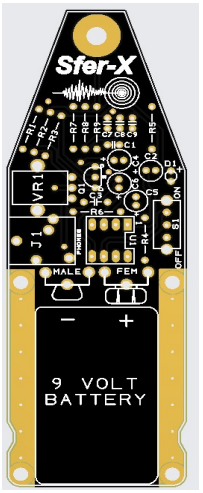
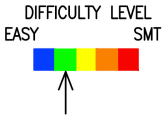
QRPBuilder K8TND Sfer-X Receiver





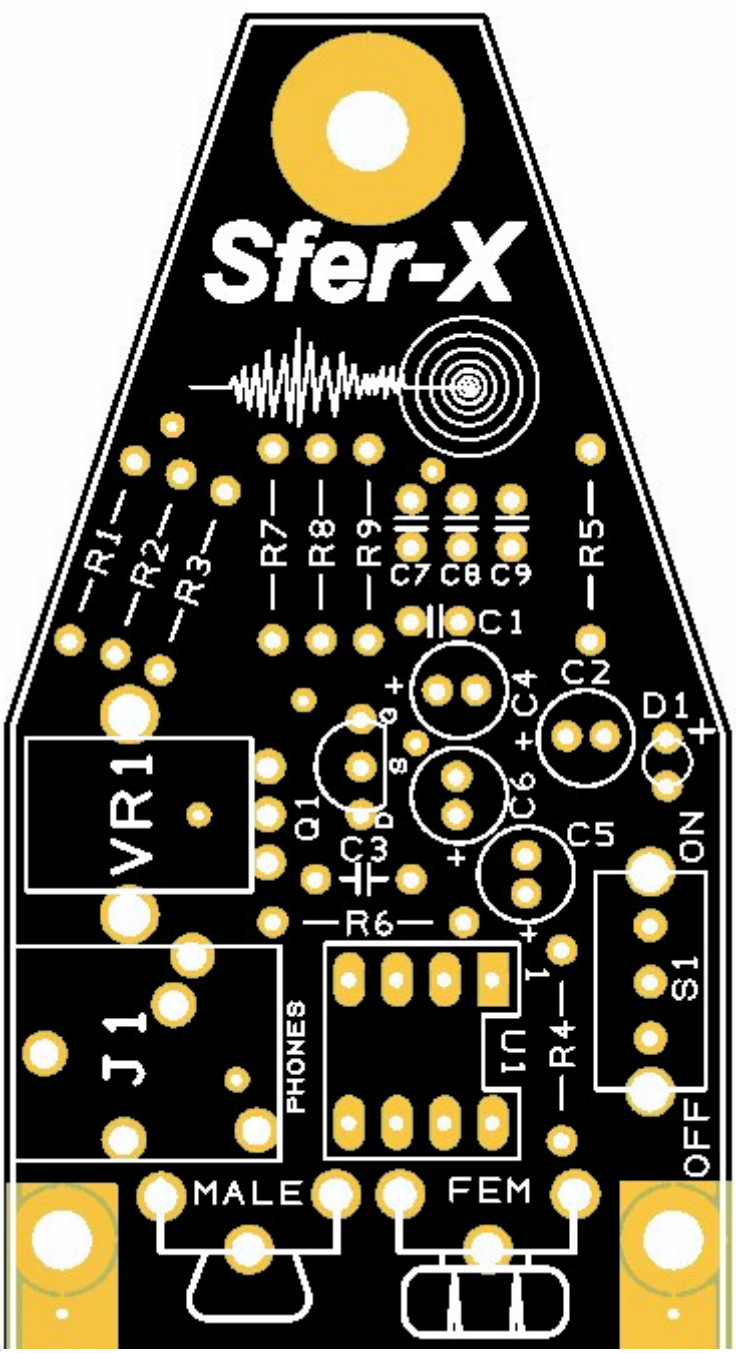
First, familiarize yourself with the parts and check for all the components. If a part is missing, please contact us at qrpbuilder@gmail.com andd we will send you one.

Please read all the instructions before starting to assemble the receiver. Read the tips carefully in the Appendix. Also, the Appendix contains information to help identify the various small components.

