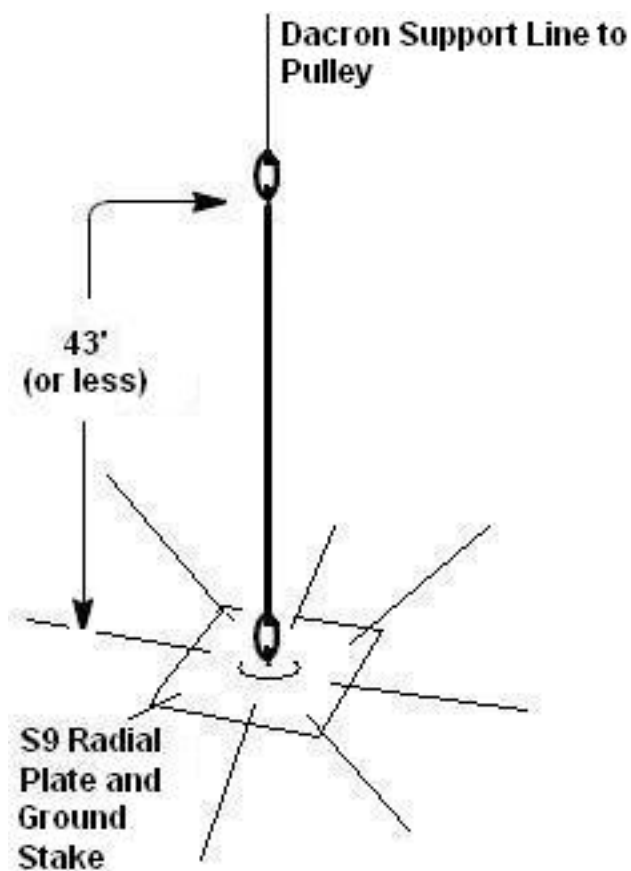


**43' Multiband Wire Vertical
for 80 – 6 Meters**

Installation Guide



WARNING: INSTALLATION OF THIS PRODUCT NEAR POWERLINES IS DANGEROUS. FOR YOUR SAFETY, FOLLOW THE INSTALLATION DIRECTIONS.

INTRODUCTION

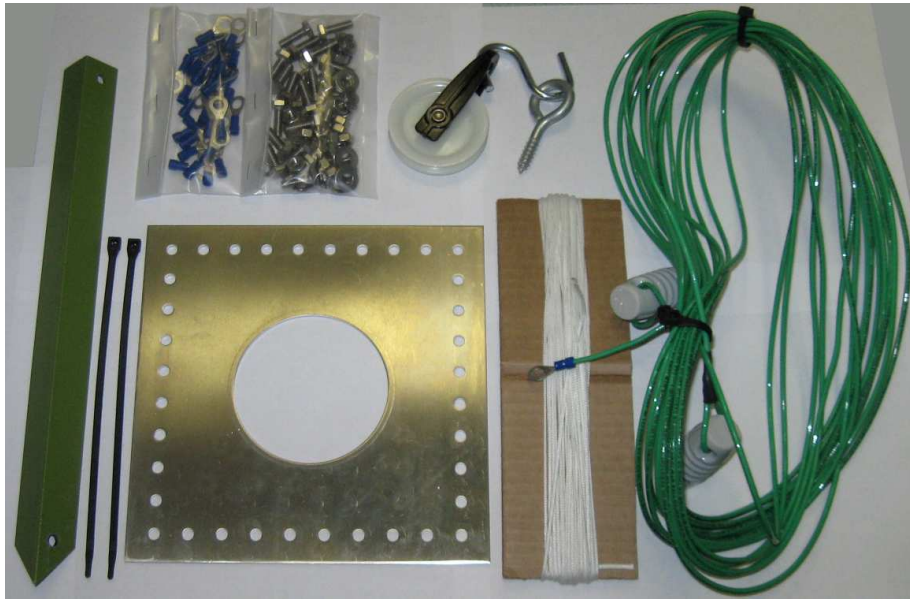
Thank you for purchasing the S9W, a heavy-duty 43' wire vertical for 80 thru 6 Meters. The S9W may be shortened to fit the support structure height or trimmed and used as a $\frac{1}{4}$ -wave monoband vertical on 40, 30 or 20 Meters.

Please read this guide in its entirety **FIRST** before installing your S9W. The S9W is easy to install and deploy, but reading through this guide first will make it a painless and enjoyable experience.

