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

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MADE IN U.S.A.

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.

Photographs and diagrams in this manual may vary slightly from current production units due to manufacturing changes that do not affect the form, fit, or function of the product.

Introduction

The Chameleon Antenna™ Modular Portable Antenna System 2.0 – Military (CHA MPAS 2.0 – MIL) is designed to be the most versatile, high performance, and rugged portable / man-packable High Frequency (HF) antenna available. The CHA MPAS 2.0 - MIL has several product improvements over the original MPAS, which were designed to improve the overall performance, portability, and durability of the antenna system.

The integral broadband impedance matching transformer of the CHA MPAS 2.0 – MIL allows broadband antenna tuning. The antenna will operate continuously from 1.8 – 54.0 MHz without any adjustment, when used with a wide range antenna tuner or coupler and is capable of short to long distance HF communication. The CHA MPAS 2.0 – MIL is man-packable and setups quickly in the field by one person.

The CHA MPAS 2.0 - MIL can be configured to facilitate ground wave, sky wave, and Near-Vertical Incident Sky wave (NVIS) communications. This antenna is also compatible with Automated Link Establishment (ALE) communication networks. The CHA MPAS 2.0 - MIL requires use of 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 of the CHA MPAS 2.0 – MIL antenna.

Parts of the Antenna

The CHA MPAS 2.0 - MIL is comprised of the following assemblies and components, see figure (1). The components of the CHA MPAS 2.0 - MIL provide a continuum of portability and performance to meet your tactical communications requirements.

A. Matching Transformer. The Matching Transformer provides a mounting base and impedance matching for the CHA MPAS 2.0 – MIL antenna.

B. Whip Antenna. The Whip Antenna is a military-style collapsible whip antenna. It can be used by itself or as the top section of the vertical antenna.

C. Antenna Extension. The Antenna Extension is used to increase the length of the Whip Antenna. This significantly increases the performance of the vertical antenna, especially on lower frequencies.

D. Ground Spike. The Ground Spike is a stainless-steel spike with a 3/8" x 24 (fine thread) female fitting on top for the Matching Transformer and a screw with a knurled knob on the

side for the Counterpoise Wire connection. It is used as the in-ground mount for the antenna.

Figure 1. Antenna Components.

E. Antenna Wire. The Antenna Wire is a 73-foot length of insulated wire wound on a line winder. It is used for longer range communications.

F. Counterpoise Wire. The Counterpoise Wire is a 25-foot length of insulated wire wound on a line winder. It provides the necessary ground counterpoise for all configurations of the antenna.

G. Paracord. The Paracord consists of 50 feet of Paracord on a line winder. It is used to suspend the Antenna Wire.

H. Coaxial Cable. The Coaxial Cable consists 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 BNC Connector.

I. Throw Bag. The Throw Bag is used to loft the Paracord over tree branches or other supports when using the Antenna Wire.

J. Anti-Oxidant Compound – The Anti-Oxidant Compound is used to treat the joints of the Antenna Extension to prevent corrosion.

Antenna Configurations

Using the supplied components, the CHA MPAS 2.0 - MIL can be deployed into a number of operationally useful configurations. Six configurations, see table (1), are described in this manual, each with unique performance characteristics.

Configuration	Ground	Short	Medium	Long	Directionality
Vertical Whip (1-Section)	↑		↑		Omnidirectional
Vertical Whip (2-Sections)	↕		↑		Omnidirectional
Horizontal NVIS		↓	↑		Omnidirectional
Sloping Wire	↓		↕		Unidirectional
Inverted "L"		↓	↕		Bidirectional
End-Fed Inverted "V"	↕		↓	↑	Bidirectional

Table 1. 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 - MIL 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.

More information on tactical radio communications can be found in the Tactical Radio Operations Field Manual (FM 6-02.53).

Vertical Whip (1 or 2 Sections)

The Vertical Whip configurations are broadband short-range High Frequency (HF) and Very High Frequency (VHF) Low antennas. It is especially designed to be man-packable or portable, 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 using the 1-Section configuration. The 2-Section configuration has better performance below 3.5 MHz and also enhances medium range sky wave propagation, especially above 12 MHz. The 25-foot Counterpoise Wire provides a good compromise between portability and performance. This configuration is not suitable for NVIS communication. Use the following procedure to deploy the Vertical Whip configurations.

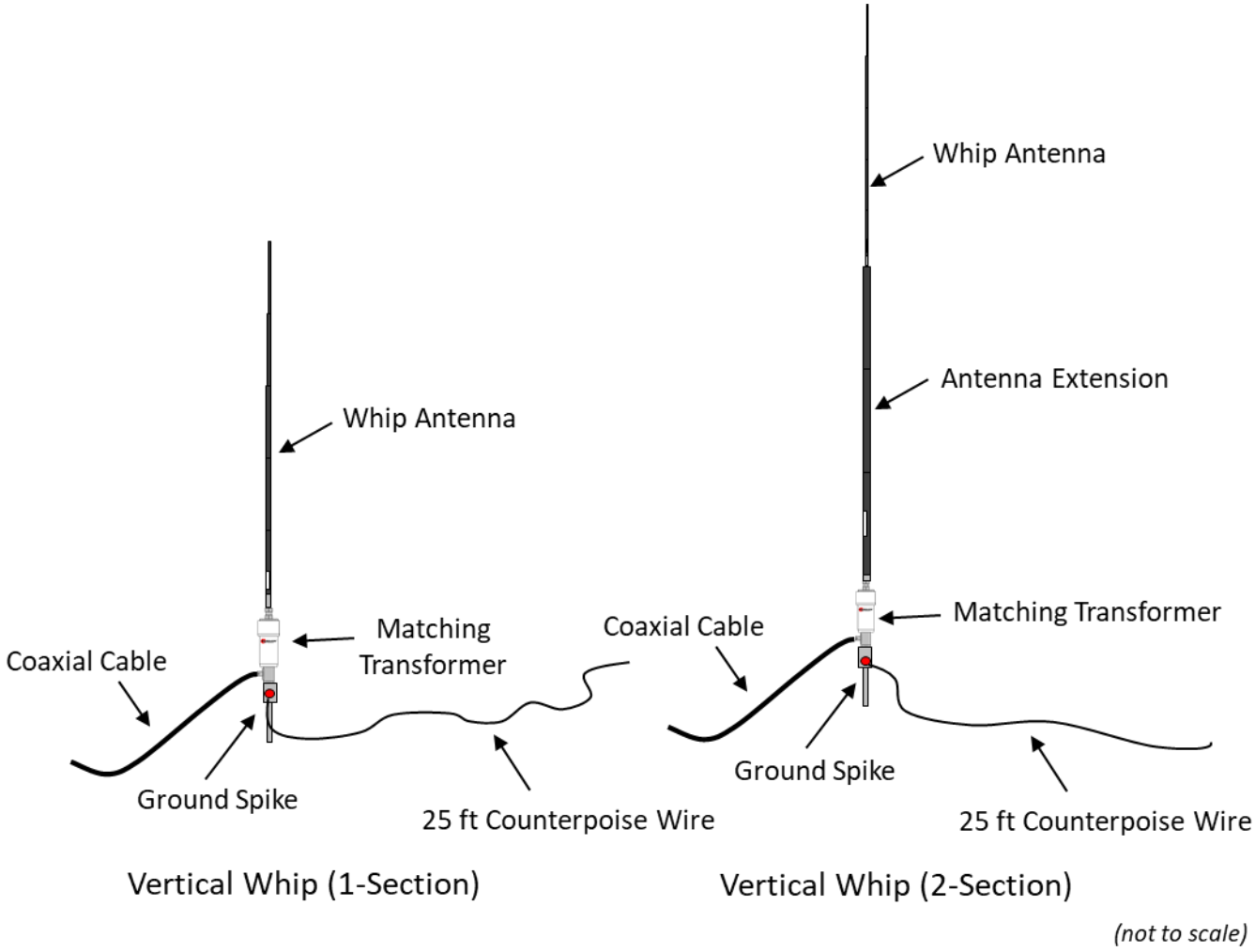

Figure 2. Vertical Whip Configuration.

Site Selection and Preparation

1. Select a site to deploy the antenna in the Vertical Whip configuration. Locate the antenna in a high clear area for best performance.
2. Drive the Ground Spike (D) into the ground. Use a rubber mallet to avoid damage to the Ground Spike threaded socket.
3. If attached, remove the Shackle from the top and the 3/8" x 24 nut from the bottom of the Matching Transformer (A) and store them in the backpack.

Refer to figure (3) for Assembly of the Antenna

4. Thread the stud on the bottom of the Matching Transformer into the top of the Ground Spike and tighten until finger tight.
5. If using both sections of the antenna, extend the Antenna Extension (C) by unfolding each section of tubing, starting at the top, and seating it onto the tube below until all sections of tubing have been seated.
6. Extend the Whip Antenna (B) 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.
7. Connect the Whip Antenna to the Antenna Extension *(if used)* by carefully threading the bottom of the Whip Antenna into the top of the Antenna Extension and tighten until finger tight.
8. Thread the stud on the bottom of the Antenna Extension *(if used)* or the Antenna Whip *(if Antenna Extension is not used)* into the top of the Matching Transformer and tighten until finger tight.

Connect the Matching Transformer

9. Connect the BNC Connector Plug at the Integrated RFI Choke end of the Coaxial Cable (H) to the BNC Connector Socket on the side of the Matching Transformer.

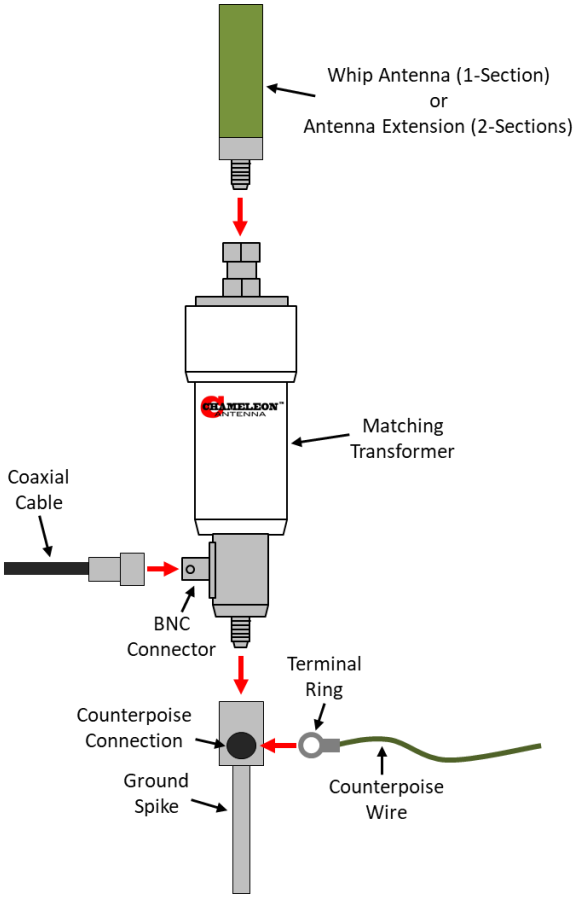

Figure 3. Vertical Whip Antenna Assembly.

Connect the Counterpoise Wire

10. Connect the Terminal Ring at the end of the Counterpoise Wire to the Counterpoise Connection on the Ground Spike.

11. Extend the Counterpoise Wire along the ground in any convenient direction. *There may be slight directivity in the direction of the Counterpoise Wire.*
12. Connect Coaxial Cable to Radio Set or Coupler per Radio Set instructions and perform operational test.

Horizontal NVIS

The Horizontal NVIS configuration, see figure (4), 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. Use the following procedure to deploy the Horizontal NVIS configuration.

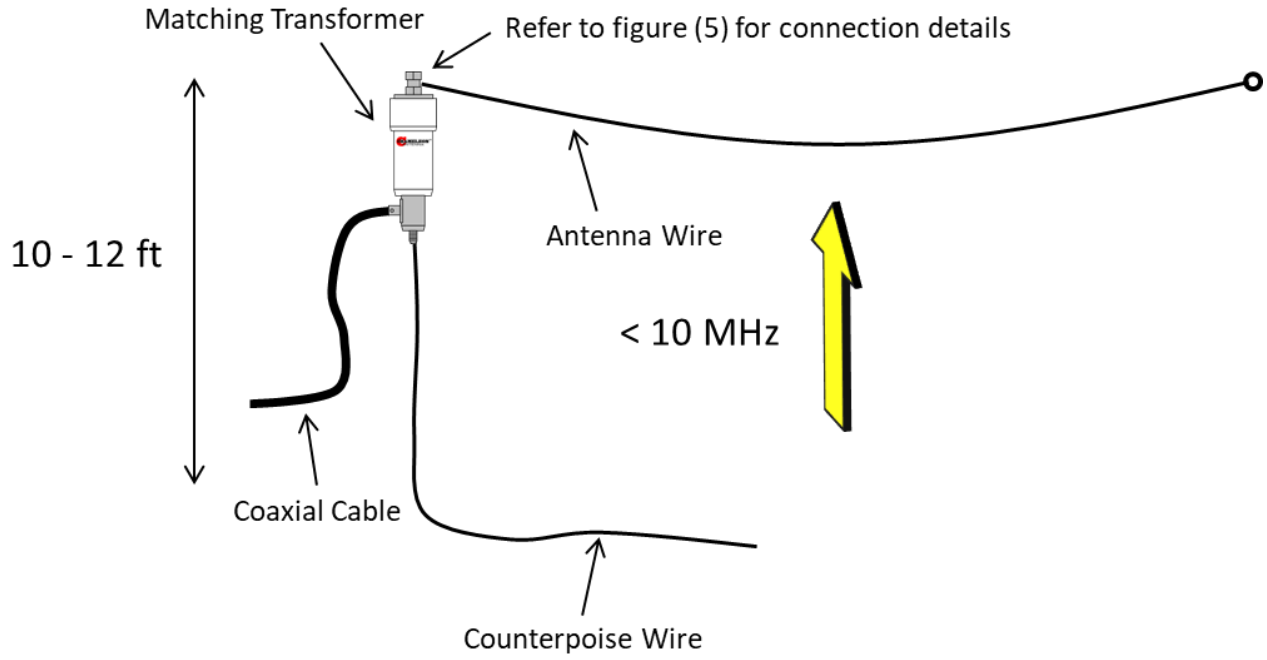

Figure 4. Horizontal NVIS Configuration.

Site Selection and Preparation

1. Select a site to deploy the Horizontal NVIS configuration. The site must have two supports (such as trees, structures, masts, or tops of vehicles) that will position the Matching Transformer and the end of the Antenna Wire to be at a height of between 10 and 12 feet and 73 feet apart. *Lower height may be necessary in the desert, on a beach, or areas covered with deep snow.*
2. If not already attached, attach the Carabiner to the Insulator Ring at the Terminal Ring end of the Antenna Wire (E).

