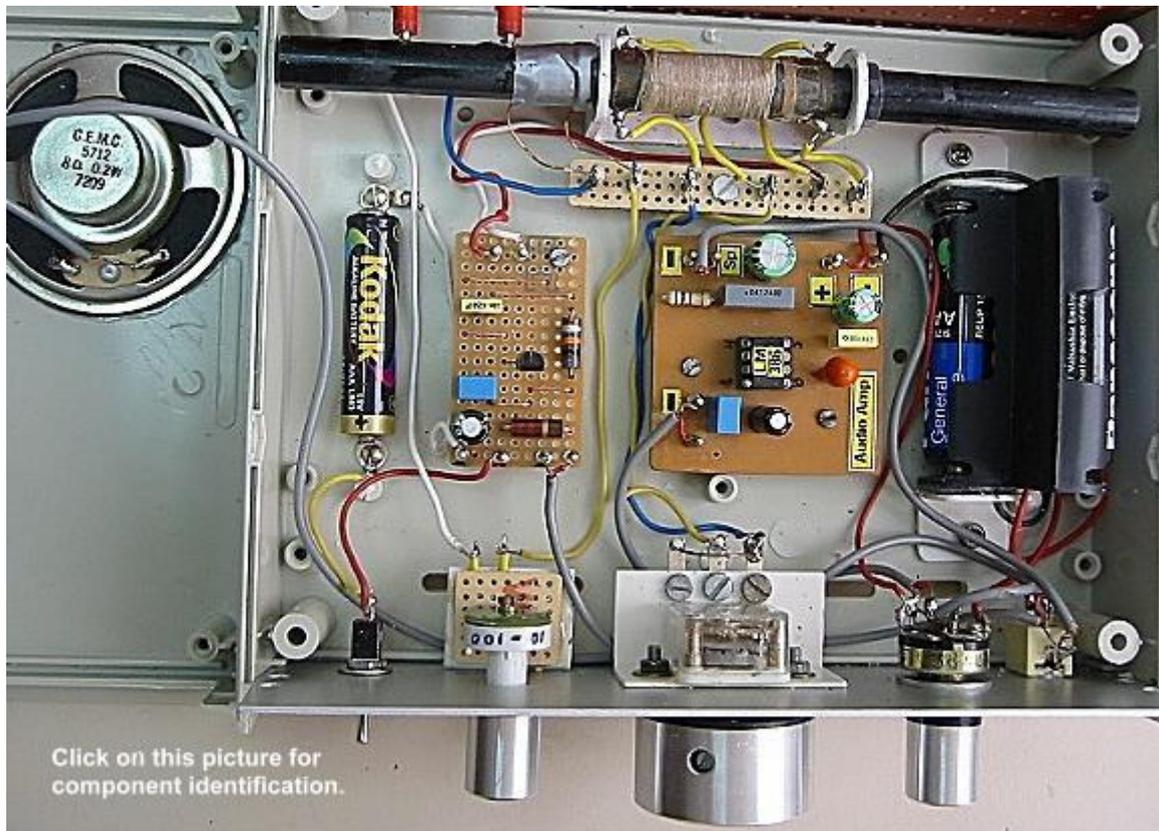


Build an efficient MW-Receiver with the MK484 & LM 386 ICs



Among the immense amount of modern integrated circuits, now has come to life a new version of the old ZN 414 (developed by Ferranti) which in 1973 and following years was so well known to radio receiver constructors. This new integrated is the MK 484; a three pins chip with the looking of a single transistor, but with nothing more than three radio frequency stages...an automatic gain control-detector-and a high input rating up to 4 megohms.

If you add to all this that the MK 484 needs only 1,5 volts as a driving voltage, you will understand how attractive is this integrated circuit to build your own radio receiver. I certainly could not resist to experiment with this chip and develop my personal circuit combining its characteristics with an LM 386 IC audio amplifier.

