User's Guide

HFp

Vertical

7 MHz – 54 MHz Amateur Radio Antenna

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Here is the HFp - Vertical antenna, assembled in its 40 Meter configuration, with included guy lines attached.

It's about 9 feet tall – you can just see the top whip against the tree background.

If the guy lines were black, it would almost completely disappear!

The *HFp* Antenna

The HFp design provides a highly efficient vertically polarized antenna design in an extremely portable package - the entire kit weighs about 2.5 pounds (1 kg). The antenna is highly configurable, and covers all the Amateur bands from 7 MHz to 54 MHz (as well as most of the frequencies in between). An add-on option is available which covers 60, 75 and 80 Meters.

In this User's Guide, you will find setup configurations for each Ham band from 40 Meters through Six Meters, for the antenna sitting on the ground. If the antenna is on a balcony, or mounted with the optional BackPack Mount Kit, you can use the configuration table as a starting point, but you will need to experiment to get the setup right with the different mounting. There is also a laminated card in the antenna bag, with the Ham Band configuration tables on it. The card makes it easy to take the basic setup information with you on your portable operation trips.

The antenna is configured for different bands by the selection and orientation of the six elements that are included in the kit. Three of the elements are marked with a single stripe and contain no loading coil. One element is marked with two stripes and contains a small inductive load near one end. One element is marked with three stripes and contains a larger inductive load near one end. And one element is about 2/3 the length of the others, and has no stripe or load. The elements are coupled together by means of threaded brass Inter-Element Connectors (IECs).

In addition to using combinations of elements, the orientation of the loaded elements (the two- and three-stripe elements), with the striped end either **UP** or **DOWN,** determines the operating frequency. In the configuration table later in the User's Guide, as well as on the laminated configuration card, you will see elements marked, for example, "2-stripe up". **If you assemble these elements in the wrong orientation, the antenna will not tune to the desired frequency.** The one-stripe and zero-stripe elements have no orientation, and may be assembled into the antenna either "up" or "down".

The HFp is designed to operate optimally with **three tuned radial wires**. We have found, after much testing, that less than three wires reduces the antenna's effectivity, and more than three doesn't seem to add much. The antenna will certainly radiate with one or two radials, but unless you are hanging from a cliff, it is worth the time to set up all three. The radial wires are coiled on plastic spools, and are marked in several places along their length. In use, the ring terminal is attached to the antenna base, and the wire is un-spooled to the correct mark for the band in use, as indicated in the Configuration Chart. This length is the "tuned length" for the radial wire, not the quarter-wave length, and can later be adjusted for the lowest SWR.

