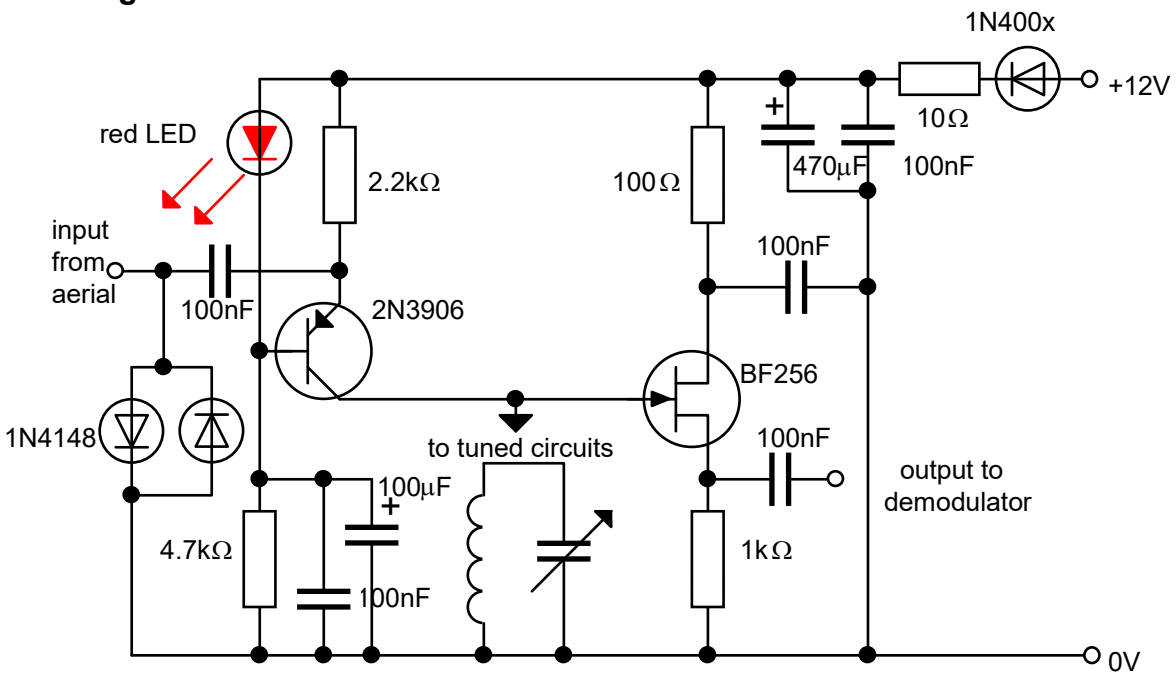
Radio frequency amplifier subsystem.

Specification

Low input resistance (≈ 50Ω)
Low output resistance (≈ 50Ω)
Wide frequency range (100kHz to 30MHz)
Large voltage gain (500 - 1000 depending on the tuned circuits)
Provides very large resistance across the tuned circuits.

Circuit diagram

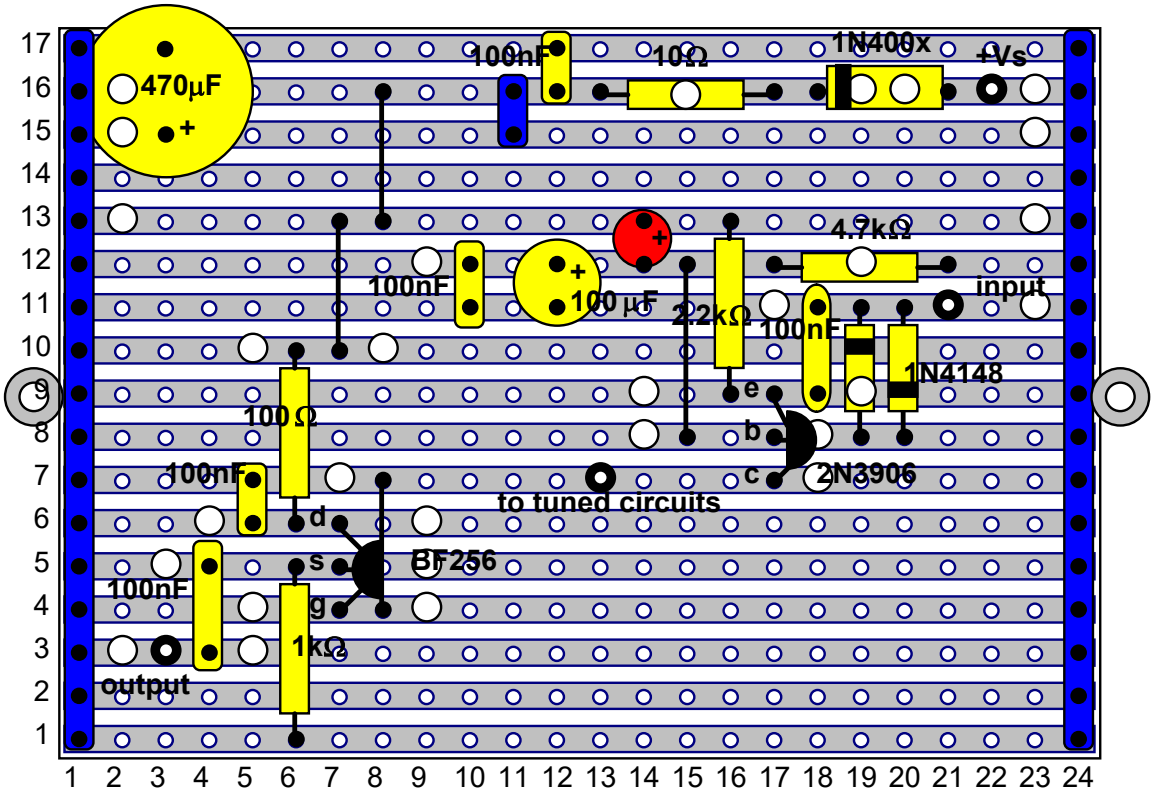


How it works

The 1N400x diode prevents damage if connected incorrectly to the power supply.
The 10Ω resistor, 470µF capacitor and 100nF capacitor smooth the power supply and minimise radio frequencies getting into or out of the circuit on the power supply.
The 2N3906 transistor is a common base amplifier.
The red LED, 4.7kΩ resistor form a stabilised power supply for the base of the 2N3906 transistor.
The associated 100µF and 100nF capacitors remove noise from the LED and ensure that there are no rf signals on the base of the 2N3906.
There is approximately 2V across the LED, which means that the voltage across the 2.2kΩ resistor plus the 0.7V of the base emitter junction must equal 2V. The current through the 2.2kΩ resistor will therefore be (2 - 0.7)/2200 ≈ 0.6mA.
The input resistance to a common base amplifier is $1/40I_E$ where I_E is the emitter current.
The input resistance of this common base amplifier is therefore ≈ 42Ω.
The collector circuit of the common base amplifier acts as a constant current supply and as such has a large resistance and so will not reduce the efficiency of the tuned circuit.
The BF256 JFET is a source follower and has a low output resistance and a very large input resistance so maintaining the efficiency of the tuned circuit.
The two 1N4148 diodes on the input limit the voltage of the input signal to ≈ ± 0.7V. This will prevent damage to the rf amplifier from any radio transmitters that are near by.

Construction

The rf amplifier is built onto stripboard and follows the standard subsystem layout.



The photograph below shows an early version of the rf amplifier and does not have the input protection diodes.