'The Reggie][' from QRPme

The Reggie][is QRPme's kit version of AA1TJ's Reggie transceiver with a interesting twist on construction. The original Reggie transceiver used Manhattan construction with parts out of AA1TJ's junk bin that are not easily included in a kit product: slug tuned coils and cans, silver mica capacitors, air variable caps and 600 ohm headphones. The Reggie][has a few design changes to eliminate these problem parts. Adding a second transistor as an audio amplifier now enables the use of Walkman type low impedance headphones. Slug tuned coils were replaced by toroids. A polyvaricon variable capacitor was substituted for the expensive and scarce air variable. Of course, if you have the original parts in your junk bin, you can adapt the circuit board for any of the original parts you might have.....

The circuit board is another unique feature of the Reggie][kit. Most of you may have heard about or seen Manhattan construction projects. Manhattan construction involves gluing down pads on a piece of pcb stock using Superglue. Circuit construction is rather free form and becomes easier to do as you gain experience. First timers may have a hard time figuring out just how to lay out a circuit. Joe Porter, W0MQY, from Pittsburg Kansas created Pittsburg construction where the pads for Manhattan construct were etched into a bare copper pcb to eliminate the gluing and to enable mass distribution of a board. W1REX (me) created Limerick construction to take the technique a couple more steps. With Limerick construction, not only are the pads etched into the pcb but also the interconnects between the pads. Furthermore, the Limerick construction boards have a silk screened part legend for easy parts placement. A solder mask and tinned pads are also featured for ease of construction. Heresy you say? Sounds like 'regular' circuit boards! Well, Limerick construction boards are a little of both. The idea for Limerick construction was formed when I volunteered to be an Elmer at the 2009 FDIM Build-a-thon. G3RJV's Sudden receiver was the kit and Manhattan construction was the technique. It was supposed to be a introduction to Manhattan construction techniques but the Manhattan construction technique proved to be vexing. It took some hams 5 or 6 hours to complete the construction.

After a 6 hour build-a-thon session with a young ham who had never built anything in her short ham career, I had a few thoughts running around in my head.

If ***most* of the pads were already glued down**, the builders could still experience Manhattan construction techniques without spending all that time gluing down **all** those pads…..

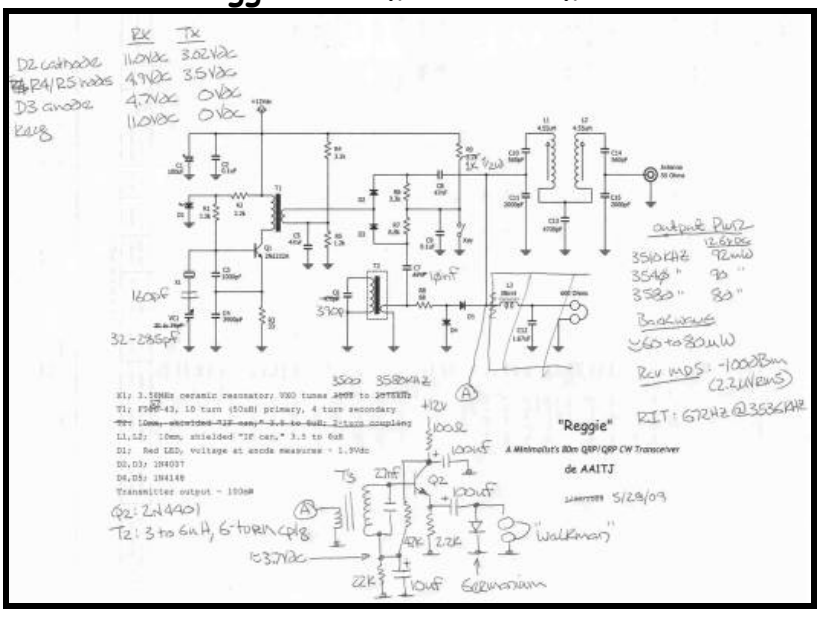
If a ***pad template was available***, there could have been more building and less frustration about not knowing what to do next and everybody could have completed their projects much quicker and had an opportunity to use their new rig instead of just building their rig….

If it was ***easier to solder to the pads***, most of the new builders would have finished quicker as there would be less soldering errors to find and correct…

Limerick style construction addresses these issues and turns the Manhattan style construction into both a learning experience and quick build technique with lots of room for tweaking and mods.

