Table of Contents
Introduction ........................................................................................................................................... 3
VHF/UHF Propagation............................................................................................................................ 3
Portable Dual-Band Vertical/Horizontal Antenna Description .............................................................. 4
Parts of the Portable Dual-Band Vertical/Horizontal Antenna ............................................................. 4
Assembling the Portable Dual-Band Vertical/Horizontal Antenna ....................................................... 5
Troubleshooting................................................................................................................................... 7
Specifications ........................................................................................................................................ 7
Warranty ................................................................................................................................................ 8
Accessories........................................................................................................................................... 9
Chameleon Antenna™ Products ............................................................................................................. 9
References ............................................................................................................................................ 10

WARNING! Never mount this, or any other antenna near power lines or utility wires! Any materials: ladders, ropes, or feedlines that contact power lines can conduct voltages that kill. Never trust insulation to protect you. Stay away from all power lines.

WARNING! Never operate this antenna where people could be subjected to high levels of RF exposure, especially above 10 watts or above 14 MHz. Never use this antenna near RF sensitive medical devices, such as pacemakers.

All information on this product and the product itself is the property of and is proprietary to Chameleon Antenna™. Specifications are subject to change without prior notice.
Introduction

Thank you for purchasing and using the Chameleon Antenna™ Portable Dual-Band Vertical/Horizontal Antenna. This antenna, shown in plate (1), will enable operation on both the 144 MHz (2m) and 440 MHz (70cm) Amateur Radio Service bands in both vertical and horizontal polarization configurations. This innovative antenna concept is designed to be the most versatile and rugged portable Very High Frequency (VHF) / Ultra High Frequency (UHF) antenna available and will enable the operator to communicate on CW and SSB using horizontal polarization and on FM simplex and repeaters using vertical polarization with one simple antenna whip change.

Plate 1. Portable Dual-Band VHF/UHF Antenna.

The Chameleon Antenna™ Portable Dual-Band Vertical/Horizontal Antenna is an ideal accessory for the Modular Portable Antenna System (MPAS) as part of a total portable communication system. It will greatly extend communications range when using a portable VHF/UHF hand-held transceiver (HT) as compared to the typical flexible whip “rubber duck” antenna. The Portable Dual-Band Vertical/Horizontal Antenna also provides horizontally polarized capability, that is usually forgotten by most manufacturers of portable VHF/UHF antennas, for use with transceivers that have CW/SSB modes. It is especially suitable for use when camping or in a Recreational Vehicle (RV), apartment, condominium, HOA, or inside an attic - anywhere you need portability or have limited space or restrictions against permanent antennas. It would also be useful as a backup base station antenna or for EMCOMM. The Chameleon Antenna™ Portable Dual-Band Vertical/Horizontal Antenna is made from a durable weather-resistant case and easily attaches to an antenna mast that has a 3/8” x 24 stud socket, such as the CHA MIL EXT 2.0 collapsible mast or the CHA JAW MOUNT (both sold separately). Antennas and antenna accessories built by Chameleon Antenna™ are versatile, dependable, stealthy, and built to last. Please read this user guide so that you may maximize the utility you obtain from your Chameleon Antenna™ Portable Dual-Band Vertical/Horizontal Antenna.

VHF/UHF Propagation

VHF and UHF radio provides relatively inexpensive and reliable local voice and data communication capability. It is especially suitable for local areas where normal telecommunications are not available, too costly or scarce, or where the commercial telecommunications infrastructure has been damaged by a natural disaster or military conflict.

Although VHF/UHF radio is a reasonably reliable method of communication, VHF/UHF radio waves propagate through a complex and constantly changing environment and are affected greatly by terrain and to a lesser extent, weather. A detailed explanation of the theory of VHF/UHF radio wave propagation is beyond the scope of this operator’s manual, but an understanding of the basic principles will help the operator decide what frequency, communications mode, and polarization will support their communication requirements.

VHF/UHF radio waves propagate from the transmitting antenna to the receiving antenna using two general methods: line-of-sight and refraction.
The broad term "line-of-sight" includes actual line-of-sight (when the transmitting station and receiving station have an unobstructed, direct path between each other) as well as reflections. True line-of-sight range for most portable VHF/UHF stations is only a few miles, so longer range typically occurs through reflections, caused by intervening terrain and structures. Signal enhancements and fading are caused by reflections arriving from different directions and phases (referred to as "multipath"). You have probably noticed this effect, called “picket fencing” by hams, while operating mobile. A radio signal also travels further than the visual horizon due to a tendency for radio waves to be refracted slightly groundward when travelling through the atmosphere. This distance is called the radio horizon and can be estimated by the formula:

\[ d = \sqrt{2 \times h} \]

Where: \( d \) = distance (miles) and \( h \) = antenna height (feet). For example, the maximum line-of-sight range for a portable station using this antenna and communicating with a typical VHF/UHF FM base station would be around 12 miles. Typical communication range using a repeater is around 30 miles and, of course, being on a mountain or hill top can greatly increase this.

Ducting and troposcatter are both forms of refraction enabling communication beyond the radio horizon. Apart from the normal refraction described above, severe refraction due to tropospheric temperature inversions cause a rare phenomenon known as ducting. VHF/UHF signals propagated by ducting can travel for several hundred miles with little loss. The temperature inversions that causes ducting are associated with climatic conditions like frontal boundaries.

A more common and reliable propagation technique for over-the-horizon VHF/UHF communication is troposcatter. Troposcatter is caused by scattering of radio waves by wavelength-sized gradients in the common scattering volume between two stations. Normally, these transmissions would pass through the layers of the atmosphere and into space, but due to the gradients, a small part of the transmission is scattered towards the receiving station, and thus made able to be received. Troposcatter propagation is almost always present, but due to the large path losses, works best with narrow band modes (e.g. CW and SSB), high power, high gain directional antennas, and most important, high elevations with no obstructions low to the horizon (like on mountain or hill tops). The calculated maximum range for troposcatter propagation between a station using this antenna in the horizontal configuration, SSB mode, and with a power level of 100 Watts, communicating with a typical VHF/UHF base station, is around 160 miles for VHF and 70 miles for UHF.

**Portable Dual-Band Vertical/Horizontal Antenna Description**

The Chameleon Antenna™ Portable Dual-Band Vertical/Horizontal Antenna is comprised of a weather resistant base designed to allow mounting of the two included dual-band VHF/UHF whip antennas that can be easily configured as either a quarter-wave vertical monopole or half-wave horizontal dipole antenna. The Antenna Base (a) can be installed on any mount that accepts the standard 3/8” x 24 stud, such as the CHA MIL EXT 2.0 collapsible antenna extension or the CHA JAW MOUNT (both available from Chameleon Antenna™).

**Parts of the Portable Dual-Band Vertical/Horizontal Antenna**

The Portable Dual-Band Vertical/Horizontal Antenna is comprised of the following components, see plate (2).

- **Antenna Base.** The Antenna Base is the center of the Portable Dual-Band Vertical/Horizontal Antenna System and has three 3/8” x 24 couplings, used to mount the dual-band whip antennas in either a horizontal or vertical position.
b. **Dual-Band Whip.** The Dual-Band Whip is a quarter wave antenna for the 144 MHz (2m) and 440 MHz (70cm) Amateur Radio Service bands.

c. **Antenna Stud.** The Antenna Stud is a standard 3/8” x 24 stub base used to affix the Dual-Band Whip (b) to the Antenna Base.

![Image of Dual-Band Vertical/Horizontal Antenna Components]

Plate 2. Portable Dual-Band Vertical/Horizontal Antenna Components.

**Coupling 1 - 3.** The three 3/8” x 24 threaded Couplings are used to attach the Dual-Band Whips (c) to the Antenna Base. Each Coupling is marked with a color during final assembly, usually they are: Blue (1) for the Vertical Dual-Band Whip, Red (2) for the Horizontal Dual-Band Whip, and Green (3) for the Dual-Band Whip used as the radial/counterpoise. The labelling in Plate (2) the colored labels on the actual Antenna Base may not be identical on all units. The purpose of the labelling is to demonstrate the installation of the Dual-Band Whips in the Vertical and Horizontal configurations.

d. **Base Stud.** The Base Stud is used to mount the Antenna Base (a) to the mast or mount used to erect the antenna.

e. **UHF Socket.** The UHF Socket (SO-239) is used to connect the coaxial cable assembly (not supplied, but available as an option).

**Assembling the Portable Dual-Band Vertical/Horizontal Antenna**

Assembly of the Portable Dual-Band Vertical/Horizontal Antenna is very quick and easy – just perform the following steps.

1. For vertical polarization (used for FM, repeaters, APRS/Packet, and VARA FM), connect one Dual-Band Whip (b) Antenna Stud (c) to Coupling (1) on top of the Antenna Base(a), as shown in figure (1).

2. For horizontal polarization (used for CW, SSB, and SSB-based data modes, like WSPR, FT-8, or PSK-31), connect one Dual-Band Whip Antenna Stud to Coupling (2), on the left side of the Antenna Base (when the UHF Socket is facing you), as shown in figure (1).

3. Connect the Radial/Counterpoise Dual-Band Whip Antenna Stud to Coupling (3), on the right side of the Antenna Base (when the UHF Socket is facing you), as shown in figure (1).
4. Attach the Antenna Base to the mount on the support mast (not supplied, but available as an accessory) by threading the Base Stud (d) into the mount’s 3/8” x 24 socket.

5. Attach the coaxial cable (not supplied, but available as an accessory) to the UHF Socket (e).

6. Raise the antenna mast.

7. Install non-conducting guy lines (not supplied, but available as an accessory), if needed. The assembled and erected antenna should look similar to that pictured in plate (3).

8. Perform operational check.

9. To change antenna polarization, perform step 1 or 2, as appropriate.
Troubleshooting
Most problems experienced when using the Portable Dual-Band Vertical/Horizontal Antenna are likely to be caused by defects in the coaxial cable assembly. The Dual-Band Whips (b) have been pre-tuned by the manufacturer and should not require field tuning. Perform the following steps to troubleshoot problems with the Portable Dual-Band Vertical/Horizontal Antenna.

1. Connect a Standing Wave Ratio (SWR) Power Meter and check SWR.
2. If the SWR is greater than 1.5:1 and less than 5:1, it is likely this is a Dual-Band Whip (b) tuning problem. Contact Chameleon Antenna for assistance.
3. Ensure the coaxial cable assembly UHF Connector Plug (PL-259) is securely tightened to the UHF Socket (e). Recheck SWR.
4. If the SWR is still higher than 5:1, inspect and check or replace the coaxial cable. Most problems causing extremely high SWR are caused by the coaxial cables and connectors. Recheck SWR.
5. If the SWR is still higher than 5:1, disconnect the coaxial cable from the Antenna Base (a). Use a Multi-Meter to check for a short in the Antenna Base by placing one lead on the outside of the UHF Socket and the other lead in the center of the UHF Socket. It should have an infinite resistance. If it has any value other than an infinite resistance reading (within the accuracy of the meter), replace the Antenna Base.
6. Use a Multi-Meter to check for continuity in the Antenna Base by placing one lead in the center of the UHF Socket and the other on Coupling (1). Perform the same measurement for Coupling (2). Move the Multi-Meter lead from the center of the UHF Socket to the outside of the UHF Socket and measure Coupling (3). They all should have had zero resistance. If any of the Couplings had unexpected values (not close to zero or infinity - within the accuracy of the meter), replace the Antenna Spoke Base.
7. If still not operating correctly, contact Chameleon Antenna for technical support. Explain to them the steps you have already taken to isolate the problem.

Specifications
- Frequency Range: 144.0-148.0 MHz (2m) and 420-450 MHz (70cm).
- SWR: Less than 1.5:1.
- Power Handling: 100 W.
- Polarization: Vertical and Horizontal by changing the radiator whip position.
- Space Required: Maximum diameter of 40 inches.
- RF Connection: UHF Socket (SO-239)
- Personnel Requirements and Setup Time: one operator, less than 5 minutes.
- Figure (1) shows the far field plot for the vertical monopole and figure (2) shows the far field plot for the horizontal dipole.
Figure 1. Far Field Plot Vertical Monopole.

Figure 2 Far Field Plot Horizontal Dipole.

Warranty
The Chameleon Portable Dual-Band Vertical/Horizontal Antenna is warranted to be free from defects in materials and workmanship for a period of 12 months from the date of purchase. To obtain warranty service, return all components of the system to Chameleon Antenna at your expense. Chameleon Antenna will repair or replace defective components and return the system to you at no charge. We encourage you to call us for technical support before returning the antenna system. This warranty excludes components that have been damaged or modified by the customer.
Accessories
The following accessories are available for purchase from Chameleon Antenna™. Please contact us at support@chameleonantenna.com for current prices and availability or see our website www.chameleonantenna.com.

- **Guying System.** The Universal Guying System (CHA UGS) is recommended to stabilize the erected antenna mast.
- **Coaxial Cable Assembly.** The CHA 50’ COAX CABLE with integrated RFI Choke is perfect for use as the feedline to the Portable Dual-Band Vertical/Horizontal Antenna.
- **Portable Collapsible Mast.** The CHA MIL EXT 2.0 is an aluminum 8’ 9” antenna mast that collapses to less than 29” for portability. The Chameleon Antenna™ Portable Dual-Band Vertical/Horizontal Antenna was specifically designed to use this mast.
- **JAW MOUNT.** The CHA JAW MOUNT is a versatile antenna mount that can clamp to an existing support, like a pole or fence rail, up to 3” thick, depending on the shape.

Recommended non-supplied accessories:

- 1/2” Combination Wrench.
- SWR Power Meter or Antenna Analyzer.
- Multi-Meter.

Chameleon Antenna™ Products
The following are a few of the quality products available for purchase from Chameleon Antenna™. Many other antenna products are also available. Go to www.chameleonantenna.com for ordering and more information.

**CHA MPAS 2.0** – The Modular Portable Antenna System (MPAS 2.0) is a concept allowing the radio operator to configure and deploy the antenna system in a variety of configurations. It covers 1.8 to 54.0 MHz and comes in a military-style backpack. **Note:** includes the CHA MIL EXT 2.0 collapsible mast.

**CHA F-LOOP 2.0 and CHA P-Loop 2.0** – The CHA F-LOOP 2.0 Magnetic Loop Antenna is only 36” in diameter and covers 3.5 to 29.7 MHz. The CHA P-Loop 2.0 is less than 34” and covers 7.0 to 29.7 MHz. Both loops were designed with portability, ease of use simplicity, ruggedness and high performance in mind. They are perfect for apartment balconies.

**CHA EMCOMM III** – The EMCOMM III Portable antenna is a portable High Frequency (HF) antenna specially designed for short to long range portable and man-pack HF communications. The EMCOMM III Portable antenna is ideal for hiking, backpacking, and both tent and Recreational Vehicle (RV) camping. It would also be ideal as a backup emergency HF antenna.

**CHA TD Tactical Dipole LITE** - The CHA TD LITE (Tactical Dipole LITE) is a HF broadband antenna specially designed for portable HF communication where rapid deployment and simplicity of operation is essential but compactness is essential. The antenna will operate at all frequencies in the 1.8-54 MHz band without any adjustment with most modern external antenna tuners. No masts or guying are required.

**CHA TD Tactical Dipole** - The CHA TD (Tactical Dipole) Antenna has been designed as an add-on for the CHA HYBRID - MINI / MICRO. The CHA TD is a HF broadband antenna specially designed for portable HF communication where rapid deployment and simplicity of operation is essential. The antenna will operate at all frequencies in the 1.8-30 MHz band without any adjustment with most modern internal antenna tuners. It is ideal for use in conjunction with modern, digitally configured, HF communication
transceivers where features such as ALE and frequency hopping require true broadband capability.

References