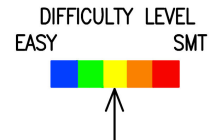
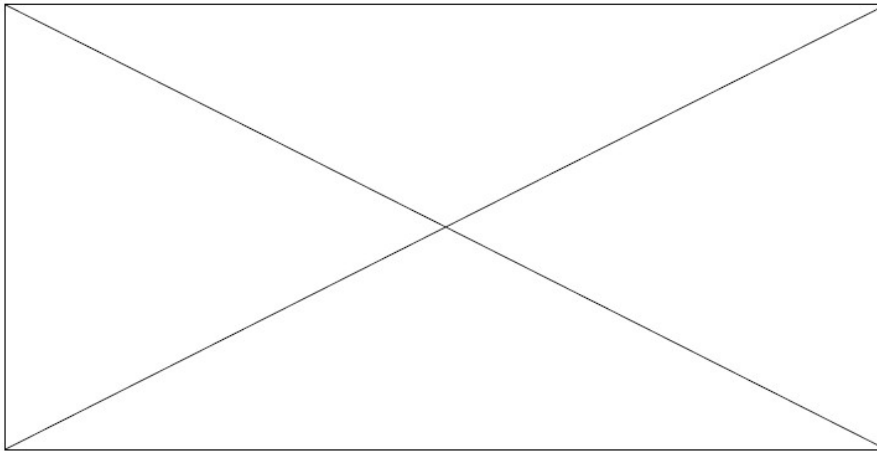




QRPBuilder Patriot K8TND Regenerative Receiver



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

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

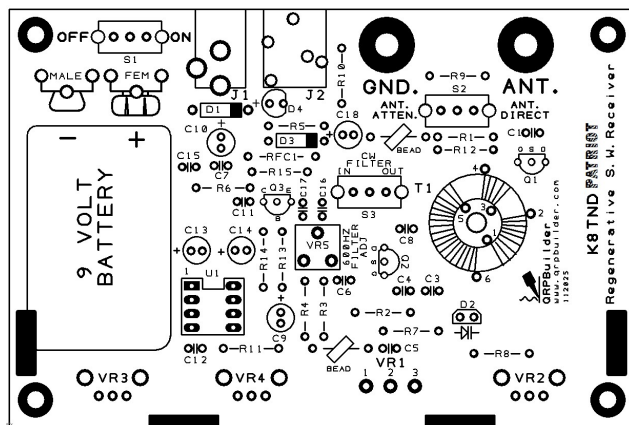
Parts List

- 1 – QRPGuys K8TND Regen Receiver PCB, 4 pieces
- 1 – U1, LM386 DIP IC
- 1 – Q3, 2N3904 transistor
- 2 – Q1,2, J310 FET
- 1 – D1, 1N4007 diode, black, silver band on one end
- 1 – D2, ISV149 varactor diode, marked v149
- 1 – D3, 1N4737A, 7.5V zener diode, small glass, black band on one end
- 1 – D4, green led
- 2 – R2,8, 1 meg ohm resistor (brown-black-green-gold)
- 5 – R1,3,7,11,15, 10K resistor (brown-black-orange-gold)
- 1 – R4, 5.6K resistor (green-blue-red-gold)
- 2 – R1,5, 1K resistor (brown-black-red-gold)
- 1 – R6, 10 ohm resistor (brown-black-black-gold)
- 1 – R9, 51 ohm resistor (green-brown-black-gold)
- 1 – R10, 4.7k ohm (yellow-violet-red-gold)
- 1 – R12, 470 ohm resistor (yellow-violet-brown-gold)
- 1 – R13, 22K ohm (red-red-orange-gold)
- 1 – R14, 220K ohm (red-red-yellow-gold)
- 1 – C4, 8pF ceramic disk capacitor, marked 8
- 6 – C1,5,7,11,12,15, .01uF MLCC capacitor, marked 103
- 1 – C3, 560pF NP0/C0G capacitor, marked 561
- 1 – C6, .001uF MLCC capacitor, marked 102
- 1 – C8, 470pF NP0/C0G capacitor, marked 471
- 2 – C9,18 4.7uF electrolytic capacitor
- 2 – C10,14, 100uF electrolytic capacitor
- 1 – C13, 1uF electrolytic capacitor
- 2 – C16,17 .022uF MLCC capacitor, marked 223
- 3 – VR2,3,4, 10K pcb mounted potentiometer
- 1 – VR1, 10K panel mount pot