Here is the original schematic for the Reggie Transceiver as modified by Michael Rainey, AA1TJ, to include the audio amplifier for using Walkman style headphones in place of the original 600 ohm headphones as used in the original Reggie transceiver.

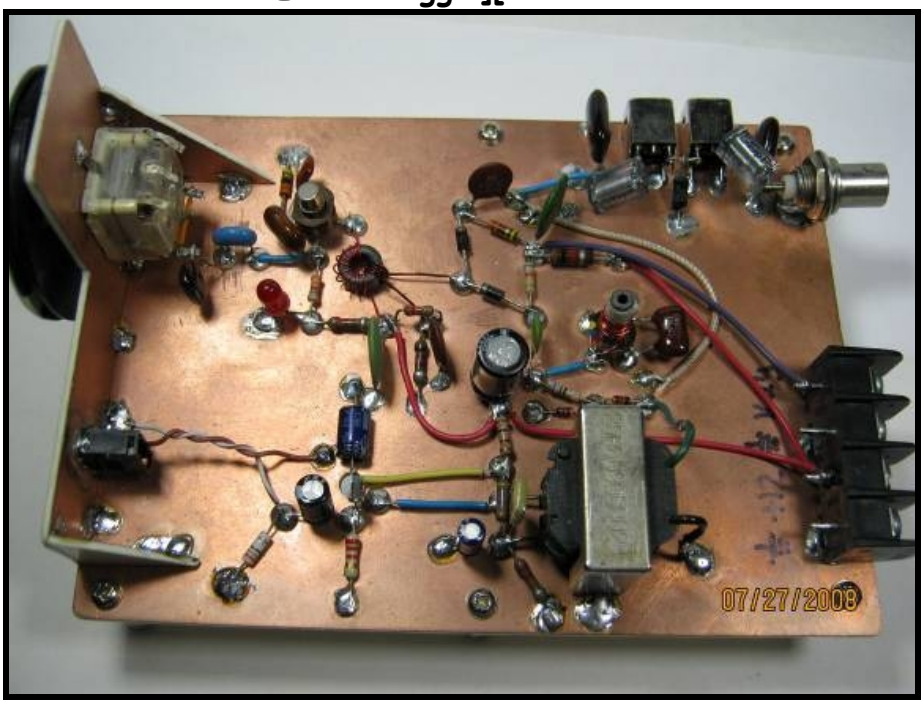
Reggie Schematic with mods



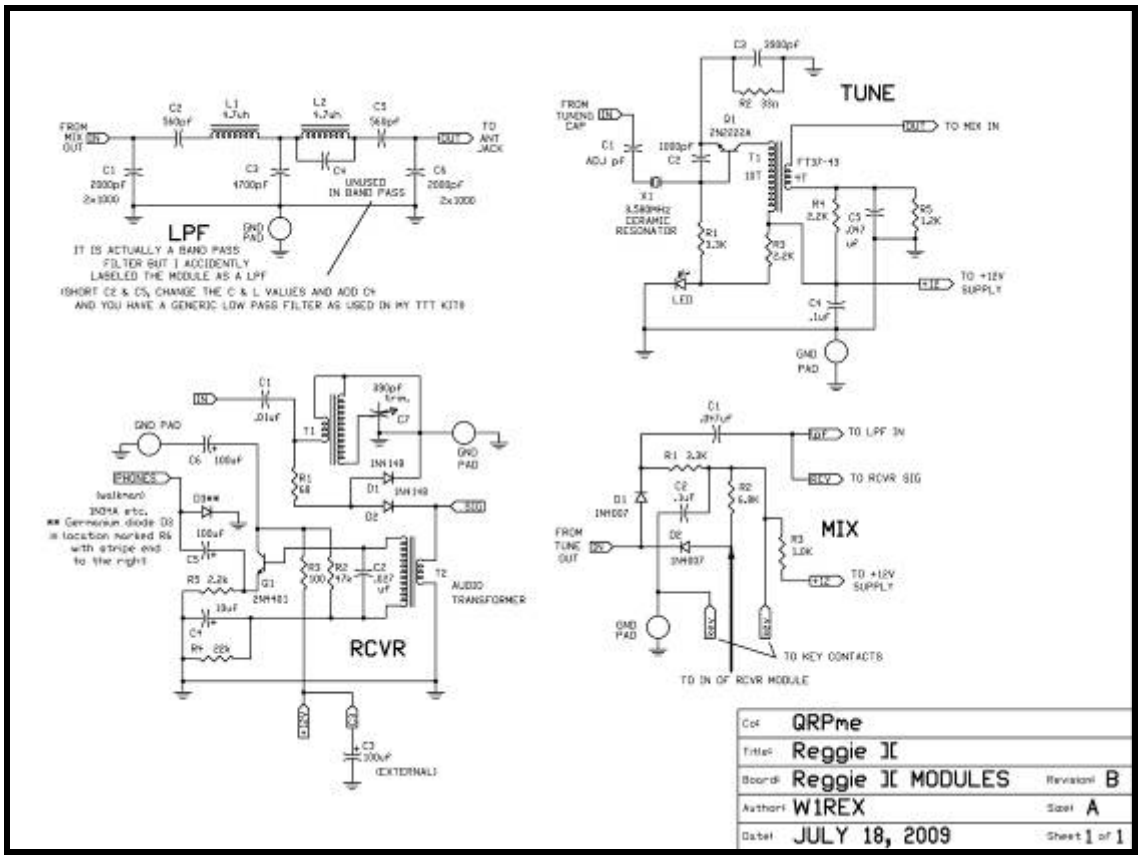
Further changes were made to the circuit in order to eliminate the hard to source junk bin parts which were used in the original Reggie.

