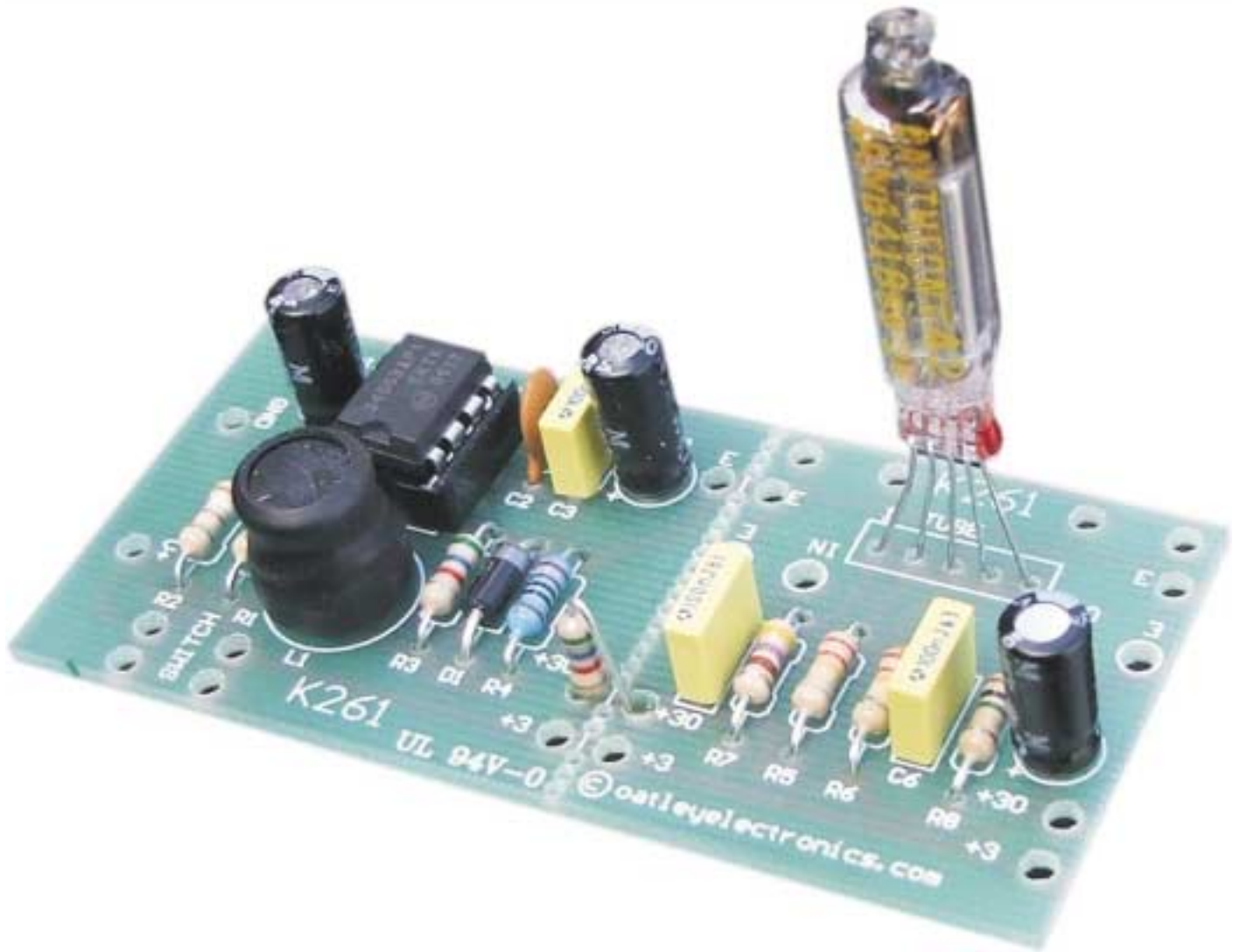


K261 VALVE AMPLIFIER NOTES



WE DO NOT HAVE EXPERIENCE WITH PERFORMANCE COMPARISON OF TUBE/VALVE AND SOLID STATE AMPLIFIERS. ANY COMMENTS MADE IN THE FOLLOWING NOTES ARE BASED ONLY ON RESEARCH

TUBE SOUND PREAMPLIFIER

BASIC SPECIFICATIONS

Frequency response:
4Hz to 120kHz.

Gain: 8 times

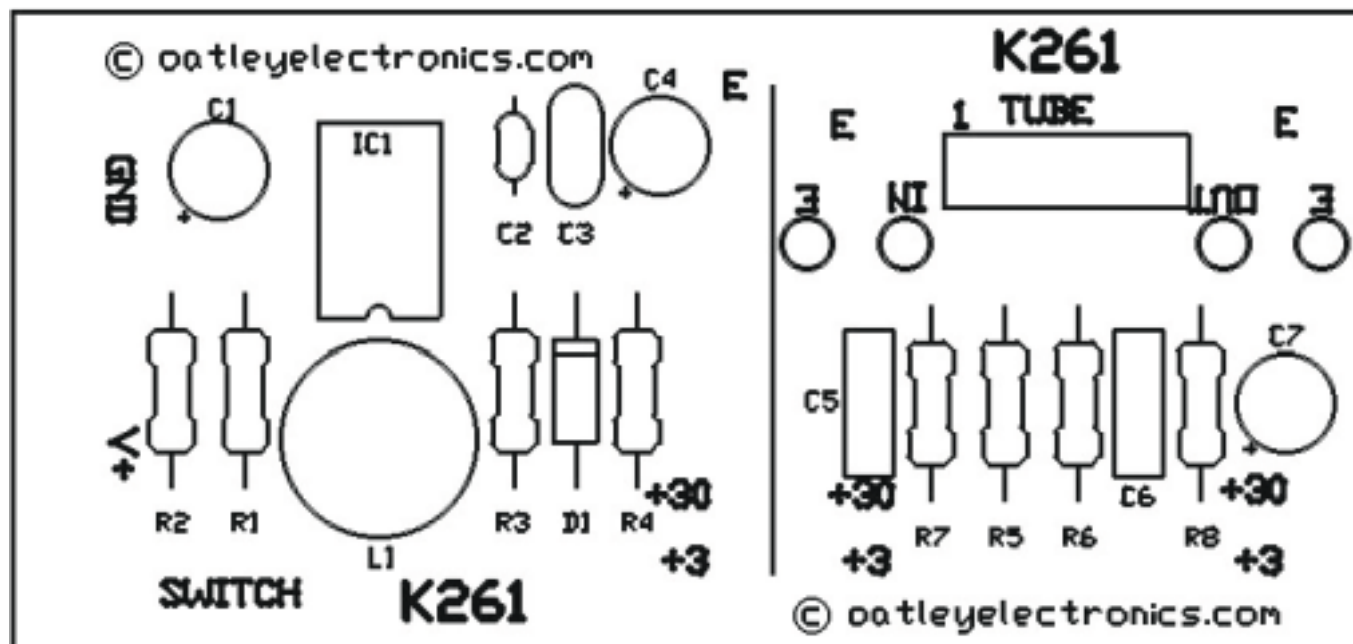
Supply: 6VDC

PCB size: 34mm (1.3") X
70mm (2.75")

INTRODUCTION

This low cost, simple to construct tube preamplifier lets you experience "tube sound". It is based on low power consumption Raytheon JAN6418 sub-miniature pentode. This tube was made in USA very late in the peak of the tube-making era: Around 1980. It is interesting to know that Audio Technica uses this same tube in its model AT3060 condenser microphone, which currently sells for around \$600US! Many critical listeners have discovered that they prefer the sound of tube based amplifiers. They claim that tube amplifiers sound "fuller" and "warmer" than solid state amplifiers. Whatever ones

view is, it is a fact that a lot of people are willing to pay a lot of money for the privilege. The warmth in this pre-amplifier can certainly not be attributed to the heat given off by the filament: The 1.2V filament draws just 10mA! You may be able to just see its glow in a very dark room. Perhaps the reason for the preference of tube amplifiers is because unlike solid state amplifiers they start "squashing" the signal before running out of headroom. The squashing action in a simple common cathode tube amplifier produces even order harmonics. A human brain is good at noticing small amounts of odd-order distortion generated by some



transistor amplifiers, but it will ignore even order harmonics generated by valve amplifiers. This preamplifier has a gain of 8 and its frequency response extends from 4Hz-120KHz. Unlike other earlier tubes this one has a maximum plate voltage of 30V so there is no high voltage hazard. As supplied the kit is designed for 6V-70mA battery operation. By changing the value of two resistors it can be made to operate from 3-30V DC: See the notes in the construction section.

HOW IT WORKS POWER SUPPLY ..

The incoming 6V DC battery voltage is stepped up to 32V by a switched mode power supply. This supply is based on a MC34063A IC. The data and application information for this IC can easily be found on the Internet. The collector of its internal switching transistor is at pin 1. When this transistor turns on the current flowing in the inductor (L1) builds up energy in the inductor. When the transistor turns off the collapsing magnetic field produces a back EMF so the voltage at

pin 1 can rise to a high value. This pulse is applied via rectifier diode D1 to capacitor C6. The feedback control voltage (1.25V) is applied to pin 5 on the IC and with the voltage divider resistors (R3+R4) selected the output is regulated to 33V.

HOW IT WORKS PREAMPLIFIER SECTION..

The preamplifier is based on the 6418 tube. Information on this tube can be found by searching on google.com for "6418 data tube". The input signal is applied via a coupling capacitor C4 to R4 and the grid of the tube. Resistor R7 limits the filament current to the required 10mA. The tube is configured as a common cathode amplifier and the overall gain is approximately 8 times. The signal at the valve anode is transferred via coupling capacitor C5 to the output.

CONSTRUCTION NOTES

As mentioned before this kit can be made to operate from 3-30V DC by changing the value of 2 resistors. The value of resistor R7 needs to be

changed so to limit the filament current to 10mA. $R7 = V_{in} \text{ (battery V)} - 1.250$ 0.01 For example R7 would need to be 475ohms for 6V operation, 775ohms for 9V operation, 1075ohms for 12V operation, etc. The nearest proffered values would be 470, 750 and 1100 ohms. With respect to R7 power dissipation, resistors with a power dissipation of 1/4W are suitable for operation up to 12V. Above 12V R7 should be a 1/2W resistor. The value of resistor R2 also needs to be changed for different supply voltages. Design tools for the MC34063A can be found on the Internet, one such good site is <http://www.nomad.ee/micros/mc34063a/index.shtml> The switched mode power supply does produce some high frequency hash which is outside the audible spectrum but may have some effects on other equipment. In order to greatly reduce this hash we have modified the circuit by adding resistor R9. This can be easily added to the PCB, but a short section of a copper track needs to be cut as shown.

MICROPHONIC TUBE

The tube used in this kit like all other tubes is microphonic. And will "ring" if struck. For best results The PCB and tube assembly suspended in some soft foam or acoustic material to cushion it from any external vibration.

PARTS LIST

MISCELLANEOUS

- 1 X PCB1 (K261)
- 1 X 100uF Inductor
- 1 X 4148 Tube/Valve
- 1 X Piezo disk
- 1 X Uni-directional microphone

1/4W 5% RESISTORS

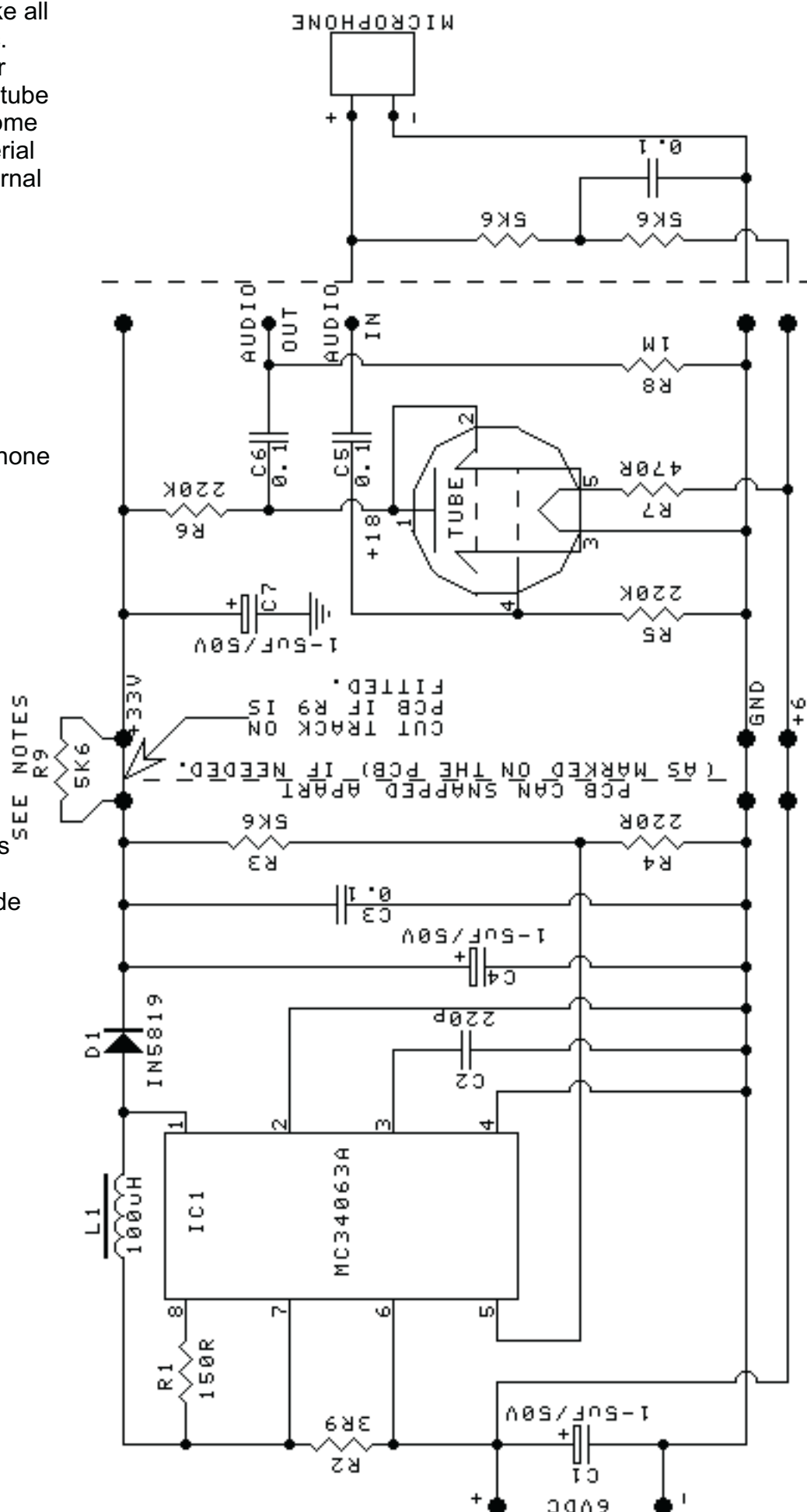
- 1 X 3R9
- 1 X 150 R
- 1 X 220 R
- 1 X 470 R
- 4 X 5K6
- 2 X 220K
- 1 X 1M R

CAPACITORS

- 1 X 220pF Ceramic
- 4 X 0.1uF Polyester
- 3 X 1-5uF/50V Electrolytics

SEMICONDUCTORS

- 1 X IN5819 Schottky Diode
- 1 X MC34063A IC



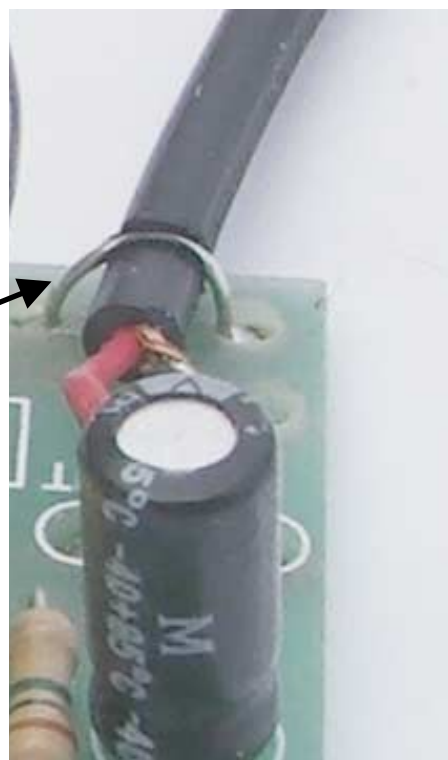
PIEZO PICKUP

The piezo disk should be connected via shielded cable. The center conductor of the cable connects to the light coloured center of the disk and the shield connects to the outer gold coloured section of the disk. It is easy to solder to the center disk but you will need to be careful not to use too much solder. Create a small loop in the end of the wire and tin it with solder, place the wire in position on the disk and place the soldering iron on the wire to flow the solder. To stop the wires fraying and breaking you can use some epoxy glue. This assembly can then be attached to musical instrument like a guitar with double sided tape.



CABLE STRAIN RELIEF

There are a number of pairs of holes provided on the PCB. They can be used as strain relief for the cables to reduce the chance of cables fraying. Just use discarded component leads as shown in the diagram.



NOTE

Pin 1 of the tube is incorrectly shown on some PCBs. Pin one should be as shown in this diagram. The red mark on the tube is pin 1 of the tube. ➔

