butternut

Instructions

Model TBR-160-HD

Butternut Electronics Co's Instruction Manual for:
Model TBR-160-HD — 1981

NOTE:

The TBR-160-HD Top band resonator kit (160 meters) previously manufactured by Butternut Electronics Co. was discontinued in 1987. Parts are no longer available for this accessory. This instruction is made available as a reference.

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BUTTERNUT ELECTRONICS CO.

MODEL TBR-160 HD

Assembly and Installation Instructions

The TBR-160 HD is a higher-power version of the earlier TBR-160 . It attaches to the base of Butternut vertical antenna models HF5V-II, HF5V-III and HF6V in order to provide 160 meter operation without sacrificing operation on any of the other HF bands for which those models were designed.

Theory of Operation:

The TBR-160 HD is a parallel-tuned L-C circuit that produces the inductive reactance required for overall antenna resonance in the 1800-2000 khz range. At higher frequencies this same circuit produces decreasing amounts of capacitive reactance that will cause the antenna to resonate at slightly higher frequencies than normal in the mid-HF range. The upward frequency shift for a five-band vertical when the TBR-160 HD is installed is approximately 200 khz at 3.5 and 7 mhz; at 14 mhz and higher the upward frequency shift is slight to negligible. Each of the three Butternut models listed above are easily readjusted to compensated for the effect of the TBR-160 HD on the higher bands, and the only compromise that must be accepted for the sake of 160 meter operation in the average case is a slight reduction in VSWR bandwidth on 80 and 40 meters. The TBR-160 HD is conservatively rated for power inputs of 500 watts on c.w. and 1,000 watts on SSB. If operation at higher power levels is contemplated tune-up time should be held to a minimum. Bandwidth for VSWR of 2:1 or less on 160 meters will depend to a large extent on the efficiency of the ground system used with the antenna, and 10 khz would be a more or less representative figure for fair to good ground systems. Greater bandwidth is possible with poorer ground systems, but the best possible radial or other system is recommended. Radiation efficiency with very short loaded radiators (a 26-ft. vertical on 160 meters is equivalent to a 19-inch radiator on 10 meters) is difficult to achieve at best, so there is no point in using less than the best ground system that circumstances permit. In spite of the compromises in efficiency and operating bandwidth that must be accepted for the sake of 160 meter operation with a physically short antenna, the TBR-160 HD will permit 160 meter contacts out to several thousand miles, and DX contacts, even at "barefoot" power levels are not out of the question.

ASSEMBLY

Refer to the drawings and to the parts list to make sure that all parts are present before proceeding.

1. Locate coil (A) and clamp (B). Refer to the drawings in the following steps.
2. Pass a 3/4" x 1/4" bolt through the outer hole of the tab on clamp (B). Holding the bolt tightly against the inside of the tab, place the loop at the upper end of coil (A) over the threaded end of the bolt. Place a 1/4" flat washer, then a 1/4" split lock washer over the bolt and fasten snugly with a 1/4" hex nut. A 7/16" wrench will be useful for this operation, and a small screwdriver may be inserted edgewise into the slot on the head of the bolt to keep it from moving while the nut is being tightened. Be careful not to bend or distort the coil during this operation.
3. Pass the lower coil clamp and then the rest of the coil over the upper (insulator) end of coil support tube (C) as shown in the drawing. Position clamp (B) so that the small hole on the curve of the clamp lines up with the hole drilled into the insulator.
4. Pass a 1" x 1/4" bolt through the remaining holes of clamp (B) as shown in the top view of the coil and clamp assembly. Pass a flat washer and a split lock washer over the threaded end of the bolt and fasten securely with a hex nut. Make sure that the small hole in the clamp lines up with the hole in the insulator.
5. Repeat step 4 for the lower coil clamp, using a wing nut instead of a hex nut. Leave the turns of of the coil fully compressed and tighten the wing nut only slightly.