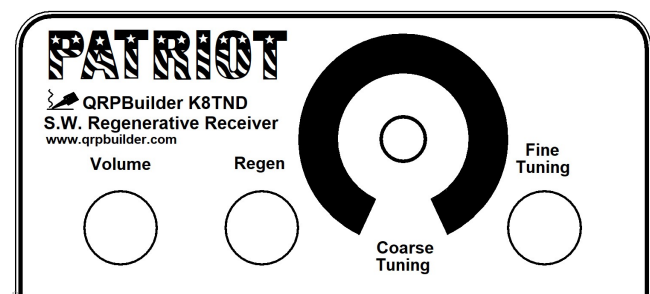
- 1 – VR5, 2K 6mm trimpot, marked 202
- 1 – RFC1, 1mH molded inductor, green body (brown-black-red-silver)
- 1 – J1, DC power jack
- 1 – J2, 3.5mm stereo jack
- 3 – S1,2,3, SPDT slide switch
- 1 – 8 pin DIP socket
- 1 – 9V battery clip-female
- 1 – 9V battery clip-male
- 1 – 48" 26awg magnet wire
- 1 – T68-2 toroid core (red)
- 2 – 8-32 x 3/4" L SS Phillips pan head screw
- 4 – 8-32 SS hex nut
- 2 – 8-32 SS wing nut
- 2 – 8-32 SS internal tooth lock washer
- 1 – 4-40 x .50" L nylon screw
- 1 – 4-40 nylon hex nut
- 1 – #4 nylon washer
- 4 – 3/8" dia. rubber foot
- 1 – 8" hook-up wire
- 1 – control knob

First item to assemble is the PCB chassis.

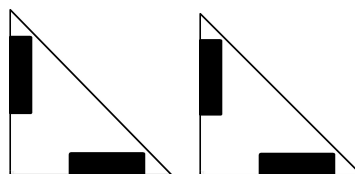
Even if you have done radio kit assembly before, please read through all the instructions before you start. This kit is a little different, in that the mechanical chassis components are the part of the printed circuit board. The instructions give you the scope of the project and an understanding of the techniques we have employed. You will be assembling the kit from four pieces of pcb material. The base pcb contains all the circuitry for the receiver. When you tack and then solder the components it will make a sturdy mechanical assembly. Refer to the figure below for identification of the individual pcb parts.



BASE

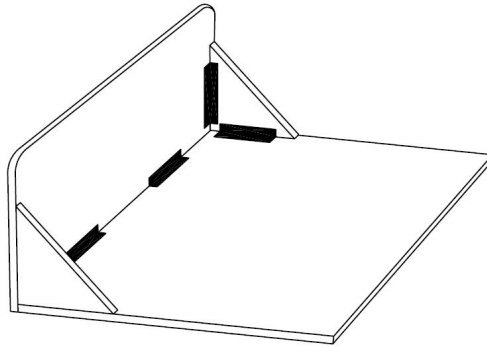


FRONT PANEL



GUSSETS

On all the mechanical assembly soldering, you will use the same technique. You tack a single tiny point first, and then check to see that it is square and aligned properly with the assembly notes. It is easy to re-heat the joint and adjust the alignment when there is only a single point. You will tack all the other pads, before you do the finish soldering.

