HF Modular Portable Antenna System 2.0 (CHA MPAS 2.0) Operator's Manual

Nevada - USA
WWW.CHAMELEONANTENNA.COM

VERSATILE – DEPENDABLE – STEALTH – BUILT TO LAST

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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.

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Introduction

Thank you for purchasing and using the Chameleon Antenna™ High Frequency (HF) Modular Portable Antenna System 2.0 (CHA MPAS 2.0). The CHA MPAS 2.0 is designed to be the most versatile, high performance, and rugged portable / man-packable HF antenna available using the "LEGO® BLOCK" approach, as described by Survival Tech Nord. The CHA MPAS 2.0 has several product improvements over the original MPAS, which were designed to improve the overall performance, portability, and durability of the antenna system. We believe the CHA MPAS 2.0 is the best modular portable HF antenna system in the world.

The core components of the antenna system, see plate (1), are: a CHA HYBRID-MICRO or CHA HYBRID-MINI *(special order for Government/Military, Non-Governmental Organization (NGO), and commercial use at additional charge)* matching unit and antenna base, 73 feet of antenna wire, 25 feet of counterpoise wire, a 9'4" military-style collapsible whip antenna (CHA MIL 2.0), a 8'9" military-style antenna extension (CHA MIL EXT 2.0), an in-ground antenna mount (CHA SPIKE), and a coaxial cable with an integrated Radio Frequency Interference (RFI) choke and UHF Connectors *(Type N Connector available on one end as* a *special order for Government/Military, Non-Governmental Organization (NGO), and commercial use at additional charge),* and a military-style olive green backpack. Available high-performance options *(sold separately)* include a counterpoise (radial) kit (CHA COUNTERPOISE KIT), a high-efficiency capacity hat (CHA CAP HAT), a clamp-on antenna mount (CHA JAW MOUNT), and a Universal Guying System (CHA UGS). The components of the CHA MPAS 2.0 provide a continuum of portability and performance to meet your communications requirements.

Plate 1. CHA MPAS 2.0 Core Components.

The integral broadband impedance matching network transformer of the CHA HYBRID MICRO 2.0 allows broadband antenna tuning. The antenna will operate continuously from 1.8 – 54.0 MHz (including 160m – 6m amateur bands) without any adjustment with a wide range antenna tuner or coupler (the shortest configuration has limited performance below 3.5 MHz). The CHA MPAS 2.0 is perfect for Government/Military, Non-Governmental Organizations (NGO), and Emergency Preparedness and Survival Communication. It is also the antenna for hams that enjoy camping, hiking, biking or other types of outdoor recreation which require communication gear to be both effective and highly portable. The CHA MPAS 2.0 is configurable to facilitate Near-Vertical Incident Sky wave (NVIS) communication and is totally waterproof. The CHA MPAS 2.0 requires a wide range antenna tuner or coupler. Antennas built by Chameleon Antenna™ are versatile, dependable, stealthy, and built to last. Please read this operator's manual so that you may maximize the utility you obtain from your CHA MPAS 2.0.

HF Propagation

HF radio provides relatively inexpensive and reliable local, regional, national, and international voice and data communication capability. It is especially suitable for undeveloped 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 HF radio is a reasonably reliable method of communication, HF radio waves propagate through a complex and constantly changing environment and are affected by weather, terrain, latitude, time of day, season, and the 11-year solar cycle. A detailed explanation of the theory of HF 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 and which of the CHA MPAS configurations will support their communication requirements.

HF radio waves propagate from the transmitting antenna to the receiving antenna using two methods: ground waves and sky waves.

Ground waves are composed of direct waves and surface waves. Direct waves travel directly from the transmitting antenna to the receiving antenna when they are within the radio line-of-sight. Typically, this distance is 8 to 14 miles for field stations. Surface waves follow the curvature of the Earth beyond the radio horizon.

They are usable, during the day and under optimal conditions, up to around 90 miles, see table (1). Low power, horizontal antenna polarization, rugged or urban terrain, dense foliage, or dry soil conditions can reduce the range very significantly. The U.S. Army found that in the dense jungles of Vietnam, the range for ground waves was sometimes less than one mile.

Frequency	Distance	Frequency	Distance
2 MHz	88 miles	**14 MHz**	33 miles
4 MHz	62 miles	**18MHz**	29 miles
7 MHz	47 miles	**24 MHz**	25 miles
10 MHz	39 miles	**30 MHz**	23 miles

Table 1. Maximum Surface Wave Range by Frequency.

Sky waves are the primary method of HF radio wave propagation. HF radio waves on a frequency below the critical frequency (found by an ionosonde) are reflected off one of the layers of the ionosphere and back to Earth between 300 and 2,500 miles, depending upon the frequency and ionospheric conditions. HF radio waves can then be reflected from the Earth to the ionosphere again during multi-hop propagation for longer range communication. The most important thing for the operator to understand about HF radio wave propagation is the concept of Maximum Usable Frequency (MUF), Lowest Usable Frequency (LUF), and Optimal Working Frequency (OWF). The MUF is the frequency for which successful communications between two points is predicted on 50% of the days of in a month. The LUF is the frequency below which successful communications are lost due to ionospheric loses. The OWF, which is somewhere between the LUF and around 80% of the MUF, is the range of frequencies which can be used for reliable communication. If the LUF is above the MUF, HF sky wave propagation is unlikely to occur.

The HF part of the Radio Frequency (RF) spectrum is usually filled with communications activity and an experienced operator can often determine where the MUF is, and with less certainty, the LUF by listening to where activity ends. The operator can then pick a frequency in the OWF and attempt to establish contact. Another method is using HF propagation prediction software, such as the *Voice of America Coverage Analysis Program (VOACAP)*, which is available at no cost to download or use online at www.voacap.com. The operator enters the location of the two stations and the program show a wheel with the predicted percentage of success based on frequency and time. ALE, which is the standard for interoperable HF communications, is an automated method of finding a frequency in the OWF and establishing and maintaining a communications link.

Even under optimal conditions, there is a gap between where ground waves end (around 40 to 90 miles) and the sky wave returns to Earth on the first hop (around 300 miles). NVIS propagation can be used to fill this gap. The frequency selected must be below the critical frequency, so NVIS is can normally only be used on frequencies from around 2 to 10 MHz. Frequencies of 2 – 4 MHz are typical at night and 4 – 8 MHz during the day.

Parts of the Antenna

The CHA MPAS 2.0 is comprised of the following assemblies and components, see plates (2) through (4):

a. Hybrid Micro

The Hybrid Micro provides a mounting base and impedance matching for the CHA MPAS 2.0. The CHA Hybrid Mini performs the same function, and has the same electrical and mechanical connections as the Hybrid Micro, but is slightly larger and heavier.

b. Antenna Wire

The Antenna Wire is a 73-foot length of black insulated wire wound on a line winder (e).

c. Isolation Loop

An Isolation Loop is permanently attached to both ends of the Antenna Wire (b). There is also a floating Isolation Loop which is used to suspend the Antenna Wire anywhere in the middle for Inverted "V" and Inverted "L" antenna configurations (see Configurations section).

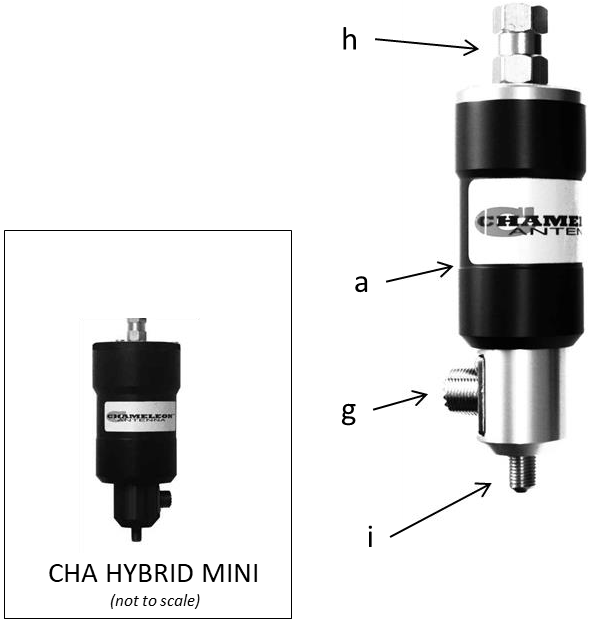

Plate 2. Hybrid Micro.

d. Carabiner

The Carabiner is a removable pear-shaped stainless-steel hook with a spring-loaded gate used for mechanical connections.

e. Line Winder

The Line Winder is used to store the Antenna Wire (b) and Counterpoise Wire (k). It enables rapid deployment and recovery of the CHA MPAS 2.0.

f. Wire Connector

The Wire Connectors are terminal lugs located at one end of the Antenna Wire (b) and Counterpoise Wire (k).

g. UHF Connector Socket

The UHF Connector Socket, SO-239, is located on the side of the Hybrid Micro (a).

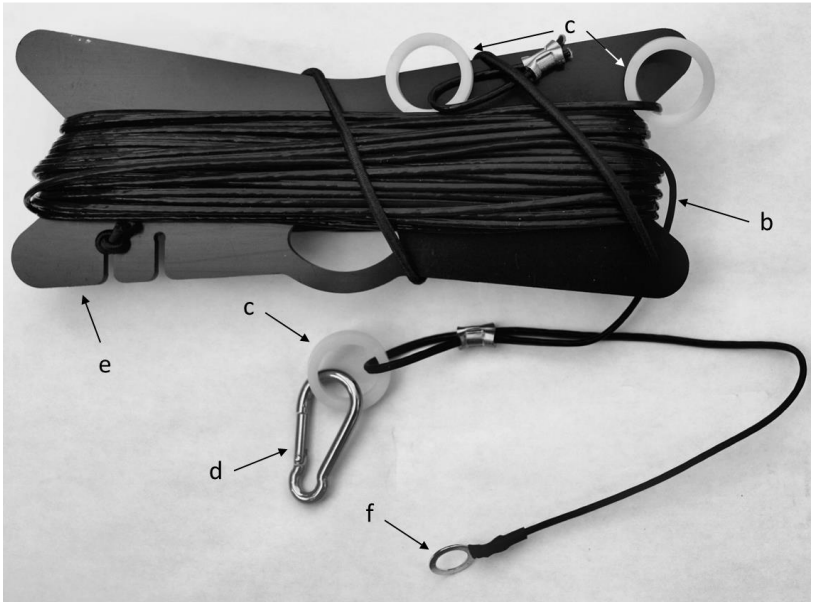

Plate 3. Antenna Wire Assembly.

h. Antenna Connection

The Antenna Connection is located on the top of the Hybrid Micro (a). It is a 3/8" x 24 (fine thread) female fitting.

i. Base Connection

The Base Connection is located on the bottom of the Hybrid Micro (a). It is a 3/8" x 24 (fine thread) male fitting. This fitting provides mechanical connection to the Spike Mount (l). It is also used for the ground connection when not using the Spike Mount (l).

j. Antenna Shackle

The Antenna Shackle, see plate (5), consists of a shackle, bolt, and nut. It is attached to the top of the Hybrid Micro (a).

k. Counterpoise Wire *(not shown)*

The Counterpoise Wire, not shown, consists of 25 feet of black insulated wire with a Wire Connector (f) on one end and wound on a line winder (e).

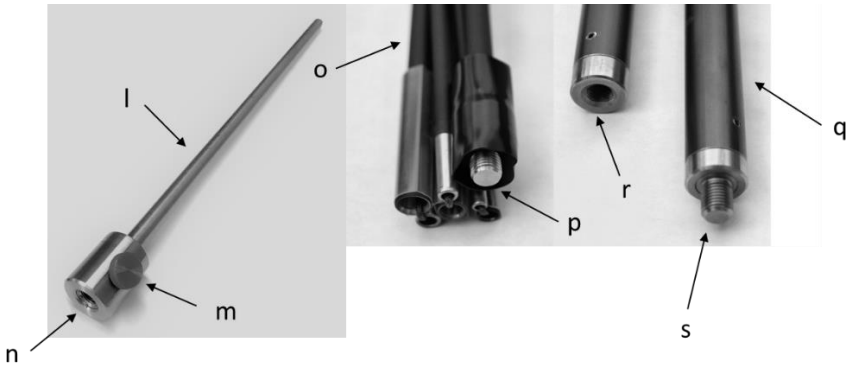

Plate 4. Whip Antenna and Spike Mount Connections.

l. Spike Mount

The Spike Mount (CHA SPIKE) is stainless-steel spike with a 3/8” x 24 (fine thread) female fitting and knurled knob, used as the in-ground mount for the vertical antenna configuration.

m. Ground Connection

The Ground Connection is used as the electrical connection point for the Counterpose Wire (k).

n. Mount Connection

The Mount Connection is used as the mechanical connection point for the Hybrid Micro (a).

o. Whip Antenna

The Whip Antenna (CHA MIL 2.0) is a military-style collapsible whip antenna. It can be used with the Hybrid Micro (a) only or with the Hybrid Micro and Antenna Extension (q) *(see Configuration section).*

p. Whip Base

The Whip Base is used to connect the Whip Antenna (o) to the Hybrid Micro (a).

q. Antenna Extension

The Antenna Extension (CHA MIL EXT 2.0) is used to increase the length of the Whip Antenna (o) which significantly increases the performance of the MPAS 2.0, especially on lower frequencies.

r. Extension Connection

The Extension Connection is used to connect the Whip Antenna (o) to the Antenna Extension (q).

s. Extension Base

The Extension Base is used to connect the Antenna Extension (q) to the Hybrid Micro (a).

t. Coaxial Cable *(not shown)*

The Coaxial Cable (CHA 50' COAX) consist of 50 feet of 50 Ohm coaxial cable with an integrated Radio Frequency Interference (RFI) choke. Both ends of the coaxial cable are terminated with a UHF Connector *(or a Type N Connector on one end, which is available as* a *special order for Government/Military, Non-Governmental Organization (NGO), and commercial use).*

u. Backpack *(not shown)*

The Backpack, not shown, is an olive-green military-style backpack used to store the components of the MPAS 2.0.

Antenna Configurations

Using the supplied components*, the CHA MPAS 2..0 can be deployed into a number of operationally useful configurations. Six configurations, see table (2), are described in this manual, each with unique performance characteristics. **Note: you will also need approximately 50 feet of Paracord or other low-stretch synthetic line, a tent stake, and a plastic mallet.*

Configuration	Ground	Short	Medium	Long	Directionality
Manpack Vertical	↕				Omnidirectional
Portable Vertical	↕		↑		Omnidirectional
Horizontal NVIS		↓	↑		Omnidirectional
Sloping Wire	↓		↕		Unidirectional
End-Fed Inverted "L"		↓	↕		Bidirectional
End-Fed Inverted "V"	↕		↓	↑	Bidirectional

Table 2. Antenna Configuration Selection.

The table can assist the operator to quickly select the most appropriate antenna configuration to meet their operational requirements. To use the table, decide which distance column (Ground = 0 to 90 miles, Short = 0 - 300 miles, Medium = 300 – 1500 miles, Long > 1500 miles) best matches the distance to the station with whom you need to communicate. Then, determine if the OWF is in the lower (↓ = 1.8 – 10 MHz) or upper (↑ = 10 – 30 MHz) frequency range. Finally, select the antenna configuration with the corresponding symbol in the appropriate distance column. All CHA MPAS 2.0 configurations provide some capability in each distance category, so depending upon the complexity of your communications network, you may need to select the best overall configuration. The directionality column indicates the predominate directionality characteristic of the antenna configuration. When using NVIS, all the configurations are omnidirectional. Most configuration and frequency combinations will require a wide range antenna tuner or coupler.

Manpack Vertical

The CHA MPAS 2.0 Manpack Vertical configuration is a broadband short-range HF/VHF-LO antenna. This configuration, see figure (1), use four components from the CHA MPAS 2.0: CHA MIL 2.0, CHA HYBRID MINI 2.0,

Counterpoise Wire, and CHA COAX 50' *(a shorter 50 Ohm coaxial cable (not included) may be substituted to increase portability in this configuration)*. It is especially designed to be man-packable, is omnidirectional and provides ground wave communication on frequencies between 1.8 – 54.0 MHz without using sky wave propagation. Performance is limited below 3.5 MHz, but very good above 24 MHz. The included 25-foot counterpoise "tail wire" provides a good compromise between portability and performance. An antenna tuner or coupler is required on frequencies below 10 MHz. Use the following procedure to install the Manpack Vertical configuration.

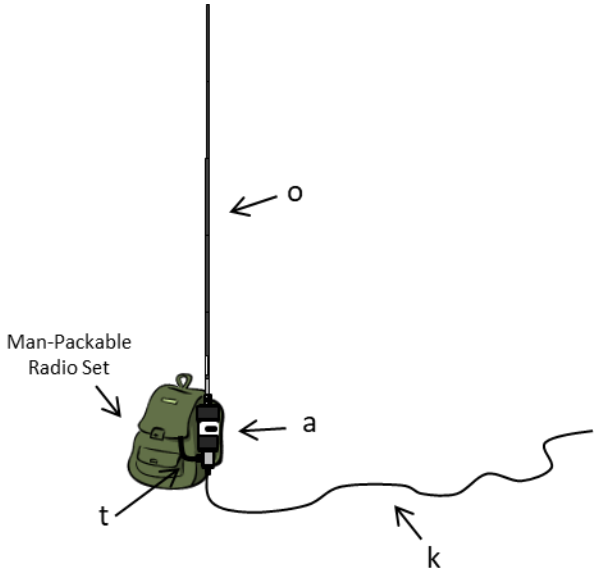

Figure 1. Manpack Vertical.

Site Selection and Preparation

1. Select a site to deploy the CHA MPAS 2.0 Manpack Vertical configuration. Best ground wave communication occurs when the radio set is located in a clear area and the whip antenna is vertical.

Refer to plates (2) - (5) for the following steps.

2. If attached, remove the Antenna Shackle (j) from the Hybrid Micro (a) by loosening the nut on the Antenna Shackle and then unscrewing the Antenna Shackle from the Antenna Connector (h).
3. Store in backpack (u).

Connect the Hybrid Micro.

4. Temporarily remove one nut from the Base Connection (i) of the Hybrid Micro.
5. Attach the Counterpoise Wire (k) to the Hybrid Micro by placing the Wire Connector (f) over the Base Connection (i). Replace and tighten the nut until snug.
6. Connect the UHF Connector Plug at the Integrated RFI Choke end of the Coaxial Cable (t) to the UHF Connector Socket (g) on the Hybrid Micro. *A shorter 50 Ohm coaxial cable (not included) may be substituted to increase portability in this configuration.*

Raise the Antenna.

