

Preamplifier Assembly Guide V1.0

ANALOG METRIC

www.analogmetric.com

sales@analogmetric.com

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DISCLAIMER

Caution!



The circuits and subjects discussed in this manual operate from or involve dangerously high voltages. Do not attempt to build or modify any of the circuits described here, or work on live equipment, without proper experiences or training. It is the reader's responsibility to ensure that any circuits or equipment constructed or modified, using the information given in this manual is safe to use.

PRE-AMPLIFIER

The basic building blocks or modules for a complete preamplifier include (I) power transformer, (II) voltage regulator, (III) preamplifier, (IV) attenuator (volume control), (V) input selector and (VI) delay protection, where IV, V and VI is optional. The floorplan is illustrated in Figure 1.

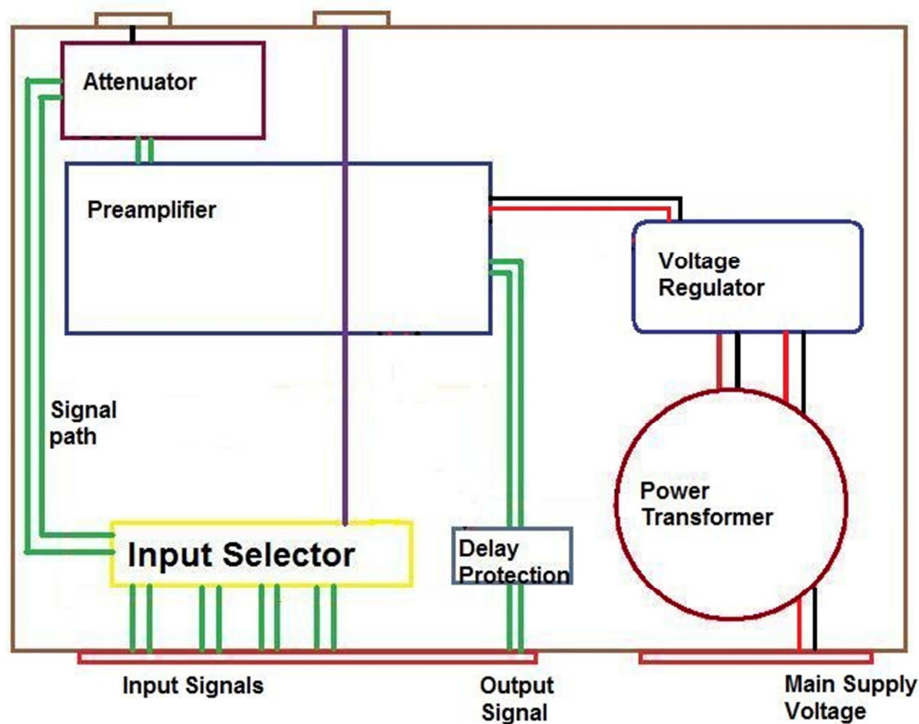


Figure 1. Floorplan of a preamplifier

I. Power Transformer (Model: T30, T110, T120 and R80)

It is the most powerful noise source to produce an audible humming in preamplifiers or amplifiers. It often adds a transformer metal case to cover it completely or a separated metal compartment for EM wave shielding. The thumb of rule tells the strength of EM wave is inversely proportional to their separation distance. Therefore, it is essential to maximize the distance between any weak signal paths and the transformer

The primary connection for US and EU standard is shown in the following Figure 2.