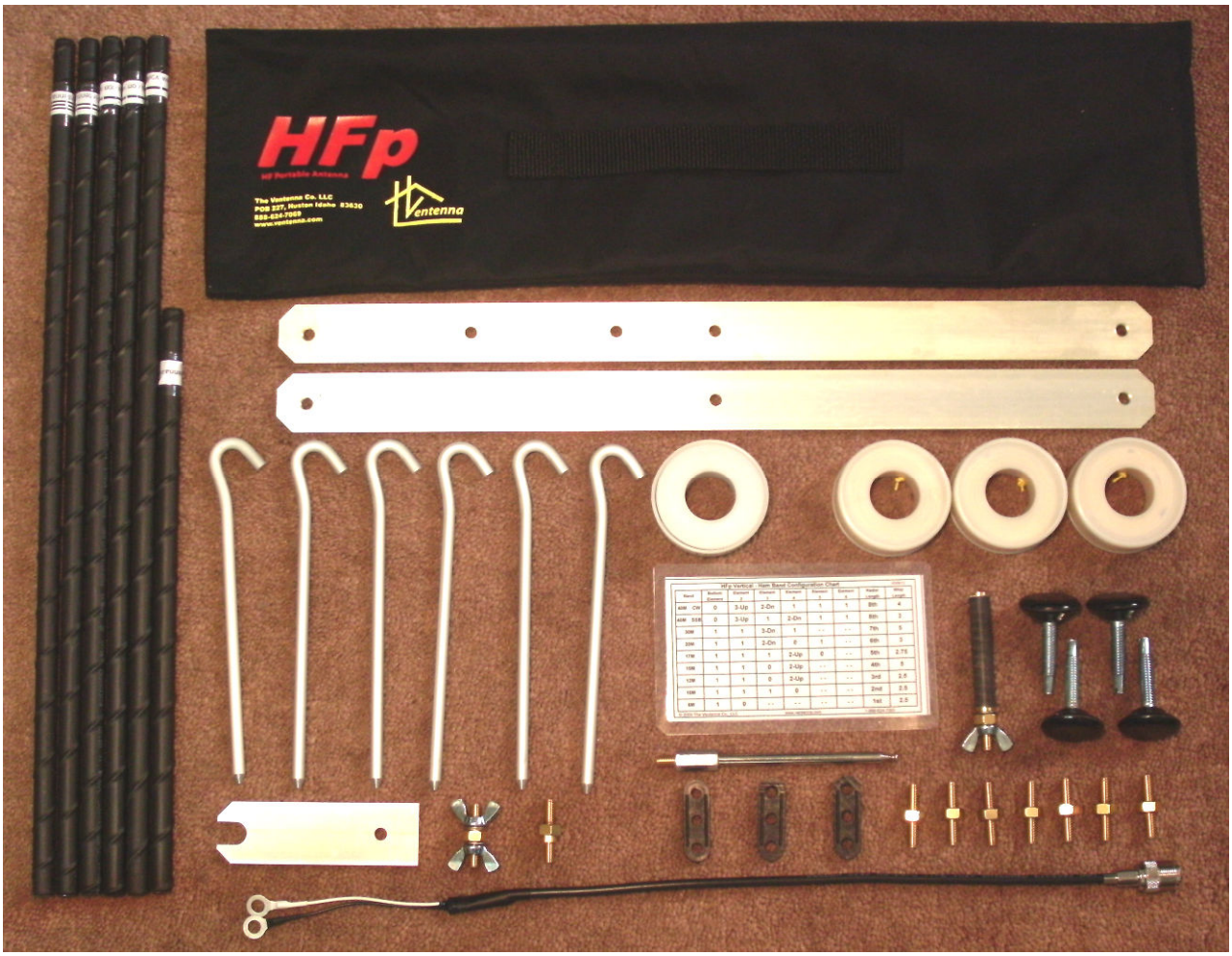
Guy lines are included with the HFp for use when it is windy, or when the antenna will be left up for some time. It is recommended that the guys always be used for the 40 meter configuration. The guy lines have lug rings which are placed between two of the upright elements (typically between the fourth and fifth elements from the bottom), using a special IEC. The lines are then run out to their full length and secured with the aluminum stakes provided, or tied to a handy rock. Some small flag material attached to the guys will help prevent people from walking into them. If the guys are run in the same direction as the radial wires, they will help protect the radials from being tripped upon, as well. The Guy Line Sliders make adjusting the guy lines very easy. (See Page 10)

You will need a length of coax to go from the HFp to your radio location. It should be long enough so that you are at least a half-wavelength away at the lowest operating frequency. RG-58 has acceptable loss at these frequencies, and can be used for up to 100 Watts of power.

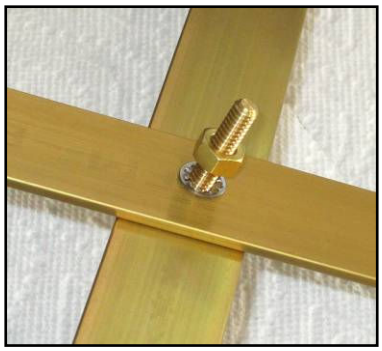
HFp Vertical Parts List

Before assembling your antenna, verify that you have all the parts in the list below:

Item Description	Quantity	Item Description	Quantity
Zero-stripe element	1	Base Plate	2
One-stripe element	3	Base Feet	4
Two-stripe element	1	Coaxial Pigtail	1
Three-stripe element	1	Radial Wire Spool	3
Collapsible Whip	1	Guy Line Spool	1
Inter-Element Connector (IEC)	7	Radial/Guy Stake	6
Base Insulator	1	Laminated Setup Card	1
Ground Lug Assembly	1	Guy Line Sliders	3
HFp Wrench	1	Special IEC	1



