Grounded Grid Plus Vacuum Tube Preamplifier User Manual

Analog Metric


WIMA
4,7 µF
MKP 10
400


novox

INTRODUCTION

This Grounded Grid Plus preamplifier provides enhanced performance out of the original Grounded Grid design. This new design adapted a feature like using beta-eliminated BJT current sources to act as constant current sources to bias the differential pairs of the channels separately, whereas only resistors are found in the original design for the current source, which are noise susceptible and voltage dependent. The power rectifier and regulator circuitry is redesigned to support full-wave rectification which is provided as another kit. A lowpass filter with an inductor option is incorporated after the full-wave rectified voltage. There are two independent output voltages (B+: 200-400V DC/100mA) and one independent filament output voltage (0-30V DC/3A); they can be fine trimmed by the variable resistors.

This Grounded Grid Plus preamp will not make any artifacts to the sound, and play 100% originally and naturally, due to the simplicity of circuit design and symmetric layout design without adding spared components. This design is fully verified by the simulations and evaluated with a working prototype. There is clear difference between the original GG and GG plus. The GG plus provides extra quiescent background due to lower noise (*decoupling cap of 20000uF for tube filament, two independent B+ supplies with full-wave rectification and LC filter and decoupling cap of 200uF, and constant BJT current source*). The human voice becomes much more detail. In addition, for the signal path, the simplicity of the differential amplifying stage configuration and negative feedback provides high and frequency response and flat pass band as reflected by its high dynamicity.

The high voltage supply for the tube preamp is obtained from the secondary coil (200VAC) of T30. A RC lowpass filter simply employs to reduce the undesired voltage supply ripple.The static current consumption of GG tube preamp (2 channels) is approximately 8mA. By including the power consumption of ZENER diode, the total current consumption is just about 13mA. The power supply of the filament is come from the secondary winding (12.6VAC) of T30, where the rectified voltage is regulated with the low voltage dropout LT1085CT. The heat is dissipated by relative large surface area of the heat sink, so the temperature of the heat sink is almost remain constant to produce a stable DC voltage source for filament.

The voltage gain is 10-15dB. It can be set by adjusting the ratio of R10/R12 and R9/R11, respectively for right and left channels by the following equations.

Voltage gain (dB) = $20log\left(\frac{R10}{R12}\right)$ (for right channel)

Voltage gain (dB) = $20log\left(\frac{R9}{R11}\right)$ (for left channel)

In this kit, R9 and R10 uses 100Kohm; whereas R11 and R12 uses 20k, so the gain of the amplifier is about 14dB.

Since the signal grounding of this small signal preamp is very critical to determine the overall performance, there is a need to have good signal grounding which can reduce the noise distortion or addition to the original weak audio signal. In practical, one can use the method suggested by Bruce Rozenblit that is bypassing the GND of RCA input with a 10ohm (0.5W) resistor or the GND of filtering capacitor via copper strip to the metal chassis, it can greatly reduce the surrounding noise interference. For this purpose, w GND hole for copper strip is designed. A copper strip is used to connect the hole to metal chassis, good shielding and low noise will be resulted.

FEATURES

- Three vacuum tubes 12AU7.
- Two single-ended inputs and two single-ended outputs
- Voltage gain ~15dB
- High dynamic range, output voltage max. 20Vrms
- S/N ratio >90dB
- Two separated voltage regulator boards to provide +200V and -200V DC.
- RC filters for ripple rejection and noise filtering.
- Optional connectors for choke 10H 100mA.
- Independent amplifier core and power supply block which are connected by flying wires.
- GND hole for signal grounding.
- It can be reconfigured to the original Grounded Grid Preamplifier.
- Power requirements: two 200V AC (100mA) and one 12V AC (1A)
- PCB dimension: 96mm (W) x 148mm (L) for Grounded Grid Plus core board and 98mm(W) x 155(L) for two BJT voltage regulator boards.
- PCB thickness: 2.5mm, double layer, 2oz copper.

