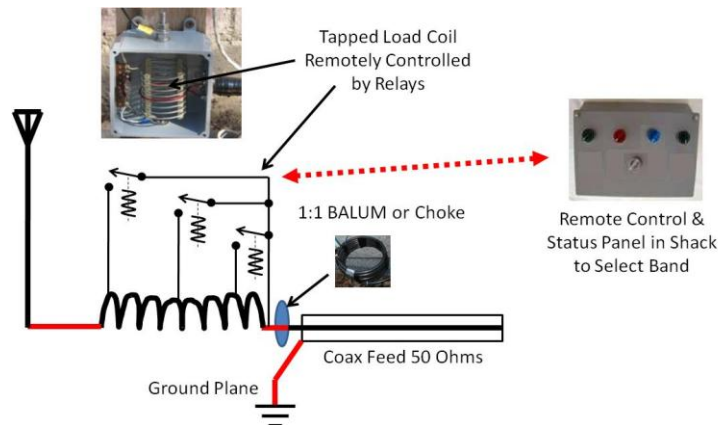


# Making a Remotely Switched Load Coil

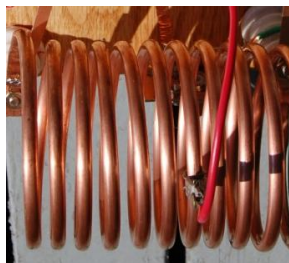


Now that you have built a flagpole antenna and the yard is filled with 32 buried radial wires to make a ground system you are ready for a tuner or better to make your own matching system.

## Theoretical Results from Perfect Antenna and Ground Plane

- 80 M taps have 200 KHz BW set at 3.6, 3.7 & 3.9 MHz
- 40 M tap has 330 KHz BW set at 7.15 MHz
- 20 M tap has 700 KHz BW set at 14.20 MHz
- 15 M tap has 1,100 KHz BW set at 21.00 MHz
- 10 M tap has 1,700 KHz BW set at 29.00 MHz

The first step is to decide which bands and frequencies are desired for the tuning system. In most cases the 2:1 SWR bandwidth will be the entire band for 40M, 30M, 20M, 17M, 15M and maybe all of 10M. The 80M 2:1 SWR bandwidth will be 150-180KHz so plan on 1-3 depending on the mode(s) you want to run. This means the design could require 5 relays for 40-15M plus 2 for 10M and 3 for 80M for a total of ten relays. Considering tune the vertical for 40M to work okay as a 3/4-wavelength vertical on 15M and the same for 30M and 10M respectively. In the real world 40M and 15M are the same tap, 10M and 30M are the same tap and most of us only operate in one mode in 80M requiring 1 tap for a total of 6 taps (or 6 relays). Now six relays is a more manageable design.



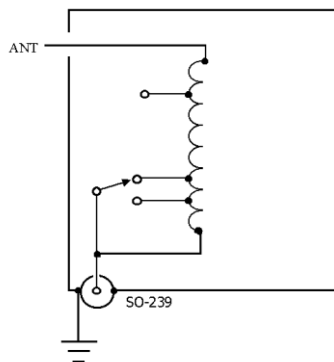
Clip Leads can be used for testing (must be short)

I recommend you make your coil from bare #10 or #12 AWG Copper wire winding the coil about 40 turns tightly without spacing around a 3 to 4 Inch form like a soup can. A smaller diameter can be used but the capacitance will increase in the coil. The wire will be stiff so you will need a helper to use a can or a rolling pin if you do not get caught. Back off the tension to remove your form and stretch the coil out so you have 5 to 6 turns per Inch spacing. Now you can add terminal lugs to mount your coil on a sheet of acrylic plastic sheet with the relays. When selecting an enclosure for your remote load coil be sure the box is big enough to keep the coil 1 ½ Inches from plastic and three Inches from metal. Note if you are using a metal box the VSWR will change when opening and closing the cover of the metal box. Most metal boxes have only a minor effect on the VSWR.



### Homebrew Coil Winder provides extra hands to hold coil

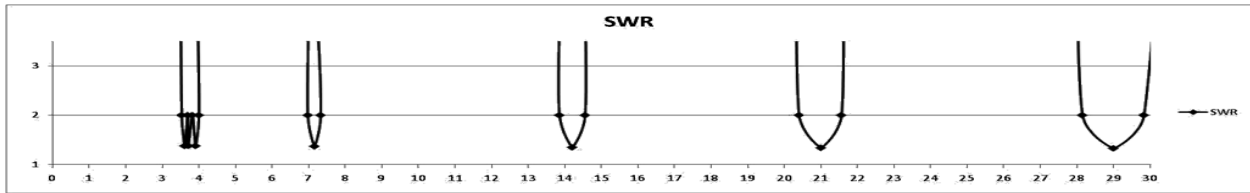
The dimensions and coil settings given above should produce reasonably low VSWR readings over the entire 10, 15, 20 and 30 meter bands and over at least 250 kHz of the 40 Meter band. Bandwidth on 80/75 meters should be at least 100 KHz for VSWR of 2:1 or less at the low end of the band and may be as much as 200 KHz at the high end of the band, depending on the efficiency of the ground system used, greater bandwidth being associated with poor ground systems. It should be remembered that on those bands where the physical height of a vertical antenna is less than a quarter wavelength, the earth (or the resonant radial system in above-ground installations) will have a good deal to do with VSWR and antenna tuning, bandwidth and overall performance,



### Functional Diagram of Tapped Load Coil (Note: Coil always in circuit)

When you are ready to start measuring to set your taps the first measurement should be finding the basic resonance of the antenna. Note VSWR is not best VSWR, resonance is when the antenna is purely resistive, 7 MHz to 11 MHz depending on the element RF length (33 or 22 Feet) selected. VSWR is a ratio to your 50 Ohm cable. Also low VSWR by itself does not mean that a vertical antenna is operating efficiently. If a low wide bandwidth VSWR is obtained likely means the opposite. This condition means you will have improper tuning of antenna can usually be attributed to inadequate (or even reactive)

ground systems or interaction with objects in the vicinity of the antenna. For these reasons it is suggested that the antenna be placed as much in the clear area as possible and used with the best ground system that conditions permit.



### **Taps provide Matching in Band (Note: 80M requires multiple taps for full band coverage)**

It is reasonable to expect your best results on 40M with a VSWR at the base of the antenna less than 2:1 across the band. For taps you should start at 3900 KHz to find the 80-meter relay lead was touched on the turns of the coil until minimum reflected power was indicated. Solder the wire in place on the coil. Next try 7150 KHz and touched the 40-meter relay lead to the coil turns until an SWR of 1:3 is read. While using the same coil tap measure on 21.1 MHz and checked the SWR. If the VSWR is less than 2:1 you are done, but most will need to move the coil tap just  $\frac{1}{2}$  to 1 turn you are able to get an SWR of 1.8:1 on 15 meters. Now recheck on 40M is required and this process is repeated until both 40M and 15M Bands are less than 2:1. The same process is required for 30M and 10M. After that you can move on to 20M, 17M and 12M taps. Note if you are using a metal box the VSWR will change when opening and closing the cover of the metal box. Most metal boxes have only a minor effect on the VSWR.

### **Electrical (Metal & PVC) Enclosures and Sprinkler Control Box Provide possible Matching Coil Cabinets**



### **Remember "High & Dry"**

Now hook up your coaxial cable and move to your shack to check each band again. Remember the length of the coaxial cable can cause VSWR mis-match. The 40M  $\frac{1}{4}$  wavelength antenna is dependent on the coaxial feed length. You should use cable lengths of 40-50, 70-80, 100-110 or 130-140 feet and DO NOT use cable lengths of 30, 60, 90, 120 feet.