Assembling the Antenna for Use

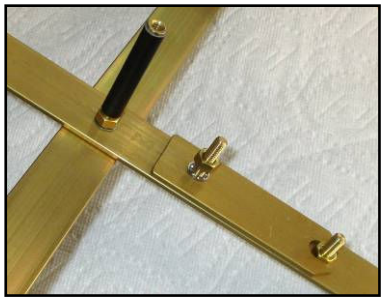


1) First, screw the four feet into the ends of the aluminum base pieces. After the HFp is set up, you can adjust these feet to make it vertical, so it looks good.

2) Place a lock washer on an IEC, and, from the top, insert the IEC stud with the washer through the center holes in **both** base plates.

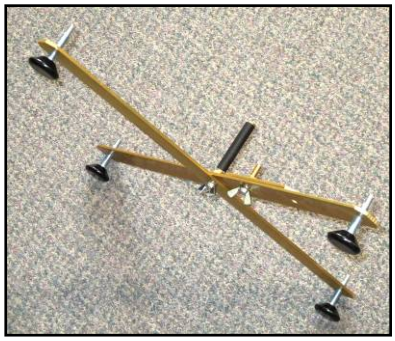
Place a wing nut on the bottom of the IEC, align the plates to be at right angles, and tighten the wing nut.

Screw the Base Insulator onto the top of the IEC.



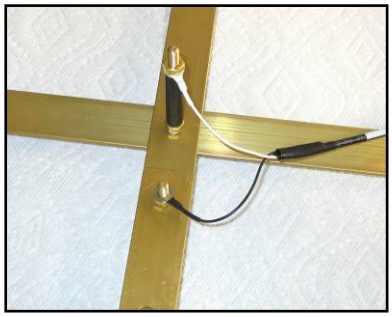
3) Place the Wrench on the top of the plate, with the mounting hole aligned with the hole just offset from the center hole in one of the base pieces.

Put a lock washer on an IEC, and put the IEC stud with the washer through the Wrench hole and the Base Plate hole. Use another IEC to position the wrench slot correctly over the IEC removal hole.



4) Use one of the Wing Nuts on the bottom of the Base Plate to hold the IEC and Wrench in position.

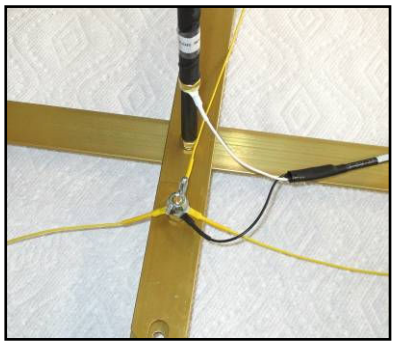
5) Screw an Inter-Element Connector (IEC) into the top of the Base Insulator, and place the center conductor lug of the coaxial pigtail (the white wire) over the IEC. (Under the IEC is also OK)



6) Put the coax shield lug (the black wire) on the ground stud, put on one of the flat washers, then screw the wing nut on top of it - not tight - you will need to take it off in a minute. Then place the base on the ground or another flat surface.

7) Take off the Ground Lug wing nut and put the lugs from each of the three radial wires over the ground lug, then the second flat washer on top, them put the wing nut on loosely.

Arrange the Radial Wires at about 120 degree equally-spaced triangular pattern from the lug and tighten the wing nut. Leave the wires spooled for now.



8) Next, use the Configuration Table on the next page, or the Laminated Card to determine which radiator elements you need for the frequency band on which you wish to operate, and their assembly sequence.

Get these elements, and the IECs, ready to assemble.

HFp Vertical Configuration Table

This is the Configuration Table for the HFp sitting on the ground, out in the open. The same table appears on the Laminated Card.

Note that the length specifications for the extendable whip are in "Sections". The whip fully collapsed is one "section" long. The whip fully extended is six "sections" long.

Each different configuration calls out specific settings for the Elements, the Radial Wires, and the Whip. But, it is important to remember that these settings were determined with the HFp set up in an open area, away from any objects.

