A $\frac{5}{8}$ WAVE VERTICAL ANTENNA FOR 440

BY BYRON H. KRETZMAN,*
W2JTP

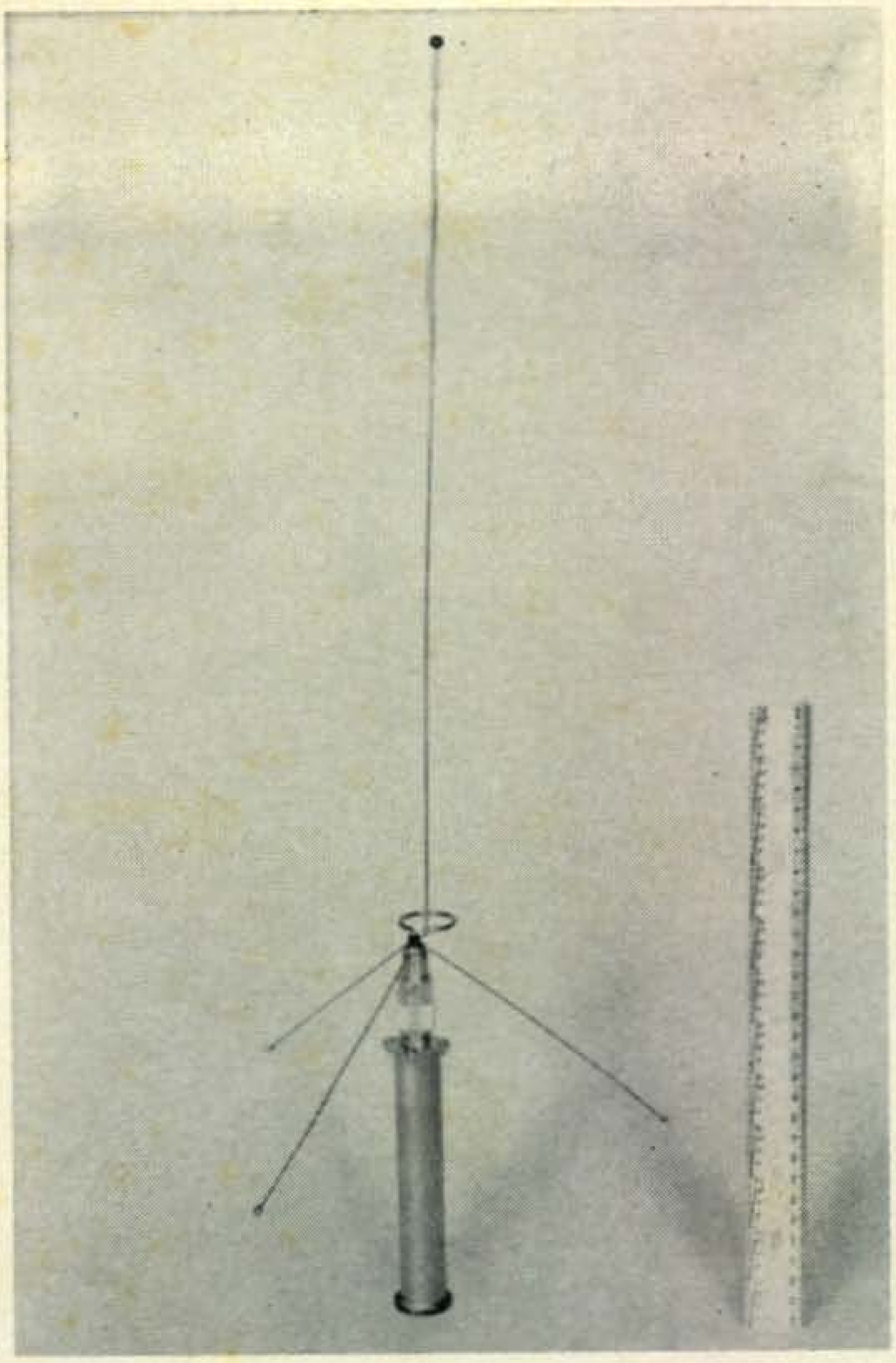
IT's probably news to most hams, but the 420 to 450 mc band *is* used for something else besides occasional long distance DX-chasing via meteors. It is used by the f.m. operators when it is desired to have a "private" channel, free from the big ears with the tunable gooney boxes. It is also used by certain other groups, such as DX associations, particularly in large metropolitan areas, who have found that their "private" continuously monitored channels on 2 meter f.m. were not quite private enough.

Equipment in most general use on the 420/450 band is Motorola (T44A), Link, or RCA, ex-mobile two-way f.m. radio gear, operated usually with home-brewed a.c. power supplies. Antenna polarization has been standardized upon as vertical, mainly because a vertical is omnidirectional, and secondly because operation with mobiles is sometimes required. (Mobile on 420/450? Yes, indeed. Remember, these f.m. sets were mobiles in commercial service.) Thirdly, it is possible to build gain into a vertical omnidirectional antenna without getting into a massive complicated structure.

A ⅝-Wave Antenna

Although the f.m. gear used on the 420/450 band puts *out* about 20 to 30 watts, operators soon find that, if they use simple ground plane antennas, their range is considerably less than it was on 2 meters with about the same amount of power. The obvious solution is to increase the antenna gain, remembering that this works both ways, receiving as well as transmitting, and, is omnidirectional.

The ⅝-Wave "ground plane" vertical[1] is in wide use on 2, thanks to W9EGQ. This type of antenna provides almost 3 db gain; as if you doubled your power. Why not build a ⅝-Wave vertical for the 420/450 band? It struck us that such an antenna could be built simply, with basic hand tools such as an "egg-beater" hand drill and a soldering iron. We found that it could.



A ⅝-Wave Vertical Antenna for 440 mc f.m. This little "ground-plane" provides almost 3 db of gain.

Construction

Our ⅝-Wave antenna was built around the common readily-available u.h.f. coax cable male plug, the PL-259 (Amphenol 83-1SP). Also used was the equally common and available UG-176/U adapter, used normally to adapt the PL-259 to the thinner RG-59/U cable. Figure 1 shows an exploded view of our antenna. The whole assembly plugs into a standard SO-239 female chassis connector equipped with a UG-106/U hood.

The most complicated, if you could call it that, part of building this antenna is drilling, with a #37 drill, a hole through the center of the ¼ inch, 1¼ inch long, piece of bakelite or polystyrene rod. The piece of #12 copper wire that passes through the rod is soldered into the pin of the PL-259 connector. Be sure that the sleeve cap is over the bottom part and that the UG-176/U Adapter is screwed all the way in. The adapter is drilled with a #60 drill, holes roughly 120° apart, for the three #18 wire radials which are soldered in. Incidentally, the radials don't *have* to be copperweld, but the copperweld does make a much more rugged antenna than if soft drawn copper were used. Right at the point where the #12 wire comes out of the bakelite rod, 3 inches of the wire is bent into a horizontal circle about 1 inch in

*431 Woodbury Road, Huntington, N.Y., 11743.

[1]Brier, H S., "A ⅝-Wave Vertical for 2," *CQ* Feb. '64, pg. 45.

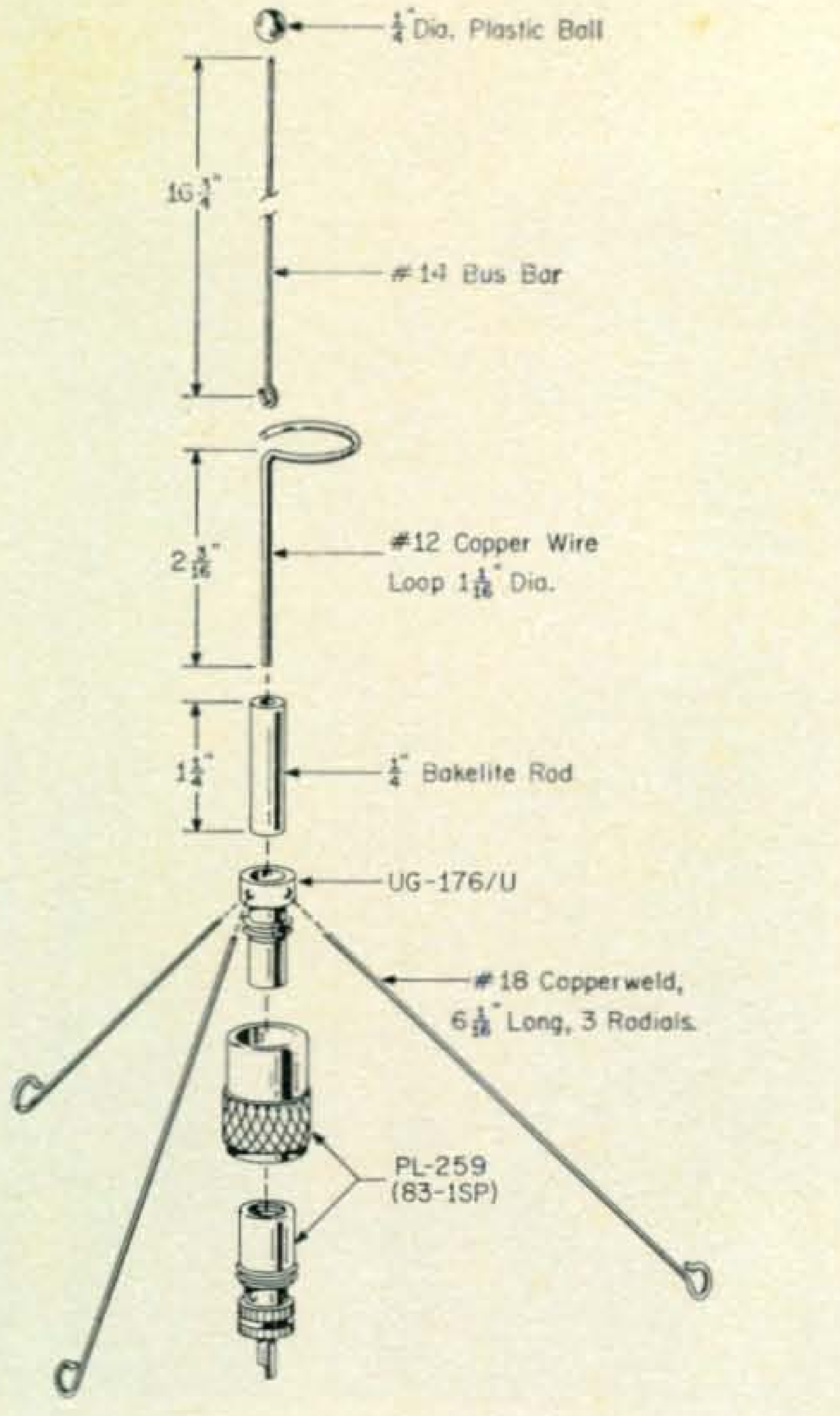


Fig. 1—Exploded view of the ⅝-Wave vertical for 440 mc f.m.

diameter, leaving an opening of about ⅛-inch at the end of the loop.

The vertical ⅝-Wave radiator, total length 16¾ inches, is made from a length of hard-drawn #14 bus bar and a small loop is bent into the bottom end to go over the open end of the #12 wire loading coil loop. This connection is carefully soldered, avoiding a cold joint and excess solder. The top of the radiator has a plastic ball attached, mainly for safety's sake (to prevent poking the eye); however, lacking such a gimmick, the top should be bent into a small loop, as in the manner of the radials which are so treated for the same reason.

Installation

As we said, the assembled antenna plugs into a standard u.h.f. SO-239 chassis connector to which the coaxial cable is fastened through a UG-106/U Cable Hood. The hood is then bolted to the chassis connector and soldered into a short piece of ¾-inch (i.d.) copper pipe, through which the coax is run. The pipe is then clamped to a standard 10 foot length of aluminum TV masting, taping the coax to the outside of the mast.

It is recommended that a foam-type of coax, similar to RG-8/U, be used, and that the run be kept as short as possible even though maximum antenna elevation is *very* important on this band. Should a long run, say around 100 feet, be necessary, it is recommended that a solid-wall coax, such as the Communications Products Company Type 348-509, be used, or perhaps the surplus ⅞-inch diameter RG-17/U, although finding connectors at a reasonable price for this cable can be a problem.

After the antenna mounting pipe is strapped to the mast it is suggested that it be weather-proofed with a heavy polystyrene coil dope, such as the Walsco No. 152, particularly around the point where the bakelite rod comes out of the connector.

Performance

Operation on f.m. in the 420/450 mc band is usually confined to the upper 10 mc, 440 to 450 mc. The main reason is that the commercial equipment used was designed for 450 to 470 mc, and the low-pass filter (u.h.f. TVI?) in the output circuit of some transmitters causes output to drop off the lower we go. Our ⅝-Wave vertical is therefore tuned up for the high end. We used the Allied P2 Standing Wave Ratio Bridge, which performs quite well at these frequencies, and bent the loop for the lowest v.s.w.r. at about 448 mc. We also found that the best v.s.w.r. was obtained with the three ground radials bent down at about 45 degrees. The end result was a v.s.w.r. which was less than 1.5 to 1 over a frequency range of 440 to 450 mc.

Many different types of antennas were tried by our local group on this band. The rotatable beam, of any type, was found impracticable because of the desire to continuously monitor from all directions. The ordinary ground plane, using a 16 inch aluminum transcription disc as the ground plane, was just not efficient enough. The discone was handy in some locations as a single antenna for three bands (144/148, 220/225, 420/450) but its efficiency of only 80% made it not very good for our purpose. The improvement was strikingly obvious to all who changed over to the ⅝-Wave vertical.

Thanks go to W9EGQ for the original inspiration and to K2IEG who built the first model of the ⅝-Wave vertical for 420/450 mc.

Appendix

1—Channels: Like the 6 meter and the 2 meter bands, f.m. general practice has resulted in a standard channel allocation and a separation of 120 kc between channel centers. Starting at the upper end, the first is 449.88, the second 449.76, the third 449.64, *etc*. This procedure avoids adjacent channel splatter, and permits swapping of crystals among the different groups and individuals.

2—Equipment: Motorola T44A equipment is available from FM Surplus Sales, 1100 Tremont Street, Roxbury, Massachusetts 021120. They also have available, for $3.95 postpaid, the FM Schematic Digest, which is a collection of invaluable schematics and other important information on all the Motorola f.m. sets which have become so available these past few years. The Link equipment, with 5894 finals, may be available from Selectronics, 1206 South Napa Street, Philadelphia, Pennsylvania. ■