The Reggie][prototype

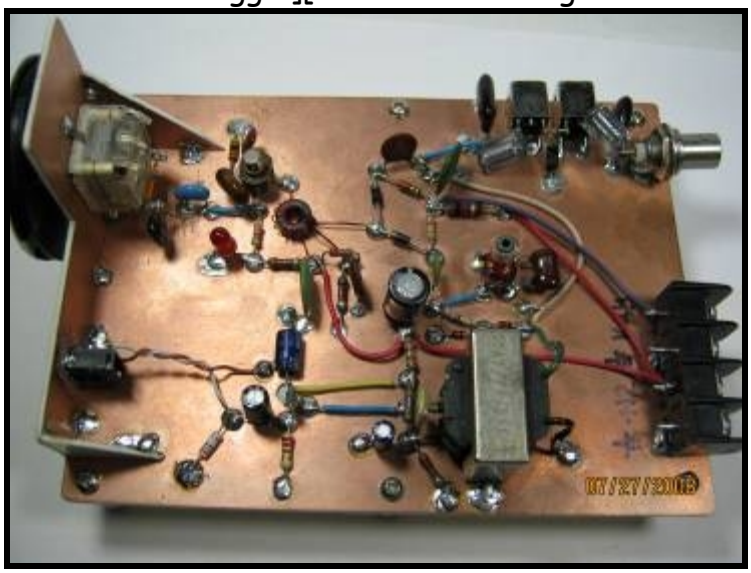
The Entire Reggie][Circuit Board



After studying both the Reggie][schematic and prototype, I redrew the schematic and broke the circuit up into 4 sections.