The HFp may be affected by nearby objects (within a half-wavelength) in any particular location, and the specified settings may need to be modified. If this is the case, the settings in the Configuration Table may be deemed "starting points" for resonating the HFp at your frequency.

In some situations, where there are nearby objects strongly affecting the antenna's resonant frequency (typically lowering it), shortening the whip all the way may still not bring the SWR to its lowest level. If this is the case, you may have to re-configure the elements. See the "Frequency Adjustments" section for information on how to change the antenna configuration to raise or lower the antenna's frequency.

Be sure to notice the orientation of the stripes on the two-stripe and three-stripe elements. They are always specified as "stripes-up" or "stripes-down". Remember that the one-stripe and zero-stripe elements may be assembled either "up" or "down".

In the table, the bottom element is the one screwed onto the base insulator.

HFp Vertical - Ham Band Configuration Chart 03/08/12

Band	Bottom Element	Element 2	Element 3	Element 4	Element 5	Element 6	Radial Length	Whip Length
40M CW	0	3-Up	2-Dn	1	1	1	8th	4
40M SSB	0	3-Up	1	2-Dn	1	1	8th	3
30M	1	1	3-Dn	1	- -	- -	7th	5
20M	1	1	2-Dn	0	1	- -	6th	3
17M	1	1	1	2-Up	0	- -	5th	2.75
15M	1	1	0	2-Up	- -	- -	4th	5
12M	1	1	0	2-Up	- -	- -	3rd	2.5
10M	1	1	1	0	- -	- -	2nd	2.5
6M	1	0	- -	- -	- -	- -	1st	2.5

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A chart listing configurations for all the frequencies the HFp can cover is available on the Ventenna website, at http://www.ventenna.com/Manuals.html.

Element Stack Assembly

Using the Configuration Table, extend the whip to the correct length for the band. (Remember – fully collapsed is one "section".) Screw the whip into the top element.

Screw the bottom element for the band you want onto the base insulator IEC (finger tight, not wrench tight). Note that the "Bottom" element will always be a One- or Zero-Stripe element, to keep the high-current node as high in the element stack as possible. **Hint** - For 40 and 80 meters, you might want to put 2 or 3 elements on the bottom first - the stack can get pretty tall.

Using the threaded inter-element connectors, assemble the remaining elements (all finger-tight) - then screw the assembled element stack onto the bottom element(s).

IMPORTANT NOTE - If it is windy, you should use the guy lines to secure the antenna. To do so, use the Special IEC between two of the upper elements - about head high, or just above, in the stack. Put the Guy Line lugs on the sleeve of the Special IEC. See the Guy Line details on Page 9. (We recommend you always do this for 40m and longer configurations, or if you are going to leave the HFp up for a while… the wind can come up quickly.)

Unwind the radial wires to the proper mark (from the Laminated Card) and stake the spools down with the provided stakes (or use rocks to weigh them down). You should try to evenly space the radial wires — place them approximately a 120 degree angles from each other.

Fine Tuning

The best method to fine-tune the HFp is to use one of the portable antenna analyzers. There are a number of these available from MFJ, AEA, Autek and others. A list comparing the different models and prices can be found at http://www.eham.net/reviews/products/31.

Set up the HFp, with the extension cable you intend to use to connect it to your radio, and set the analyzer for a frequency range which includes your target frequency. There should be a null in the response at or near the target frequency. Adjust the whip to put it right on target.

If the null is out of the whip adjustment range, you will have to re-configure the elements to bring it closer. Use the techniques in Frequency Adjustments (on Page 8) to change the antenna configuration to raise or lower the antenna's frequency. When you get close, use the whip adjustment to refine the SWR to the best reading.

You can also use your radio to set up the antenna. This is less desirable because it has the potential to generate some interference to other stations, so you should only use it if you have no other choice. The procedure is as follows:

1. Set up the HFp according to the chart for the band of interest.
2. Set the radio to AM mode, and for SWR indication. If the radio has adjustable power, use a low power setting.
3. Transmit a very short carrier at the low end of the band. Note the SWR reading.
4. Transmit a very short carrier in the middle of the band. Note the SWR reading.
5. Transmit a very short carrier at the top end of the band. Note the SWR reading.

