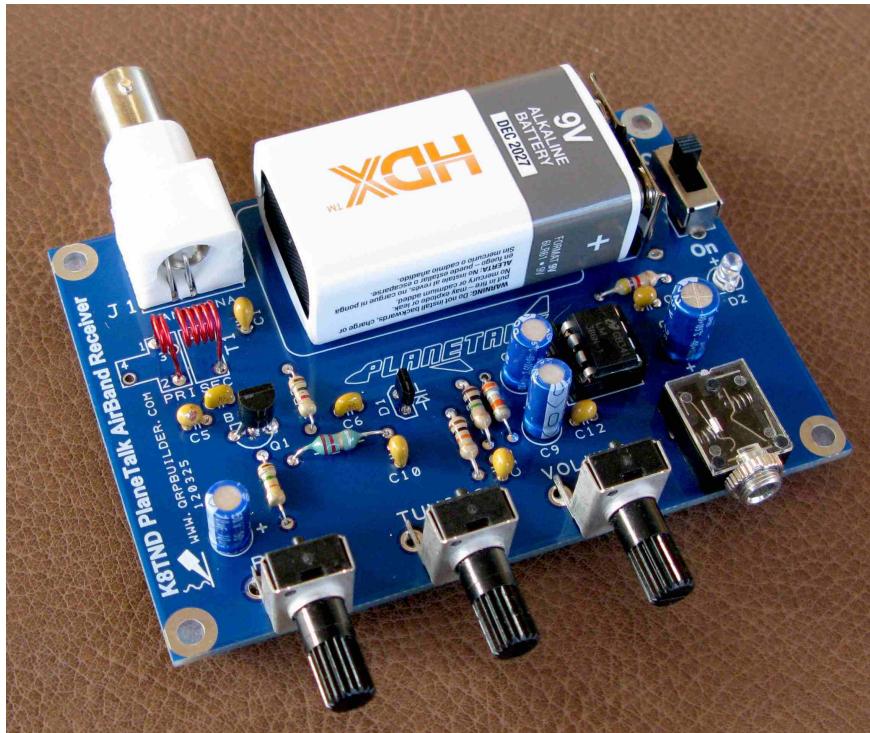




# QRBuilder K8TND PlaneTalk VHF Air Band Receiver



A horizontal bar divided into five colored segments: blue, green, yellow, orange, and red. Below the bar is a vertical black arrow pointing upwards towards the center of the bar.

First, familiarize yourself with the parts and check for all the components. If a part is missing, please contact us at [grpbuilder@gmail.com](mailto:grpbuilder@gmail.com) and we will send you one. If you are new to parts identification refer to the appendix for part markings.

*Please read all the instructions before starting to assemble the receiver.*

## Parts List

- 1 – QRBuilder K8TND PlaneTalk VHF Receiver PCB
- 1 – U1, LM386 DIP IC
- 1 – Q1, BF199 transistor
- 1 – D1, BB910 varactor diode, marked BB910, B910, or 910
- 1 – D2, green led
- 1 – R1, 4.7K resistor (yellow-violet-red-gold)
- 1 – R2, 1K resistor (brown-black-red-gold)
- 1 – R3, 1M ohm resistor (brown-black-green-gold)
- 1 – R4, 39K resistor (orange-white-orange-gold)
- 1 – R5, 15K resistor (brown-green-orange-gold)
- 1 – R6, 10K resistor (brown-black-orange-gold)
- 1 – L1, 2.2uH molded inductor (red-red-gold-silver or gold)
- 3 – C1,11,12, .01uF (10nF) mono capacitor, marked 103
- 2 – C3,5, .1uF (100nF) mono capacitor, marked 104
- 1 – C2, 10pF NP0/C0G capacitor, marked 10 or 100
- 3 - C4,8,9, 10uF electrolytic capacitor
- 1 – C6, 100pF NP0/C0G capacitor, marked 101
- 1 – C10,.001uF (1nF) mono capacitor marked 102
- 1 – C7, 100uF electrolytic capacitor
- 3 – VR1,2,3, 10K PCB potentiometer
- 1 – J1, BNC female pcb connector
- 1 – J2, 3.5mm stereo pcb jack

