

Rescaling the MRX-40 Receiver for 80 Meters

Last October I found myself on a flight to Tyndall Air Force Base in Florida to meet my new grandson, Kyle Charles Stanfield II, born Sept 27, 2000, to my daughter, Gwen, KB4UNT, and her husband, Kyle, KF4TIV. Before leaving, I put a request on the QRP-L e-mail reflector (qrp-l@lehigh.edu) for ideas or designs for a companion receiver kit to match the NoGANaut 80-meter transmitter. Several folks replied, including Mike Boatright, KO4WX, who said he'd meet me at the Atlanta airport during my layover and show me his newly completed design.

After a two-hour flight, I met Mike in Atlanta. He took me into the Delta Air Lines Crown Room, where we had a great

time talking QRP. Mike pulled out his new receiver, a redesign of the MRX-40 ("The MRX-40 Mini Receiver" by Steve Bornstein, K8IDN, *QST* September 1997, page 59), for use on 80 meters. Mike furnished me with a basic parts kit, a PC board and a set of modification instructions. I decided to build the receiver while on vacation in Florida.

Subbing Parts

Figure 1 shows the modified schematic of the MRX-80 receiver, set up for operation on the NoGA (North Georgia QRP Club) net frequency, 3686.4 kHz. Mike substituted the NE612 (U1) used on the MRX-40 with a NE602 since the latter has 4 dB more conversion gain. The

LM380 (U2) was also changed to a LM386, which is a more easily obtainable part. Although the LM386 has less output power, it is adequate for use with headphones. C10 was included in the audio stage to increase the LM386's gain to approximately 200 (46 dB). Finally, the 6-V regulator used in the 40 meter version was replaced with a 78L08 (8-V) regulator. The 78L08 is about top end for the mixer chip, but it yields an additional 1dB of conversion gain in the NE602.

In order to make the MRX-40 work on 80 meters, the LC ratios had to be rescaled. C1 worked out to 172 pF. By paralleling one 150 pF with a 22 pF capacitor, the desired value is achieved. Mike thinks a 180 pF would also work

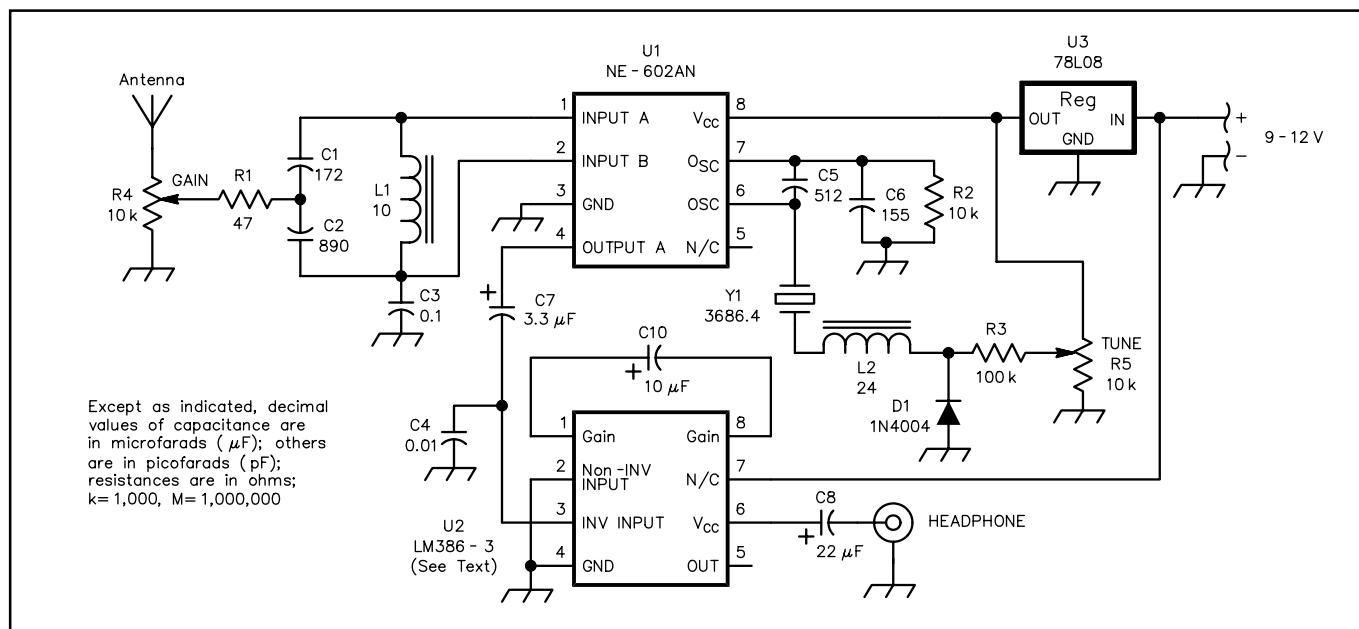


Figure 1—Schematic diagram for the MRX-80 receiver (an MRX-40 converted to 80 meters).

Component Changes:

U1, the NE612, was replaced with an NE602. Either component will work in this circuit, however, the NE602 has 4 dB more conversion gain than the NE612.

U2, the LM380, was replaced with an LM386. The LM386 is a more easily obtainable part (available at most Radio-Shack stores) than the LM380N-8. However, it does have less power output. The LM386-3 provides up to 700 mW of power, more than adequate for headphone use. Note that C10 was

added to the circuit to boost the LM386 gain to 46 dB (200).

U3, the 78L06 was replaced with a 78L08. Either component will work in this circuit, but running the NE602 at 8 V yields an extra 1 dB of conversion gain.

RF Component Scalings:

C1—scaled to 172 pF ($X_c = 250 \Omega$); not a standard value, but can be made using a 150 pF and a 22 pF (or 20 pF) in parallel. A 180 pF would probably work also.

C2—scaled to 890 pF ($X_c = 48 \Omega$); not a standard value, but can be made using

an 820 pF and a 68 pF (or 82 pF) in parallel.

C5—scaled to 512 pF ($X_c = 84 \Omega$); not a standard value, but 470 pF works just fine as a replacement.

C6—scaled to 155 pF ($X_c = 277 \Omega$); not a standard value, but 150 pF is close enough.

L1—scaled to 10.6 mH ($X_L = 246 \Omega$); can use standard value 10 mH molded inductor

L2—scaled to 28 mH ($X_L = 660 \Omega$); can use standard value 27 mH or 33 mH molded inductor.

well. Same with C2, which scaled to 890 pF. By paralleling an 820 pF with a 68 pF you can get very close to the 890 pF capacitance. C5 and C6 were rescaled to 512 pF and 155 pF respectively. A 470 pF works for C5 while 150 pF works for C6. L1 and L2 are rescaled to 10.6 μ H and 28 μ H respectively. Standard-value 10 μ H and 27 μ H molded inductors work just fine for these two inductors.

Mike's PC board is what I call "Ugly Manhattan Style" construction. Everything is soldered to the circuit pads *etched on top of the PC board*. This saves drilling holes and, in the case of standard "Manhattan Style" construction, gluing the small pieces of PC material to the main PC board groundplane. I'd never tried this style construction before and was pleasantly surprised at how easily and rapidly the circuit went together. Total construction time was around one hour. I clipped a 9-V battery to the circuit, plugged in the headphones and wire antenna and was rewarded with CW near the 3686.4 kHz operating frequency. There are virtually no alignment steps after the receiver is built and working.



Figure 2—My version of the MRX-80.

Just plug everything in and listen to 80 meters.

Great Little Receiver

How well does this little receiver work? Considering the simplicity of design and minimal parts count, I am amazed! Granted there is only a 500-600 Hz swing using the tune control, which severely limits the tunable reception, but for coupling to a NoGANaut transmitter or KnightLite SMiTe transmitter (also on 3686.4 kHz) the MRX-80 is just the ticket. There is no AF filtering to speak of, so you hear a lot of stuff around the

operating frequency. It would not be hard to include an active AF filter on output of the receiver to help limit the AF bandwidth. Figure 2 shows my MRX-80 receiver.

Mike's idea of rescaling the MRX-40 into an 80-meter receiver was brilliant. The overall simplicity of design and common parts means that most people can build one on a shoestring budget. While the MRX-80 is not on par with a superhet design, it certainly will work well for the intended purpose, which is 80 meter net operations. You could pair the MRX-80 with any 80-meter transmitter. Those folks who modified their Tuna-Tin II transmitters for operation on 80 now have a companion receiver.

This is a fun project. My thanks to Mike Boatright, KO4WX, for sharing his redesign of the MRX-40 with the readers of "QRP Power." This receiver should be dead simple to duplicate using perfboard or Manhattan Style construction. Parts are easily obtainable and there's not much to go wrong. Should you desire a one-night project, why not try the MRX-80 receiver? 