The antenna is shipped with all the components and hardware you need to install it. You will need to furnish coax cable and a 4:1 unun and antenna tuner (for multi-band use) or a 1:1 choke balun (for monoband use). You may also want to furnish a weight for the support line to allow the antenna to move with the wind.

S9W COMPONENTS

The S9W comes completely assembled and includes the following items:



- * 43' of 12 AWG insulated stranded copper wire with two traditional ceramic dog-bone insulators (hand soldered and wrapped) at each end
- * S9 Radial Plate with 20 sets of stainless steel bolts, nuts, washers and lock washers and 30 ring terminal connectors
- * A ground stake to anchor the S9W feed point within the S9 Radial Plate
- * Two heavy-duty 8-inch UV resistant zip ties
- * One insulated polymer pulley
- * One heavy-duty eye screw (used to secure the top of the antenna)
- * One S-hook (used to hang the pulley from the eye screw)
- * 50' of braided Dacron line

Coax Cable

For top performance, the S9W must be fed with a quality, low-loss 50-ohm coaxial feed line cable such as RG-213 or LMR400.

Antenna Tuner

The antenna requires an antenna tuner in your shack or remotely located at the antenna feed point. (Internal rig tuners do not have adequate range to match the higher impedances presented by the antenna.)

Using a weatherproofed remote antenna tuner at the antenna feed point ensures absolute lowest signal loss and best overall multi-band performance. When a remote tuner is used, an unun is not required.

Unun

A 4:1 “unun” is required at the antenna feed point (unless you are using a remote antenna tuner). A 4:1 unun helps match the impedance presented by the antenna to your coax feed line. S9 recommends Balun Designs ununs. Balun Designs manufactures two 4:1 ununs specifically for this antenna, depending on the amount of power you expect to run. These ununs may be purchased on-line at www.balundesigns.com:

- If you are running 300 watts or less, use the Balun Designs “Model 4130sv for S9 Vertical”.
- If you are running more than 300 watts, use the Balun Designs “4:1 Unun for Verticals” (Model # 4134).

40, 30 or 20 Meter Monoband Configuration

If you want to use the S9W as a 40, 30 or 20 Meter monoband vertical, you will need to shorten the length of the antenna wire. To do this, simply trim the wire to $\frac{1}{4}$ -wavelength of the desired frequency using the formula:

$$\text{wire length in feet} = 234 / \text{freq. in MHz}$$

For example, to create a 30 Meter vertical that is resonant on 10.1 MHz:
 $234/10.1 = 23.17$ feet = 23 feet, 2 inches long. If you modify the antenna for another band, be sure to cut the antenna slightly longer than the desired length to avoid having to lengthen the antenna later on when you are tuning it.

When used as a monoband vertical, you should use a 1:1 current choke balun at the antenna feed point.

The 1:1 current choke balun should be located as close as possible to the antenna feed point to prevent RF from coming back into your shack over the coax shield. There are several commercially-available 1:1 current choke baluns (Balun Designs being one of the best – see them at www.balundesigns.com) or you can create a simple choke balun using your coax feed line.

To create a 1:1 choke balun using your coax feed line, simply wind the last 18 to 21 feet of your coax feed line before the antenna evenly around a 4-inch round form such as a PVC pipe. You can use zip lock cable ties to secure the windings and to maintain the coil form. Additional information about constructing an inexpensive 1:1 choke balun using your coax feedline can be found on-line at: <http://www.hamuniverse.com/balun.html>.

Ground Radials

For optimum performance, the S9W must be used with a good RF ground. A general rule of thumb for radials is: “longer” and “more” is better and “some” are better than “none”. A ground rod is not a suitable RF ground.

We recommend at least 16 radials, with each radial at least 0.2 wavelength at the lowest operating frequency. If you have the time and resources, 32 or more radials at least 0.2 wavelength long (or longer) should be considered. There is no precise formula to calculate the length of ground-mounted radials because everyone has different soil and soil tends to change the electrical length of the radials. That said, the following table contains suggested lengths for 0.2 wavelength radial wires for 80 thru 20 Meters:

Band	Frequency	Minimum Radial Length
80 Meters	3.5 MHz	53 feet, 6 inches
40 Meters	7 MHz	26 feet, 5 inches
30 Meters	10.1 MHz	18 feet, 6 inches
20 Meters	14 MHz	13 feet, 5 inches

The included S9 Radial Plate is used to connect and organize your radials and to provide the vital ground connection for your coax feed line. The S9 Radial Plate has 36 radial mounting holes - enough to easily connect 80 radials to the plate.

