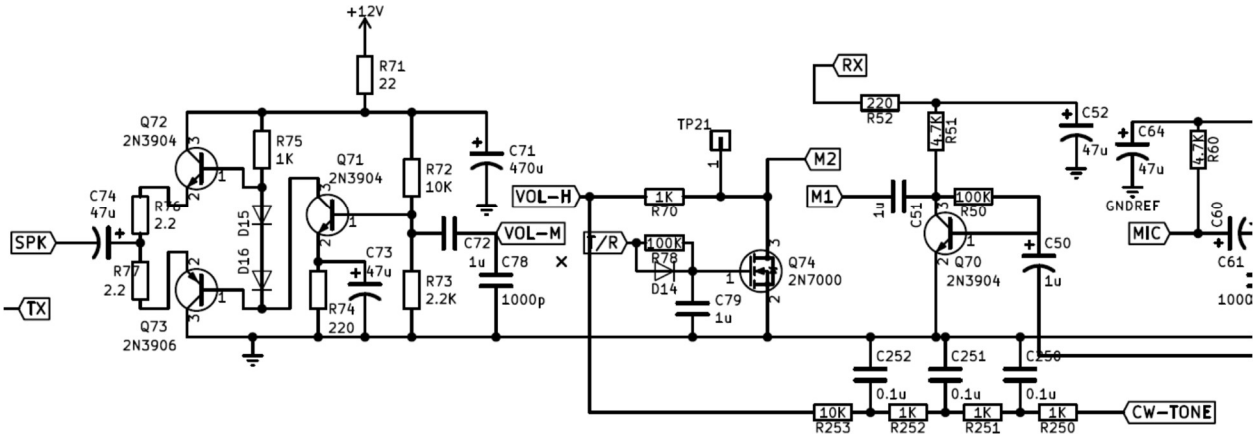
Reducing Sidetone Volume

Purpose & Discussion

The µBITX's CW sidetone, that is, the audible tone heard either through the built-in speaker or headphones, is – to my ears – uncomfortably loud. It is also coupled to the volume control so that the tone is louder if the volume is turned up and quieter if the volume is turned down. This is a challenge if attempting a QSO with a weak signal. If the volume is up to hear weak signals the sidetone is very loud. Turning the volume down to reduce sidetone level may prevent hearing weak signals.

The µBITX schematic illustrates this.



The CW-TONE signal is a +5V square wave generated by the Raduino. It feeds a three stage low pass filter comprised of R250, C250, R251, C251, R252, C252, and R253. The filtered signal is then applied to VOL-H which connects to the "high" side of the volume control potentiometer. Two challenges exist with this configuration. First, reduce the amplitude of the tone and second, decouple it from the volume control.

Based on a suggestion from Steve, N3SB, the concept was to remove the connection from R253 to the volume control and connect it at VOL-M, the direct input to the audio power amplifier. To bring the sidetone volume done, the forums contained a suggestion to replace R253 with a 220K Ohm resistor.

Parts

3.3M Ohm Resistor
Soldering iron, needle-nose pliers, wire cutters, knive

Procedure

1. Remove the board from the case.
2. Cut the trace connecting R253 and the off-board connector, near the resistor. This disconnects the sidetone from the volume control. Alternatively, you can remove R253 but this changes where the 3.3M Ohm resistor will be attached.
3. Carefully scrape a small section (2 or 3 mm) from the section or trace connected to R253 to expose a solderable area.

4. Trim one lead from the resistor to about 7 mm and bend it so it contacts the trace when the resistor is flat on the board. Tin both the lead and the exposed trace for easy soldering.
5. Using a small piece of wire, solder it to the other end of the resistor, near the resistor body, and trim the remaining resistor lead.
6. Trim the wire to the appropriate length to connect to the node between C72 and C78, and trimming back about 2 mm from the end, solder it to one of the surface mount capacitors at that node, C72 or C78.
7. Holding the resistor flat on the board so the short end touches the exposed trace, gently solder it in place.
8. Reassemble and test.

Result

Following both the forum's and Steve's suggestion, I inserted a 250K Ohm trim pot between R253 and the node of C72 and C78, configured as a variable resistor. This involved cutting the trace near R253. Setting the trim pot for maximum resistance, the sidetone volume was still uncomfortablely loud. Connecting the unused leg of the trim pot to ground, turning the variable resistor into a voltage divider, allowed adjustment of the sidetone level to zero, but also reduced the receive audio to zero due to the low impedance of the voltage divider when the sidetone was a comfortable levels.

Removing the trim pot, and conducting experiments with increasing values of resistors, 3.3MΩ gave a comfortable side tone volume through headphones. There was very little sidetone audio from the speaker and this is commensurate with the performance of the audio power amplifier.

The final installation is pictured below. You can see marks from cutting the trace under the left end of the resistor.