Mixitronix ™

ELECTRONIC LAB

ELECTRONIC AM/FM RADIO KIT

OWNER'S MANUAL

Safe, Solderless, Exciting, Educational and Fun!
Easy-To-Read Illustrated
Operating Manual Included!

- Learn and Build your own AM/FM RADIO!
- Tune in your favorite AM/FM RADIO stations!
- Receives band from 520-1650 KHz (AM) & 88-108 MHz (FM)!
- Learn how RADIOS work!
- With earphone included!
- Uses one 9V battery!(not included)

Cat. No. MX-9044

For ages 8 and up

TABLE OF CONTENTS

This AM-FM Radio is an excellent kit to help you begin your study of electronics. It's so simple you'll spend only a couple of hours putting it together. No soldering is required and you can make circuit changes very easily.

You will find this simple to assemble AM-FM radio performs amazingly well. Radio circuits require many unique parts, such as limiting circuits and frequency to voltage converters for FM, as well as amplitude detection for AM. FM also requires very complex tuner alignment procedures. This makes a simple basic kit difficult to manufacture. The MX-901AF overcomes these problems by assembly and alignment of the FM Tuner in the factory, and easy to follow installation instructions.

Because the FM tuner is rather critical, please handle it with care. ***Do not move or touch any of the parts that are on the small Printed Circuit Board.***

The FM Radio covers the standard FM (Frequency Modulated) band of 88 to 108 MHz. The AM (Amplitude Modulated) radio tunes the standard 520 to 1620 KHz AM band.

First, the antenna picks up a very weak signal, the stations broadcasted radio wave, which produces an equally weak current in the antenna wire. A tuning coil and a variable capacitor selects the desired station. Broadcast waves consist of RF (high Radio Frequency) transmissions modulated with AF (low Audio Frequency) radio waves. The process of "detection", a kind of separation, is used to remove the AF signal from the RF. RF is used as the carrier of the signal that comprises the sounds you ultimately listen to.

The electronic process of amplification increases the weak current that flows in the antenna, step by step.

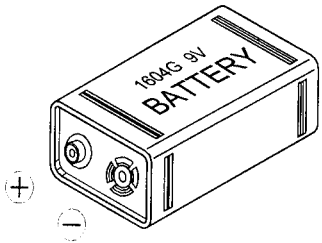
The FM Tuner is on the small Printed Circuit Board. It gets its signal from the black and green wires, once the circuit is built. All of the AM circuit is in the spring area. Its signal comes from terminals 12, 13 and 11.

The circuit enclosed by terminals 17, 13 and 16 is the one-transistor amplifier. This circuit increases the Audio Frequency (AF) amplitude and allows you to hear the music or speech being transmitted by the radio station.

TOOLS REQUIRED

Only a few, commonly available tools are needed to build your kit:

* A small screwdriver
* A pair of long-nose pliers
* Wire cutters (small diagonal type)



BATTERY

GETTING STARTED

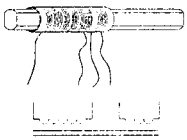
The first thing good kit builders do with a new project is to make sure all the necessary parts are in their kit.

Check the contents of your kit against the parts list. The parts list is separated into two sections, electrical parts (resistor, transistors and so forth) and mechanical parts (nuts, spring, screws, wires etc.). As you check off the parts, put them in a safe place so they will not get lost or damaged. Keeping them in the lid of the kit box is a good idea.

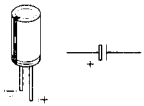
Next to each electronic part, you will see a picture of the part as well as its "schematic symbol" in the parts list. The schematic symbol will help you identify the part and locate the correct position for the part on the kit's cardboard panel. The quantity provided is in parenthesis.

PARTS LIST

Electrical Components



☐ Bar Antenna (1) – This is a ferrite rod with the antenna coil wound around it.