1 - S1, SPDT slide switch  
 1 – 9V battery clip-female  
 1 – 9V battery clip-male  
 1 – 8pin DIP socket  
 1 - #10-24 x 1" L screw  
 4 – rubber self adhesive foot  
 1 – 12" #22AWG magnet wire

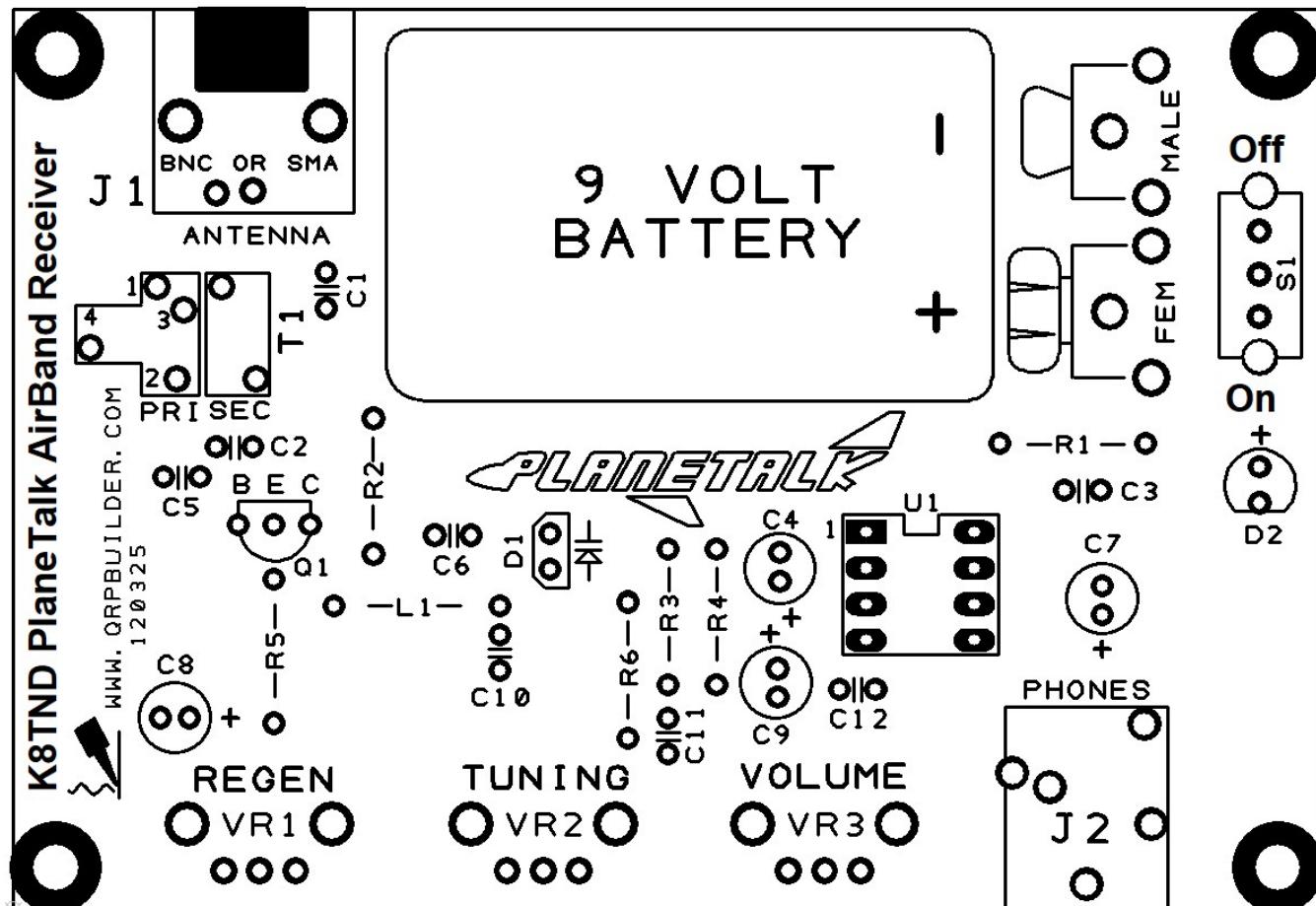
*Alternate components for 6m reception*

1 – L1, 1mH choke, marked (brn-blk-red-silver or gold)  
 1 – R5, 24K 1/4W resistor (red-yellow-orange-gold)  
 1 – T1 secondary, 12" #26AWG magnet wire

For help identifying the above components refer to the appendix.

