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Simple FM Receiver

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A radio or FM receiver is an electronic device that receives radio waves and converts the information carried by them to a usable form. An antenna is used to catch the desired frequency waves. The receiver uses electronic filters to separate the desired signal from all the other signals picked up by the antenna, an **electronic amplifier** to increase the power of the signal for further processing, and finally recovers the desired information through demodulation.

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Of the radio waves, FM is the most popular one. Frequency modulation is widely used for FM radio broadcasting. It is also used in telemetry, radar, seismic prospecting, and monitoring newborns for seizures via **EEG**, two-way radio communication systems, music synthesis, magnetic tape-recording systems and some video-transmission systems. An advantage of frequency modulation is that it has a larger signal-to-noise ratio and therefore rejects radio frequency interference better than an equal power amplitude modulation (AM) signal.

FM frequency ranges

Frequency modulation is used in a radio broadcast in the 88-108MHz VHF frequency band. This bandwidth range is marked as FM on the band scales of radio receivers, and the devices that are able to receive such signals are called FM receivers.

The FM radio transmitter has a 200kHz wide channel. The maximum audio frequency transmitted in FM is 15 kHz as compared to 4.5 kHz in AM. This allows a much larger range of frequencies to be transferred in FM and thus the quality of FM transmission is significantly higher than of AM transmission. Presented below is an electronics circuit for FM receiver along with its full explanation.

List of Components

- IC- LM386
- T1 BF494
- T2 BF495
- 4 turn 22SWG 4mm dia air core
- C1 220nF
- C2 2.2nF
- C 100nF * 2
- C4 10uF
- C5 10uF (25 V)
- C7 47nF
- C8 220 uF(25 V)
- C9 100 uF (25 V) * 2
- R 10K Ω * 2
- R3 1K Ω
- R4 10 Ω
- Variable resistance
- Variable capacitance
- Speaker
- Switch
- Antenna
- Battery

FM Receiver Circuit Explanation

Here's a simple FM receiver with minimum components for local FM reception.

Transistor BF495 (T2), together with a 10k resistor (R1), coil L, 22pF variable capacitor (VC), and internal capacitances of transistor BF494 (T1), comprises the **Colpitts oscillator**.

The resonance frequency of this oscillator is set by trimmer VC to the frequency of the transmitting station that we wish to listen. That is, it has to be tuned between 88 and 108 MHz. The information signal used in the transmitter to perform the modulation is

extracted on resistor R1 and fed to the audio amplifier over a 220nF coupling capacitor (C1).

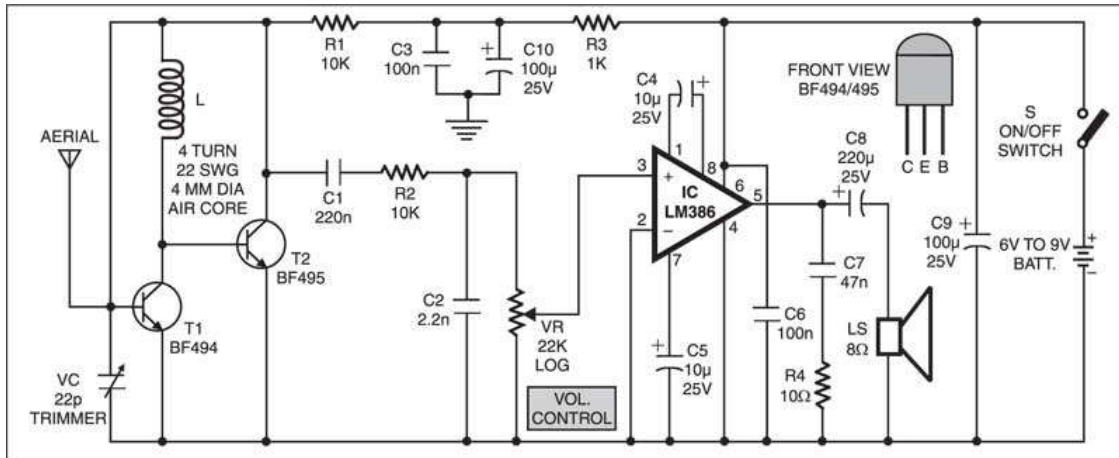


Fig.1: FM Receiver Circuit Diagram

You should be able to change the capacitance of the variable capacitor from a couple of picofarads to about 20 pF. So, a 22pF trimmer is a good choice to be used as VC in the circuit. It is readily available in the market.

If you are using some other capacitor that has a larger capacitance and are unable to receive the full FM bandwidth (88-108 MHz), try changing the value of VC. Its capacitance is to be determined experimentally.

The self-supporting coil L has four turns of 22 SWG enamelled copper wire, with air core having a 4mm internal diameter. It can be constructed on any cylindrical object, such as a pencil or pen, having a diameter of 4 mm. When the required number of turns of the coil has reached, the coil is taken off the cylinder and stretched a little so that the turns don't touch each other.

Capacitors C3 (100nF) and C10 (100μF, 25V), together with R3 (1k), comprise a band-pass filter for very low frequencies, which is used to separate the low-frequency signal from the high-frequency signal in the receiver.

Antenna is a bit tricky

You can use the telescopic antenna of any unused device. However, A good reception can also be obtained with a piece of isolated copper wire about 60 cm long. The optimum length of copper wire can be found experimentally.

The performance of this tiny receiver depends on several factors such as quality and turns of coil L, aerial type, and distance from FM transmitter.

IC LM386 is an audio power amplifier designed for use in low-voltage consumer applications. It provides 1 to 2 watts, which is enough to drive any small-size speaker. The 22k volume control (VR) is a logarithmic potentiometer that is connected to pin 3 and the amplified output is obtained at pin 5 of IC LM386. The receiver can be operated off a 6V-9V battery.

This circuit costs around ₹120.

More on FM receivers in the slideshow below.

Chapter 5 FM Receivers from [mkazree](#)

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