butternut

Instructions

Model HF4V-II

Butternut Electronics Co's Instruction Manual for:
Model HF4V-II — 1978

NOTE:
The HF4V-II Vertical antenna previously manufactured by Butternut Electronics Co. was discontinued in 1981. Parts are no longer available for these antennas. This instruction is made available as a reference.

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BUTTERNUT ELECTRONICS CO.
ROUTE 1, LAKE CRYSTAL, MN 56055

ASSEMBLY AND INSTALLATION: MODEL HF4V-II

(September, 1978)

During assembly and installation take care to avoid contacting power lines with the antenna. Do not mount the antenna in any location where it might blow into or fall upon power lines.

Tools recommended for assembly: Standard blade screwdriver, 5/16 in. nut-driver, pliers, pocket knife.

Study the pictorial diagrams and proceed as follows:

1. Check to see that all parts are present. See the parts pictorial page.

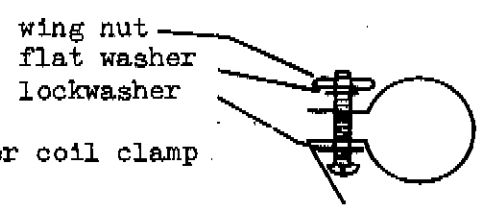
2. Plant the mounting post(A) in a hole approximately 21 in. deep so that the upper end of the fiberglass insulator clears the ground by 5 or 6 in. Pack earth tightly around the tubing post to make sure that it remains vertical. Concrete is recommended for more strength. The post may be twisted slightly while the concrete is setting so that it may be removed easily at a later date, if desired. The post should not wobble in the hole. NOTE: Hammering the post into the ground may cause splintering of the fiberglass insulator. If the post must be hammered, protect the top with a block of wood.

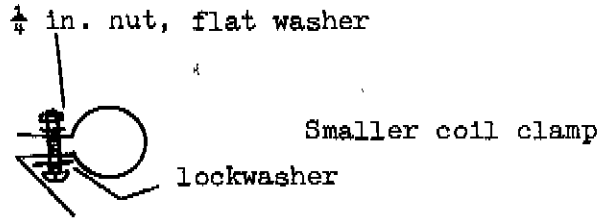
3. Prepare the impedance matching/grounding coil (K) as shown on the pictorial page.

4. Note that the 40m resonator coil (C) has two clamps, one large and one small. Pass the top of section (B) first through the larger clamp, then through the smaller clamp. The larger clamp should be below the black plastic on (B).

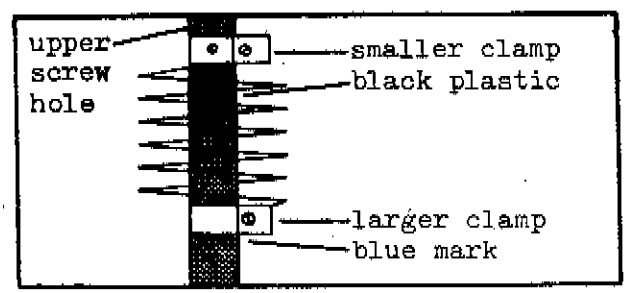
5. Pass a 1/4 in. x 1 in. screw through a lockwasher, through the screw holes in the smaller clamp of (C). Line up the small screw hole in the curved part of the clamp with the lower screw hole in the top of section (B). Tighten the 1/4 in. hardware using a flat washer and a hex nut, then put a #10-24 self-tapping screw into the small hole and tighten, further securing the clamp to (B).

   NOTE: If you use a screwdriver to put in self-tapping screws, do not hold the work immediately opposite the blade. Be prepared for the blade to slip.





6. Pass a 1/4 in. x 1 in. screw through a lockwasher, then through the holes in the larger clamp of (C). Secure with a flat washer and a wing nut, but do not tighten, as the clamp will be moved in the next step.



7. Slide the larger clamp of (C) down section (B) until the bottom of the clamp touches the blue mark on (B). Tighten the wing nut. This gives the preliminary coil extension for 40m resonance. Set (B)-(C) aside.

8. Place a large stainless steel clamp over the slotted end of (E). Telescope section (D) into (E). Measure the distance from the end of (E) to the black plastic of the trap, setting to 6 ft. 8 in. and tighten the clamp. This gives the preliminary 15m setting.

9. Slide the end of section (F) with the screw hole into the top of (E). Line up the screw holes and secure with a #10-24 self-tapping screw.

10. Locate sections (G), (H), and (I). Note that (H) has a screw hole in each end, one small, one large. Slide the open end of (I) into the end of (H) with the small screw hole. Line up the screw holes and secure with a #6 (small) self-tapping screw. Then slide the end of (G) into the end of (H) with the larger screw hole, and secure with a # 10-24 self-tapping screw.

11. Place a small stainless steel clamp over the slotted end of (F). Telescope (G) into (F), measuring the distance from the top of the black plastic trap to the tip of (I) to 13 ft. 2 in. and tighten the clamp.

NOTE: The first section of the antenna will be stood on the mounting post in the following step. In the case of roof mounting, it may be desirable to assemble the entire antenna and then install it on the mounting post.

12. Place the bottom of section (B) over the fiberglass insulator of (A). Line up the screw holes. Pass a 1-1/2 in. x #8 screw through a flat washer, then through the screw holes. Secure with a lockwasher and nut.

13. WATCH OUT FOR POWER LINES! Raise assembly (D) through (I) and place it atop (B). Line up the screw holes and secure with a #10-24 self-tapping screw.

14. Install the 75 ohm matching line on sections (A) and (B) as shown on the pictorial page. The center conductor must be connected to (B). Simply place the lugs over the ends of the #8 screws.

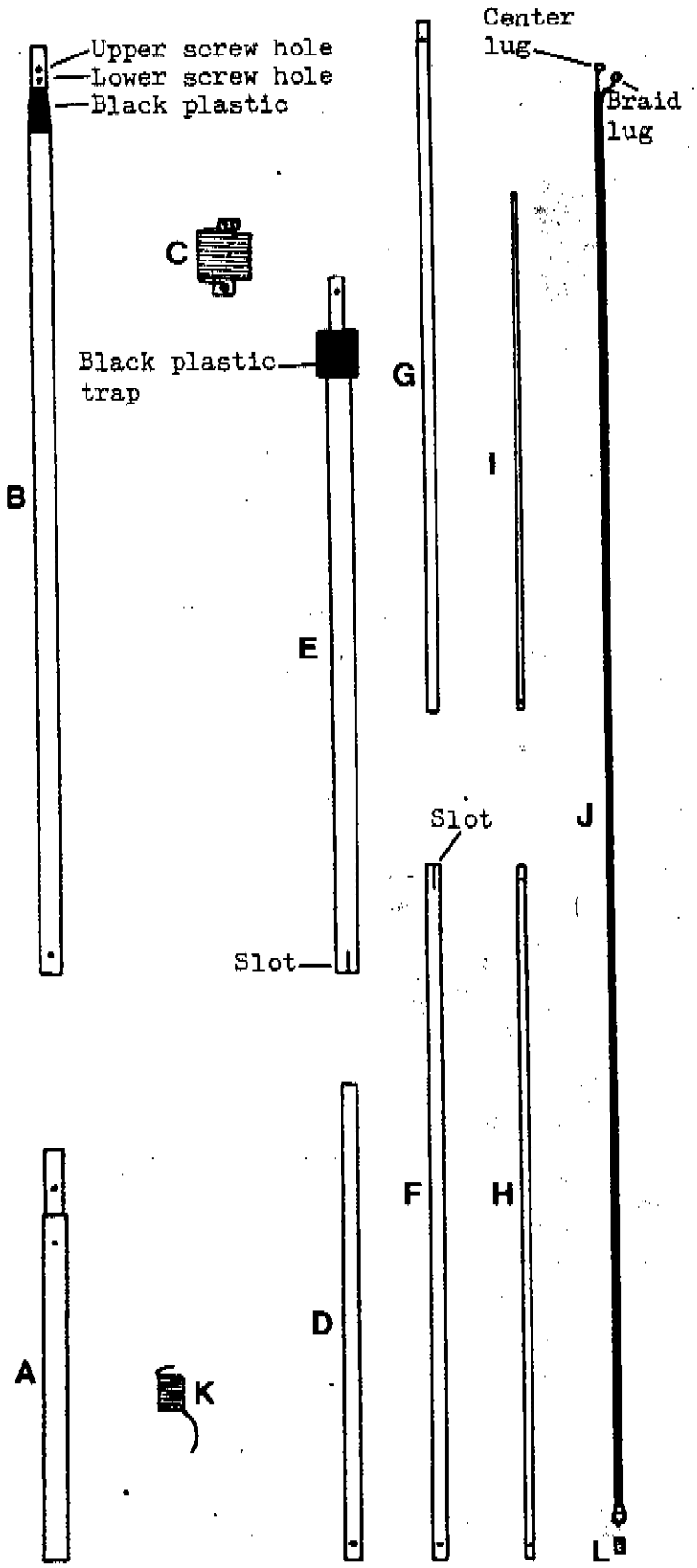
15. Install the impedance/grounding coil (K) as shown in the pictorial. Point 1 should go to (B), point 2 to (A), and point 3 to the ground system. Flat washers may be installed between the coax lugs and this coil if desired.

16. Secure the connections to (B) with a flat washer, a lockwasher, and a nut.

17. Radials or additional grounding may be added to the connection at (A). Secure with a flat washer, a lock washer, and a nut.

18. Connect the impedance matching line (J) to any length of 50-53 ohm coax by means of connector (L). CAUTION: Remember that the antenna is grounded! To avoid a shock hazard, ground and/or unplug the rig from the AC line before connecting the coax.

HF4V-II page three PARTS PICTORIAL



Parts List:

(A) Mounting post. Two ft. aluminum tube with fiberglass insert.

(B) 40m capacitor section. 5-1/2 ft.

(C) 40m resonator coil.

(D) 1 in. O.D. tube. 4 ft.

(E) 15m trap section.

(F) 3/4 in. O.D. tube. 4 ft.

(G) 5/8 in. O.D. tube. 4 ft.

(H) 1/2 in. O.D. tube. 4 ft.

(I) 3/8 in. O.D. tube. 3 ft.

(J) 75 ohm impedance line.

(K) Impedance matching/grounding coil.

(L) Connector

Hardware Packet #1:
Four #10-24 self-tapping screws.
One #6 self-tapping screw.
One #8 x 1-1/2 in. screw.
Three #8 nuts.
Three #8 lockwashers.
Five #8 flat washers.
Two stainless steel clamps, one large, one small.

Hardware Packet #2:
1/4 in. hardware:
Two 1 in. screws.
Two flat washers.
Two lockwashers.
One hex nut.
One wing nut.

BUTTERNUT ELECTRONICS CO.
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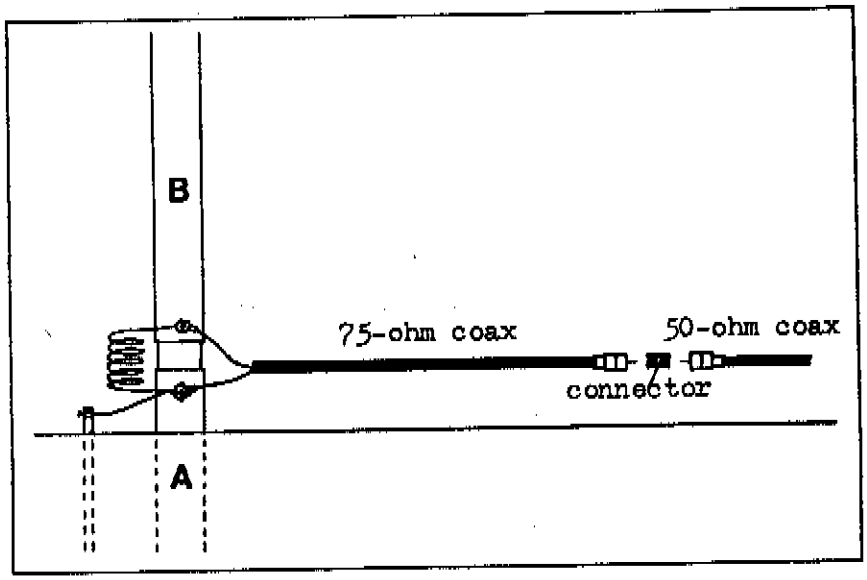
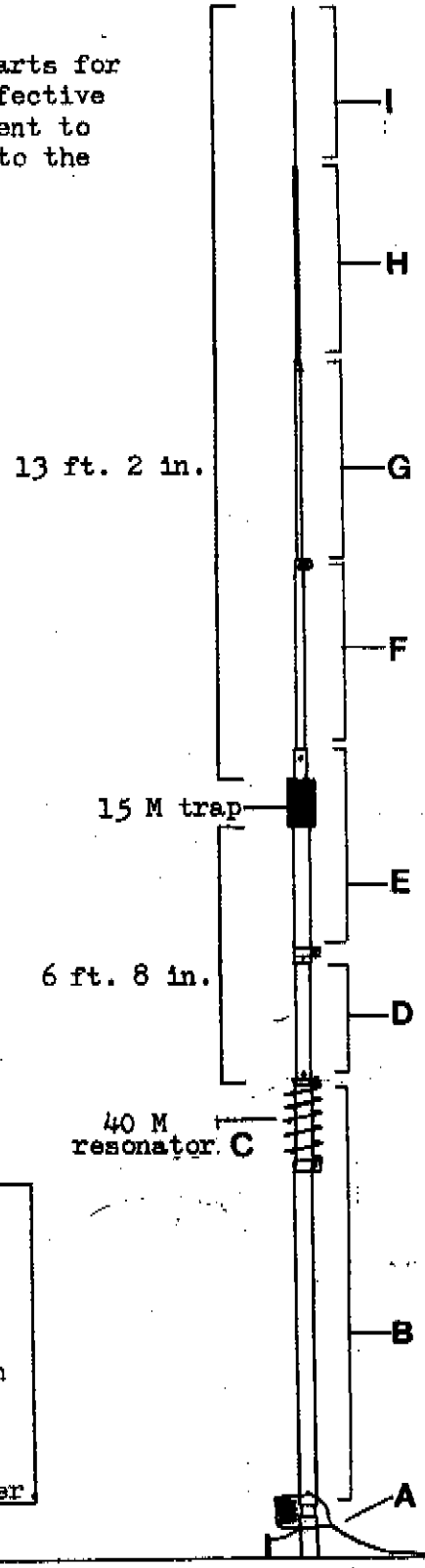
MODEL HF4V VERTICAL ANTENNA
PICTORIAL DIAGRAM

Warranty: Butternut will repair or replace defective parts for a period of 90 days following the date of purchase. Defective parts, if returned for repair or replacement, must be sent to the factory. The purchaser bears the cost of shipping to the factory; we pay the return shipping.

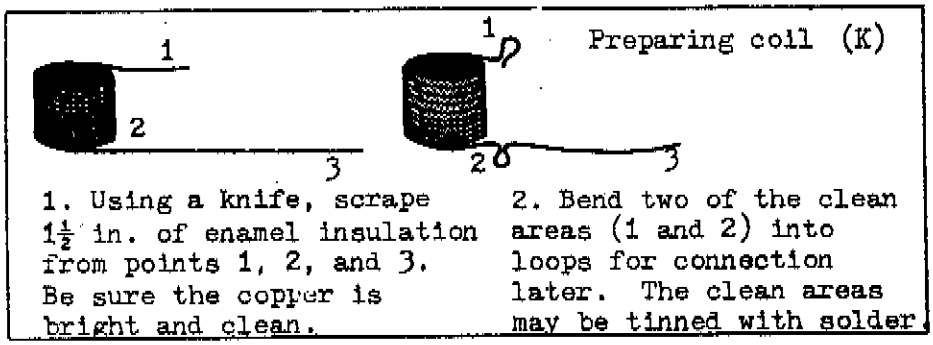




Safety first! Do not install the antenna where it can contact power lines during or after installation!

High R.F. voltages can appear on the exposed resonator coils--a protective fence around the antenna is recommended if there is a chance of people touching them during operation.

Remember that the transmitter chassis will be connected to the braid of the coaxial feedline. A good earth ground to the transmitter chassis will reduce the danger of shock when making adjustments at the antenna.



1. Using a knife, scrape $1\frac{1}{2}$ in. of enamel insulation from points 1, 2, and 3. Be sure the copper is bright and clean.

2. Bend two of the clean areas (1 and 2) into loops for connection later. The clean areas may be tinned with solder.

CHECKOUT AND ADJUSTMENT

The dimensions given in the pictorial should produce low SWR readings over all four bands. Inasmuch as some variation may be expected, the following procedure may be used to adjust the antenna for minimum SWR on one or more of the four bands. SWR readings may be taken at the transmitter end of the main feed line or at the junction of the 75 ohm and 50 ohm lines for greater accuracy.

1. Determine the frequency of lowest SWR on 15m. To raise frequency, telescope sections (D) and (E). To lower frequency, pull them apart.

2. Determine the frequency of minimum SWR on 20m. To raise or lower frequency, adjust the total length of sections (F) through (I) by varying the overlap between sections (F) and (G) a few inches at a time.

3. Determine the frequency of minimum SWR on 10m. The 20m adjustment also determines the 10m resonant frequency, but resonance on both bands is so broad that slight adjustments for the sake of improved SWR on one band will not materially affect SWR on the other.

4. Determine the frequency of minimum SWR on 40m. Adjustment is made by loosening the lower coil clamp and sliding it down section (B) to raise frequency of sliding it up section (B) to lower frequency.

5. Repeat as necessary.

Finally, it should be remembered that SWR will depend to some extent on losses in the ground connection and that low SWR readings do not necessarily mean that an antenna is operating efficiently. In any case, there is no point in expending great effort to attain SWR readings significantly below 2:1 over the operating range on any of the five bands, as the difference between 2:1 SWR and a perfect match would be negligible in the average case.

THEORY OF OPERATION

The HF4V operates as a full quarter-wavelength radiator on 15 meters, using a parallel-tuned decoupling trap to isolate sections D through G from the lower antenna sections on this band. On 20 meters the entire antenna length is active, and the antenna operates with a physical and electrical length of approximately 3/8 wavelengths. This length is resonated by the capacitive reactance of the 40 meter resonator circuit and by the inductive reactance of the 15 meter trap. 20 meter radiation resistance is much higher than that of conventional trapped or monoband quarter-wave verticals, and overall efficiency is considerably better. 10 meter operation is similar to that on 20 meters, and the antenna functions as an electrical 3/4 wavelength radiator with improved low-angle radiation characteristics and higher efficiency than quarter-wave types.

Because of the higher than normal radiation resistance on 20 meters, the impedance at the base of the antenna is approximately 100 ohms on that band. An electrical quarter-wavelength section of 75-ohm coaxial cable is used as a matching transformer for the 50 ohms impedance of the main transmission line. This matching section does not appreciably affect impedance matching on the other bands.