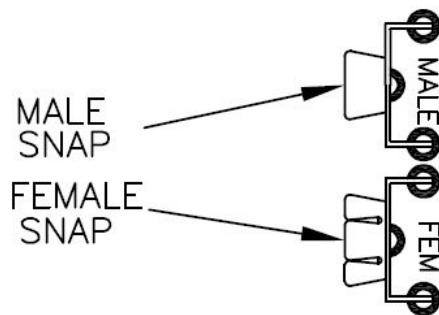
*Installing the three 6 meter alternative components are covered at the end of the document*

Using the guide below, start assembling with the smallest parts first. On any component, I always solder a single lead first, align the component if needed. and then solder the other pad(s).



- [ ] Install C1,11,12, .01uF (10nF) mono capacitor, marked 103
- [ ] Install C3,5, .1uF (100nF) mono capacitor, marked 104
- [ ] Install C2, 10pF NP0/C0G capacitor, marked 10

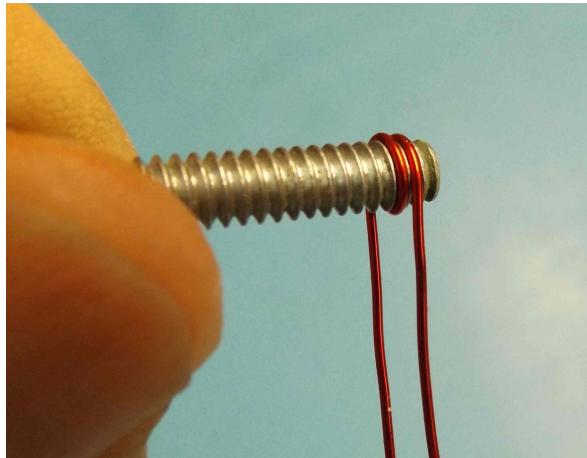
- [ ] Install C6, 100pF NP0/C0G capacitor, marked 101
- [ ] Install C10, .001uF (1nF) mono capacitor, marked 102
- [ ] Install R1, 4.7K resistor (yellow-violet-red-gold)
- [ ] Install R2, 1K resistor (brown-black-red-gold)
- [ ] Install R3, 1M ohm resistor (brown-black-green-gold)
- [ ] Install R4, 39K resistor (orange-white-orange-gold)
- [ ] Install R5, 15K resistor (brown-green-orange-gold), “6 meter” value 24K(red-yellow-org-gold)
- [ ] Install R6, 10K resistor (brown-black-orange-gold)
- [ ] Install L1, 2.2uH molded inductor (red-red-gold-silver or gold), the “6 meter” value is 1mH
- [ ] Install 8pin DIP socket
- [ ] Install D1, BB910 varactor diode, **polarity sensitive, match the board outline**
- [ ] Install D2, green led, **observe polarity, the long lead is positive**
- [ ] Install Q1, BF199 transistor, **match the board outline**
- [ ] Install S1, SPDT slide switch
- [ ] Install C4,8,9, 10uF electrolytic capacitor, **long lead is “+”**
- [ ] Install C7, 100uF electrolytic capacitor, **long lead is “+”**
- [ ] Install J2, 3.5mm stereo jack
- [ ] Install 9V battery clips, as shown below, **don't mix them up**



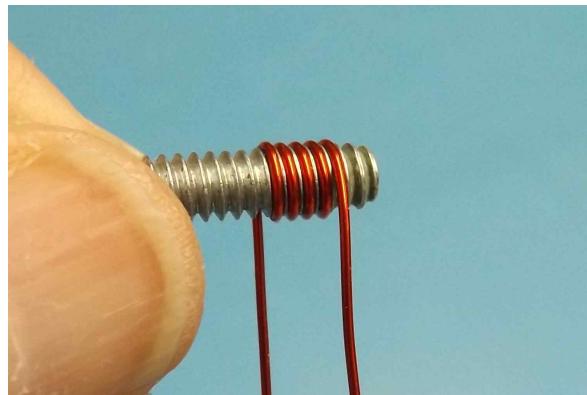
- [ ] Install J1, female BNC connector
- [ ] Install VR1,2,3, 10K PCB potentiometer
- [ ] Install the four rubber feet in the corners

The last item to install is the T1 air wound transformer. We provide a #10-24 screw to act as a winding form for the coil. It is mounted about a half inch above the surface of the pcb to allow some adjustment of the winding distance between the secondary and primary. Make two as shown below.

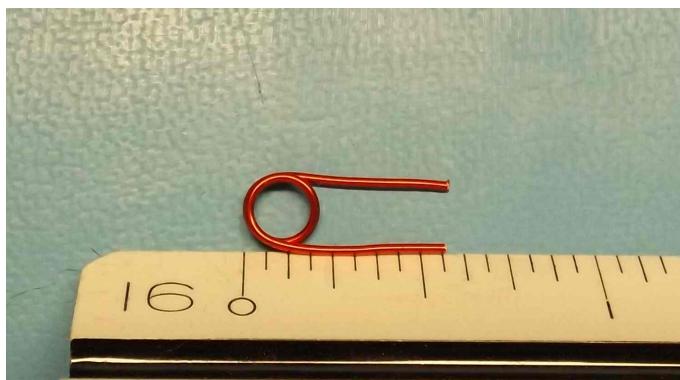
- [ ] Wind the Primary, (1 1/2 turns) on the supplied screw into the grooves of the screw thread as shown below, with the 22awg magnet wire. \*Wind the same for 6 meters.\*



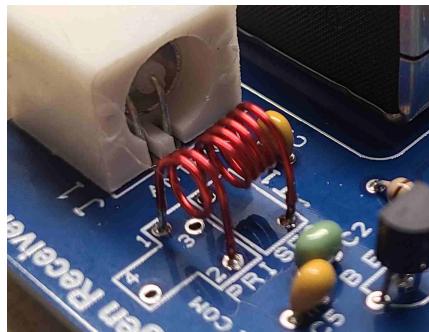
- [ ] Wind the Secondary, (4 1/2 turns) on the supplied screw into the grooves of the screw thread as shown below, with the 22awg magnet wire. \*For 6 meters, wind 10 1/2 turns #26awg on a .20" diameter form.\*



- [ ] Trim both primary and secondary to 9/16" length and tin 1/8" of the lead ends as shown below.

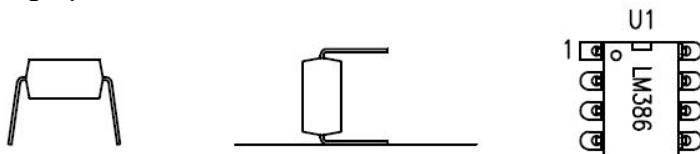


- [ ] Position and solder T1 primary and secondary windings elevated from the surface of the board as shown. The spacing between the coils should be approx. 1/8" (3mm) This will allow for spreading or adjustment between the two, during the setup procedure. For Aircraft band use holes marked 1 and 2 for the primary.



This completes the assembly

[ ] Next, power up the receiver with a 9V battery. Turn on and the LED should illuminate. Check for 9V on pin #6 of the U1 socket. If all is ok, install the LM386 into the socket noting the position of pin 1 shown in the graphic below.



When inserting IC, the pins are flared so that they can be retained by automatic insertion tools. Gently rock it on a flat surface so the pins are parallel and it will insert into the socket more easily.

## Alignment and Setup:

There are three ways to align your K8TND VHF Regenerative Receiver for the AM aircraft band.

The "spacing between coils" should be approx. 1/8" (3mm). The further the spacing (to a limit), the more selective the receiver will be.

1. If you have an Elmer or friend that has a signal generator, you can set it for 123 Mhz., which is the center frequency of the AM aircraft band. Then adjust the larger coil near the antenna connector by slightly spreading it open or closed to make the radio pick up the signal generator near midpoint on the tuning control.
2. If you don't have access to a signal generator, you can also adjust the larger coil by stretching it open or squeezing it closed until you get the lower, most counter-clockwise point on your tuning control to just barely pick up the highest frequency FM broadcast station. This should give you a tuning range that covers most of the aircraft band.
3. An easy, but not so accurate method, is to adjust the larger coil until you center the most active channels in the middle of the tuning control range. Traditionally, most of the activity on the air band tends to be near the center of that allocated spectrum.

If you need more audio gain, change R4 to a lower value, but not less than 15K.

## Using a Regeneration (REGEN) control:

The REGEN is easy to adjust on this receiver. Turn the control all the way down, counter-clockwise, then slowly turn it clockwise and you'll hear a little "pop", which means the receiver has gone into regeneration.

Now keep slowly turning it clockwise and you will hear an increasingly louder static level and then when it gets real loud, you'll hear another "pop" and it will be all quiet in the headphones. Back down the control to a midpoint between the upper and lower popping sound to where you get the best signal to static ratio.

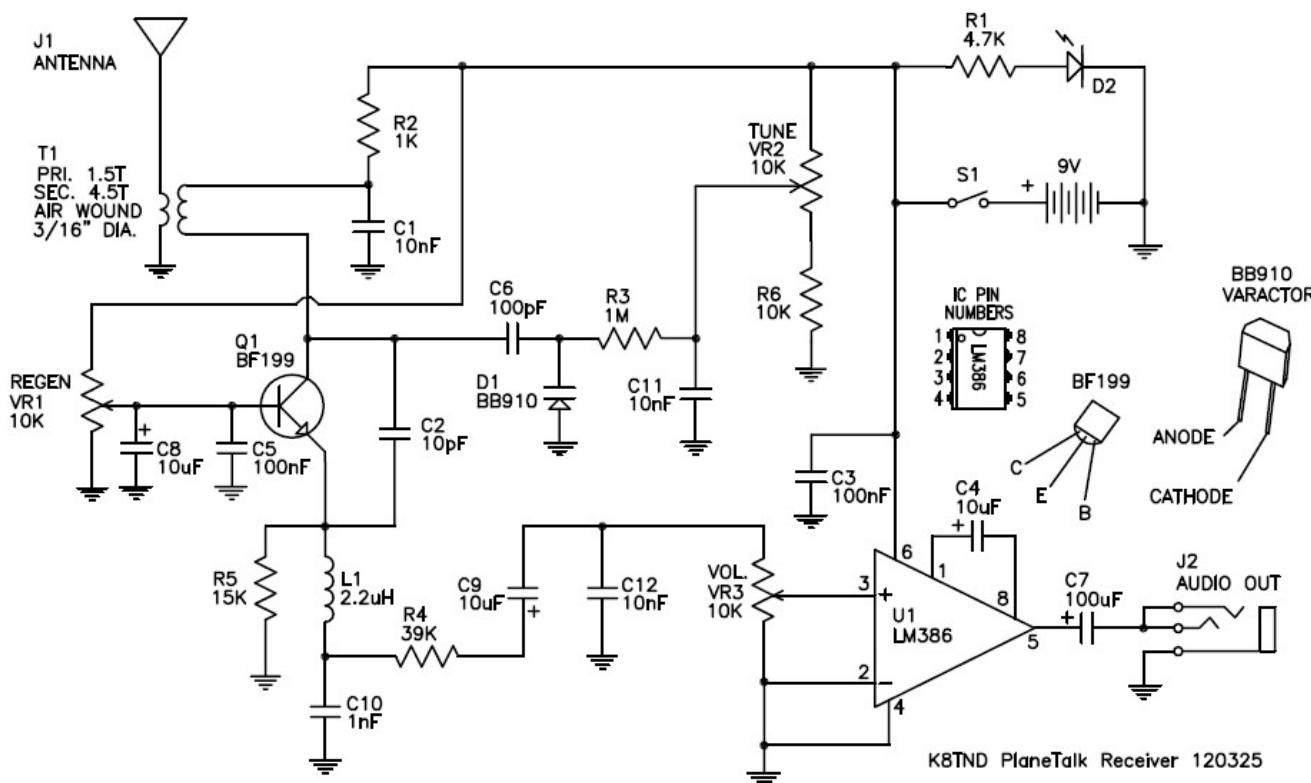
With a little practice, you'll soon find the magic spot on the REGEN control where the signal is the loudest and the static is the lowest. Once you've found this spot on your control, there should be no need to adjust the REGEN control again, unless you so desire.