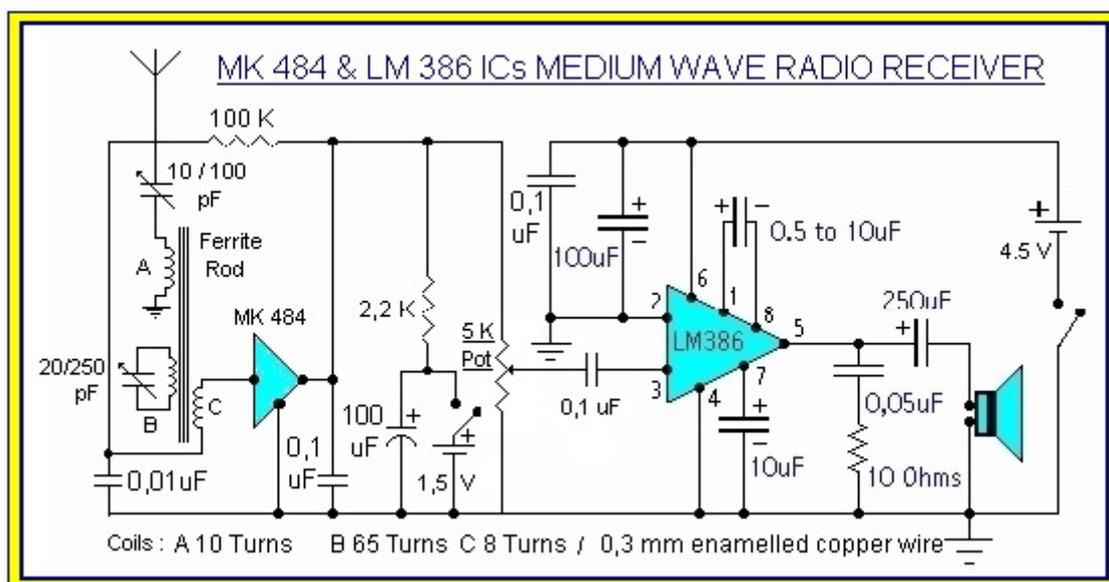


I have made up my project in two modules; one is the MK 484 receiver itself and the other is the audio amplifier.

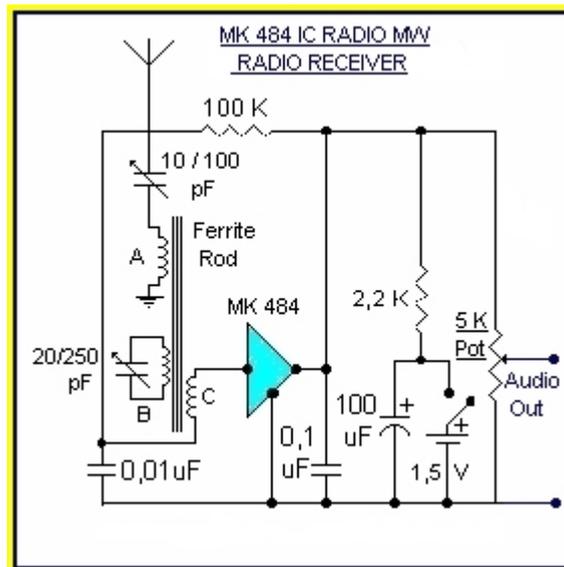
The output of the receiver module is introduced to the LM 386 audio amplifier through a 0,1 uF capacitor after being adjusted by a 5 Kohms potentiometer.

The set has two different power sources; one with 1,5 volts for the receiver and another one with 4,5 volts to the amplifier.

