Base Matching for Mobile Antennas

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When any antenna is properly resonated, you will see a total resistance composed of the radiation resistance, coil losses and ground losses. For short antennas, the radiation resistance is very low—on the order of 2 to 3 Ω for a center loaded 40 meter antenna. Assuming you have reasonable coil and ground losses, you will see how impedance at resonance that needs to be matched to 50 Ω. This can be done with either a shunt inductor or a shunt capacitor mounted at the base of the antenna.

By lengthening the antenna a little bit, the antenna will have an inductive component, so that shunt capacitive tuning works. The effective series inductance and shunt capacitance make up an L network that transforms the low impedance to 50 Ω . If the antenna is shortened a bit, it looks capacitive and so a shunt inductor completes the L match to 50 Ω.

With a shunt inductor, you need to change coil taps. With a shunt capacitor, you need to change capacitors as you change bands. I've always preferred using shunt capacitors and use 300 V silver-mica capacitors, which are fine for a 100 W transmitter.

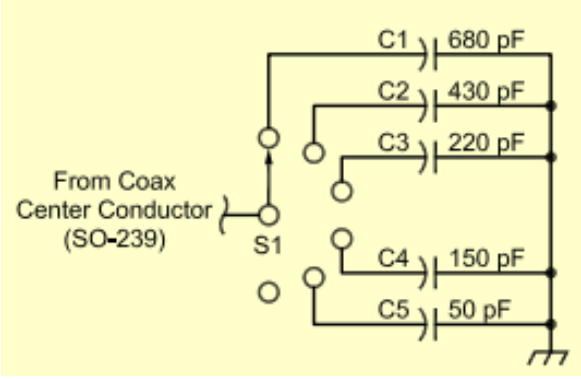
The ARRL Antenna Book and ARRL Handbook for Radio Communications show how to calculate the capacitance values needed based on VSWR measurements. It's easy to just put a variable capacitor across the input to the antenna and find the value that gives the best match. Then measure this capacitor value with an antenna analyzer and replace it with a fixed value.

For the Carolina Bug Catcher and Hamstick antennas, the values of capacitance that properly match the antennas are shown in Table 1.

Table 1
Capacitance Values for Each Band

	40 M	*30 M*	*20 M*	*17 M*	*15 M*	*12/10 M*
Carolina Bug Catcher	680 pF	430 pF	220 pF	150 pF	50 pF	none
Hamstick	560 pF	390 pF	150 pF	150 pF	none	none

Figure 3—The schematic and parts list for the antenna matching base and rotary capacitor switch.



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