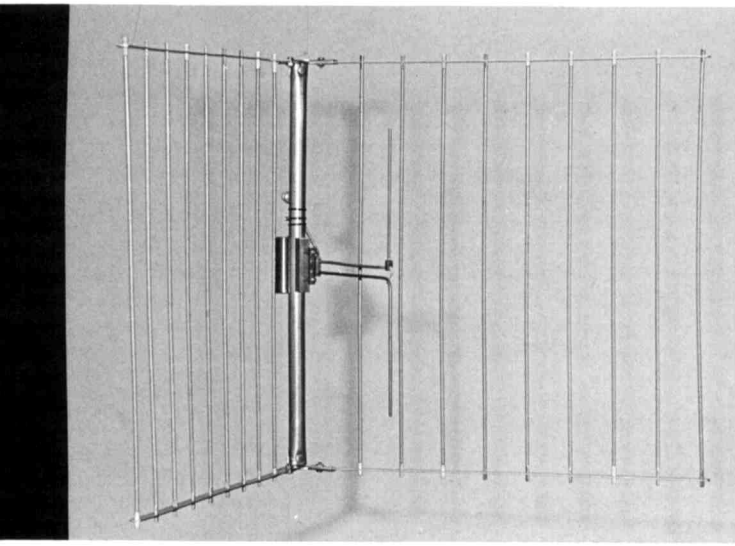


432-MHz corner-reflector antenna

This miniature 7-dB antenna may be used by apartment dwellers, or as a reference for antenna measuring

Fred Telewski, WA2FSQ

Here is a small 432-MHz antenna which will suit the needs of apartment dwelling amateurs or those who want a standard gain reference antenna. This 7-dB antenna makes a nice portable window unit as well as an excellent comparision antenna for larger arrays.

Antenna contests have shown that many complex arrays (both amateur and commercial) do not perform as expected. This is due in part to the fact that many gain measurements are made via E- and H-plane pattern integration that assume a lossless structure. This is often not true because the structures are lossy. In addition, directivity is a prerequisite for gain but gain is not required for directivity. Since the corner reflector described here is simple and foolproof it will provide a good reference for large arrays.

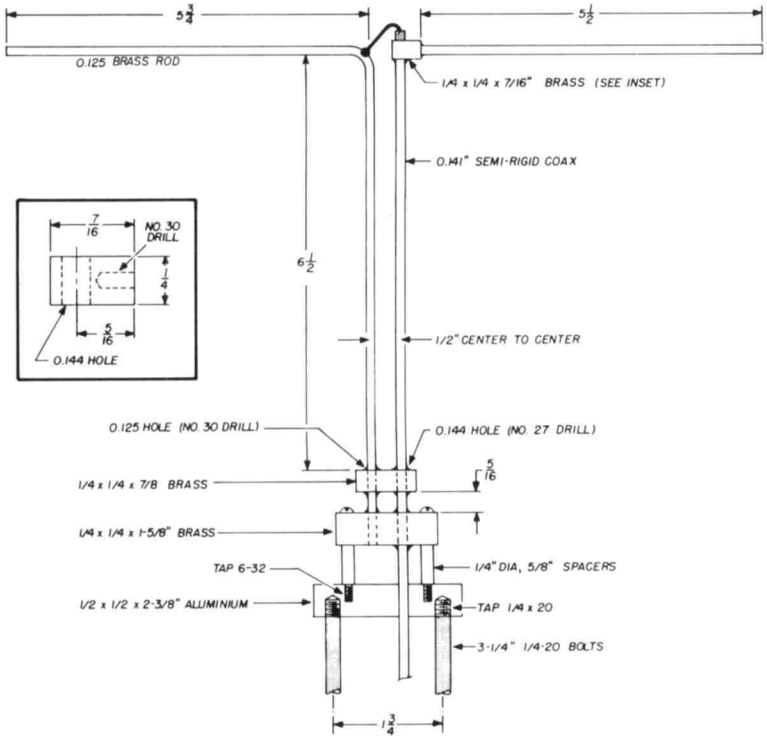
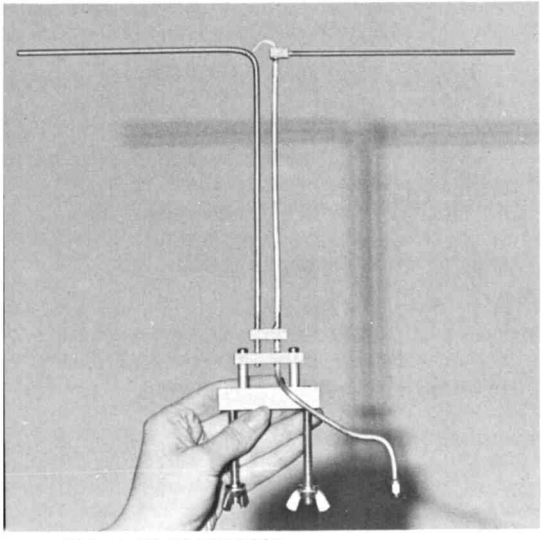


fig. 1. Construction details for the driven dipole element of the 432-MHz corner reflector antenna. Reflector is built from commercial uhf-tv antenna.

the reflector

The corner reflector is a modified JFD uhf television antenna which is priced at around $5.00. Start modifying the antenna by removing the U-bolt and saddle clamps; drill out the rivet which holds the bow-tie assembly in place. Discard the bow-tie and replace it with the driven dipole described in **fig. 1.** The original bow-tie will not function properly at 432 MHz.

For a completely collapsible antenna, drill out the spring-loaded rivets which hold the reflector panels to the back bar and replace them with 8-32 screws and wing nuts.



Driven dipole assembly.

driven dipole

The driven dipole consists of a coaxial line (Phelps-Dodge 0.141-inch semirigid line*), a balancer and a dipole. A variety of connectors for the semirigid line are available from Phelps Dodge Corporation;

*Phelps Dodge Communications Corporation, 60 Dodge Avenue, North Haven, Connecticut 06473.

the one recommended here is a BNC female type PDM 952-001. If you don't want to purchase a special connector, you can make one out of a BNC type UG-88/U connector by making a bushing which will adapt 0.141-inch line to the parts carefully with fine sandpaper or steel wool and apply flux before soldering. Do not use a torch; the excessive heat may cause the Teflon to expand and burst the outer conductor of the semi-rigid line.

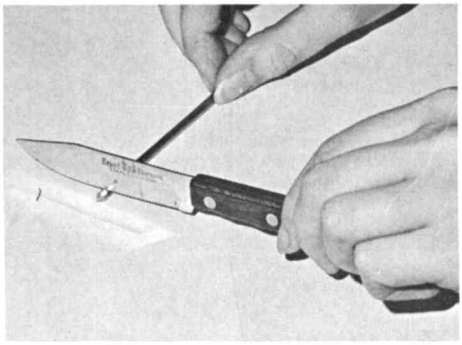


fig. 2. First step in preparing semi-rigid coaxial line is to score the outer conductor with a sharp knife.

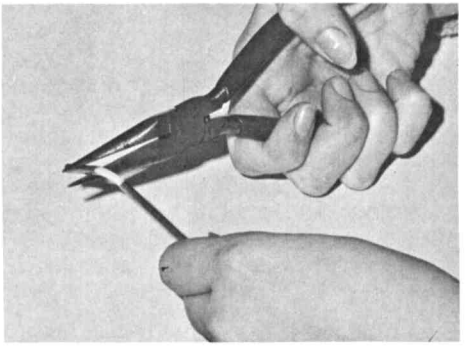
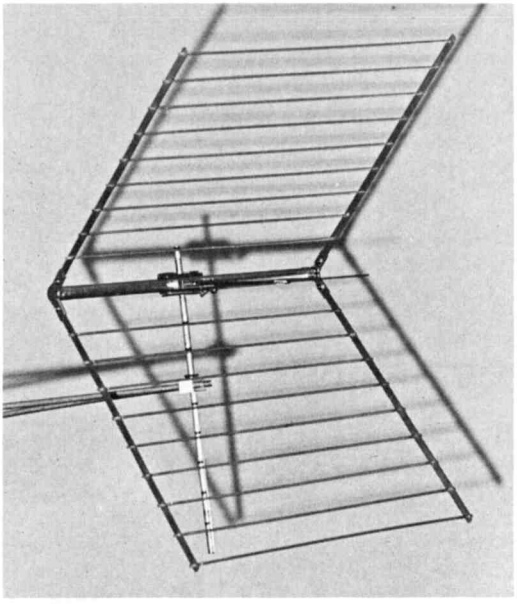


fig. 3. Break the outer conductor by grasping the end with pliers and rocking it back and forth.

rear nut and soldering it in place.

The driven dipole parts should be soldered with a 250-watt iron. Clean the



Corner reflector attached to window-mounting bracket.

A few hints are in order for working with the semirigid coaxial line. This cable may be prepared by scoring the outer conductor with a sharp knife (see **fig. 2**). When the score is complete, grasp the end lightly with a pair of pliers and rock from side to side (see **fig. 3**). This separates the outer conductor from the Teflon dielectric. Now the outer conductor may be removed. Carefully score the Teflon (do not nick the center conductor) and remove it to expose the center conductor (see **fig. 4**).

performance

This antenna will deliver approximately 7 dB gain over a dipole. This design should yield a vswr of 1.2:1 or less if the dipole is carefully constructed. The 0.141-inch semirigid line will handle 200 watts of rf output power quite easily. For higher powers (500 to 600 watts) use 0.250-inch semirigid coaxial line.

radiation hazard

The potential hazards of rf radiation should always be considered when working in close proximity to vhf and uhf

antennas. In general, it is good practice not to stand directly in front of any vhf-uhf antenna excited with 10 watts or more of rf. At these frequencies the rf energy causes thermal heating of body tissue which may have undesirable effects

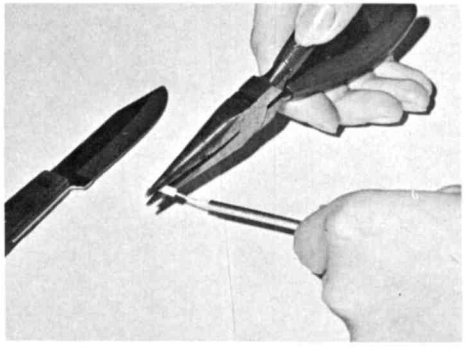


fig. 4. Score the Teflon dielectric and remove. Be careful not to nick the center conductor.

on body organs, notably the eyes. Since rf radiation effects are dependent on the average power dissipated by the tissue, a-m and fm are potentially worse than CW or ssb. This is due to the continuous high-level carrier associated with a-m and fm.

With 100 watts of rf delivered to this antenna, the field strength 6 feet in front of the antenna is well below the 10 mW/cm^2 safety standard commonly accepted in America. Radiation off the sides and back of the antenna is less than 0.1 mW/cm^2. (These measurements were conducted with a calibrated power meter and a Narda microwave radiation monitor, model B86B3.)

The antenna may be mounted out a window and swung from side to side without any significant rf field concentration in the building. The window brace shown in **fig. 5** is useful for mounting the antenna in an apartment window.

reference antenna

Amateurs who want to use this antenna as a reference might wonder why you would use a gain antenna as a reference instead of a dipole. This is because of the serious errors often introduced with a dipole reference because the dipole is prone to picking up reflections from the back, as well as ground reflections from the front.

In many cases the comparison antenna can be made to look like a champ or a dud by simply moving the reference dipole two or three feet in one direction or another so that reflections are arriving in or out of phase. Therefore, a reference antenna with some gain and a single major lobe is desirable. It eliminates back-lobe contributions so the major reflections which effect the antenna are the forward ground type; the effects of these may be determined by moving the antenna in the vertical plane.

In general, measurements with respect to this type of reference antenna are a good deal more consistent than those made with respect to a dipole. Since the amateur is not usually concerned with the absolute gain of his system but rather

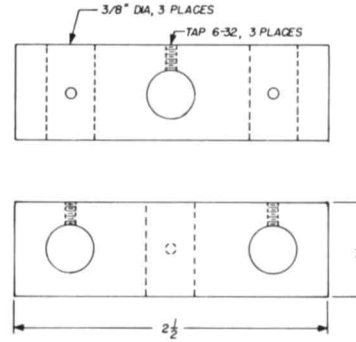


fig. 5. Window mounting blocks are made from ¾" aluminum bar stock. Mounting rods are 3/8" aluminum tubing, 2-feet long. Complete installation requires 2 mounting blocks and 3 rods.

whether he has made an improvement or not, consistency in the measurement technique is most desirable.

In conclusion I would like to extend my thanks to Ted Miller of Phelps Dodge for his cooperation. I would also like to acknowledge R. Knadle, K2RIW, for his help and comments.

ham radio