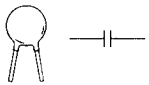


☐ Capacitor (5) – There are two kinds of capacitors in your kit: the electrolytic capacitor looks like a tiny tin can. You should have only one electrolytic capacitor.

1 – marked 1uF, 25V or 50V

The ceramic capacitors are small, flat and circular. Each is marked with its value.

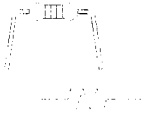
1 large – marked .1 or 104.



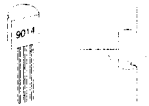
1 large – marked .05 or 503.

1 small – marked .005 or 502.

1 small – marked 471.

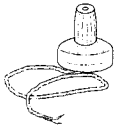


☐ Resistors (5) – these are the small, tan tubular objects with colored stripes. The stripes will help you identify them later.

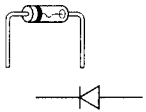


☐ Transistor (2) – Transistors have three leads (instead of two like the other parts you have seen). Possible markings are C945, C1815, 3904, 9013, or 9014.

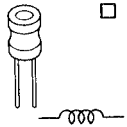
☐ Tuner Assembly for FM (1) – The FM tuner circuit is factory assembled on the small Printed Circuit Board.



☐ Earphone (1), changes electrical energy to audible sound waves.



☐ Diode (1) made of germanium with black or red band.



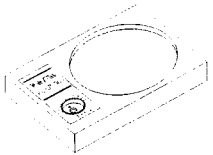
□ Coil (1) – This choke coil looks likes small can with two leads.

Mechanical Parts

□ Battery Snap for 9V Battery (1)

□ Antenna Holder (polypropylene) for mounting Bar Antenna (1)

□ Cardboard Panel with Plastic Frame (1)



□ Tuning Knob (1)

□ Screws:

Long Type M3.0x12 (1)

Long Type M3.0x8 (1)

Short Type M2.6x4 (3)

□ Nuts (2)

□ Spring Terminal (17)

□ FM Antenna Wire (1)

□ Wires:

White, (3') 75mm (8)

Refer to the following illustrations of complete unit when you are building the kit:

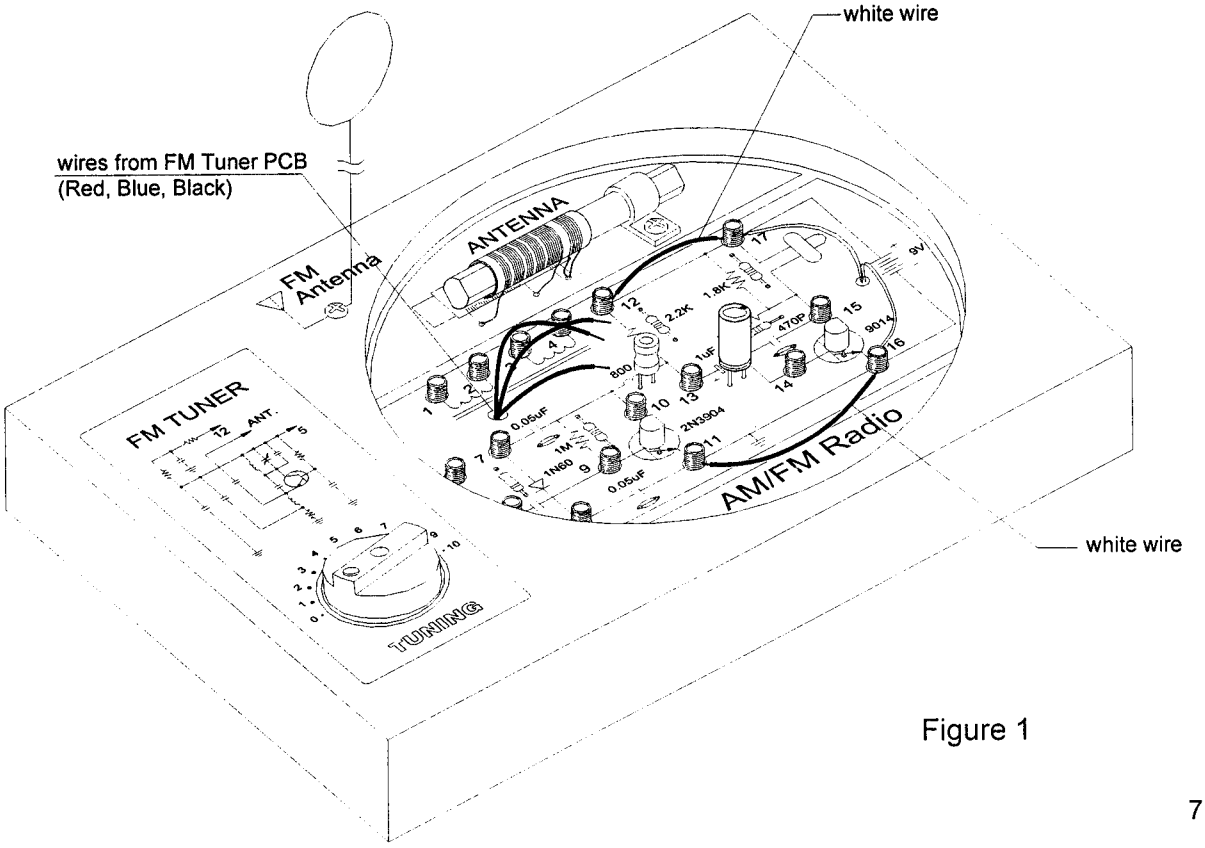


Figure 1

Refer to the following illustration of complete unit when you building the kit:

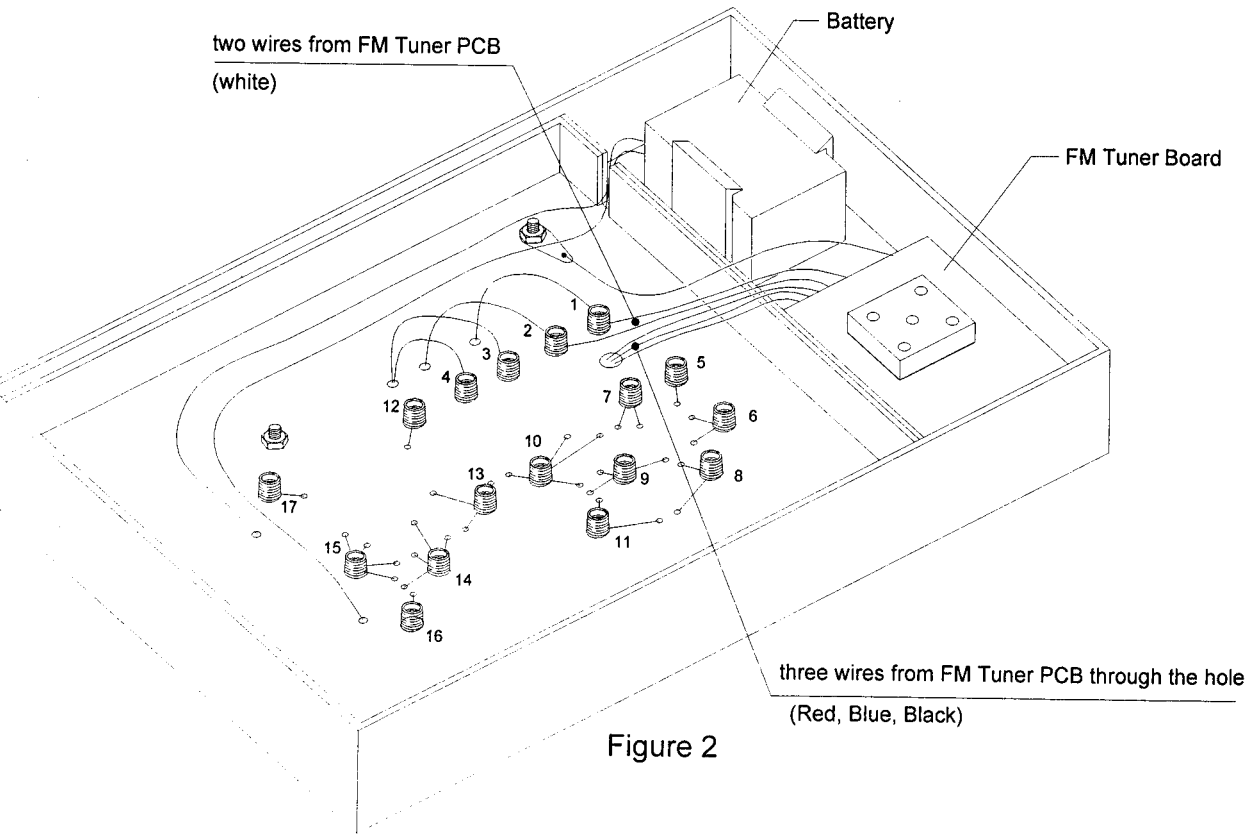


Figure 2

ASSEMBLY INSTRUCTIONS

Spring Terminals

The spring terminals provide an easy way to make electrical connections without the use of solder.

- ☐ From the top side of the cardboard panel, install 17 spring terminals into the 17 large, numbered holes; To make installation easier, use the pointed end of a pencil or ballpoint pen to push the spring through the holes and twist slightly. (See Figure 3.)

You will make many of your connections on the backside of the cardboard panel. As you install each spring, mark the number of each terminal on the backside of the panel.

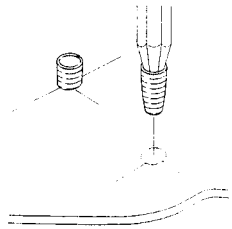


Figure 3

Resistors

Mount the 4.7k ohm resistor first. (yellow, purple, red, and gold)

- ☐ Mount the resistor by bending its leads and inserting them, from the top of the cardboard panel, through the holes next to schematic symbol. (See Figure 4.)

- ☐ Now turn the panel over and connect each lead to 5 and 6. Simply bend the spring to one side with the long-nose pliers or your finger and insert the wire between the coils of the spring. The first connections are always the hardest, but you will soon learn to do this easily.

Remember that you will identify the resistors by their color bands.

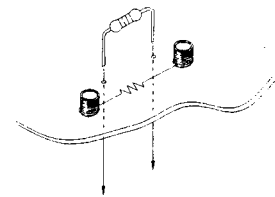


Figure 4

- ☐ Connect the 2.2K ohm resistor (red, red, red, and gold) to terminals 12 and 13.
- ☐ Connect the 1.8K ohm resistor (brown, gray, red, gold) to terminals 17 and 15.
- ☐ Connect one 1M ohm resistor (brown, black, green, and gold) to terminals 9 and 10.
- ☐ Connect the other 1M-ohm resistor (brown, black, green, and gold) to terminals 14 and 15.

Capacitor

From the top of the cardboard panel, insert the two leads of each capacitor through the holes next to its schematic symbol. (See Figure 5.)

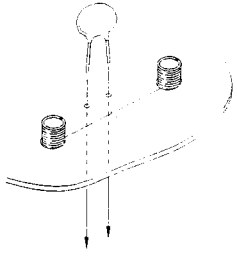


Figure 5

Then on the backside of the panel, connect the leads to the designated spring terminals.

- ☐ Mount the 0.1 uF capacitor (large, marked 104) and connect its leads to 6 and 9 .
- ☐ Mount the .005uF capacitor (small, marked 502) and connect its leads to 7 and 10.
- ☐ Mount the 0.05 uF capacitor (large, marked 503) and connect its leads to 8 and 11.
- ☐ Mount the 470pF capacitor (small, marked 471) and connect its leads to 14 and 15.