7. Extend the Whip Antenna (o) by unfolding the sections of the whip, starting with the section above the bottom section. Ensure each section is fully seated onto section below until the whip is fully extended.
8. Connect the Whip Antenna to the Hybrid Micro by carefully threading the Whip Base (p) into the Antenna Connection (h) until finger tight.

Extend the Counterpoise

9. Extend the Counterpoise Wire along the ground in any convenient direction.
10. Perform operational test.

Portable Vertical

The CHA MPAS 2.0 Portable Vertical configuration, is a broadband short to medium range HF/VHF-LO antenna. This configuration, see figure (2), use six components from the CHA MPAS 2.0: CHA MIL 2.0, CHA MIL EXT 2.0, CHA HYBRID MINI 2.0, Counterpoise Wire, CHA SPIKE MOUNT, and CHA 50' COAX. This configuration, which is especially designed to be portable, is omnidirectional and provides ground wave communication on frequencies between 1.8 – 54.0 MHz without using sky wave propagation. It also provides sky wave propagation, especially above 12 MHz. The antenna is normally ground mounted using the Spike Mount, but can be mounted on almost any support, such as a camouflage netting support pole, fence post, picnic table using the optional CHA JAW MOUNT. The optional counterpoise radials (CHA COUNTERPOISE KIT), capacity hat (CHA CAP HAT), and guying system (CHA UNIVERSAL GUYING SYSTEM) will improve the performance of the Portable Vertical configuration. An antenna tuner or coupler is required on most frequencies below 10 MHz. Use the following procedure to install the Portable Vertical configuration.

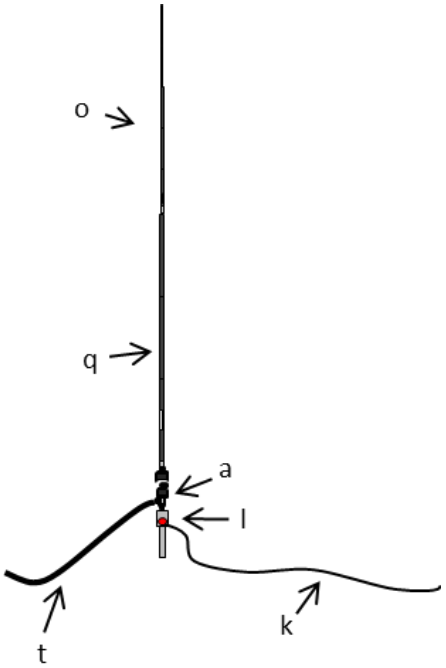

Figure 2. Portable Vertical.

Site Selection and Preparation

1. Select a site to deploy the CHA MPAS 2.0 Portable Vertical configuration. Best ground wave communication occurs when the radio set is located in a clear area and the whip antenna is vertical.
2. Drive the Spike Mount (l) into the ground. Use a plastic mallet to avoid damage to the Spike Mount threaded socket.

Refer to plates (2) - (5) for the following steps.

3. If attached, remove the Antenna Shackle (j) from the Hybrid Micro (a) by loosening the nut on the Antenna Shackle and then unscrewing the Antenna Shackle from the Antenna Connector (h).
4. If attached, remove the nuts from the Base Connection (i) on the bottom of the Hybrid Micro.
5. Store unused components in the backpack (u).

Connect the Hybrid Micro.

6. Connect the Wire Connector (f) from the end of the Counterpoise Wire (k) to the Ground Connection (m) on the side of the Spike Mount.
7. Thread the Hybrid Micro Base Connection into the Mount Connection (n) of the Spike Mount until finger tight.

8. Connect the UHF Connector at the end of the Coaxial Cable (t) with the RFI Choke into the UHF Connector Socket (g) on the Hybrid Micro.

Raise the Antenna

9. Extend the Antenna Extension (q) by unfolding each section, starting at the top, and seating it onto the section below until all sections have been seated.
10. Extend the Whip Antenna (o) by unfolding the sections of the whip, starting with the section above the bottom section. Ensure each section is fully seated onto section below until the whip is fully extended.
11. Connect the Whip Antenna to the Antenna Extension by carefully threading Whip Base (p) into the Extension Connection (r) on top of the Antenna Extension until finger tight.
12. Connect the Antenna Extension to the Hybrid Micro by carefully threading the Extension Base (s) on the bottom of the Antenna Extension into the Antenna Connection on top of the Hybrid Micro until finger tight.

Extend the Counterpoise

13. Extend the Counterpoise Wire along the ground in any convenient direction.
14. Perform operational test.

Horizontal NVIS

The CHA MPAS 2.0 Horizontal NVIS configuration, see figure (3), is a special configuration designed to provide good NVIS propagation on lower frequencies. It is predominately omnidirectional and also provides medium range sky wave propagation on frequencies above 10 MHz. It requires two supports that will enable the ends of the antenna to be raised to a height of 10 – 12 feet and 73 feet apart. The Horizontal NVIS configuration uses four components of the CHA MPAS 2.0: CHA HYBRID 2.0, Antenna Wire, Counterpoise Wire, and CHA 50' COAX. Use the following procedure to install the Horizontal NVIS configuration.

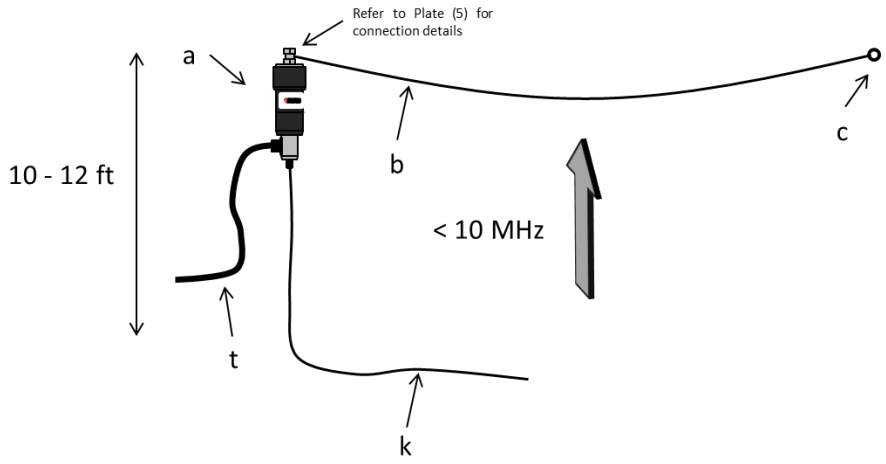

Figure 3. Horizontal NVIS Configuration.

Site Selection and Preparation.

1. Select a site to deploy the CHA MPAS 2.0 Horizontal NVIS configuration. The site must have two supports that will position the Hybrid Micro and the end of the Antenna Wire to be at a height of between 10 and 12 feet and 73 feet apart. Lower heights may be necessary in the desert, on a beach, or on snow covered ground.

Refer to plates (2)-(5) for the following steps.

2. If not already attached, connect the Carabiner (d) to the Isolation Loop (c) at the Wire Connector (f) end of the Antenna Wire (b).

Connect the Hybrid Micro.

3. Temporarily remove the Antenna Shackle (j) from the Antenna Connection (h). Place the Wire Connector from the Antenna Wire over the

Antenna Connection and replace the Antenna Shackle. Tighten the nut snugly.

4. Connect the Carabiner from the Antenna Wire to the Antenna Shackle.
5. Temporarily remove the nut from the Base Connection (i) of the Hybrid Micro.
6. Connect the Wire Connector at the end of the Counterpoise Wire (k) to the Base Connection. Replace the nut and tighten snugly.

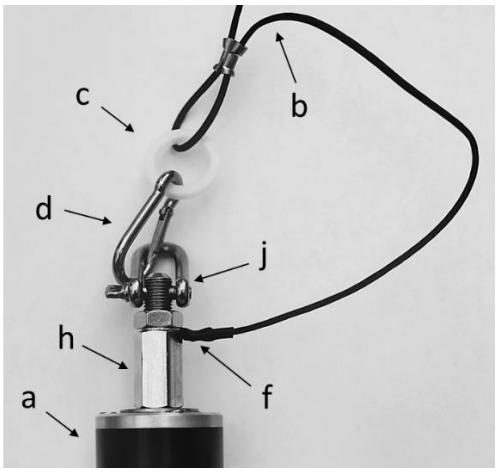

Plate 5. Hybrid Micro / Mini Connections.

7. Connect the UHF Connector at the end of the Coaxial Cable (t) with the RFI Choke to the UHF Connector Socket (g) on the Hybrid Micro.

Raise the Antenna.

8. Using a Bowline or similar knot, tie the end of a long length (25 feet or more) of Paracord *(not supplied)* to the Carabiner.
9. Using a throw weight or other method, loop the Paracord over the support that is closest to where the radio set will be located.
10. Raise the Hybrid Micro end of the antenna to a height of 10 to 12 feet and secure it to the support using a Round Turn and two Half Hitches, or similar knot.
11. Using a Bowline, or similar knot, tie another long length of Paracord to the Isolation Loop at the end of the Antenna Wire.
12. Using a throw weight, or some other method, loop the Paracord over the other support.
13. Raise the end of the Antenna Wire to a height of 10 to 12 feet, such that the Antenna Wire is horizontal, but not quite taut, and secure it to the support using a Round Turn and two Half Hitches.

Extend the Counterpoise.

14. Extend the Counterpoise Wire down from the Hybrid Micro and then along the ground under the antenna, as shown in figure (3).
15. Perform operational test.

Sloping Wire

The CHA MPAS 2.0 Sloping Wire configuration, see figure (4), is a broadband short to medium range HF antenna. It is a good general-purpose antenna, which provides acceptable ground wave and sky wave propagation, and can be hastily deployed. This configuration is predominately omnidirectional, becoming slightly unidirectional towards the end of the antenna wire as the frequency increases. The Sloping Wire requires one support and should be mounted at a height of 25 to 40 feet for best performance. The Sloping Wire configuration uses five of the CHA MPAS 2.0 components: CHA HYBRID MICRO, Antenna Wire, Counterpoise Wire, CHA SPIKE MOUNT, and CHA 50' COAX. Use the following procedure to install the Sloping Wire configuration.

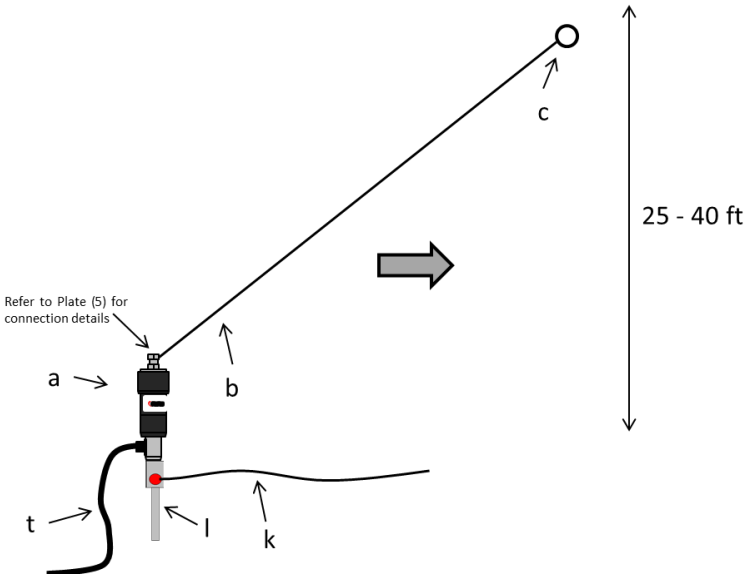

Figure 4. Sloping Wire Configuration.

Site Selection and Preparation.

1. Select a site to deploy the CHA MPAS 2.0 Sloping Wire configuration. The site must have a support that will position the end of the Antenna Wire at a height of 25 to 40 feet. If the right support is unavailable, any convenient object, such as a fence post or the top of a vehicle, may be used as a field expedient support with reduced performance.

Refer to plates (2) - (5) for the following steps.

Raise the Antenna.

2. Using a Bowline, or similar knot, tie a long length (50 feet or more) of Paracord *(not supplied)* to the Isolation Loop (c) at the far end of the Antenna Wire (b).
3. Using a throw weight or some other method, loop the Paracord over the support.
4. Raise the end of the Antenna Wire to the desired height and secure it to the support using a Round Turn and two Half Hitches, or similar knot.
5. Fully extend the Antenna Wire so that it is not quite taut.

Install the Spike Mount.

6. Drive the Spike Mount (l) into the ground near the low end of the Antenna Wire. Use a plastic mallet to avoid damage to the Spike Mount threaded socket.
7. If installed, remove the nuts from the Base Connection (i) of the Hybrid Micro (a).
8. Store the nuts in the backpack (u).
9. Thread the Base Connection of the Hybrid Micro (a) into the Mount Connection (n) of the Spike Mount until hand tight.

Connect the Hybrid Micro.

10. If not already attached, connect a Carabiner (d) to the Isolation Loop at the Wire Connector (f) end of the Antenna Wire.
11. Temporarily remove the Antenna Shackle (j) from the Antenna Connection (h).
12. Place the Wire Connector from the Antenna Wire over the Antenna Connection and replace the Antenna Shackle. Tighten the nut snugly.
13. Connect the Carabiner from the Antenna Wire to the Antenna Shackle.
14. Connect the Wire Connector at the end of the Counterpoise Wire (k) to the Ground Connection (m) of the Spike Mount. Tighten snugly.
15. Connect the UHF Connector at end of the Coaxial Cable (t) with the RFI Choke to the UHF Connector Socket (g) on the Hybrid Micro.

Extend the Counterpoise.

16. Extend the Counterpoise Wire along the ground in any convenient direction.
17. Perform operational test.

End-Fed Inverted "L"

The CHA MPAS Inverted "L" configuration, see figure (5), is a broadband short to medium range HF antenna. This configuration tends to be unidirectional, favoring the end of the horizontal part of the antenna. It also provides effective ground waves communication during the day time on frequencies between 1.8 – 4.0 MHz without using sky wave propagation. The Inverted "L" requires two supports and should be mounted at a height of 25 feet for best performance. Though, it will provide good performance at a height of 10 to 20 feet, and is usable when mounted as low as three feet. The End-Fed Inverted "L" configuration uses five of the CHA MPAS 2.0 components: CHA HYBRID MICRO, Antenna Wire, Counterpoise Wire, CHA SPIKE MOUNT, and CHA 50' COAX. Use the following procedure to install the Inverted "L" configuration.

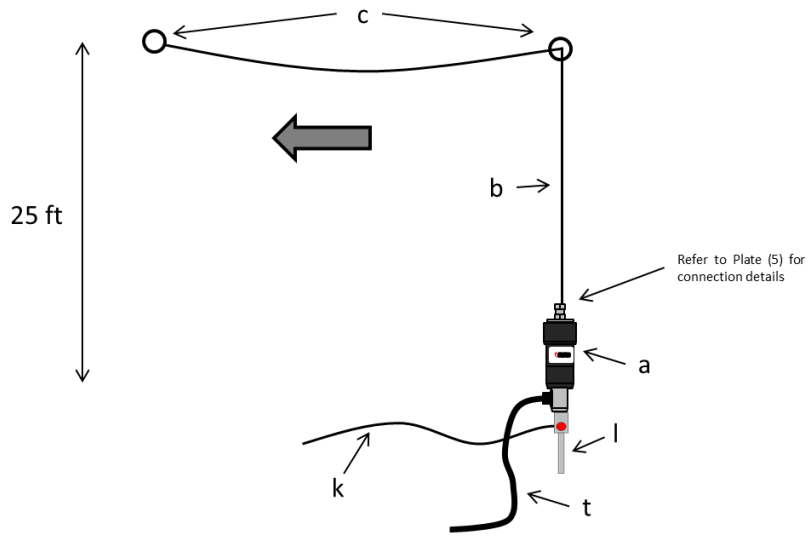

Figure 5. Inverted "L" Configuration.

Site Selection and Preparation.

1. Select a site to deploy the CHA MPAS Inverted "L" configuration. The site must have two supports that will position the corner of the "L" and the end of the Antenna Wire around 48 feet apart at a height of about 25 feet. If the right supports are unavailable, any convenient objects, such as fence posts or the tops of vehicles, may be used as a field expedient supports with reduced performance.

Refer to plates (2) - (5) for the following steps.

Install the Spike Mount.

2. Drive the Spike Mount (l) into the ground near one the supports. Use a plastic mallet to avoid damage to the Spike Mount threaded socket.
2. If installed, remove the nut(s) from the Base Connection (i) of the Hybrid Micro (a).
3. Store the nut(s) in the backpack (u).
4. Thread the Base Connection of the Hybrid Micro (a) into the Mount Connection (n) of the Spike Mount until hand tight.

Connect the Hybrid Micro.

5. If not already attached, connect a Carabiner (d) to the Isolation Loop at the Wire Connector (f) end of the Antenna Wire (b).
6. Temporarily remove the Antenna Shackle (j) from the Antenna Connection (h).
7. Place the Wire Connector from the Antenna Wire over the Antenna Connection and replace the Antenna Shackle. Tighten the nut snugly.
8. Connect the Carabiner from the Antenna Wire to the Antenna Shackle.
9. Connect the Wire Connector at the end of the Counterpoise Wire (k) to the Ground Connection (m) of the Spike Mount. Tighten snugly.

Raise the Corner of the "L".

10. Using a Bowline, or similar knot, tie a long length (50 feet or more) of Paracord *(not supplied)* to the floating Isolation Loop (c) in the middle of the Antenna Wire.
11. Using a throw weight or some other method, loop the Paracord over the support.
12. Raise the corner of the "L" of the Antenna Wire to the desired height and secure it to the support using a Round Turn and two Half Hitches, or similar knot.

Raise the End of the Antenna.

13. Using a Bowline, or similar knot, tie a long length (50 feet or more) of Paracord to the Isolation Loop at the end of the Antenna Wire.
14. Using a throw weight or some other method, loop the Paracord over the support.
15. Raise and extend the end of the Antenna Wire to the desired height, so that the top of the antenna is horizontal and not quite taut, and secure it to the support using a Round Turn and two Half Hitches, or similar knot.
16. Connect the end of the Coaxial Cable (t) with the RFI Choke to the UHF Connector Socket (g) on the Hybrid Micro.

Extend the Counterpoise.

17. Extend the Counterpoise Wire along the ground in any convenient direction.
18. Perform operational test.

End-Fed Inverted "V"

The CHA MPAS Inverted "V" configuration, see figure (6), is a broadband medium to long range HF antenna. This configuration tends to be bidirectional, favoring broadside to the antenna and will provides effective ground and sky wave propagation. The End-Fed Inverted "V" configuration uses five of the CHA MPAS 2.0 components: CHA HYBRID MICRO, Antenna Wire, Counterpoise Wire, CHA SPIKE MOUNT, and CHA 50' COAX. Use the following procedure to install the Inverted "V" configuration.

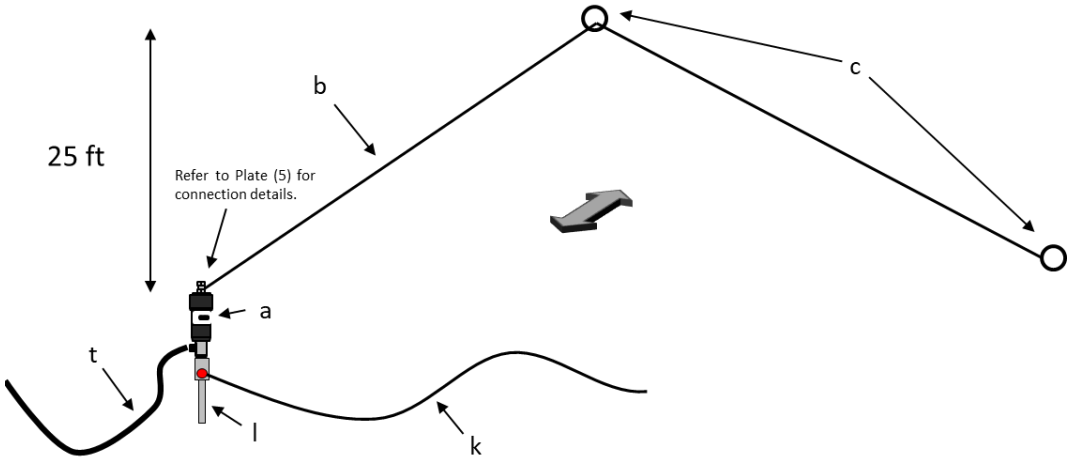

Figure 6. Inverted "V" Configuration.

1. Select a site to deploy the CHA MPAS Inverted "V" configuration. The site must have one center support, around 25 feet high and with 27 feet on each side for the ends of the antenna. If the right supports are unavailable, any convenient objects, such as fence posts or the tops of vehicles, may be used as a field expedient supports with reduced performance.

Refer to plates (2) through (5) for steps (2) – (8).

Raise the Center of the antenna.

2. Using a Bowline, or similar knot, tie a long length (50 feet or more) of Paracord *(not supplied)* to

the floating Isolation Loop (c) in the middle of the Antenna Wire (b).

3. Using a throw weight or some other method, loop the Paracord over the support.
4. Raise the center of the Antenna Wire to the desired height and secure it to the support using a Round Turn and two Half Hitches, or similar knot. *For optimum performance, the center should be less than 37 feet high.*

Install the Spike Mount.

5. Drive the Spike Mount (l) into the ground, near the location of the radio set, around 27 feet from the center of the antenna. Use a plastic or rubber mallet to avoid damage to the Spike Mount threaded socket.
6. If installed, remove the nut(s) from the Base Connection (i) of the Hybrid Micro (a).
7. Store the nut(s) in the backpack (u).
8. Thread the Base Connection of the Hybrid Micro (a) into the Mount Connection (n) of the Spike Mount until hand tight.

Connect the Hybrid Micro.

9. If not already attached, connect a Carabiner (d) to the Isolation Loop at the Wire Connector (f) end of the Antenna Wire.
10. Temporarily remove the Antenna Shackle (j) from the Antenna Connection (h).
11. Place the Wire Connector from the Antenna Wire over the Antenna Connection and replace the Antenna Shackle. Tighten the nut snugly.
12. Connect the Carabiner from the Antenna Wire to the Antenna Shackle.
13. Connect the Wire Connector at the end of the Counterpoise Wire (k) to the Ground Connection (m) of the Spike Mount. Tighten snugly.

Raise the End of the Antenna.

14. Using a Bowline, or similar knot, tie a short length (around six feet) of Paracord *(not supplied)* to the Isolation Loop at the end of the Antenna Wire.
15. Extend the end of the Antenna Wire so that it is not quite taut.
16. Drive a tent peg *(not supplied)* into the ground near the end of the extended antenna wire.
17. Secure the Paracord to the tent peg using a Round Turn and two Half Hitches, or similar knot.
18. Connect the end of the Coaxial Cable (t) with the RFI Choke to the UHF Connector Socket (g) on the Hybrid Micro.

Extend the Counterpoise.

19. Extend the Counterpoise Wire along the ground in any convenient direction.
20. Perform operational test.

Dipole

The dipole is the most basic antenna design. It consists of two identical length wires which are resonant at a specific frequency. When used on the resonant frequency and installed a quarter wavelength high, the antenna has a figure eight radiation pattern broadside to the wire. The dipole will produce some NVIS skywaves (especially when installed lower than a quarter wavelength in height) for short-range communication as well as low elevation skywaves for longer range communication. The formula for calculating the length of each side of a resonant dipole antenna is:

Length in feet = 234 / Frequency in MHz.

For example, if your operating frequency is 5.4 MHz, the length of each side of the dipole would be **234 / 5.4**, which equals 43.3 feet (43 ft 4 in). When using the Hybrid Micro (a) as the center of a dipole antenna, the antenna is more broad-banded and does not necessarily need to be cut for a specific length. Two lengths of wire, *(not supplied)* around 60 feet in length each, will permit operation from 1.8 to 54.0 MHz when using a wide range antenna tuner or coupler.

When constructing a dipole antenna, connect one wire, using a 3/8" terminal lug *(not supplied)* to the Antenna Connection (h) of the Hybrid Micro (a) and the other wire, also using a 3/8" terminal lug, to the Base Connection (i).

Be sure to provide for strain relief. Suspend the antenna horizontally from both ends, and optionally in the middle, as shown in figure (7).

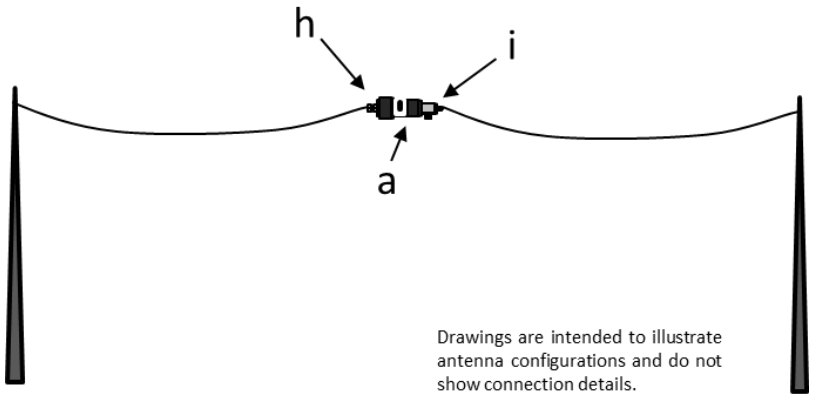

Figure (7). Horizontal Dipole.

Loops

A Vertical Loop antenna has a low angle of radiation and low noise making it superior to dipoles and verticals for long distance communication. A Horizontal Loop antenna will outperform a dipole when installed at a lower height, making it good for lower frequencies. The formula for calculating the entire length of a resonant loop antenna is:

Length in feet = 1005 / frequency in MHz.

For example, if your operating frequency is 5.4 MHz, the length of the entire loop would be **1005 / 5.4**, which equals 186.1 feet (186 ft 1 in). As with the dipole antenna, when using the Hybrid Micro (a), the antenna is more broad-banded and does not need to be cut for a specific length. Calculate the loop length for the lowest frequency you plan to use and it will work for your other frequencies (when using a wide range antenna tuner or coupler). Cut the wire *(not supplied)* to the calculated length.

When constructing a Vertical Loop, a triangle is the best shape. Divide the length of the loop by 1/3 to get the length of each side of the triangle (forming an equilateral triangle). Install the Hybrid Micro (a) at the mid-point of one of the vertical sides as shown in figure (8). Connect one side of the loop wire to the Antenna Connection (h), using a 3/8" terminal lug *(not supplied)*. Connect the other side of the loop wire to the Base Connection (i), also using a 3/8" terminal lug. Be sure to provide for strain relief. Suspend the antenna vertically from the top two corners and with the other corner pointing down.

A square shape is best for a Horizontal Loop. Divide the length of the loop by 1/4 to get the length of each side of the square. Install the Hybrid Micro (a) in one corner of the square, as shown in figure (8). Connect one side of the loop wire to the Antenna Connection (h), using a 3/8" terminal lug *(not supplied)*. Connect the other side of the loop wire to the Base Connection (i), also using a 3/8" terminal lug. Suspend the antenna horizontally from all four corners.

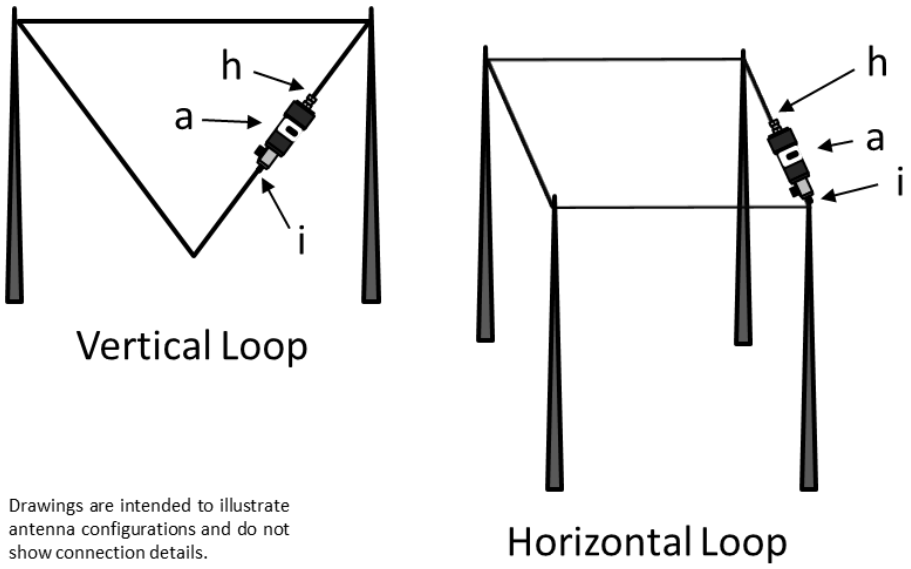

Figure (8). Loop Configurations.

Vehicle Installation

The Hybrid Micro / Mini is excellent for vehicular use when used with a one-piece stainless-steel whip *(not supplied).* When used with the Hybrid Micro / Mini, a 102" stainless-steel whip, such as those used for Citizen's Band (CB) radios, will enable operation from 3.5 to 54.0 MHz. A heavy-duty ball-type mount, such as the Hustler SSM-2, is required for a 102" whip. A 54" inch stainless-steel whip will enable operations from 7.0 to 54.0 MHz. A heavy-duty lip mount, such as the Diamond K400 or heavy-duty magnetic mount, such as the MFJ-336T Magnet Mount can be used with a 54" whip. All three mounts are shown in plate (6). Fiberglass whips are not recommended due to their rigidity and high wind resistance. The stainless-steel whips and antenna mounts described here are available from the quality retailers that sell Chameleon Antenna™ products in their stores or on-line.

Plate (6). Vehicle Antenna Mounts.

Attach the Hybrid Micro / Mini (a) to these style mounts by threading the Base Connection (i) onto the 3/8" fitting on the antenna mount, as shown in plate (7). The antenna is fed by attaching the Coaxial Cable (t) to the UHF Connector (g) on the side of the Hybrid Micro / Mini. The normal antenna feed through the mount will not be used and instead a good RF ground connection needs to be made to the vehicle body using a short, flat, braided wire.

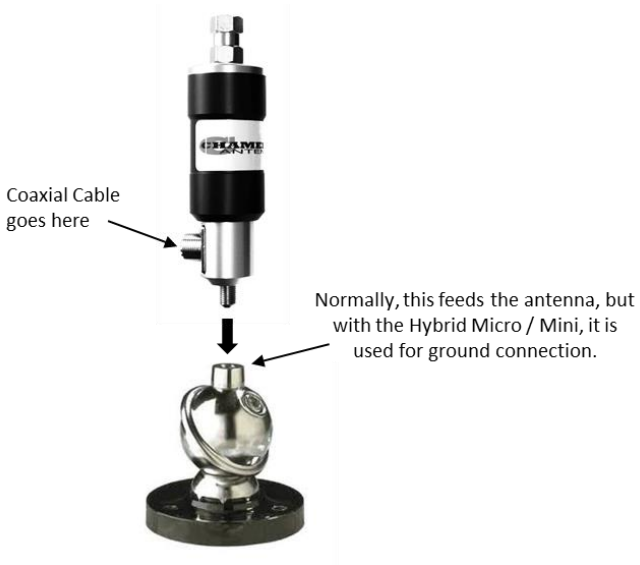

Plate (7). Hybrid Micro / Mini Electrical and Mechanical Connections.

Recovery Procedure

To recover the CHA MPAS 2.0, perform the following steps:

1. Disconnect the Coaxial Cable (t) from the radio set.
2. Lower the antenna to the ground or disconnect the Hybrid Micro (a) from the Spike Mount (l).
3. Disconnect the Coaxial Cable from the Hybrid Micro.
4. Carefully roll (do not twist) the Coaxial Cable.
5. Disconnect, wind, and store the Counterpoise Wire (k).
6. If used, disconnect the Carabiner (d) from the Antenna Shackle (j).
7. Disconnect the Antenna Whip (o), Antenna Extension (q), or Antenna Wire (b), depending upon configuration used, from the Hybrid Micro.
8. If used, wind the Antenna Wire onto the Line Winder (e) and secure with attached shock cord.
9. If used, take down the Antenna Extension (q). Starting at the bottom, pull the section apart from the section above and fold the section above over the section below. Repeat until all sections are apart. Secure the sections together with provided sticky strap.
10. If used, take down the Whip Antenna (o). **VERY IMPORTANT!** Starting at the top, pull the section apart from the section below and fold the section above over the section below. Repeat until all sections are apart. Secure the sections together with provided sticky strap. **It is very important to take down the CHA MIL 2.0 beginning at the top. Failure to begin at the top may cause premature failure of the internal connecting braided cord.**
11. Pull the Spike Mount from the ground, if used.
12. Check area for overlooked antenna components.
13. Remove dirt from antenna components and inspect them for signs of wear.
14. Inspect the bare aluminum joints of the Antenna Extension for signs of corrosion. **We recommend application of an anti-oxidant compound, like Ideal Noalox (P/N 30-026), be applied to the CHA MIL EXT 2.0 bare aluminum joints to prevent corrosion.**
15. Store components together in the backpack (u).

Troubleshooting

1. If using the Antenna Wire (b), ensure the Wire Connector (f) is securely connected.
2. Inspect the Antenna Wire or Whip for breakage, corrosion, or signs of strain.
3. Ensure the UHF Connector Plugs are securely tightened.
4. Inspect the Coaxial Cable for cuts in insulation or exposed shielding. Replace if damaged.
5. If still not operational, connect a Standing Wave Ratio (SWR) Power Meter and check SWR.
6. If SWR is greater than 10:1, check antenna tuner or coupler using the technical manual or manufacturer's procedure. Be sure to check the Coaxial Patch Cable that connects the radio set to the antenna tuner or coupler.
7. If still not operational, replace Coaxial Cable. *Most problems with antenna systems are caused by the coaxial cables and connectors.*
8. Connect a Multi-Meter to the Antenna Wire to check continuity. Replace assemblies that do not pass a continuity check.
9. If still not operational, replace the Hybrid Micro (a).

Specifications

- Frequency: *(all configurations require a wide range antenna tuner or coupler)*
    - CHA HYBRID MICRO / MINI with 73' wire: 1.8 MHz through 54.0 MHz continuous *(including all Amateur Radio Service bands 160m to 6m)*.
    - CHA MIL 2.0: 1.8 – 54.0 MHz *(with CHA HYBRID MICRO / MINI. Limited performance below 3.5 MHz.)*
    - CHA MIL 2.0 with CHA MIL EXT 2.0: 1.8 – 54.0 MHz *(with CHA HYBRID MICRO / MINI.)*
- Power: CHA HYBRID MICRO / MINI: 50 W continuous duty cycle (CW, AM, FM, RTTY), 100 W intermittent duty cycle (SSB and SSB-based digital modes)
- RF Connection: UHF Plug (PL-259) or Type N Connector *(special order for Government / Military, Non-Governmental Organization (NGO), and commercial use at additional charge)*
- Length:
    - Antenna Wire: 73 ft
    - CHA MIL 2.0: 9 ft 4 3/4 in extended, 17 in collapsed
    - CHA MIL EXT 2.0: 8 ft 9 in extended, 28 3/4 in collapsed
    - CHA MIL 2.0 with CHA MIL EXT 2.0: 18 ft 1 3/4 in extended
- Weight:
    - CHA HYBRID MICRO: 1 lb
    - CHA MIL WHIP: 12 oz
    - CHA MIL WHIP with CHA MIL EXT: 1 lb 12 oz
    - CHA MPAS 2.0 (all components): 8 lbs 12 oz
- Personnel Requirements and Setup Time: one operator, less than 15 minutes (antenna wire), less than 5 minutes (whip).
- CHA MPAS 2.0 Configuration Far Field Plots are shown in figures (10) through (15).
- SWR: Subject to frequency and configuration, but within limits of most wide range antenna tuners or couplers. Figure (9) shows a graph of SWR by frequency for a typical deployment.

Warranty

The Chameleon Antenna Modular Portable Antenna System 2.0 (CHA MPAS 2.0) 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.

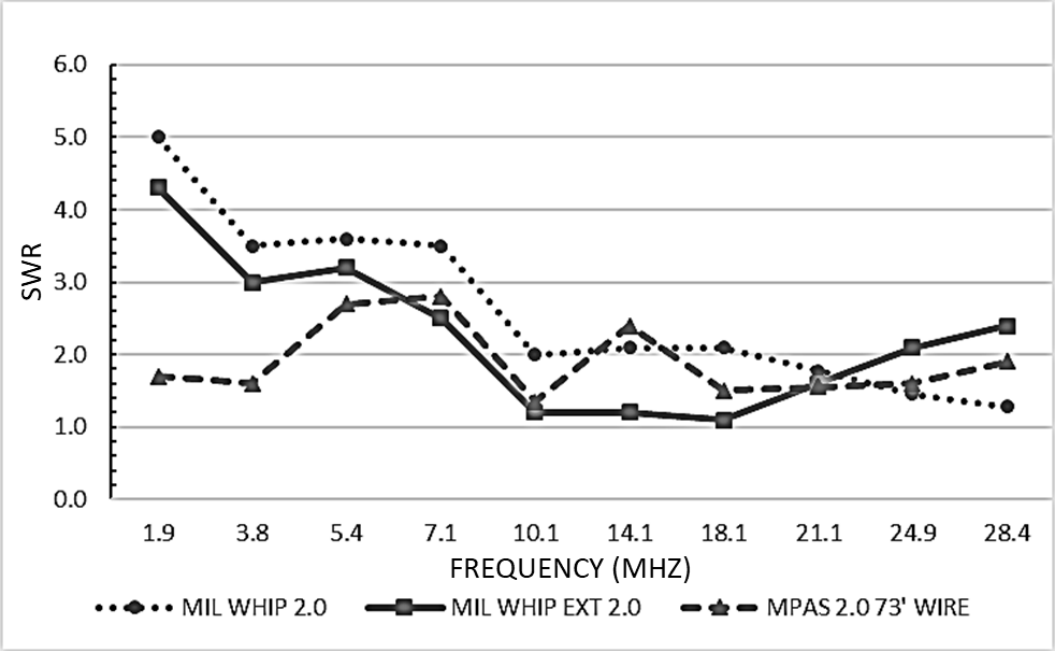

Figure 9. SWR by Frequency Graph.

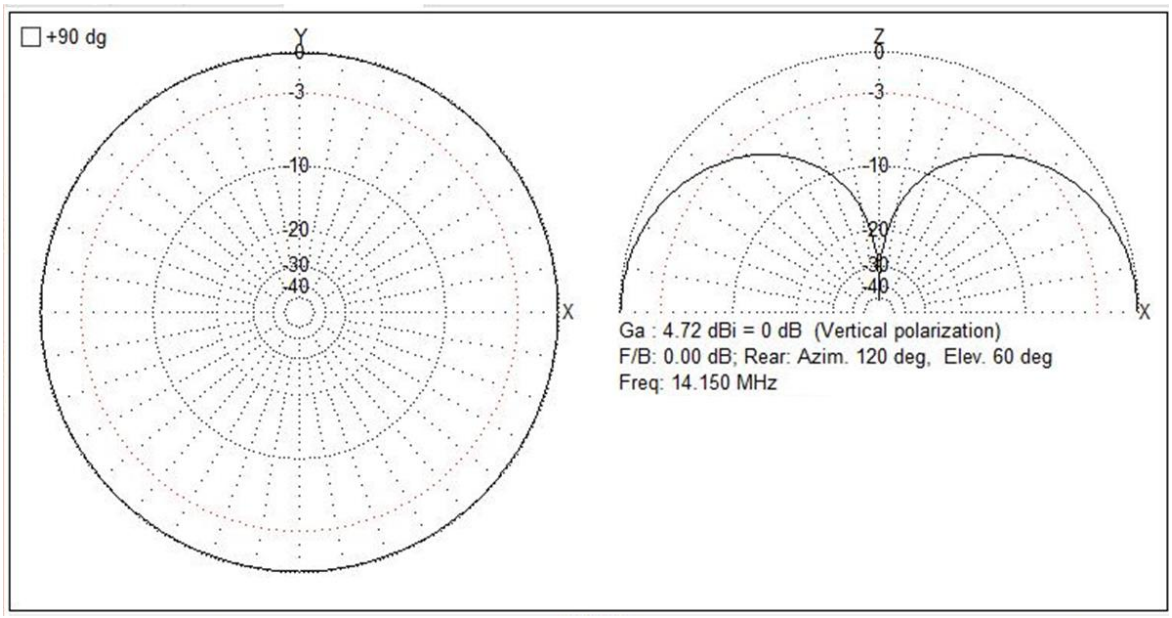

Figure 10. Manpack Vertical Far Field Plot 14 MHz.

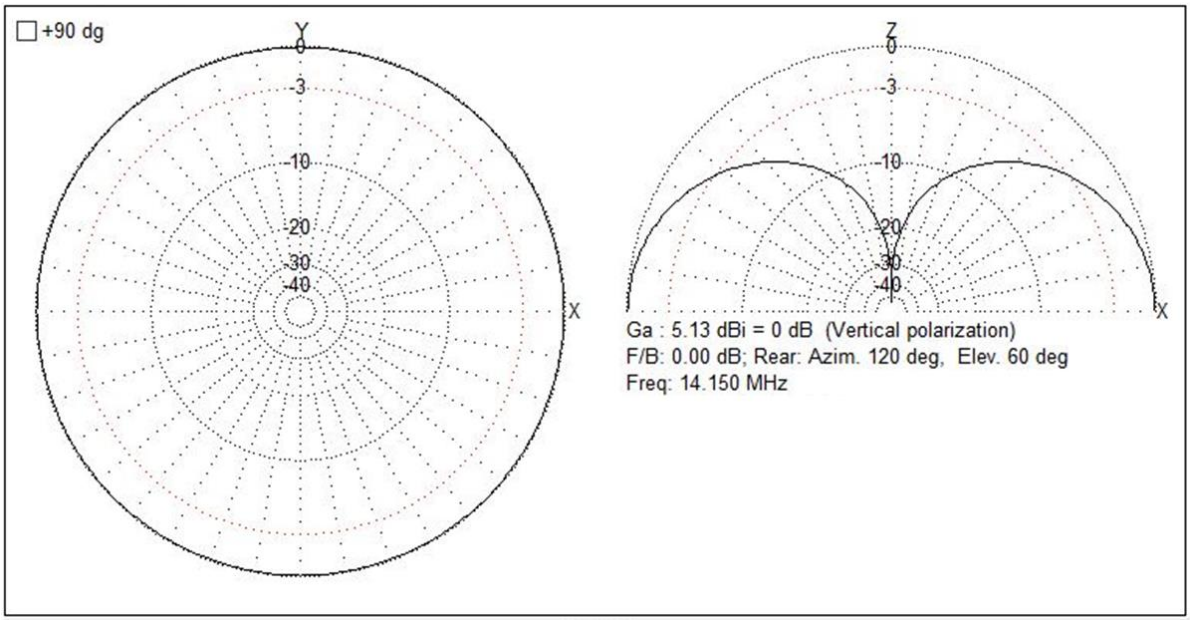

Figure 11. Portable Vertical Far Field Plot 14 MHz.

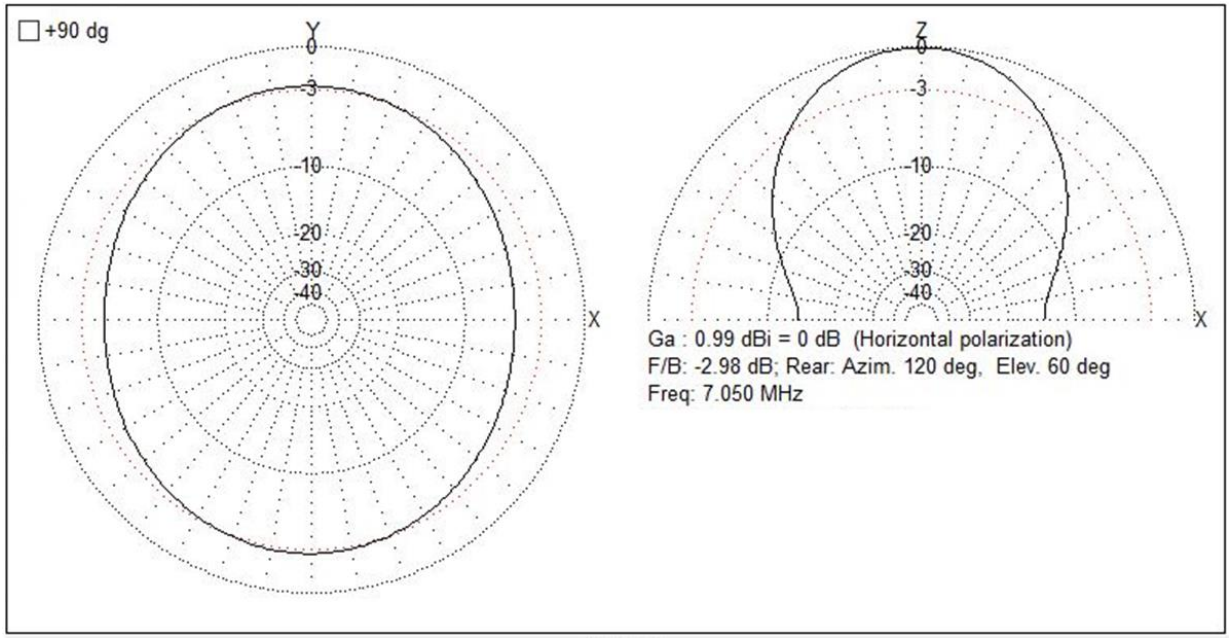

Figure 12. Horizontal NVIS Far Field Plot 7 MHz.

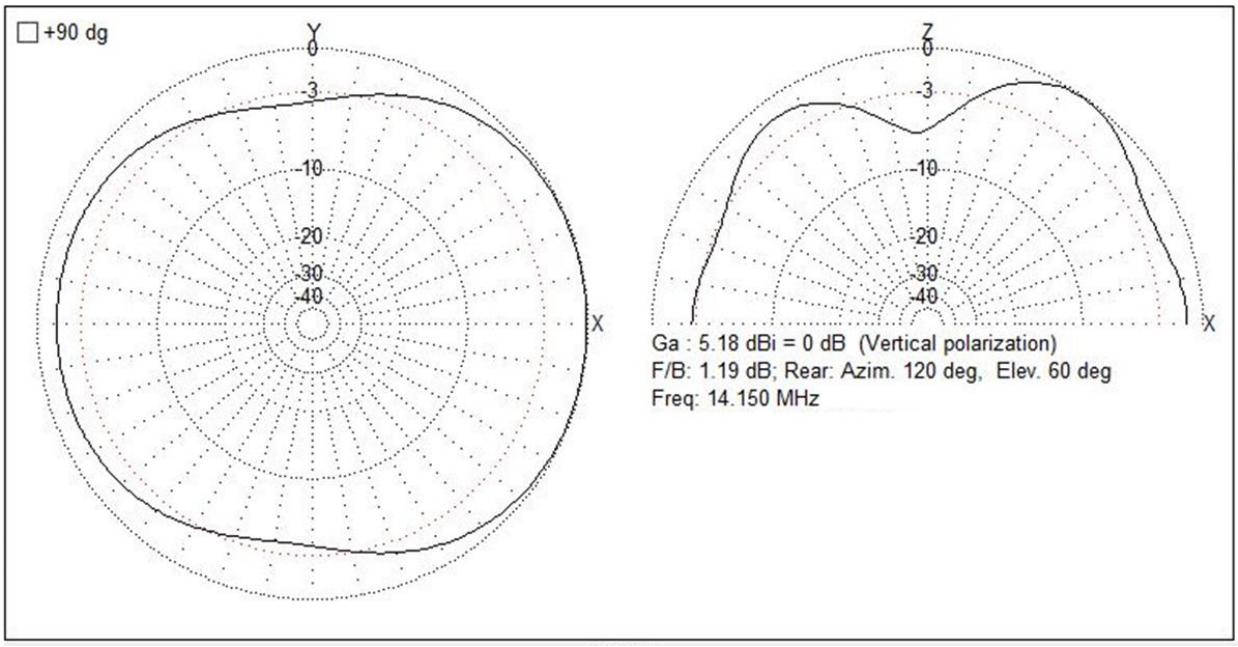

Figure 13. Sloping Wire Far Field Plot 14 MHz.

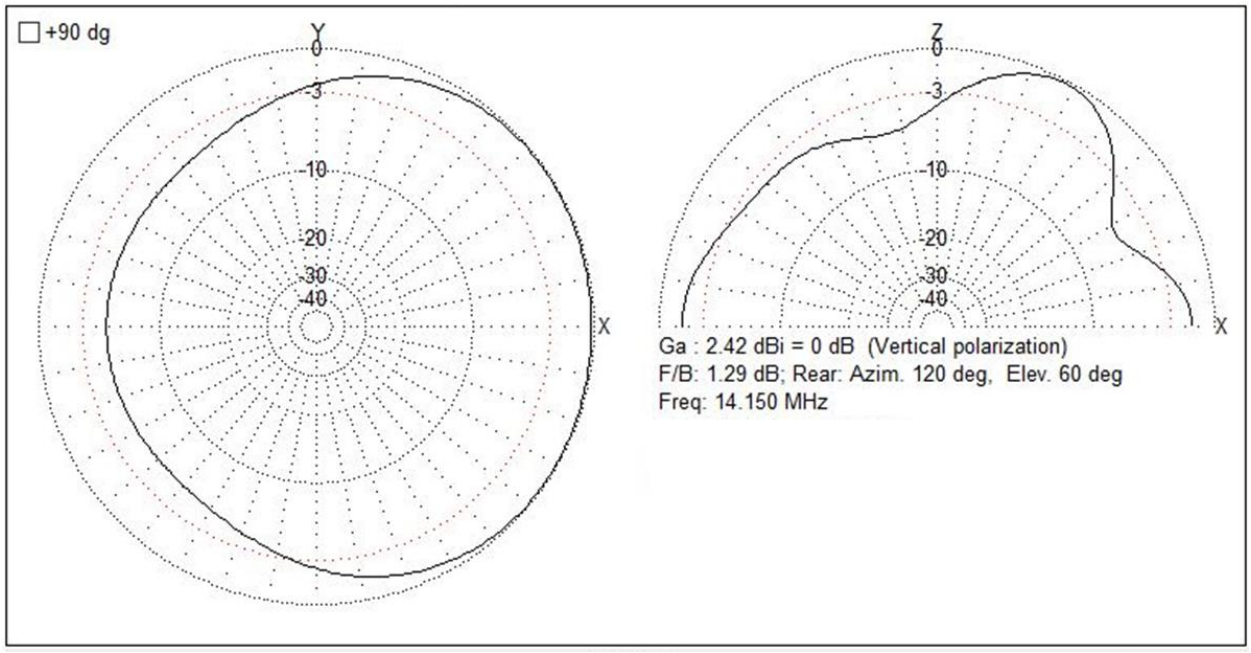

Figure 14. Inverted "L" Far Field Plot 14 MHz.

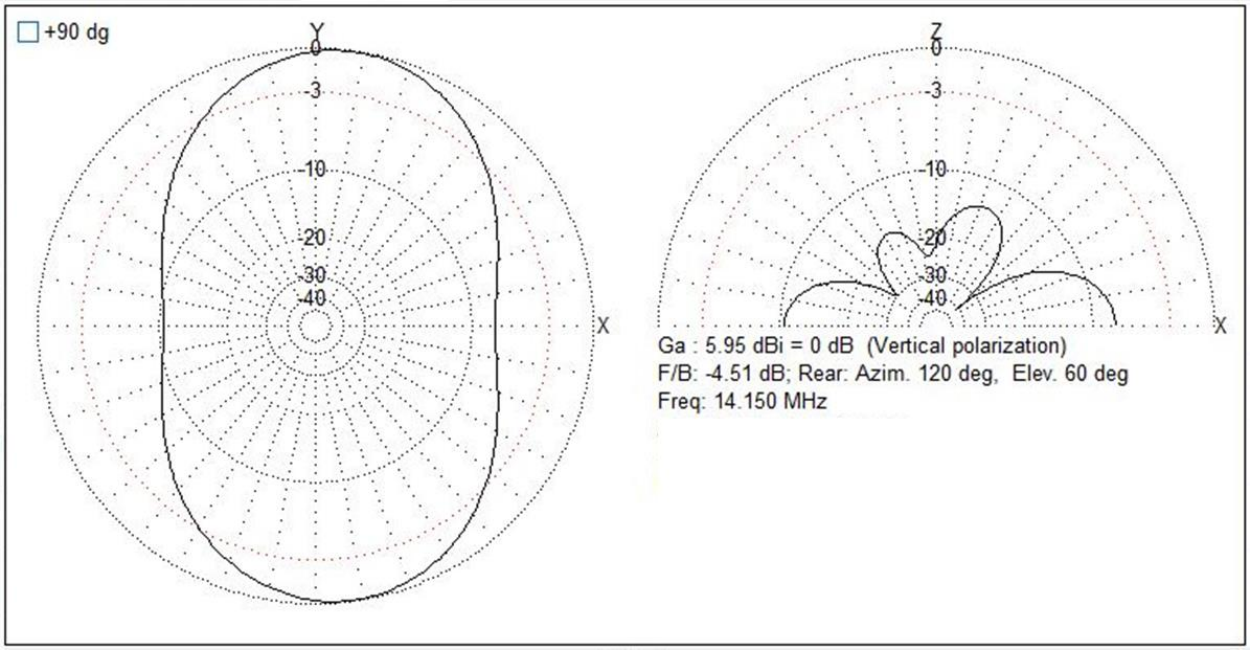

Figure 15. Inverted "V" Far Field Plot 14 MHz.

Accessories

The following accessories are available for purchase from Chameleon Antenna™. Please contact us at support@chameleonantenna.com for current prices and availability.

- **Counterpoise Kit.** The CHA COUNTERPOISE KIT is ideal for portable antenna deployment. The system will create the ground-plane needed to any vertical antennas and will also play the role of guy wires. It contains four 25-foot wire radials secured around plastic wire winders and four steel tent stakes.
- **Capacity Hat.** The CHA CAP-HAT has been designed to enhance the radiation of any screw together HF antenna.
- **50' Paracord and Line Winder Assembly.** One assembly is recommended to enable installation of the CHA MPAS wire configurations.
- **Guying System.** The Universal Guying System (CHA UGS) is recommended to stabilize the assembled CHA MIL 2.0 and CHA MIL EXT 2.0 vertical during high winds.
- **Clamp Mount.** The CHA JAW MOUNT has been assembled to offer portable antenna versatility for Chameleon Antenna owners. The mount orientation can easily be changed with a simple 3/16 Allen Key.

Recommended non-supplied accessories:

- Wide range antenna tuner or coupler. *(Required for most configurations)*
- Paracord or similar low-stretch synthetic line. *(Required for wire antenna configurations)*
- Tent stake.
- Plastic mallet.
- Flashlight.
- Multi-tool.
- Throwing weight and string.
- Ideal 30-030 Noalox Anti-Oxidant Compound.

Chameleon Antenna™ Products

The following products are available for purchase from Chameleon Antenna™.
Go to http://chameleonantenna.com *for ordering and more information.*

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 primordial. 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. No masts or guying are required. The CHA TD can also be used without antenna tuner, as the SWR will stay under 2.5:1 between 10M and 80M and under 2.75:1 on 160M.

References

1. Silver, H. Ward (editor), 2013, *2014 ARRL Handbook for Radio Communications*, 91st Edition, American Radio Relay League, Newington, CT.
2. 1987*, Tactical Single-Channel Radio Communications Techniques (FM 24-18)*, Department of the Army, Washington, DC.
3. Turkes, Gurkan, 1990, *Tactical HF Field Expedient Antenna Performance Volume I Thesis*, U.S. Naval Post Graduate School, Monterey, CA.