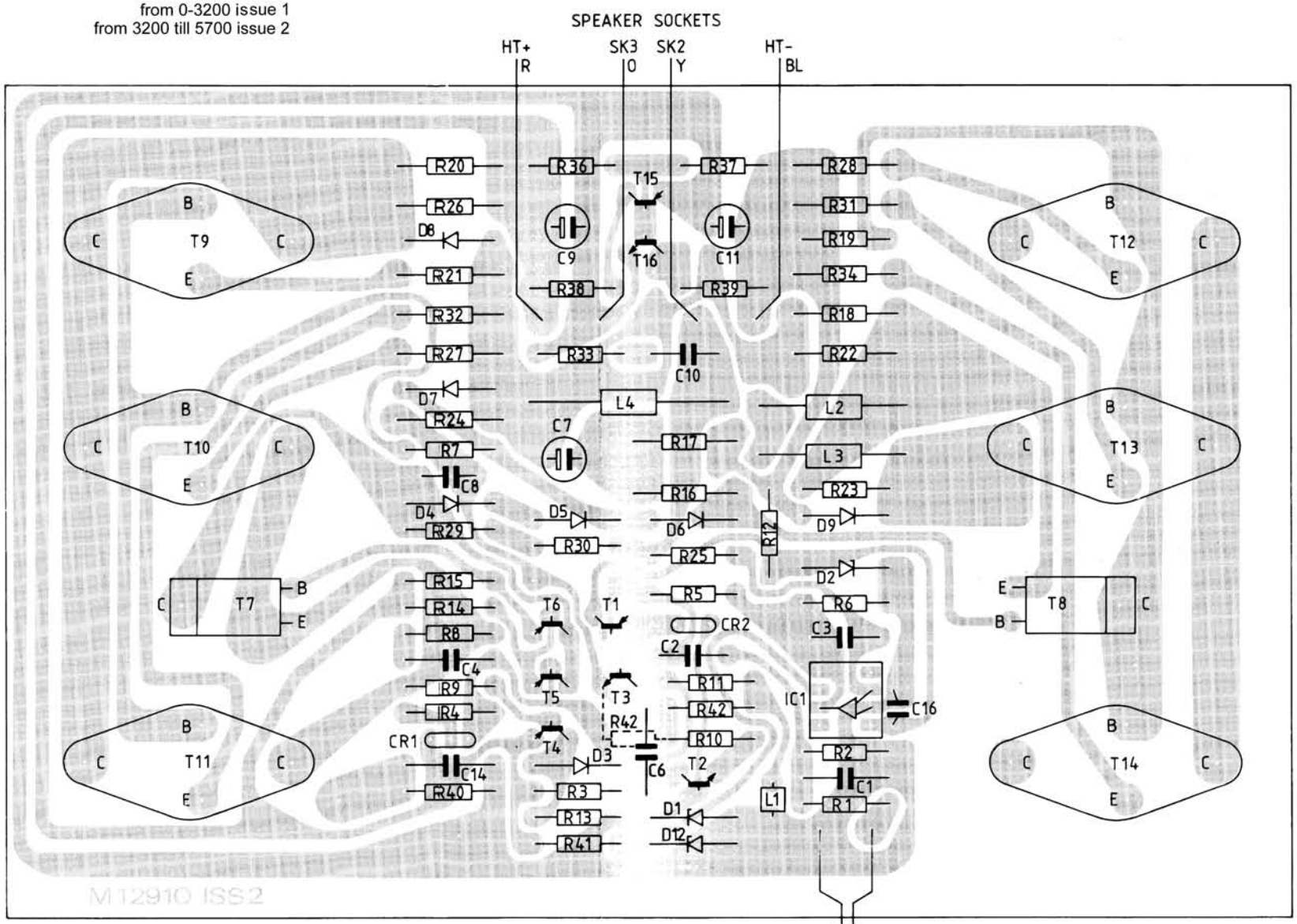


Circuit Diagam (Issue 1-2 PCB)

