Lightweight End Fed Half Wave Sloper (CHA LEFS 4010) Operator's Manual

Nevada - USA
WWW.CHAMELEONANTENNA.COM

VERSATILE – DEPENDABLE – STEALTH – BUILT TO LAST

Rev. 6/9/2025

Table of Contents

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.

The 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

Thank you for purchasing and using the Chameleon Antenna™ Lightweight End Fed Half Wave Sloper (CHA LEFS 4010). The CHA LEFS 4010 is a four-band no-tuner (seven band with tuner), High Frequency (HF) antenna for use on the 40, 20, 15, and 10 meter Amateur Radio Service (ham) bands (30, 17, and 12 meters with a tuner). The combination of the CHA LEFS 4010's small size, light weight, and popular band coverage make it ideal for Parks on the Air (POTA), Summits on the Air (SOTA) and other hiking and biking outdoor adventures. Leave the tuner and SWR meter at home – just pack your radio and the CHA LEFS 4010 and go activate a park or summit!

Plate 1. CHA LEFS 4010 Antenna.

The CHA LEFS 4010 is designed for outdoor adventures - the lightweight End Assembly with an integrated line winder and high-efficiency impedance matching network transformer, ultra-thin 20-gauge antenna wire, and micro-size RG-316 coaxial cable, make the CHA LEFS 4010 the perfect companion for pocket-sized QRP (low power) transceivers. Setup is quick and easy, and the antenna will operate without a tuner or adjustment on the entire 40, 20, 15, and 10 meter ham bands. Using a tuner the 30, 17, and 12 meters ham bands can also be used. Optional dipole kits are also available. When you're ready to hit the trail, the CHA LEFS 4010 won't take up much space in your backpack – it is only 6 ½ inches long, 3 ¾ inches wide, and weighs only 1.1 pounds. The CHA LEFS 4010 can be used with a lightweight telescopic fishing or kite pole to install it as a Sloper and is also configurable to facilitate Near-Vertical Incident Sky wave (NVIS) communication.

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 LEFS 4010.

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 LEFS 4010 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 shows 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 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 LEFS 4010 is comprised of the following components, see plate (2). The letter references are used to identify components of the antenna in the detailed installation instructions.