The remaining capacitor is an electrolytic. This means it must be connected observing the proper polarity (+ and -). The side of the capacitor with the minus (-) lead is marked with a vertical strip and minus (-) signs. Of course, the other side is (+). (See Figure 6.)

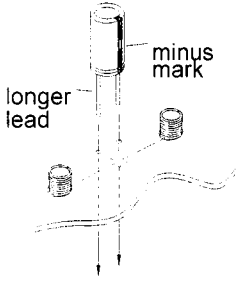


Figure 6

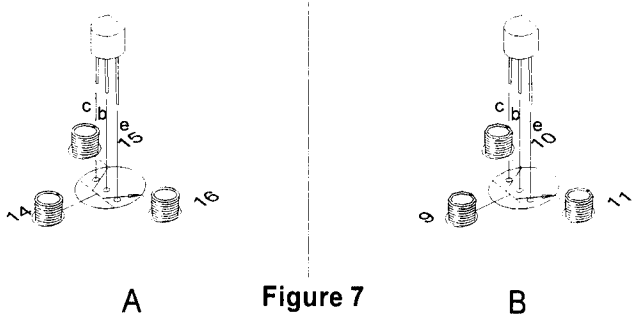
- ☐ Connect the 1uF capacitor to terminals13 (+) and 14 (-).

Now go back and carefully check your work. Be sure you have positioned each part in the right place. Be sure the minus (-) side of the electrolytic capacitor is toward the proper terminal.

Double-check these parts. On the bottom side, cut off any excess wire ends.

Transistors

Each transistor has three leads. **Each lead MUST go into the correct hole in the Panel Board.** Pick up the Transistors and look at the bottom, where the leads come out.



A **Figure 7** B

Make a mental note of the position of each lead, E, C and B. (See Figure 7.)

- ☐ Mount a Transistor marked 9014 between 14, 15 and 16. **Position it so the flat side is away from spring 14, Insert the leads through the holes provided.** On the bottom, connect the upper lead to 15, the center lead to 14 and the lower lead to 16. (See Figure 7A and 8.)
- ☐ Mount a Transistor marked 2N3904 between 9, 10, And 11. **Position it so the flat side is away from spring 9, Insert the leads through the holes provided.** On the bottom, connect the upper lead to 10, the center lead to 9 and the lower lead to 11. (See Figure 7B and 8.)

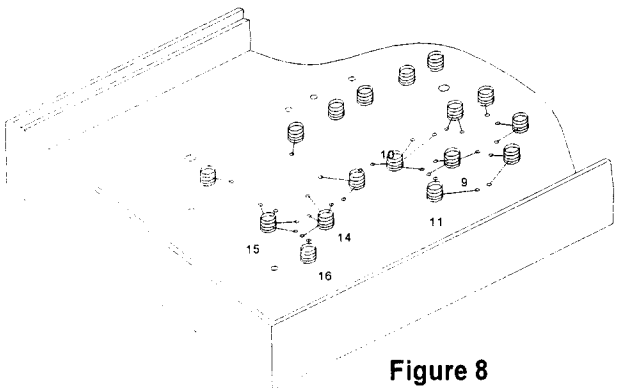


Figure 8

- ☐ Since the transistors are very important, **you must be sure you installed them correctly.** Double-check them to be certain that each lead goes into the correct hole and that you do not have the leads overlapping on bottom side.

Diode and Choke Coil

There is only one way to mount the diode.

- ☐ From the top of the Cardboard panel, insert the two leads of the diode through the holes next to the schematic symbol. Banded end to terminal 6. (See Figure 9.)
- ☐ Connect the leads to Terminal 8 (banded end) and 7.