Parts List

1 – QRPGuys K8TND Sferics Receiver PCB
1 – U1, LM386 DIP IC
1 – Q1, J310 transistor
1 – D1, green LED
1 – R1, 20 megohm resistor (red-black-blue-gold)
1 – R2, 10K resistor (brown-black-orange-gold)
1 – R3, 6.2K resistor (blue-red-red-gold)
2 – R4,6, 820 ohm resistor (gray-red-brown-gold)
1 – R5, 4.7K resistor (yellow-violet-red-gold)
1 – R7, 1M resistor (brown-black-green-gold)
1 – R8,9, 3.9M resistor (orange-white-green-gold)
1 – VR1, 50K vertical pot
1 – C1, 220pF MLCC capacitor, marked 221
3 – C2,5,6 10uF electrolytic capacitor
1 – C3, .47 uF polyester film capacitor, marked 474
1 – C4, 1uF electrolytic capacitor
1 – C7,8,9, .001uF MLCC capacitor, marked 102
1 – J2, 3.5mm stereo pcb jack
1 – S1, SPDT slide switch
1 – 9V battery clip-female
1 – 9V battery clip-male
1 – 8 pin DIP socket
1 - 8-32 x 3/4”L SS Phillips pan head screw
1 – 8-32 S.S. wing nut
2 – 8-32 S.S. nut
1 - #8 S.S. internal tooth lock washer
1 – 12” 14awg solid wire
1 – rubber band

Using the guide below, start assembling with the smallest parts first.



[ ] Install C1, 220pF C0G capacitor, marked 221

[ ] Install C7,8,9, .001uF, marked 102

[ ] Install R1, 20M resistor (red-black-blue-gold)

[ ] Install R2, 10K resistor (brown-black-orange)

[ ] Install R3, 6.2K resistor (blue-red-red-gold)

[ ] Install R4,6, 820 ohm resistor (gray-red-brown-gold)

[ ] Install R5, 4.7K resistor (yellow-violet-red-gold)

[ ] Install R7, 1M resistor (brown-black-green-gold)

[ ] Install R8,9, 3.9M resistor (orange-white-green-gold)

[ ] Install D1, green LED, *observe polarity, the long lead is "+"*

[ ] Install 8 pin DIP socket*, match the board outline*

[ ] Install Q1, J310 transistor*, match the board outline*

[ ] Install S1, SPDT slide switch

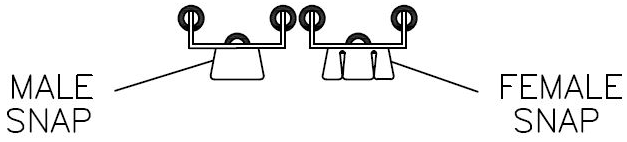
[ ] Install C3, .47 uF mono capacitor, marked 474

[ ] Install C2,5 10uF electrolytic capacitor, *long lead is "+"*

[ ] Install C4,6, 1uF electrolytic capacitor, *long lead is "+"*

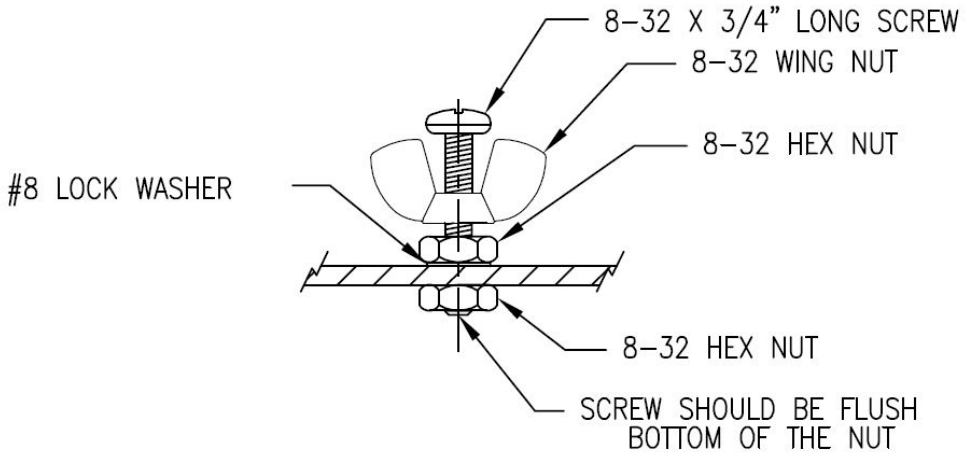
[ ] Install J2, 3.5mm stereo jack

[ ] Install 9V battery clips, as shown below. *Do not mix them up.*



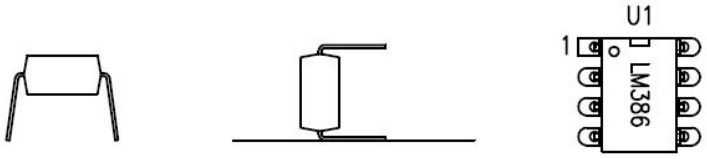
[ ] Install VR1, 50K vertical pot

[ ] Install the antenna connection hardware as shown below, and you will never lose the wingnut.



