



# Portable HF Magnetic Loop Antenna System

Model HF-315

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# Introduction

Thank you for purchasing the Portable HF Magnetic Loop Antenna System from Caras Manufacturing. These antennas are ideal for most any application where a very small, often unobtrusive yet high performance HF antenna is needed – i.e. apartments, hotels/motels, temporary demonstrations, camping/hiking, and any other space constricted area. Many operators are using small magnetic loop antennas with good performance results in communities where larger antennas are restricted or not permitted. This antenna is ideal for Amateur Radio, Emergency Communications, Short Wave Listening, and many other applications. Small HF loop antennas have long been utilized anywhere in which very compact size along with high performance are needed.

## **Main Features:**

- Ultra portable. Can be easily stored inside a small case, bag, backpack, etc.
- Very lightweight. 1.5lbs.(0.7kg.) without included PVC stand, 3lbs.(1.36kg) with stand.
- A great HF antenna solution for Hiking, SOTA, EMCOMM, etc.
- Built-in standard tripod mount for use with photo tripods if needed.
- Quick-Connect BNC connection to radio.
- No separate coupling loop needed. Tuning and coupling components are housed within a single enclosure.
- Very quick and easy to tune as needed. Simply tune for maximum noise on receive and then apply transmit power & fine tune (if needed) for lowest SWR.
- Transmit/Receive frequency coverage is continuous from 3 mhz to 15 mhz, including the 80/75m, 60m, 40m, 30m, and 20m Amateur Radio bands.
- Design provides good performance at all covered frequencies.
- Rated transmit power of 25 watts P.E.P. SSB/CW, 10 watts continuous carrier.
- Wide usable bandwidth between 2.0:1 swr points, even at lower frequencies. Typically 15khz or more. High signal transfer efficiency is maintained throughout the usable bandwidth.
- Does not require any type of counterpoise, ground radials, nor ground connection for operation.
- Does not require an antenna tuner. Tuner is built-in.
- Inherent low-noise, high signal ratio.
- Hi-Q design helps to reject off-channel interference.
- Directional & magnetic signal response properties of the antenna allow for high rejection of local noise sources along with maximum reception of the desired signal.

# **SAFETY INFORMATION**

**WARNING:** INSTALLATION OF THIS PRODUCT NEAR POWER LINES IS DANGEROUS! FOR YOUR SAFETY, FOLLOW THE PROVIDED INSTALLATION INSTRUCTIONS. INSTALLER ASSUMES ALL LIABILITY FOR PROPERTY AND LIFE SAFETY.

**WARNING:** HIGH VOLTAGES MAY BE PRESENT ON THE LOOP ANTENNA ELEMENT AND ASSOCIATED CONNECTORS DURING TRANSMITTER OPERATION. DO NOT TOUCH ANY PART OF THE ACTUAL LOOP ANTENNA ELEMENT OR CONNECTORS WHILE TRANSMITTING!

## **EXCESS RF EXPOSURE WARNING**

In the United States, the Federal Communications Commission has established guidelines for human exposure to Radio Frequency (RF) electromagnetic fields. The commission's requirements are detailed in parts 1 & 2 of the FCC's rules and regulations [47 CFR, 1.1307(b), 1.1310, 2.1091, 2.1093]. It is the responsibility of the owner/operator of this device to follow all applicable warnings and precautions regarding human exposure to RF fields.

The FCC Office of Engineering Technology (OET) Bulletin 65, Supplement B, Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields directly concerns the use and operation of the model HF-315 Portable Magnetic Loop Antenna System. This bulletin establishes safe operating distances from the loop antenna and associated power levels in order to permit the operator and persons who may be impacted by operation to exist in a safe environment. Guidelines for Maximum Permissible Exposure or MPE are defined in Supplement B of the bulletin.

### **IMPORTANT NOTE:**

Refer to the above mentioned Supplement B along with FCC OET Bulletin 65, Version 97-01. The information in the supplement provides additional details which are used for evaluating compliance of amateur radio stations with FCC guidelines for exposure to radio frequency electromagnetic fields. However, Supplement B users should also consult Bulletin 65 for complete information on FCC policies, guidelines and compliance-related issues. Definitions of terms used in this supplement appear in Bulletin 65. Bulletin 65 can be viewed and downloaded from the FCC's Office of Engineering and Technology's World Wide Web Internet Site:  
<http://www.fcc.gov/oet/rfsafety>

# **WARRANTY INFORMATION**

## **LIMITED PRODUCT WARRANTY**

Caras Mfg. Co. warrants its products to be free from defects in material and workmanship for a period of one hundred eighty (180) days from date of shipment. Any product found to be defective within this time period may be returned to our factory, freight prepaid, with prior return authorization for repair or replacement (at our discretion) at no charge (with the exception of batteries and other expendable items). Our liability under this warranty is limited to the repair or replacement of the defective product and in no event shall Caras Mfg. Co. be liable for consequential or indirect damages to goods, property, equipment or personnel. Nor shall we be liable for damages to equipment or for personal injury caused by misuse, overload, accidental damage, alteration, improper installation, or unauthorized opening of the equipment. Under no circumstances will we be responsible for any indirect or consequential damages due to errors in or failure of our product to perform properly.

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# Assembling and using your antenna

## Assembly:

The model HF-315 loop antenna is designed to be ultra portable and is very quick & easy to deploy. The antenna can be used either with or without the included support which is constructed from 1/2-inch schedule 40 PVC pipe. The HF-315 can be mounted to a photo tripod if desired, and a standard 1/4x20 female thread mount is located inside the bottom of the PVC antenna support for this purpose.

In some cases such as long-range hiking, mountain climbing, etc. it may be desirable to take along only the coaxial loop element and the tuning/coupling unit so as to minimize weight. This way weight of the antenna system is just 1.5lbs.(0.7kg.). In these situations, the PVC loop support can be left behind and the loop may be supported simply by hanging from convenient natural objects such as trees, tall bushes, large rocks, etc.

In other cases such as camping, hotel/motel room use, use in apartments, ham radio demonstrations, or any other place where a very compact yet high performance HF antenna is needed, use of the antenna with the provided PVC support may be best.

Assembly of the antenna is very simple and involves these steps:

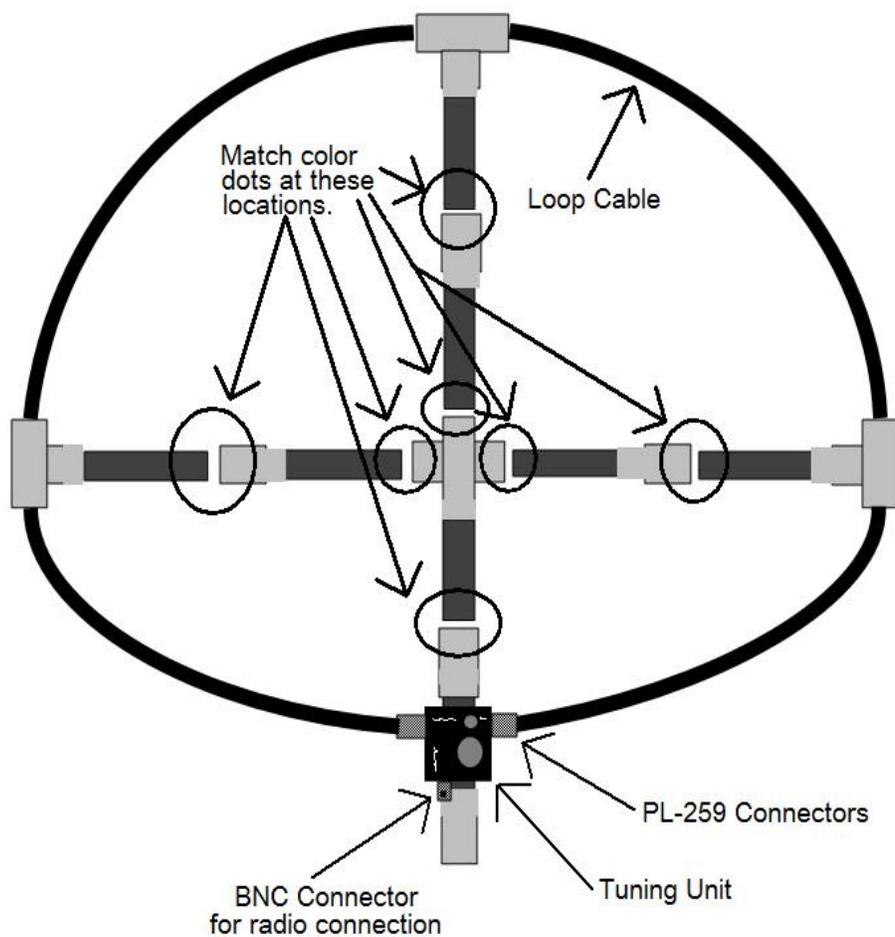
(Refer to figs. 1 & 2 on the following pages for illustration of assembly)