When used as a monoband antenna, the antenna SWR is determined by the efficiency of your RF ground system. A poor ground system will actually yield a low SWR reading at the resonant frequency. As ground radials are added, the SWR increases because the impedance of the antenna is lowered by the radials – this is normal! A theoretically perfect RF ground (approximately 120, 1/5-wavelength or longer radials) will lower the impedance of the antenna to around 36 Ohms at the resonant frequency. The SWR under this scenario will be high, but the antenna will perform at maximum efficiency.

We have seen little “real world” performance improvement with more than 32 radials. Our test field has 84, ¼-wave radials and the SWR curve ranges from 1.5:1 to 1.8:1. If you have a less efficient RF ground system, you will experience lower SWR readings at the resonant frequency.

INSTALLATION

Determine the Configuration. Try to use a clear and open area to deploy the antenna. Even though the antenna wire is insulated, you absolutely MUST locate the antenna site at least 50' away from power lines. You can suspend the vertical wire between two supports or underneath a tree branch. You can also trim the length of the antenna to fit the supporting structure height. (If the antenna length is shortened by 8 feet or more, you may not be able to use the antenna on 80 Meters.)

1. **Secure Pulley to the Vertical Support.** If the vertical support is a tree, use the provided eye screw and S-hook to hang the pulley from the tree. Next, connect the Dacron line to the antenna top insulator and thread the free end of the Dacron line through the pulley, letting the line fall to the ground.
2. **Anchor Antenna to the Ground.** Next, stand directly under the pulley and pull on the Dacron line to raise the bottom end of the antenna off of the ground. Determine the anchor spot for the antenna and use a spare piece of wood and a hammer to drive the provided stake into the ground. If you have soft soil, drive the stake into the ground at a slight angle to help increase the holding power of the stake.



IMPORTANT!

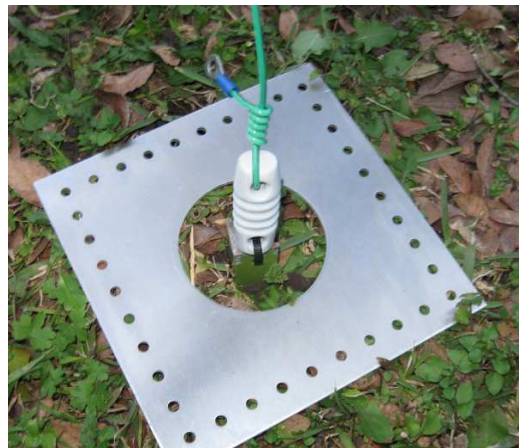
Place a piece of wood over the top of the stake to protect the top edges from becoming deformed. Do NOT directly hammer the stake – hammer the wood to protect the stake.

Leave just enough of the ground stake exposed above the ground (1" max) to allow access to the hole at the top of the stake.

Next, place the radial plate on the ground over the stake, as shown below.



Using a supplied 8" zip tie, secure the lower portion of the feed point insulator to the ground stake, as shown below.



3. **Raise the Antenna.** Pull on the Dacron line to raise the antenna. Either tie off the Dacron line at a convenient height near the ground or consider attaching a small weight to the line so the vertical can move with the support in strong winds.

Connect Coax Feed Line to Antenna

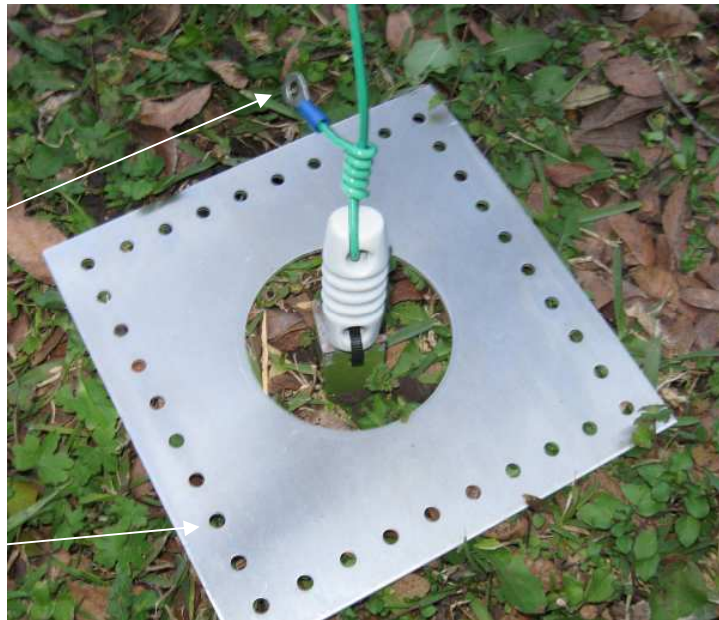
Position your 4:1 unun/remote antenna tuner (multi-band use) or coax/1:1 choke balun (monoband use) at the radial plate and connect the S9W antenna ring terminal connector to the coax center or balun/unun/remote antenna tuner connection marked **Antenna**.

