Build a Remote Control Antenna Switch

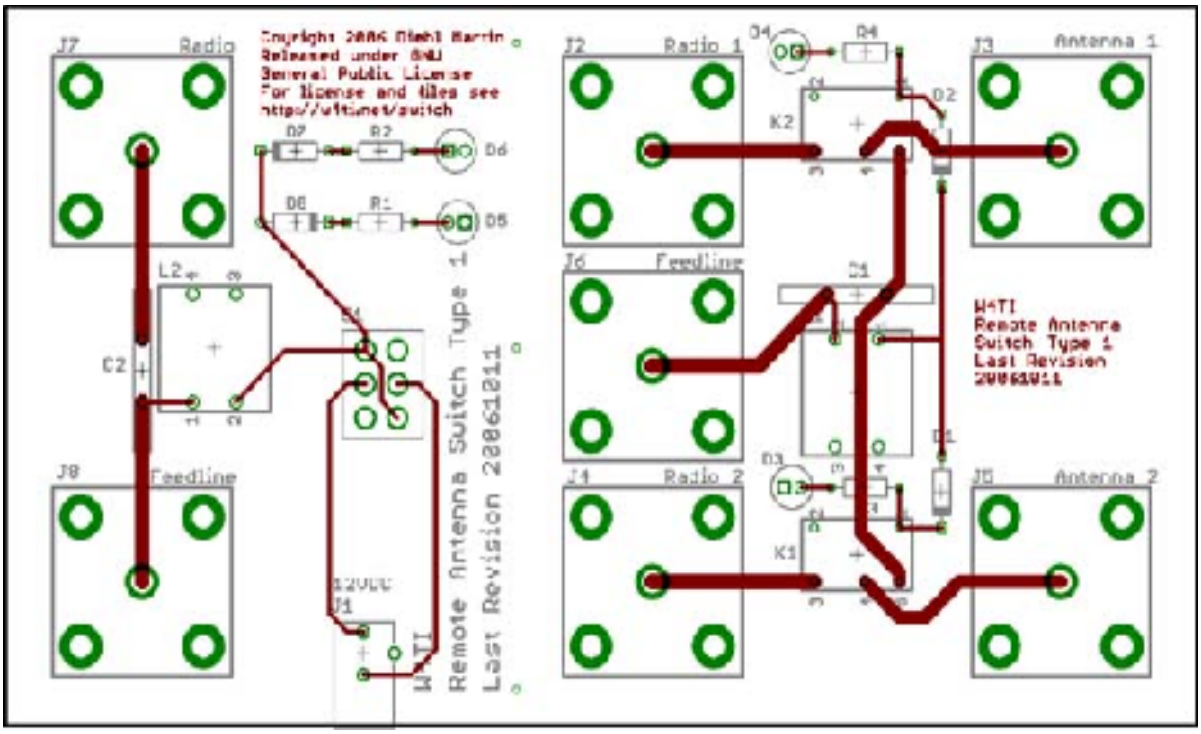

Figure 1. The Remote Control Antenna Switch consists of two circuit boards. The control unit is on the left, and the remotely controlled switch is on the right

This design is for a remotely controlled antenna switch, for which the control signals are sent over the coaxial cable to the switch, rather than requiring an additional control cable. This is accomplished by use of what is called a “bias tee” which allows DC power to be sent over coaxial cable, without interfering with the transmission of RF signals simultaneously.

One of my express purposes in this design it to make it such that the entire unit can be built using printed circuit boards alone, with no extra wiring required. This makes it much easier for someone else to replicate, and to have it turn out the same every time. It also reduces the cost for serial production, if anyone cares to do so. Both the control end and the remote switch end can be built easily in a Hammond die-cast metal case, which provided a well-shielded and sturdy chassis.

This design has some features which may appear peculiar at first glance, but which work out well in practice. It was designed and built to meet a particular need, and also to be versatile enough to be able to be used for many other configurations and purposes. I hope you find it useful.

This particular switch has several possible configurations, allowing for multiple possible uses. The most basic configuration is that of an A/B/off switch, where the feedline is electrically attached to either of two antennas, or else is disconnected from both. It is possible to make the switch also ground the disconnected antenna, or to attach a load to it. It is also possible to make it switch between multiple radio systems.

This switch is limited in its power handling capability. The intent here is to provide switching for low-level signals (receive-level signals can be below a microvolt) and to also handle transmitted power of as much as 150 watts. The power level is limited by the size and type of relays used in the remote switch. It was decided that the 150 watt level would handle the vast majority of potential uses. It would be possible to redesign this using larger relays, but that is left as an exercise for

someone else, since I personally do not need that capability.

The bias tee network is both the key to the functionality of this unit, and a cause of a key limitation. The ability to use the feedline (in my case, I use RG-213 type coaxial cable) to carry the switching signal and power vastly simplifies the implementation of a remote switch. However, this limits the switch to switching RF signals (in this case, above 1.8 MHz). The parts chosen for the bias tee also cause there to be a frequency range where the switch may be damaged if signals are transmitted. The design goal for this switch, since it is designed for amateur radio use, is to put that unusable frequency range in an area which hams do not use for transmission. In this case, the range is centered around 40 MHz, which is between the 10 and 6 meter bands, so the switch should be able to be used for any normal ham band use. Notice also that I have tested this only for high frequency use, i.e. between 1,8 and 54 MHz. It may work outside of that range, but I have not tested it, and have no plans to do so.

The design is released under the GNU General Public License. As I understand the license, it allows you, the user, to study the design, build the design, give the design to someone else, modify the design, and all of the normal uses hams have for electronic devices, and all for free. The only restriction is that if you choose to distribute the design (either as a new design or as hardware) that if you make any improvements or changes to the design, that you distribute your changed design under the same license. This is the layman's term version of the license. Look it up if you want to know all the gory details. It is meant to maximize the users' freedom. Enjoy!

The design was performed using the Eagle electronic CAD system. (For details, look at http://cadsoft.de/) The complete design is here, including all of the CAD and manufacturing files.

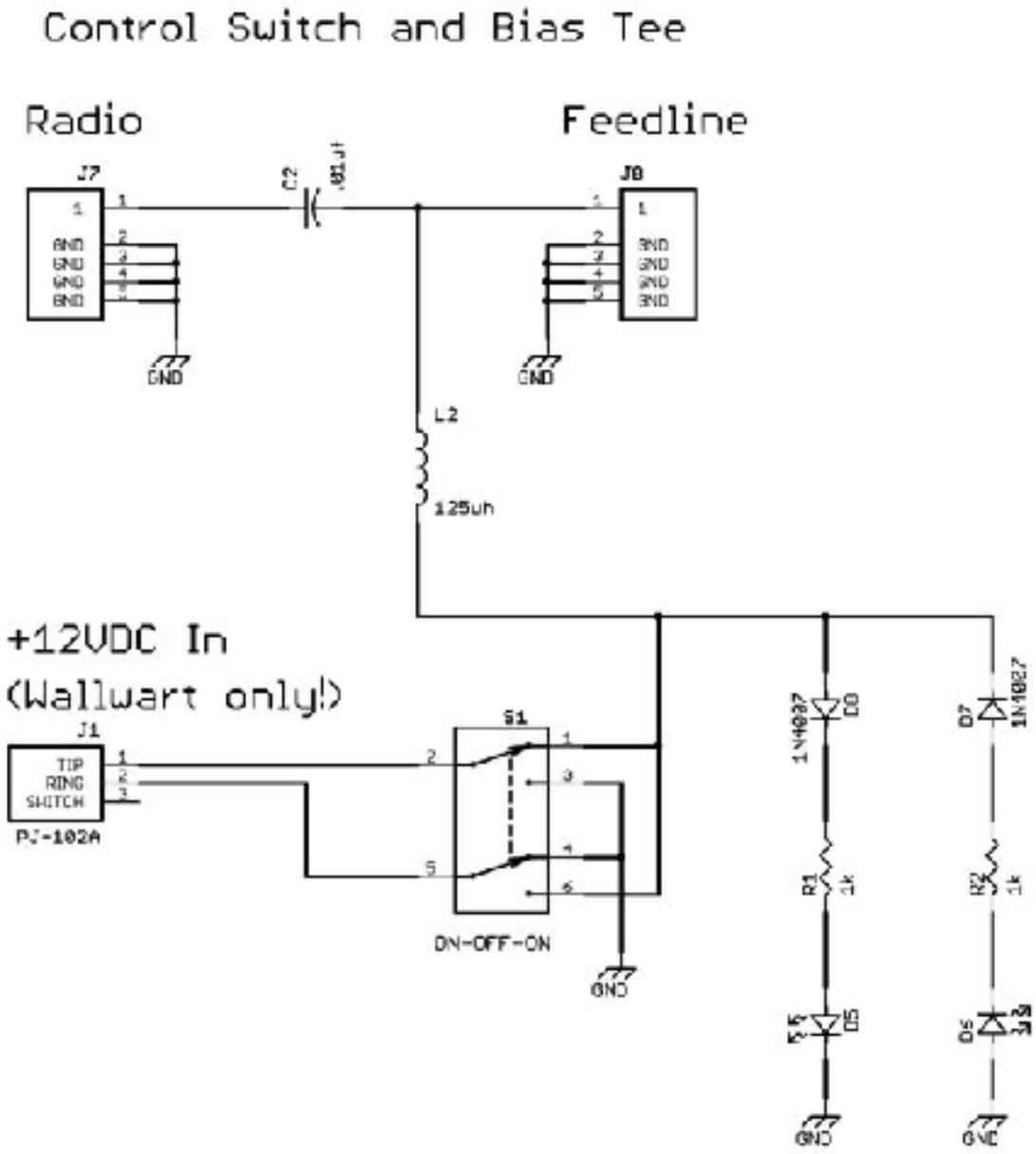

Figure 2. This is the "sending" end of the system. Switch S1 controls which antenna is remotely connected to the feedline.

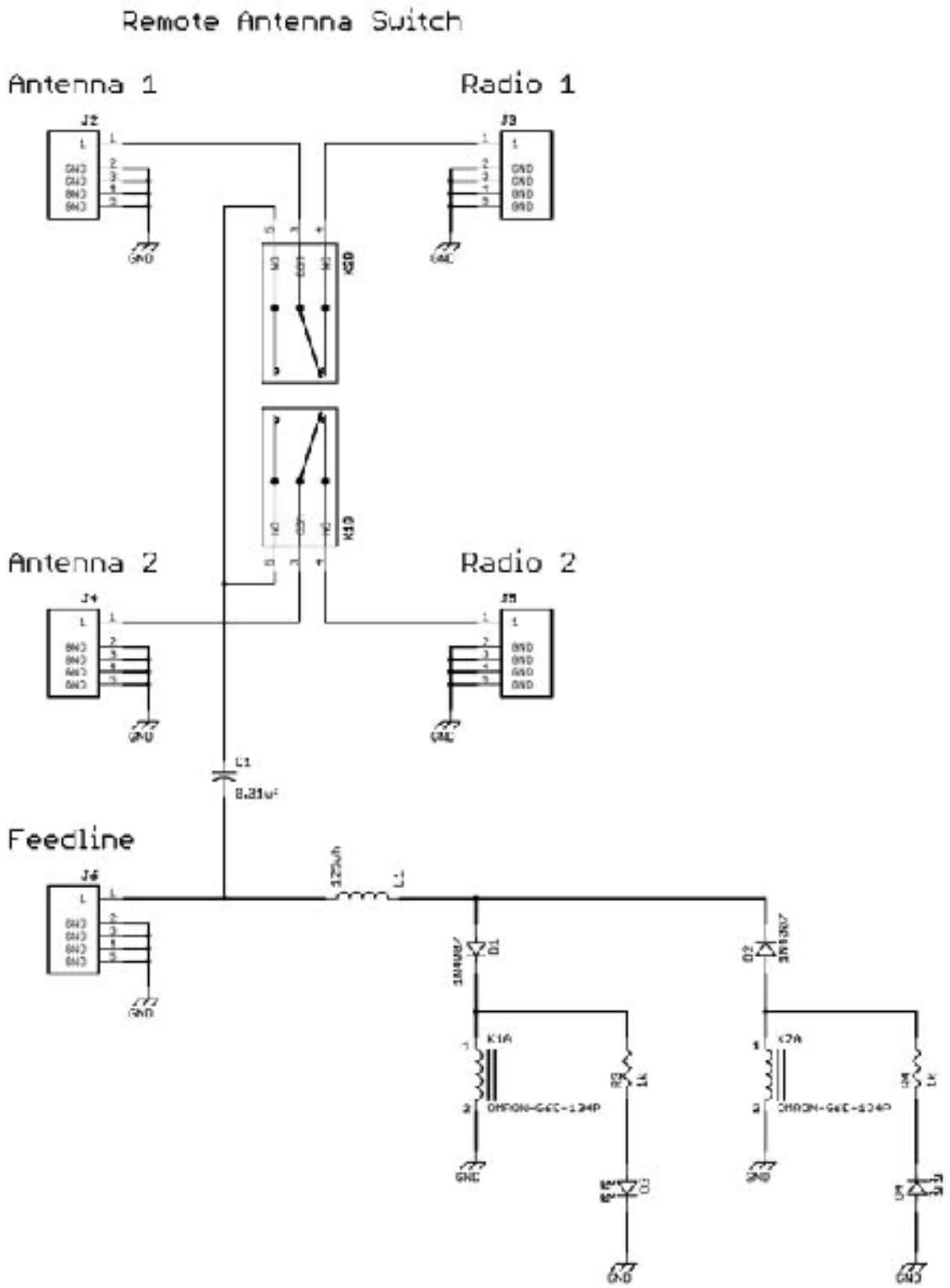

Figure 3. This is the remote antenna switch end of the system. The Feedline (J6) is remotely commanded to connect to either Antenna 1 (J2) or Antenna 2 (J4).