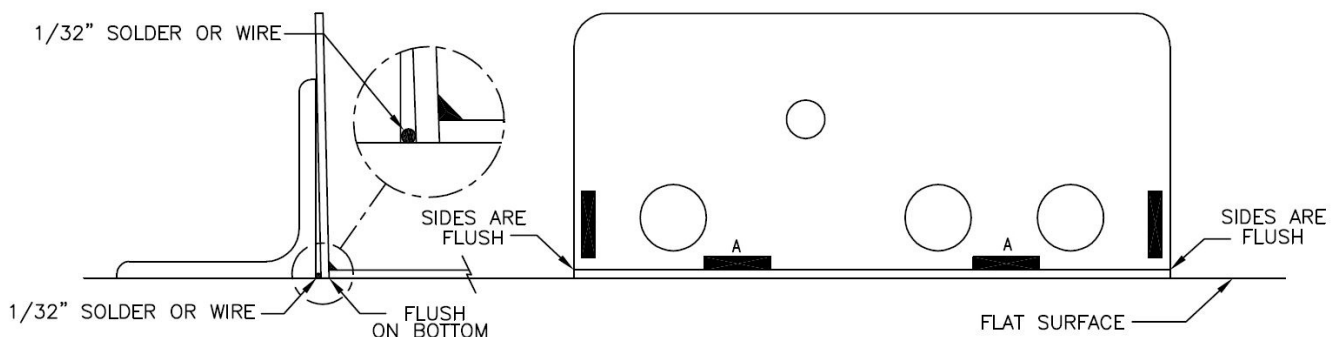


When soldered, the completed chassis will look like this, with all the holes and circuitry needed for the assembly. There will be no drilled holes to be added.

Soldering the chassis together:

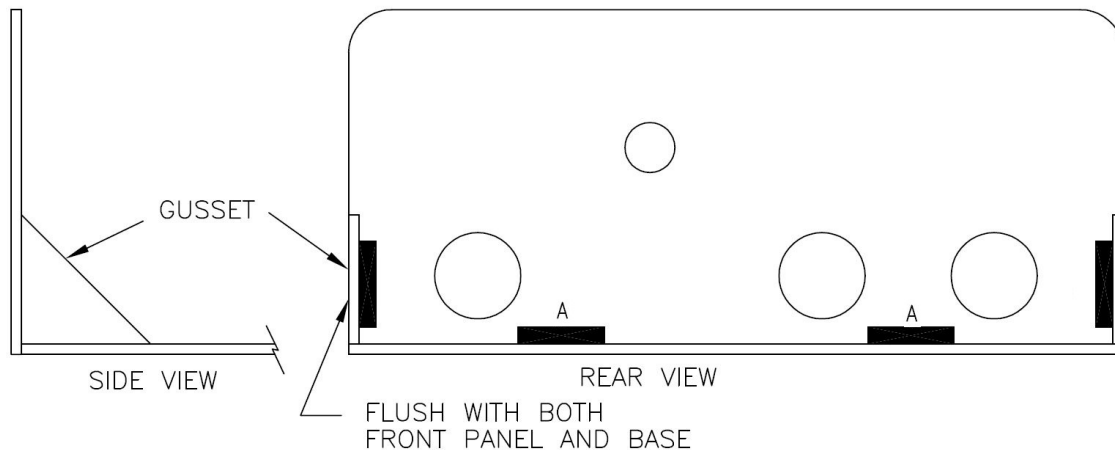
One of the physical properties of solder is that it contracts when it cools. Knowing this, we can allow for it. If two pieces of the pcb material are clamped 90° apart, and you apply solder at the joint, the joint will close about 1°-2°, no matter how well you clamp it, the PCB material will flex and you will end up with an 88° corner. That doesn't sound like a lot, but you don't want that to happen. If you try to straighten it cold, you will lift off the solder pad from the PCB. To counteract this, you position the front panel at slightly greater than 90°. When it's tacked it will pull back to square (90°). Finally, adding the gussets maintain this position and make a strong assembly.

