are numerous antenna configurations that will give excellent all band results, however, in nearly all cases the impedance presented to the transmitter on one or more bands will not be within the capabilities of the PI-NET, and an antenna tuner will be required. The simple DIPOLE, or FOLDED DIPOLE will most likely be easiest to match. While the free space impedance of the dipole, at the center, is usually considered to be about 70 ohms, in practice it is usually 50-60 ohms. This is due to the fact that the impedance is lowered considerably by it's being nearer to ground. If the antenna is 1/2 wave or more above the ground, a 72 ohm line will most likely give the better match. If nearer a 1/4 wave, or less, a 50 ohm line is usually best. Using a folded dipole made of 300 ohm ribbon will give a center impedance of around 270 ohms, therefore making an acceptable match to 300 ohm feedline. A height of 1/2 wave, or more, is still very desirable.

7-4. One of the most commonly encountered troubles is a feedline that acts as a transformer. Such a feedline may present a complex load to the transmitter very different from the impedance at the feed point of the antenna. As an example; using a 52 ohm feedline having an SWR of only 1.5:1, due to mismatch at the antenna, the impedance at the transmitter end of the feedline may be anywhere from approximately 32 to 77 ohms resistive and 21 ohms reactive. At an SWR of only 3:1 the resistance may vary from 17 to 156 ohms and the reactance to 70 ohms. The transmitter may normally have the capability of matching this resistive range, but due to compensation for such a large reactance, the transmitter may no longer be able to match the resistive load. A resistive antenna having an impedance the same as the characteristic impedance of the feedline should give no difficulty, as the line is flat, and changing the length of the feedline will not change the feed point impedance. Where the antenna does not have an impedance the same as the feedline, or where the antenna is reactive (off resonance) the feedline should preferably be cut to exact EVEN multiples of ½ wave, taking into account velocity factor of the type feedline used. In such case the impedance at the end of the feed line will be the same as to the antenna feed point. A feed line cut to 1/8 or 1/4 wave can present a very complex impedance at the end of the feed line. Such a feed line, while measuring a relatively low SWR, may be virtually impossible to load in many cases.

7-5. On most all bands, the GLOBE KING 500B can match in excess of 50-600 ohms where little reactance is present. On 160 meters the minimum impedance that may be matched is 300 ohms. On this band a 300 ohm folded dipole is good, or a 1/2 wave antenna fed off center with a single wire, against ground. In the case of the latter arrangement, a very good ground is necessary. The exact feed point can be determined experimentally with a point about 1/3 in from either end being acceptable. The 400 ohm point, if it can be determined, would be most satisfactory.

7-6. Beams usually have a very low impedance, often as low as 15 ohms for a close spaced 3 element array. By using a folded dipole driven element, "T" match or other means to increase the feed point impedance, the feed point impedance is increased to a high enough value to use common type feed lines. Even so, it takes a very little reactance to present a complex impedance below 50 ohms, and out of range for the PI-NET to match. In any type antenna it is best to try and make the impedance presented to the antenna about 70 ohms where a bit more reactance can be tuned out and still maintain a match.

7-7. The most reliable way to adjust any antenna is by the use of a good SWR bridge. Most bridges cover the range of 52-72 ohms. The bridge should be excited by a low power signal on the operating frequency (power to be determined by the manufacturers specifications on the particular instrument), and the antenna adjusted for the lowest possible SWR, (1:1 not usually obtainable). A SWR of 1.5:1 is good. If the bridge used is for coax, a balancing device should be used (or the readings most likely will be in error) when measuring a balanced type antenna feedline. The antenna section of A.R.R.L. Handbook gives many suggestions for antennas, or similar publications can be refered to.

7-8. Keep in mind the fact that many antenna diagrams refer only to free space, or theoretical dimensions and impedances which will seldom hold true in practical application. Also an antenna which may be a certain impedance at one location may be considerably different at another location, even when the same height above ground, and this can be due to no more than different soil conductivity. Therefore, specified dimensions may have to be corrected for each particular loaction and the only sure way that an antenna impedance can be determined is to measure it, properly.

7-9. FORMULA. (ALL ANSWERS IN FT.)

1 wavelength in free space = $\frac{300}{\text{f mc.}}$

1/2 wave dipole (end supported) = $\frac{468}{\text{f mc.}}$

1/2 wave folded dipole (end supported) = $\frac{462}{\text{f mc.}}$