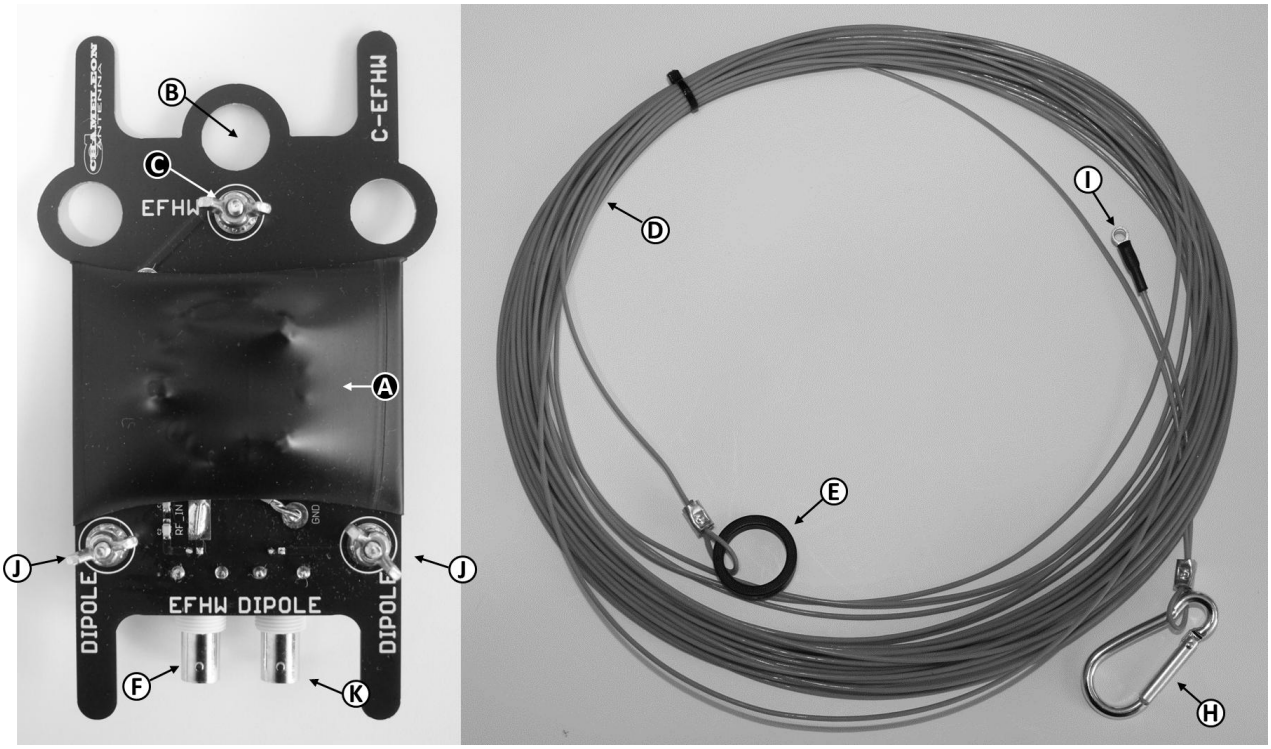


Plate 2. Components of the CHA LEFS 4010 Antenna.

A. End Assembly. The End Assembly is a unitary assembly with the components and sub-components of the CHA LEFS 4010 antenna and functions as the suspension and feed point of the antenna.

B. Suspension Point. The Suspension Point is the large hole in the top of the End Assembly, which is used to attach paracord for suspension of the antenna feed point.

C. EFHW Attachment. The EFHW Attachment is used to connect the Antenna Wire for an End Fed Half Wave antenna.

D. Antenna Wire. The Antenna Wire is comprised of 65 feet of strong, lightweight 20-gauge wire. Optional Dipole Antenna Wire sets (two per band) are available for the 30, 17, and 12 meter ham bands.

E. Insulator Loop. An Insulator Loop *(not pictured)* is permanently installed on the far end of the Antenna Wire.

F. EFHW Coaxial Connector. The EFHW Coaxial Connector is located on the bottom of the End Assembly and is used to connect the Coaxial Cable to the End Fed Half Wave antenna.

G. Coaxial Cable. The Coaxial Cable *(not pictured)* is 25 feet of RG-316 with an integrated RFI Choke and BNC connectors on each end. It is used to connect the antenna to the radio set.

H. Carabiner. The Carabiner is used to mechanically attach the Antenna Wire to the End Assembly and provide strain relief.

I. Terminal Lug. The Terminal Lug is located at the end of the Antenna Wire and is used to connect it to the End Assembly.

J. Dipole Attachment. The two Dipole Attachments are used to connect operator supplied and fabricated Antenna Wires when the CHA LEFS 4010 is configured as a Dipole.

K. Dipole Coaxial Connector. The Dipole Coaxial Connector is located on the bottom of the End Assembly (next to the "EFHW" Coaxial Connector) and is used to connect the Coaxial Cable when the CHA LEFS 4010 is configured a Dipole.

L. Dipole Strain Relief Point. Two Dipole Strain Relief Points are located near the top on each side of the End Assembly and are used to provide strain relief for the Dipole Antenna Wires.

Antenna Configurations

There are three basic configurations for the CHA LEFS 4010: End Fed Sloper, End Fed Horizontal, and Half Wave Dipole.

Sloper Configuration

Figure (1) shows the Sloper configuration, to which the installation instructions and specifications apply. The Sloper is a short to medium range antenna. The main advantage of the Sloper for portable operation is that it requires only one end support and is fast and easy to setup. During field use, it can be installed at a height of around 20 feet and have good performance and enough coaxial cable left to reach the radio set. The antenna exhibits a little directivity broadside to the antenna on 40 meters and towards the ends of the antenna on 20 meters and above. A lightweight, 12-15 foot tall, telescopic fishing or kite pole works well as an ultra-portable mast for wind-swept summits or beaches without trees. In addition to the components supplied with the CHA LEFS 4010, you may need: a 12-15 foot telescopic fishing or kite pole, a tent state, and 30 feet of paracord.