You will need to work on a flat surface. I use a 1 foot square piece of a Formica counter top, but any flat surface will do. The first task is to position the front panel and the base with the "C's" matching, so that both side edges are flush with each other against something you have that is square. It can be a small piece of angle iron, or a square piece of wood with sharp corners. Position a short piece of 1/32" diameter solder or wire 4" long against the bottom of the square corner and lean the front panel back. This gives you the greater than 90° you are looking for. See figures below.



- [] A small "tack" at one of the "A" pads is all that is required at this time. **Check for squareness, flush on both sides, and flush on the bottom.** If not all these conditions are met you only have to reheat the one tack and reposition the two pieces. When you are satisfied, "tack" the other "A" pad. **Do not completely solder the pads.**

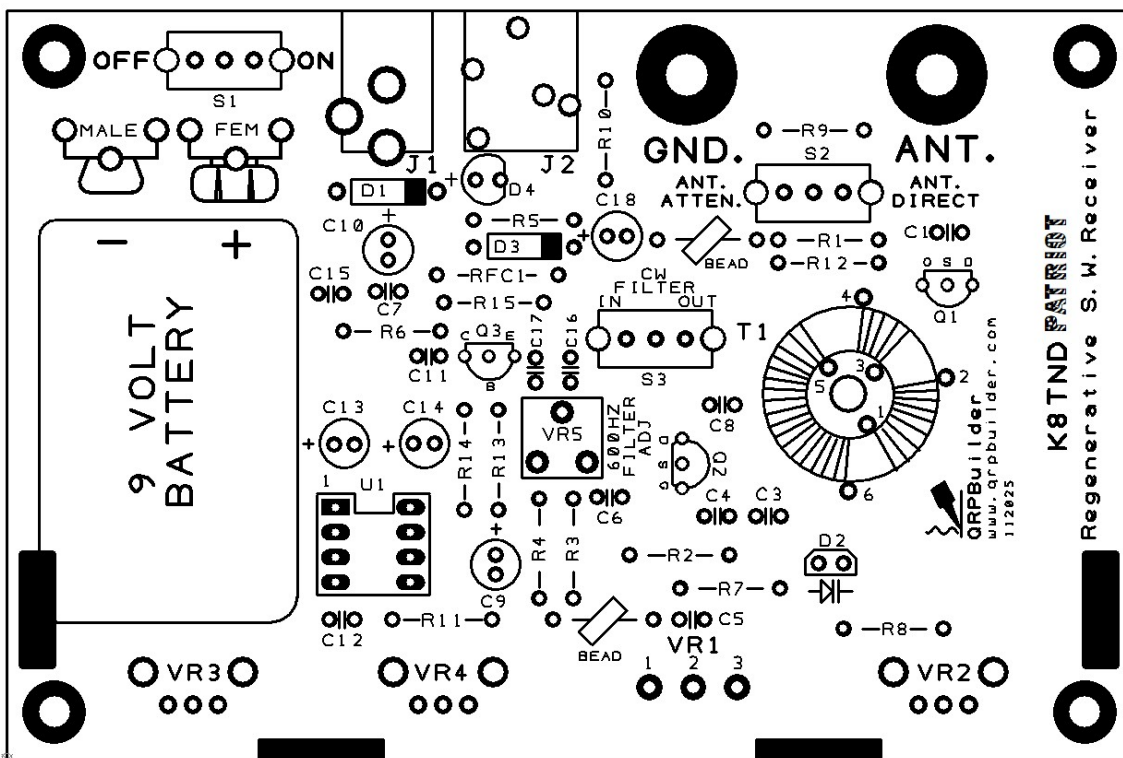
Position either of the side gussets against the inside edge of the previous assembly. You can hold the small triangle of PCB material while you put a small “tack” on one of the pads. As before, check for squareness, and a flush joint. See the figure below.