Ideally, the SWR should be lowest at the middle of the band, and higher toward the top and toward the bottom of the band. If the SWR is not acceptable in the band, then do the next steps.

6. If the SWR is lower at the **bottom** of the band, and increases through the band, then the antenna is resonant at too low a frequency. Shorten the antenna whip one section, and do steps 3) through 5) again.
7. If the SWR is lower at the **top** of the band, and increases through the band, then the antenna is resonant at too high a frequency. Lengthen the antenna whip one section, and do steps 3) through 5) again.

If changing the whip length does not get the SWR to an acceptable level at your operating frequency, then the antenna will need to be re-configured.

Use the techniques in "Frequency Adjustments" to change the antenna configuration to raise or lower the antenna's frequency. After each change, do steps 3) through 5) again.

When you get close, use the whip adjustment to refine the SWR to the best reading.

HFp Antenna Notes

The following notes can ease your setup, as well as provide you with ideas for experimentation. While we have defined configurations for the ham bands, you can arrange the elements into other configurations to cover the same, or other bands. In fact, the HFp Vertical can be configured to ANY frequency between about 6.5 and 65 MHz (down to about 3.5 MHz when using the 80M coil). We encourage you to experiment. If you find interesting configurations, please email us and tell us about your experiments at <info@ventenna.com>.

Antennas

Any antenna truly worth the name will exhibit as large a "capture area" as possible. That is, it will present the largest possible amount of resonant structure to capture (or radiate) signals. The larger the "capture area" the better the antenna works. The HFp configurations shown in the configuration charts were designed to have large capture areas, but it is possible to achieve a resonant antenna in a smaller assemblage of the elements, if having a smaller physical structure is desired. Experimenting with the mix of elements may result in different combinations of elements for any particular frequency. Just remember that the shorter antenna won't reach out quite as far as the longer one.

Frequency Adjustments

Note - If you need to adjust the resonant frequency of the HFp because nearby objects are affecting it, most likely the resonant frequency will have to be raised.

1. **Raising the resonant frequency** – Moving an inductive load position higher in the antenna will raise the frequency. This can be accomplished by turning over one of the loaded elements (putting the stripes "up"), or moving it up in the assembly of elements.

   Shortening the antenna by removing a zero- or a 1-stripe element, or replacing a 1-stripe element with the zero-stripe will also raise the resonant frequency. And shortening the whip will raise the resonant frequency.

2. **Lowering the resonant frequency** – Moving an inductive load position lower in the antenna will lower the frequency. This can be accomplished by turning over one of the loaded elements (putting the stripes "down"), or moving it down in the assembly of elements.

   Adding a zero- or a 1-stripe element (making the antenna longer) will also lower the resonant frequency. And extending the whip will lower the resonant frequency.

The HFp Radials

The HFp configuration charts define the tuned length radials for each Ham band, over moderately damp, conductive ground. These tuned lengths are an important concept in the proper operation of a ground-mounted vertical antenna. A write-up available on the Ventenna web site explains the effect of different radial lengths and especially the problems which can be generated by radials that are too long. Go to "http://www.ventenna.com/Manuals.html", and download "Radials for ground-mounted Verticals".

Although we have determined that the HFp will usually operate properly with the three radials provided, adding radials may help lower the SWR in some situations, particularly in elevated mount installations or over very dry or stony ground. It is easy to add extra wire to the radial system to see what effect more radials might have.

You can also affect the performance of your antenna by lengthening or shortening the tuned radials. Change all the radials the same amount, a little at a time, and follow the "Fine Tuning" procedure to check SWR. Also, see the "SWR" discussion at the end of this manual.

In the "Radials for ground-mounted Verticals" write-up, you will notice that there is a broad range of length for the radials which will provide good SWR. Because of this, it is possible to use one length setting for multiple bands.