Next, connect the 4:1 unun/remote antenna tuner (multi-band use) or coax shield/balun (monoband use) **Ground** connection to any hole on the radial plate.

Finally, connect your coax feed line male PL-259 connector to the balun/unun/remote antenna tuner female SO-239 connector.

Connect
4:1 unun
Antenna
connection
to S9W
feed point

Connect
4:1 unun
Ground
connection
anywhere
on the
radial plate

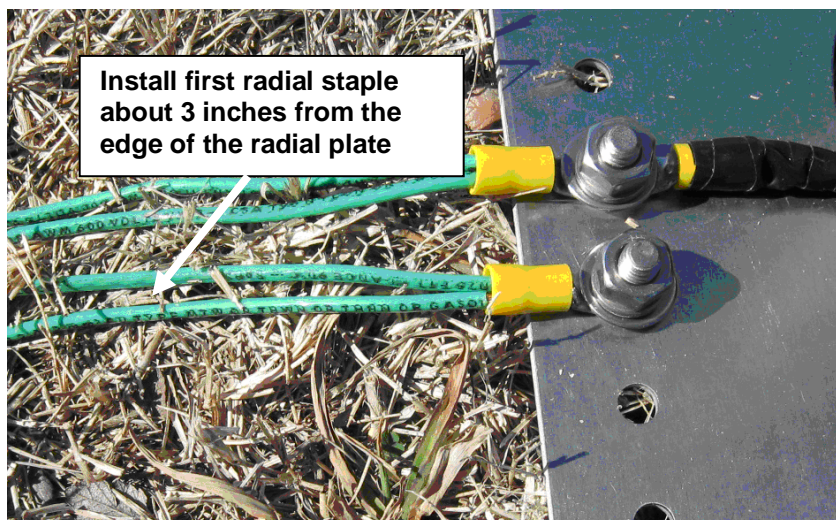


COMPLETELY weatherproof all feed line connections using the sealant of your choice such as coax seal, silicon RTV, etc.

About Ground Radials...

We recommend a minimum of 16 radials, each at least 0.2 wavelength long at the lowest operating frequency, spaced as evenly as possible around the antenna feed point – like wheel spokes. For best performance, use 32 (or more) radials. It is suggested that you use 14 AWG insulated stranded copper wire (available at Home Depot™ and sold in 500-ft rolls for around \$35) for the radials. Attach the radials to the radial plate using the supplied stainless steel hardware.

Use optional S9 Radial Staples to secure the radials to the ground. Install the first staple about 3 inches or so from the edge of the radial plate. Grass will eventually grow over the radials and cover them. In the meantime, be sure to set your lawn mower blade higher than normal to ensure that the radials do not get caught in the mower blade - this advice comes from real-world "experience" (!). It is best to use lots of staples for each radial to ensure that the radials are held firmly against the ground.



NOTE: It is not necessary to weatherproof the radial connections on the S9 Radial Plate.



Tuning the Antenna

When used as a multi-band antenna, the antenna is tuned using your antenna tuner.

When installed for monoband use, the S9W can be trimmed for resonance at or near the desired frequency. Proximity to large objects such as trees and buildings will affect resonance. The antenna is manually tuned by shortening (raises resonant frequency) or lengthening (lowers resonant frequency) the top end of the antenna. For best results, always make your SWR measurements at the antenna feed point or use an antenna analyzer at the S9W feed point.

SUPPORT

If you have any questions or problems installing or using your S9W, please contact us. If your antenna becomes damaged, replacement components are available from S9 at reasonable cost.

You can reach us via email at: john@s9antennas.com or feel free to call us at 469-426-8554 from 8 AM to 6 PM CST M-F.

Our mailing address is:

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