- [] “Tack” the other pad on that side. *Do not completely solder the pads.*
- [] Use the same technique with the other gusset.
- [] When you are satisfied with the alignment and squareness of the “tacked” assembly you can go back and complete the soldering of all the pads. Alternate between different pads and add a small amount on each pad until the joints are complete.

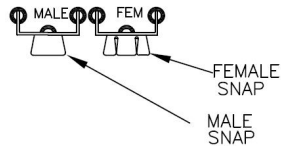
This completes the chassis.

Now that the chassis is complete. Using the guide below, start assembling and check off as you go. On any component, I always solder a single lead first, align the component if needed, then solder the other pad(s).

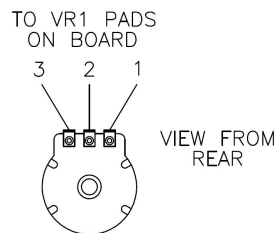


- [] Install VR 2,3,4, 10K pcb mounted potentiometer
- [] Install R2,8, 1 meg ohm resistor (brown-black-green-gold)
- [] Install R3, 7,11,15 10K resistor (brown-black-orange-gold)
- [] Install R4, 5.6K resistor (green-blue-red-gold)
- [] Install R1,5, 1K resistor (brown-black-red-gold)
- [] Install R6, 10 ohm resistor (brown-black-black-gold)
- [] Install R9, 51 ohm resistor (green-brown-black-gold)
- [] Install R10, 4.7k ohm (yellow-violet-red-gold)
- [] Install R12, 100k ohm, (brown-black-yellow-gold)
- [] Install R13, 22K ohm, (red-red-orange-gold)
- [] Install R14, 220K ohm, (red-red-yellow-gold)
- [] Install RFC1, 1mH molded inductor, green body (brown-black-red-silver)
- [] Install D1, 1N4001-7 diode, *match the band on the diode with the outline*
- [] Install D3, 1N4737A, small glass diode, *match the band on the diode with the outline*
- [] Install D4, green led, *observe polarity, the long lead is positive*
- [] Install D2, ISV149, marked V149, *polarity sensitive, match the board outline*
- [] Install C1,5,7,11,12,15, .01uF MLCC capacitor, marked 103
- [] Install C3, 560pF NP0/C0G capacitor, marked 561
- [] Install C4, 8pF ceramic disk capacitor, marked 8
- [] Install C6, .001uF MLCC capacitor, marked 102
- [] Install C8, 470pF NP0/C0G capacitor, marked 471
- [] Install C16,17, .022uF film capacitor, marked 223
- [] Install 8 pin DIP socket
- [] Install J2, 3.5mm stereo jack
- [] Install S1,2,3 SPDT slide switch
- [] Install Q3, 2N3904, *match the board outline*
- [] Install Q1,2, J310 transistor, *match the board outline*
- [] Install C9,18, 4.7uF electrolytic capacitor, *observe polarity, the long lead is positive*
- [] Install C10,14 100uF electrolytic capacitor, *observe polarity, the long lead is positive*

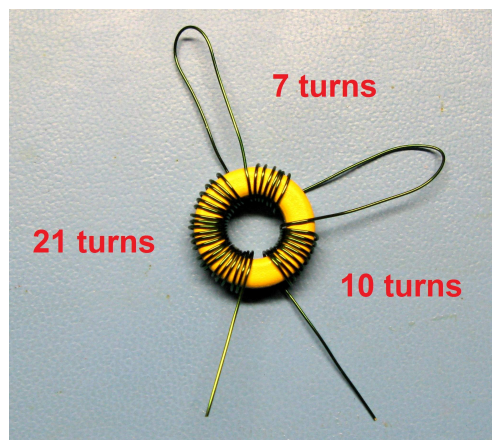
- [] Install C13, 1uF electrolytic capacitor, *observe polarity, the long lead is positive*
- [] Install J1, DC power jack
- [] Install VR5, 2k trimpot, marked 202
- [] Install 9V battery clip-female, as shown below. *Don't mix them up.*
- [] Install 9V battery clip-male, as shown below. *Don't mix them up.*



- [] Install VR1, 10K panel mount pot. Rotate the pot so that the terminals are to the top. Connect to the pcb using three short pieces of the hook-up wire provided, as shown below.