Schematic for the Middle Wave Receiver Using the MK484 and LM386 Integrated Circuits



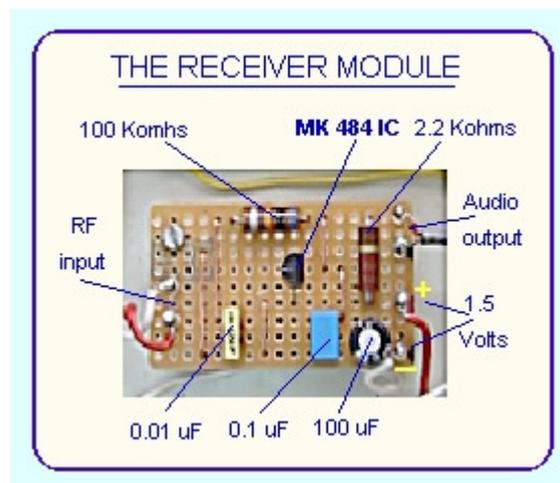
Schematic for the MK484 IC Receiver



You will find on the web some schematics for radio receivers built with the MK 484 IC. In general, all them have a resonant circuit made up of a ferrite rod antenna coil coupled in parallel with a variable capacitor. This resonant circuit is plugged directly to the input of the MK 484 IC. I have tested some of these circuits and found that in spite of the automatic gain control (AGC), when you have a powerful broadcast station near your home, it is difficult to tune other stations of weaker signals...though some improvement can be reached with the ferrite rod directional effect.

We have developed a better circuit using a second coil to the ferrite rod with only a few turns (8 turns) and plugging this coil to the input of the MK 484 IC. With this method we reach a greater selectivity and sensitivity and though a powerful transmitter can overshadow other broadcast stations near to its frequency, the signal of that transmitter disappears when other stations are correctly tuned.

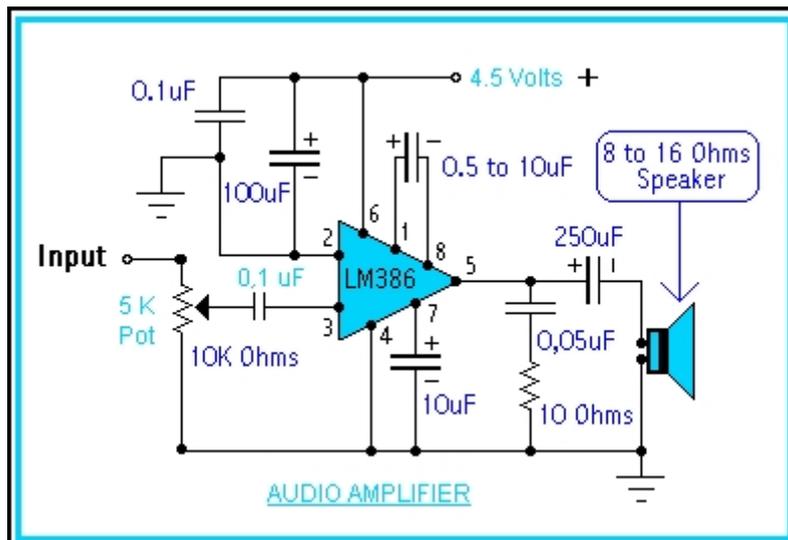
A more improved method is the addition of a third coil, also on the ferrite rod, to facilitate the use of an external antenna, what opens an interesting set of experiments for exploring how we can tune far distant stations. *Please see the details and values of the components that integrate this receiver in the schematics.*



List of Components Needed for the MK 484 Receiver

Variable Tuning Capacitor (20pf to 250pf)	100 kohms 1/4 Watt Resistor
Antenna coupling (Variable Capacitor 10pF to 100pF)	2.2 kohms 1/4 Watt Resistor
Ferrite Rod Antenna (Please see text)	5 kohms Logarithmic Potentiometer
0.01uF Ceramic or Mylar Capacitor	1.5 Volt Battery
0.1uF Ceramic or Mylar Capacitor	MK 484 Integrated Circuit
100uF Electrolytic Capacitor	A Switch

