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Instructions

Model BUT-TBR-160S

160 Meter add-on for the HF2V, HF6V and HF9V

The TBR-160-S is a parallel tuned circuit that attaches to the base of BUTTERNUT[®] vertical antenna models HF2V and HF6V-X/HF9V-X permitting operation on 160 meters.

THEORY OF OPERATION

The TBR-160-S functions as an inductive reactance in series with the antenna feedpoint, loading the antenna structure to resonance on the 160 meter band. On the higher bands the TBR-160-S produces decreasing values of capacitive reactance, slightly raising the resonant frequency (by 300-400 kHz) on 80 & 40 meters. Above 7 MHz this detuning is negligible, and the antenna may be adjusted to compensate. In general, the only compromise that one must accept for the sake of 160 meter operation is reduced SWR bandwidth on 80 meters and to a lesser extent, on 40 meters with the HF6V-X/HF9V-X. The TBR-160-S is rated at output power levels of 500 watts on CW and 1000 watts PEP SSB, although prolonged tune-up at these power levels should be avoided. Bandwidth for SWR 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; 10 kHz is a typical figure with a fair-to-good ground system and a relatively short antenna such as the HF6VX/HF9V-X. With the longer HF2V, especially if top loading "umbrella" wires are used, SWR bandwidths of 15 to 35 kHz between 2:1 points are possible. Greater bandwidths are likely with poorer (higher loss) ground systems, but the best possible ground systems should always be used with electrically short loaded antennas. Since this is a short antenna for 160 meters, optimum performance cannot be expected. Also note that a good radial system (32 or more radials of 50-65 feet each) is a requirement. Even at best, the bandwidth will be very narrow so when tuning for 160 meters, you will have to determine which slice of the band you will be working in.

ASSEMBLY

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

1. Locate coil A and clamp B. Pass a 3/4" bolt through the hole on the tab of 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. Then, place a washer and lock washer over the bolt and fasten snugly with a hex nut. The tab of clamp B may be bent away slightly to insert a screwdriver in the head of the bolt to prevent its turning as the hex nut is tightened. Be careful not to bend the coil during this operation.
2. 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, then pass a 1-1/4" bolt through the remaining hole in the coil end of clamp B. Use a washer, lock washer and hex nut as shown to fasten that end of the clamp securely around the insulator end of support tube C.
3. Similarly, install a washer, lock washer and wing nut on the lower coil clamp. Leave the coil fully

compressed, and tighten the wing nut only enough to hold the coil in place. You will adjust the coil later.

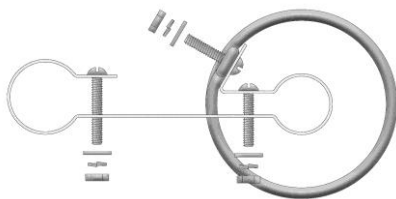
4. Locate the capacitor clamp D and slide one end of it up over the lower end of coil support tube C. Use 1" bolt, washer, lock washer and hex nut to fasten this end of clamp D securely around tube C. Align clamp D so that it is in the same plane as clamp B.
5. To install the TBR-160-S on the antenna, simply slide the freed ends of clamps B and D around the base of the antenna as shown in the drawing and use 1-1/4" bolts, washers, lock washers, and hex nuts to hold the assembly securely in place.

TESTING AND ADJUSTMENT

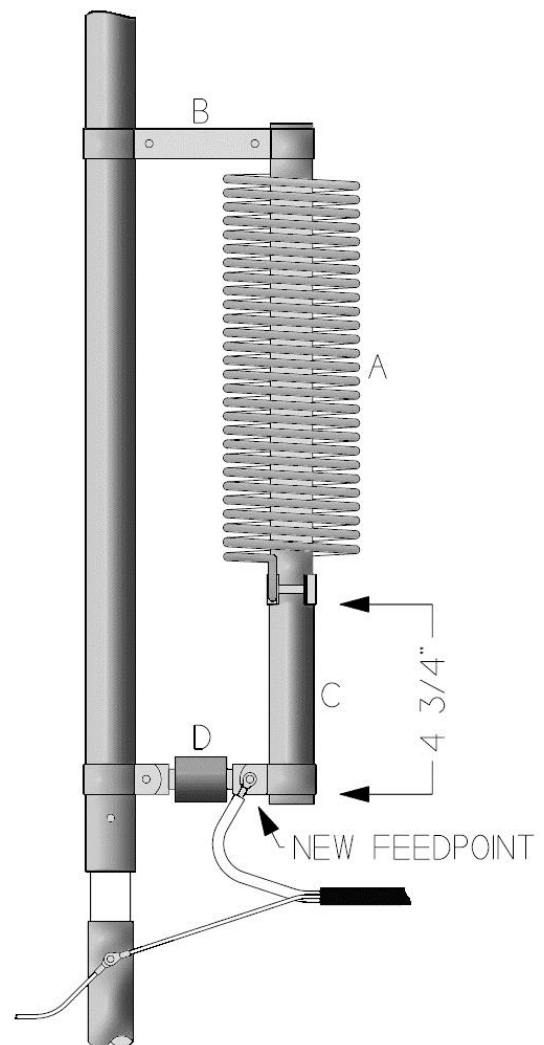
1. With the TBR-160-S installed as shown, the center conductor of the coaxial feedline must be moved from the base of the antenna to the coil end of clamp D. The remaining hardware should be used to fasten the lug of the center conductor to the bolt holding the clamp around coil support tube C. Radials, ground wires, and the braid of the coaxial cable should remain attached to the mounting post. The top of the small impedance matching/grounding coil ("Q") should be disconnected from the base of the antenna, but the lower end should remain connected to the mounting post for possible use later.

Some users have reported that a new "Q" coil made with 12 gauge wire, 15 turns and a 2.25" to 2.5" diameter will help not only with 160 meters, but will also allow the other bands on your antenna to be tuned properly. You will most likely have to examine and re-tune all of the bands after adding the 160 meter kit. All the bands will probably shift up in frequency. The 80M coil has to be compressed about 3" and the 40M coil an inch. The overall length will most likely need to be increased by 6" for 10 meters. The 15M wire has to be lengthened by 3". Once 30M is adjusted, it may also bring 20M back in, so you can avoid adjusting the 20M tap. 17M and 12M coils may need to be compressed fractions of an inch for tuning. The 17M adjustment may be better than it was without the 160M coil. The only elements that may not require adjusting after adding the 160M kit are the 20M tap and the 6M wire.

2. Loosen the wing nut on the lower coil clamp and stretch the coil by sliding the clamp down tube C until the lower edge of the clamp is approximately 4-3/4" (12 cm.) from the lower edge of clamp D. This setting should produce lowest SWR



between 1800 and 1900 kHz. Tuning is very sharp so SWR



checks at intervals of 5 kHz may be necessary to determine the resonant frequency with the initial setting. If no frequency can be found where the SWR drops to a minimum value, simply stretch the coil out an inch or less, and begin another series of SWR checks. Once the low SWR point has been found, it is a simple matter to make adjustments for any frequency between 1800 and 2000 kHz. To raise the frequency of lowest SWR, stretch the coil a slight amount. To lower the frequency, compress the coil. Final adjustments should be made with changes of 1/2" or less. For operation above 1900 kHz it may be necessary to short out or remove several turns of the coil if it cannot be stretched sufficiently.

3. After the TBR-160-S has been adjusted for 160 meter operation it will be necessary to readjust the 80 and 40 meter resonator circuits for greater inductance. Do this by compressing the coils for those bands. The circuits for the higher-frequency bands should not require adjustment. In some installations, however, it may be found that the previous 10 meter resonance moves to a lower center frequency and shows narrower bandwidth, while a second unwanted resonance occurs in the 27 MHz range. If the lower resonance cannot be moved above 28 MHz by shortening the upper section of the antenna (Model HF6V-X/HF9V-X), it may be necessary to neutralize the 27 MHz resonance by shunting the capacitor across the lower few turns of the TRS-160-S coil. Should this measure become necessary for proper 10 meter tuning, please contact our customer service department for detailed instructions and appropriate materials. In the case of the HF2V, which is not designed for operation above 10 MHz, this problem will not arise.

MATCHING CONSIDERATIONS

It is totally unrealistic to expect a perfect match to 50 ohm cable over the 1.8 to 28 MHz range with a single antenna, because earth losses, antenna radiation resistance, and conductor losses, all of which determine the feedpoint impedance of the antenna, can vary greatly over the HF spectrum. With poor-to-fair ground systems SWR resonance on 160 meters should be less than 2:1. With better ground systems, SWR may exceed 2:1, although the antenna will perform more efficiently. In such a case, it may be desirable to reconnect the free end of the impedance matching/grounding coil to the feedpoint of the TBR-160-S and adjust for lower SWR. In general the reactance of this coil is not sufficient to keep 160 meter energy from passing through it to the ground, even with the coil fully compressed at settings that provide the best match on 80 meters unless the feedpoint impedance is much less than 50 ohms as would be the case with a good ground system. If necessary, additional inductance may be placed between the base matching/grounding coil (the replacement "Q" coil as described earlier) and the 160 meter feedpoint for the sake of a better match on that band. Unfortunately, the amount of inductance that provides the best match on 160 meters will probably not provide the best match on 80 meters, in which case it may be necessary to settle for a compromise adjustment for both 160 and 80 meters.

Hardware Package List		
QTY	Part Number	Description
3	V00153	#10 x 1-1/4" Screw
1	V00131	#10 x 1" Screw
1	V00226	#10 x 3/4" Screw
6	V00132	#10 Flat Washer
6	V00133	#10 Lock Washer
5	V00134	#10 Hex Nut
1	V00135	#10 Wing Nut

Parts List		
	Part Number	Description
A	V00339	Coil Assy - 160M
B	V00267	Coil Clamp
C	V00196	Coil Support Tube
D	V00266	160M Capacitor Assy

Photos from a **BUT-TBR-160S** installation courtesy of Scott Myers, AC8DE:



Technical Support

If you have questions about this product, or if you experience difficulties during the installation, contact Butternut at (330) 572-3200. For best service, please take a few minutes to review this manual before you call.

Another great place for information about the classic Butternut® Antennas is the Butternut® Yahoo Group - <https://groups.yahoo.com/neo/groups/Butternut-antennas/info>

This special interest group is moderated by Scott Myers, AC8DE and contains a treasure trove of Butternut® antenna information from users around the world.

Warranty

All products manufactured by Butternut are warranted to be free from defects in material and workmanship for a period of one (1) year from date of shipment. Butternut's sole obligation under these warranties shall be to issue credit, repair or replace any item or part thereof which is proved to be other than as warranted; no allowance shall be made for any labor charges of Buyer for replacement of parts, adjustment or repairs, or any other work, unless such charges are authorized in advance by Butternut. If Butternut's products are claimed to be defective in material or workmanship, Butternut shall, upon prompt notice thereof, issue shipping instructions for return to Butternut (transportation-charges prepaid by Buyer). Every such claim for breach of these warranties shall be deemed to be waived by Buyer unless made in writing. The above warranties shall not extend to any products or parts thereof which have been subjected to any misuse or neglect, damaged by accident, rendered defective by reason of improper installation, damaged from severe weather including floods, or abnormal environmental conditions such as prolonged exposure to corrosives or power surges, or by the performance of repairs or alterations outside of our plant, and shall not apply to any goods or parts thereof furnished by Buyer or acquired from others at Buyer's specifications. In addition, Butternut's warranties do not extend to other equipment and parts manufactured by others except to the extent of the original manufacturer's warranty to Butternut. The obligations under the foregoing warranties are limited to the precise terms thereof. These warranties provide exclusive remedies, expressly in lieu of all other remedies including claims for special or consequential damages. SELLER NEITHER MAKES NOR ASSUMES ANY OTHER WARRANTY WHATSOEVER, WHETHER EXPRESS, STATUTORY, OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS, AND NO PERSON IS AUTHORIZED TO ASSUME FOR BUTTERNUT ANY OBLIGATION OR LIABILITY NOT STRICTLY IN ACCORDANCE WITH THE FOREGOING.

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