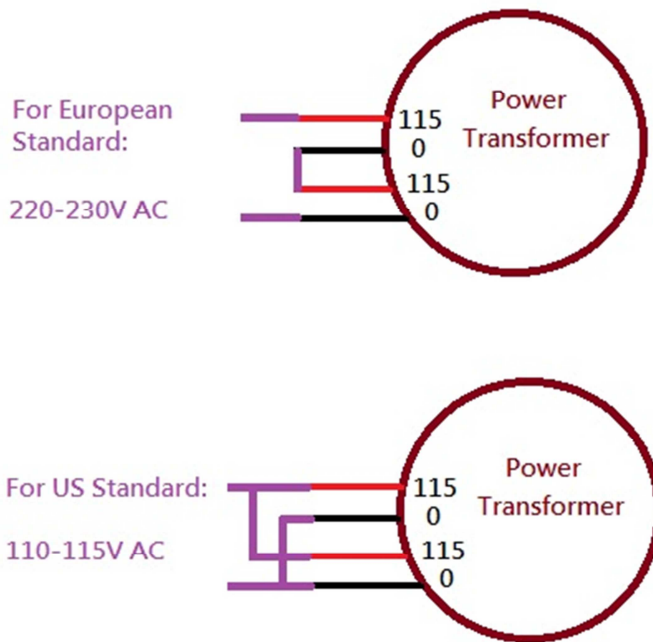


Figure 2: Transformer primary connection for EU and US standards.

II. Voltage Regulator (Model: HV400, CM400, PS200, TVR 6V6 and RT400)

The purpose of a voltage regulator is to convert a AC voltage from a power source (e.g. power transformer) to a DC voltage with as minimum ripple noise as possible. The Figure 3 demonstrates the block diagram and the general idea of a power supply unit (PSU). The input AC high voltage and AC low voltage to the regulator are denoted by HV AC and LV AC, respectively; whereas the corresponding output DC voltages are HV DC and LV DC accordingly. To have better noise depression, an optional choke 10H is often added to the regulator to form a 3rd order CLC filter (60dB/decade attenuation) compared to original CRC filter (40dB/decade attenuation) . For the tube voltage regulator, it requires several AC voltages e.g. 5V or 6.3V for tube filaments so that the tube can operate.

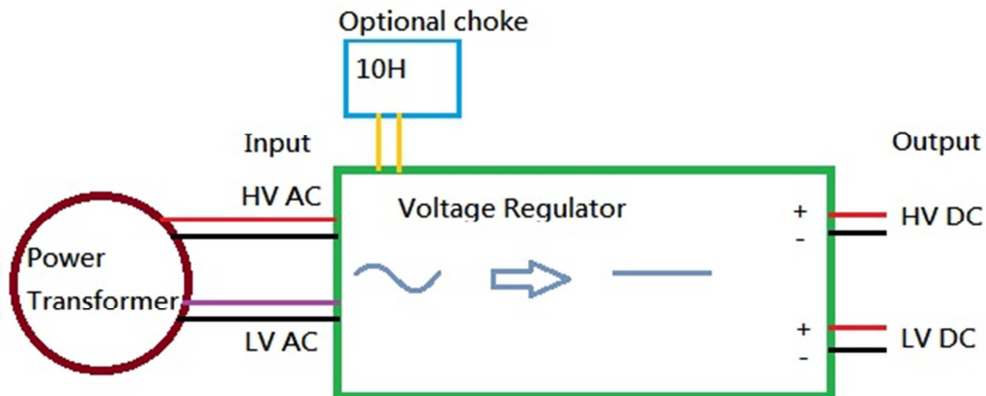


Figure 3: Block diagram of a power supply unit (PSU).

The Figure 4 and 5 shows the configuration to obtain both positive and negative power supplies by one (T120 and R80-44) and two power transformers (T30L/T30 and T110).

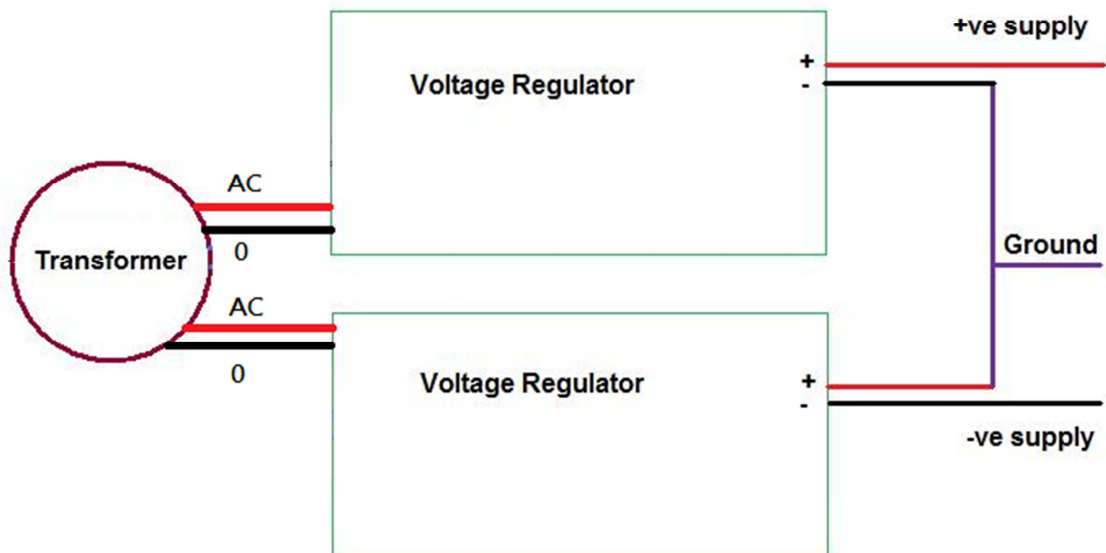


Figure 4: Generation of positive and negative voltage by one transformer with two secondary wires.

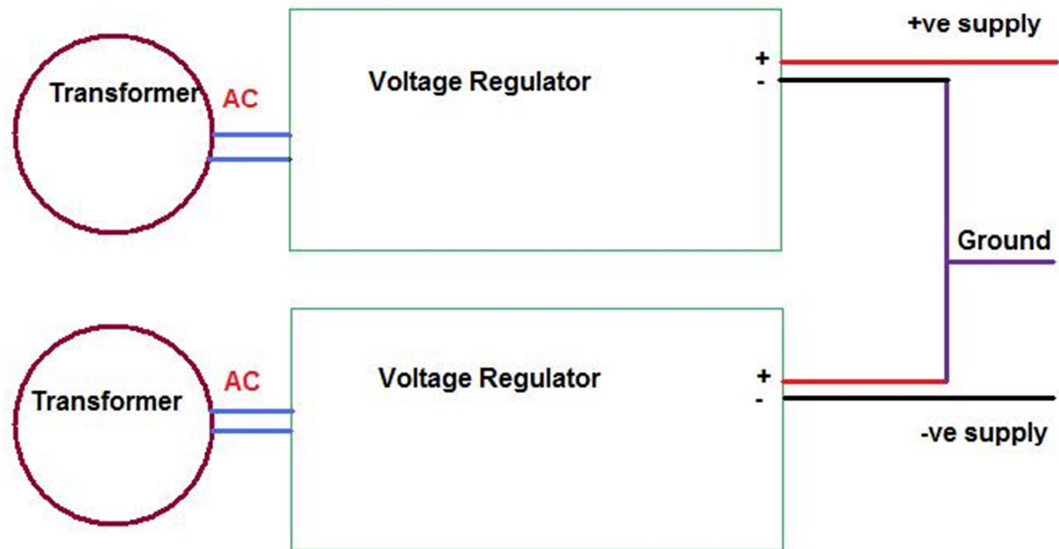


Figure 5: Generation of positive and negative voltage by two transformer.

III. Pre-amplifier (Model: GG, JP200, M7C, C22 etc)

A good preamplifier is essential to amplify a weak audio signal while suppressing undesirable noises. The ultimate goal is to preserve the original musical contents and to increase their amplitudes only. However, there exists noise that could be come from signal source, power supply, non-linear distortion and EM radiation. For tube preamplifier, it is generally supplied with one DC high voltage (>100V DC) for power rail and several AC or DC low voltages for tube filaments. The block diagram of a preamplifier is shown in Figure 6.

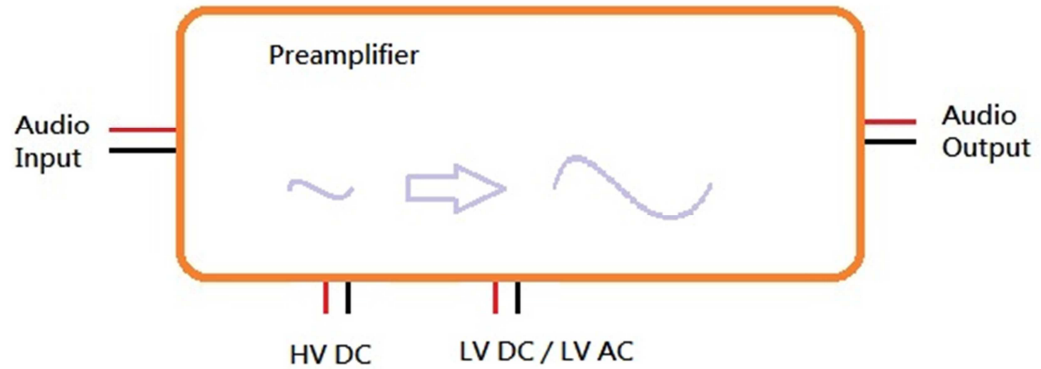


Figure 6: Block diagram of a preamplifier

IV. Attenuator (23 / 24 Step, IR Remote 6CH, ALPS POT)

Volume control can be done by adding a potentiometer or attenuator. It is basically a voltage or potential divider as illustrated in Figure 7. The output voltage is determined by the ratio of the two resistors. For a 23/24 step ladder attenuator, each step is represented by two resistors as Figure 7, similar to ALPS POT.

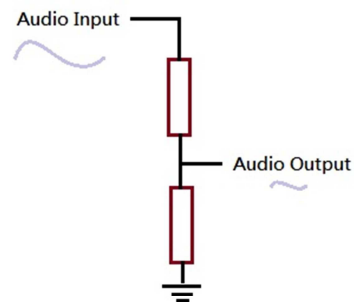


Figure 7: Circuit of a voltage divider.

V. Input Selector (4CH and 6CH)

An input selector likes a switch to select one input source from various audio sources (line, phono, CD and etc). The connection diagram is shown in Figure 8, where all grounds (black) are connected together. The right and left channels are highlighted by

green and red, respectively. One of the channels can be either configured as a single-end or balanced signal.

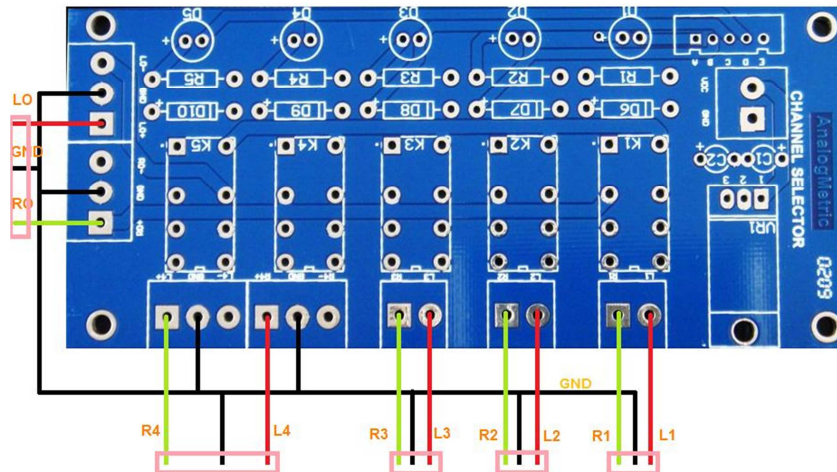


Figure 8: Block diagram of input selector.

VI. Delay Protection (DP555 and CP1237)

It is added to the output of a preamplifier or amplifier to prevent undesirable pop sound when power on or off, until the supply voltage becomes steady. It simply adds a certain delay time, e.g. 3s before allowing any outputs to other devices.

ASSEMBLY AND TROUBLESHOOTING

1. Solder each building block according to their part lists and guides which can be downloaded from our website:
http://www.analogmetric.com/download/download_page.htm
2. Double check the primary connections of the power transformer either in EU or US standards as well as the secondary connections to the subsequent modules. A proper fuse (<5A) is required to protect this costly transformer in case of any short circuit which will draw tremendous current that kill the transformer.
3. Double check the soldering to see if there are any short or missing, and also check the direction of polar electrode capacitors corresponding to the placement on PCB.
4. Test each building block individually before connecting them together. Apply correct supply voltage to the block and measure the voltages by a multimeter (Be careful that it takes seconds to minutes to discharge a high voltage capacitor after power off. Improper handling may cause harmful electric shock.) If these supply voltage cannot maintain or drawing unexpected lots of current or some components getting too hot,

stop the power supply and goes to step 1. For a tube preamplifier, test it before plugging any tubes. If everything works fine, plug in the tube and measure again the voltage to see if there are any discrepancies. It is normal that there may be some little voltage drop. Also, the tube will be lit up.

5. Connect power supply unit (power transformer plus voltage regulator) to the preamplifier. Measure the voltage again. If no problem occurs, mount all the modules to the chassis according to our recommended floorplan (Figure 1)
6. They are mounted in the following sequence:
 - A. Mount the chassis with the provided screws (in one bag)
 - B. Mount the power transformer with four 4mm screws, pads and nuts. Connect the primary wires (refer to section I for EU or US standards) to the IEC socket of the chassis via a fuse socket and a power switches as Figure 9.

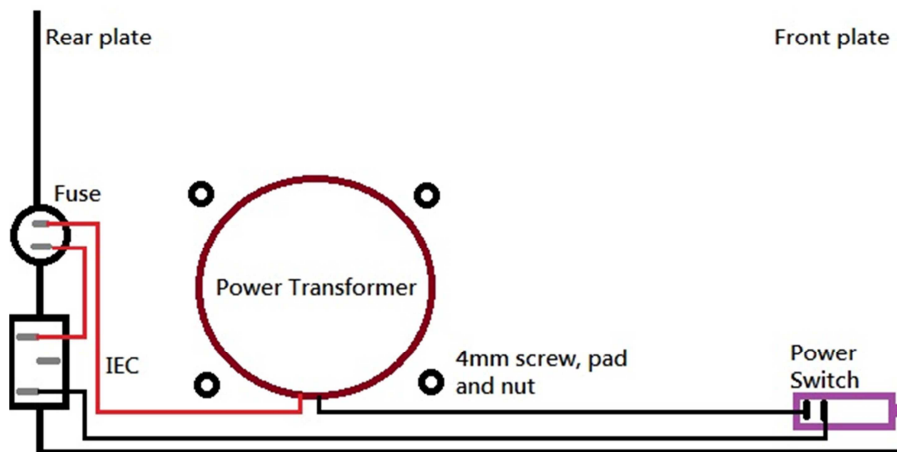


Figure 9: Connection diagram of power transformer to IEC socket

- C. Mount (3mm screw and nut) and connect the input selector to RCA sockets at the rear plate of the chassis. The connection is shown in Figure 10. The ground wires (black) are connected together.

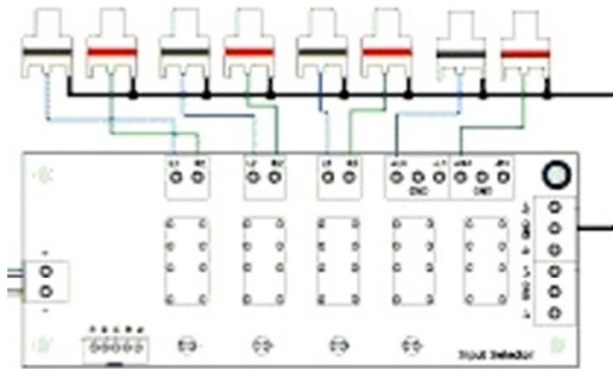


Figure 10: Connection diagram of input selector

- D. Mount (3mm screw and nut) and connect the input selector, potentiometer (POT), delay protection and voltage regulator to the preamplifier as shown in Figure 11.

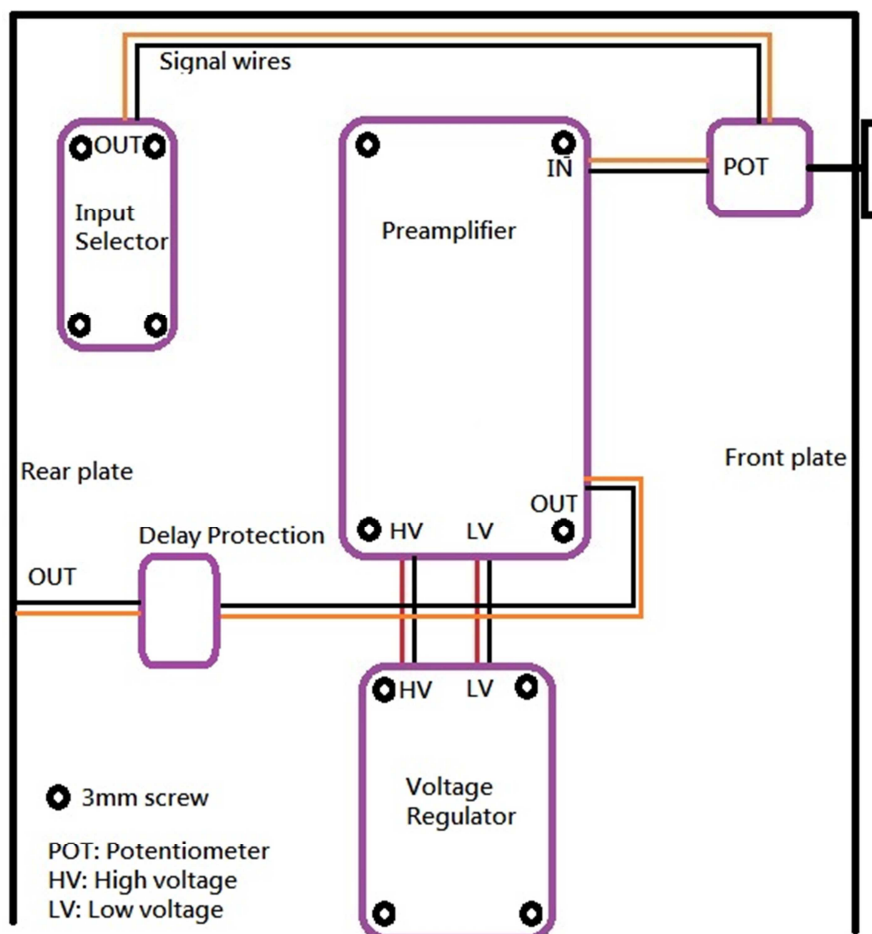


Figure 11: Connection diagram to preamplifier board

7. Apply main power (110/115V AC or 220/230V AC to the IEC of the preamplifier. If tube preamplifier, the tube will be lit up gradually. Measure and check the B+ voltage (HV) and tube filament voltages (LV)
8. Set and fine tuning the B+ voltage of the preamplifier to attain better sound performance.
9. If everything works fine, feed audio to the input RCA socket of the chassis and obtain the amplified output signal from the output RCA.

If you have any questions, please contact us by tech@analogmetric.com