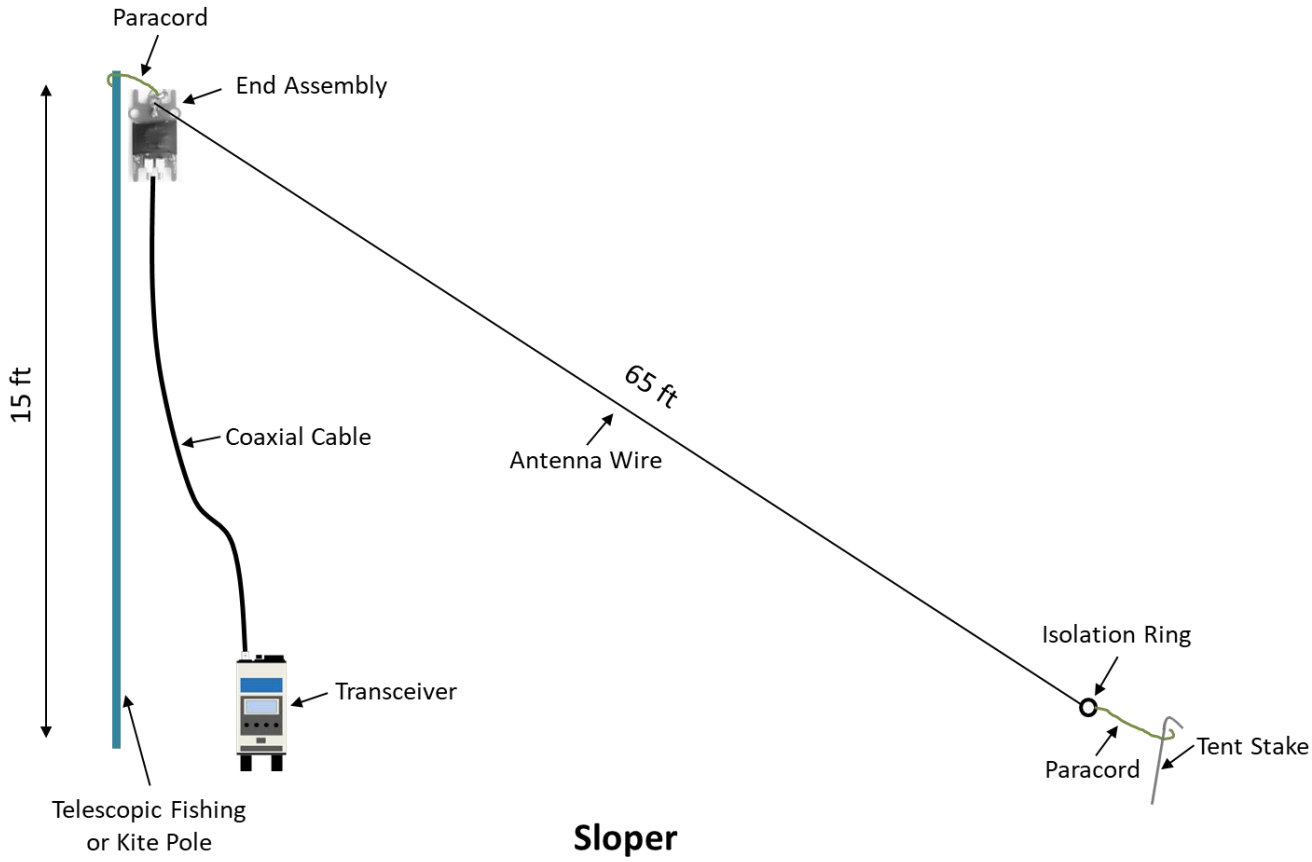


Figure 1. CHA LEFS 4010 Sloper Configuration.

Sloper Installation

Use the following procedure to install the CHA LEFS 4010 Sloper configuration. Refer to plate (4) for connection details.

Site Selection and Preparation.

1. Select a site to deploy the CHA LEFS 4010 Sloper configuration. The site must have a support that will position the End Assembly at a height of around 15 to 20 feet. If the right support is not available, any available support can be used, such as a fence post, hiking pole, or fishing pole with reduced performance.

Raise the Antenna.

2. Using a Bowline, or similar knot, attach a long length *(around 25 ft.)* of Paracord *(not supplied)* to the Suspension Point (B) of the End Assembly (A).
3. Using a throw weight or some other method, loop the Paracord over the support.
4. Unwrap the Antenna Wire (D) from the End Assembly.
5. Clip the Carabiner (H) to the End Assembly Suspension Point (B) for Antenna Wire strain relief.
6. Connect the Antenna Wire Terminal Lug (I) to the End Assembly EFHW Attachment (C). Tighten wing nut finger tight.
7. Connect one end of the Coaxial Cable to the End Assembly BNC Coaxial Connector marked “EFHW” (F).
8. Raise the End Assembly to the desired height and secure it to the support using a Round Turn and two Half Hitches, or similar knot.
9. Clip the Carabiner (H) to the End Assembly Suspension Point (B) for Antenna Wire strain relief.

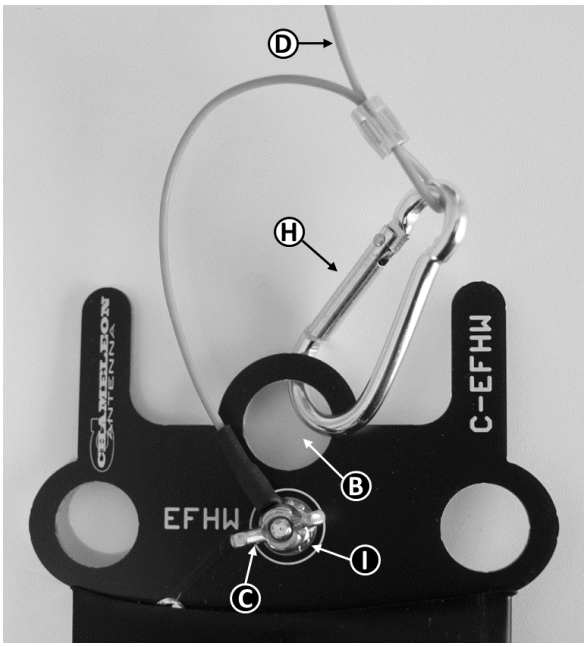


Plate 4. EFHW Connection Details.

10. Connect the Antenna Wire Terminal Lug (I) to the End Assembly EFHW Attachment (C). Tighten wing nut finger tight.
11. Connect one end of the Coaxial Cable to the End Assembly BNC Coaxial Connector marked “EFHW” (F).
12. Raise the End Assembly to the desired height and secure it to the support using a Round Turn and two Half Hitches, or similar knot.

13. Clip the Carabiner (H) to the End Assembly Suspension Point (B) for Antenna Wire strain relief.
14. Connect the Antenna Wire Terminal Lug (I) to the End Assembly EFHW Attachment (C). Tighten wing nut finger tight.
15. Connect one end of the Coaxial Cable to the End Assembly BNC Coaxial Connector marked “EFHW” (F).
16. Raise the End Assembly to the desired height and secure it to the support using a Round Turn and two Half Hitches, or similar knot.

Finish Installation.

17. Using a Bowline, or similar knot, attach a short length *(around 5 ft.)* of Paracord *(not supplied)* to the Insulator Loop (E) at the end of the Antenna Wire.
18. Fully extend the Antenna Wire, allowing some sag in the wire. Do not make the Antenna Wire taut. *The Antenna Wire is made from a lightweight 20-gauge wire. Although it is strong, it is not as strong as heavier gauge wire.* ***It is very important not to over-tension the wire, or it may break.***
19. Drive a Tent Stake *(not supplied)* into the ground around three feet past the end of the Antenna Wire.
20. Tie the Paracord from the end of the Antenna Wire to the Tent Stake, using a round-turn and two half-hitches or similar knot. Do not make the Antenna Wire taut.
21. Connect the Coaxial Cable to the Radio Set and perform an operational test.

NVIS Configuration

Figure (2) shows the End Fed Horizontal NVIS configuration. By installing the antenna to a height of around 12-15 feet at both ends, you can enhance NVIS propagation. You will need a support at both ends of the antenna, such as trees or telescopic fishing or kite poles and 50 feet of paracord. Installation of this configuration is similar to the procedure for Sloper Installation.

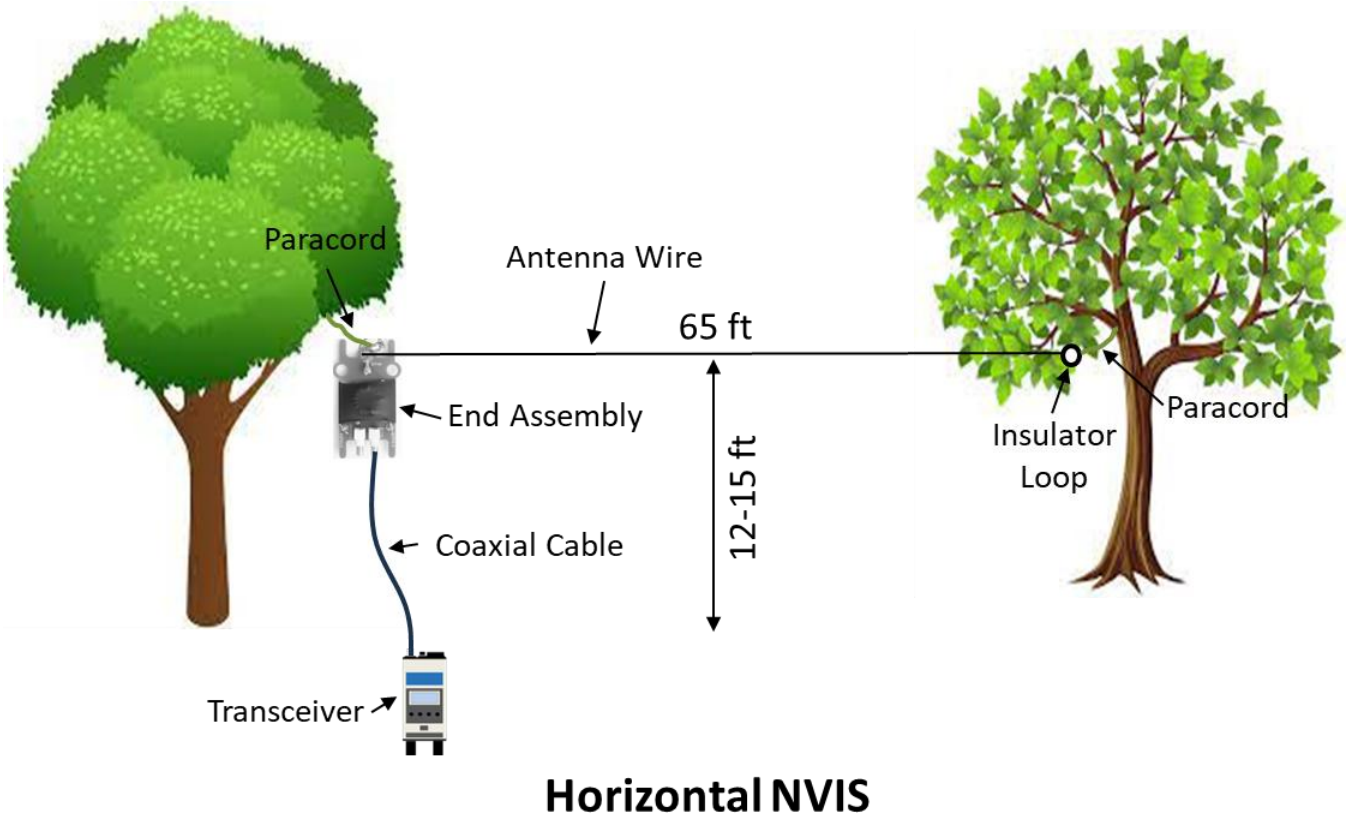


Figure 2. CHA LEFS 4010 Horizontal NVIS Configuration.

Dipole Configurations

The CHA LEFS 4010 can be configured as several resonant Half Wave Dipole antennas using the End Assembly and the following optional add-on kits.

CHA LINK-D (40, 30, and 20 meters)

A 40, 30, and 20 meter Linked Dipole is available as an optional add-on, see figure (3). Using band links, it can be used on one band at a time for these three popular bands.

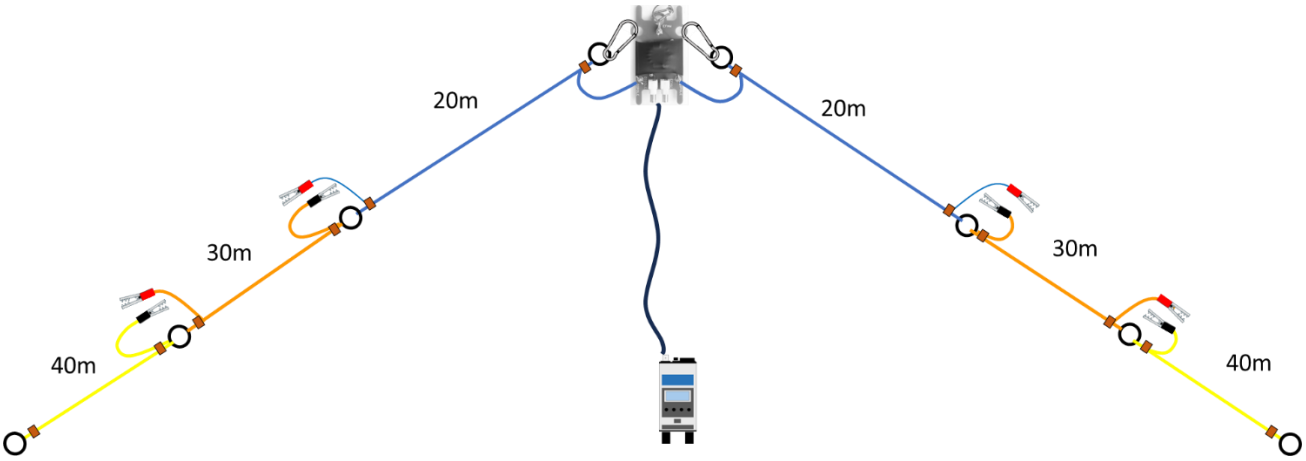


Figure 3. CHA LINK-D Antenna.

CHA LINK-D15 (40, 20, and 15 meters)

A 40, 20, and 15 meter Linked Dipole is also available as an optional add-on, see figure (4). Using band links, it can be used on one band at a time for these equally popular three bands.

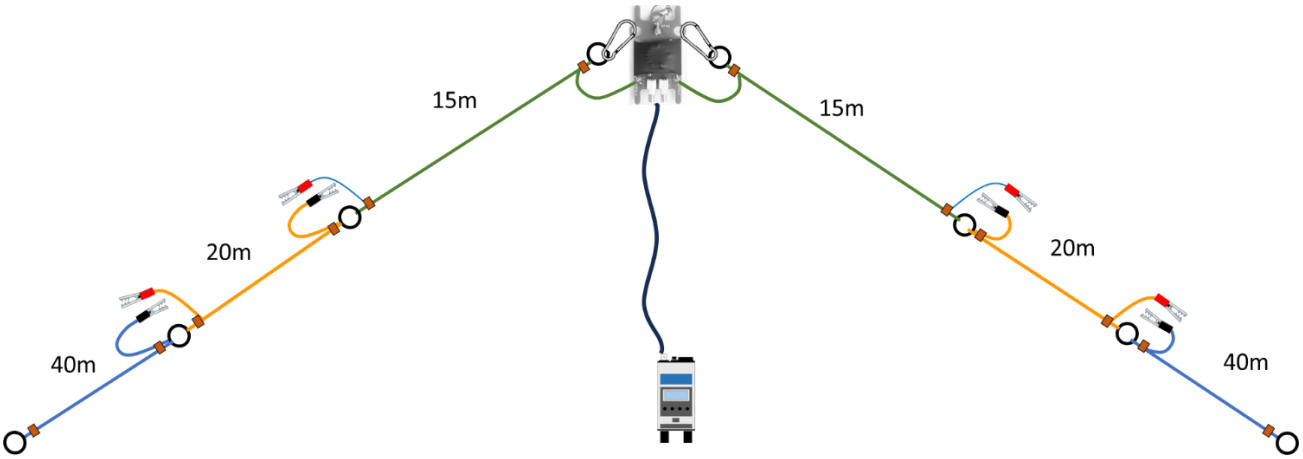


Figure 4. CHA LINK-D15 Antenna.

CHA WARC-D (30, 17, and 12 meters)

Also available as an optional add-on, is a set of single band dipoles for the WARC bands (30, 17, and 12 meters), see figure 5.

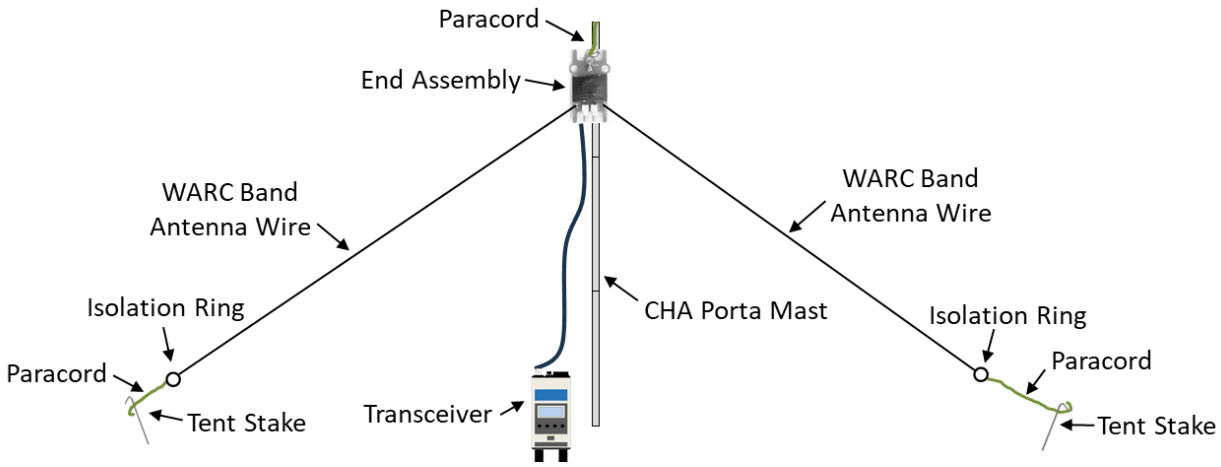


Figure 5. WARC Inverted "V" Dipole Configuration.

Dipole Connections

To use the CHA LEFS 4010 as a dipole, connect the set of Antenna Wires to the wing nut connections on the End Assembly marked "DIPOLE" and connect the Coaxial Cable to the BNC Coaxial Connector marked "DIPOLE", as shown in plate (3).

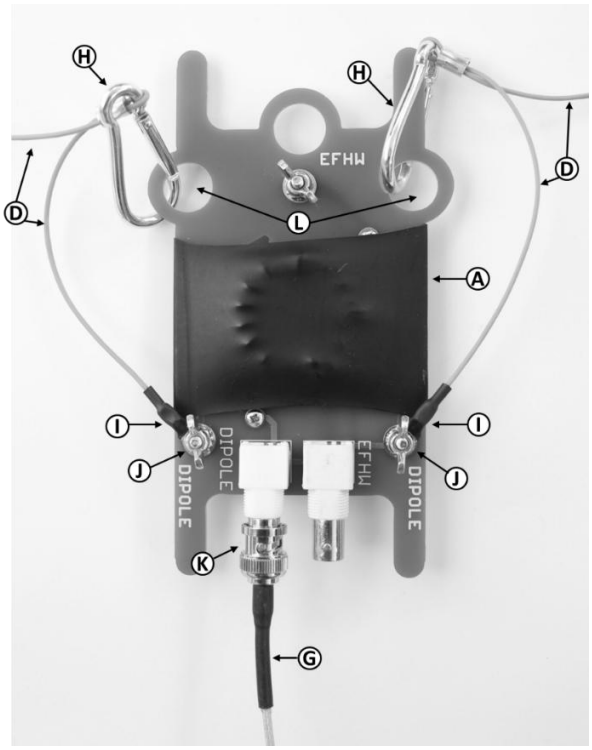


Plate 3. Dipole Wire Connections.

All three dipole kits can be setup in either a horizontal or Inverted "V" dipole configuration and suspended from a convenient tree branch or a mast. See www.chameleonantenna.com or your local dealer to purchase LEFS 4010 dipole add-ons.

Recovery Procedure

To recover the CHA LEFS 4010, perform the following steps:

1. Disconnect the Coaxial Cable from the radio set.
2. Lower the End Assembly to the ground.
3. Disconnect the Coaxial Cable from the End Assembly.
4. Carefully roll (do not twist) the Coaxial Cable.
5. Detach the far end of the Antenna Wire.
6. Wrap the Antenna Wire around the End Assembly, as shown in plate (1).
7. If used, wrap the Paracord around the End Assembly.
8. Remove dirt from antenna components and inspect them for signs of wear.
9. Stored antenna and antenna components in your backpack.

Troubleshooting

1. Inspect the Antenna Wire and Loading Coil for breakage, corrosion, or signs of strain.
2. Ensure the Antenna Wire is securely connected.
3. Ensure the BNC Connector Plug is securely connected.
4. Inspect the Coaxial Cable assembly 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 3:1 on specified bands, replace Coaxial Cable. *Most problems with antenna systems are caused by the coaxial cables and connectors.*
7. If still not operational, contact Chameleon Antenna™ Technical Support. Explain to them what specifically does not work correctly about the antenna, the steps you have taken during troubleshooting, and those results.

Specifications

- Frequency:
  - 7.0 - 7.3 MHz (40m)
  - 10.1-10.15 MHz (30m) with optional CHA WARC-D or CHA LINK-D dipole wire sets.
  - 14.1 - 14.35 MHz (20m)
  - 18.068-18.168 MHz (17m) with optional CHA WARD-D dipole wire set.
  - 21.0 – 21.45 MHz (15m)
  - 24.890-24.990 MHz (12m) with optional CHA WARD-D dipole wire set.
  - 28.0 – 29.7 MHz (10m)
- SWR (frequency ranges listed above): Less than 2.0:1. The SWR graph for the EFHW Antenna is shown in figure (4). *The SWR graph shown is typical for a Sloper field installation; but installed height and nearby objects can have a pronounced effect on SWR.*

  Figures (5)-(7) show SWR graphs for the optional CHA LINK-D Linked Dipoles (40, 30 and 20 meters). Figures (8) – (10) show SWR graphs for the optional CHA WARC-D Band Dipoles (30, 17, and 12 meters). Figures (11) – (13) show SWR graphs for the optional CHA LINK-D15 (40, 20, and 15 meters).

