

Homebrewing Fun

Building equipment for contest stations

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Building equipment for contest stations

Why Homebrew

- Cost
 - Often times gear can be built for less money than bought
- Customization
 - Made to your needs
- Fun
 - Be proud of something you did yourself (or with others)
- Learning
 - You don't know "it all" yet, just another way to practice skills. Improve your soldering, or experiment with new technology

Where Does Radiosport Fit In?

- Every station for contesting is different, and must fit the needs of the operator
 - Often the exact piece of gear needed for a station doesn't exist
- Many contest stations are quite large, and may have many antennas and antenna systems, which need to be handled in a special way.
 - Again, customization is required to fit the needs of the operator.

My project: Antenna Switching

- An asset in contest station design, is automation. Removing as many of the unnecessary controls from the operator is key, so they can focus on the contest.
 - Automation of critical tasks really helps after 40 hours in the chair
 - I was really sick of manually switching all of my antennas manually – and I was afraid of selecting the wrong one at the wrong time.
- Many stations implement systems that automatically switch antennas based on the frequency of the radio.
 - A leading commercial system made by Array Solutions offers a lot of similar features, but was out of my price range

There are many other products on the market that offer similar features, but there wasn't anything that fit in my price range, and did what I want

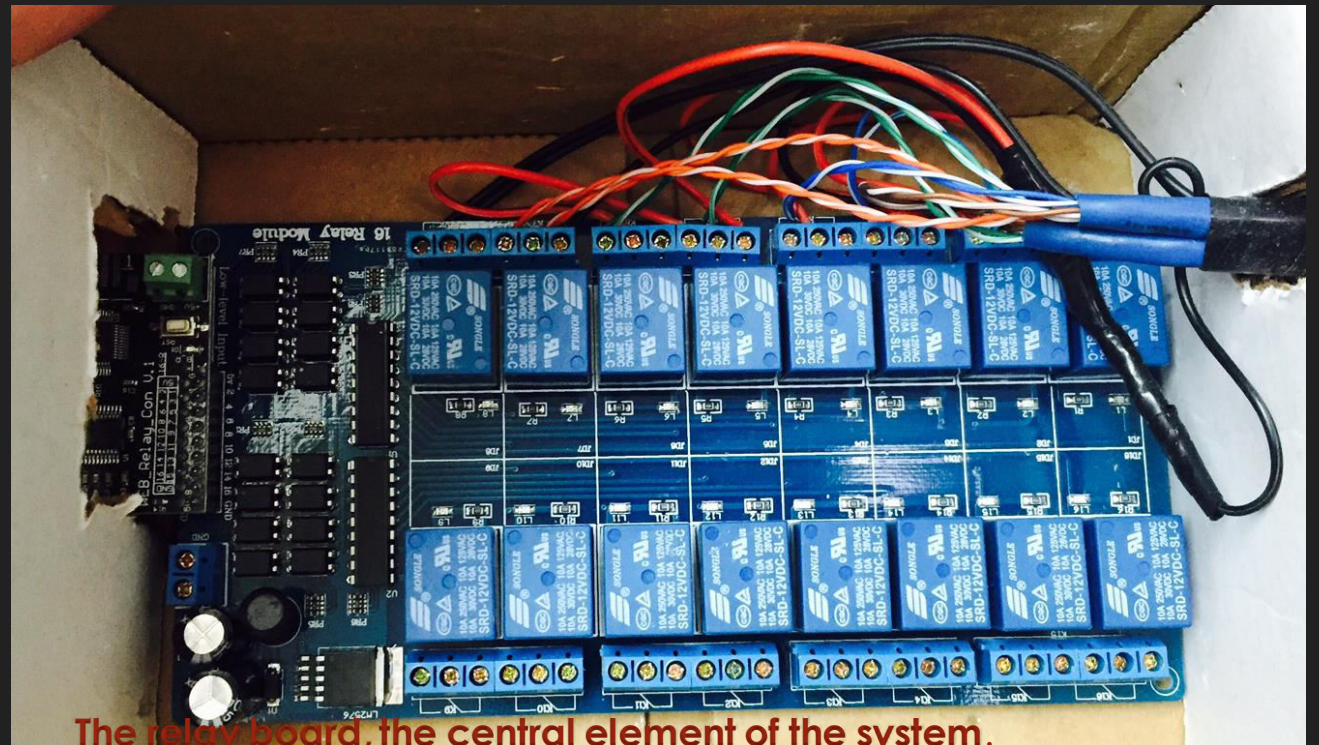


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My project:

Antenna Switching Design Goals

- Full station automation of antenna switching
- Ability to take manual control of antenna switching, with power off defaults allowing automatic system to be “invisible”
- Low cost
- Ability to expand the system to switch other station gear, like band pass filters.
- Switching gear placed away from operating position over



The relay board, the central element of the system.

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The Homebrew Method - Hardware

- This system has two components
 - A relay board that actually switches the coaxes for antennas, and manual “stock” controller - Ameritron
 - A relay board that switches between manual and automatic control, as well as automatically switching antennas
 - It is an off the shelf part from SainSmart,
 - Built in server
 - Relays can be “thrown” using a few lines of code.



The manual control console

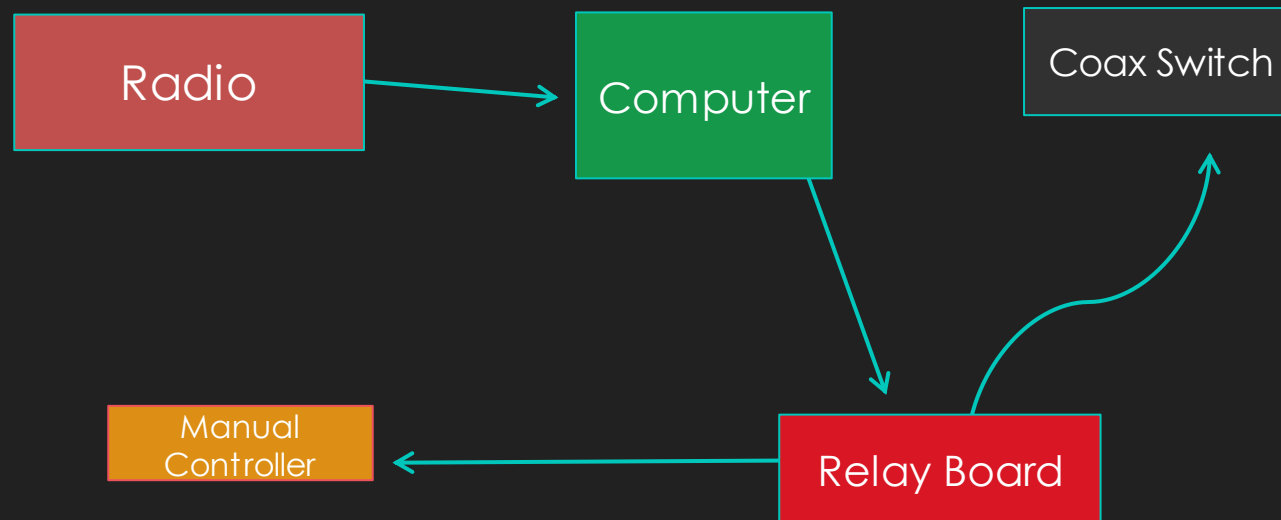
The Build - Software “Workflow” and Design

- The software was written in a language called Python, and is still under development.
 - My coding skills are developing
 - Once I feel as though my code isn't “broken” and there aren't any issues that could blow someone's station up, I may release it publicly

Workflow of software:

1. The radio is connected to computer running N1MM+ logging software
2. The software sends out broadcast packets over the internet network containing the current frequency
3. The software then passes off commands to the relay board to switch antennas (over network)
4. The software then patiently waits until the radio changes frequency to repeat

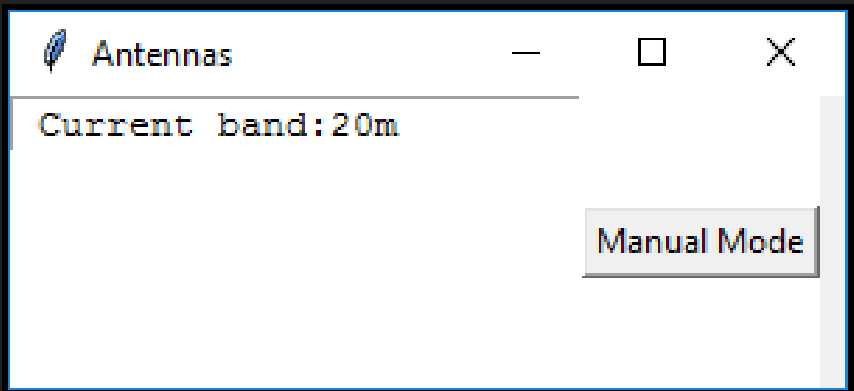
The Homebrew Method – Layout



The relay board can either switch control of the unit to manual control, or, switch 12v to control the antenna switching system. This setting is controlled in the software program. The system is completely fail safe, so that when power is removed, the device acts as if it was invisible.

The coax switching itself is controlled using 12v relays which communicate over BCD (binary coded decimal) from the originating source, which can be the manual controller or the software.

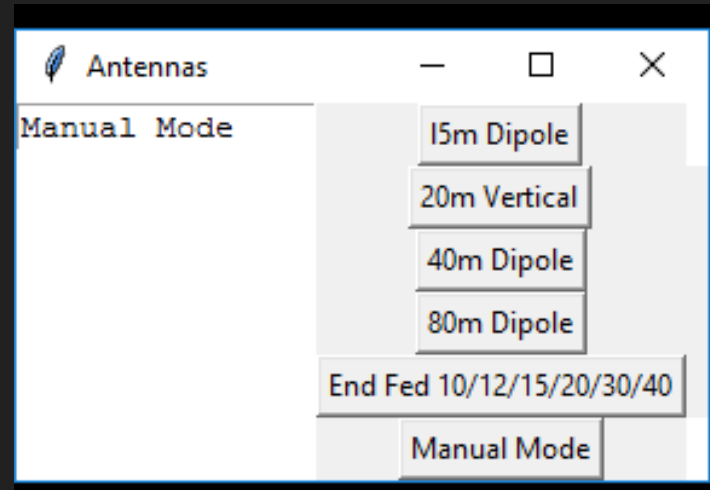
Control Software



Fully automatic window

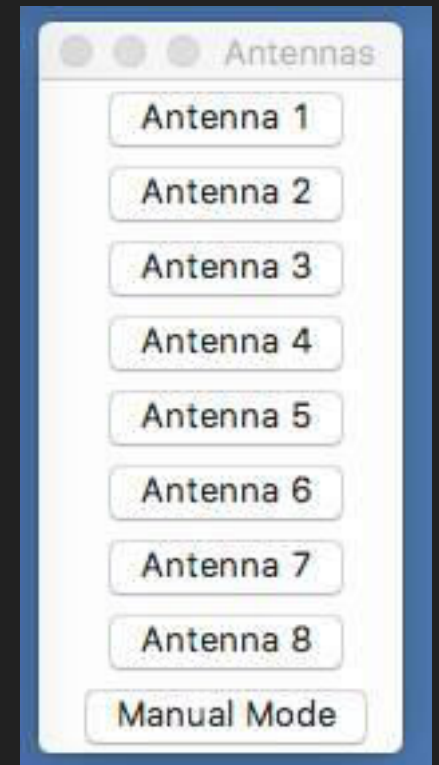
The computer itself is not physically connected to the relay control box. It all works over the wireless internet network.

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Home screen with antenna manual selection available, along with controls to allow operation from control box

All of this was written in a programming language called Python



Early testing on a mac

Results!

- System successfully used during multiple recent contests.
 - Made close to 1000 QSOs in CQ WPX in a part time effort with no issues.
 - I haven't blown anything up due to band changing issues yet!
 - System has also been integrated into my station for use during remote operation.
- Plans are in place to add support for SO2R, as well as more configurable menus for controlling stacked arrays, and electronically rotatable antennas.
- Homebrewing is fun!
- I appreciate all of the help I got from my elmers
- I got to learn plenty of coding and networks knowledge through this project, and I am currently developing the project in more depth, including adding documentation to allow for other users to use the system.