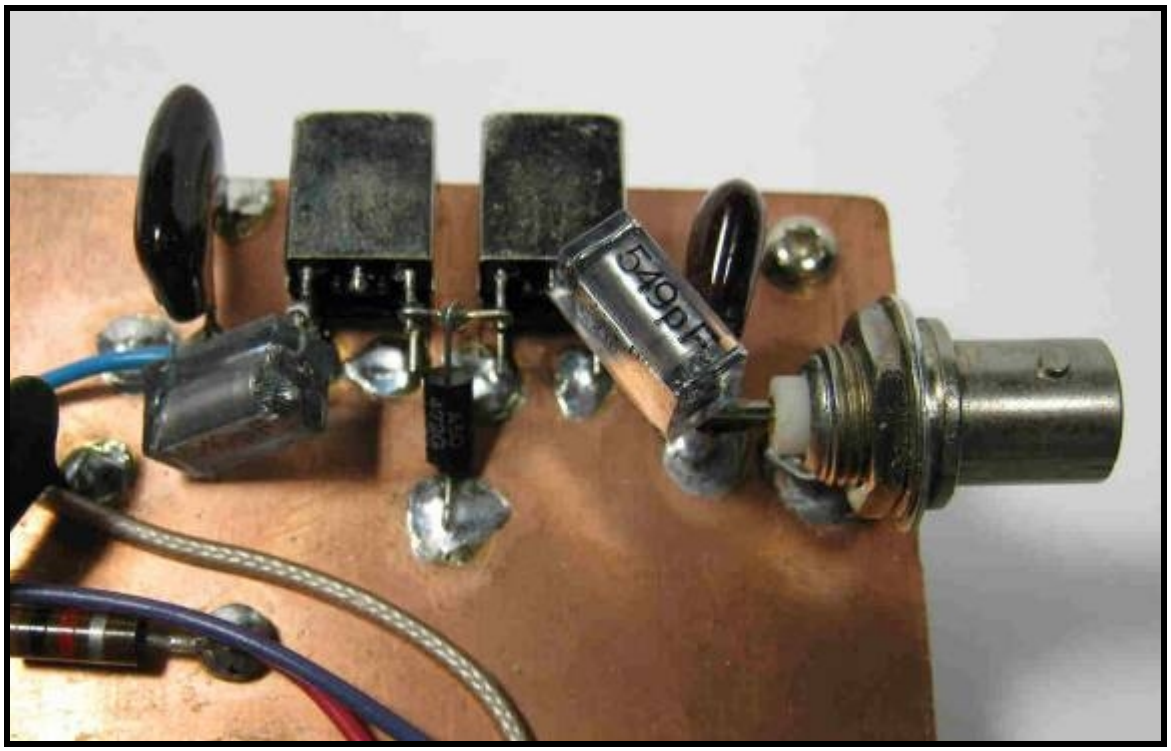


The Reggie][Circuit Board…again.