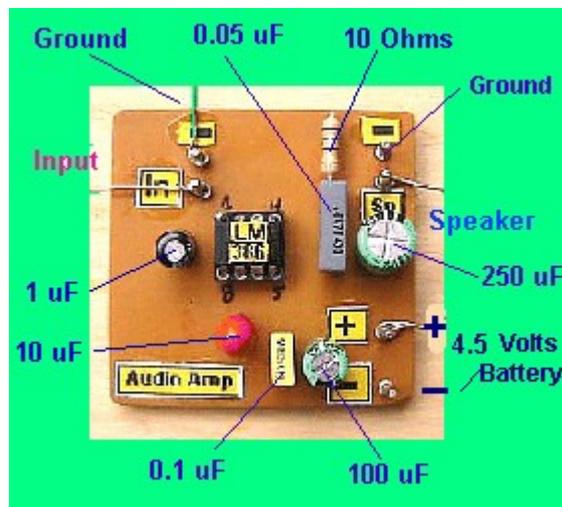
Schematic for the LM386 Audio Amplifier



This receiver can be operated directly with a high impedance earphone, a crystal or ceramic earphone...but adding to its output an audio amplifier makes the set a complete radio receiver able to drive any 8 ohms 0.2 watts speaker.

So you have enough audio power to fill your room. Though if you prefer listening with phones, it is possible to add a plug for inserting any low magnetic phone. The schematics of the audio amplifier is the same as you can find in our pages built with the LM 386 IC on our website...

The only difference is that this audio amplifier is driven with a 4,5 volts battery or three 1.5 volts cells in a series connection. We prefer an independent battery to the audio amplifier to eliminate the risk of an over-voltage to the MK 484 IC in case of a connection error. Please remember that this integrated does not support voltages over 1.8 volts. ***The quality of this audio amplifier meets the standards of any commercial radio receiver.***

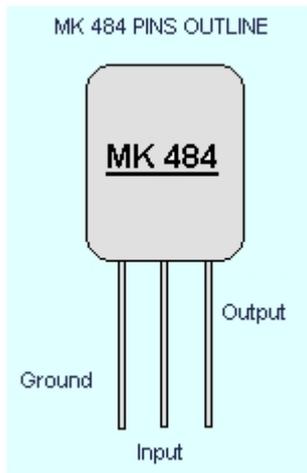


List of Components Needed for the LM386 Audio Amp

0.1uF Ceramic or Mylar Capacitor	250uF 16 Volt Electrolytic Capacitor
100uF Electrolytic 16 Volt Capacitor	8 to 16 Ohms Loudspeaker
0.1uF Ceramic or Mylar Capacitor	4.5 Volt Battery
0.5uF to 10uF Electrolytic 16 Volt Capacitor	LM 386 Integrated Circuit
0.05uF Ceramic or Mylar Capacitor	A Switch

MK 484 IC Main Data and Pin Outline

This integrated is quite easy to manage. Its main characteristic is its low feeding voltage...only 1.5 volts. Nevertheless you can drive this integrated from 1.1 to 1.8 volts, but not more than 1.8 volts; higher voltages will destroy the circuit.



