A Junk Box Integrated Station Control System

Control station power and audio signals remotely to help to keep the rats' nest at bay.

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As I leaned under the desk, fumbling to find the ham station power strip POWER switch, it occurred to me that life would be a lot easier if I had desk top remote POWER switches for my computer and ham station power. An added benefit would be to add two other important station switching options.

The Environment at Hand

Not only was I getting tired of leaning under the desk to turn on and off plug strips for the computer and ham equipment, but I also had needed an easy way to switch audio between two receivers and switch a remote antenna coax relay. The functions could best be actuated from a single small desktop box. Since my home office and ham station are on the same desk, an uncluttered operating position was important. My operations are focused on digital HF modes using an ICOM IC-706 HF transceiver and an ICOM PCR-1000 receiver.

My hilltop location in western Washington is currently configured with two antennas, a 140 foot dipole and Cushcraft R-4 vertical antenna. A surplus coax relay located near the antenna provides remote horizontal to vertical antenna switching about 90 feet from my basement shack.

A Plan Unfolds

The design boiled down to a small switch and indicator based control box sitting on the desk with LEDs showing the position of the switches. A larger box on the floor contains the ac power switching, fuses, audio cables and terminals for the remote coax relay.

This project uses a small aluminum mini box with double throw switches to run a remote low voltage control system for the ac switching (see Figure 1). Two additional double throw switches take care of receiver audio switching to the PC sound card input and control of the remote coax switch. LED indicators running off the second set of switch contacts indicate the position of the switches. In a separate floor box, two solid state relays (SSRs), a couple of extension cord female ends, fuses and a suitable safe chassis complete the project.

Getting Into the Details

A quick look at the schematic diagram (Figure 2) shows that eight conductors are needed to communicate all the switch positions and also receive LED power from the floor box. I found a used Cat-5 Ethernet cable in my junk box that contains the required eight conductors. This is a nice choice that saves time in wiring up our own custom con-

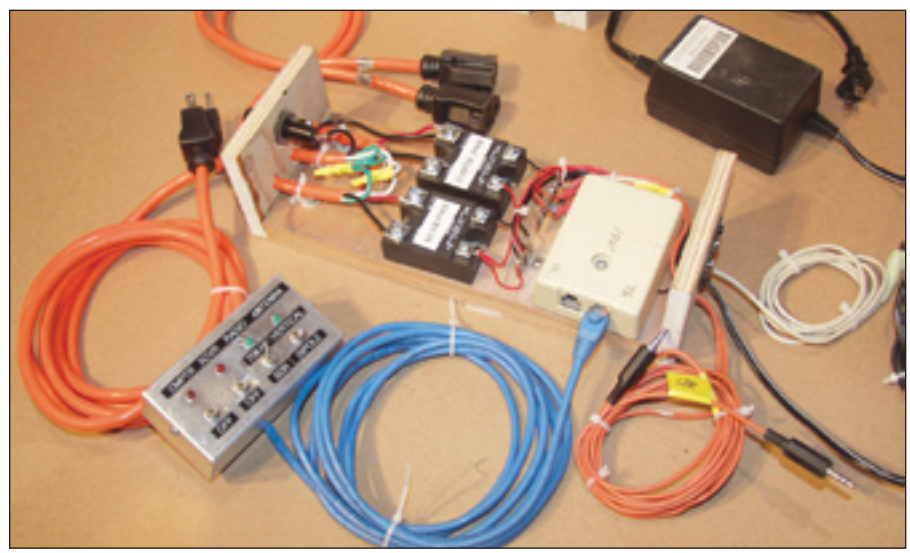

Figure 1 — The aluminum mini box in the lower portion of the photo contains the double throw switches and LED indicators. The wooden box with the ac connections and SSRs is above.

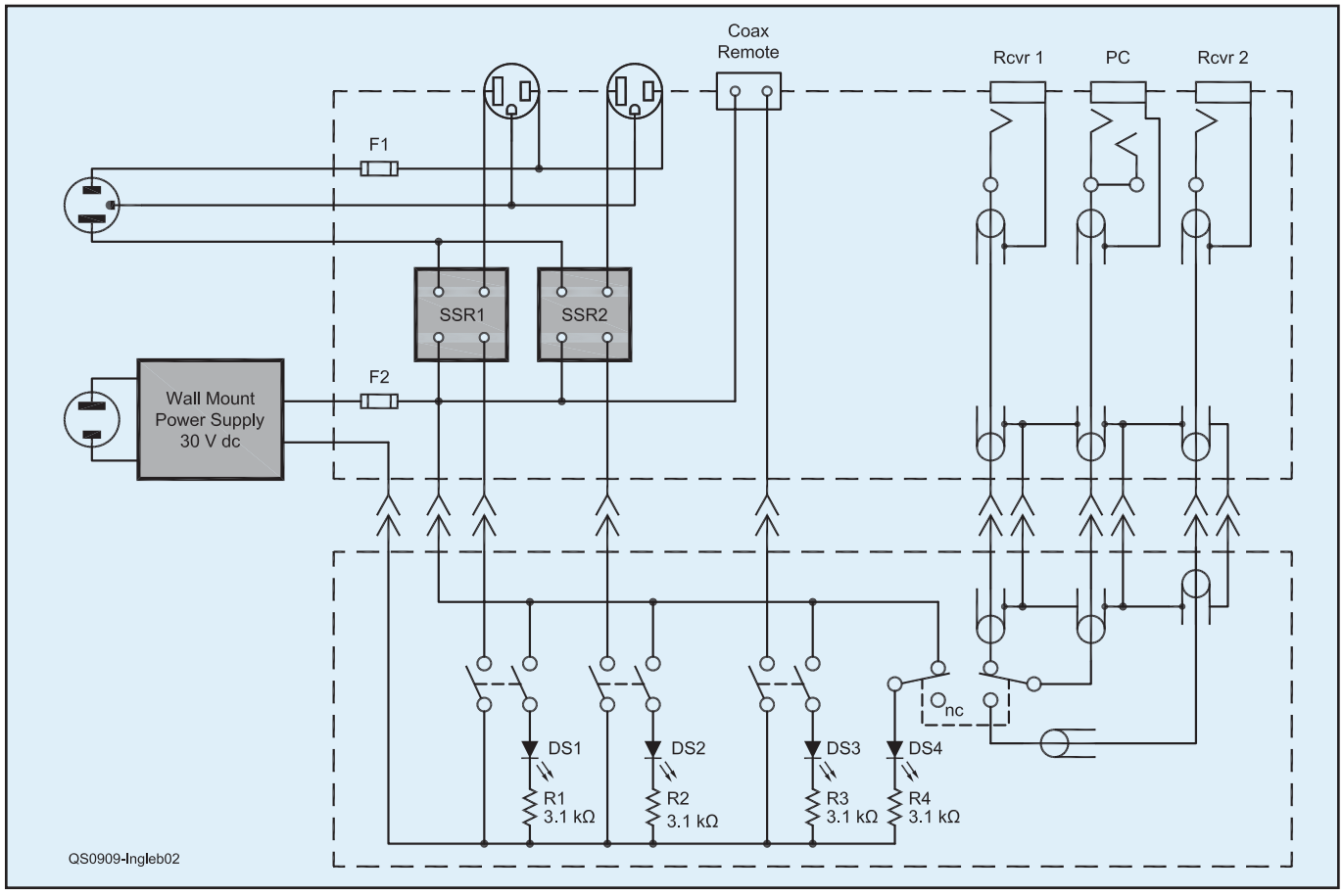

Figure 2 — Schematic diagram of the control box. Parts are listed in Table 1.

nector and provides a nice looking, ready made quick disconnect.

For the power supply, you may use whatever dc control voltage is convenient. Most SSRs require between 10 and 30 V to close their virtual contacts. My remote coax relay had an odd 30 V coil voltage requirement. That made it easy to choose 30 V as the main control voltage.

To properly illuminate the LEDs, the current limiting resistor size needs to be calculated using Ohm's law. My junk box variety LEDs light up very nicely at 10 mA and so the math was: R=E/I or 30 V/0.01 A = 3000 Ω or 3 kΩ. The EIA standard value for a resistor near 3 kΩ is 3.1 kΩ and the LEDs will never know the difference. The power rating of the resistor is really not a factor here due to the low current, but let's check anyway. P = I × E, so 0.010 A × 30 V = 0.03 W.

Putting it all Together

Using good construction practice, drill and mount all the components on the minibox. A bit of two part epoxy will hold the LED nicely, but be sure you are done for the day when you mount them, as this type of epoxy usually needs a 24 hour setup time. For the floor mounted box, I chose to mount the SSRs on a ¾ inch rectangle of plywood with a wooden cover, as shown on the top of Figure 1, but any substantial box with a cover may be utilized. Good practice would have you position the ac line components: cords, splices and fuse all at one end of the chassis. Be sure to chamfer the edges of the wire holes to act as a grommet to avoid chafing wear.

Make all the signal and low voltage connections at the other end of the box Don't attempt this project unless you are comfortable working with 120 V ac circuits. Ensure that all connections are adequately insulated and strain reliefs are used on all cable feedthroughs. Add a cover and the project is done. Recheck all wiring and then perform a quick test for functionality.

Each switch should illuminate its LED when switched to ON. Plug a test load into each female cord end and verify that it receives power when the corresponding switch is closed. Using a volt-ohm-milliameter or digital voltmeter (DVM), verify proper switching of the receiver audio from each source to the PC sound card input. Verify a control voltage output for the antenna relay.

Table 1

Required Parts for Integrated Control System

Quantity	*Description*
1	Cat-5 cable, about 5 feet with one end cut off.
1	Cat-5 receptacle.
2	Fuse holders and suitable fuses.
3	DPST miniature toggle switches.
1	DPDT miniature toggle switch.
2	Solid state relays.
1	Wall wart dc power supply (see text).
1	Minibox, 3 × 4 × 2 inch.
4	3.1 kΩ resistors (see text).
4	LEDs, any color.
3	Audio cables, 4 feet with ⅛ inch stereo plugs (as needed for specific radios and PCs).
1	Plywood "chassis."

ARRL member Dave Ingebright, WB7ELY, has been licensed since 1976 and holds a General class license. Dave is active with a digital station on the HF bands and 440 MHz UHF with a hilltop UHF repeater. Dave manages a small electronics research and development lab for a major aerospace manufacturing company. He is an active designer and builder of custom automation and remote control equipment in his spare time. Dave holds a patent on an optically isolated intercom system for flight test aircraft. You can reach Dave at 15819 Jordan Rd, Arlington, WA 98223 or at **treez@hughes.net**.