41Hz Audio

AMP10

www.41hz.com

Assembly instructions

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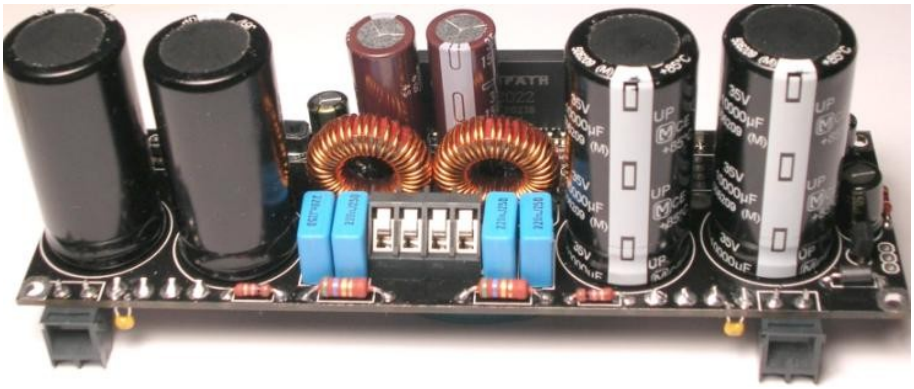
by Giovanni Falasca & Jan Fredriksson



AMP10 FEATURES

- Stereo or bridged mono inputs/outputs
- Audiophile sound quality, < 0,015% TDH+N at 2x50 W RMS, 8 ohm
- Bridged 8 ohms 140W at 0,1% THD+N, 200W at 1% THD+N
- Footprint, 50x160 mm
- Line level analogue audio inputs. Sensitivity adjustable with external resistors
- High efficiency 85-90% means small heat sink and small transformer requirements
- Power supply for main power and +5V on the board. Just add a transformer.
- Mute function for click-less on-off
- Over / under voltage turn off
- Over current protection, temperature overload protection
- The module is suitable for amplifiers and active speakers

TA2022 FEATURES

- Class-T architecture

- High Power
- 100W @ 4Ω, 1.0% THD+N
- 90W @ 4Ω, 0.1% THD+N
- 60W @ 8Ω, 0.1% THD+N

- “Audiophile” Sound Quality
- 0.015% THD+N @ 70W 4Ω
- 0.015% THD+N @ 45W 8Ω
- 0.10% IHF-IM @ 25W 4Ω

- High Efficiency
- 92% @ 88W 8Ω
- 87% @ 125W 4Ω
- Dynamic Range = 102 dB
- Mute Input
- Integrated Gate Drive Supply
- Over-current protection
- Over and under-voltage protection
- Single ended outputs
- Outputs can be operated in bridged mode
- 32-pin SSIP package

Summary

WARNING: The voltages and currents involved in building this amplifier can be lethal if not handled properly. If you do not have sufficient knowledge, do not proceed in building or using this kit. 41Hz Audio can in no way be held responsible for the consequences of the use of the kit. The kit is not suitable if you have no experience in soldering and electronics. On delivery, check that all components have been included. If something is missing, let us know immediately, so we can replace them and/or correct the packaging. Components packaged in an aluminized bag should be considered ESD sensitive and should be handled using normal ESD precautions.

Introduction

Thank you for choosing an audio kit from 41hz.com!

On delivery, check that all components have been included. We do double-check the component count but mistakes can happen. Please contact us at once if something is not OK with the shipping. A bill of material (BOM) is found as APPENDIX 1 in this document.

Assembly of the kits requires the usual set of electronics working tools:

- Wire cutter and screw driver, tweezers or fine pointed pliers.
- Soldering iron. The boards are double sided, double weight copper so a high-power soldering iron is recommended, especially for components connected to the ground plane. Solder irons without temperature control should not be used.
- A magnifying glass/loupe of the type that you wear like a pair of glasses or like a cap is recommended, as it increases the precision and quality of your work
- Solder flux of no-clean type and soldering wick are useful extras.

IMPORTANT NOTE: components packaged in a shielded, aluminized bag should be considered ESD sensitive and should be handled with ESD care. The Tripath chips use MOSFEt outputs which by nature are sensitive to ESD (Electro Static Discharge). Use ESD precautions. Preferably work on a conductive, grounded “ESD mat”, and avoid touching the chip leads with your fingers. Discharge yourself before working with the components.

Optional Other (Additional, Peripheral?) components

The following will at some stage be needed to complete the amplifier, but is not included in the kit:

- **Transformer**. A toroid with a nominal voltage of +/-18V$_{AC}$ to +/-24V$_{AC}$ is recommended. More about this can be found later in this manual.
- **Fuse**. The fuse should not be higher rated than the transformer maximal nominal load.
- **Heat sink**. Screws and heat conductive paste to mount the heat sink. -It is recommended that you solder hookup wires to the board.
- Screw / solder **terminals**.
- A **mute/un-mute switch** is *recommended* for thump-less power-on. You can wire this to a switch on your panel. Optionally use a 2.5 mm jumper (50 mil) on the board.
- You can optionally fit a **volume control** chip DS1802 on the board. Some additional components may then also be required.

Soldering

The kit is not suitable for complete beginners. If you are not familiar with soldering, it is recommended that you get help from someone who knows how to do, and that you do some test soldering on a separate scrap piece of material.

The boards for AMP10 are double weight, double sided copper. Even if the PCB and components are small, quite a powerful soldering iron is very helpful. Especially components and pads connected to the ground plane require significant heating. A temperature controlled 50W soldering iron is the minimum recommended. At the same time, applying excessive heat may damage the FRP plastic of the board, causing the copper pads to come off. Preheating the board to around 100ºC will make work easier and allows using a lower solder iron temperature which decreases the damage risk. Increasing the solder iron temperature is NOT recommended as it increases the risk of damaging the board. Some information on how to solder components is available in the forum on http://www.41hz.com

Power supply

The AMP10 requires a dual rail power supply plus a stabilized +5V 100 mA supply. The rail voltages could be **+/-20V to +/-30V**. Higher voltage gives a higher possible maximum power output. With 4 ohm speakers or 8 ohm bridged mono, +/- 30V is the maximum recommended by Tripath, to avoid tripping the over-current shutdown at high power. With 8 ohm loads, +/- 30V can be used without tripping the over-current limit. Toroid transformers are available with standard values. **Nominal voltages of +/18V$_{AC}$ to +/-22V$_{AC}$ are common**. When rectified, this will give about +/-24V$_{DC}$ to +/-30V$_{DC}$. Note that transformer voltages are given for full rated power. At low power, the voltage will be slightly higher. **For maximum power a 2x22VAC transformer would be about ideal**.

Mains power is lethal! If you are not professionally qualified to work with mains power, get help from someone who is!

The +5V is used for the analogue input amplifier and the in-chip digital parts of the TA2022. It needs to be well stabilized and well bypassed. On the board there is a regulated supply for the +5V. It uses a LM317 voltage regulator and taps from the positive main supply. The +5V should not draw more than about 60 mA. A jumper J10, can break the +5V supply which can be useful when testing.

Wind the toroid inductors.