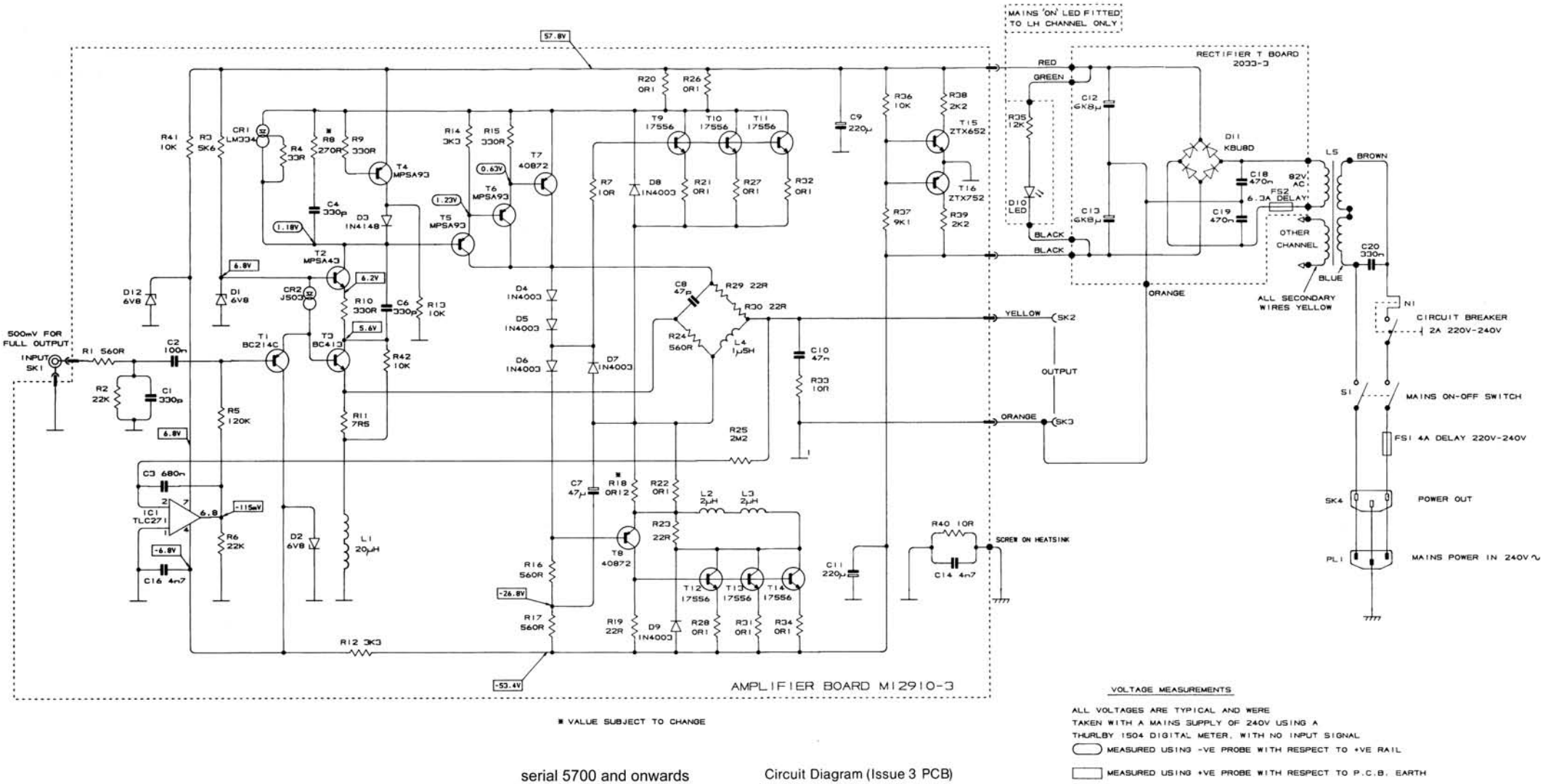
from 0-3200 issue 1
from 3200 till 5700 issue 2

from 0-3200 issue 1
from 3200 till 5700 issue 2



PCB Layout (Issue 1-2 PCB) Track Side

NOTE: ISSUE 1 PCB LAYOUT IS ALMOST IDENTICAL APART FROM R42 (10K Ω) WHICH IS FITTED TO THE UNDERSIDE OF THE PCB AS SHOWN DOTTED



