Quad 303 all versions illustrated upgrade guidelines V2.0

These are the illustrated step-by-step guidelines for upgrading your Quad 303 with the Dada Electronics upgrade-kit.

First of all, thanks for your purchase of our upgrade kit! Hereunder, you will find the step-by-step guidelines for upgrading the Quad 303 amplifier to modern, high-end standards. A word of advice: be sure to always watch the polarity of all diodes, zeners & electrolytic capacitors mentioned, and strictly follow the steps described in these guidelines!

There are in fact three versions of the Quad 303. The first two versions (up to serial no. 11500) have different driver boards. Make sure you use the schematic that corresponds with the version you have. You will find the schematics and the service manual in our download section, the information from the service manual and the diagrams will not be repeated in this manual. We cover all the versions with one kit. Only RV101 is different and will be delivered in two values!

We do not advice to revise boards older than version 9, although it can be done, the quality of the boards is too low in most cases and there are circuit changes*. Instead, purchase our HE boards or the 303 High-end board & capacitor set.*

We will replace all electrolytic capacitors, the trimmer-potentiometers and some of the cabling.

Electrolytic capacitors dry out after more than 10 years and the capacitance as well as the internal resistance might change drastically. As the 303 uses output-capacitors this will cause an audible reduction of the sound quality, the amplifier will produce a “behind the curtain” sound with considerably less dynamics, especially in the low frequencies. Replacing th0se capacitors with high-end components will give a dramatic improvement in sound quality.

As the 303 is a push-pull Class AB amplifier, the correct calibration of the quiescent-current is extremely important in order to reduce the crossover distortion. The old trimmers will be replaced and a re-calibration of the output circuit will have to be executed for optimal performance.

The upgrade will be done step-by-step. This is important because some steps are more difficult after other steps have been taken. For every step these guidelines will tell what needs to be done (underlined) and will provide for tips, tricks and advice *(*in *italics)*.

A warning about soldering and de-soldering: the circuit tracks, being very old and predating modern PCBs, may involuntarily lift when removing components, so additional care should be taken. Do not (!) apply too much heat or mechanical pressure. Use a desoldering pump or -station. Always use leaded solder Tin/Lead 60/40.

Be sure to always take *appropriate safety measures* when performing the upgrades mentioned.

You can obtain 7/7 technical support for upgrading the 303 via this e-mail address: tech@dadaelectronics.eu.
Also, make sure to check the Quad Service manual.
The diagrams and the service manual can be downloaded from our website; details will not be repeated in these guidelines. Please refer to our download section.
The Quad 33 revision kit (with selected components) is available from the Dada Electronics web shop as well as the High End boards & capacitor set.

When the project done is a success, you will be listening to one of the best high-end amplifiers ever made with a Quad-sound that is generally considered to be an improvement to the original.

Component-types may change without notice. If you plan the upgrade somewhere in the future, store the kit with the corresponding upgrade guidelines, older versions of the upgrade manual are not stored online.

Stefaan & Joost
October 2020

Step 1 – The tools & the Components

The tools needed:

- A good quality soldering iron with a fine point (max 30) Watt or a soldering-station.
- A desoldering-pump or desoldering station
- A micro cutting nipper, a wire-stripper and a miniature plier
- A small 2,5x50 flat screwdriver and a 5x125 flat screwdriver
- Tin/lead solder wire Sn60Pb40, don't use lead-free solder!
- A digital multimeter with DC millivolt range

If you don't have these tools they can be ordered from our Dada Electronics Webshop.

The 303 upgrade-kit consists of:

- 1x 4700µF 100V capacitor for the power-supply
- 2x 4700uF, 6800µF or 10.000µF 63V or 100V capacitors for the outputs
- 1 LED red, square with a 12K 1/2W resistance well suited to replace the signal lamp when broken
- ½ M red .75mm flexible cable
- ½ M blue .75mm flexible cable
- ½ M yellow .75mm flexible cable