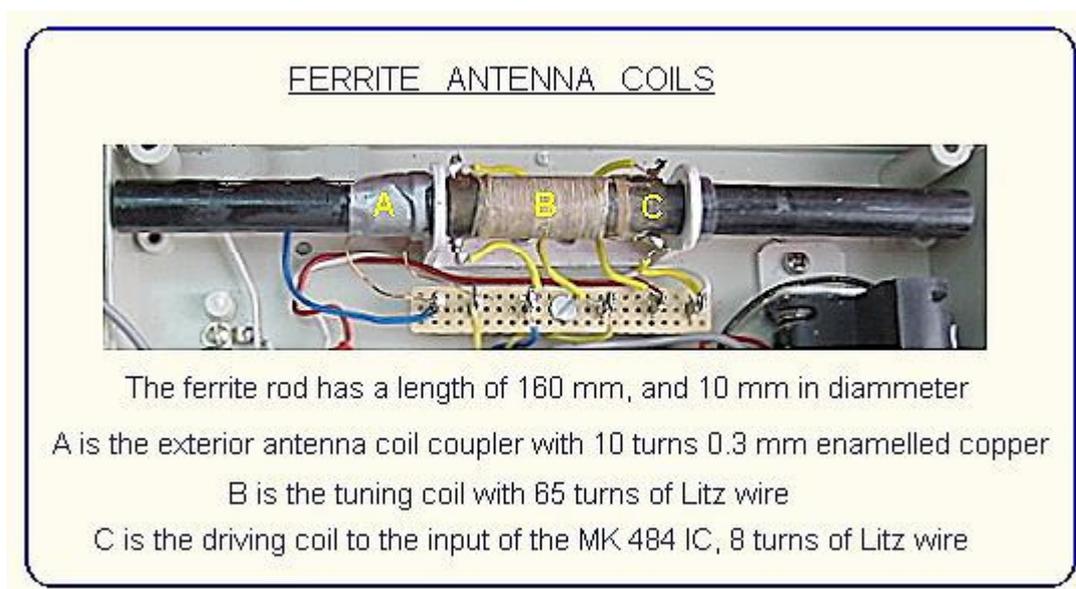
In our project, and to avoid the risk of over-voltages, we have used a separate battery to feed the chip. It is a cell of 1.5 volts with its corresponding switch. The audio amplifier has another independent battery of 4.5 volts that sources enough power to drive an 8 ohms 0.2 W loudspeaker. We have used a special battery for the MK 484 IC due to the fact that the current drawn from the battery, only about 300 microampers (0,003 milliampers), assures an extremely long life for this battery...if you consider that the set will function till its voltage drop to 1.1 volts.

Other attractive characteristics are its 0.8 to 1.5 millivolts output voltage enough to drive an audio amplifier, and its frequency covering range, from 150 KHz up to 3 MHz, as well as the input resistance of 4 Megohms. With all these you could construct a receiver for the long wave range, the medium wave, and even for the lower short wave band.

The Ferrite Antenna

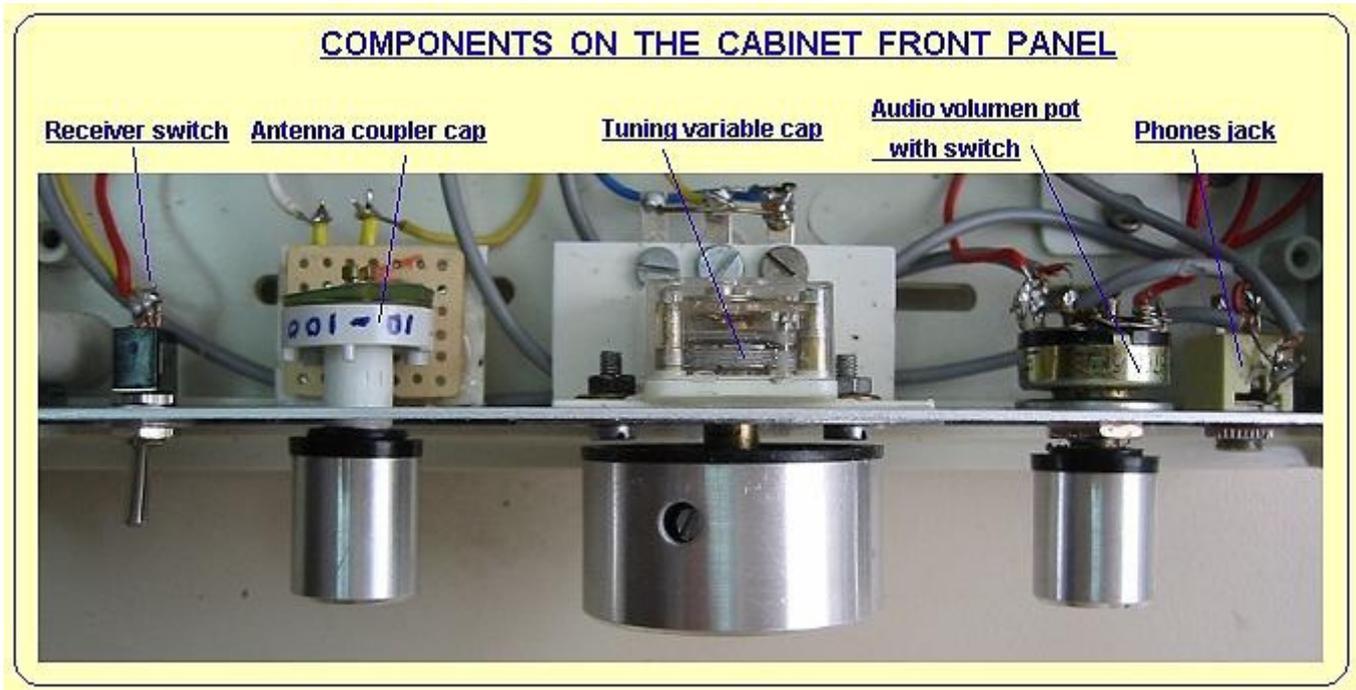
This receiver operates normally with its ferrite antenna and also is provided with a special coil to allow receiving signals from a external antenna. This coil has 10 turns of enameled 0.3 mm diameter copper wire. The tuning coil has 65 turns of Litz wire. If you are inspired by this project, let me recommend to you using Litz wire instead of enamelled copper wire.

