

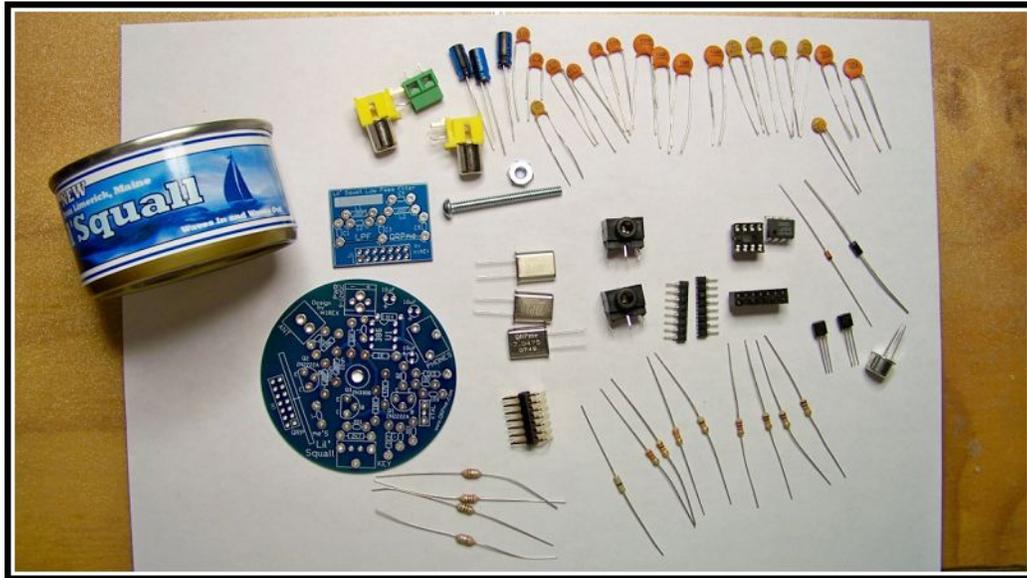
# **Simple Builder's Guide** to the **Lil' Squall Transceiver**



**Guide written by: NZ1I & W1REX**

**Version 1.1 April 11,2011**

**Version 1.2 May 2,2011**



Be sure to check [www.QRPme.com](http://www.QRPme.com) for latest kit files.

Also consider joining the 'QRPme\_Kits'  
Yahoo Group for the latest kit information.

Be sure to check the parts received against the List of Materials.

Go slow and take your time.

Remember, the journey is as much a part of the experience as the  
end result!



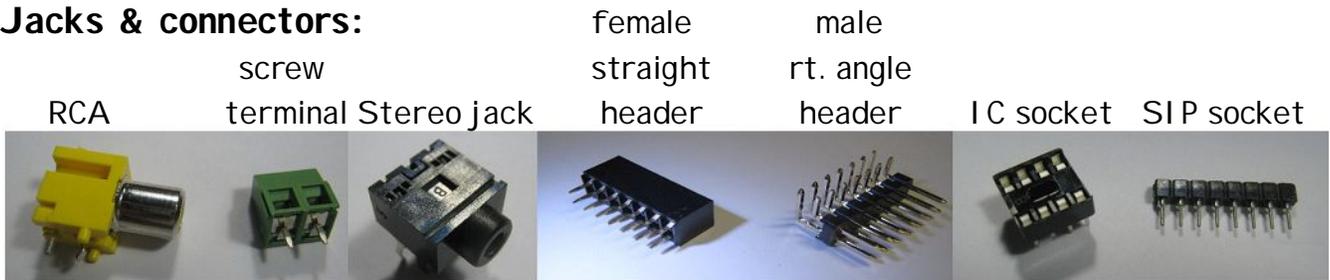
# List of Materials:

QTY Description (locations)

- ( ) 1- 2N3866 Transistor house marked as M 4-247 CG0001 (Q2)  
Disregard Silk Screen Marking Q2 as 2N2222A (2N3866 is better)
- ( ) 1- LM386 Audio Amplifier (U1) 8-pin DIP
- ( ) 1- PN2222A Transistor (Q1)
- ( ) 1- 2N3906 Transistor (Q3)
- ( ) 1- 1N914 or 1N4148 Diode (914)
- ( ) 1- 7.030 & 7.0475 & 7.122 Crystals (XTAL)
- ( ) 1- 0 Ohm Resistor (Tan Body with Black Stripe)
- ( ) 1- 1K Ohm Resistor (Brown-Black-Red)
- ( ) 1- 1.5K Ohm Resistor (Brown-Green-Red)
- ( ) 1- 2.2K Ohm Resistor (Red-Red-Red)
- ( ) 1- 2.7K Ohm Resistor (Red-Violet-Red)
- ( ) 2- 10K Ohm Resistor (Brown-Black-Orange)
- ( ) 1- 33K Ohm Resistor (Orange-Orange-Orange)
- ( ) 1- 47K Ohm Resistor (Yellow-Violet-Orange)
- ( ) 1- 22uH Choke (Red-Red-Black, Oval Shaped)
- ( ) 1- 100uH Choke (Brown-Black-Brown, Oval Shaped)
- ( ) 2- 82pF Capacitor (82) (1 @ 82, 1 @ .001)
- ( ) 2- 100pF Capacitor (101) (1 each to 100)
- ( ) 2- .001uF Capacitor (102) (1 @ .001, 1 @ C-T)
- ( ) 1- .047uF Capacitor (.47uF (473) in place of .05)
- ( ) 4- .1uF Capacitor (104) (2 @ .1, 2 for Mods)
- ( ) 3- 10uF Electrolytic Capacitor
- ( ) 1- 2 Screw Terminal Block
- ( ) 2- RCA Jack
- ( ) 2- Stereo Jack
- ( ) 1- 2x7x.1" Female Header (1)
- ( ) 2- 8 pin SIP Socket (IC Pins)
- ( ) 1- 8 pin DIP Socket for U1
- ( ) 1- 1/8" Screw and Nut
- ( ) 1- 1N5818 Diode
- ( ) 1- Lil' Squall PCB
- ( ) 1- Label