This completes the assembly

[ ] Next, power up the receiver with a 9V battery, and secure it with the supplied rubber band in the board notches. Turn on and the LED should illuminate. Check for 9V on pin #6 of the U1 socket. If all is ok, turn off and 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.

[ ] Straighten the 12” piece of 14awg solid wire. Strip off 1” of the insulation, if present, and bend the exposed portion to a “U” shape to attach under the 8-32 wing nut. You may shape the wire around a pen or pencil if you want to shorten it’s length.

Operation:

Firstly, you must get the Sfer-X receiver a long ways away from any power lines or house electrical wiring. When I say "long ways" I'm talking at least a couple miles away from anything mains electrical. You're also going to want to stay away from trees, they are absolute dead zones for what you want to receive.

For better reception, you can hold the unit above your head, with the antenna pointing straight up. The antenna is going to be a user supplied coat hanger or 1 foot piece of heavy gauge copper wire. Next, make sure the antenna wire is hooked up and tightened down.

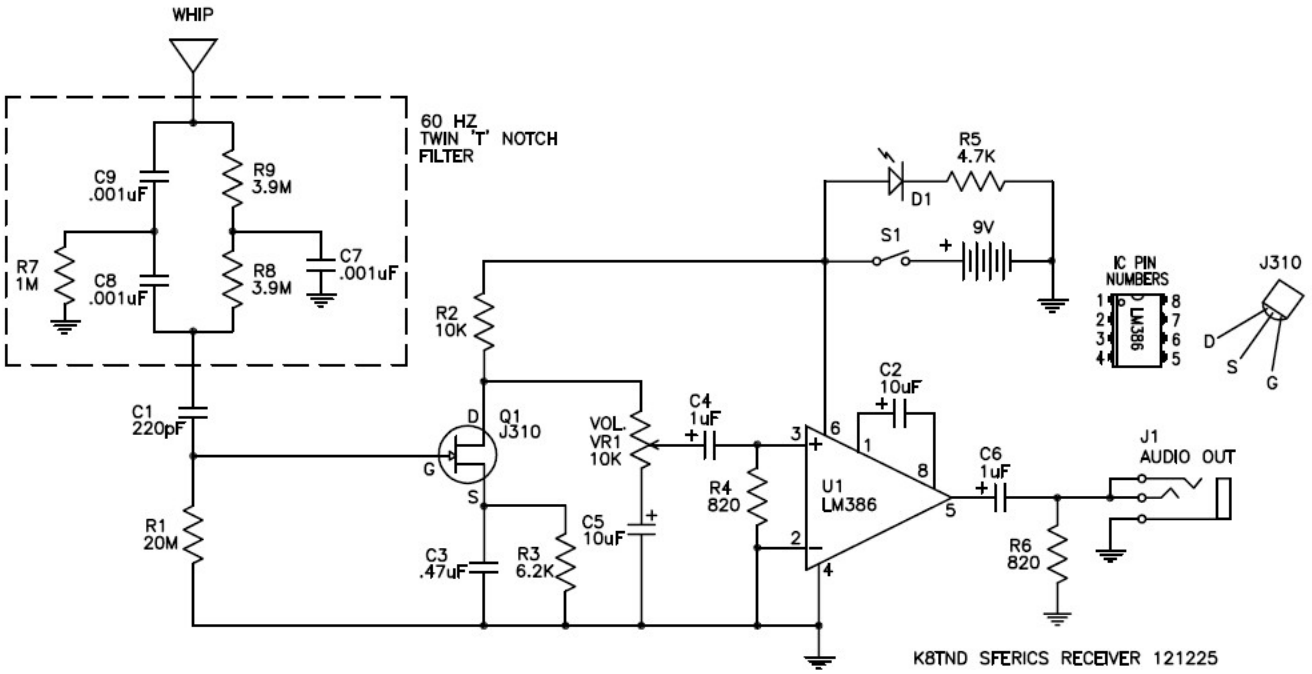
The Sfer-X receiver is quite simple to operate, with nothing but a volume control to adjust. Before turning the receiver on, put a rubber band around the board and battery where the notches are.
This will hold your battery in tight and keep it from flopping around. Next, turn the volume control all the way down, fully counter-clockwise and plug the headphones in. If the headphones are quiet, go ahead and put them on.

Turn the ignition off on your vehicle and take the receiver a few feet away from it. Turn the receiver on and very slowly turn the volume up until you have a comfortable listening level. At this point the AC hum level should be very low and you should be hearing the clicking and popping sounds of lightning up to a thousand miles away.