The toroids used by Tripath are T68-2 size. With the AMP10 kit, slightly larger T80-2 for better linearity, lower load and allowing thicker copper wire for lower resistive loss. The number of turns is related to toroid cross section area and toroid material (which has some tolerance batch to batch) to get the right inductance. With the T80-2 size inductors included in the AMP10 kit you should use about **44 turns of wire to get 11 uH** (10-12 uH is acceptable). Wind as tight as you can. Tight winding minimizes HF signal leakage from the inductors. With the supplied 0.7 mm wire, you can wind the 44 turns in a single layer before coming back to the starting point. The first turns where probably not so neat so when you have finished the turns, unwind the first ones and redo them. If you have an inductance meter, measure the value and adjust if required.

Selecting the gain

The amplification, or gain, of the amplifier is set in two stages: Input stage gain and power stage gain. Optimally you should match the input gain to your signal source signal level and the power stage gain to your supply rail voltage. Just remember that music signals are very dynamic by nature, signal levels are approximate and impossible to predict accurately.

Input stage gain

In *table 1* you can see some typical input signal sources and gains you can set with the supplied components. The maximum recommended voltage *out* of the input stage is +/-2V peak to peak (1.41 VRMS), including some margin. At higher output signals, the input stage may clip.

The amplifier input stage in the Tripath chip is of the inverted operational amplifier type. The gain is calculated as:

Gain = -1 * Rfeedback/Rin On the board, R51 and R32 are the R_{in} and R43 and R44 are the $R_{feedback}$. With the kit, there are four 22 KΩ resistors and two 47 KΩ. With these resistor values, you can choose one of three different input gains/sensitivities as shown in table 1. If you use other input resistor values, they should be of a low noise type. I recommend metal film resistors.

Rin	Rfeedback	Gain [V/V]	Suitable signal source
22 KΩ	47 KΩ	-2.1	Direct connection of portable MP3/CD player with built in volume control or via a passive volume pot.
22 KΩ	22 KΩ	-1	General use
47 KΩ	22 KΩ	-0.47	(Pro) preamplifier with fairly high output signal

Table 1. Input stage gain setting recommendations

Modulator gain

The “modulator gain” is the power stage voltage gain. You can select this to match your power supply voltage, by selecting the value of the modulator feedback resistors R31, R37, R41 and R52. The supplied value fore these is 8.2Kohm. Each of these has a 1Kohm In series (R311, R371, R411, R521). So for the supplied values, the feedback resistors are total 9.2Kohm. *Table 2* gives some values for modulator feedback resistors and the rail voltages they are suitable for. If you use other resistor values than the supplied, you should use 1% tolerance resistors, preferably of the metal film type.

Rmfb	Gain [V/V]	Suitable rail voltage
6.8+1=7.1 KΩ		+/-20V to +/- 27V
8.2+1=9.2 KΩ		+/-25V to +/- 32V
10+1=11 KΩ		+/-28V to +/- 35V

Table 2. Modulator / power stage gain

The total gain is the input stage gain multiplied by the modulator gain. If we assume you have selected the input stage gain, as you normally should, for a maximum +/-2V output, then the maximum output voltage to the speakers will be 2x the modulator gain. For example with 10 kOhm feedback resistors, and +/-2V from the input stage, you would have +/- 38.6V out maximum. You can see that the calculated maximum output can be higher than the rail voltage. In reality, the output voltage can only be as high as the rail voltage, or actually a little lower. Therefore there will be some clipping of the highest peaks at the maximum input signal. This is quite OK and assures you can reach maximum output power at near the maximum input volume setting. If you decrease the modulator gain, you will not reach maximum power/clipping even at maximum input signal. If contrary, the modulator gain is too high, you will reach maximum output before the input stage is at full signal. The disadvantage here is that at low volume, the signal voltage will be very low, and the background noise may be higher than it could be.

Summary on selecting the gain

- Select **input gain** to match the music source signal level
- Select the **modulator gain** to match the supply rail voltage

Input stage gain	**Result**
Input Gain to low	Maximum output is to low. Amp may not reach full power.
Input Gain correct	Output from input stage is +/-2V peak to peak at full input volume
Input gain to high	Input stage clips before maximum output power is reached
Power stage gain	**Result**
Modulator gain to low	Output never reaches maximum power, even with maximum input signal
Modulator gain correct	Output clips slightly with a main stage input signal of around +/-2V
Modulator gain to high	Input stage is operating at low voltage; possibly increased THD+N at low power levels. Output may clip excessively at full volume.

Table 3. Gain setting; summary

Hookup and shielding.

Switched mode amplifiers are a bit noisy by nature, in the sense that they emit EMI that is generated by the high power, high frequency output transistors. This can be transmitted via cabling or as radiated in the atmosphere and picked up by other equipment like radios, preamplifiers etc or by the amplifier inputs. It is therefore recommended that some precautions are taken. The most important is that the amp is housed in a metal/shielded casing.

Proper grounding is also important. Note that input ground should be taken to the board J2 connector ground, not to the housing or power supply ground. The speaker returns should lead to J3 ground, not to the casing or power supply ground. It is strongly recommended that hookup cable for the signal input is shielded and as short as possible so that it does not pick up noise from the outputs. Input cables should lead away from the outputs as far as possible.

Speaker cable and power cables should be twisted to limit EMI radiation. All cables should lead the shortest way out of the casing. For most users, using shielded cables and a metal housing provides sufficient EMI damping. If this is not the case for you, for example if you get disturbances on radio receivers, damping can be used on the cables. The amplifier inputs can be decoupled with 100pF capacitors on the RCA connectors, between “ground and live”. The two 100 pF can also be placed on the PCB of AMP10. On the speaker outputs, and power rail connections, capacitors of 1000pF can be placed between ground and live. These should be where the cable enters the amp housing. Two 100pF and four 1000 pF capacitors are included with the kit for this. Note; while the speaker returns are “ground” you should connect them to the PCB, and not to the amp housing. The same is true for signal inputs; lead the grounds of the inputs to the input jumper on the PCB rather than to the amp housing.

The TA2022 copper slug on the back of the chip is connected internally to the chip ground. Therefore, it is not required to have electrically insulating mounting of the chip to the heat sink. However, it may be better to use insulation for two reasons; one is to avoid ground loops and the other is top reduce EMI from the heat sink. Some experimentation is recommended and feedback on this would be appreciated.

The LM317 on the other hand, must have insulated mounting, if using heat sink connected to ground.

Mounting the components

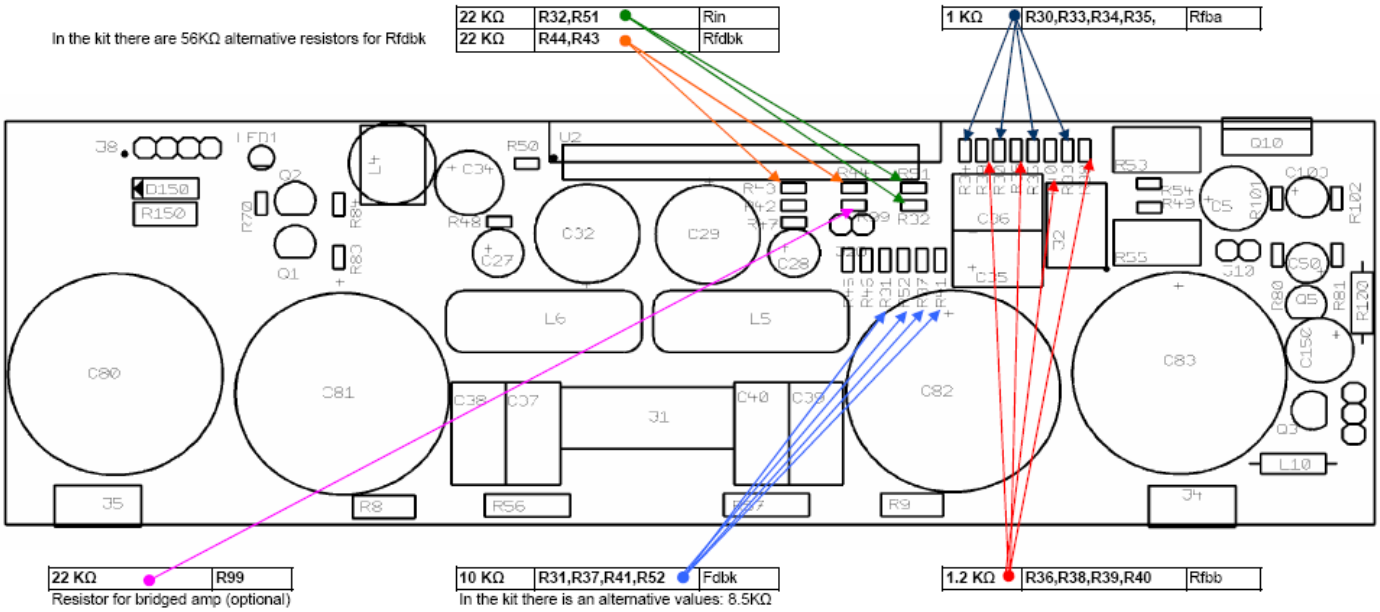
Instructions

To mount the amp, follow the steps in following paragraphs in the same order. In each table are indicated the components, in small groups, and the place where to solder them. This saves time, because arrows lead to board placement for each component. This way probability of mistakes is greatly reduced, even for expert diyers.

At the end of this assembly instructions there are three sheets with components names,. each in Each has its own rectangle.

- Remove the sheets and place them on the table
- Take out the components from the bags and place them each in its their own rectangle on the sheets. This operation also serves to check components delivered.
- The time spent is regained when soldering, as there is no need to look for components and the place where to solder them on the board. The time spent to discover a small mistake takes days.
- At the end of each step make a pause to check what *i*s done. There is always a picture in each step to compare with.
- Print this document, possibly with colors: the following pages are useful when soldering.

Step 1: Resistors for gain settings



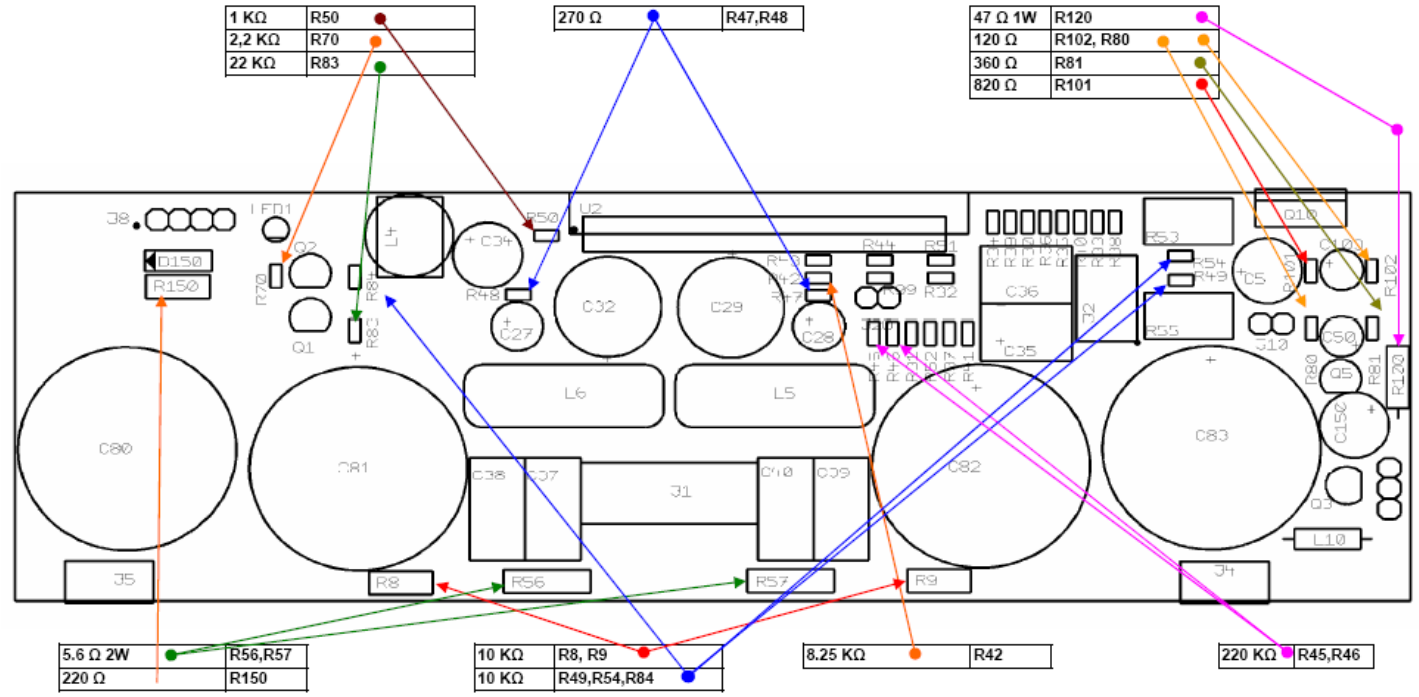
Resistors values indicated are those included in the kit. Alternative resistors are also included.

- **GAIN = Input Gain * Modulator Gain**
- **Input Gain = - Rfdbk / Rin**
- **Modulator Gain = (Rfbc * (Rfba + Rfbb) / Rfba *Rfbb) + 1**

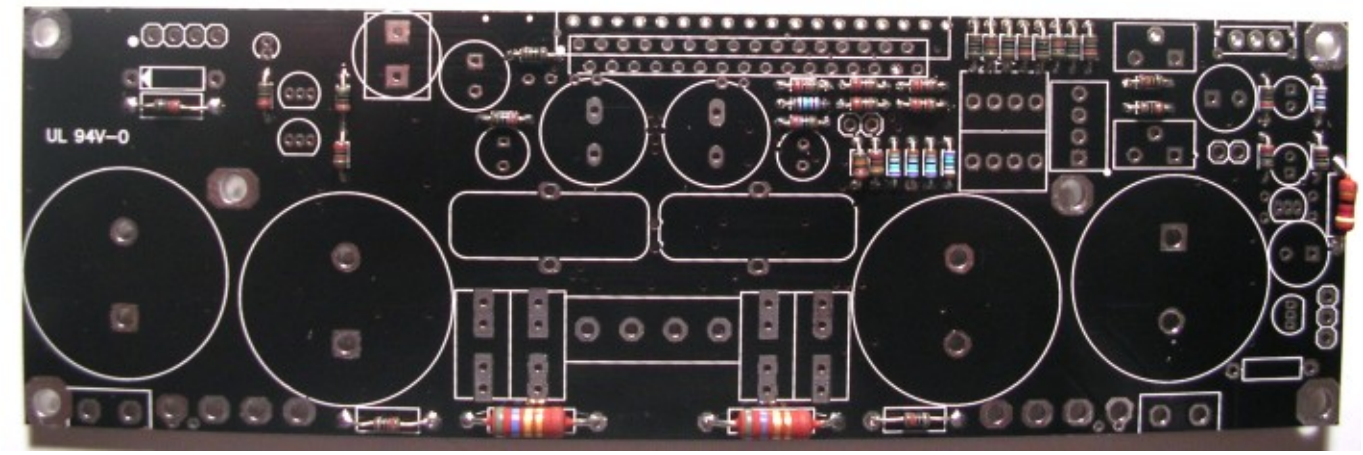
The resistor used to bridge the inputs, R99, can be soldered anyway. There is a jumper, J20, to close for bridged operation or let open for stereo.