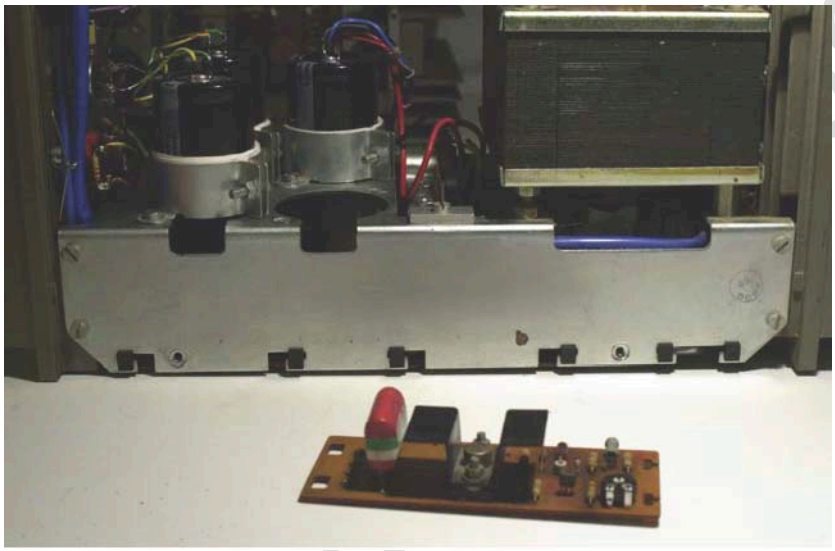
Components for the power-supply board are:

- R200, R201, R204: Resistance 10K ½W 1% (Brown-Black-Black-Red-Brown)
- R202: Resistance 8K2 ½ W 1% (Grey-Red-Black-Brown-Brown)
- R203: Resistance 2K2 ½ W 1% (Red-Red-Black-Brown-Brown)
- R205: Resistance 4K7 ½ W 1% (Yellow-Violet-Black-Brown-Brown)

- R206: Resistance 10R ½ W 1% (Brown-Black-Black-Gold-Brown)
- R207: Resistance 68R ½ W 1% (Blue-Grey-Black-Gold-Brown)
- MR200: 1N4004, 1N4005 or 1N4006 diode
- MR201: 12V 1,3W Zener diode
- RV200: 4K7 Trimmer potentiometer

Components for the driver boards (x2) are:

- C100: Capacitor 1µF foil capacitor, 10mm pin spacing
- C101: Capacitor 470µF >=16V
- C104: Capacitor 22µF >=25V
- C106: Capacitor 47µF >=25V
- RV100: 4K7 Trimmer potentiometer
- RV101: 2K2 Trimmer potentiometer (or 22K for the versions below serial 11500)



Options (available from *our Dada Electronics Webshop.):*

- Red + Black RCA connectors
- Red + Black Loudspeaker binding posts for Amplifier
- 35mm capacitor mounting-rings
- 4BA screw-set
- 303 high-end replacement boards (power supply & drivers)
- 2N3055, MJ15003 replacement transistors
- All other Quad 303 components are available in the Webshop

Step 2 – Installing the PSU & output capacitors

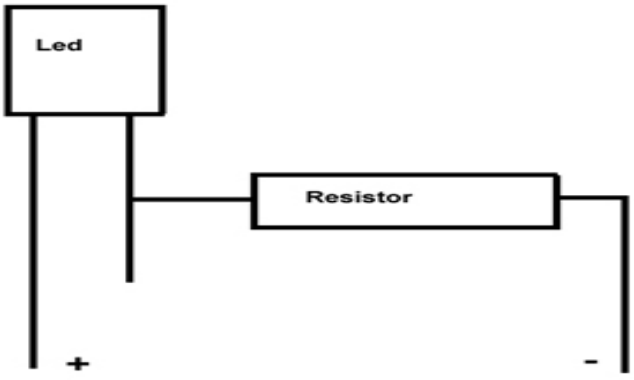
Remove the non-wired side of the printed circuit-boards from the plastic mounting-clips using a small screwdriver.
In earlier versions of the 303, the PSU & output capacitors have been installed with connections on the downside, in later versions the connections were on the upside of the capacitors. In all versions produced, the connection of the capacitors to the cable-beam is as described hereunder:

- Green/Red wire on the left output-capacitor: + (positive)
- Yellow/Red wire on the left output capacitor: - (negative)
- Green/White wire on the right output-capacitor: + (positive)
- Yellow/White wire on the right output-capacitor: - (negative)
- Blue wires on the PSU-capacitor: - (negative)
- Red wires on the PSU-capacitor: + (positive)

We will replace the original 2000µF output-capacitors with 4700uF to 10.000µF and the 2x 2000µF PSU capacitors (in parallel) with 1x 4700MF 100V.
Modern capacitors are a lot smaller (and better) than their 6-ties ancestors. In some cases you may need to wind some self-adhesive tape around the capacitor to fit it into the mounting-rings (see the picture above). We will re-wire the PSU-connections with new cable.