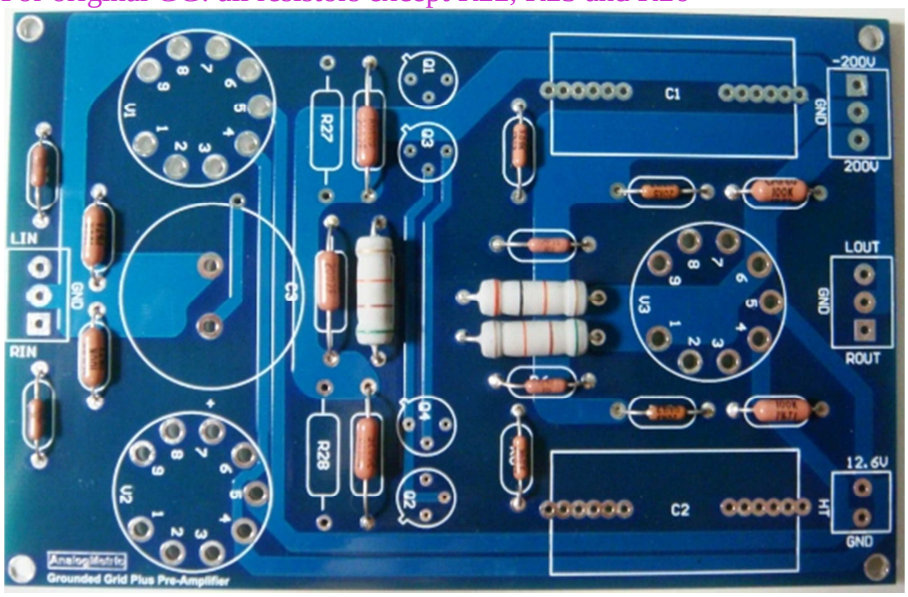
PRECAUTIONS

- Do not use finger or any body parts to touch the components or board! It is hazardous, since the high voltage capacitors may not be fully discharges after switched off the power supply.
- Turn off the power supply if the transformer is getting hot or some smoke is observed or strange buzz sound is heard.
- Fuse should be used either in power transformer or main socket to avoid accidentally large current drawing.
- Always contact technicans or experts to seek help.

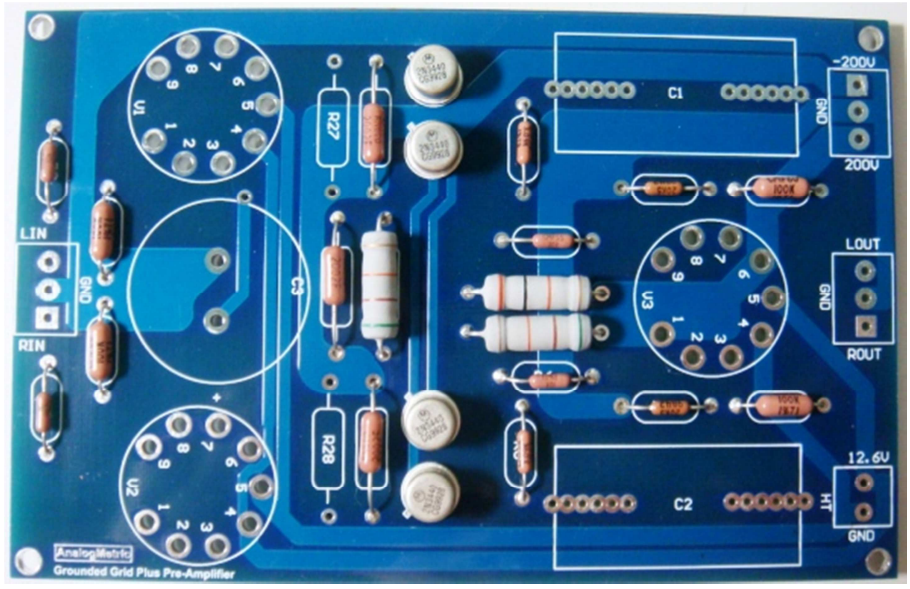
PROCEDURES

All photos shown are for Grouded Grid Plus Pre-amplifier. This guide also includes the steps to reconfigure it to original GG.

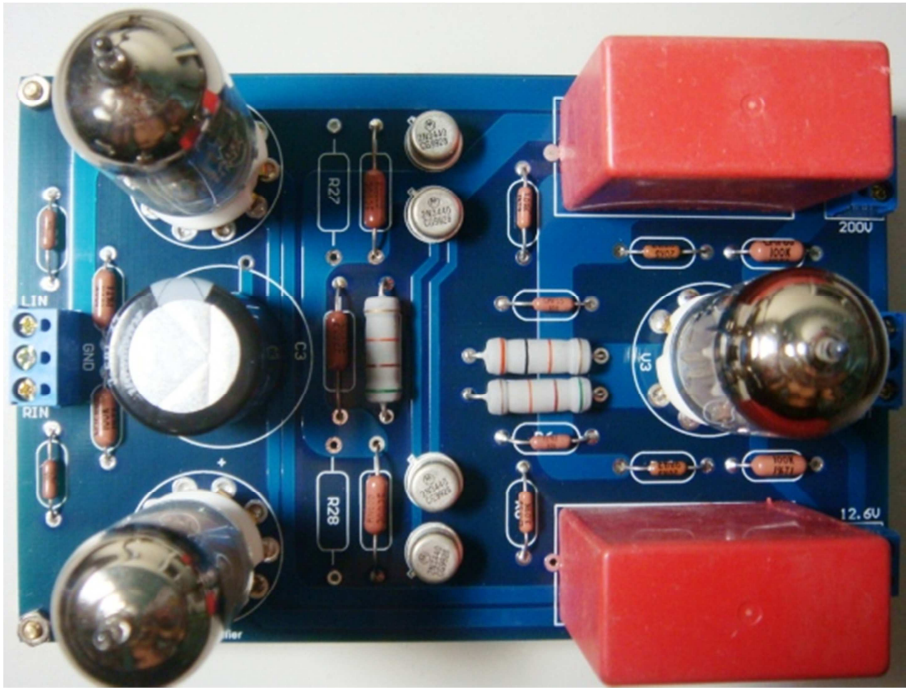
1. Solder the resistors according to the part list
For GG plus: all resistors except R27 and R28
For original GG: all resistors except R22, R23 and R26



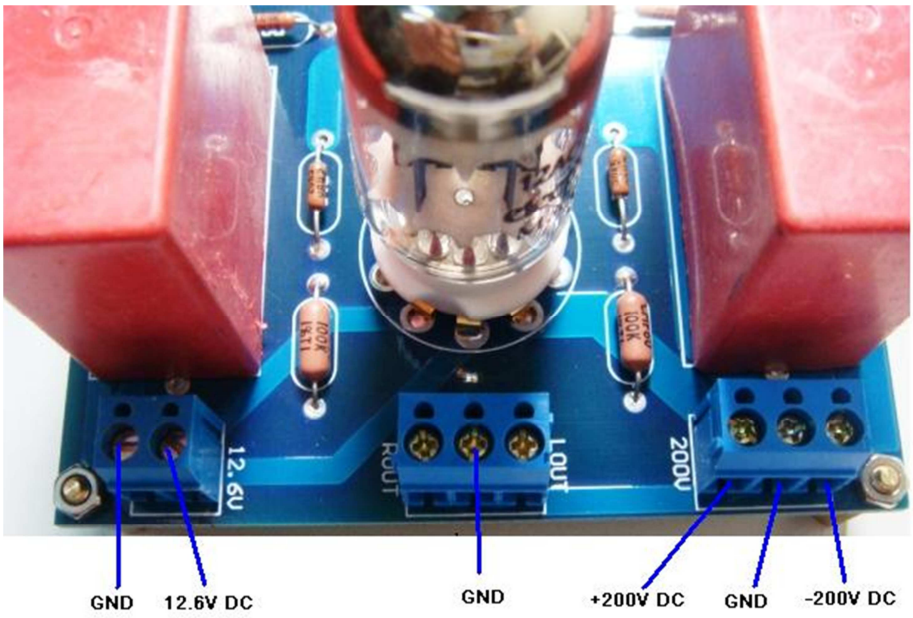
2. Solder power BJT
For GG Plus: Solder the power BJT (2N3439/2N3440).
For original GG: skip this step



3. Solder the tube sockets, connectors, and then the output capacitors. Note to the polarity of the electrolytic capacitor (big and black in color).



4. Connect the DC power lines 12.6V, +200V, -200V and GND according to the photo.



6. If the components are correctly soldered, the tubes will light up after turn on power.
7. Apply analog signal to the input socket (IN) and obtain the output signal at the output socket (OUT).

8. Enjoy it and good luck.

For the assembling of variable high voltage BJT regulator, please refer to the user manual.

If you have any problems in assembly, please contact us by email:
tech@analogmetric.com