So taking another look at the prototype…

The Reggie][Band Pass Filter Section

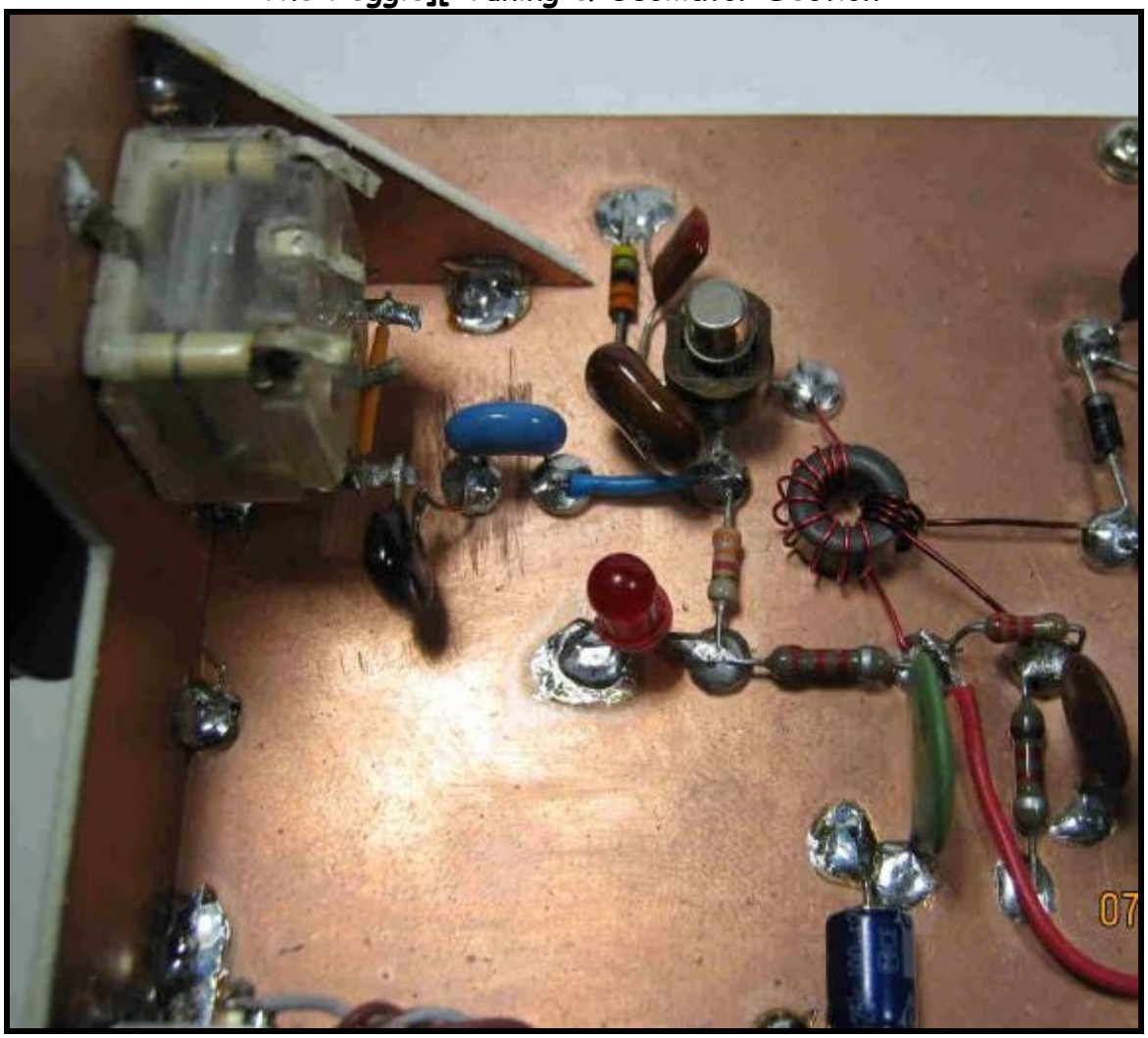


The upper right section of the prototype is a Band Pass Filter (BPF). The BNC connector is the antenna jack and the blue wire on the left side is where the BPF is connected to the rest of the circuit.

The Reggie][Keying Circuit

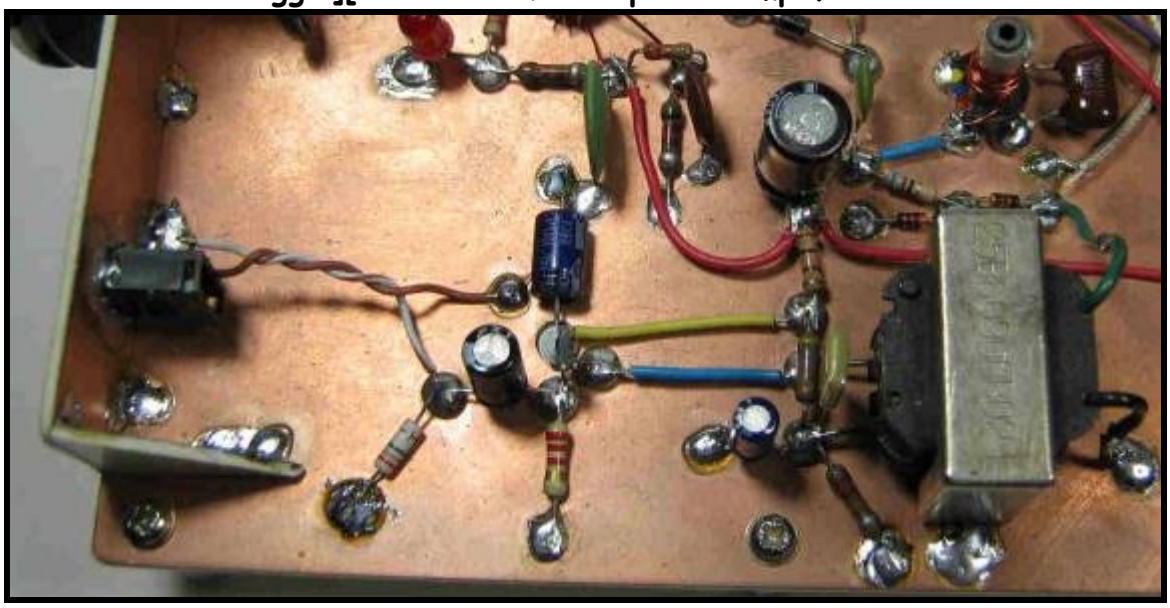
This little section of the Reggie board is where the KEY determines where the RF oscillator signal is directed in the circuit. With the KEY down, the oscillator is connected through the BPF and on to the antenna for transmission. With the KEY up, the oscillator is routed to the RCVR module to act as a local oscillator.

The Reggie][Tuning & Oscillator Section



This section of the Reggie][is the tuning and oscillator section. A poly-varicon capacitor loads the ceramic resonator, the small blue jelly bean shaped component, which is the frequency determining element in the 2N2222A based oscillator. The oscillator is coupled to the rest of the circuits via a link coupling of on the toroidal transformer.