- Solder Blue cable between the diode-bridge and the - (negative) of the PSU capacitor.
- Solder Red cable between the diode-bridge and the + (positive) of the PSU capacitor
- Solder Yellow cable between the AC-connections of the diode-bridge and the secondary windings of the transformer

The most practical way to solder several cables to the same point is to twist them together before soldering.
The square LED with the 12K resistor can replace the old neon-bulb if it is broken. The LED with the resistor in series should be connected to the + (positive) and - (negative) DC voltage of the PSU on top of the PSU capacitor. Watch the polarity of the LED, the long lead should be connected to the + (positive) and the short lead to the resistor. The other lead of the resistor should be connected to the - (negative) of the PSU.



Step 3 – Replacing components on the PSU-board

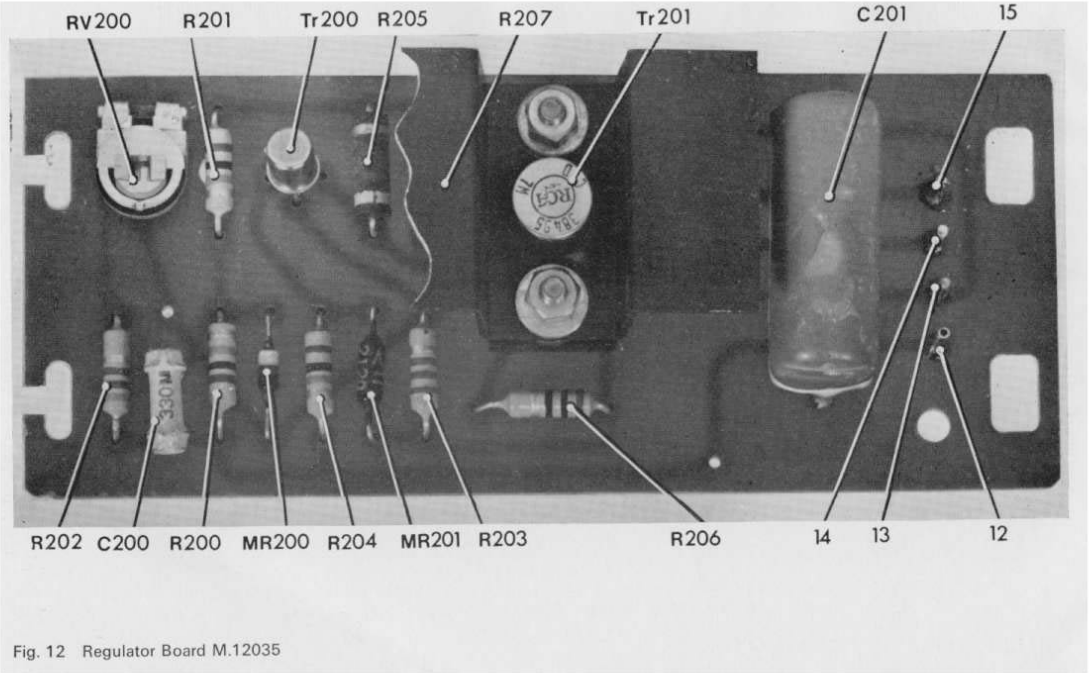


Fig. 12 Regulator Board M.12035

- Replace R200, R201, R204 with 10K (brown,black,black,red,brown)
- Replace R202 with 8K2 (grey,red,black,brown,brown)
- Replace R203 with 2K2 (red,red,black,brown,brown)
- Replace R205 with 4K7 (yellow,violet,black,brown,brown)
- Replace R206 with 10R (brown,black,black,gold,brown)
- Replace R207 with 68R (blue,grey,black,gold,brown)
- Replace MR200 with 1N4004 (black with silver or white stripe)
- Replace MR201 with a Zener diode 12V 1,3W
- Replace RV200 with a 4K7 trimmer

The trimmer should remain in the middle position for the time being. Please be considerate and watch the polarity of the diode and the zener. The cathode (black stripe or white/silver) should be pointing towards the middle of the board.

Step 4 – Replacing components on the driver boards

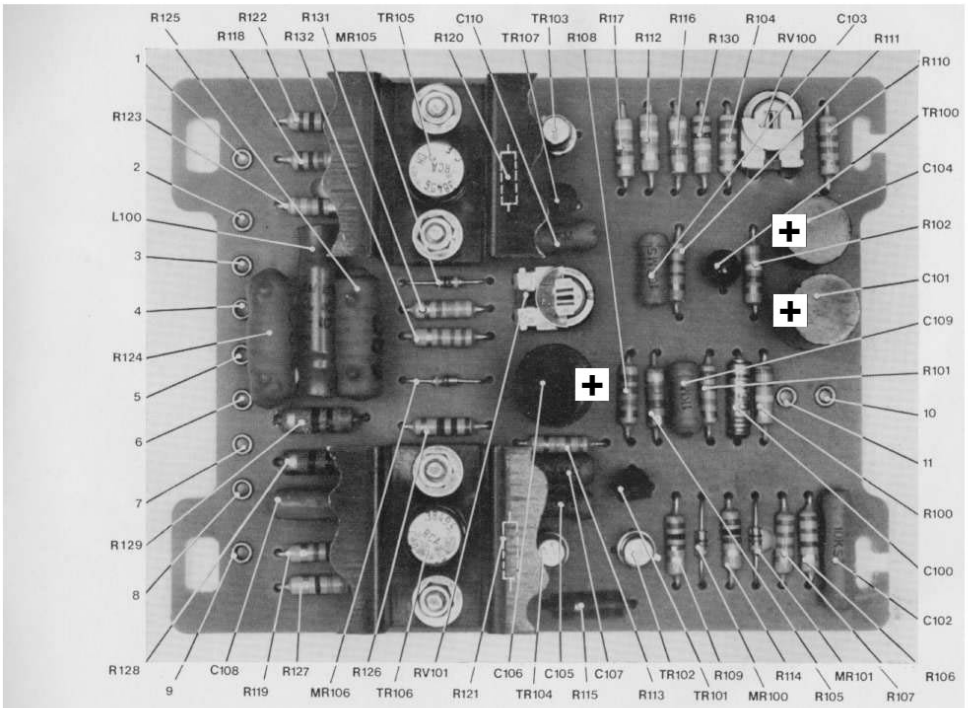


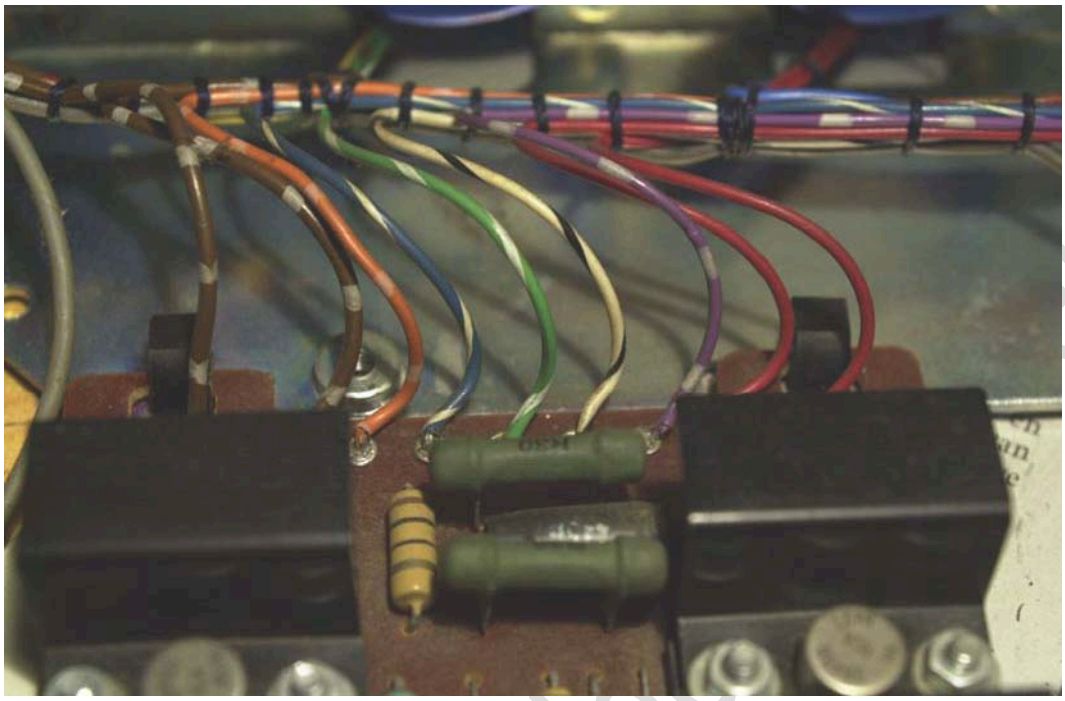
Fig. 11 (b) Driver Board M.12038 (issue 10)