See figure (5) for connecting the Matching Transformer

3. Temporarily remove the Shackle from the top of the Matching Transformer Connection. Place the Terminal Ring from the end of the Antenna Wire over the socket on top of the Matching Transformer and replace the Shackle. Tighten the nut snugly.
4. Connect the Carabiner from the Antenna Wire Insulator Ring to the Shackle bail.

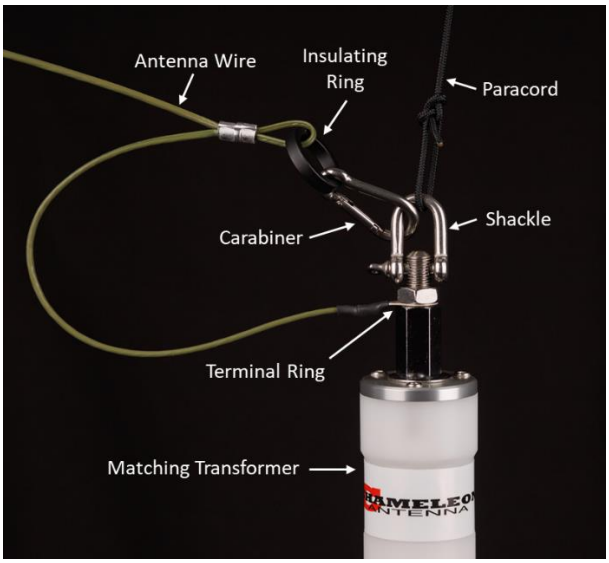

Figure 5. Antenna Wire Connections.

5. Connect the BNC Connector, at the end of the Coaxial Cable (H) with the RFI Choke, to the side of the Matching Transformer.
6. Using a Bowline or similar knot, tie a long length *(25 feet or more)* of Paracord (G) to the Shackle.
7. Connect the Terminal Ring at the end of the Counterpoise Wire (F) to the stud on the base of the Matching Transformer using a 3/8" x 24 nut and tighten snugly.

Raise the Antenna

8. Using the Throw Bag (I), loft the Paracord over the support that is closest to where the radio set will be located.
9. Raise the Matching Transformer end of the antenna to a height of 10 to 12 feet and secure the end of the Paracord.
10. Using a Bowline, or similar knot, tie another long length of Paracord to the Insulator Ring at the end of the Antenna Wire.
11. Using the Throw Bag, loft the Paracord over the other support.
12. 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 the end of the Paracord.
13. Extend the Counterpoise Wire down from the Matching Transformer and then along the ground under the antenna, as shown in figure (4).
14. Connect Coaxial Cable to Radio Set or Coupler per Radio Set instructions and perform operational test.

Sloping Wire

The Sloping Wire configuration, see figure (6), 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. Use the following procedure to deploy the Sloping Wire configuration.

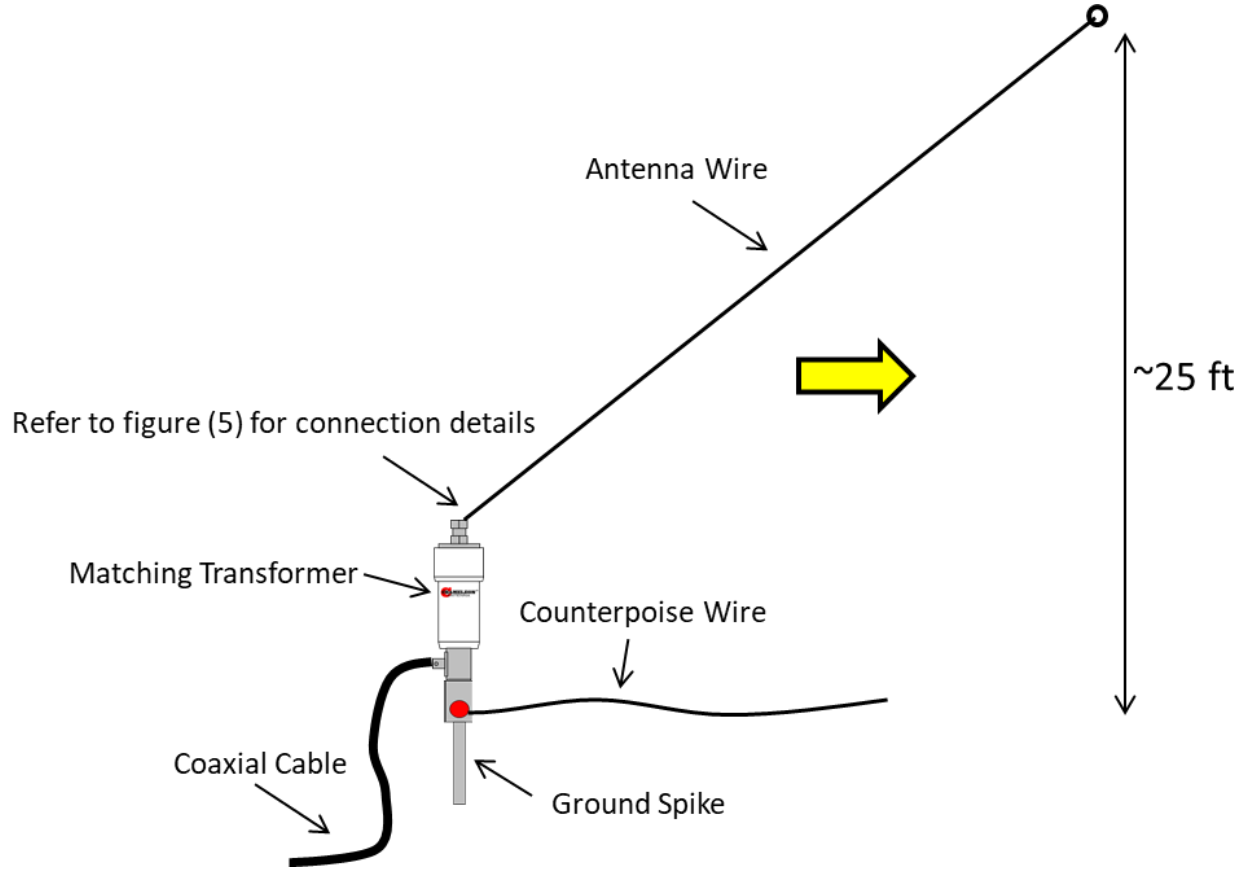

Figure 6. Sloping Wire Configuration.

Site Selection and Preparation

1. Select a site to deploy the Sloping Wire configuration. The site must have a support (such as a tree, structure, or mast) that will position the end of the Antenna Wire at a height of around 25 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.

Raise the Antenna.

2. Using a Bowline, or similar knot, tie a long length (50 feet or more) of Paracord (G) to the Insulator Ring at the far end of the Antenna Wire (E).

3. Using the Throw Bag (I), loft the Paracord over the support.
4. Raise the end of the Antenna Wire to the desired height and secure the end of the Paracord.
5. Fully extend the Antenna Wire so that it is not quite taut.

Install the Spike Mount

6. Drive the Ground Spike (D) into the ground near the low end of the Antenna Wire. Use a rubber mallet to avoid damage to the Ground Spike threaded socket.
7. If installed, remove the 3/8" x 24 nut from the bottom of the Matching Transformer (A) and store it in the backpack.
8. Thread the bottom stud of the Matching Transformer into the top of the Ground Spike and tighten until hand tight.

Refer to figure (5) for Connecting the Matching Transformer

9. If not already attached, connect a Carabiner to the Insulator Ring at the Ring Terminal end of the Antenna Wire (E).
10. Temporarily remove the Shackle from the top of the Matching Transformer.
11. Place the Ring Terminal on the Antenna Wire over the 3/8" x 24 socket on top of the Matching Transformer and replace the Shackle. Tighten the nut snugly.
12. Connect the Carabiner from the Antenna Wire to the Shackle.

Connect the Counterpoise Wire

13. Connect the Ring Terminal at the end of the Counterpoise Wire (F) to the Counterpoise Connection on the side of the Ground Spike. Tighten snugly.
14. Extend the Counterpoise Wire along the ground in any convenient direction.

Connect the Coaxial Cable

15. Connect the BNC Connector, at the end of the Coaxial Cable (H) with the RFI Choke, to the side of the Matching Transformer.
16. Connect Coaxial Cable to Radio Set or Coupler per Radio Set instructions and perform operational test.

Inverted "L"

The Inverted "L" configuration, see figure (7), 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. Use the following procedure to deploy the Inverted "L" configuration.