* VALUE SUBJECT TO CHANGE

VOLTAGE MEASUREMENTS

ALL VOLTAGES ARE TYPICAL AND WERE TAKEN WITH A MAINS SUPPLY OF 240V USING A THURLBY 1504 DIGITAL METER, WITH NO INPUT SIGNAL

(oval) MEASURED USING -VE PROBE WITH RESPECT TO +VE RAIL

(rectangle) MEASURED USING +VE PROBE WITH RESPECT TO P.C.B. EARTH

serial 5700 and onwards

Circuit Diagram (Issue 3 PCB)

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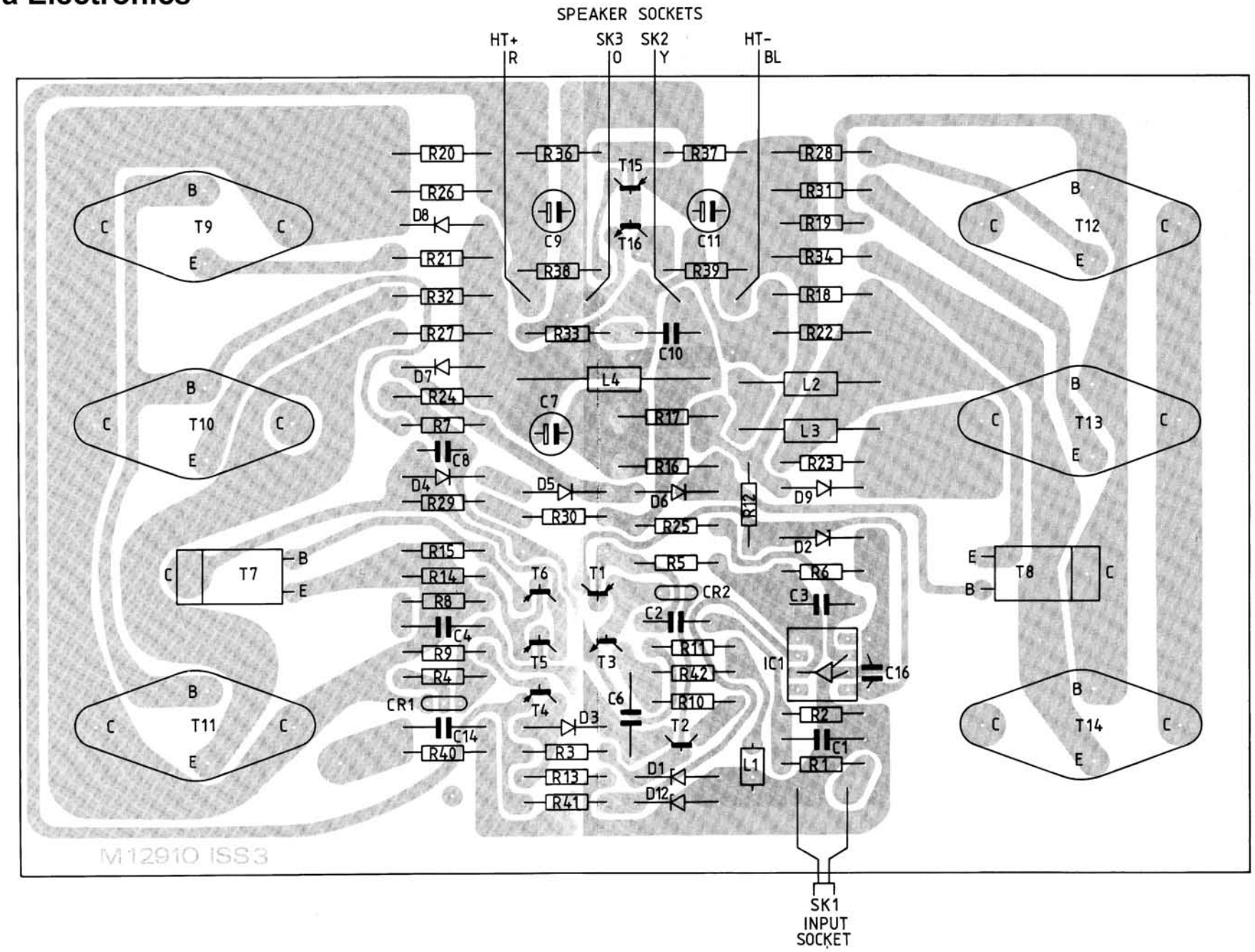
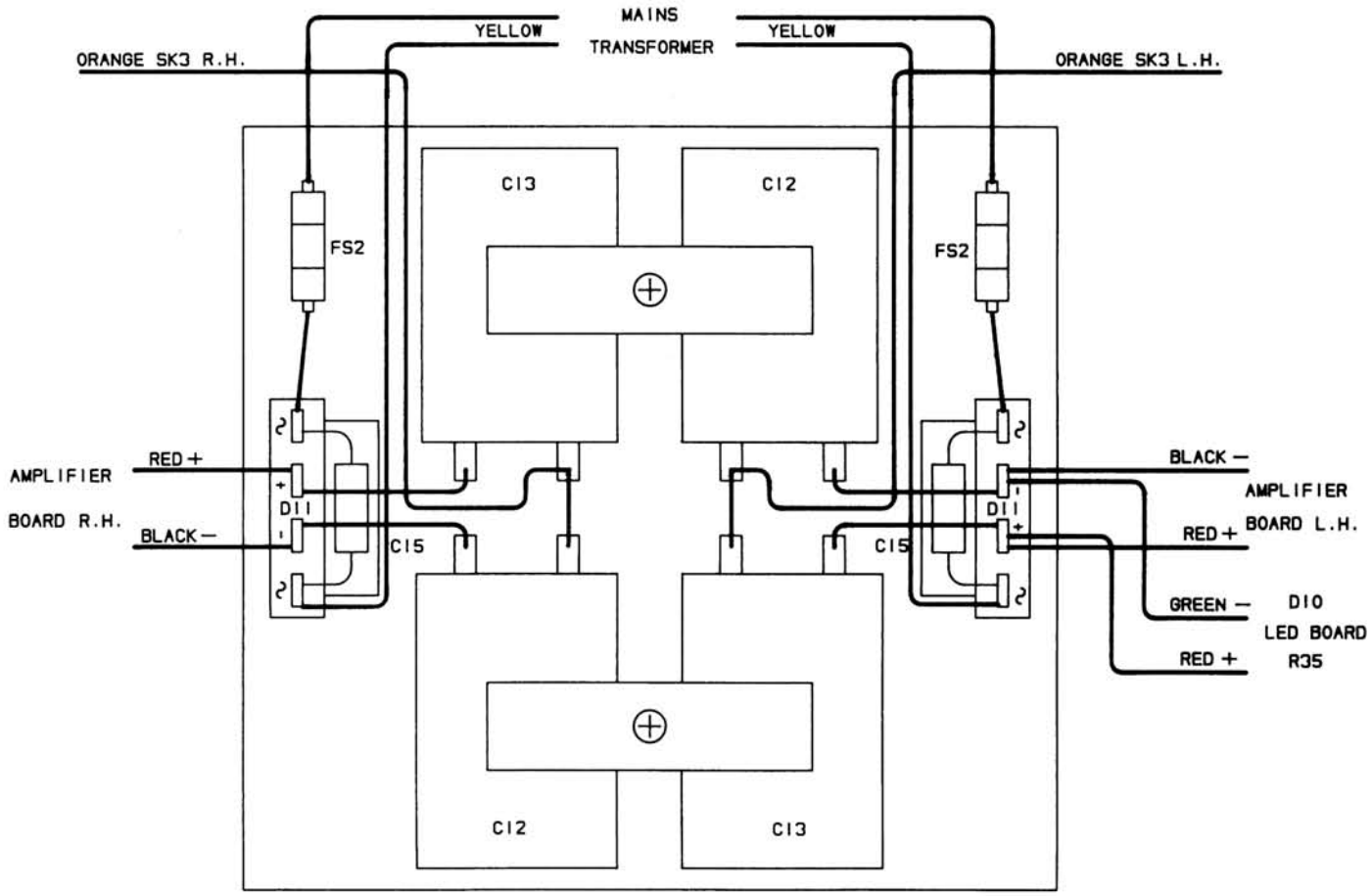


PCB Layout (Issue 3 PCB) Track Side

serial 5700 and onwards



606 Pre Rectifier 'T' Board
(Before S/No. 1751)
(Bottom View)

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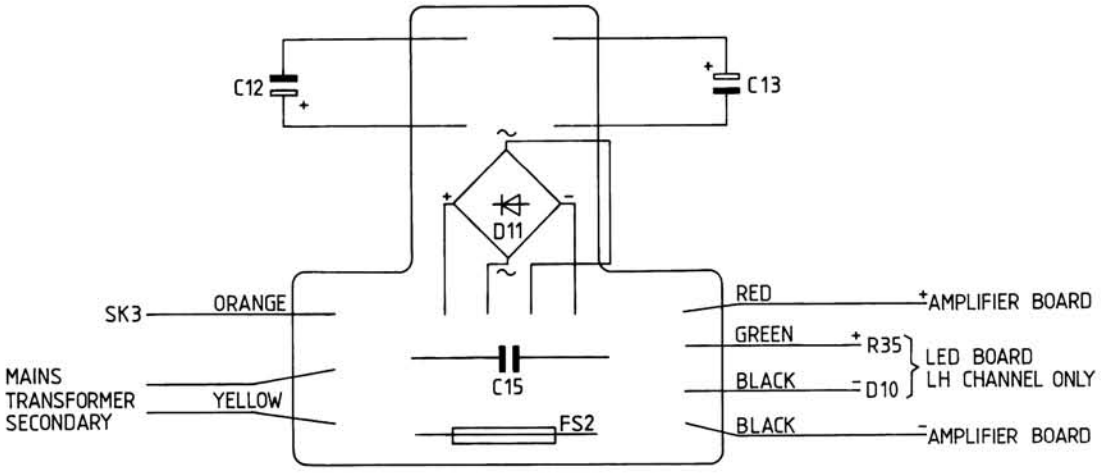
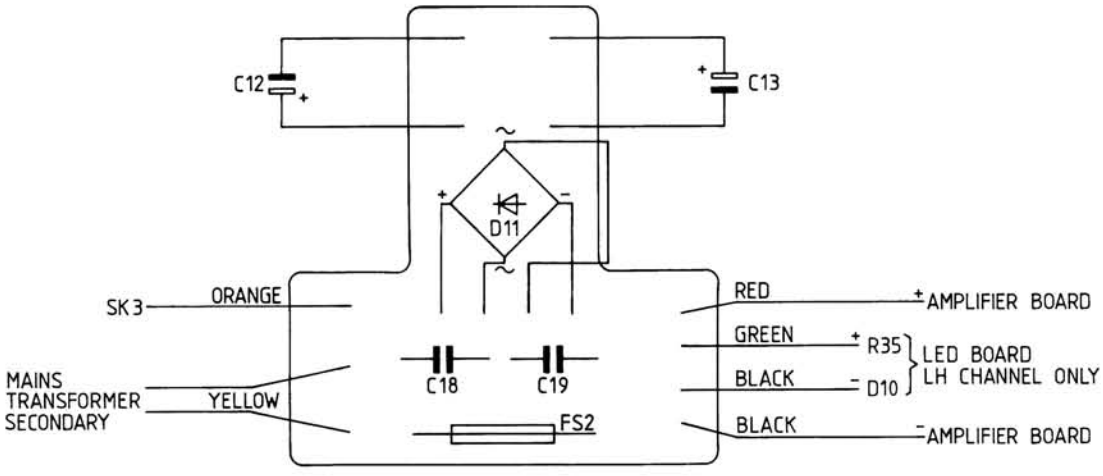