Congratulations, your receiver is now working. Enjoy the many sounds of nature and PLEASE do not use your receiver if lightning is close by.

Cliff/K8TND

Schematic:



We designed the board for two assembly options. A handheld option as described here, and for those that want to utilize a chassis. The chassis option would involve **not** installing the pot, earphone jack, spdt switch and the antenna hardware. These items or more appropriate chassis mounted styles would be installed in your case. In this situation, a small die cast aluminum chassis would be ideal. Ensure that your metal case is grounded to the pcb.

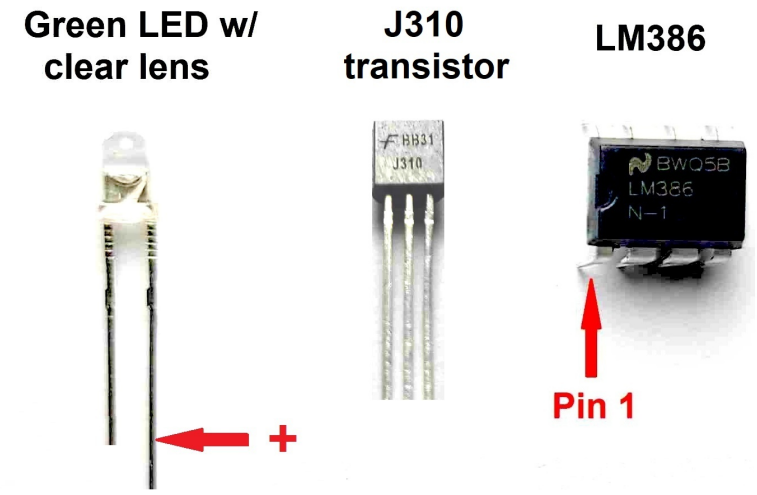
Appendix:

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

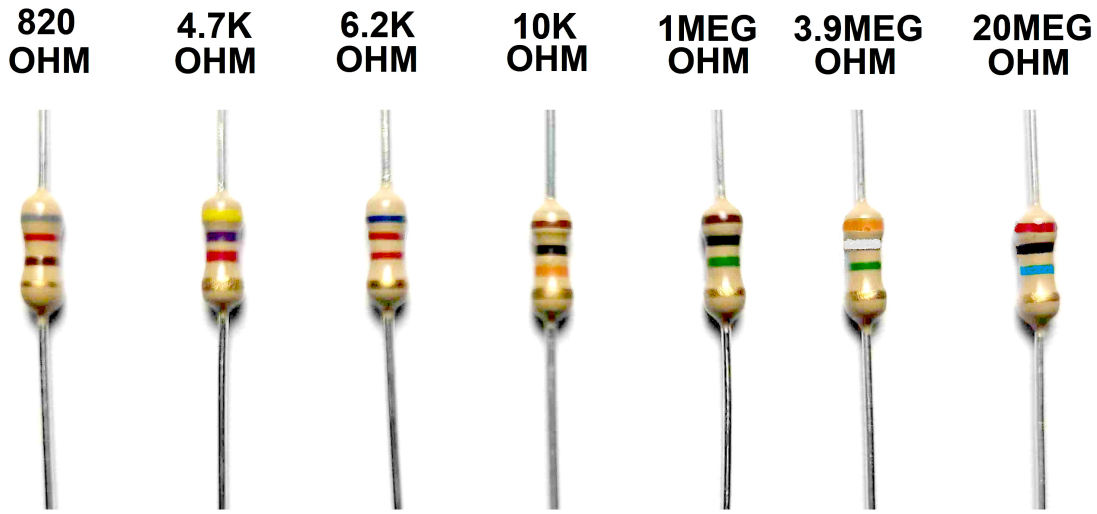
25W soldering iron, with a fine tip
General purpose rosin core, 60/40 solder .03” -.04” diameter
Small side cutters to trim wires
Small needle nose pliers are helpful
Magnifier to read small component markings

Other notes and thoughts:

- All the resistors are 4 color, 1/4 watt, 5% tolerance, carbon type, having a tan colored body so the colors are easy to identify using 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 matching the silkscreen outline.
- Ensure the battery clips are not mixed male/female, or the battery will not be installed correctly.
- On any component or socket, I always solder a single lead first, align the component if needed, then solder the other pad(s).



