Example: 3.800 MHz

Overall Length cut to 125 Ft.
Leg 1 = 62.5 Ft.
Leg 2 = 62.5 Ft.

Overall length plus some extra for wire fastening & tuning

Longer length dipole legs (up to 2 feet longer) may be required for Inverted-V antennas.

Multi-Band Center Fed Shortened Dipole using Ladder Line Feedline

A simple multi-band dipole may be constructed by first choosing the lowest band on which operation is desired. The overall length of the dipole antenna should be a shortened half wavelength as shown in **Table 1**. This antenna will be fed with ladder line and an antenna tuner with balanced connections. You can also use a *Balun Designs* model 4114t external balun connected with coaxial cable to an unbalanced tuner for tuning the different bands.

Although it may not seem logical, shortening a multi-band dipole intended for 160 through 10 meter operation to less than 220 Ft. will actually help your wide range antenna tuner cover the lower frequencies easier. That is because you are using a non-resonant antenna system when you use ladder line feed systems for multi-band operations. Changing the length of the ladder line will alter resulting impedances enough so that the tuner may be able to reach a certain frequency that was giving it trouble. The coax from the *Balun Designs* balun to the tuner should be kept short; typically 5 to 15 feet is best.

The ladder feedline for a multi-band dipole *must* be in **odd** multiple lengths of 1/8 wavelength on the lowest operating frequency, used to optimize the impedance presented to the balun and tuner over the frequency range of the antenna. The formula can also be used to calculate ladder line feedline for large loops. This length can be calculated using the following formula or use **Table 1**.

Most 300 Ω ladder feedline has a VF (Velocity Factor) of 0.88, for different feedline be sure to change the velocity factor in the formula.

Formula:
$$\text{Length} = \frac{123}{\text{Freq (MHz)}} \times 0.88$$

Where: 123 = 1/8-Wavelength Factor,   Freq = Frequency in MHz,
0.88 = Velocity Factor of 300 Ω Ladder line. ==For 450 Ω use .94==

Multiply the result times the odd multiple (1, 3, 5, 7, etc) to get the correct length closest to your required feedline length.

Table 1 Recommended Antenna and Feedline Length for Shortened Multi-Band Dipoles for easier tuning		
Frequency (MHz)	**Shortened Dipole (Ft.)**	**Make feedline an Odd Multiple of this length in Feet (x 1, 3, 5, etc.)**
1.8	220	60.1
3.5	110	30.9
5.3	76	20.4
7	55	15.4
10.1	41	10.7
14	29	7.7
18	22	6
21	19	5.2
24	19	4.5
28	19	3.9

==*Note: If using an external balun, the feedline length should be calculated to the balun.*==

Example: To use an antenna from 80 meters to 10 meters, the feedline should be in odd 1/8 wavelength multiples on 80 meters.

The 80 meter band starts at 3.5 MHz. Therefore, 123/3.5 = 35.1.
300 ohm feedline has a VF of 0.88, so 35.1 x 0.88 = 30.9 ft. per 1/8-wavelength.

If 90 feet is required to get to your operating position, the nearest odd multiple 1/8 wavelength length is 92.7 feet (30.9 x 3).

If you needed 110 feet, you would have to add to the feedline to achieve 154.5 feet (30.9 x 5) to maintain the odd 1/8th multiple-rule for length.

If you have excess ladder line, it can be zigzagged while suspended in air, but it can't be closer than a few conductor widths to metallic objects and **cannot be coiled** or laid on the ground. If it is necessary to pass closely to a metallic object, twist the line to partially balance the effect on both sides of the feedline. One twist per 2-3 feet of feedline.