The Reggie][Receiver & Headphone Amplifier Section



The remaining section of the Reggie][circuitry performs the receive function of the diminutive transceiver. The audio signal is recovered in the circuitry above the audio transformer and is then fed to a second transistor for amplification so that Walkman type headphones can be used.

I thought that the minimalist little Reggie transceiver would be a good candidate for teaching how to construct a project Manhattan style...without all the problems. You build the Reggie][in modules as if it each module was a project in itself. By breaking the Reggie][into 4 simpler modules, you immediately reduce the complexity of each module by a factor of 4. Each module is therefore easier to visualize and to build. After the 4 modules are built, you then glue them down to a piece of bare copper clad circuit board material like they were giant Manhattan pads. Once the modules are arranged and glued down, you then add the interconnect wiring between the modules and to the input and output connections.

So here is the sequence:
1.) Study the circuit that you are building and try to understand the functions performed by each part. Looking at the Reggie][circuit diagrams. you can see that the Reggie][circuit is broken down into 4 functional blocks: TUNE, MIX, RCVR & LPF.
(Better names have already been suggested: VXO, KEY, RCV & BPF.)

2.) Each of the 4 functional blocks is converted into a separate self contained circuit that is fairly simple and straightforward. You could say that the 'typical' circuit would then be about one forth the complexity of the entire project.

3.) Each circuit is then converted to a little mini-module on a single sided circuit board complete with pads and interconnects. Study the pcb layout diagram to see how each circuit board is a small exercise in geometry and electronic circuit 'mapping' to re-created the electronic circuit onto a flat 2 dimensional space.

4.) Each mini circuit board is silk screened with component identifiers and locations to make them even easier to build. Notice that each board has designators that start at 1 to emphasize that each module is a circuit in itself and again, a simple little project. The pads are tinned and there is a solder mask for easier soldering. Building each board is a 'small' project and accomplished fairly easily and quickly.

5.) Once you have the 4 mini boards built, you can try to arrange them in a pattern that suits your needs as to how to fit them onto a bare circuit board or into your enclosure. Sketching 4 rectangles on a piece of paper and trying to pencil-interconnect them at the proper locations will lead you to the 'best fit' for your pcb or enclosure situation.

6.) Glue each mini board down onto your bare copper pcb as if they were giant Manhattan pads.

7.) Solder the interconnect wiring, grounds and power caps. Add the I/O connections and you should be close to operational.

8.) Test operation and debug each module as necessary.

9.) And the Limerick construction moniker: QRPme is in Limerick, Maine so my version of Manhattan construction is named after Limerick, Maine. AND……. if I really wanted to, I could snap apart the 4 modules and include the entire module set AND all the parts inside my good old trade marked tuna can!