(If not using the included antenna support then uncoil loop coax and proceed to step 3)

- 1) Assemble the antenna support if you are going to use it. (refer to fig. 2 on page 6).
- 2) Uncoil the coaxial loop element and insert into the "Tee" connectors at the ends of the PVC support arms. The tees are cut so as to allow quick insertion and removal of the coaxial loop element without the need to disconnect/reconnect the tuning unit each time.
- 3) Connect the male connectors at each end of the loop coax to the corresponding female connectors (Marked "LOOP") on the tuning unit. **IMPORTANT: For proper operation, the loop connectors must be clean and tight at all times during antenna operation.**
- 4) Connect an appropriate cable between the "RADIO" connector on the bottom of the tuning unit and your radio. The antenna is now ready for use.

## Initial Tuning

Tuning the loop antenna is very simple. First, select the frequency on which you wish to operate. Second, adjust the "Tuning" control on the loop tuning unit for maximum background noise level on receive. If you only wish to receive (i.e. SWL), then no other steps are needed. For transmit operation, one additional step is needed: Key the transmitter on CW/AM/FM or any continuous carrier mode, using about 5-8 watts of power. Readjust the "Tuning" control on the loop tuning unit for minimum SWR if an SWR indicator is available. **See Page 8 for further discussion regarding transmit tuning.**



To assemble PVC Antenna Stand, simply line up & match the color dots which are found at mating joints on the stand. Connect the pieces together by lining up the color dots and simply push the smaller pipes into the larger couplings.

## Specifications:

Frequency Range: 3 to 15 mhz.  
Maximum Transmit Power: 25 watts PEP SSB, 10 watts carrier

**Approximate** bandwidth per band  
between 2.62:1 SWR points:

80m = 15khz  
60m = All channels  
40m = 40khz  
30m = 50khz  
20m = 145khz

Loop Diameter: Approx. 34.5in.(87.6cm.)  
Loop Material: High-quality 50-ohm .405dia coaxial cable.  
Total weight: 1.5lbs.(0.7kg.) without included PVC stand, 3lbs.(1.36kg)  
with stand.



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## **A few usage hints**

Small loop antennas such as this one usually show a bi-directional radiation pattern – i.e. a figure-eight pattern with deep nulls which are perpendicular to the plane of the antenna, and maximum signal strength within the loop plane. Also, in the near field, these antennas respond primarily to the magnetic component of a given signal rather than the electrical component. These things can be advantageous in several ways. For receiving, the antenna can be rotated either for maximum signal strength or for minimum background noise. Rotating the antenna for minimum background noise will usually result in the best signal-to-noise ratio and often will cause signals to “rise up” out of the noise, even though the desired signal may be lower in strength on the S-meter as compared to pointing the antenna directly at the signal or compared to a larger antenna such as a dipole. After tuning the HF-315 loop antenna on a given frequency, both ways of rotation should be tried and then using that which results in best reception of the desired signal. In other words, strongest signal and best reception may not necessarily be the same, especially in areas with high levels of man-made RF noise. Nulls of the HF-315 antenna are quite sharp so be sure to rotate the antenna slowly while listening for best reception. If you intend to transmit to a specific station, it might be best to rotate the loop for maximum receive signal strength from that station before transmitting.

### **Transmit Tuning:**

#### **USE NO MORE THAN 10-12 Watts of transmit power during tuning.**

Note that tuning for lowest SWR during transmit may be somewhat “touchy”, especially on higher frequencies such as 20m. This is true for all loop antennas of this type. After a bit of practice it becomes quick & easy. Using a technique called “Reverse Tuning” seems to work well. i.e.- With TX keyed, SLOWLY turn the tuning knob on the tuning unit until a dip in SWR is observed. Pull hand away from the tuning box and note the SWR reading at that point. Grasp the tuning knob again and gently turn it counterclockwise until SWR reading matches that which was just noted after moving the hand away from the tuning box. At this point, when the hand is once again moved away from the tuning control, TX SWR should then be at its lowest point.

Note also that lowest SWR does not always reflect best transmit efficiency, and that in most cases it is much better to simply tune for maximum transmitted radiation by using a field-strength meter or other such indicating device placed within 6-18 inches of the loop coaxial cable. Then simply key the TX and tune for maximum indication on the field-strength device.