- Replace C100 with 1uF
- Replace C101 with 470µF
- Replace C104 with 22µF
- Replace C106 with 47µF
- Replace RV100 with a 4K7 trimmer
- Replace RV101 with a 2K2 trimmer (or 22K in the case of version 9 or lower driver board).

Be advised: watch the polarity of the electrolytic capacitors. The + (positive) of C104 and C101 is towards the inside of the board. The + (positive) of C106 is towards the back-end of the board.

It is good practice to upgrade the boards one by one. This way you can compare the boards for the polarity of the capacitors.

The connections of the driver boards to the cable-beam are as follows:



1. Red: + (positive) power-supply
2. Red: Collector of TR1
3. Violet/White: Base of TR1
4. Black/White: Emitter of TR1
5. Green/White: Output (to output capacitor)
6. Blue/White: Collector of TR2
7. Orange/White: Base of TR2
8. Brown/White: Emitter of TR2 and - (negative) Power Supply
9. Brown/White: - LS

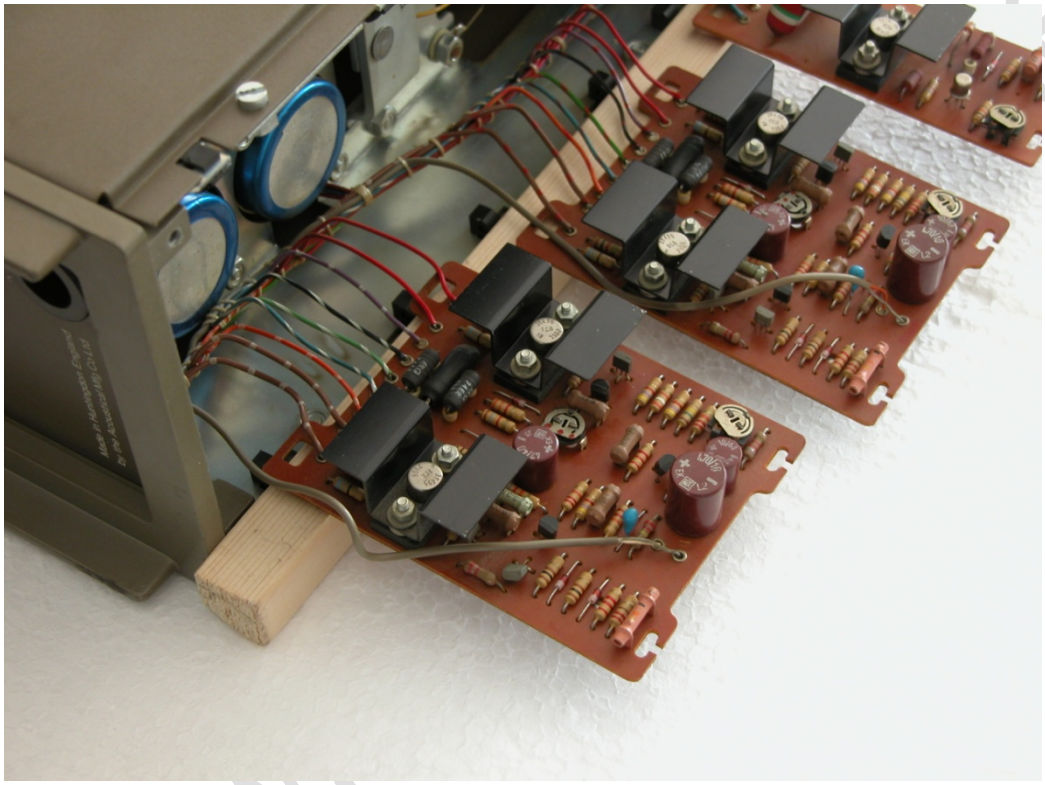
These are for the left-channel. The left channel is the board closests to the front panel. The bottom two transistors on the heat sink are also left channel. In the right-channel White should read Red.

The connections to the PSU-board are:

12. Red: + (positive) (from the PSU capacitor)
13. Brown: Negative voltage & Collector of TR3
14. Orange: Base of TR3
15. Blue: - (negative) (from the PSU capacitor)

Step 5 – Calibrating the voltages and the quiescent-current

"**WARNING**! *Be sure to* ***remove the boards completely from the plastic clips during the calibration, the same goes for the backend. Contact between the track (copper) side of the printed circuit board and the chassis should be avoided at all time. Non-compliance will result in destroying the driver boards and the power transistors." Please refer to the picture hereunder; use for instance a small piece of wood bar to meticulously isolate the Pcb from the chassis.***



Beware: to get meaningful results, please perform the calibration without any signal source or loudspeaker connected to the 303 concerned!

- Connect a DC multimeter between pins (wire) 1 and 9 on one of the driver boards. Adapt RV200 on the PSU-board until you measure exactly 67 Volt DC.

- Connect a DC multimeter between pins 1 and 5 on a driver board. Adapt RV100 until exactly (!) 33.5 Volt DC is measured. Repeat this step for the other driver board.

- Connect a multimeter between pins 4 and 6 on any of the driver boards. Set the multimeter to its DC millivolt (mV)-range.

- Adapt RV101 until you measure at least 6 mV DC. A somewhat higher value will not be a problem, but 15mV is about the maximum. The optimum is 6 to

9mV. The bias current will then be in between 10mA and 18mA DC. In its technical documentation, Quad stated the value should be somewhere between 5 and 10mA DC. Because of renewed tolerances and the low distortion of the circuit it is advisable to maintain a small margin. Please be sure to repeat this exact step for the other driver board.

The exact values will vary around the ideal value when the transistors are cold. Connect the amplifier & use it for some hours at a normal volume. Then please repeat the calibration steps as described above.

Appendix

1. Driver board pictures and layout for a serial # below 11500
2. Schematics; refer to the download section of our webpage.
3. Color coding of resistors
4. Identification of electrolyte capacitors, diodes and zeners

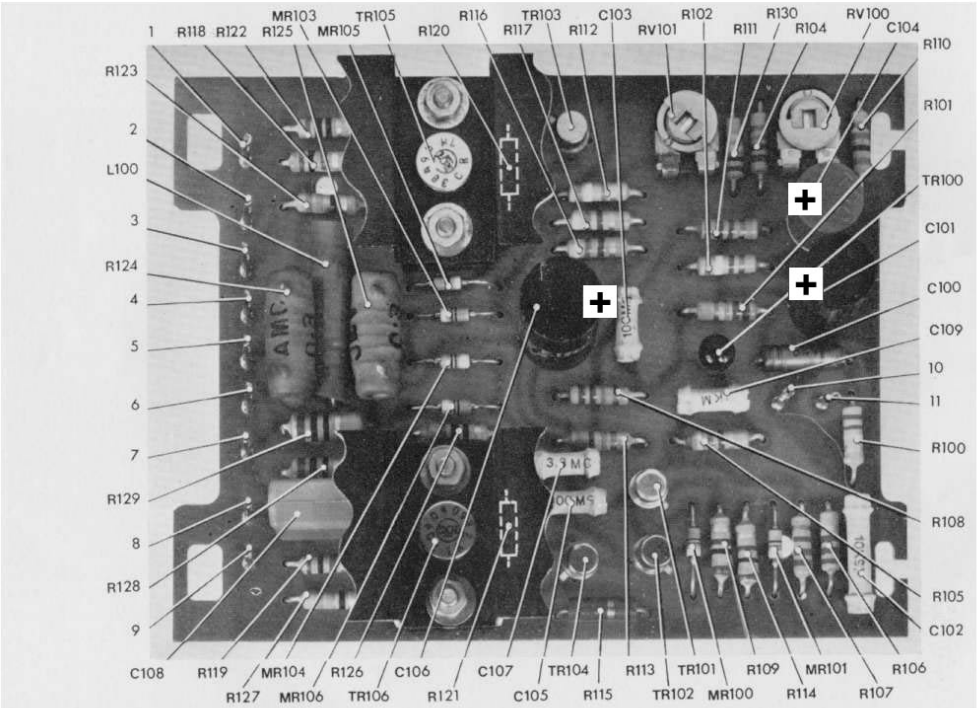
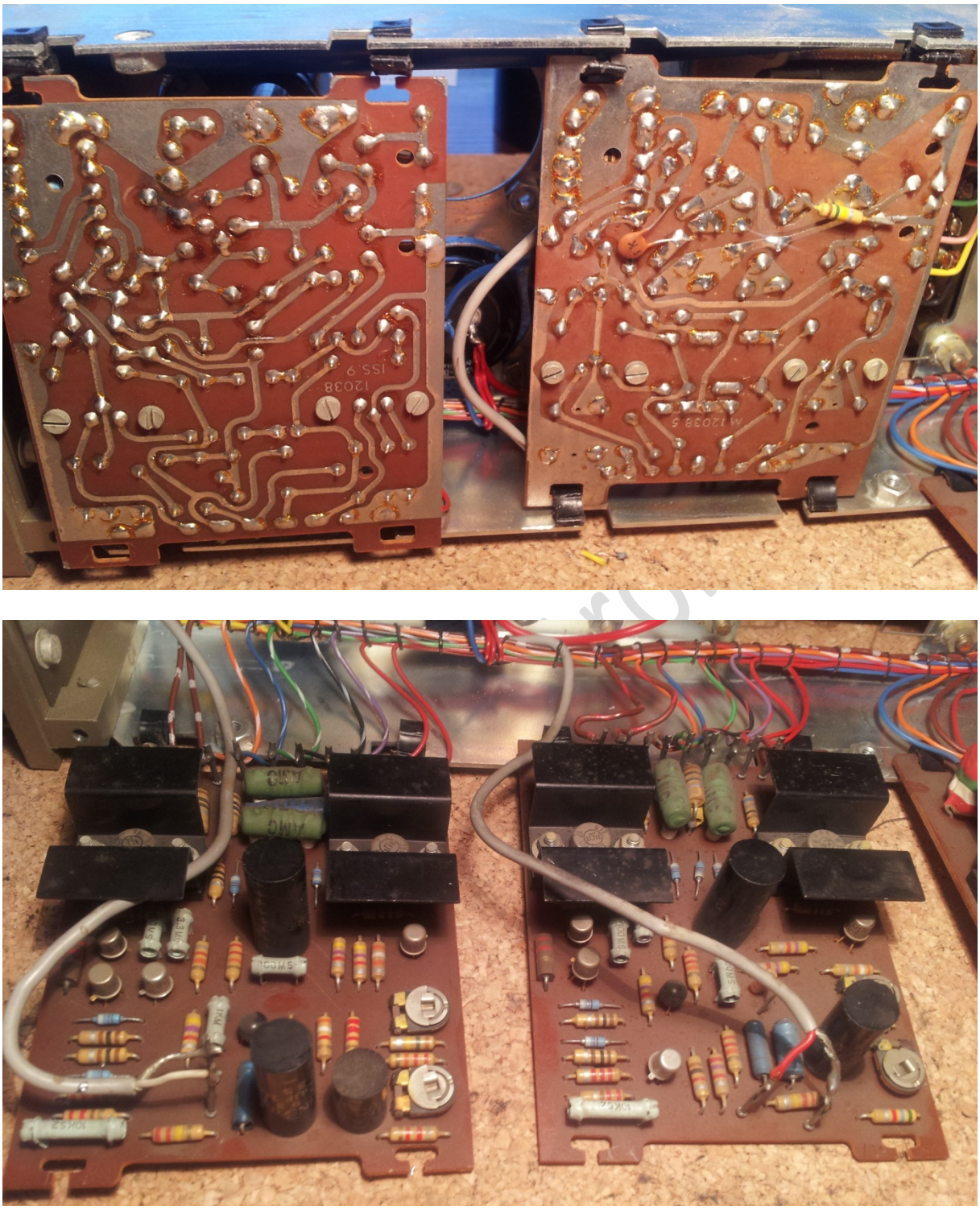