You may hear several stations on a given frequency, sometimes covering each other up. This is because aircraft from all over the area use common channels, which sometimes appear on a sensitive receiver to be garbling and interference.

Other tips on regenerative receiver tuning can be found here at the ARRL site, <http://www.arrl.org/tuning-a-regenerative-receiver>

There are many antennas available on eBay if you do not want to build the one detailed on the home page. Look for vertical whip with bases and a coax cable attached or for closer reception telescoping types with integral bnc connectors .Remember, higher is better. For the Air Band, I have used a 2m whip with a magnetic base for very good reception, and I built the dipole on the web site.

### Schematic:

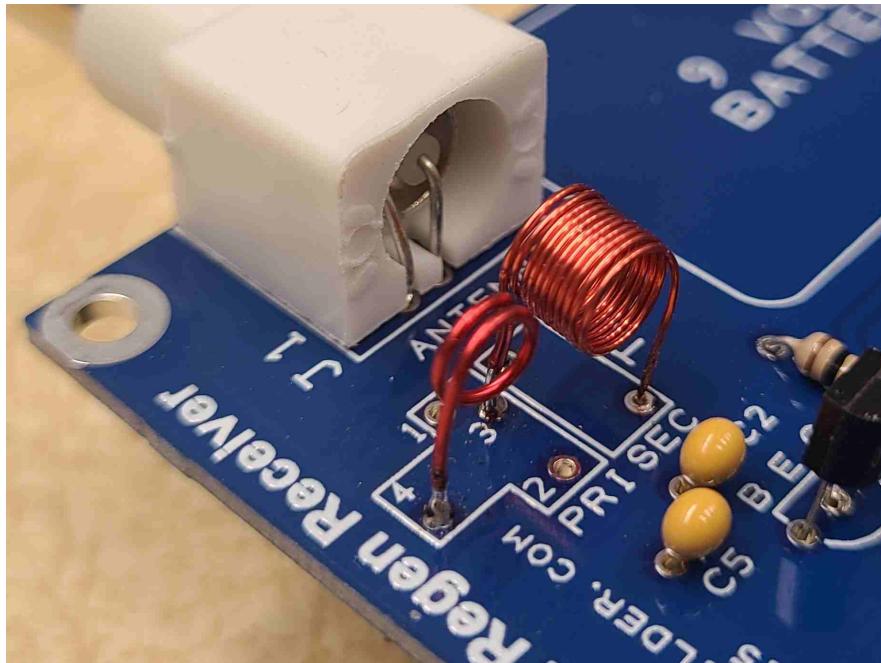


## For 6m reception

K8TND has successfully moved the coverage to 6 meters, by changing three components to the values below. This modification yielded coverage of ~50.1 – 60.4MHz. Your results may vary, but you can see what can be done with a little experimentation.

L1 – 1mH molded inductor, marked (brown-black-red-gold)  
R5 – 24K 1/4W resistor, (red-yellow-orange-gold)  
T1 primary – same as for Air band  
T1 secondary - 10 1/2 turns #26awg on a .20" diameter form.

