

ANTENNA TUNER MATCHING PROBLEMS AND SUGGESTED FEEDLINE LENGTHS

Matching Problems using a tuner and high impedance feedline

Most matching problems occur when the *antenna system* presents an extremely high impedance to the tuner. An *antenna system* should be considered everything from the tuner to the tip of the antenna. High impedance feedline is usually considered that which has over 300 ohms impedance. Common high impedance feedlines are 300 ohms, 450 ohms and 600s ohms in impedance. When the antenna impedance is much lower than the feedline impedance, an *odd quarter-wavelength* feedline converts the low antenna impedance to a very high impedance at the tuner.

A similar problem occurs if the antenna has an extremely high impedance and the transmission line is a multiple of a half-wavelength. The half-wavelength line *repeats* the very high antenna impedance at the tuner. Incorrect feedline and antenna lengths can make an antenna system very difficult or impossible to tune.

This problem often occurs on 80 meters if an odd quarter-wave (60 to 70 foot) open wire line is used to feed a half-wave (100 to 140 foot) dipole. The odd quarter-wave line transforms the dipole's low impedance to over three thousand ohms at the tuner. This is because the mismatched feedline is an *odd multiple* of 1/4 wavelength long. The line *inverts* (or teeter-totters) the antenna impedance.

A problem also occurs on 40 meters with this 80 meter antenna example above. The feedline is now a multiple of a half-wave (60 to 70 foot) and connects to a full-wave high impedance antenna (100 to 140 foot). The half-wave line repeats the high antenna impedance at the tuner. *The antenna system looks like several thousand ohms at the tuner on 40 meters.*

The following suggestions will reduce the difficulty in matching an antenna with a tuner:

1. **Never** center feed a half-wave multi-band antenna with a high impedance feedline that is close to an odd multiple of a quarter-wave long.

2. **Never** center feed a full-wave antenna with any feedline close to a multiple of a halfwave long.

3. If a tuner will not tune a multi-band antenna, add or subtract 1/8 wave of feedline (for the band that won't tune) and try again.

4. **Never** try to load a G5RV or center fed dipole on a band below the half-wave design frequency. If you want to operate an 80 meter antenna on 160 meters, feed either or both conductors as a longwire against the station ground.

To avoid problems matching or feeding any dipole antenna with high impedance lines, keep the lines around the length in the **green area** of the chart below.

Suggested lengths for high impedance feedline on dipole type antennas
Good lengths are **green shaded** area in the chart below.

160 meter dipole	35-60, 170-195 or 210-235 feet	(Avoid 130, 260 ft)
80 meter dipole	34-40, 90-102 or 160-172 feet	(Avoid 66, 135, 190 ft)
40 meter dipole	42-52, 73-83, 112-123 or 145-155 feet	(Avoid 32, 64, 96, 128 ft)

The **worst possible** line lengths are shown in the **red shaded area**.
Some trimming or adding of line may be necessary to accommodate higher bands.

Here are 2 examples:

1. You have a dipole and you want to make it into a multibander using a tuner.

You calculate that it is about 135 feet long for 80 meters...

You would use either, 34-40, 90-102 or 160-172 feet for the feedline going to your tuner.

2. Your dipole is cut for 40 meters or about 66 feet total length and you feed it with 450 ladder line to a tuner to make it a multibander.

You would use either, 42-52, 73-83, 112-123 or 145-155 feet according to the chart above.

WARNING: To avoid problems, a dipole antenna should be a full half-wave on the lowest band. On 160 meters, an 80 or 40 meter antenna fed the normal way will be extremely reactive with only a few ohms of

feedpoint resistance. **Trying to load an 80 meter (or higher frequency) antenna on 160 meters can be a disaster for both your signal and the tuner.** The best way to operate 160 with an 80 or 40 meter antenna is to load either or both feedline wires (in parallel) as a longwire. The antenna will act like a "T" antenna worked against the station ground.

Source: MFJ Enterprises as printed in most of their tuner manuals.

Editor's note:

So in a nutshell, if you're having trouble matching your antenna system on a particular band using high impedance feedline with your tuner, add or subtract the appropriate amount of feedline according to the chart above and try again.....73! Hopefully, you will find that "magic" length!