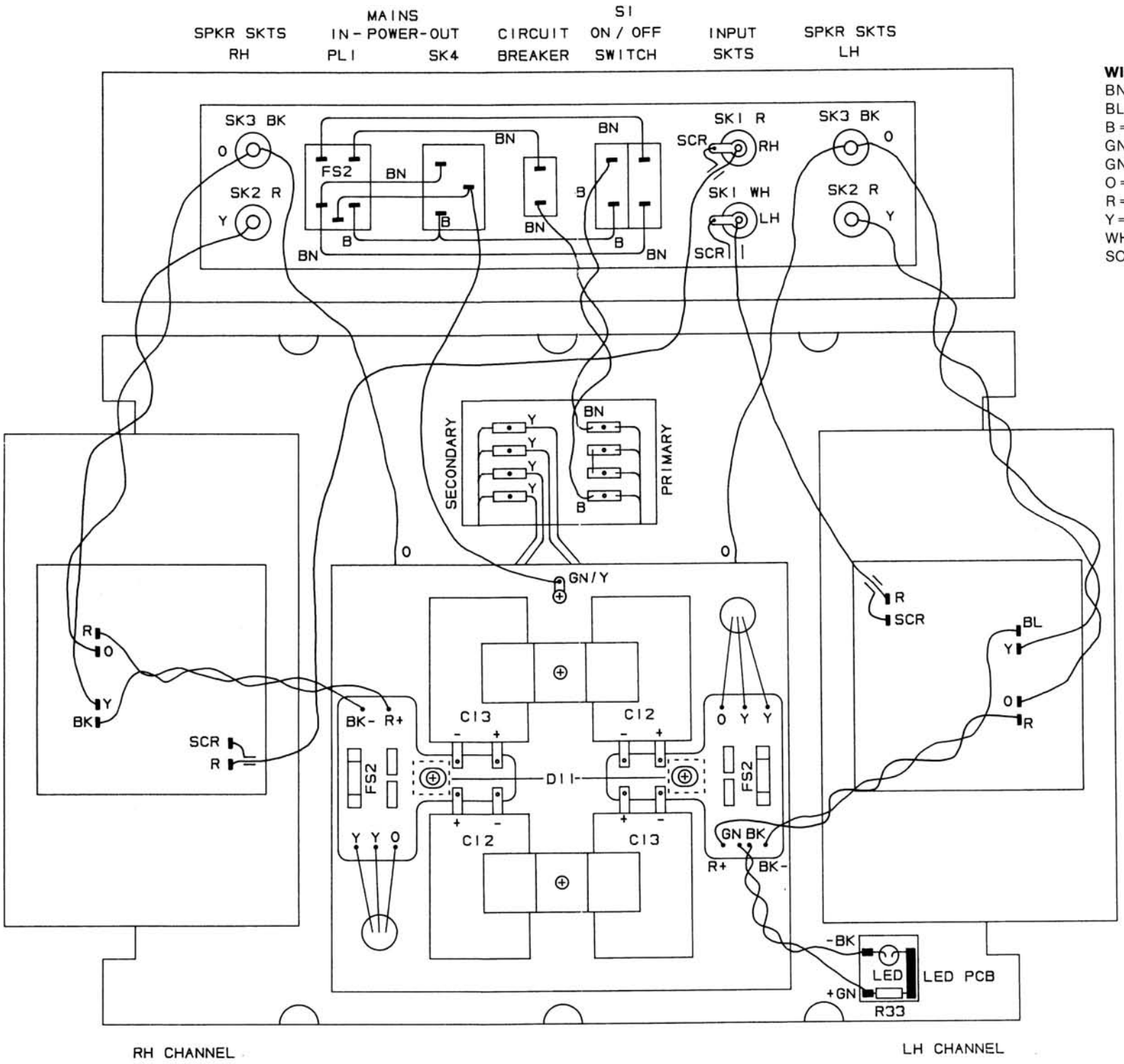
2033-1 T BOARD



2033-3 T BOARD

DaDa Electronics

606 Rectifier 'T' Board
(After S/No. 1751)
Track Side



WIRING COLOUR CODE

BN = BROWN
BL = BLACK
B = BLUE
GN = GREEN
GN/Y = GREEN/YELLOW
O = ORANGE
R = RED
Y = YELLOW
WH = WHITE
SCR = SCREEN

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