The coils' quality are superior using Litz wire and in consequence the selectivity and sensitivity of the receiver. Ferrite rod length and diameter are also quite important. Get for your receiver the longest rod you could, and with the bigger diameters as possible. The dimensions in the picture given for the ferrite antenna and coils are not to be followed slavishly...some experimentation on behalf of the constructor will provide the best results.



The Front Panel of the Receiver

Once that the two modules of the receiver are built we have to choose some way of housing them, and all their auxiliary components into a box; if you want to give your receiver a permanent enclosure.



We have situated the external antenna variable capacitor at the left of the front panel; just near the receiver switch. At the right is the volume audio control potentiometer, near a jack for the phones, and in the center is the tuning variable capacitor. At the rear panel of the cabinet are two jacks, one for the exterior antenna and other for ground. Having the main knobs and switches in the front panel is quite easy and a pleasure to command the receiver.



The Cabinet for the MK484 IC Radio Receiver

Any radio receiver driven with a ferrite antenna must be enclosed either in a wooden or a plastic cabinet . Do not use a metallic cabinet for your receiver. Metallic boxes are what is called a Faraday's cage and electromagnetic waves are kept out without reaching the ferrite antennas.



For that reason we have chosen a plastic cabinet with the front and rear metallic panels.



But as the ferrite rod antenna was placed near the rear panel, we have changed this one for a plastic sheet that does not shadow the electromagnetic waves.

Closing words...

The components for this receiver are easy to find at your local electronics shop. Even some items can be taken from discarded commercial transistor radios; such as the variable tuning capacitor and the ferrite antenna rod.

If you have an antenna ferrite rod from a discarded transistor some modification is necessary. The output leads must be separated to identify the leads from the tuning coil which are the two leads that present the higher resistance (about 1.2 ohms) and the two leads for the coupling coil, those with less resistance(about 0.8 ohms). Use the continuity tester and your ohmmeter for this operation.

Finding the MK 484 IC can be a bit more difficult. I got five MK 484 chips from

http://www.bowood-electronics.co.uk/advanced_search_result.php?keywords=MK484&x=0&y=0

at one pound. About \$1.50 for each one.

With all the components on your workbench, I wish you happy hours of fun and a complete success with this interesting project !

...your friend, Pedro