# Beginner's Stuff Some info on items on the above list of materials:

## Jacks & connectors:

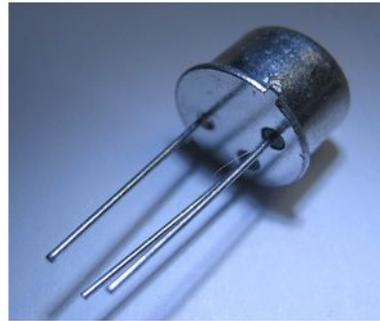
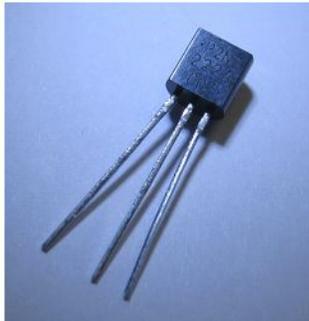


header connectors can have multiple rows of pins and all kinds of different pin spacings and configurations so they are further identified by their configurations: for example  
 2x7x.1" straight male = 2 rows of 7 pins straight 'male' fingers with .1" pin spacing  
 1x8x.1" female socket = 1 row of 8 IC socket pins with .1" pin spacing  
 the SIP in SIP socket stands for Single Inline Pins so it is always 1x something...

## Transistors:

transistors are polarized and have 3 leads to worry about getting into the right holes...

|                       |                 |                               |
|-----------------------|-----------------|-------------------------------|
| PN2222A               | 2N2222A         | 2N2219A or 2N3866             |
| TO-92                 | TO-18           | TO-39                         |
| plastic               | small metal can | large metal can               |
| E B C across the flat | C B E with E    | closest to tab on side of can |



## Diodes:

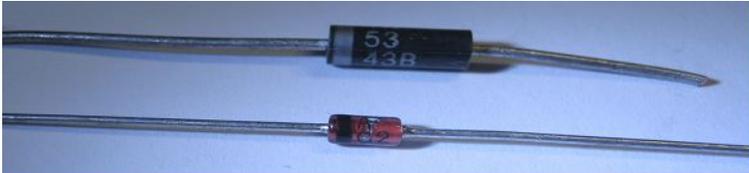
diodes have a polarity which is marked with a band close to one end of the body match the band with the band marked on the pcb silk screen

the diode type is marked with lettering...usually in 2 rows

the picture below shows a larger plastic encased diode and a small glass diode

the lettering on the black diode is: 1N (not shown 53 43B for a 1N5343B diode

the small glass diode has similar, but much harder to read, markings



## Resistors:



resistors are marked using bands of color which follow a code:

black=0 brown=1 red=2 orange=3 yellow=4 green=5 blue=6 violet=7 gray=8 white=9

the 1<sup>st</sup> band is the color band closest to the edge of the body

the 1<sup>st</sup> 2 bands convert to numbers and the 3<sup>rd</sup> band represents the # of zeros

in the above picture,

the BIG power resistor: brown-black-black = 1 + 0 + 0 zeros = 1 + 0 = 10 ohms

the little resistor = red-violet-orange = 2 + 7 + 3 zeros = 27000 = 27K



## Chokes:

chokes look like resistors but are a little tubbier or have a 'waist' and a different body color and colors bands are used similar to resistors but a little different

our friend the 27K resistor (top) is shown with 2 types of chokes (center & bottom)

center choke = brown-black-black = 1 + 0 + 0 zeros = 1 + 0 = 10uh

sometimes you have to identify a choke AFTER identifying all the other parts...

## Capacitors: (non-polarized)



caps are usually marked with 3 numbers for value and letters for temperature and tolerance specs. While it is not necessary to know all the spec codes, it is important to know that all 100pf (or any other value) caps are not the same. Some will love working with 200 volts while others will explode with a Ka-Pow! When you put 200 volts across them. When special caps are called for in particular spot, special identifying instructions are usually added to help you select the right one from the line-up.