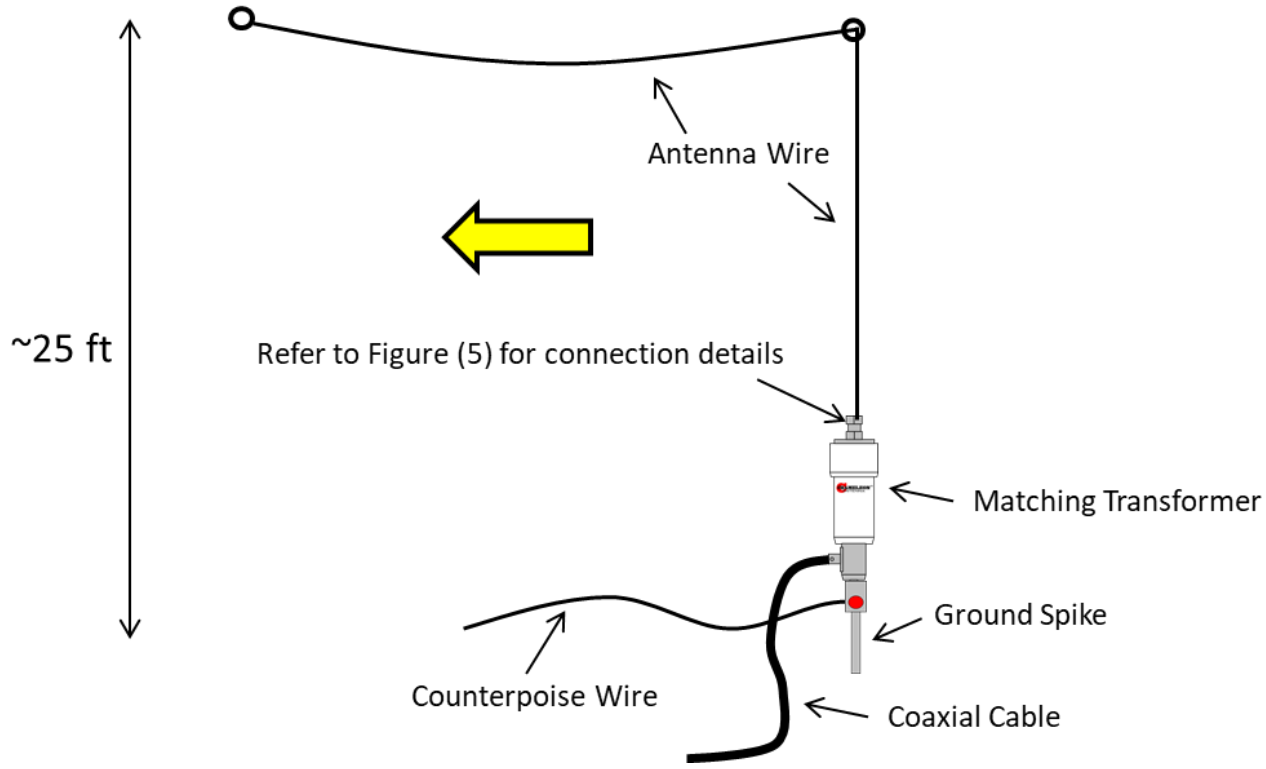

Figure 7. Inverted "L" Configuration.

Site Selection and Preparation

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

Install the Ground Spike

2. Drive the Ground Spike(D) into the ground near one the supports. Use a

rubber mallet to avoid damage to the Ground Spike threaded socket.

2. If installed, remove the nut from the 3/8" x 24 stud on the bottom of the Matching Transformer (A) and store it in the backpack.
3. Thread the 3/8" x 24 stud on the bottom of the Matching Transformer into the top of the Ground Spike (D) until hand tight.

Refer to Figure (5) for Connecting the Matching Transformer

4. If not already attached, connect a Carabiner to the Insulator Ring at the Ring Terminal end of the Antenna Wire (E).
5. Temporarily remove the Shackle from the top of the Matching Transformer.
6. Place the Ring Terminal on the Antenna Wire over the 3/8" x 24 socket on top of the Matching Transformer and replace the Shackle. Tighten the nut snugly.
7. Connect the Carabiner from the Antenna Wire to the Shackle.

Raise the Corner of the "L"

8. Using a Bowline, or similar knot, tie a long length (50 feet or more) of Paracord (G) to the floating Insulator Ring in the middle of the Antenna Wire.
9. Using the Throw Bag (I), loft the Paracord over the support nearest to the Ground Spike.

Refer to figure(7) for steps 10-15

10. Raise the corner of the "L" of the Antenna Wire to the desired height and secure the end of the Paracord.

Raise the End of the Antenna

11. Using a Bowline, or similar knot, tie a long length (50 feet or more) of Paracord to the Insulator Ring at the end of the Antenna Wire.
12. Using the Throw Bag (I), loft the Paracord over the other support.
13. Raise 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 the end of the Paracord.

Connect and Extend the Counterpoise.

14. Connect the Ring Terminal at the end of the Counterpoise Wire (F) to the Counterpoise Connection on the side of the Ground Spike. Tighten snugly.
15. Extend the Counterpoise Wire along the ground in any convenient direction.

Connect the Coaxial Cable

17. Connect the BNC Connector, at the end of the Coaxial Cable (H) with the RFI Choke, to the side of the Matching Transformer.
18. Connect Coaxial Cable to Radio Set or Coupler per Radio Set instructions and perform operational test.

End-Fed Inverted "V"

The Inverted "V" configuration, see figure (8), 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. Use the following procedure to deploy the Inverted "V" configuration.