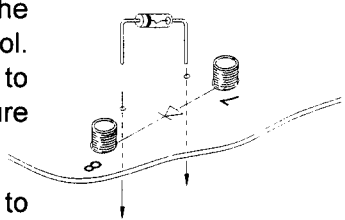


Figure 9

- ☐ Mount the choke coil and connect its leads to terminals 10 and 13.

Bar Antenna

The antenna Coils have very thin wires coming from them and they must be handled with care.

- ☐ Slip the white plastic Bracket over one end of the Coil. (See Figure 10.)
- ☐ Position the Coil and Bracket as shown inserting the leads down through the holes provided and mount with a medium screw and nut.
- ☐ Turn the Panel over and very carefully connect the wires from the Antenna Coils as shown:

  White wire to terminal 1.
  Black wire to terminal 2.
  Red wire to terminal 3.
  Green wire to terminal 4.

Note: be sure that you connect the tinned end to each spring. Do not let any wires cross each other.

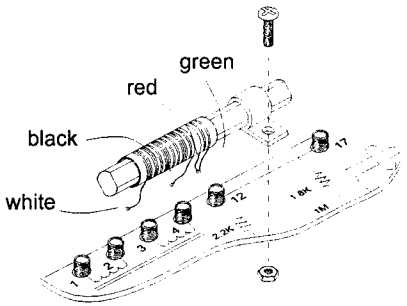


Figure 10

FM Tuner Board

- ☐ Mount the FM Tuner Board from the bottom of the panel and position as shown in Figure 11.
- ☐ On the top, fasten it with two small screws.
- ☐ Mount the Tuning Knob to the Tuning Capacitor.
- ☐ Make sure the mark is at the left side of the shaft when you rotate the knob fully counter-clockwise.
- ☐ Fasten the knob with a small screw.
- ☐ Turn the Panel over and connect the Tuning Capacitor two white leads to terminal 1 and 2. No order required. (Pass the remaining wires of red, blue, and black through the hole under the Terminals 1& 2.)

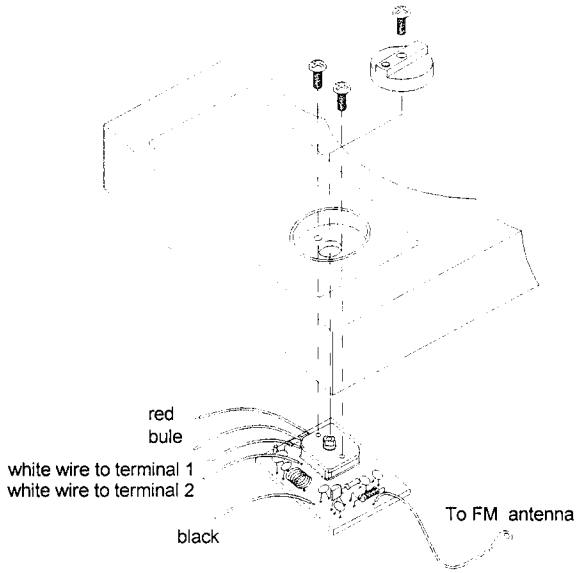


Figure 11

BATTERY AND BATTERY SNAP

Mount a 9V battery into the battery slot. (See Figure 12.)

Connect the Red wire of the Battery snap to terminal 17 and the Black wire to terminal 16. (See Figure 13.)

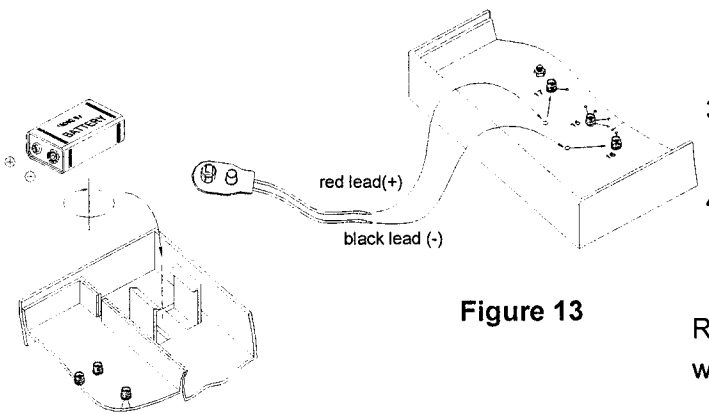


Figure 13

Figure 12

Most of the wiring on the Panel Board has been installed, but before you finish up let's check your work once more:

1. Be sure the transistor leads are connected properly. Study Figure 7 and 8 once more to make sure each lead has been correctly connected.
2. Place your Board next to Figure 1 and compare each part and its leads to the illustration.
3. Turn the Board upside down and compare your wire connections to Figure 2.
4. Cut off any remaining excess wire ends.

Wiring

REFER BACK TO FIGURE 1 and install the final wires on the top, as illustrated and noted below:

- Connect a white wire between 12 and 17.
- Connect a white wire between 11 and 16.

A) Connect the following wires for operating the FM radio:

Connect the red wire from the FM assembly board to spring 12.

Connect the blue wire from the FM assembly board to spring 5.

Connect the black wire from the FM assembly board to spring 11.

B) Connect the following wires for operating the AM Radio: *(Note: Disconnect FM wiring of above first before you operate the AM Radio)*

Connect a white wire between 3 and 9,

Connect a white wire between 4 and 8,

NOTE: For FM, only use the above FM connections. Do not make the AM connections.

For AM, only use the above AM connections. Do not make the FM wiring connections.

- ☐ Connect the Earphone leads to terminals 15 and 17.
- ☐ To turn on your radio snap the 9V battery into the Battery Snap. Be sure to install the battery with the correct polarity.

Your AM/FM Radio is now ready to use.

Place the earphone in your ear. You should hear FM or AM signal by adjusting the appropriate tuning knob, depending upon which wire connections you've chose to make first.

For FM reception, the FM Antenna can be swiveled so it points upwards. An outside or external FM antenna is not needed for proper reception.

NOTE: To turn the Radio off, remove the battery from the snap.

TROUBLE SHOOTING GUIDE

1. Make sure the 9V battery has been installed correctly.

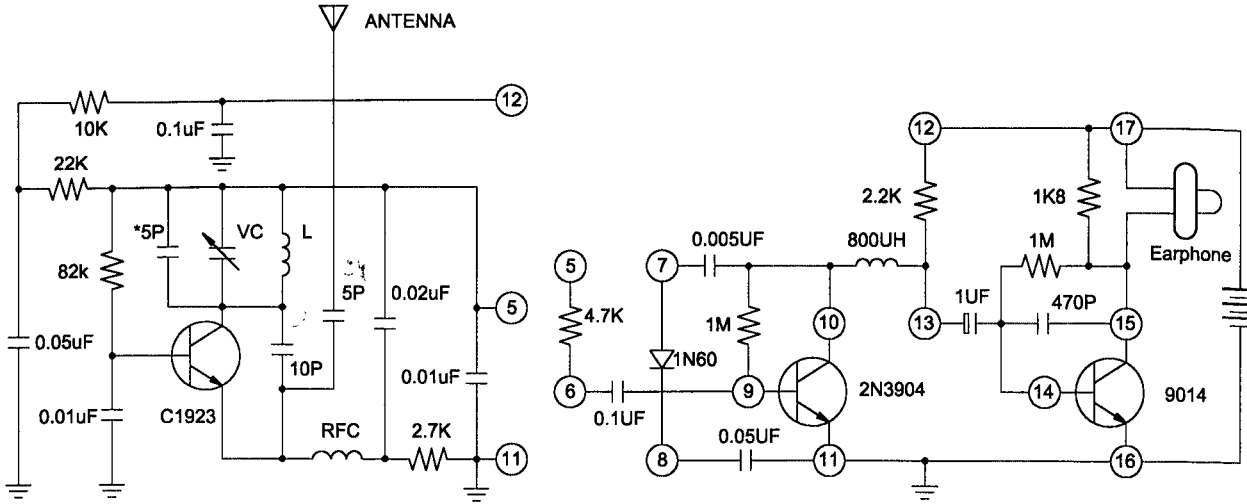
2. Try new batteries. If the Batteries are weak or dead, your Radio won't work.