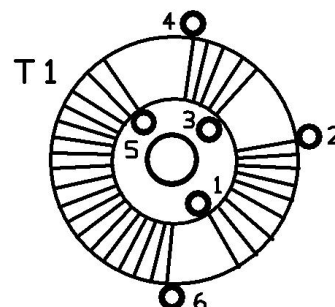
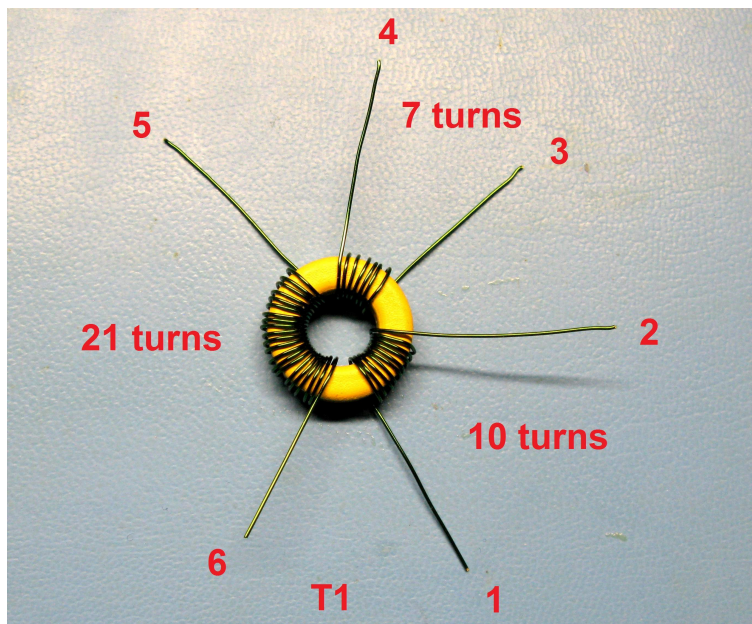


- [] Mount the control knob on VR1. It may have a removable tab to clock for mounting in a certain position. Break it off so the pot mounts flush.
- [] Use the T68-2 toroid core (red), the supplied magnet wire, and wind T1 as shown below, start winding at the 5 o'clock position. Push 1" of the wire down the hole from the top and hold it, feed the remaining turns up from the bottom. *Every time the wire goes thru the center counts as one turn.* Wind a total of 10 turns, and form a 1" loop, wind another 7 turns, and form another 1" loop, then finish with 21 more turns. If you have your own special technique for winding toroids, use it. The wires must be over the core or under the core for each group of turns as shown below. If the wound core does not look like the picture below, it will not align with the pcb holes. *Be sure to verify the turn counts on each group before you cut the loops.*



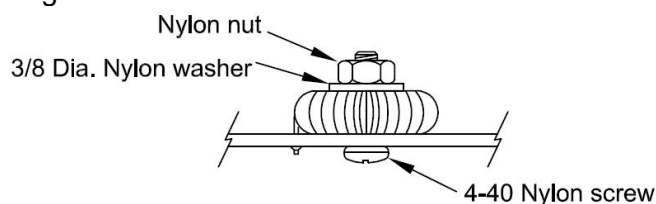
Your core is **red**, this yellow core is shown for clarity.

Note: Now is a good time to mention a good way for counting the turns on your toroids. Many times if a toroid has a lot of turns, you can lose track going around, as some are quite small. A good trick is to take a digital picture of it *before* you trim the leads and enlarge it on your computer screen. Counting is clearly a lot easier.