R120 står här. Det ska vara R100

Step 2: Other resistors

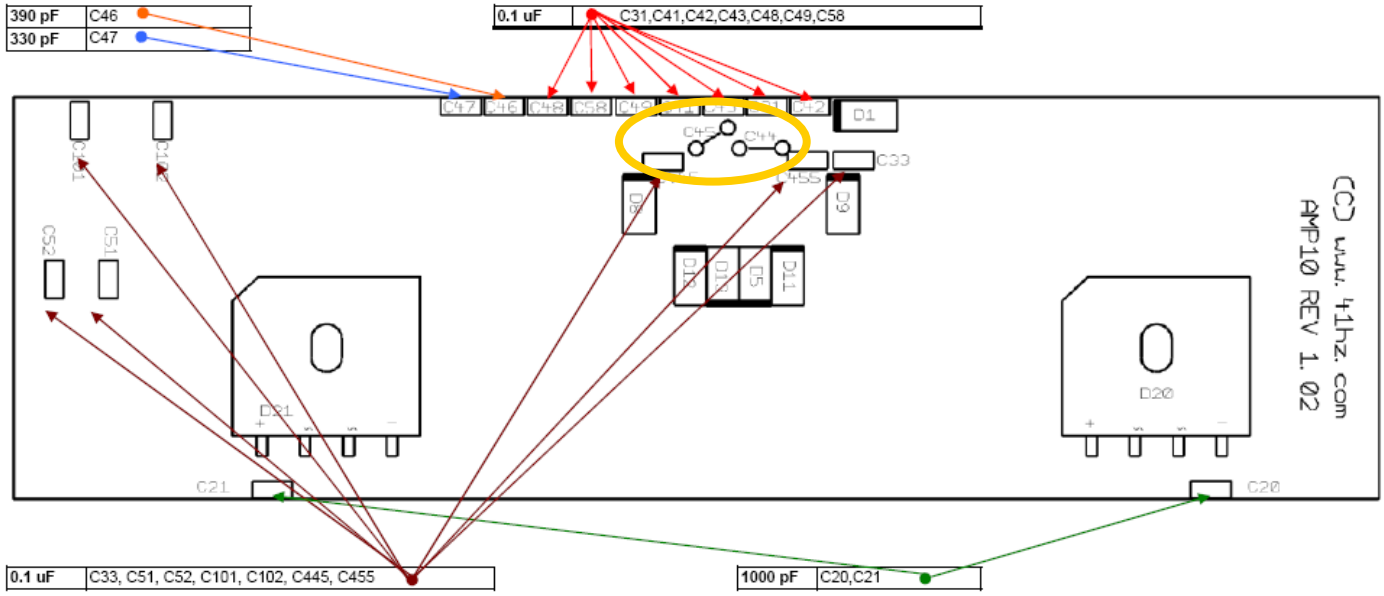


Other resistors are for on board power supply, on the right and under the bulk caps, for over/undercurrent and over/undervoltage sensing, for the on chip VN10 and for the external, optional relay.



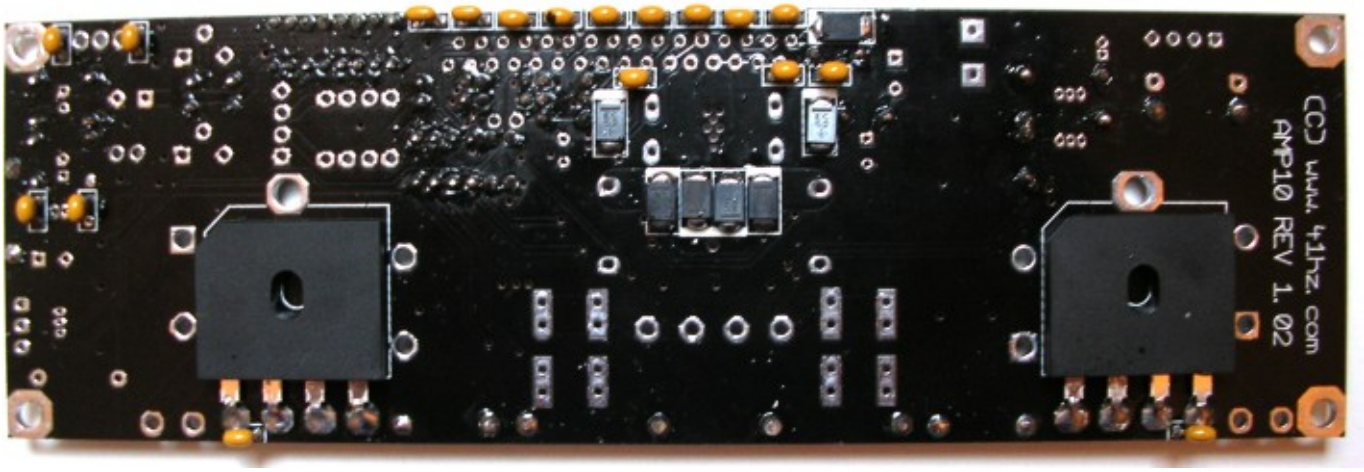
Here is how the board must appear after the first two steps. Take time to check if to each arrow on the figure above correspond to a resistor on the board, and if your board appears like the picture above. The colors of the resistors may be different, depending on the values chosen.

Step 3: Capacitors on the bottom and diodes



IMPORTANT: don't solder Capacitors C45 and C44. These must be soldered in the same holes of pin 4-8 and 9-12 of the TA2022. These caps will be soldered at the end, together with the TA2022.

All the small ceramics capacitors are on the bottom side of the board. Pay maximum attention when soldering: pads are very small and de-soldering could waste them. A bad soldering in only one of these caps can result in a hiss noise in the amplifier.

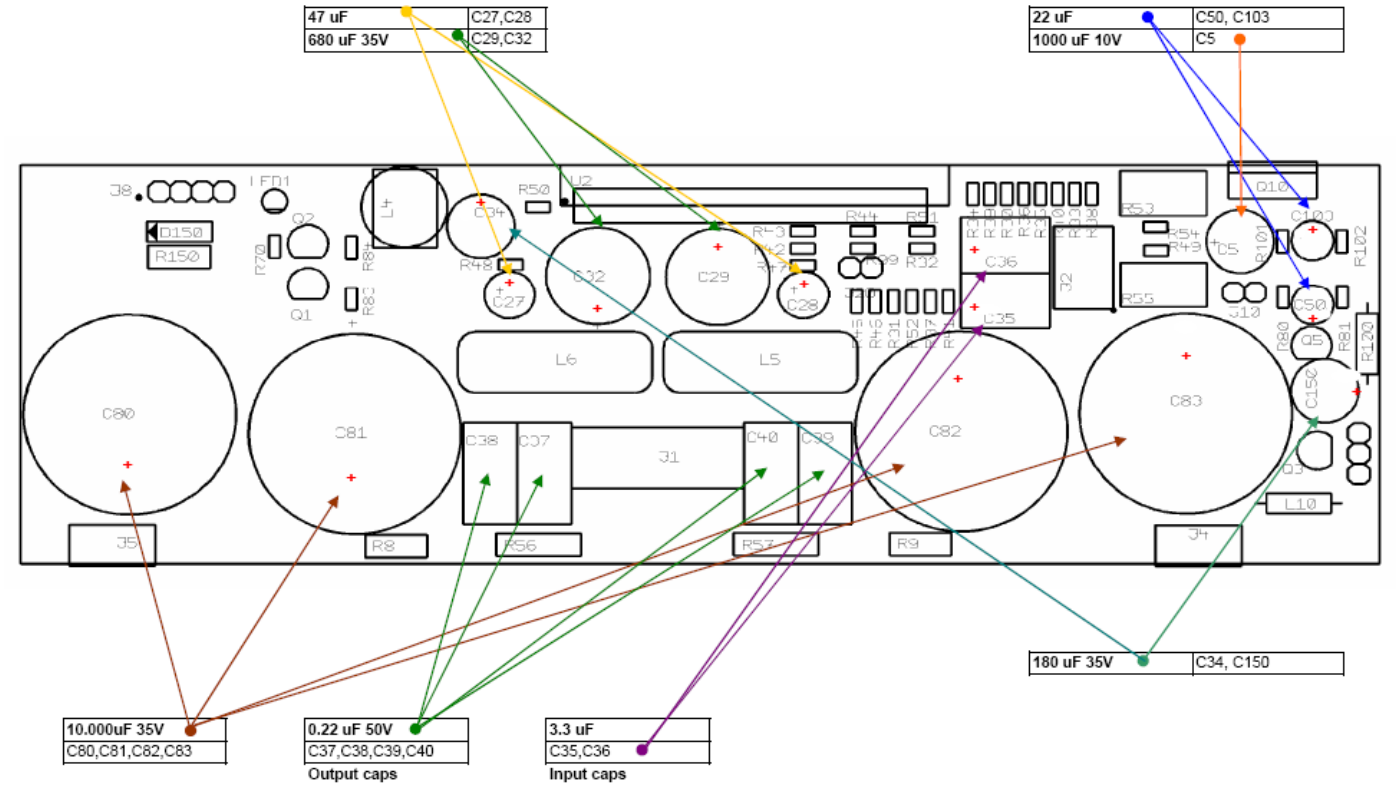


The seven diodes on the bottom are the only surface mount components, but are big enough not to worry. Pay attention to diodes direction: the thick line on the component MUST correspond to the thick line on the figure above. A diode soldered in the wrong direction may damage the amp irreversively.

The two rectifiers are to be mounted now. After that, there is nothing else to solder on the bottom, except C44 and C45 to be soldered together with the TA2022.

- Check again if all components have been soldered like in the picture.
- Double check the direction of the seven diodes.
- At this point most of the components are soldered.

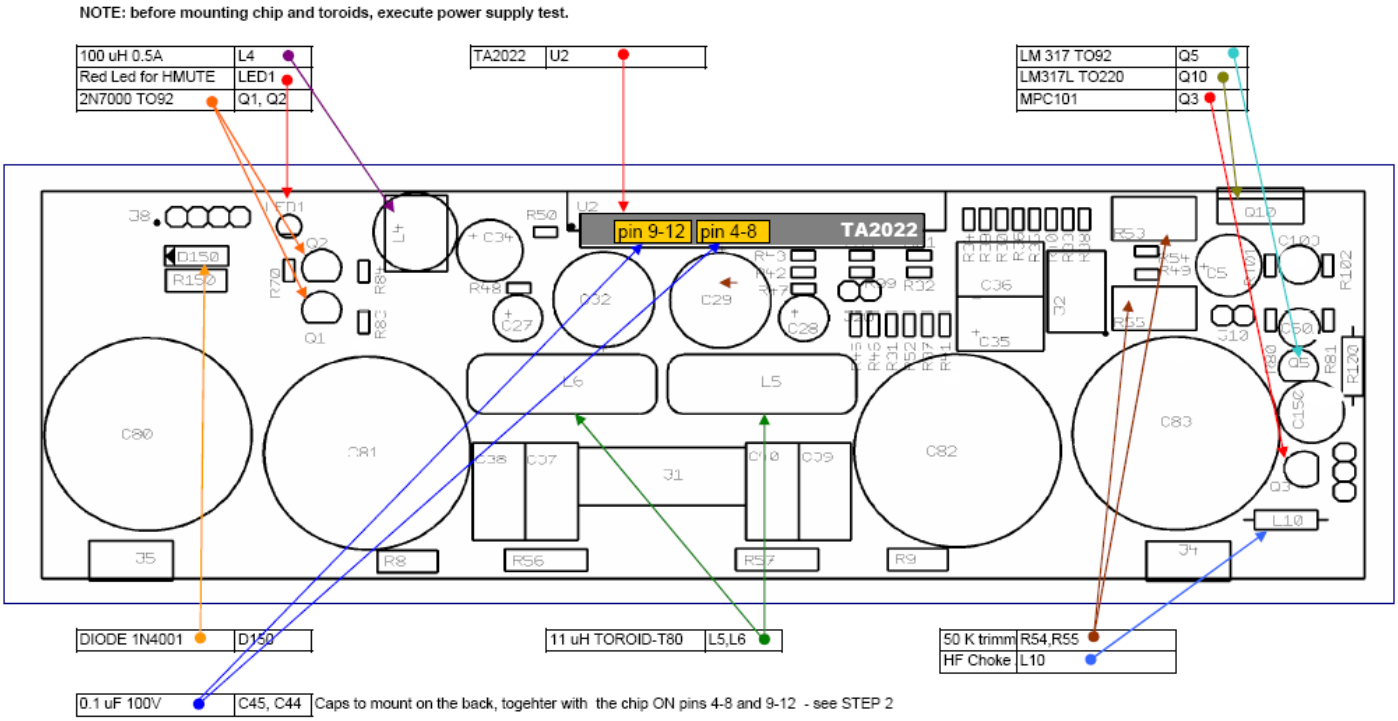
Step 4: Other capacitors



Pay attention to the polarity of each cap. A red "+" has been added to facilitate the identification of the polarity.

Check again the polarity of each cap comparing your board with the picture above. The positive pole's got a square soldering point. A reversed cap can explode and can cause injury. The four bulk caps can be soldered later, just before the power supply test. This way next step will be easier.

Step 5: IC's and remaining components



Wait the power supply test, Step 6, before mounting the TA2022 and the toroids

Step 6: Power supply test

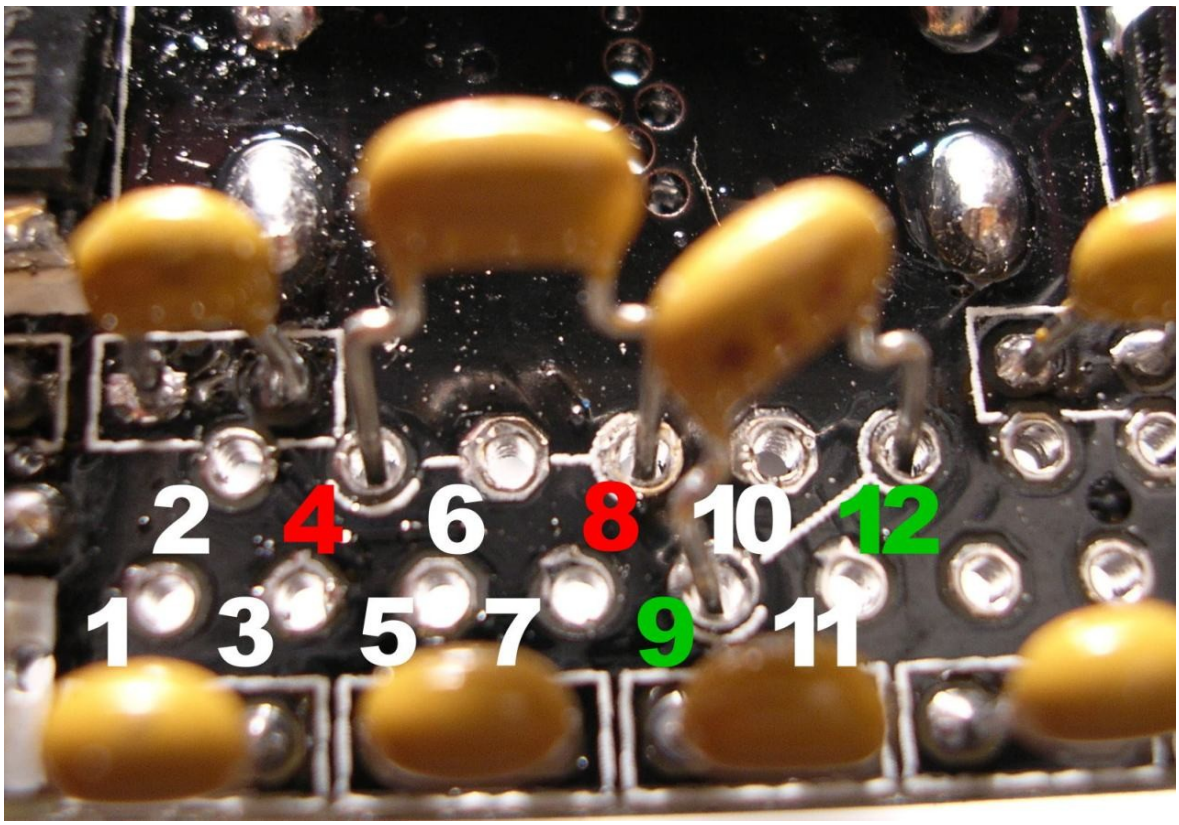
- Now, you can test the power supply.
- Solder the four bulk capacitors, or only two for the test, C81 and C82.
- Leave J10 open. This jumper separates the +5V from the “chip side” of the board, so the +5V can be tested without connecting the rest of the board. Note; do not remove this jumper for testing, once the Tripath chip has been soldered on. as this It may cause damage. Connect the transformer. Have a *slow blow* fuse of 200-300 mA on the primary side of the transformer. *A larger fuse may be required if you have a large transformer. Large toroid transformers have a*

very high current peak for a few milliseconds at startup. If you have mounted dual bulk capacitors, can also require larger fuses can be required. However, a larger fuse implies degraded protection.

- Check if the +5V is OK. The value should be between 4.9V and 5.1V. The actual value is not critical, but it is critical that it is stable. **DO NOT PROCEED FURTHER UNTILL THIS TEST HAS PASSED**. If the fuse blows, look for bad soldering and check if the diodes are in the right direction. If you need support, you can always post a question on the support site http://www.support.41hz.com or look in the forum on the web site.
- See also the problem solving appendix
- DO NOT CONNECT OR DISSCONNECT ANYTHING TO / FROM THE BOARD WHILE UNDER POWER: THIS MAY DAMAGE THE AMP. ALWAYS DE-POWER BEFORE CHANGING ANY CONNECTION, *INCLUDING INPUTS*.

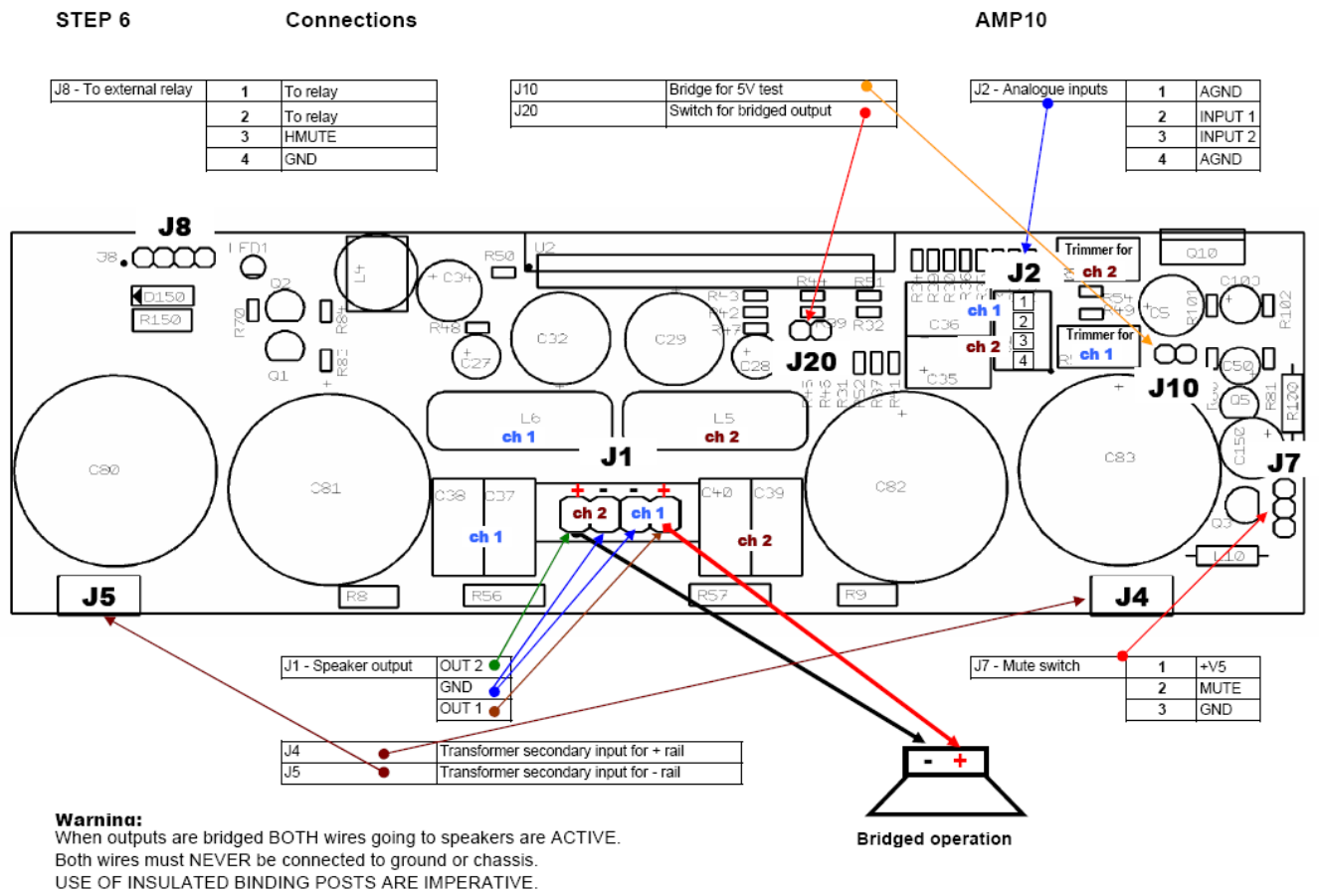
- If all is OK, discharge the capacitors, for example with a 1K resistor. Mount the optional relay and mount the toroids. Pull these snugly to the board before soldering. You can also glue them to the PCB width a small amount of temperature resistant glue, to prevent them from working loose. Silicone based glues are often suitable.