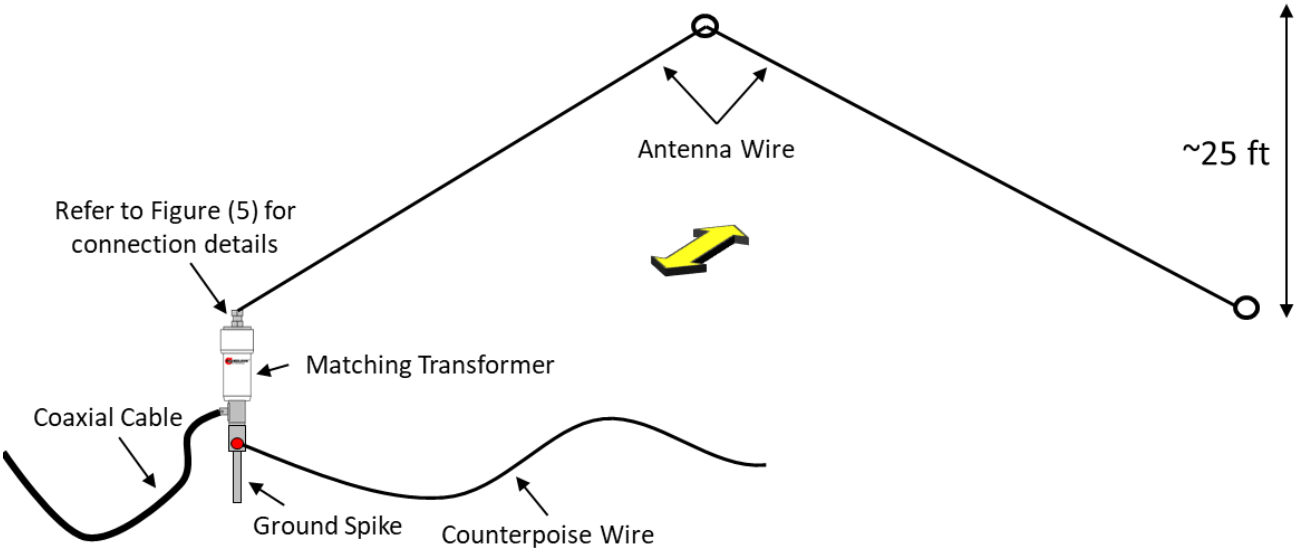

Figure 9. End-Fed Inverted "V" Configuration.

1. Select a site to deploy the End-Fed 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, as shown in figure (8). If the right supports are unavailable, any convenient object, such as a fence post or the top of a vehicle, may be used as a field expedient supports with reduced performance.

Raise the center of the Antenna

2. Using a Bowline, or similar knot, tie a long length (50 feet or more) of Paracord to the floating Insulator Ring in the middle of the Antenna Wire (E).
3. Using the Throw Bag (I), loft the Paracord over the support.
4. Raise the center of the Antenna Wire to the desired height and secure the end of the Paracord.

   For optimum performance, the center should be less than 37 feet high.

Install the Ground Spike

5. Drive the Ground Spike (D) into the ground, near the location of the Radio Set, around 27 feet from the center of the antenna. Use a rubber mallet to avoid damage to the Spike Mount threaded socket.

Attach and connect the Matching Transformer

6. If installed, remove the 3/8" x 24 nut from the stud on the bottom of the Matching Transformer (A) and store it in the backpack.

7. Thread the 3/8” x 24 stud on the bottom of the Matching Transformer into the top of the Ground Spike (D) until hand tight.
8. If not already attached, connect a Carabiner to the Insulator Ring at the Ring Terminal end of the Antenna Wire (E).
9. Temporarily remove the Shackle from the top of the Matching Transformer.
10. Place the Ring Terminal on the Antenna Wire over the 3/8” x 24 socket on top of the Matching Transformer and replace the Shackle. Tighten the nut snugly.
11. Connect the Carabiner from the Antenna Wire to the Shackle.

Raise the End of the Antenna.

12. Extend the end of the Antenna Wire so that it is not quite taut.
13. Insert a Tent Stake *(not supplied)* through the Insulator Ring at the far end of the Antenna Wire and pull the Tent Stake to extend the Antenna Wire until the Antenna Wire is not quite taut.
14. Drive the Tent Stake into the ground.

Connect and extend the Counterpoise Wire

15. Connect the Ring Terminal at the end of the Counterpoise Wire (F) to the Counterpoise Connection on the side of the Ground Spike. Tighten snugly.
16. Extend the Counterpoise Wire on the ground in any convenient direction.

Connect the Coaxial Cable

19. Connect the BNC Connector, at the end of the Coaxial Cable (H) with the RFI Choke, to the side of the Matching Transformer.
20. Connect Coaxial Cable to Radio Set or Coupler per Radio Set instructions and perform operational test.

Recovery Procedure

To recover the MPAS 2.0 - MIL, perform the following steps:

1. Disconnect the Coaxial Cable from the radio set.
2. Lower the antenna to the ground.
3. Disconnect the Coaxial Cable from the Matching Transformer.
4. Carefully roll (do not twist) the Coaxial Cable.
5. Disconnect the Counterpoise Wire and wind it on the Line Winder.
6. Detach the Matching Transformer from the Ground Spike.
7. Pull the Ground Spike from the ground.
8. If attached, detach the Carabiner from the Shackle.
9. Disconnect the Antenna Whip, Antenna Extension, or Antenna Wire, depending upon antenna configuration used, from the Matching Transformer.
10. If used, wind the Antenna Wire onto the Line Winder.
11. If used, take down the Antenna Extension. 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.
12. If used, take down the Whip Antenna. **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.
    It is very important to take down the Whip Antenna beginning at the top. Failure to begin at the top may cause premature failure of the internal connecting braided cord.
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 a thin coat of Anti-Oxidant Compound be applied to the Antenna Extension bare aluminum joints to prevent corrosion.**
15. Check area for overlooked antenna components.
16. Store components together in the backpack.