Guy Lines for the HFp Antenna

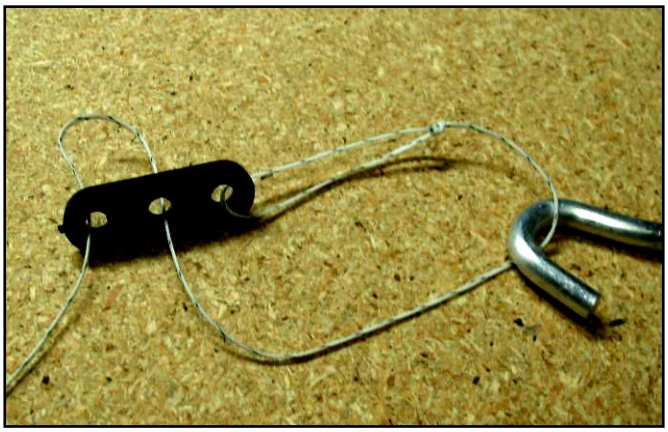
Use of the included Guy Lines is recommended if you intend to leave the antenna up for any length of time, or if it is windy. Although the antenna is quite robust, and can withstand strong winds, it will tip over (and probably damage the whip) under windy conditions if it is not guyed.

A Special IEC (Inter-Element-Connector), which has a short sleeve on it, is used to allow the element stack to rotate with the Guy Lines attached. The short sleeve provides a small space between the element and the nut in the center of the IEC. The sleeve is crimped in place on the threaded portion of the IEC.

The ring crimped to one end of each Guy Line has an opening large enough to allow it to fit loosely over the Special IEC sleeve. Because of the loose fit, the three rings can rotate freely when the element stack is turned, preventing the guy lines from wrapping around the element stack.

Here is a picture showing two elements, the Special IEC, and the three Guy Lines assembled together. This connection point for the Guy Lines is usually about head-high, or just above, in the element stack.

At the other end of the Guy Line, the line is threaded through two of the holes in the Guy Line Slider, and is tied to the third hole. A bowline knot is recommended here.



For each Guy Line, the loop between the tied end of the guy line and the middle hole goes over a Guy Stake, which is spaced about 10' away from the antenna base. Then the three sliders are adjusted to equally tighten the Guy Lines, while checking that the antenna is straight.

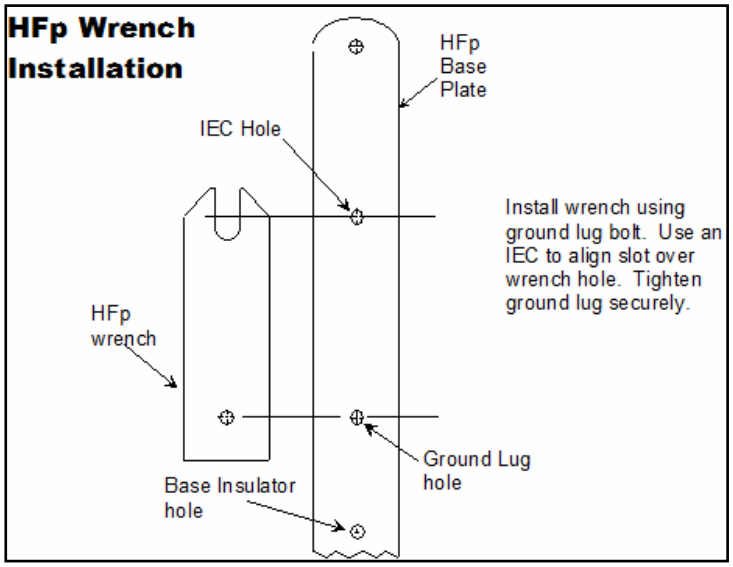
The slider moves very easily toward the antenna, tensioning the guy line. To loosen the slider, grasp and hold the guy line on the antenna side of the slider, turn the slider slightly with your other hand, and slide it toward the stake.

The HFp Wrench

The HFp wrench is designed to loosen a stuck IEC (Inter-Element-Connector) from the end of an element - a common problem when the elements are tightened securely.

The wrench is made of hard aluminum, and may be held in the hand, or may be attached to the base plate of the Vertical. It weighs about 1.2 ounces.