- Now mount the Tripath chip. There are two capacitors, C44 and C45, (0.1 uF RM5 /200 mil) which should be mounted from the back of the board into the holes of the rail power supply of the Tripath chip. The two components are marked on the back of the board as a line with circles at the ends. The name of the two capacitors components are not printed on the PCB. It is essential that the leads of these capacitors are kept as short as possible. Check that the Tripath chip is at right angle to the PCB before soldering. Soldering the ground pins of the chip requires quite a lot of heat but take care to work quite fast so the FRP is not damaged. Numers in the figures on the picture are TA2022 pins: C44 and C45 are connected to pins 4-8 and 9-12.



- Close the J10 jumper. This connects the +5V to the chip.

Step 7: Connectors and test

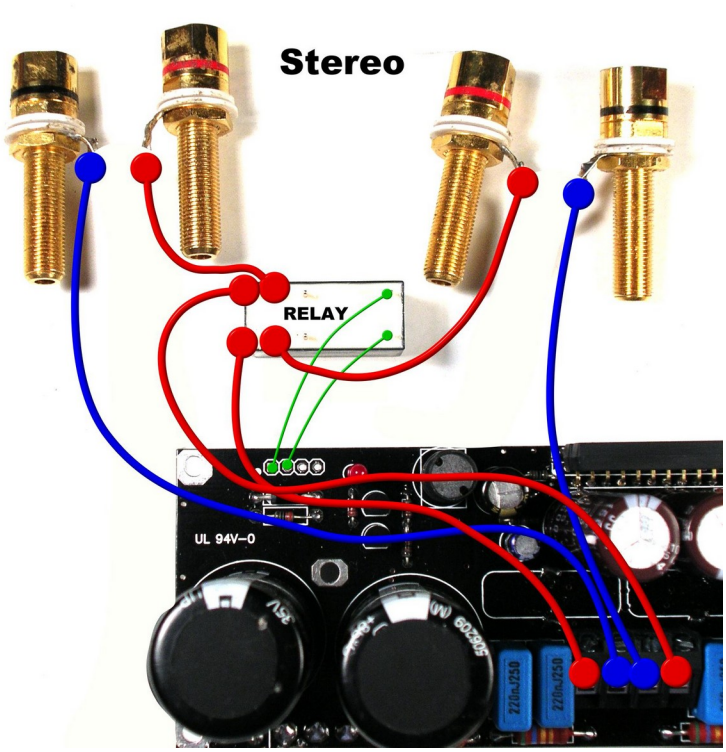


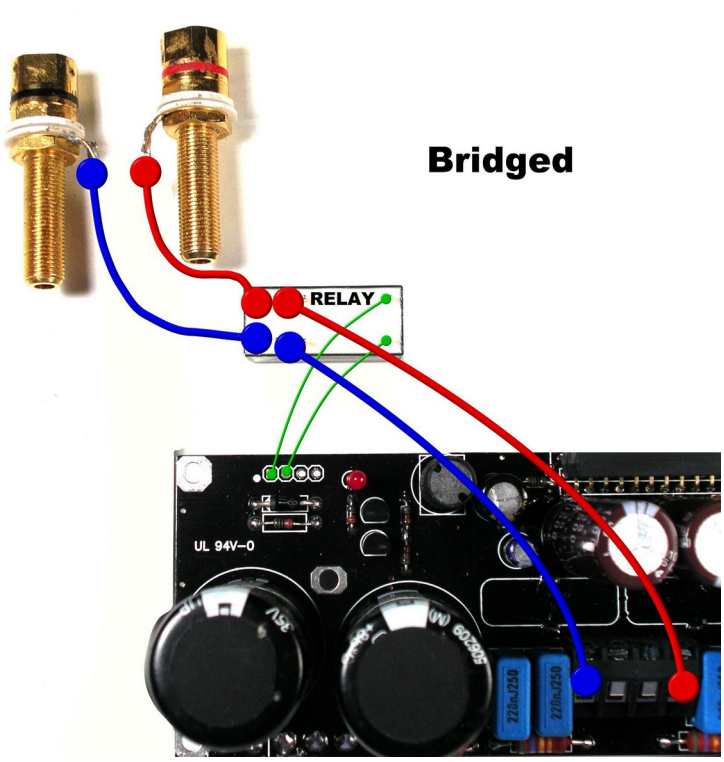
- Connect the MUTE switch or jumper to J7. Connecting pin 1-2=MUTE, pin 2-3= unmute on J7. Set the mute switch to MUTE position. Leaving this jumper open leaves the amp in an undefined mute state.
- Connect the power again. Maintain a small fuse. The led should go on. If not, something is wrong.
- If the fuse is OK, and the LED on, set the MUTE switch to awake (or move the jumper on J2 to pin 2 - pin 3). There should be a click from the relay (if mounted) and the The LED should now go off. If not, try adjusting the offset trimmer pots a bit. If offset is badly off, the amp may not un-mute.
- If all seems OK, trim adjust the trimmers until the speaker outputs are as close to zero as possible. It should be possible to trim to less than 10 mV from zero.
- MUTE the amp, de-power. Connect speakers and sound source.
- Power on. Un-mute. Check if all seems OK.
- If all seems OK, change to a fuse selected as for the power rating of your transformer.

Step 8: External relay *Som sagt: Ta bort*

On J8 is possible to mount an external relay for speakers protection. Only if the amp unmutes the relay will close and the signal will go to loudspeakers. Following picture showing proper external relay connections are autoexplicative. For bridged operation both wires are "active" and are connected both to relay, to bi switched at same time.

Pin 3 and 4 of J8 can be used to connect an external led to signal the MUTE state of the amp on the front panel. Whem the amp is muted the HMUTE (pin 32 of the chip to which J8-2 is connected) will show +5V, otherwise +0V. Only a few mA led would be used.





Enjoy the music! And please write some feedback in the http://www.41hz.com forum or by email.

APPENDIX 1 - Problem solving

Note: A troubleshooting guide is available on the downloads pages on teh web site

First

First thing to do is to clean the board from any thing that looks suspicious. This often solves problems. Micro fine strands of solder residual can short out the PCB. If this does not help, get a volt & current meter and learn how to use it if you do not know this. If the amp model has output offset trimmers, set these at centre position. Measure the main voltages and current for the rail and the +5V in muted and un-muted state. Compare this with the datasheet values.

- Most problems are due to faulty soldering
- Second most common problem is reversed components (Diodes, E-caps, IC's)
- Third most common problem is shorts caused while testing & measuring
- Components which are dead on delivery are *very* rare.

First power up, without Tripath chip and J10 open

- *Problem: Fuses blow. I do not get +5V after the regulator.*
  - If the fuse blows, check that no diode or electrolytic capacitor has been reversed. A large toroid transformer has a very high startup current peak. A slow fuse is a must and a larger fuse may be required. As an alternative, you can use a small "wall wart" power supply with at least 9V, and at least 200 mA and connect this to J3. Connect minus of the power supply to pin 6 (marked GND) and plus to pin 7 (marked AC1).
  - Check that you have positive voltage (8 to 35V) on the positive main rail, for example over one of the bulk capacitors.