3. Go back through this manual and recheck each step. A good way to do this is with a colored pencil. Mark on the illustrations the wiring that you have on your unit and then you can see where you might have gone wrong.

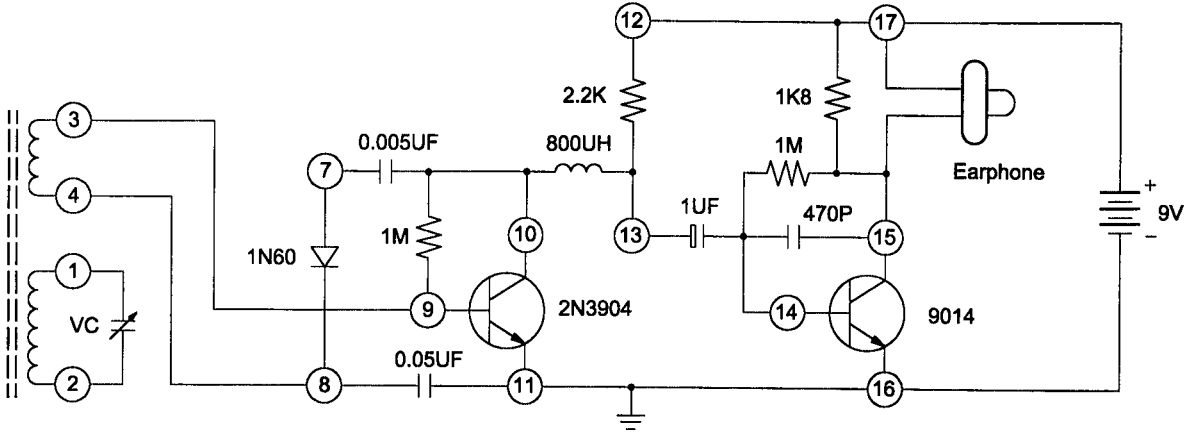
4. Check your wired unit against Figure 1 and Figure 2.

5. Be especially careful as you check the wiring of the Transistors, electrolytic Capacitors, and diodes. If these parts are inserted backwards the radio will not work.

6. It's always a good idea to have a friend double check your work. You might be overlooking the same mistake time and again. Have a friend compare your Panel (with all parts mounted on it) with Figures 1 and 2.



FM RADIO SCHEMATIC DIAGRAM



AM MW RADIO SCHEMATIC DIAGRAM

MASTER PARTS LIST

Description	Description
Antenna Wire for FM Bar Antenna with Coils for AM Capacitors: 1uF 25V or 50V electrolytic 470pF ceramic disc 0.005uF ceramic disc 0.05uF ceramic disc 0.1uF ceramic disc Resistor: 1.8K ohm (brown, gray, red, gold) 2.2K ohm (red, red, red, gold) 4.7K ohm (orange, purple, red, gold) 1M ohm (brown, black, green, gold) (2) Transistors 2SC1815, 9013, 9014, 2N3904 or 9018 (Any of these will work) Tuning Capacitor Choke Coil 800uH	Diode IN60 Earphone, ceramic Tuner Assembly for FM Bracket for Antenna coil Knob for tuning Cardboard Panel with plastic Frame Screws: Long Type M3.0x12 Long Type M3.0x8 Short Type M2.6x4 (3) Nuts (2) Snap for 9V Battery Spring, Terminals (17) Wires, for Hook up White (3") 75mm (8)