6. Force-fit one hole of plastic spacer (D) over the lower end of coil support tube (C) and position it approximately one inch above the lower end of the tube as shown in the drawing.
7. Place the end tabs of capacitor assembly (E) against the upper coil clamp (B) and the lower end of coil support tube (C) as shown. Align the hole in the upper tab with the holes in the clamp and in the insulator and fasten securely with the self-tapping screw. A 5/16" nutdriver is recommended for this operation, but a flat-blade screwdriver may be used if care is taken to avoid injury in case the blade slips out of the slot under pressure. Do not hold the work opposite the screwdriver.
8. Pass the 2" x 8/32" bolt through the lower tab of the capacitor assembly and then through the holes at the lower end of the coil support tube. Place a small lock washer over the threaded end of the bolt and fasten securely with a #8 hex nut. Again, do not hold the work opposite a screwdriver if one is used. An 11/32" nutdriver is recommended for this operation if one is available.
9. At this point it will be necessary to remove the antenna from its mounting post in order to attach the assembled TBR-160HD to the bottom of the lower section. Force-fit the hole at the other end o plastic spacer (D) over the lower end of the antenna as in step 6 and position the TBR-160 H D as shown in the drawing. Secure the antenna end of clamp (B) as shown, using the remaining 1/4-inch hardware. Place the antenna back on its mounting post.

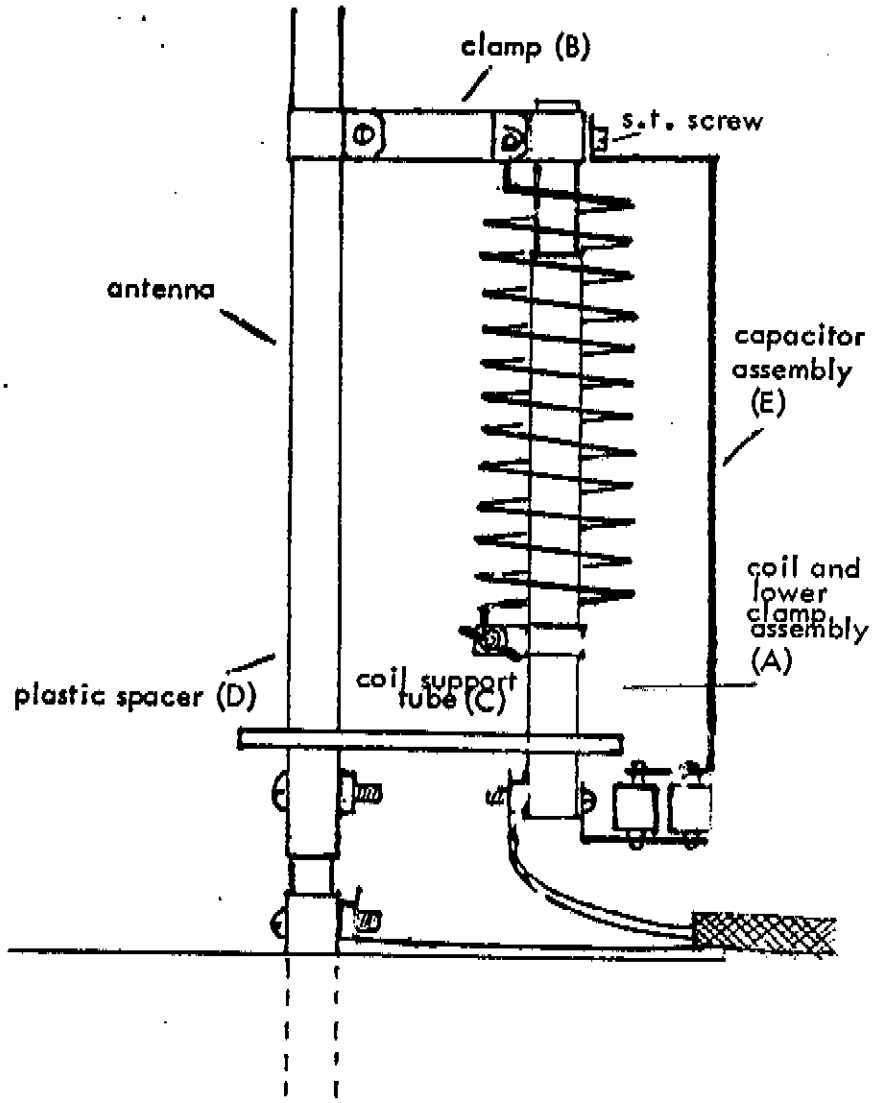
TESTING AND ADJUSTMENT

1. With the TBR-160 HD in place, the feedline should be connected as shown. The remaining #8 hardware may be used to connect the center conductor of the feedline to the TBR-160 HD. Radials, ground wires and the outer conductor braid of the feedline should remain attached to the mounting post. The copper impedance matching/grounding coil should not be attached at this time.
2. Loosen the wing nut on the lower coil clamp and set the coil so that the lower edge of this clamp is approximately 4-3/4 inches (12 cm.) from the lower end of the coil support tube. This setting should produce resonance and lowest VSWR at some point in the 1800-1900 khz range. Tuning is very sharp on this band, so VSWR checks every 5 khz or so may be required to determine the exact resonant frequency with this initial setting. If no frequency in this range can be found at which the VSWR drops to a minimum value, loosen the wing nut, stretch the coil another half-inch or so, tighten the wing nut, and run another series of VSWR checks beginning at 1800 khz.
3. Once a frequency of minimum VSWR has been found, the lower clamp/coil setting may be adjusted for resonance at any particular frequency by setting the turns of the coil closer together to lower frequency or setting them farther apart to raise frequency. If operation above 1900 khz is planned it may be necessary to short out several turns of the coil.
4. After adjustment for resonance on 160 meters it will be necessary to readjust the antenna 80 and 40 meter circuits by setting the turns of each coil closer together. Although the 20 and 15 meter resonances should not change significantly, it may be found that 10 meter resonance occurs at a lower frequency than before, in which case the overall height of the antenna may have to be reduced (perhaps by a foot or more in the case of the HF6V). This final adjustment may necessitate slight readjustment of the other circuits, depending on the amount of shortening required.

MATCHING CONSIDERATIONS

VSWR at resonance on 160 meters should be 1.5:1 or less with most ground systems, and even lower values of VSWR may be encountered under poor ground conditions. If a fair to good ground system is used it may be found that the 80 and 40 meter VSWR will be higher than before because the copper impedance matching/grounding coil is no longer connected across the feedpoint (its reactance is usually too low to perform the matching function on 160 meters). In spite of its low reactance, the 80 meter matching coil may often be attached to the 160 meter feedpoint on the TBR-160 HD (the other

end of the coil going to the ground connection on the mounting post) and adjusted so as to "split the difference" for reasonably low VSWR on both 80 and 160 meters, particularly if the ground system is a good one. If lower VSWRs can be obtained on 80 and 160 meters without the matching coil (the usual case with fair to poor ground systems) a "garden variety" r.f. choke having an inductance of more than about 8 microhenries may be placed across the coaxial feedline for static reduction.

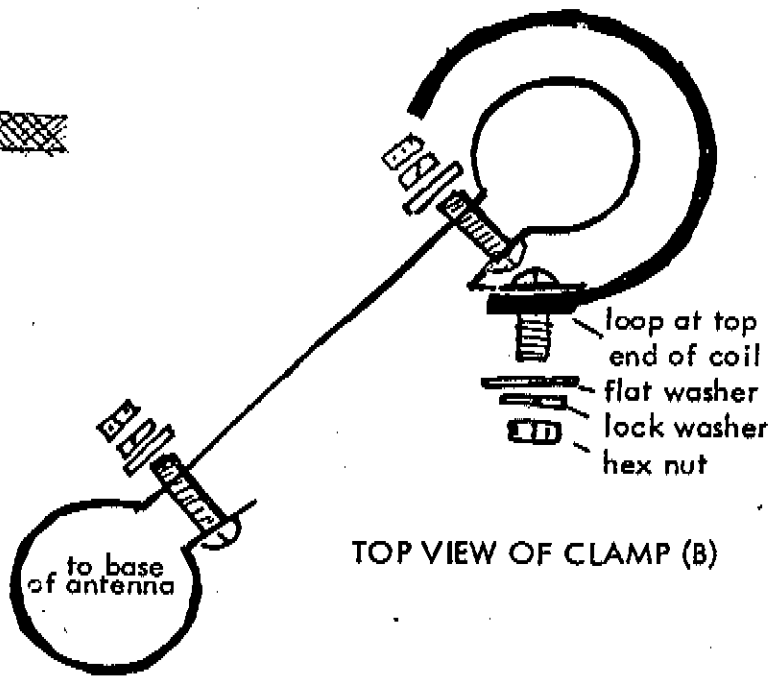


Parts List:

1--coil and lower clamp assembly (A)
1--upper (double) coil clamp (B)
1--coil support tube (C)
1--plastic spacer (D)
1--capacitor assembly (E)

Hardware package:

3--1" x 1/4" bolts
1--3/4" x 1/4" bolt
4--1/4" split lock washers
4--1/4" flat washers
3--1/4" hex nuts
1--1/4" wing nut
1--self-tapping screw (slotted hex head)
1--2" x 8/32" bolt
2--#8 lockwashers
2--#8 flat washers
2--#8 hex nuts



TOP VIEW OF CLAMP (B)