The Vertical base plate application of the wrench makes it extremely convenient to loosen a stuck IEC. Removing a stuck IEC is now a one-hand operation!



To loosen a stuck IEC, simply insert the IEC stud into the IEC hole in the base plate, turning the element slightly to align the nut flats with the wrench slot. Then twist the element (to the left!) to loosen the IEC.

Hints and Kinks for the HFp Vertical

Element Inserts and IECs -

With time, the brass inserts used in the ends of the fiberglass elements may become dirty, or develop corrosion. One of the "Scotchguard" abrasive sponges works very well at cleaning the element ends to assure good electrical contact.

The threaded brass inter-element connectors may also occasionally require cleaning, as well. An old toothbrush works well to clean the IEC threads.

Waterproofing the Pigtail -

The "SO" connector on the pigtail is not waterproof, and neither is the "PL" connector which connects to it. So, if you are going to leave the antenna up for some time, you need to provide some moisture protection for the connection.

A plastic box with a snap-on lid can provide fair short-term protection. Cut a couple of slots in the ends, just about the width of the cable, slide the slots over the cable (with the connection inside the box), and snap on the lid. For better waterproofing, see the writeup "How to Seal Coax Connectors" on the Ventenna website (https://www.ventenna.com/App-Notes.html).

SWR (Standing Wave Ratio) -

SWR is a measure of how well the antenna is absorbing the power generated by the transmitter. The best SWR is 1.0:1 (referred to as "one-to-one"), which means that all of the RF power coming from the transmitter is being absorbed by the antenna - just as you would like it to be. If the SWR in your system is higher than 1:1, it means that some of the power sent to the antenna is being reflected back to the transmitter, and not being used by the antenna.

Most modern transmitters will operate with full power into a load with an SWR of 2:1 or less. If the SWR is higher than 2:1, many transmitters will cut back on their output power to protect themselves from damage caused by excessive amounts of reflected power.

In most situations, setting up the HFp according to the Laminated Card, out in the open, will result in an SWR well below 2:1 - usually in the range of 1.2:1 – which your radio will think is just fine.

Many folks think that the lower you get the SWR, the better the antenna will work, and, technically, they are correct. But, it takes some effort to get an antenna's SWR substantially below 1.2:1, so, the question is –"Is it really worth the time and effort to achieve this ideal?".

At 2:1 SWR, a little over 11% of the transmitter's power is not absorbed by the antenna, and is reflected back to the transmitter. This is where modern transmitters begin to protect themselves, and back off on the power. At 1.5:1, the returned power is 4%, and at 1.2:1, it's less than 1 percent – specifically 0.8% – practically insignificant. Getting it lower may not be worth the trouble.

But, if you really want to make it perfect, it is possible with the HFp (most other portable HF antennas don't have enough adjustment capability to get the SWR perfect), by carefully refining the HFp radial lengths and the whip length. It'll just take a bit of time to get the adjustments exactly right. A write-up available on the Ventenna website tells you how. For a copy, go to "https://www.ventenna.com/App-Notes.html ". Look for "SWR and How to adjust the HFp".

Loose Element Inserts -

Occasionally, one of the brass element inserts will loosen and turn inside the element's fiberglass tubing. Sometimes it will turn far enough to break the wire connected to it.

The Ventenna Company will replace any element which experiences this condition, for free.

But, if you need to get back on the air quickly, you may be able to do repairs yourself. You can find the repair instructions at "https://www.ventenna.com/App-Notes.html". Look for "How to repair an HFp Element".

HFp-V Options

There are a number of mounting possibilities to use instead of the base plates - a large and a small Clamp, a Mobile Mount Adapter, Magnetic Feet, a Back-Pack Mount and a Ground-Mount Stake. The "HFp Mounting Accessories" flyer in the Manuals section of the website gives details of these mounting setups.

There is an "80M Option" which allows setting the antenna to 60, 75, and 80 Meters. The manual for this option (on the website) gives details about operating on these bands.

There is a "Dipole Add-on" option which adds in the extra parts needed to use the same highly-configurable element system to set up a rotatable horizontal dipole using an extendable painter's pole. The manual for the HFp-Dipole (on the website) gives details about this setup.

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