- Check that you have a DC voltage over C150 which is the input cap to the +5V regulator.
- Check that the regulator has not been reversed. The flat side of the regulator should be on the side marked with a double line on the PCB. Check that R151, R152, R153 are right. Note +5V is available on pin 12 of J2 but not until J10 has been closed.

5V is OK, Tripath chip in place and J10 closed

- *Problem: LED goes on at power-up, but dos not go off at un-muting. Relay does not close.*
  - Check that voltages on both rails are within limits. They should be between +/-24 and +/-35V, otherwise the amp will not un-mute.
  - Adjust the trimmers and try again (nominally set them in center position). If offset is big, the amp may not un-mute.
  - Check if there is about 1.2 V over *REF* which is R42.
- *Problem: LED goes off at un-muting. Relay does not close.*
  - Check if there is a voltage over R155. It should be 0 when muted, +5V when un-muted.
  - Check if there is a significant voltage change over the relay coil (the two relay pins towards the center of the board), when un-muting. The relay needs about 20V to close. If the voltage is low (i.e. rail voltage is close to 25V), replace R60 with a smaller resistor, 10 to 47 ohms which increases the relay coil voltage

Amp un-mutes

- Problem: Sound, but with noise
  - Proper grounding is essential due to the somewhat noisy nature of the switching section.
  - Signal sources should be connected with its ground to J2. Use shielded cables. Microphone type cable is usually usable. Ethernet type cable can be an alternative. Make sure no signal leads are near the power section.
  - Make sure speakers are grounded to J3, RET1 and RET2, not to chassis.
  - Connect transformer ground and chassis ground/earth to J3 PGND with heavy duty wire.
  - Go over the soldering of the 0.1 uF capacitors. Especially C48.
  - Check that toroids and output filters are properly soldered.
  - Put some distance between amp and transformer.
  - If there is a ringing of around 2 kHz; check L4, if the tone changes when placing for example a screw diver near L4. This is an inductor for the built in VN10 generator. This is a small SMPS, running at 400 kHz. The L4 is the exact part number recommended by Tripath. However, it is an axial choke that seems to emit some disturbances, for some users, with some signal sources.
  - Arranging cables properly and using shielded hookup cable seems to help.
  - Grounding the Tripath chip slug may help.
  - Using a larger C34 may help If none of this helps, we are investigating alternate shielded type inductors. Contact 41Hz Audio for a replacement.
  - Put the amp in a shielded enclosure.

The amp will be very quiet when everything is OK.

Start-up thump

When the amp is taken from sleep to awake, the +5V regulator starts up and the input capacitors charge up. If the input capacitors are big, this will take some time, and during that time the voltage on the input will be rapidly changing. The amp sees this as an input signal and can output a thump. The way to prevent this is by keeping the amp in MUTE while it goes out of SLEEP / and / or by limiting the input capacitor size. It is also possible to have an output relay open until things have settled.

On some amp models there is a voltage supervisor that delays the turn-on un-mute until the +5V has stabilized.

VREF

The Tripath chip needs an internal voltage of about 1.1V. It is generated by connecting one of the chip pins to ground via a 8.2K resistor. This voltage is not influenced by other components, so if the VREF voltage is not close to 1.1V and the resistor is in place and the pins properly soldered, then the chip is probably damaged.

Input Bias

All of the Tripath chip with analogue inputs has the inputs biased to 2.5V. Therefore, signal input DC blocking capacitors must be used. After the input capacitors the signal will swing between 0 and +5V maximum, with a zero input would be 2.5V after the input capacitor. You can measure the input bias to ground to see if it is OK. If there is a zero or +5V voltage there, something is wrong, either by faulty soldering or internally in the chip. The Tripath chip senses this as a full signal to one side and will try to output this to the speakers. In that case, you will see a voltage close to rail voltage on the speaker output. As mentioned earlier, some AMP models have a voltage supervisor which delays the un-mute for some time, until the +5V and associated input bias has stabilized.

Over/Under-voltage sensing

Most Tripath chip has a built in voltage sensing. The amp will be forced to MUTE when the voltage is outside limits and un-mute when inside the limits again. Note that the voltage sensing does NOT provide any real protection, only a warning that the supply is out of limits. The voltage sensing limits for TA2022 TA2030 and TC2000-based chipsets, can be set by resistor values. The lower and upper limits for the voltage can not be set independently.

If the supply voltage is near the limit, the over-voltage sensing may mute the amp when playing at high power, due to rail voltage fluctuations at high power.

Noise

The AMPs from 41Hz audio are normally very, very quiet. If this is not the case, here are some things to look for.

Hizzzzzzzz

This is typically caused by a missing decoupling capacitor. The BIASCAP and the +5V supply 0.1 uF decoupling capacitors are especially important. Noise can also be picked up by unshielded input signal wires or unshielded +5V wires (AMP1, AMP2). Try to lead signal wires away from the amp, never wrap them around the amp.

Beeeeeeeep

A faint beep can be caused by the VN10 SMPS. Early shipments included an axial choke (as specified by Tripath) which caused this problem on AMP1, AMP2 and AMP5. These now ship with a shielded

inductor which solves the problem. The problem is also to a large extent solvable by using shielded signal connectors, and make sue they do not pass close tho the power amp section / outputs.

Faint, weak output

This is typically caused by faulty soldering of the output inductors. Clean the copper wire, preferably with a mini-torch, and solder with extra flux.

Other strange sounding output, possibly with low power

Again, bad connections in the output section can cause this. Again, especially the soldering of the inductors is important.

Large DC on outputs

Either there is an input signal / bias which is not 2.5V on the inputs. Then troubleshoot the input section.

If the inputs are OK, check the soldering of the feedback resistors (TA2022, TK2350, TA3020, TK2050). If these are OK, and there is no short circuit on the output section, and you have checked according to the above sections, then the output FETs in the Tripath chip are probably fried. Then the only help is to change the chip. New chip are available at the 41Hz Audio web site.

APPENDIX 2 - Winding inductors

A guide on winding toroids is available on the support web site

RESISTORS - Lay all resistors from bags to the cells below: it will be easy to find components when soldering.

R100 47 ohm 1W	**R8, R9 10 K**	**R45, R46 220 K**	**2.2 K**
120 ohm	**22 K**	**360 ohm**	**10 K**
220 ohm	**1.2 K**	**Trimmer 50 K**	**270 ohm**
1 K	**8.25 K**	**5.6 ohm 2W**	**820 ohm**

Capacitors - Lay all capacitors from bags to the cells below: it will be easy to find components when soldering.

22 uF 50V 10uF 35V	**0.1 uF**	**0.1 uF 100V RM5,08**	**10.000uF 50V**
1000 pF	**180 uF 50V 150uF 50V**	**330 pF**	**10.000uF 50V**
47 uF	**3.3 uF**	**390 pF**	
1000 uF 10V	**0.22 uF Polypro**	**680 uF 50V 1000uF 10V**	

IC's and other components - Lay all remaining components from bags to the cells below: it will be easy to find components when soldering.

MURS110 - SMT DIODES	**100 uH 2A**	**MCP101**	**CONNECTORS**
DIOD_4001	**LED_3MM**	**LM317L TO92**	R54 och R55 trim pot 50 k finns ej med
GBU_RECTIFIER RM5	**2N7000 TO92**	**TA2022**	
HF Choke Axial	**LM 317**	**11 uH TOROID-T80**	