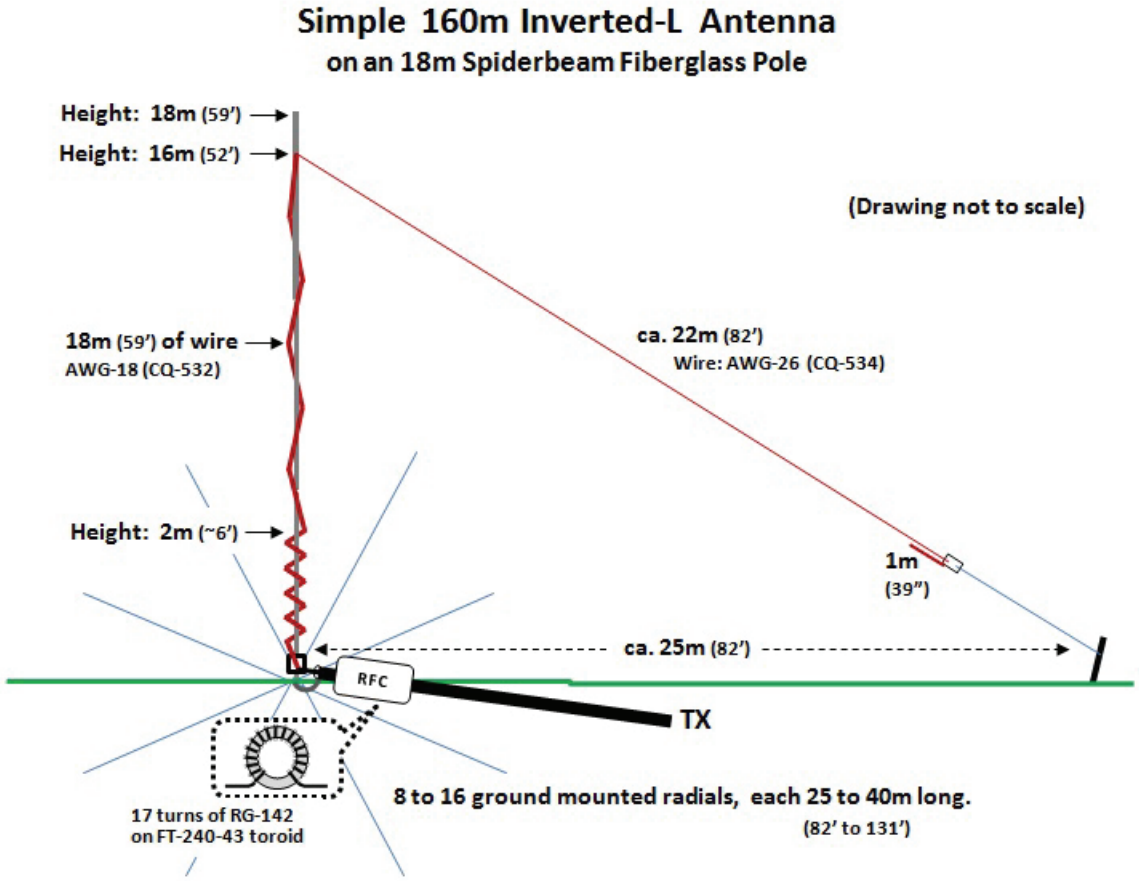
160m Inverted-L on a Spiderbeam 18m Fiberglass Pole

Different operating conditions and objectives often mandate using different antennas. For most operators, either the Inverted-L or the Vertical Ground Plane will perform better on 160m band than the typical dipole, because they cannot get the dipole high enough in the air to be a good DX antenna on 160m. For good performance, the dipole needs to be at least 40m (131 ft.) high.

As a general purpose antenna, the Inverted-L antenna has a slight advantage over a pure Vertical (Ground Plane) antenna, because it has good low angle radiation as well as some high angle radiation, which is good for local QSOs. For pure DX work, the Vertical (Ground Plane) antenna is a better choice because it has a stronger low angle radiation pattern and almost no high angle radiation. A full-size vertical for 160m would be 40m high, so for mechanical reasons the inverted L is often the preferred solution anyway, because it is more practical.



NOTE: for simplicity, the guy ropes are not shown in this drawing.

When building an inverted-L for 160m, the accepted rule of thumb is to make the vertical portion of the wire as long as possible, and the rest of the wire is run in a horizontal plane to a distant point. In practice this horizontal wire is often sloping down to a distant point.

When using a Spiderbeam 18m telescoping fiberglass pole as a support, one should only use the bottom 16m to 17m of the pole. Do not run the wire all the way to the top. The very top segment of the pole is too thin to support the sloping wire. If no elevated support is available at the far end, tie the wire element to a distant ground stake.

For good efficiency, use 8 to 16 ground mounted radials, each 25 to 40m long.

The radials connect to the shield side of the coax, and should be spread equal distance around the pole.

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Note: for ground-mounted radials (as recommended here), the length is not critical. They do not need to be resonant. It is better to use many short radials than a few long radials. When space is limited, you may even zigzag the radials to get more wire length into the space available. Elevated radials must be resonant so their length is very critical.