The capacitor numeric code:

the 1<sup>st</sup> two numbers are followed by the number of zeros indicated by the 3<sup>rd</sup> number in the above picture, 473 is  $4 + 7 + 000 = 47000 \text{ pf} = .047 \text{ uf}$

the letter M (from THIS manufacturer) indicates +/- 20% and a temperature range of -10 degrees C to +85 degrees C

## Capacitors: (polarized)

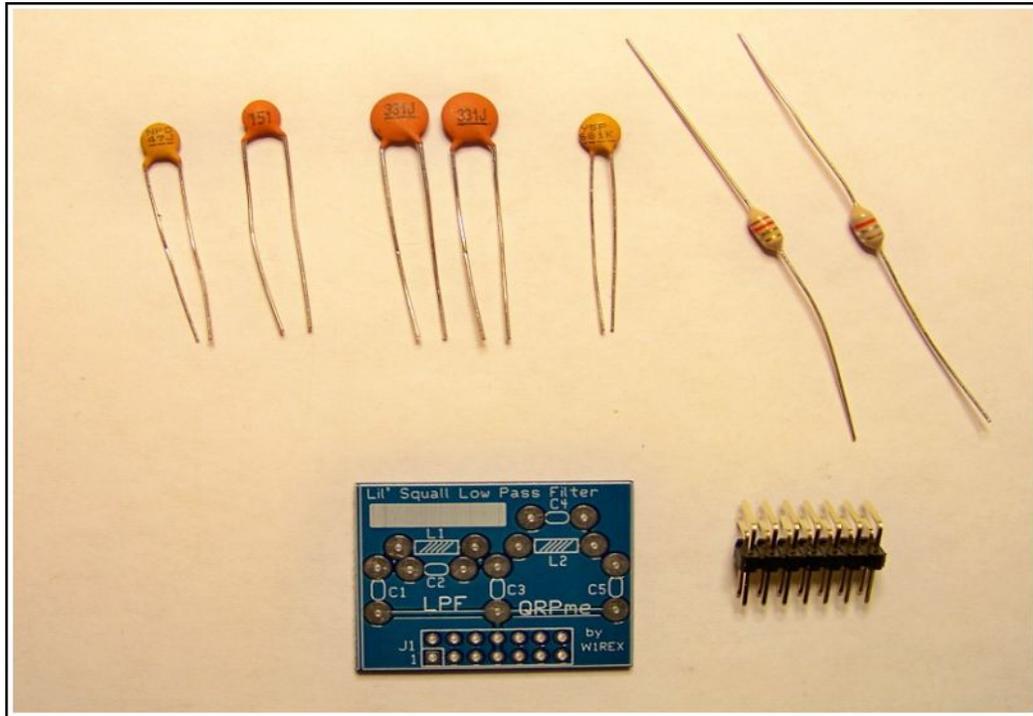


polarized or electrolytic capacitors are either marked similar to non-polarized caps if the body is real small or marked plainly on large body caps

in the above picture you can plainly read 22uf (with a working voltage of) 25 volts

**So that's all for the parts tutorial!**

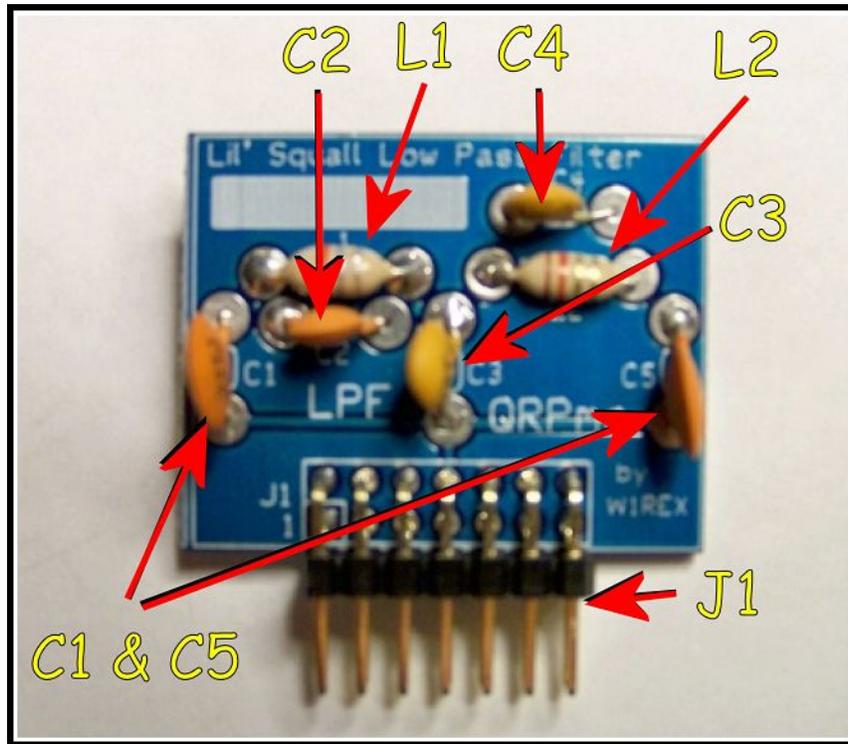
# Lil' Squall LPF 40m Band Module



## List of Materials:

- ( ) 1- Lil' Squall Low Pass Filter PCB
- ( ) 1- 47pF Capacitor (47J)
- ( ) 1- 150pF Capacitor (151)
- ( ) 2- 330pF Capacitor (331)
- ( ) 1- 680pF Capacitor (681)
- ( ) 1- 1.2uH Choke (Brown-Red-Gold, Oval Shaped)
- ( ) 1- .82uH Choke (Grey-Red-Silver, Oval Shaped)
- ( ) 1- 2x7x.1" Right Angle Male Header

## Construction of Band Module

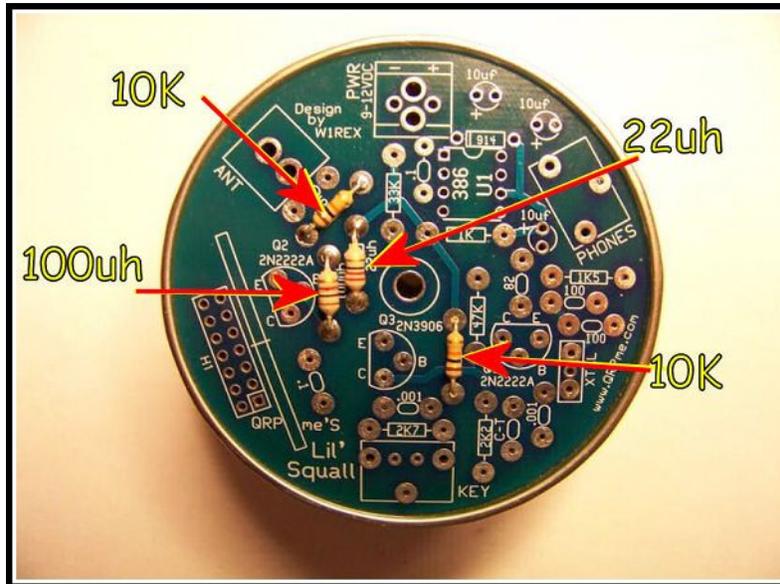


- ( ) Install 47pF Capacitor (47J) in C4
- ( ) Install 150pF Capacitor (151) in C2
- ( ) Install 1- 330pF Capacitor (331) in C1 and 1- 330pF Capacitor (331) in C5
- ( ) Install 680pF Capacitor (681) in C3
- ( ) Install 1.2uH Choke (Red-Brown-Gold, Oval Shaped) in L2
- ( ) Install .82uH Choke (Grey-Red-Silver, Oval Shaped) in L1
- ( ) Install Right Angle Male Header (with Shorter Pins into Bottom Front of LPF PCB)

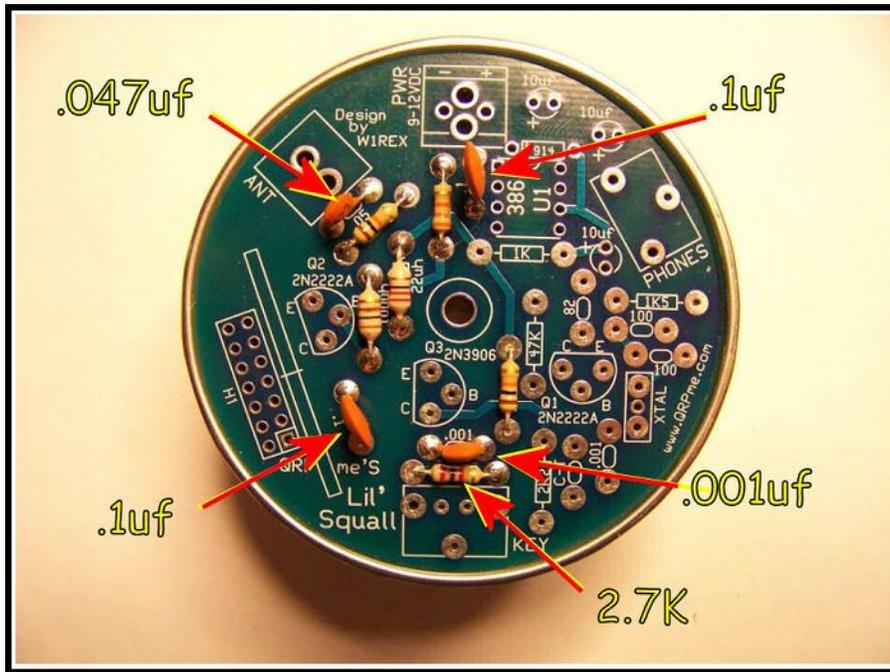
Don't Forget to Mark the LPF as 40 Mtrs in the Grey Rectangle in upper left corner!

The 40Mtr Band Module is now complete!

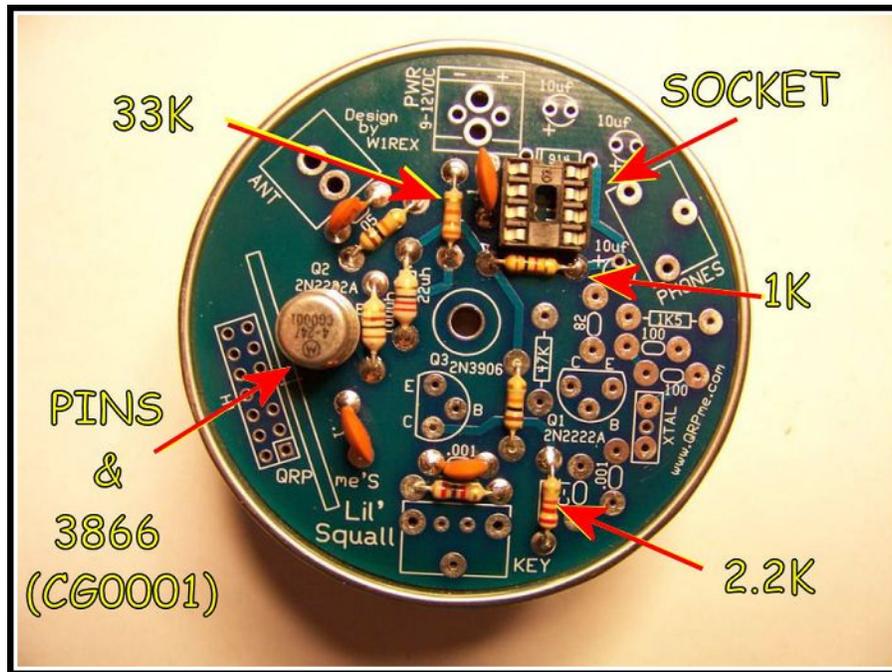
# Lil' Squall Construction



- ( ) Install 22uH Choke (Red-Red-Black, Oval Shaped)
- ( ) Install 100uH Choke (Brown-Black-Brown, Oval Shaped)
- ( ) Install 10K Ohm Resistor
- ( ) Install 10K Ohm Resistor



- ( ) Install .047uF Capacitor (.047uF (473) in place of .05)
- ( ) Install .1uF Capacitors (104) at .1, 1 at lower left, 1 at upper center
- NOTE: Leave .approx. 1/2" on the lower lead of the .1uF cap next to pin3 of the 386 U1.  
See install of socket U1..
- ( ) Install .001uF Capacitor (102) in .001 at bottom center
- ( ) Install 2.7k Ohm Resistor (Red-Violet-Red) at 2K7 bottom center

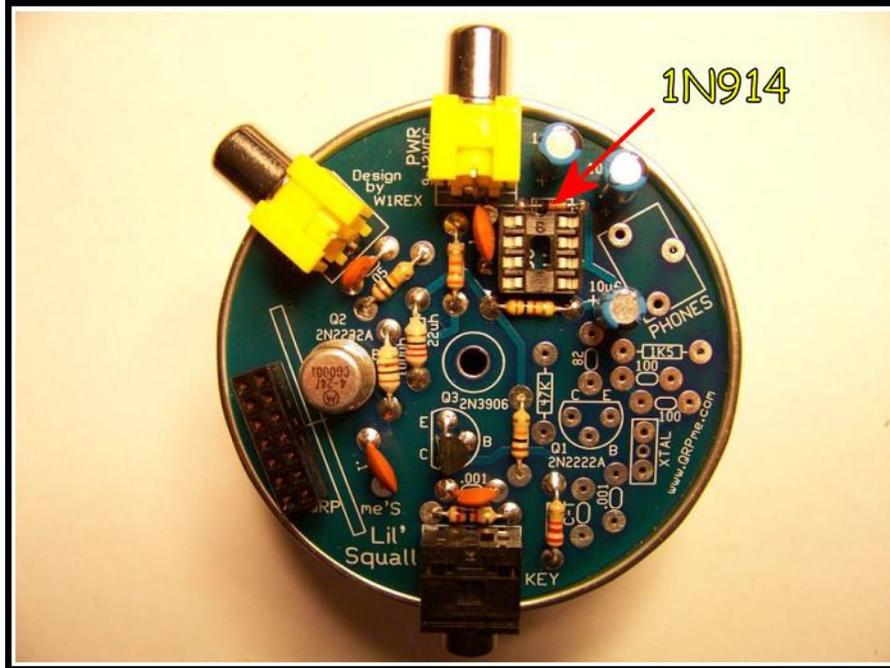


- ( ) Install 33K Ohm Resistor (Orange-Orange-Orange) at 33K top center.
- ( ) Install 2.2K Ohm Resistor (Red-Red-Red) at 2K2 bottom right
- ( ) Install 1K Ohm Resistor (Brown-Black-Red) at 1K top center
- ( ) Install 8-pin Dip Socket for U-1 **Note: Place Notch end of socket at top and solder in socket. Then bend over the excess lead from the adjacent .1uf cap and cut to fit and solder to pin2 of the 386 U1 socket.**
- ( ) Cut 3 pins from 8-pin Dip Socket; Install in Q2 holes, Install 2N3866 (marked M 4-247 CG0001) in Q2 **Note: You can hand press the pins onto the transistor leads ( or better yet: a similar good **or bad** transistor from your junk box) and then use the transistor as a handle for holding the pins in place while soldering. Tab on transistor case is closest to Emitter. Pins are E-B-C)**

If you used the supplied 2N3866 as a soldering handle, remove the good transistor for the remainder of the build.

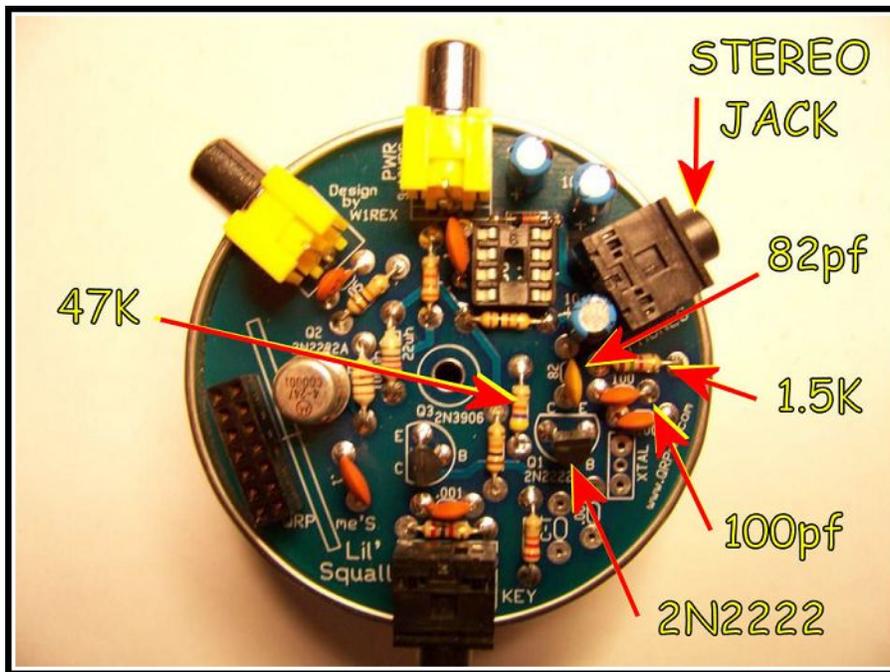
If you did use a dummy transistor for a handle, remove the transistor and return it to its 'lair' now.



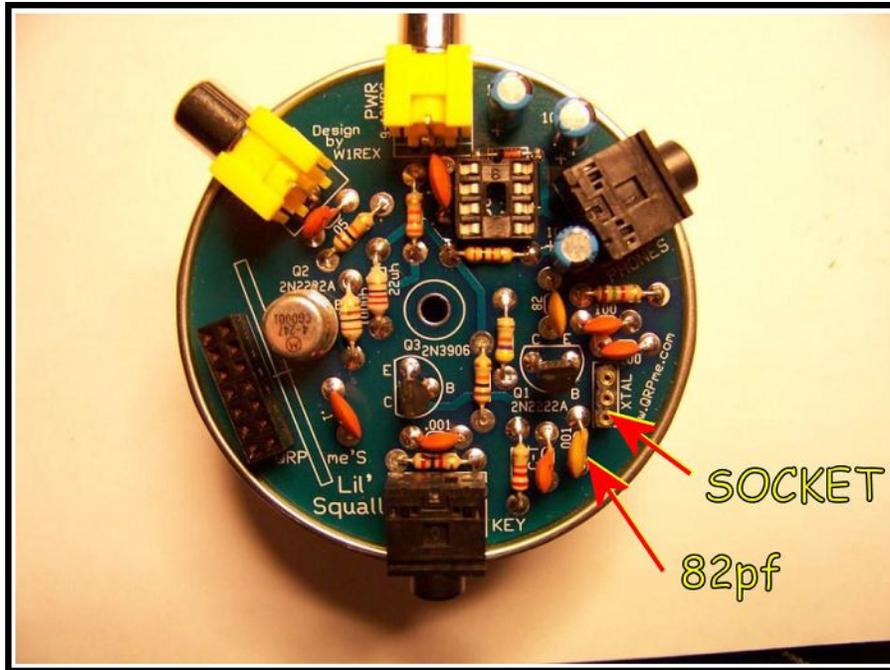


( ) Install 1N914 or 1N4148 Diode at (914) (Note Striped End to Left matching bar on silk screen. Bend Diode left lead over to adjacent .1uF Capacitor top pad, cut to fit and Solder to 914 pad AND .1uf top pad.)

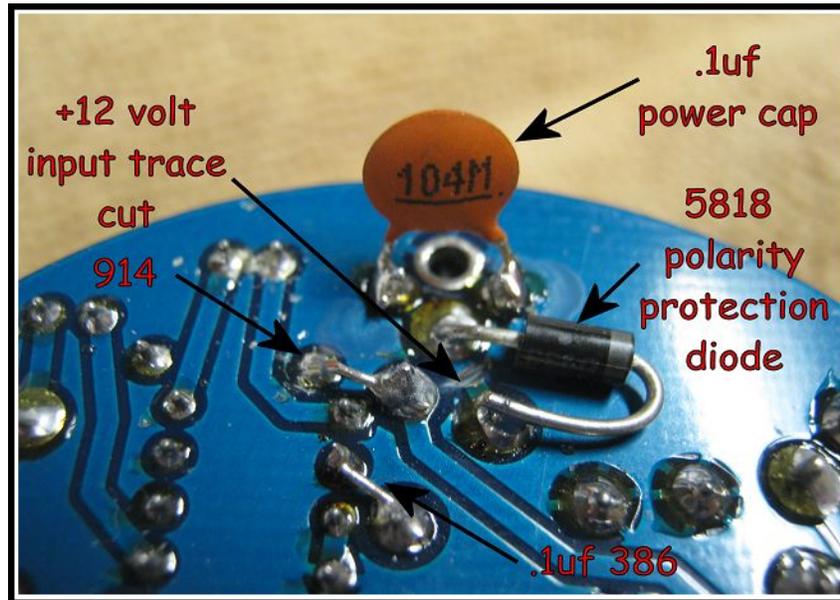




- ( ) Install 82pF Capacitor (82) at 82
- ( ) Install 47k Ohm Resistor (Yellow-Violet- Orange) at 47K **On the underside of the board, Bend the 47K Resistor Top lead over to the 10K Resistor top pad, cut to fit and Solder to both 47K pad AND 10K resistor top pad.**
- ( ) Install PN2222A plastic body TO-92 Transistor in Q1
- ( ) Install 1.5K Ohm Resistor (Brown-Green-Red) to 1K5 right side middle
- ( ) Install 100pF Capacitors (101) (1 each to two 100s)
- ( ) Install .001uF Capacitor (102) to C-T **Solder .001uF Cap (102) to C-T.**
- ( ) Install Stereo Jack at Phones



- ( ) Install 82pf Capacitor (82) to .001 Cut 2 socket pins from SIP socket strip, Press them onto the 82pf cap and solder (only the pins) in at 001 (right of C-T).
- ( ) Cut a 3pin section from 8-pin SIP socket strip. Install in XTAL holes and solder.
- ( ) Inspect ALL your work before moving on.



( ) Cut the trace between the +12 volt input pin and the top of the 33K resistor. **BE CAREFULL!** A quick touch with a Dremel cutter bit will work nicely. Or use a sharp Xacto blade and slice through the trace in two places slightly apart from each other. Touching the little 'island' created by the 2 cuts with a hot iron will quickly lift the trace off the board.

( ) Install 1N5818 Diode in the + (positive) Power lead.

To Prevent Reversing the Polarity of the Supply Power, install 1N5818 Diode in the + (positive) Power lead. Solder the 1N5818 diode between the + terminal of the jack and the Top Pad of the 33K Ohm Resistor right next to it. Stripe on diode goes on the end soldered to the resistor. Do this mod on the Bottom Side of the PCB.

( ) Solder .1uF Cap (104) across the +12 volt input pads.



( ) Solder .1uF Cap (104) from Collector of Q1 to ground. You might use a small piece of insulation from a piece of hookup wire or a piece of heat shrink tubing to insulate the cap's long lead heading over to the ground pad.



( ) Install board on top rim of the Lil' Squall can using supplied long bolt and nut. **Note:** 10uF Electrolytic Cap Pads closest to the edge of the PCB, at approx. 1 & 2 o'clock, could possibly short to the rim of the can. Use some electrical tape or similar to insulate the pads before installing the board on top of the can.

( ) Insert crystal of choice.

( ) Install U-1 at 386 U1 Insert LM386 with dot to Upper Left

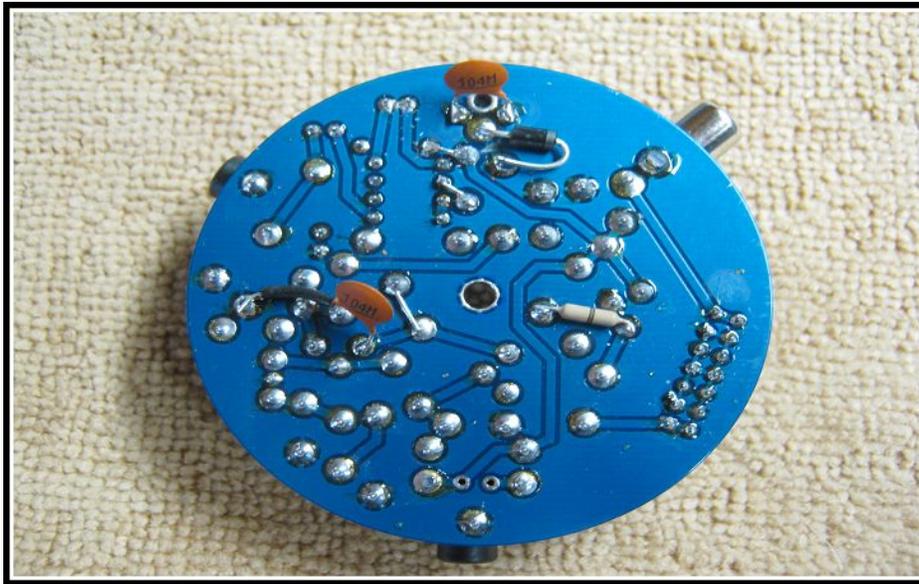
( ) Re-install 2N3866 in Q2 socket pins **Note orientation of Tab on transistor body.** Tab on transistor body is closest to emitter of transistor and is also shown on the silk screen designator.

( ) Install the band module board into header H1 with the components side facing out. **Note:** Make sure the Solder Side of the LPF band module does NOT come in contact with Transistor Q-2's metal case. Insulate with electrical tape or other similar material. I glued a piece of plastic to the entire back side of the LPF board. I cut the piece from a plastic top that comes with a can of peanuts.

**( ) Hook up your power, key, phones and antenna and you are good to go.**

## Complete Set of Mod Notes:

- 1 - Bend 47K Resistor Top Lead Over to the 10K Resistor Top Lead Pad, cut to fit and Solder to both 47K pad AND 10K pad.
- 2 - NOTE: Leave .approx. 1/2" on the lower lead of the .1uF cap next to pin3 of the 386 U1 for future mod.
- 3 - Note: Place Notch end of socket at Top and solder in socket. Then bend over the excess lead from the adjacent .1uF cap and cut to fit and solder to pin2 of the 386 U1 socket.
- 4 - Bend 914 Diode Left Lead Over to .1uF Capacitor Top Lead Pad and Solder.
- 5 - Solder 0 Ohm Resistor to 22uH Choke and Collector of Q2.
- 6 - Solder .001uF Cap (102) to C-T; Cut 2 socket pins from Sip socket strip, Press them onto the 82pf cap and solder (only the pins) in at .001 (right of C-T).
- 7 - Solder .1uF Cap (104) across Power Input pads. See Photo of back of board
- 8 - Solder .1uF Cap (104) from Collector of Q-1 to Ground. See Photo of back of board
- 9 - Note: 10uF Electrolytic Cap Pads closest to the edge of the PCB, at approx. 1 & 2 o'clock, could possibly short to the rim of the can. Use some electrical tape or similar to insulate the pads before installing the board on top of the can.
- 10 - Note: You can hand press the pins onto the transistor leads ( or better yet: a similar good **or bad** transistor from your junk box and then use the transistor as a handle for holding the pins in place while soldering. Tab on transistor case is closest to Emitter. Pins are E-B-C)  
If you used the supplied 2n3866 as a soldering handle, remove the good transistor for the remainder of the build.  
If you did use a dummy transistor for a handle, remove the transistor now.
- 11 - Note: Make sure the Solder Side of the LPF does Not come in contact with Transistor Q-2's metal case. Insulate with electrical tape or other similar material.
- 12 - To Prevent Reversing the Polarity of the Supply Power, install 1N5818 Diode in the + (positive) Power lead. This done by first cutting the + trace (lower hole for 2-screw terminal or left hole for RCA jack) that comes off the power jack. Next, soldering in the 1N5818 diode between the + terminal of the jack and the Top Pad of the 33K Ohm Resistor right next to it. Stripe on diode goes on the end soldered to the resistor. Do this mod on the Bottom Side of the PCB. See Photo of back of board



**Back side of Lil' Squall board with all mods in place**

### **Troubleshooting Notes:**

Google: 'QRP pixie motor-boating' and you will find BUNCHES of hits on theories & cures for motor-boating. The best one is to use a STOUT DC source to power your Lil' Squall rig. A 9 volt battery or huge 30 amp power supply from an old defunct QRO rig or a small plug-in 'wart' are all bad choices for a Lil' Squall power source. AC ripple from the supply will find its way into the audio circuit and produce very unpleasant sounds in your phones. Use a nice purely DC source like a 12 volt gel cell or a string of alkaline batteries to power your Lil' Squall rig.

**If you have any other good tips, I would like to add them here. Please send me an Email.**