

“The Box” – A Home Assembled RF Amp

I have a few QRP transmitters and old rigs around the shack that I run at low power, but I often want to boost up the output during summer evenings of QRN and low solar flux here at the bottom of the solar cycle. After checking out the price of small linear amps available commercially, I decided I could do better by assembling my own. (Or at least have more fun.)

Not wanting to start from scratch, it occurred to me that there are lots of old transceiver parts available on eBay that I might assemble into a useable amp. I envisioned three main pieces of work in doing so: an attenuator, the actual RF amplifying device and an output filter. These comprise what I call “The Box.”

Attenuation: This is often necessary if the exciter’s output is going to be a little on the high side or if your amplifier section is a little “squirrely,” such as with the cheap Italian “CB” amps. (These have what I call a “latching” operation and are anything but linear, especially on a low band like 80 meters.) Knowing I wouldn’t have to deal with



inputs of more than ten watts, I got out an old textbook to review attenuator circuits and designed a multi-step attenuator out of 2 watt resistors (NOT wire wound, so that they are pure resistance). You can review attenuator principles at:

<http://www.electronicstutorials.com/basics/attenuators.htm>

Physically my attenuator is a bunch of resistors soldered up on a couple of rotary switches, the combinations of which provide me attenuation levels of from 2 to 10 db.

Amplifier: They're everywhere. The one I bought for \$38 on eBay was the bolt-on booster amp (100+ watts) from an old Yaesu FT 301 transceiver. As a bolt-on, it even provided the convenience of BNC connectors! But you can also use a cheap CB type of amp with some mods, which I won't go into here for lack of space. These days, transceiver final amps are all very broadband and pretty much the same (except for quality) and they're easily modifiable. My FT 301 booster amp needed no mods since it was designed for 80 through 10 meters.

Filter: You need to filter the output of these amps for two reasons: 1) reduction of harmonics that could wind up in the bands above you, and 2) I noticed that without proper filtering, the SWR runs pretty high and I suspect it's because the antenna is dealing with so many harmonics. With the addition of a good filter (at least 7 elements or order), the SWR I get is pretty low, usually below 1.2:1. Here I'm speaking of a good quality filter in addition to any built into a booster amp or a cheap stand-alone amp. In most transceivers today, a separate 7 order filter section usually follows the amp. For a single 80 meter filter section, I played with the Elsie Filter Design program that came on the CD in my latest ARRL Handbook. For information on the program, see the November, 2007 QST. Elsie provided a cheap and easy-to-build filter design for 80, but I later decided I'd rather have a multi-filter for all the bands. So I went back on eBay and bought a switchable filter output section for a Kenwood TS450 (\$51, so it must be popular. You can also buy a switchable filter kit from HF Packer for about the same price.)

So the system's logical flow is from the transmitter's output through the Attenuator to the Booster Amp to the Band-Switchable Filter to the Antenna Tuner to the Antenna. I housed "The Box" (Attenuator-Booster Amp- Filter) in an old TBS50 cabinet (eBay, \$18) to match my TBS50D transmitter. For an exciter/transmitter I often use my Central Electronics 20A or the TBS50D that I run at low voltage/power. I usually attenuate the input to about 5 watts and put 50 watts on the air from "The Box."

I've included a picture of the box on the left of the TBS50D. Yes, I use the old knife switch to insert and take the box out of the transmit chain. Part of the finishing up process was a coat of primer and then black wrinkle paint. The meter is for another project that will also go in the box. There's plenty of room in there because, as you can see, I have the Yaesu Booster Amp sitting on top, above the digital clock and connected to SO 239 connectors on the front panel. I have a couple of inexpensive booster amps of this sort and I wanted to be able to quickly swap them in and out.

The next step will be to put in an RF sense switch with a go-around for receive so that I can use QRP transceivers as well as transmitters with "The Box."

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