Fig. 11 (a) Driver Board M.12038 (issue 9)

Layout of the driver board, below serial 11500, placement of electrolytes is the same as in later versions. We recommend replacing the older boards with new HE-boards.



M12038 Issue 5 and 9 boards in one 303! Picture by Jose Ignacio Alfaro Allona

Color coding of resistors.

To distinguish left from right there is a larger gap between the D and E bands.

- band **A** is the first significant figure of component value (left side)
- band **B** is the second significant figure
- band **C** is the third significant figure
- band **D** is the decimal multiplier
- band **E** indicates tolerance of value in percent

Color	**A** First figure	**B** Second figure	**C** Third figure	**D** Multiplier		**E** Tolerance
Black	0	0	0	×1		–
Brown	1	1	1	×10		±1%
Red	2	2	2	×100		±2%
Orange	3	3	3	×1K		–
Yellow	4	4	4	×10K		–
Green	5	5	5	×100K		±0.5%
Blue	6	6	6	×1M		±0.25%
Violet	7	7	7	×10M		±0.1%
Gray	8	8	8	×100M		±0.05%
White	9	9	9	×1G		–
Gold	–	–	–	×0.1		±5%
Silver	–	–	–	×0.01		±10%
None	–	–	–	–		±20%

Example: Red, Red, Black, Red, Brown

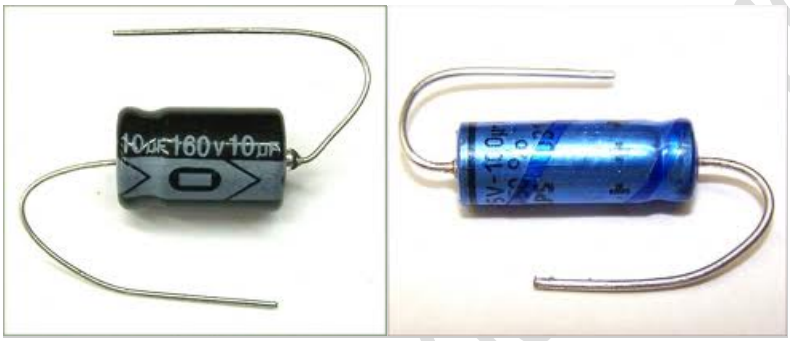
220 X 100 = 22Kohm and 1% tolerance

The identification of the plus and minus of electrolyte capacitors.

In almost all cases, the - (minus) is indicated with a long stripe with symbols at the side of the can in the color of the printed text.

Also if the capacitor has wires, the minus wire is the shortest one!

Capacitors with screw terminals will sometimes have the stripe indication or have indications on *top* of the capacitor, if any doubts, contact us! Be aware: connecting capacitors wrongly could cause serious damage or injuries!



With axial capacitors there is an extra arrow indicating the minus wire, or there is a printed small ring around the body indicating the minus wire. Also the minus wire is direct connected to the aluminum body. The plus wire is sticking through the black plastic cap.

Indication of the cathode of diodes and zener diodes

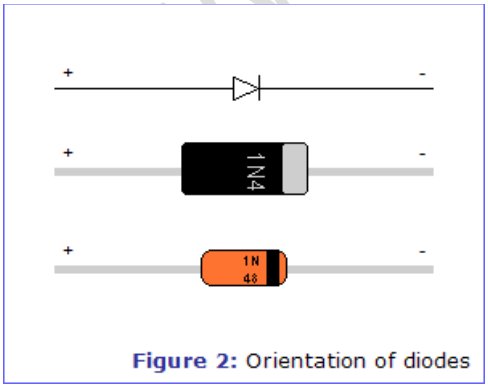


Figure 2: Orientation of diodes

The cathode will be indicated by a white, silver or black line on the body of the diode.