- [ ] Wind the primary as described for Air band and install the primary of T1 on holes 3 and 4.
- [ ] Install T1 secondary with 10 1/2 turns #26awg on a .20" diameter form. I used a 15/64" drill shank. The primary and secondary should be placed side by side as shown.
- [ ] Install R5, 24K resistor (red-yellow-orange-gold).
- [ ] Install L1, 1mH (brn-blk-red-gold) molded inductor where indicated on the pcb.



This will cover the entire 6m band. Moxon antennas work very well on 6m. There are many simple Moxon antenna plans on the internet.

## Appendix:

You will need the common electronic tools for pcb assembly. They include:

25W soldering iron, with a fine tip

General purpose rosin core, 60/40 solder .03" -.04" diameter

Small side cutters to trim wires

Small needle nose pliers are helpful

Magnifier to read small component markings

Other notes and thoughts:

- All the resistors are 4 color, 1/4 watt, 5% tolerance, carbon type, having a tan body colored so the colors are easy to identify using the chart below.
- The two green body components are molded inductors and identified by the chart below.
- Ceramic disk and multi-layer ceramic capacitors (MLCC) capacitors are all clearly marked, although some may quite small and may need magnification. Tolerance code may be omitted.
- Electrolytic capacitors are polarized, clearly marked, and for this kit, can be 16V, 25V, or 50V. Body colors may vary, and the long lead is "+".
- The led has a long lead, and is "+".
- Some of the integrated circuits, diodes and transistor markings may be quite small and require some magnification.
- Note the small notch or dimple marking on the LM386 integrated circuit designating the end for pin1.
- Mount the transistor and varactor diode matching the silkscreen outline.
- Ensure the battery clips are not mixed male/female, or the battery will not be installed correctly.
- On any component, I always solder a single lead first, align the component if needed, then solder the other pad(s).