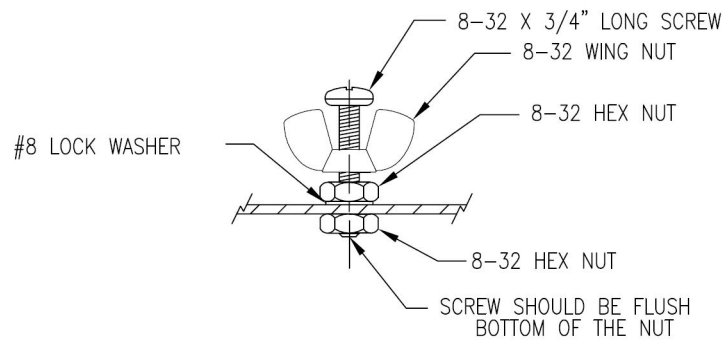
Yellow core is shown for clarity

- [] Cut the loops and straighten the wires. It should look like the picture above. If you have wound it properly, when the leads are bent down, they will align with the six pcb pads shown in the graphic above. The magnet wire has Thermaleze enamel, and can be removed with a hot soldering iron. Remove the insulation, and tin the leads before installing on the pcb. Now install T1 flat with the pcb, and solder the six leads.
- [] Retain T1 with the nylon hardware as shown in the graphic below. Feed the screw from under the pcb. Do not over tighten.

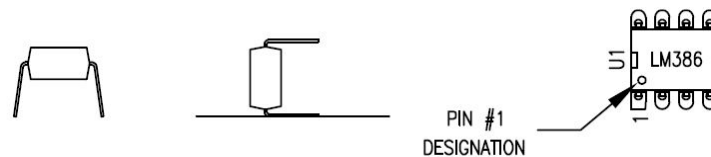


- [] Attach the four self adhesive rubber feet to the corners on the bottom of the board where indicated by the silkscreen.
- [] Secure the plastic knob at the Coarse Tuning position.

- [] Install the antenna and ground connection hardware as shown in the graphic below.



- [] Next, power up the receiver with a 9V battery. **Anytime the 12V power jack is used, be sure to remove the 9V battery.** The center pin is “+” on J2. With a battery check for ~+8.5V 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 new IC's, the pins are flared so that they can be retained by automatic insertion tools. Carefully and gently rock it on a flat surface so the pins are parallel and it will insert into the socket more easily reducing the risk of breaking or bending a pin.

Alignment:

It is easiest to mark the approximate locations of the SWL bands, WWV, etc. by using another receiver. Loosely couple the antenna with that of a nearby receiver and it will pick up the local oscillator in your regen receiver. Note the frequency or band of interest and mark with a pencil on the front panel. Make sure your fine tuning pot is in the middle of its range and you will have fine tuning either side of the frequency or band you marked. The “Fine Tuning” will cover a range of about 30Khz.

General tips and operation using a Regenerative receiver:

AM stations are best heard with the Regen control to the counterclockwise side of the knob travel, and the advanced clockwise just before sidetones are heard. **CW/SSB** stations are best heard with the Regen control to the clockwise side of the knob travel, as they require the sidetones to be present. The Regen and both Tuning controls interact with each other so a little tweaking is required. For CW reception, switch the filter IN and adjust the VR4 trim pot for the best tone and selectivity. For AM and SSB reception, switch the audio filter OUT.

When changing frequency by any appreciable amount, it will be necessary to re-adjust the “Regen” control for maximum signal strength. Adjustment will also be necessary if the “Regen” starts to oscillate. If you cannot get the regen to stop oscillating, squeeze the winding groups closer together and separate them from each other. Use the minimum amount of volume for comfortable listening. With a regenerative receiver a little back and forth is necessary, and you will get the hang of it after a few tries.

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

Schematic:



Notes:
