160-Meter Transverter

Although my Hammarlund HX-50A transmitter has done a yeoman's service on the 160-meter band for almost 20-years (along with a Collins 75A-4 receiver), it is still a "pain in the posterior" to use, especially during contests. Then, with the addition of my home brew pair of GI-7bT 160-meter linear, the operating limitations became unbearable. So, I decided to build a transverter to allow some of my better equipment to function on the 160-meter band.

The original plan was to use one of my 6-meter transceivers as the i.f. Many years ago I had built a receiving converter that took the 160-meter band to 51.8 MHz to 52.0 MHz which worked very well. However, although using a 50 MHz as the intermediate frequency works very well on the receiving side, it has MANY problems on the transmitting side. So, I went looking for some possible alternatives. In various editions of the ARRL SSB Manual and in various editions of the Radio Amateur's Handbook, there was a transverter project which used the 80-meter band as the i.f. This particular project uses a 6T9 as the crystal oscillator and transmitting mixer driving a single 6146B/8298A. The receiver front end / mixer uses a 6EH7.

I looked through my stock of crystals and had a 9000 kHz crystal. Using that frequency with a 40-meter i.f. results in a 160-meter signal. Then came the choice of tubes to use. The drive from a 6T9 into a 6146B/8298A is just not enough to result in the 70 watts, or so, need to drive my 160-meter linear. So, I decided to use the ARRL circuit to provide suggestions as to the circuit but not as a real model.

The crystal oscillator became a 6C4 which works very well at the 9 MHz frequency. Then the transmitting mixer became a 12BY7 the circuit of which was "robbed" from the Hallicrafters HA-6 6-meter transverter. Of course, the tuned circuits were changed. I had already decided to use a pair of 6146A/8298 tubes in the final. The 12BY7 provided enough drive to get between 30 and 35 watts out of the final amplifier tubes. Obviously, another stage of amplification was needed. Since I have a very good stock of 2E26 tubes (little brother to the 6146) it was decided to incorporate a 2E26 as the driver stage. Then, after several tries at a circuit for the final pair of 6146A/8298 tubes the circuit published in the ARRL publications as the "Little Firecracker" was used. Of course, the tuned circuits had to be changed but the basic design is very good.

After this portion of the transverter was completed, about 3-watts from a 40-meter source produces over 100 watts output! That is plenty to drive my 160-meter linear.

My original design for the receiver front end / mixer used a 6CB6. This worked. Unfortunately, the sensitivity of this circuit was not good! Therefore, I started looking around for an equivalent of the 6CB6 that would give more gain and the 6EW6 looked good. Replacing the 6CB6 with a 6EW6 resulted in a greatly improved sensitivity. However, the absolute sensitivity was still not good enough for outstanding operation. So, I looked at the 6DC6. The base diagram is identical to the 6CB6 and 6EW6. The only thing is that the operating voltages are less than those tubes. I increased the value of both the plate dropping resistor and the screen dropping resistor. Plugging in the 6DC6 resulted in an MDS/LDS of well under 0.1 microvolts. This is more than enough sensitivity for 160-meter operation.

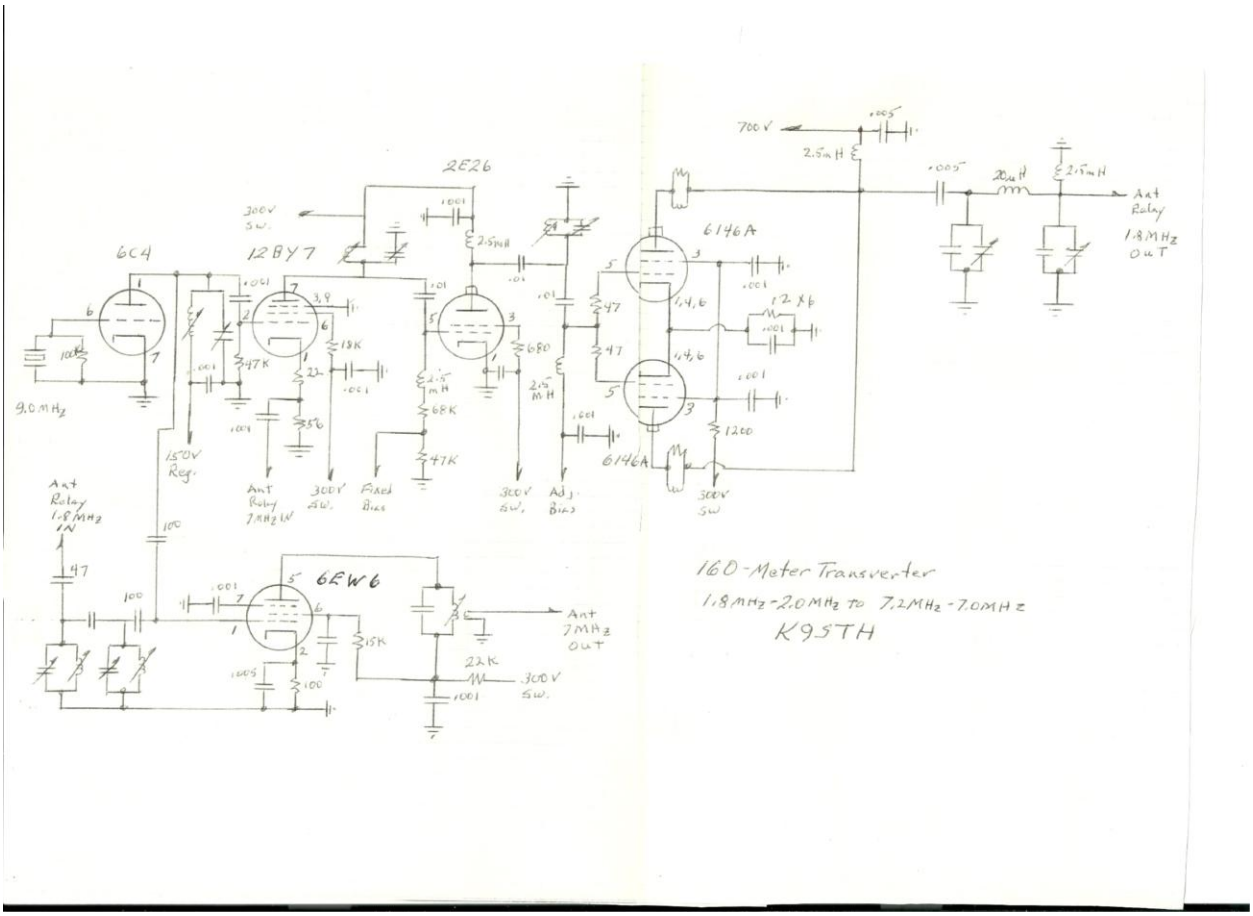
For the i.f I was contemplating on using one of my Collins "S" Lines or my Heath SB-Line. I was already using my Heath SB-301 receiver and SB-401 transmitter as the i.f. for my 2-meter Hallicrafters HA-2 transverter and had the capability of using it with my Hallicrafters HA-6 6-meter transverter. So, I decided to add the 160-meter transverter to the mix.

Although both Hallicrafters transverters can handle the full output power of the SB-401 it was way too much for the 160-meter transverter. Therefore, I decided to do like is done with the Heath SB-500 2-meter transverter and remove the screen voltage from the final amplifier section. However, the SB-500 takes the transmitter output from the driver stage in the SB-401 and this would require using an external

antenna changeover relay. Then, playing around with screen voltage I discovered that about a 30 volt screen voltage resulted in just over 3-watts output. So, I built an interface unit with a relay that either connects the normal screen voltage or 30 volts from a small power supply built into the interface unit. Then, to prevent applying full power from the transmitter to the transverter I added a DOW Key relay which only allows 3-watts to be applied to the transverter when the 30 volts is applied to the screen.

After getting everything set up on my main operating console it was time for a “smoke test”. Everything works great! There is plenty of drive for my linear and the receiver is working very well. The only thing is that the mid-September (2011) noise level is very high (rain storms were in the area). Now all that I have to do is to wait for the 160-meter contest season!

Following are photos and the schematic of the transverter. The only thing different on the schematic is that the receiver front end / mixer is now a 6DC6.



Schematic of 160-meter transverter. Only real difference between this and the final product is that the 6EW6 is now a 6DC6.

Here is the completed 160-meter transverter