**Green LED w/  
clear lens**



**BF199  
Transistor**



**BB910  
Varactor  
Diode**



**LM386**



# Semiconductors

**1K  
OHM**



**4.7K  
OHM**



**10K  
OHM**



**15K  
OHM**



**24K  
OHM**



**39K  
OHM**



**1MEG  
OHM**

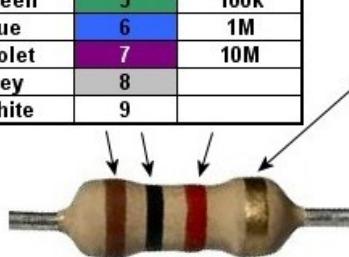


## Resistors

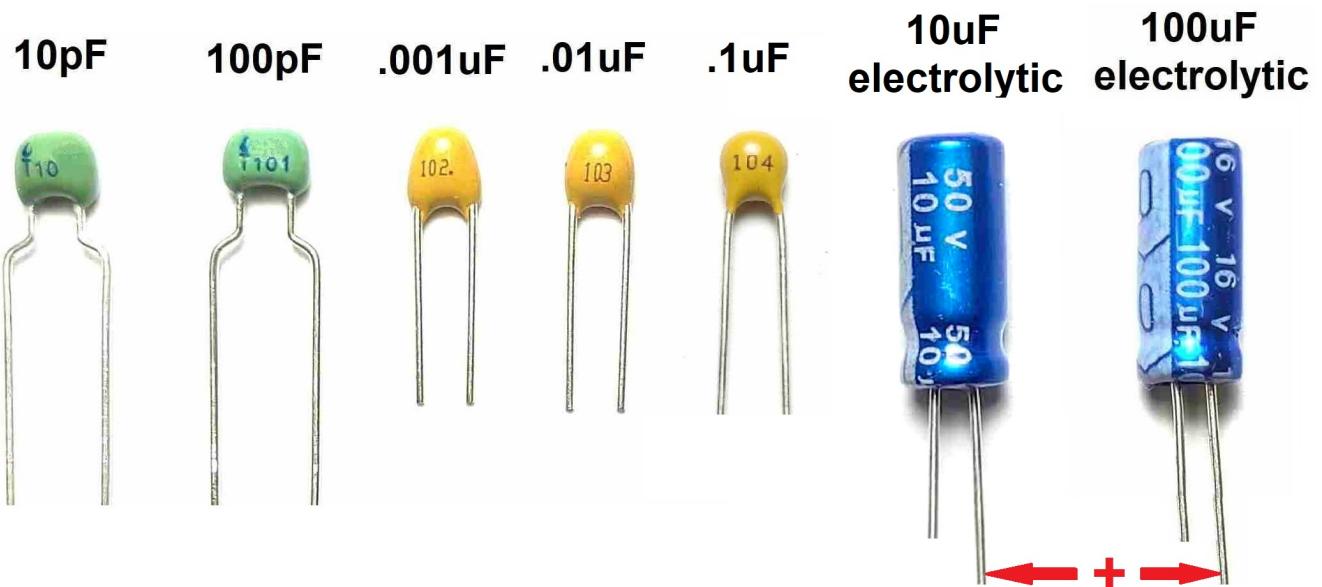
### Resistor Color Codes

	<b>Value</b>	<b>Multiplier</b>
Black	<b>0</b>	1
Brown	<b>1</b>	10
Red	<b>2</b>	100
Orange	<b>3</b>	1k
Yellow	<b>4</b>	10k
Green	<b>5</b>	100k
Blue	<b>6</b>	1M
Violet	<b>7</b>	10M
Grey	<b>8</b>	
White	<b>9</b>	

	<b>Tolerance</b>
Silver	<b>10%</b>
Gold	<b>5%</b>
Red	<b>2%</b>
Brown	<b>1%</b>

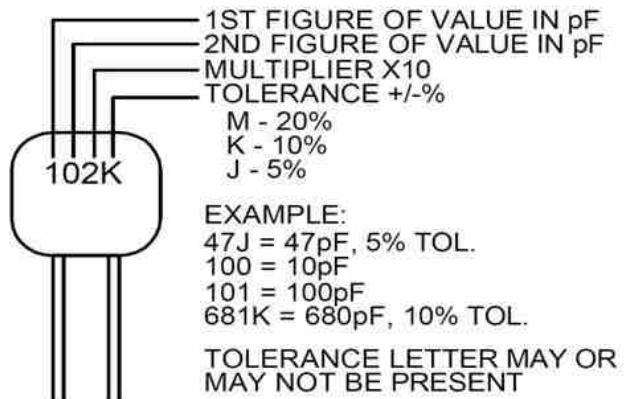


$$1 \ 0 \ 2 = 10 * 100 = 1k \text{ Ohm}$$



The component body color can change by supplier selected

## Capacitors

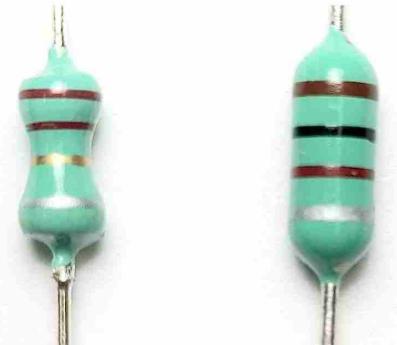


### Ceramic capacitor markings

Note: When reading the ceramic/mono capacitor values, do not confuse the manufacturing codes with the component value. If it looks strange, it may be a manufacturing code, look on the other side of the component. Also, the tolerance letter may be omitted.

2.2uH

1.0mH



## Molded Inductors

### INDUCTOR COLOR GUIDE

Result Is In  $\mu$ H

4-BAND-CODE 270 $\mu$ H ± 5%

COLOR	1st BAND	2nd BAND	MULTIPLIER	TOLERANCE
BLACK	0	0	1	± 20%
BROWN	1	1	10	Military ± 1%
RED	2	2	100	Military ± 2%
ORANGE	3	3	1,000	Military ± 3%
YELLOW	4	4	10,000	Military ± 4%
GREEN	5	5		
BLUE	6	6		
VIOLET	7	7		
GREY	8	8		
WHITE	9	9		
NONE				Military ± 20%
GOLD			0.1 / Mil. Dec. Pt.	Both ± 5%
SILVER			0.01	Both ± 10%

## Notes: