

# Building the “Woodchip” QRPp Transmitter

## Introduction

The “Woodchip” is a simple to build QRPp CW transmitter for 40 meters. The Woodchip is a “universal” transmitter designed to work with the Sawdust regen receiver, but also works well with other receivers and vintage tube type shortwave receivers. The Woodchip is built on a double sided circuit board and mounted to a small wooden breadboard. The Woodchip is crystal controlled with a three position VXO allowing three operating frequencies from a single crystal. Sidetone and receiver muting is also provided and antenna switching is available with our T/R switch kit. An external key may be plugged into a board mounted jack.

## Building Rules

1. Take your time. We recommend that you take at least two or three hours to complete your kit. If you take your time, in three hours you can have a beautiful working project that you will be proud to own and operate.
2. If you don't know how to solder parts on a circuit board, get help. Learning to solder is not hard, but please do not start this kit if you have never soldered before!
3. Most of the parts are tiny. Please use a magnifying glass.
4. Build the kit by the instructions, one step at a time.
5. Use protective eyewear.
6. Be careful with the ICs and transistors to avoid damage from static.
7. All parts should be mounted flush or as close as possible to the circuit board keeping leads short. After soldering, clip all wires close to the board.

## Finishing The Breadboard

The wooden breadboard furnished with your kit is your opportunity to express yourself. You get to finish it any way that you like...pick your color, pick your finish. MAY WE SUGGEST THE FOLLOWING?

1. Use fine grit sand paper to remove any roughness from the wood.
2. You can use brush on or spray paint or stain or no finish at all...it's up to you.

3. You are in charge of getting the board ready. Three coats with light sanding between coats and about 24 hours of drying time will produce great results. NOTE: The decals that will be placed on your breadboard at the end of kit construction are black and red on yellow.
4. When the board is finished, locate the circuit board and place it on top of the breadboard. Center the circuit board and using a small nail, phillips screwdriver or other small pointed object, push a small starter hole into the breadboard at each corner mounting hole. The starter hole will help you to then drill a 1/16th inch hole at each starter hole. The drilled holes will be used to mount the assembled circuit board in the proper location at the end of the project. Place the breadboard aside for now.

## **Building the Circuit Board**

Tools and supplies needed to build the circuit board:

1. needle nose pliers
2. diagonal cutters
3. small flat blade and phillips screwdrivers
4. Magnifying glass
5. 20-40 watt soldering iron

## **Parts List**

### 1/8 watt resistors

- R1 470 ohm
- R2 1K ohm
- R3 10K ohm
- R4 1k ohm
- R5 1K ohm
- R6 1K ohm
- R7 36K ohm

R8 100 ohm

R9 33 ohm 1/4 watt

R10 1K ohm

R11 1K ohm

#### Capacitors

C1 10 pf ceramic disc npo

C2 0.47 uf ceramic disc

C3 82 pf ceramic disc npo

C4 0.1 uf ceramic disc

C5 150 pf ceramic disc npo

C6 0.1 uf ceramic disc

C7 390 pf ceramic disc npo

C8 0.1 uf ceramic disc

C9 0.1 uf ceramic disc

C10 820 pf ceramic disc npo

C11 150 pf ceramic disc npo

C12. 0.1 uf ceramic disc

C13. 390 pf ceramic disc npo

C14. 47uf electrolytic

C15 0.1 uf ceramic disc

C16 0.1 uf ceramic disc

#### Other Parts

IC1 NE555

Q1 2N3906

Q2 2N3904

Q3 2N3053

D1 1N4001

J1 2 pos. Terminal

J2 2 pos. Terminal

J3 2 pos. Terminal

J4 RCA Jack

J5 (labeled XTAL on board) made from 2 sip sockets

J6 Phone Jack

SW1 SPDT slide switch

SW2 SP3T slide switch

SW3 DPDT slide switch

L1 22 uh choke (red, red, black)

L2 1.0 uh choke (brown, black, gold)

L3 1.0 uh choke (brown, black, gold)

L4 10 uh choke or 15uh choke may be supplied

HC-39 Crystal (7030 KHz)

Heatsink

Decal

4 wood screws

4 black spacers

4 rubber feet

wooden breadboard

circuit board

## Building the Kit

Locate the parts bag. All of the parts required for circuit board construction are enclosed. You can work from the bag and find each part as it is called for, but placing all of the parts from the bag into a bowl or small plastic tray may make it easier to sort and properly identify the parts.

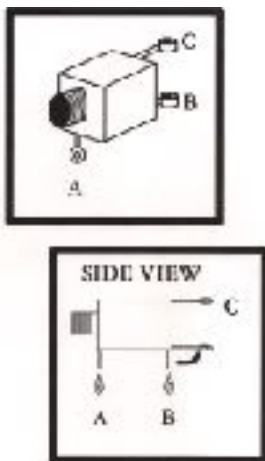
As each part is called for, be sure to identify it, then locate the proper mounting holes on the board. Insert the part and check its placement before soldering it in place. Cut all leads flush with the board. Photos of this kit on our website can usually be viewed and enlarged on your computer.

1. Mount and solder R1, 470 ohm (yellow, violet, black) Save one of the cut leads to be use later.
2. Mount and solder R2, 1k ohm (brown, black, red)
3. Mount and solder R3, 10K ohm (brown, black, orange)
4. Mount and solder R4, 1K ohm (brown, balck, red)
5. Mount and solder R5, 1K ohm (brown, black, red)
6. Mount and solder R6, 1K ohm (brown, black, red)
7. Mount and solder R7, 36K ohm (Orange, blue, orange)
8. Mount and solder R8, 100 ohm (brown, black, brown)
9. Mount and solder R9, 33 ohm (orange, orange, black) 1/4 watt
10. Mount and solder R10, 1K ohm (brown, black, red)
11. Mount and solder R11, 1K ohm (brown, black, red)
12. Mount and solder C1, 10 pf. (101) ceramic disc
13. Mount and solder C2, 0.47 uf. (474) ceramic disc
14. Mount and solder C3, 82 pf. (820) ceramic disc npo
15. Mount and solder C4, 0.1 uf. (104) ceramic disc

16. Mount and solder C5, 150 pf. (151) ceramic disc npo
17. Mount and solder C6, 0.1 uf. (104) ceramic disc
18. Mount and solder C7, 390 pf. (391) ceramic disc npo
19. Mount and solder C8, 0.1 uf. (104) ceramic disc
20. Mount and solder C9, 0.1 uf. (104) ceramic disc
21. Mount and solder C10, 820 pf. (821) ceramic disc npo
22. Mount and solder C11, 150 pf. (151) ceramic disc npo
23. Mount and solder C12, 0.1 uf. (104) ceramic disc
24. Mount and solder C13, 390 pf. (391) ceramic disc npo
25. Mount and solder C14, 47 uf. Electrolytic
26. Mount and solder C15, 0.1 uf. (104) ceramic disc
27. Mount and solder C16, 0.1 uf. (104) ceramic disc
28. Mount and solder IC1, NE555
29. Mount and solder Q1, 2N3906
30. Mount and solder Q2, 2N3904
31. Mount and solder Q3, 2N3053 (leave about 1/8th of an inch spacing between the board and transistor body to aid in cooling)
32. Mount and solder D1, 1N4001
33. Mount and solder J1, 2 pos. Screw Terminal
34. Mount and solder J2, 2 pos. Screw Terminal
35. Mount and solder J3, 2 pos. Screw Terminal
36. Mount and solder J4, RCA Jack
37. Mount and solder L1, 22uh choke
38. Mount and solder L2, 1.0 uh choke

39. Mount and solder L3, 1.0 uh choke
40. Mount and solder L4, 10 uh or 15uh choke (mounts vertically)
41. Mount and solder the 2 sip sockets at the holes labeled "XTAL" (this will create a flush socket for the crystal so that different frequency crystals may be used.)
42. Mount and solder SW1 SPDT (may be a tight fit...make sure switch is all the way in)
43. Mount and solder SW2 SP3T switch (fits only one way)
44. Mount and solder SW3 DPDT switch ( will be a tight fit and require careful alignment and perhaps slight adjustment to the pins).
45. Locate J6 a 1/8th inch phone jack and it's mounting position on the right front side of the circuit board. Refer to diagram 1 and modify the two lower soldering lugs to fit in the two mounting holes closest to the right front side of the board. Bend the lower back lug (lug B) 90 degrees so that it points down like the front lug. Using diagonal cutters, clip off the ends of lugs A and B as close as possible to the soldering hole. The remaining lugs should be as long as possible so that they will fit through the mounting holes in the circuit board. Place J6 into position with lug A and B in the mounting holes and solder with J6 flush against the board. The lugs may need slight trimming with the diagonal cutters to fit the holes. Lug B may not come all the way through the hole, but a little extra solder to fill the hole will sufficiently hold it in place. Use one of the wire leads saved from a resistor to complete mounting J6. Pass one end of the wire through lug C of J6 and into the circuit board mounting hole. Secure the top end of the wire to lug C of J6 and solder in place. Solder the other end of the wire on the bottom of the board and clip the excess wire.

Diagram 1.



This completes construction of the circuit board. Inspect the board for proper parts placement. Make sure that solder connections are good and that there are no solder bridges.

### **Final Assembly**

1. Mount the circuit board to the wooden breadboard with the black spacers and brass wood screws.
2. The peel and stick-on decal should be place on the front of the bread board.
3. Place the four rubber feet on the bottom of the breadboard (one in each corner).
4. Place the heatsink on final amplifier Q3. (be careful to spread the heatsink open so that it will easily slip on and not cause the transistor to bend the mounting wires). Apply silicone heatsink paste if available.

### **Using The Woodchip**

It is assumed that the operator has an understanding of antennas, SWR, DC power and CW (Morse code) operation.

**Antenna:** The antenna must be suitable for 40 meter operation. The antenna should be near resonance or attached to an antenna tuner. A high SWR will limit power and could damage the transmitter. When using the Woodchip with a receiver, the easiest way to provide a signal to the receiver is to use a separate antenna to the receiver, which can be as simple as a 20-30 foot wire. A better option is our external T/R switch that can provide a means to switch the transmitter antenna as well as simultaneously mute the receiver via ground short or open circuit. It will also allow the use of a foot switch for semi break-in operation.

**Power:** The power supply must be D.C. 12.0 to 14.0 volts. (battery or filtered supply) NOTE: When using the Woodchip with the Sawdust or Sawbuck receiver, best performance will be had from using a separate power source for the receiver. A 9.0 volt battery works well with the Sawdust and 12 to 14 volt supplies should be used with the Woodchip.

**Keying:** A straight key or electronic keyer should be connected to J6 with a 1/8 inch phone plug (use ring and tip). Most electronic keyers will work.



Sidetone is available at J2 when SW3 is in TX and the transmitter is keyed. It can be fed the the receiver audio or speaker. The tone is voltage blocked by capacitor C2. Alternately, a small speaker may be attached at J2.

Muting is accomplished when the RX/TX switch (SW3) is in the TX position. This causes J3 to close to ground. When used with the Sawdust or Sawbuck receiver, this action causes the receiver audio to be shorted to ground.

The crystal socket (J5) will accommodate HC-39 40 meter crystals. One is supplied with your kit. The switch operated VXO has three settings. One of the settings will allow the crystal to operate very near it's stamped frequency. Another switch position places a small capacitor in series with the crystal and raises the operating frequency. The third position places a small choke in series causing the frequency to shift lower.

### How To Spot a Signal

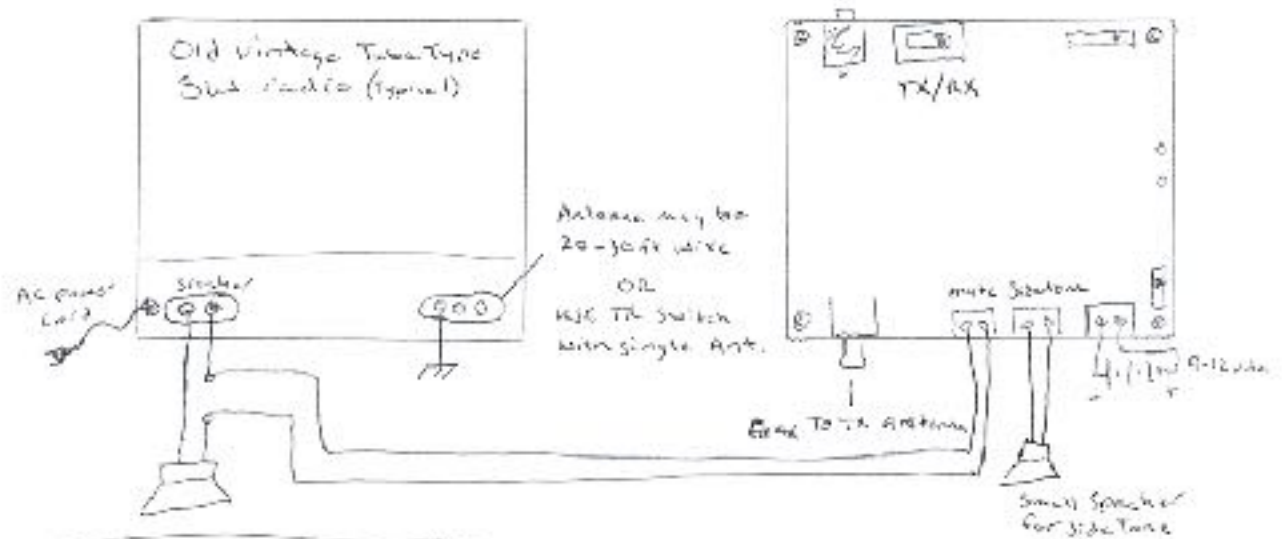
1. When the RX/TX switch is in the RX position, the Woodchip's final amplifier is not energized. When the key is depressed, only the oscillator transistor is emitting low level R.F. The signal is not enough to damage the receiver, but can be heard, allowing you to locate (or SPOT) where your transmitted signal will be heard by others when in the TX mode.

### Problems

If you have any problems with your kit, please email us at: [w4fsv@breadboardradio.com](mailto:w4fsv@breadboardradio.com) You can also refer to our website at: [www.breadboardradio.com](http://www.breadboardradio.com)

## Inter-connections from Woodchip to a Sawdust or other receiver

### How to use Vintage tube Receiver with Woodchip

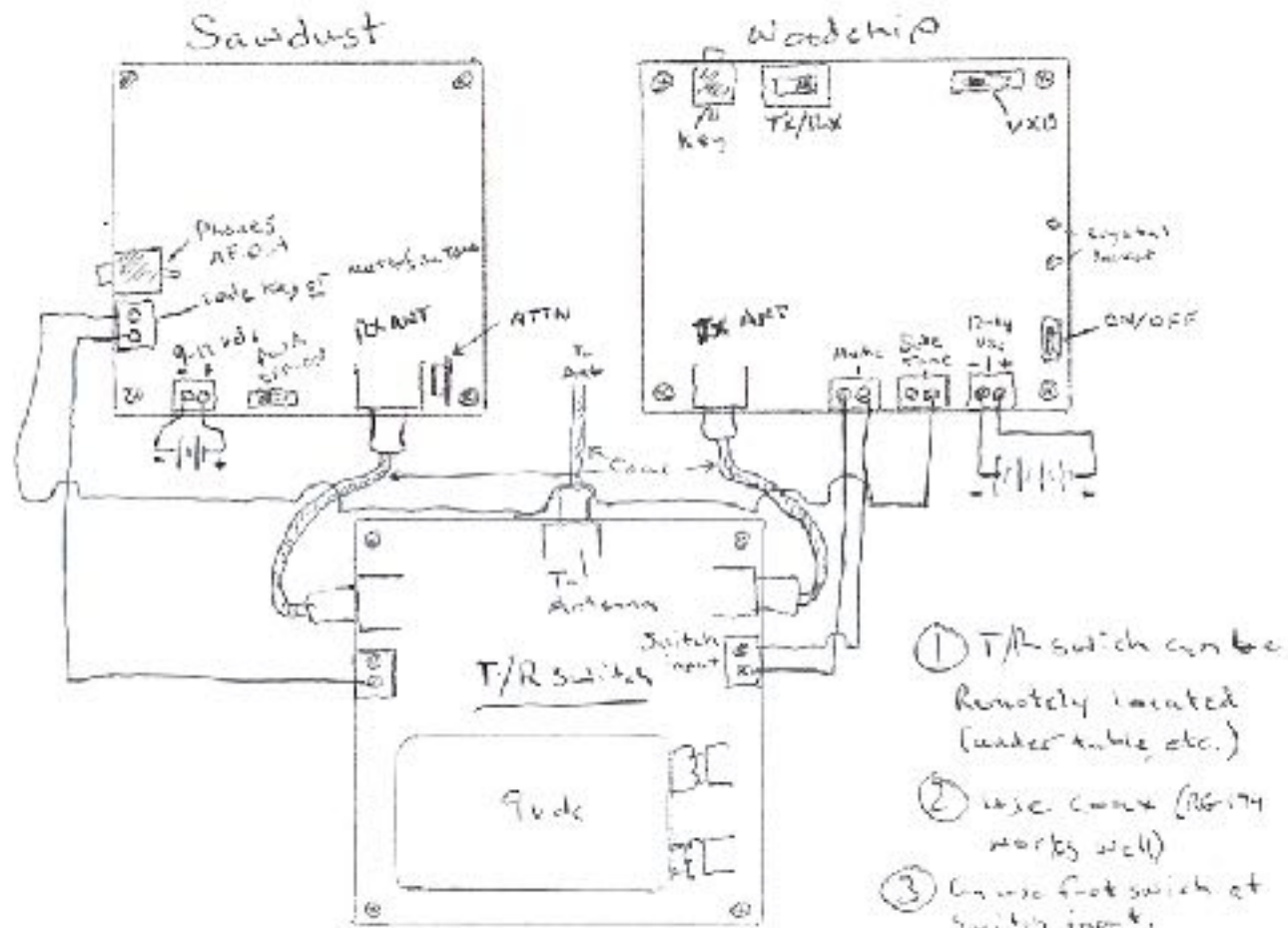


#### Easy Alternative:

- ① Do not use Woodchip mute.
- ② Leave woodchip in TX position.
- ③ Turn down RF amplifier on receiver - use TX signal as side tone

- ① To spot use RX with AF/AF turned down and woodchip in RX position - key woodchip and listen for signal in RX.

## Better Set-up with Broadband Audio T/R Switch



- ① T/R switch can be remotely located (under table, etc.)
- ② use coax (RG-174 works well)
- ③ Use foot switch at switch input.

(2) Use separate RX and TX Power  
9 volt battery works well & Soundcast

# "Woodchip"

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