BY DOUG DeMAW, W1FB

DOUG'S DESK

CONSTRUCTION PROJECTS, TECHNIQUES, AND THEORY

Remote Antenna Switching Made Easy

Various remote antenna switching devices have been described in the amateur literature, and some commercially manufactured switchers are available today. However, the amateur who is willing to heat a soldering iron and drill a few holes can build a fine antenna switch for very little money. This article recaps some previous work I did along these lines. The circuits shown here allow switching up to four antennas from a single feed line. There is provision for a 50 ohm resistive load (dummy antenna) as well. Inexpensive surplus relays are used in the interest of minimizing cost.

The first W1FB antenna-switch article appeared in *QST*.[1] Subsequent to its publication, an excellent *QST* Technical Correspondence item by KU7G described improvements for the relay logic.[2] Those modifications are included in the fig. 1 and fig. 2 circuits that follow. Information about packaging and general construction techniques is contained in the article referenced in note 1.

Why Use Remote Switching?

Quality coaxial feed line is fairly expensive. It makes economic sense to use one length of RG-213, RG-8, or hardline to feed more than one antenna on the tower or in the field. A remotely controlled antenna switch makes this possible. Furthermore, changing from one antenna to another (especially during a contest) is much more rapid when a remote switch is used. This requires the simple act of changing a ham shack control box switch position. I concede that a manual coax switch in the radio room provides the same convenience, but it can involve the added cost of several feed lines.

Circuit Notes

Fig. 1 contains a schematic diagram for the portion of the switcher that is installed on the tower or in the field. Although only four relays are shown, additional relays can be added to allow switching more than four antennas.

Relays K1 through K4 need to have contacts heavy enough to accommodate the maximum RF current for the power you are running, with some amperage rating to spare. A contact rating of 10 amperes minimum is recommended if you use a linear amplifier. For example, at 1.5 kw PEP there would be 273.8 volts RMS developed across a 50 ohm load. The RF current would be 5.47 amps. A less rugged relay will suffice if you do not intend to use more than 150 watts of transmitter output power. At 150 watts there would be 86.6 RMS volts across 50 ohms. The RF current would be 1.73 amps. Relays with 5 amp contacts would suffice in such a case.

It needs to be said that the fig. 1 circuit design is based on the use of antennas with a low SWR. Any SWR under 2:1 should be okay. High SWR at significant RF power levels can destroy the relays because of high RF voltages that may arc across the relay contacts.

K1 through K4 are protected from arcing between their contacts and circuit ground. This is accomplished by using RFC1 through RFC4. The relay field coils are "floated" above RF ground by virtue of bifilar-wound toroidal chokes. "Bifilar" means that two identical lengths of wire are wound on a toroid core at the same time. I am often asked what bifilar means. The relays should be mounted on an insulating base, such as plexiglass or fiber-

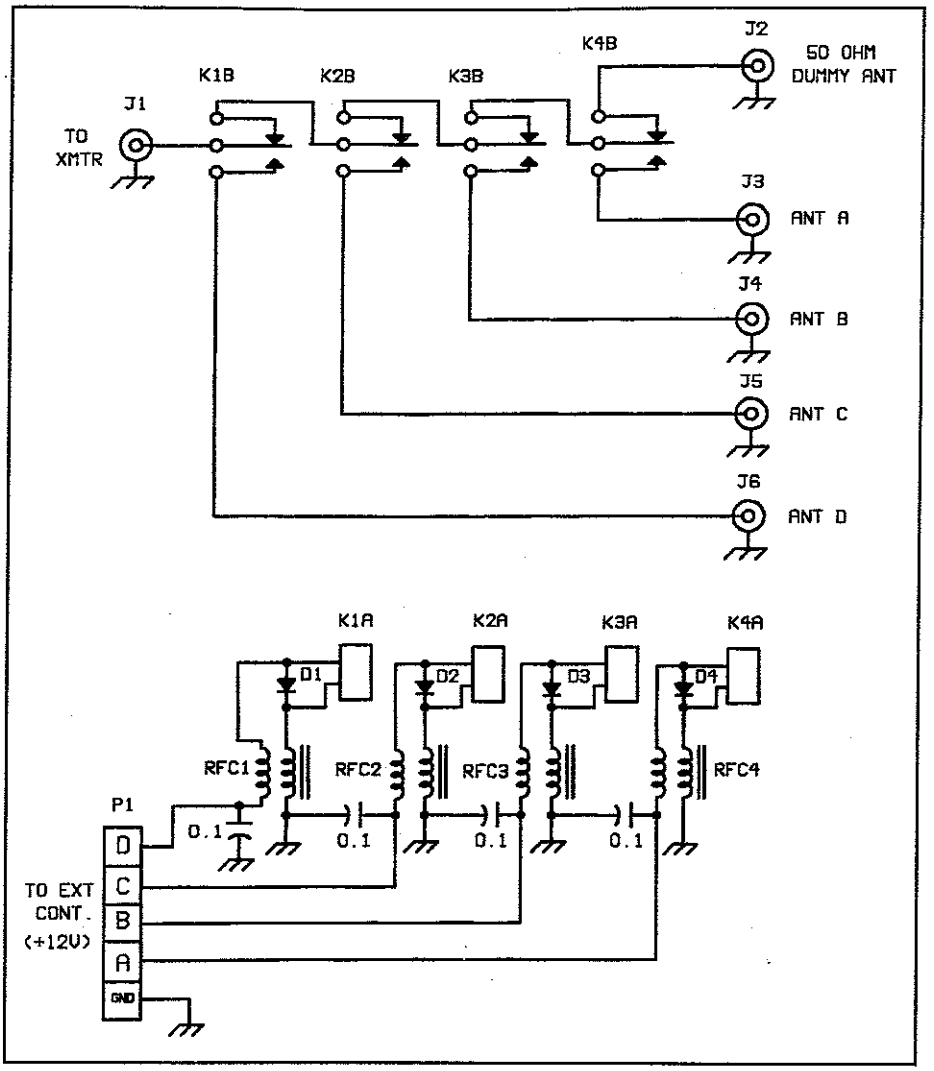

Fig. 1– Schematic diagram of the remote switching head. D1 through D4 are 1N914 small signal silicon diodes. J1 through J6 are SO-239 jacks. See text and notes 1 and 2 for data concerning K1 through K4. P1 is a male cable plug of the builder's choice. RFC1 through RFC4 have 18 bifilar turns of No. 24 enamel wire on Amidon Assoc. FT-50-43 ferrite toroid cores.

P.O. Box 250, Luther, MI 49656

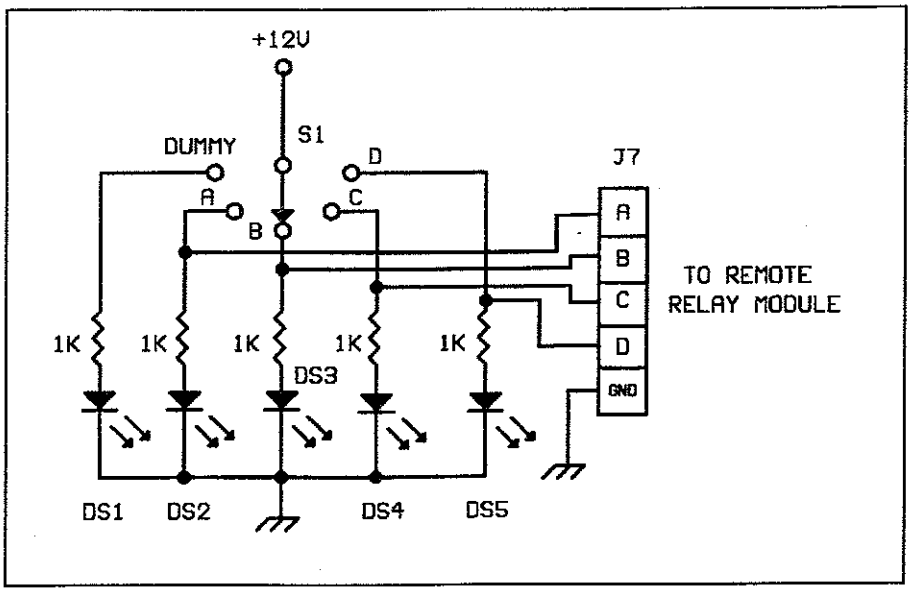

Fig. 2– Control box circuit for the antenna switcher. J7 is a female connector of the builder's choice. S1 is a single-pole, 5-position rotary wafer switch, phenolic or ceramic. A +12 volt, 500 ma wall transformer is sufficient to power the switcher.

glass, in order to isolate their frames from circuit ground.

Diodes D1 through D4 clamp on voltage spikes that can occur when the fields in the relay coils collapse. This prevents spikes from reaching the control box and 12 volt power supply. Each relay +12 volt line is bypassed with a 0.1 μF, 50 volt ceramic capacitor to keep stray RF energy off the four control lines.

A 50 ohm dummy antenna may be connected to J2 of fig. 1 if desired. This would require a weatherproof enclosure for the dummy antenna, since it would be on the tower or in the field. The dummy antenna will ensure that the transmitter has a proper load if the +12 volt relay control voltage is absent for some reason when an antenna is chosen. Tune-up into the dummy antenna may be done by using the DUMMY position of S1 in fig. 2. This removes the operating voltage from the four relays.

Construction Notes

The relay box can be made of sections of PC board. An ideal enclosure would be a cast-aluminum project box, if you can justify the expense. In any event, once the circuit is built and tested, the box should be sealed with bathtub calking or a similar weather-resistant sealant.

The control-cable conductors need only be large enough to carry the relay current without causing a voltage drop. For example, if the 12 volt relay has a 100 ohm field coil, it will draw 120 ma. No. 22 conductors should suffice for average runs of control cable.

Two SPDT high-current 12 volt relays are suggested. One of them is an automotive type with 1/4 inch spade lugs for the electrical connections. This is sold by MECI as part No. 480-0394. No. 480-0395 is the same type of relay, but it has 1/8 inch lugs. The contacts for both are rated at 30 amps. These relays sell for $1.95 each.[3] A suitable PC-mount SPDT 12 volt relay is available from All Electronics Corp. It is part No. RLY-149 and has 15 amp contacts. It sells for $2.[4]

DS1 through DS4 of fig. 2 are LEDs. You may want to use red, green, blue, and yellow LEDs to help distinguish one S1 antenna position from the others.

Closing Remarks

There is nothing new or spectacular about this project. However, it is worth repeating the information periodically for the benefit of those amateurs who arrived on the scene in recent years. My previous work on this subject was published eleven years ago.

Building this antenna switch will save dollars and should give you a feeling of pride and accomplishment. Perhaps this can be your next weekend project!

Notes

1. D. DeMaw, "A Remote Antenna Switcher for HF," *QST,* June 1986, p. 24.

2. R. Schetgen, "An Improved Remote Antenna Switcher," *QST,* Sept. 1986, p. 51.

3. MECI, 340 E. First St., Dayton, OH 45402 (phone 1-800-344-4465; e-mail <meci@meci.com>.

4. All Electronics Corp., 14928 Oxnard St., Van Nuys, CA 91411 (phone 1-800-826-5432).