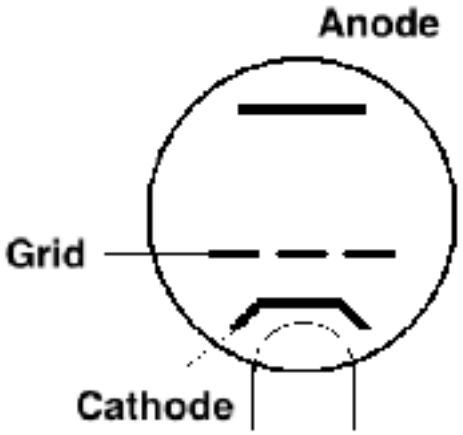
Triode

- 3 electrodes (*tri*ode).
- Normally used as an amplifier.
- Often packaged as a dual triode.
- Limited gain due to Millar Capacitance issues



The Cathode emits electrons when heated which will flow to the Anode if a positive voltage (with respect to the cathode) is applied. Current will not flow in the reverse direction.

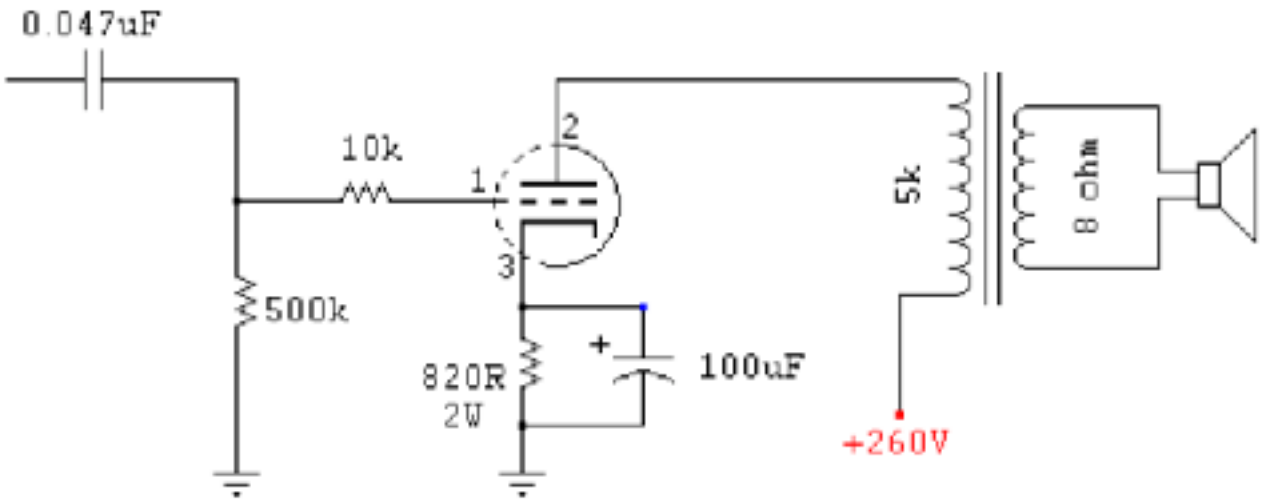
An additional electrode called the Control Grid or simply Grid is placed between the Cathode and Anode. When a negative voltage is applied to the Grid the flow of electrons between the Cathode and Anode is reduced due to negative electrostatic field.

When the relationship between Grid voltage and Anode current is plotted there are portions of the response that are linear, thus providing a device suitable for use as an amplifier. Additionally if very large negative Grid voltages are applied the Anode current can be greatly reduced and the valve can be operated in a “switch” mode.

The triode is a transconductance devices as the controlling signal applied to the grid is a voltage, and the resulting amplified signal appearing at the anode is a current. This differs from a bipolar transistor where the controlling signal and output are both currents.

It was found that when triodes are used in tuned amplification stages, they had a tendency to oscillate unless their gain was very limited. This was due to the parasitic capacitance between the anode (the amplifier's output) and the control grid (the amplifier's input), known as the Miller capacitance.

Example Circuit



This triode is operating as an amplifier. The Characteristics have been reviewed and components chosen to ensure the device is operating in a linear region. The circuit is implementing Cathode bias to achieve this.

Cathode Bias works in the following manner. As no current flows from the Grid, it is effectively held at 0 Volt via the 500K resistor. As this bias condition does not restrict the flow of current between the Cathode and Anode the valve will start to conduct current. An effect of the Cathode current is a voltage drop will develop across the 820 Ohm resistor. This causes the voltage at the Cathode to rise above the 0 Volt level. The Grid which is still at 0 Volt is then move negative with respect the Cathode, as this difference increases this causes the current flow from Anode to Cathode to reduce until a state of equilibrium is achieved. With a correctly chosen Cathode resistor the device will be operating in the middle of a linear portion of its characteristics.

The input signal is then applied via a capacitor to the Grid to control where the voltage will control the Cathode - Anode current flow. An additional capacitor is placed across the Cathode resistor to ensure the Cathode voltage remains stable and is not varied appreciably by the change in current flow caused by the input signal.

A load (or output) is placed in the Anode circuit. In this case the load is an audio output transformer that directly feeds a load speaker coil.