Semiconductors

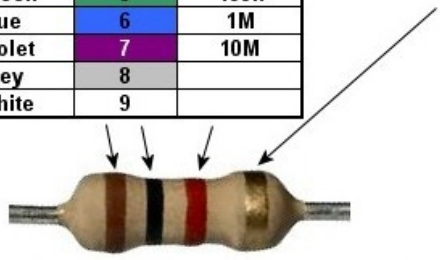


Resistors

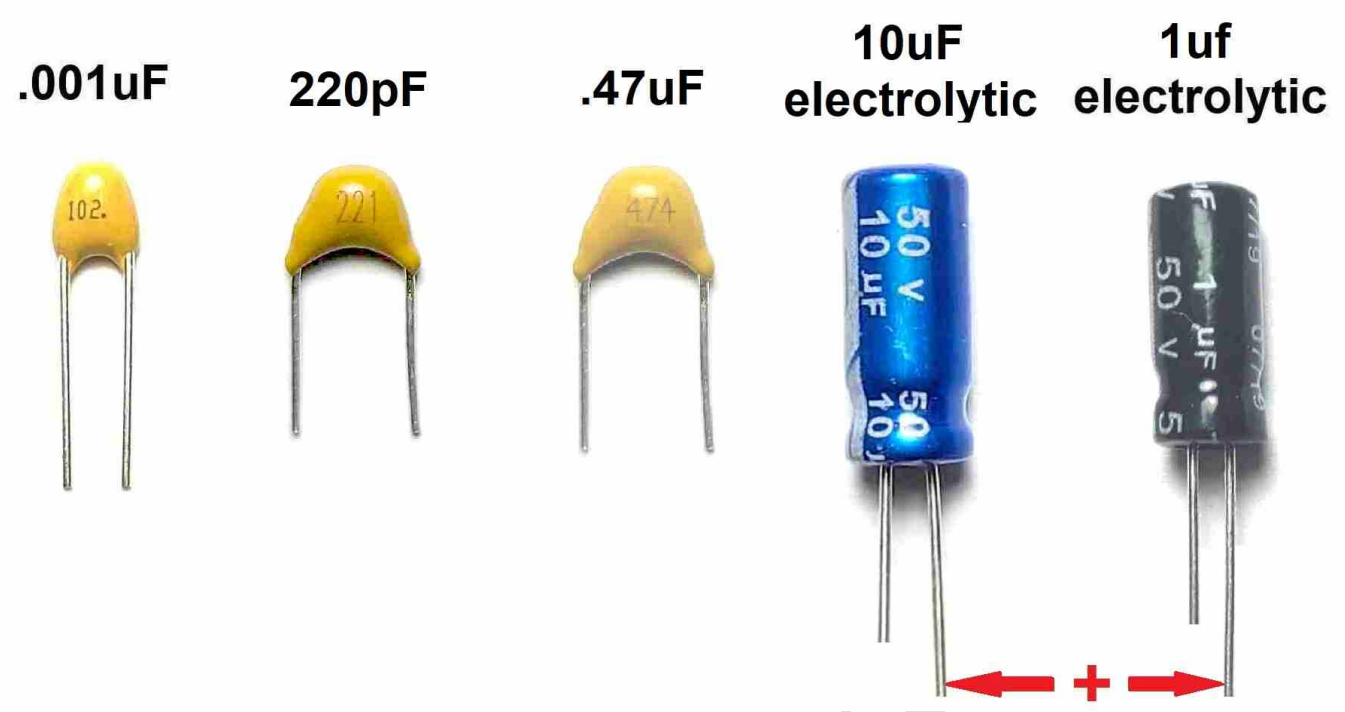
Resistor Color Codes

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

	Tolerance
Silver	10%
Gold	5%
Red	2%
Brown	1%

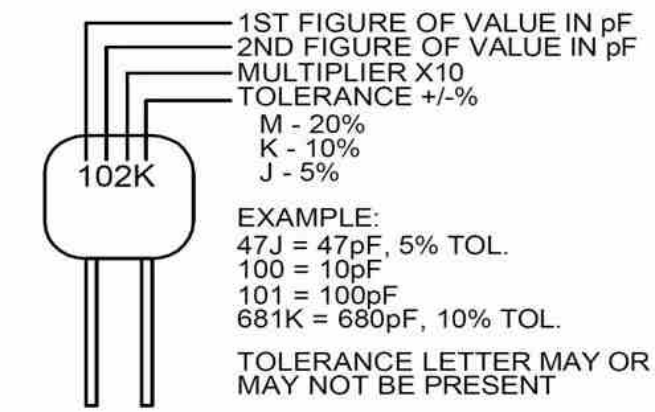


1 0 2 = 10*100 = 1k Ohm



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.

Notes: