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Title: Tuning Your 6-Meter J-Pole (sidebar to Build a Weatherproof PVC J-Pole Antenna)

Table 1
Section Lengths (See Figure 3)

Frequency (MHz)	*D, Total Length (in.)*	*A (in.)*	*B (in.)*	*C (in.)*
50.00	160.4	3.2	48.2	112.2
51.00	157.2	3.1	47.2	110.0
52.00	154.2	3.1	46.3	107.9
53.00	151.3	3.0	45.5	105.9
54.00	148.5	3.0	44.6	103.9
146.00	54.9	1.1	16.5	38.4
222.00	36.1	0.7	10.9	25.3

Tuning Your 6-Meter J-Pole

You can use a capacitive coupling strap to easily tune your 6-meter **J**-pole for a different portion of the band. No cutting or lengthening necessary!

You can make the strap from a 1-inch wide strip of aluminum foil. Wrap the foil around the lower section of the **J**-pole and hold it in place with electrical tape. The strap doesn't connect to the antenna. It merely increases the capacitance at that point where it's positioned. By moving the strap up and down along the lower section, you'll change the resonant frequency of the antenna. This technique works best on a **J**-pole designed for 50 MHz (See Table 1).

Building a J-Pole Antenna

STEP ONE: The Decision Phase

Choose a frequency for your **J**-pole. In the case of 144 or 220 MHz bands, the antenna bandwidth is many megahertz, so this isn't a critical decision. Simply use the middle of the band, 146 MHz and 222 MHz, respectively. However, on 50 MHz the antenna will not cover the entire band without readjustment. On 50 MHz the bandwidth will be approximately 2 MHz. This means you'll need to select a frequency that corresponds to your favorite portion of the band.

Table 1 gives you the cutting lengths for the antenna sections. But before you can start cutting, you need to consider the *velocity factor* of the twinlead you're using. Despite what you may have heard, RF energy does not flow through a cable at the speed of light in a vacuum. The wire and even the insulation act to slow the speed of the wave. So, the time required for the signal to travel through a length of cable is *longer* than the time required to travel the same distance in free space. This means that the full wavelength of the signal exists in a physically *shorter* length of cable. If you cut the cable for the wavelength of the signal in free space, you'll be off the mark!

Cable manufacturers test for the velocity factor and specify it as a decimal percentage of the speed of light. The lengths shown in Table 1 are based on windowed 300-Ω twinlead with a velocity factor of 0.85. If other twinlead is used, you may need to increase or decrease the lengths proportionally. For example, if a section length is 16½ inches long and you're using TV twinlead with a typical velocity factor of 0.83, reduce the length by 2%, to 16³⁄₁₆ inches. (A velocity factor of 0.83 is roughly 98% of 0.85. Putting it another way, it's 2% *less* than 0.85.)

Next, decide how the antenna will be used: indoors or outdoors, fixed station or portable. If the antenna is to be used indoors, weather sealing will not be needed. If you're going to use it outdoors, apply a sealant to cover the exposed metal (the coaxial cable connection and the copper wire in the twinlead).

To limit possible RF absorption, use schedule-40 PVC. Make sure it is ultraviolet resistant as well.

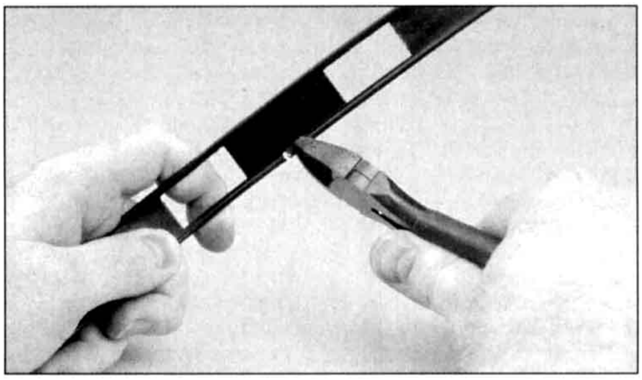
Applying a sealant directly to the twinlead will change the resonant frequency of the antenna. At first this may seem a bit odd. But, believe it or not, the sealant *does* affect the velocity factor of the twinlead. If the velocity factor changes, the resonant frequency of the antenna changes. Usually it will be lower than calculated. For example, an antenna cut for 146 MHz may resonate at 142 MHz after the exposed conductors are coated with sealant—a 4% change!

STEP TWO: Cutting the Wire

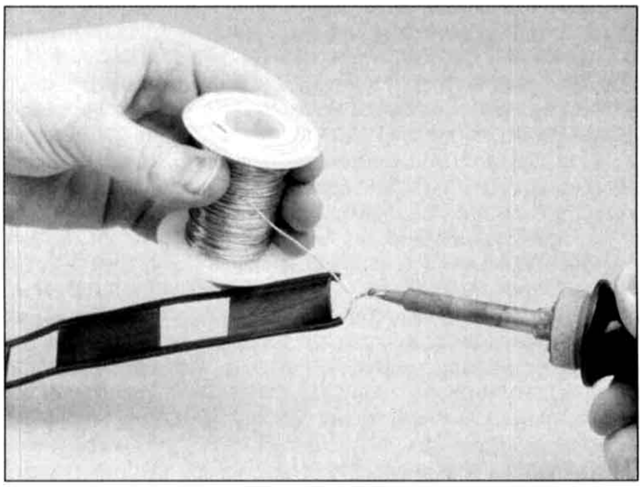
Select a good grade of 300-Ω twinlead, one that is tough and will withstand abuse. Avoid TV-grade twinleads that tend to crack easily. Windowed 300-Ω twinlead is available from several *QST* advertisers.

Measure a length of twinlead that is approximately 10% longer than the amount needed. Measure it so that the notch will be cut where there is insulation all the way across between the two conductors, not at a "window."

Cut the notch. Cut only one wire; the other will run the full length of the antenna. The notch can be a small **V** or square. Make it at least a ¼ inch long. Measure from the notch to the bottom of the antenna cut off the excess wire. Strip about ¼ inch of insulation off each of the wires at the bottom. Take a small piece of bare wire and wrap several turns between the two exposed wires at the bottom. Now measure from the bottom to the top of the antenna and cut off the excess. Using a razor knife or other sharp knife, remove the insulation where the coax will be connected.



Cut the notch in only *one* of the twinlead wires. The twinlead shown in these photographs is 450 Ω. However, the same techniques apply to 300-Ω twinlead.



Strip the insulation from the end of the twinlead and twist the conductors together. A little solder ensures a good electrical connection.