Add 60-meter coverage to your Butternut vertical – Three ways to do it!
By Phil Salas – AD5X

Introduction

The Butternut vertical is a great antenna in that it covers all HF bands from 160- though 10-meters (or 160-30 meters for the HF-2V) ***except*** 60-meters. This article describes three methods to add 60 meters to your Butternut vertical without losing any other bands.

Putting the Butternut on 60-meters – The clip-lead

The easiest thing to do is simply short out turns on the 80-meter coil with a clip-lead. The bottom of the clip-lead is connected to the bolt at the bottom of the 80-meter coil. Using my MFJ-259B antenna Analyzer, I found I could get on 60-meters with close to a 1:1 VSWR at band center (5367 kHz), and only about a 1.5:1 VSWR at the band edges. Mark the coil with a permanent marking pen to easily re-clip for 60 meters when desired.

Putting the Butternut on 60-meters – The relay

The clip-lead works great, but you must manually enable and disable 60-meters at the antenna. My Butternut is mounted about six inches from a cedar fence, so I mounted a 12V relay (All Electronics RLY-370 @ $1.00) in a plastic box (All Electronics TB-1 @ $1.75) to the fence near the 80-meter coil (don't forget a reversed-biased diode across the relay coil to protect from turn-off transients). The relay contacts are used to short 80-meter. Use an alligator clip on the end of the tap-wire to find the correct tap point, then use a Solder-It torch and Solder-It aluminum solder paste to solder the coil-tap wire directly to the 80-meter coil (www.solder-it.com). If you don't have switched DC power at the antenna, you can multiplex DC on the coax cable as shown in another article on this web site. Now you can remotely switch the antenna to 60 meters.

Putting the Butternut on 60-meters – The trap

A series-resonant 60-meter L/C trap should pretty much replace the 80-meter shorting wire, and would hopefully have minimal effect on the rest of the antenna. I used a 100 pf 5kv doorknob capacitor and an air-wound 8.75 uhy coil. I picked these values because I happened to have that capacitor! I used a high-voltage doorknob capacitor because I know that some high voltages are generated across these coils (Butternut uses doorknob capacitors on the 160-, 80-, 40 and 30-meter resonators). Feel free to experiment with other L/C values, but you shouldn't increase the capacitor value above 100 pf. Doorknob capacitors are available from Surplus Sales of Nebraska (www.surplussales.com) and RF Parts (www.rfparts.com). 5kv doorknob capacitors cost around $15. Incidentally, the Butternut vertical will work on both 75- and 60-meters with this modification. But I could not find a way to make the antenna work on both 80- and 60-meters. So if you are a cw operator, this may not be the mod for your Butternut vertical.

For the inductor, use 11-turns of an MFJ-404-008 coil ($14.95). This is a 10 turns/inch five-inch long, by 2-1/2 inch diameter air-wound coil. You'll use only a little over an inch of this coil, so you'll have plenty left for other projects. Cut the coil length to about 1.3 inches, and then unwind the turns until you have exactly 11 turns. Mix up some quick setting clear 2-part epoxy and apply to the ends of the coil for added strength.

To check resonance, I connected the 100 pf capacitor in series with the inductor and connected this in series with a 51 ohm resistor to the MFJ-259B. I verified that the resistance measured by the MFJ-259B was 51 ohms at 5.67 MHz, verifying that the trap looked like a short at that frequency. However, you shouldn't need to make this measurement, as this is very repeatable.

To attach the trap to the 80-meter Butternut coil, I made up two clamps from strips of sheet aluminum (available from your local True Value or Ace hardware stores). Refer to Figure 1 for the details. I punched holes in the aluminum strips to take #6 stainless steel screws and formed the clamps so they would fit around the coil wires. I made one of the straps longer than the other and punched a #6 hole in the longer strap at the end so that the 100 pf doorknob capacitor could be attached with a #6 stainless steel screw and lock-washer. A solder lug was added under the nut on the short strap so that the trap wire could be soldered to the clamp. Refer to Figure 2 for the complete trap assembly.

Trap placement and antenna adjustments

Attach the bottom clamp to the base of the 80-meter coil. Put the smaller clamp on the 9th turn from the bottom of the coil, and tighten the screw just enough to make a firm mechanical contact. The wire from the top of the trap may be terminated in an alligator clip, as this makes it easier to move the clamp along the 80-meter coil. When the final 80-meter coil tap point is found, however, solder the wire to the solder lug on the clamp.

Now adjust the 80-meter coil for your 75-meter desired frequency, then check the resonance on 60 meters at 5367 KHz. You'll probably need to move the tap point to center this up. Go to 40 meters and adjust the 40-meter coil for your desired 40-meter frequency. These adjustments are interactive, so you'll need to do these a few times to get everything right. I had to decrease the inductance of the 80-meter coil, and increase the inductance of the 40-meter coil to get to where I wanted to be on those bands. I saw no effect on the 160-meter and on the 20-10 meter settings.

ERP

How much power can you transmit into this antenna and meet the 50 watt ERP FCC requirement? I emailed Butternut and they estimate that the antenna has about a 1 dB penalty on 60-meters since it is less than a ¼-wavelength long. And, if you don't have a perfect ground system, you'll also suffer ground losses. From the ARRL Antenna Book, 19th Edition, page 3-3, Table 1 shows that for a ¼-wave vertical over average soil:

16 radials gives 3 db loss (plus the 1 db antenna length penalty)
24 radials gives 2 db loss (plus the 1 db antenna length penalty)
60 radials gives 1 db loss (plus the 1 db antenna length penalty)

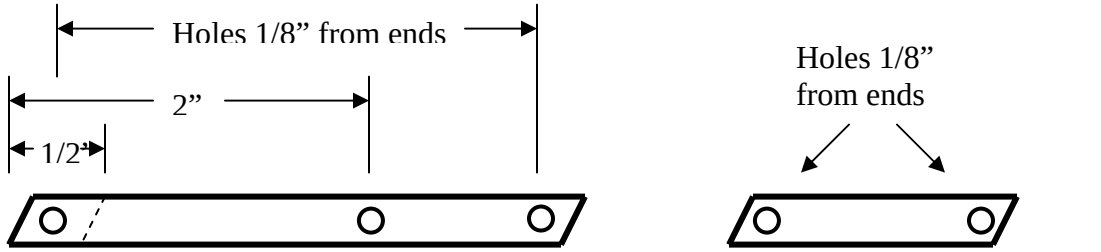
Conclusion

The Butternut vertical antenna is easily modified for 60-meters without losing any of the other bands. Try one of these three methods, and I'll see you on 60 meters!

From Bencher/Butternut

We would estimate that the "gain" of the antenna is minus 1 db, or a fraction less. As you say the antenna is shorter than a full quarter-wave, and even a perfect quarter-wave vertical has less than unity gain compared to a dipole because it radiates equally in all directions whereas a dipole has gain in two directions.

Thanks for sharing your hint with the ham community.
73!
Bob
Bencher, Inc.



½" wide x 5" long aluminum strap with three #6 clearance holes

½" wide x 1" long aluminum strap with two #6 clearance holes

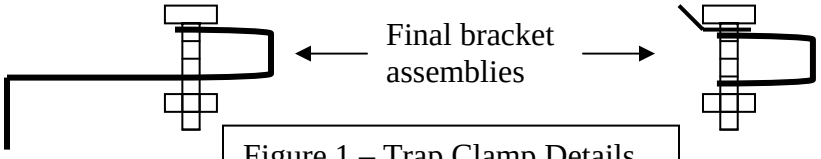


Figure 1 – Trap Clamp Details

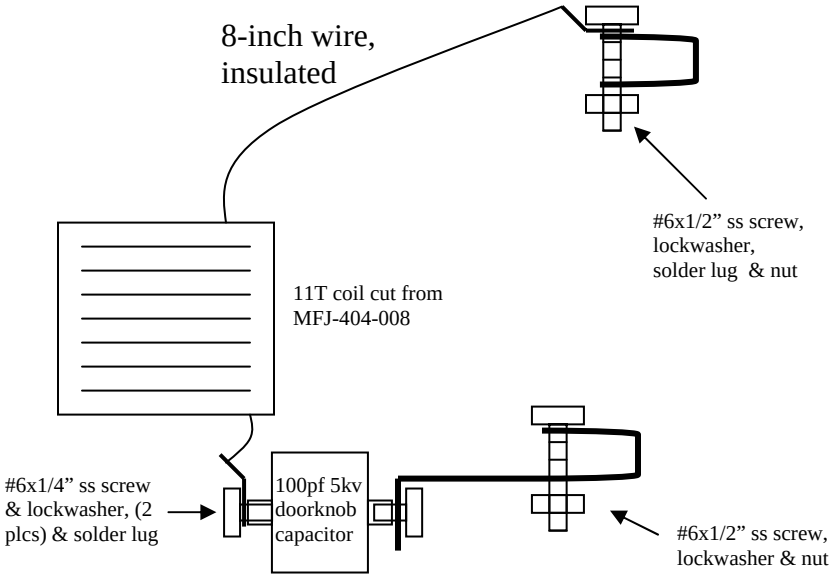
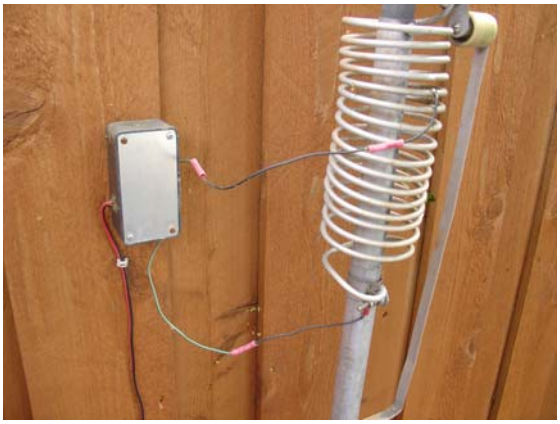
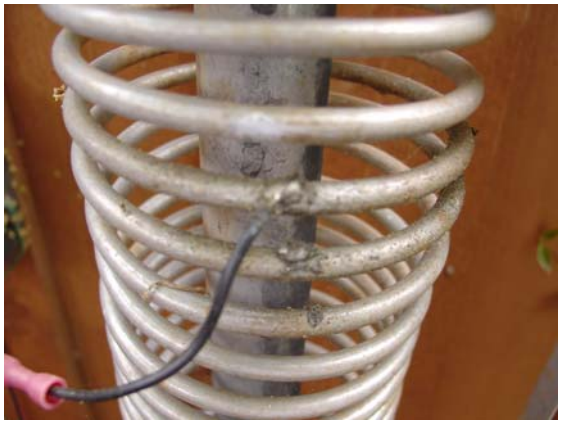


Figure 2: Trap Construction Details

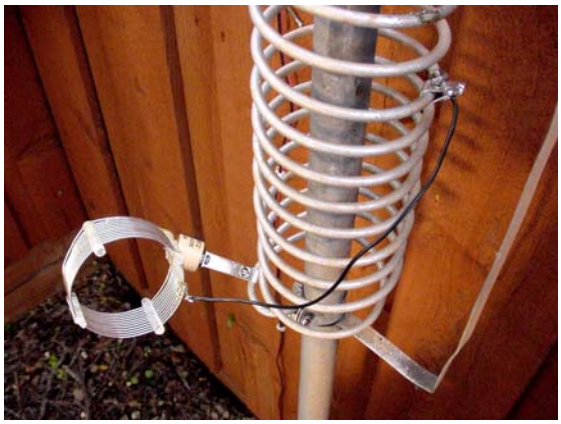


Relay box mounted on fence



Relay soldered tap point

60-meter Trap: Close-up



60-meter Trap: Tap point