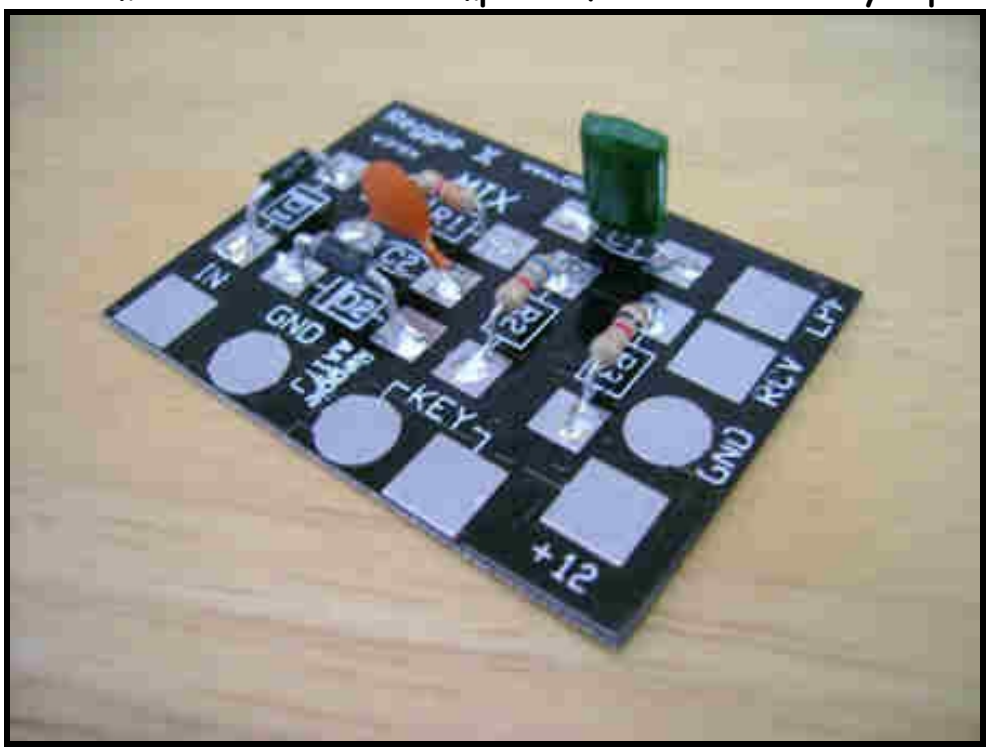
Reggie][List of Materials

RESISTORS	CAPACITORS	SEMICONDUCTORS	MISC.
LPF:			
	C1 = 2 x 1000pf		L1 = 4.7uh
	C2 = 560pf		L2 = 4.7uh
	C3 = 4700pf		
	C4 = unused		
	C5 = 560pf		
	C6 = 2 x 1000pf		
MIX:			
R1 = 3.3K	C1 = .047uf	D1 = 1N4007	
R2 = 6.8K	C2 = .1uf	D2 = 1N4007	
R3 = 1.0K			
TUNE:			
R1 = 3.3K	C1 = 330pf	Q1 = 2N2222A	T1 = FT37-43
R2 = 33	C1' = 15pf	X1 = 3.580Mhz	
R3 = 2.2K	C2 = 1000pf	LED = RED	
R4 = 2.2K	C3 = 3900pf		
R5 = 1.2K	C4 = .1uf		
	C5 = .047uf		
RCVR:			
R1 = 68	C1 = .047uf	Q1 = 2N4401	T1 = T37-2
R2 = 47K	C2 = .033uf	R6 = 1N34A	T2 = AUDIO XFORMR
R3 = 100	C3 = 100uf		
R4 = 22K	C4 = 10uf		
R5 = 2.2K	C5 = 100uf		
	C6 = 100uf		
	C7 = 12-180pf trim.		
	C8 = 220pf ???		

GENERAL:

Reggie][4 module panel, Bare PCB, Magnet wire, Tube of Super Glue, Hookup wire

The MIX module is about the simplest of the set with only 7 parts..



MIX:

R1 = 3.3K	C1 = .047uf	D1 = 1N4007
R2 = 6.8K	C2 = .1uf	D2 = 1N4007
R3 = 1.0K		

<< LPF MODULE PICTURE HERE >>

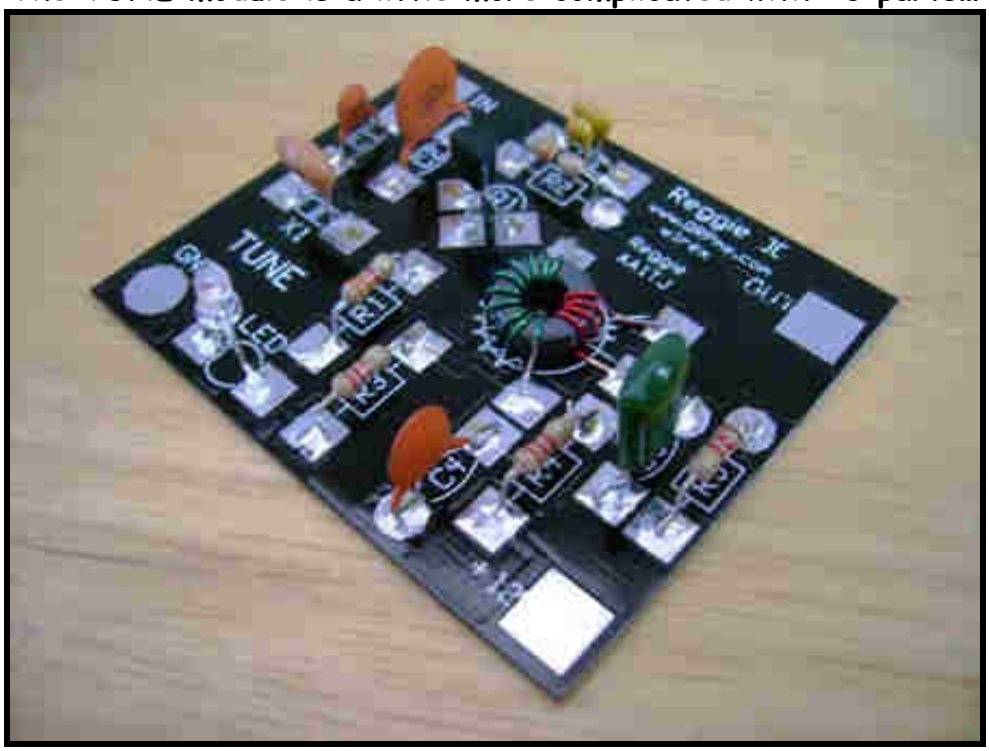
The LPF module has only 9 parts…

LPF:

C1 = 2 x 1000pf
C2 = 560pf
C3 = 4700pf
C4 = unused
C5 = 560pf
C6 = 2 x 1000pf

L1 = 4.7uh
L2 = 4.7uh

The TUNE module is a little more complicated with 13 parts…



TUNE:

R1 = 3.3K	C1 = 330pf	Q1 = 2N2222A	T1 = FT37-43
R2 = 33	C1' = 15pf	X1 = 3.580Mhz	
R3 = 2.2K	C2 = 1000pf	LED = RED	
R4 = 2.2K	C3 = 3900pf		
R5 = 1.2K	C4 = .1uf		
	C5 = .047uf		

T1 has 10 turns on the primary and 4 turns on the secondary.

The RCVR module is the most complicated of the lot with 17 parts.

<< RCVR MODULE PICTURE HERE >>

RCVR:

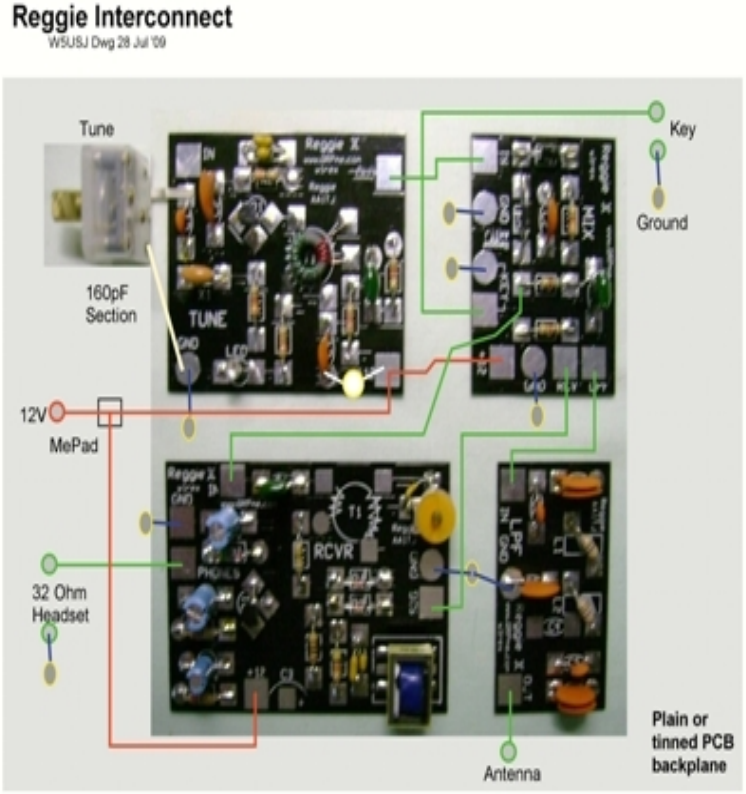
R1 = 68
R2 = 47K
R3 = 100
R4 = 22K
R5 = 2.2K

C1 = .047uf
C2 = .033uf
C3 = 100uf
C4 = 10uf
C5 = 100uf
C6 = 100uf
C7 = 12-180pf trim.
C8 = 220pf ???

Q1 = 2N4401
R6 = 1N34A

T1 = T37-2
T2 = AUDIO XFORMR

A *SUGGESTED* module layout to simplify interconnect wiring.



Note: T1 not connected in this drawing it really is there.

Tuning Capacitor: Use 160pF section with 130pF C1 in series -- Set variable trimmers to max
C_{Tmax} = (160 x 130) / (160 + 130) = 72pF -- C_{Tmin} = (20 x 130) / (20 + 130) = 20pF -- Range ~ 17 to 72pF