Guy Ropes: Normally the 18m Spiderbeam telescoping fiberglass pole should be guyed at two (2) levels (8m and 12m) and in four (4) directions (spread 90° apart). An additional set of top guy lines is required when using this pole to support an Inverted-L antenna. It need only be in 3 directions, using the horizontal (or diagonal) wire as one of the guys and two thin guy lines (PVDF Monofil or similar), as the other two lines, spread 120° apart to offset the pull of the wire element.

Building the Inverted-L:

- Cut 18 meters of thicker antenna wire, AWG-16 or AWG-18 (e.g., CQ-532)
- Cut 22 meters of thinner antenna wire, AWG-24 or AWG-26 (e.g., CQ-534)
- Splice and solder the two wires together and protect the solder joint with heat-shrink tubing or similar material.
- Attach this point to the pole at 16-17mm height using two strong cable-ties, one above and one below the solder joint. Reinforce with several layers of electrical tape.
    - Do not run the vertical wire element to the very top of the pole, because the pole is too thin at that point and will bend too much under the pull of the sloping diagonal wire.
    - Do not use metal clamps to attach this wire to the pole. Metal clamps can damage a fiberglass pole. A strong cable tie is sufficient to secure the wire antenna element.
- Secure the thicker vertical wire element by spiraling (coiling) it around the lower sections of the 18 meter Spiderbeam pole at a rate of about one turn per meter, until it reaches the top of the bottom section of the pole.
- From this point, spiral (coil) the wire about 10 turns per meter around the bottom section of the pole, spacing the turns about 10cm (4 inches) apart, and connect it to the feed point about 10cm (4 inches) above the bottom of the pole.
- Mount a good, long (but lightweight) insulator to the end of the thinner diagonal wire element, folding back 1m of wire. If you don't have a long lightweight insulator, use two lightweight insulators such as the Spiderbeam Insulator, and connect them with a short piece of Kevlar rope.

CAUTION:

KEEP THE END OF THE DIAGONAL WIRE WELL OUT OF THE REACH OF PEOPLE AND PETS.

Radio transmitters put LETHAL HIGH VOLTAGE on the diagonal wire element.

KEEP THE POLE AND WIRE ELEMENT FAR AWAY FROM POWER LINES.

- Connect some thin rope (preferably PVDF Monofil line) to the insulator and tie the rope to a substantial ground stake about 25 meters from the pole. Farther is better. This will place the end of the wire (with insulator) about 4 meters above the ground, which is safely out of reach of people and pets.
    - If it is possible, fasten the rope of the far end of the wire element to an elevated point such as a tree, or mast. Install it such that you can easily lower the end of the wire element for tuning the antenna for resonance.
    - The higher you can keep this portion of the wire, the better the antenna will work.

- Connect a good quality 50Ω coaxial cable transmission line to the feed point at the bottom of the pole. Connect the center conductor to the vertical wire element, and the braided shield conductor to the ground radials. Insulate and weatherproof the connections. Spiderbeam sells a "Radial Connection Plate" for this purpose.
- (OPTIONAL) Although it is not absolutely necessary for the function of the antenna, it is a good idea to mount a coax choke (un-un) at the feedpoint of the Inverted-L antenna. An excellent coax choke for 1.8 to 7 MHz can be made by wrapping 16 turns (about 1.5m) of RG-142 Teflon coax, onto an FT-240-43 ferrite toroid. This provides excellent common mode current rejection, which often reduces noise on the antenna (in receive mode), and also helps to reduce RFI problems inside the shack (in TX mode).

Tuning the Inverted-L:

- Measure the SWR and determine the resonant frequency of your antenna.
- Adjust the length of the 22m long thin wire to move the resonant frequency of the antenna up or down (shorter to raise the frequency, longer to lower the frequency).
    - Change the length in small increments of a few centimeters or inches, measure SWR again, then change again, etc.
    - When shortening the wire, do not cut it shorter. Fold it back, wrap it gently around itself and secure with a small wire-tie. When you are finished tuning and satisfied with the results, then you can go back and trim the excess wire folded back from the insulator.
- If necessary, but only as a last resort, adjust the "coil" at the bottom 2m of pole to adjust the resonant frequency of the antenna.
- Attach two thin guy ropes (PVDF is an excellent material) at the 16-17m point on the pole to offset the strain placed on the top of the pole by the thinner diagonal wire element. These two guy ropes and the wire element form the upper (3rd) level set of guy lines.
- FINALLY, adjust the tension of all of the guy ropes.
    - Leave some slack in ALL the guy ropes and wire element. Do not pull them too tight. As you look up the guy ropes, they should be sagging a little. This will substantially reduce stress on the pole.
    - It is absolutely normal for the pole to bend and sway in the wind. That won't hurt it. It will straighten itself when the wind subsides.
    - As long as the system remains flexible, it will survive even harsh conditions. But if you pull the guy ropes too tight, this will pre-stress the pole and cause breakage, when additional forces are added due to the wind.