Troubleshooting

1. If using the Antenna Wire, ensure the Ring Terminal is not corroded and is securely connected to the Matching Transformer and Antenna Wire.
2. Check that the Counterpoise Wire Ring Terminal is not corroded and is securely connected to the Ground Spike and Counterpoise Wire.
3. Inspect the Antenna Wire, Counterpoise Wire, Antenna Whip, and Antenna Extension for breakage, corrosion, or signs of strain.
4. Ensure the BNC Connectors are securely tightened.

5. Inspect the Coaxial Cable for cuts in insulation or exposed shielding. Replace if damaged.
6. If still not operational, connect a Standing Wave Ratio (SWR) Power Meter and check SWR.
7. If SWR is greater than 8:1 (infinite SWR), check Antenna Tuner or Coupler using the technical publication or manufacturer's procedure. Be sure to check the Coaxial Patch Cables that connect the Radio Set to the Antenna Tuner or Coupler.
8. If still not operational, replace the Coaxial Cable. *Most problems with antenna systems are caused by the coaxial cables and connectors.*
9. If still not operational, replace the Matching Transformer.
10. If still not operational, contact Chameleon Antenna™ for technical assistance.

Specifications

- Frequency: *(all configurations require a wide range Antenna Tuner or Coupler)*
    - Antenna Wire and Matching Transformer: 1.8 MHz through 54.0 MHz continuous.
    - 1-Section Vertical Antenna: 1.8 – 54.0 MHz *(limited performance below 3.5 MHz).*
    - 2-Section Vertical Antenna: 1.8 – 54.0 MHz continuous.
- Power: 100W SSB. 50W (CW, FM, and all Digital Waveforms)
- RF Connection: BNC Connector
- Length:
    - Antenna Wire: 73 ft.
    - Antenna Whip: 9 ft. 4 3/4 in. extended, 17 in. collapsed
    - Antenna Extension: 8 ft. 9 in. extended, 28 3/4 in. collapsed
    - Antenna Whip plus Antenna Extension: 18 ft. 1 3/4 in. extended
- Weight:
    - Matching Transformer: 1 lb.
    - Antenna Whip: 12 oz.
    - Antenna Whip plus Antenna Extension: 1 lb. 12 oz.
    - MPAS 2.0 – MIL antenna (all components): 8 lbs. 12 oz.
- Personnel Requirements and Setup Time: one operator, less than 15 minutes (using Antenna Wire), less than 5 minutes (using Vertical Whip).
- SWR: Subject to frequency and configuration, but within limits of most wide range Antenna Tuners or Couplers. Figure (10) shows a graph of SWR by frequency for a typical deployment.

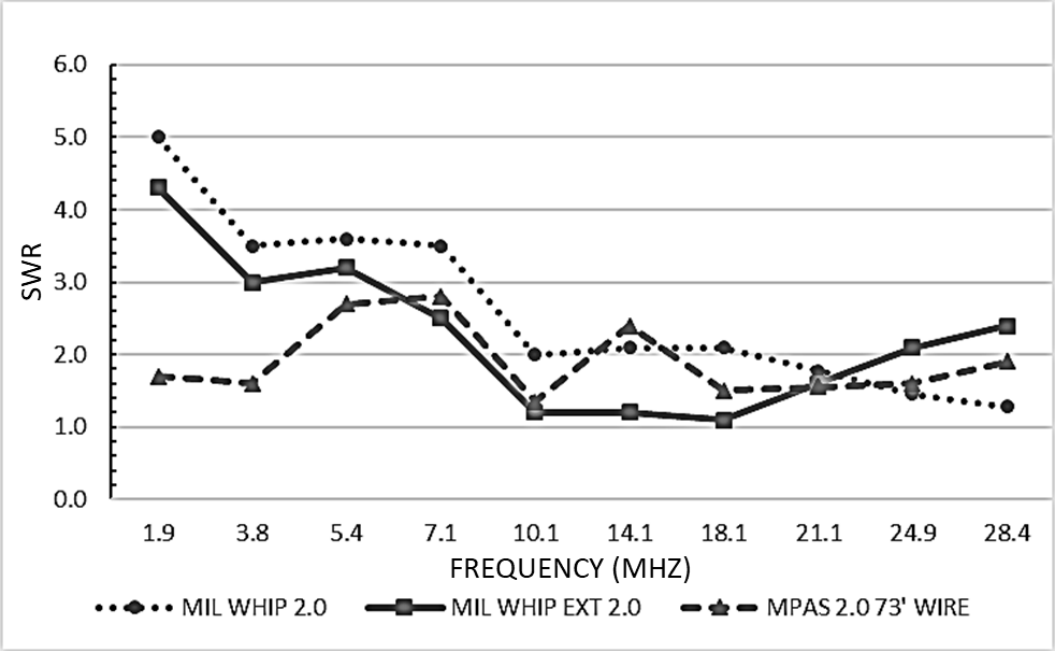

Figure 10. SWR by Frequency Graph.

References

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3. Turkes, Gurkan, 1990, *Tactical HF Field Expedient Antenna Performance Volume I Thesis*, U.S. Naval Post Graduate School, Monterey, CA.