  SWR graphs shown are for a typical Inverted "V" installation.
- Power: 100W SSB, 50W CW, and 25W Digital and all other modes
- RF Connection: BNC
- Length: 65 ft (EFHW)
- Weight: approximately 1.1 lbs.
- Personnel Requirements and Setup Time: one operator, around 10 minutes

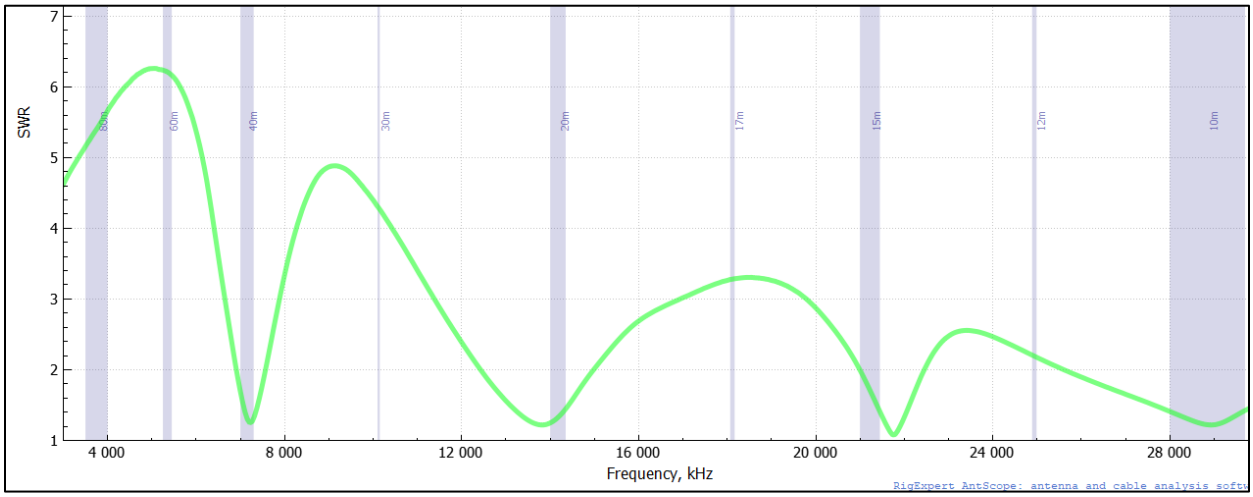


Figure 4. EFHW Antenna SWR by Frequency.

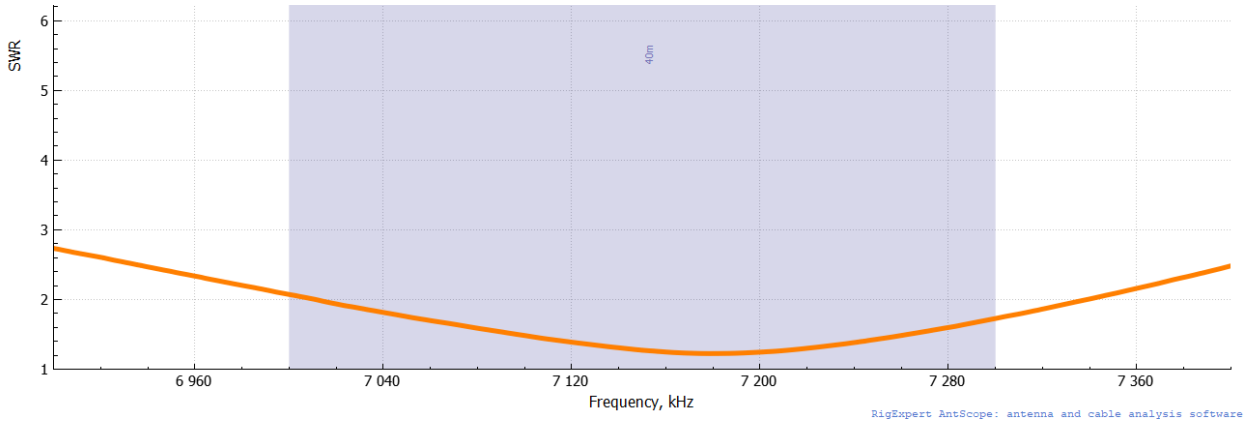


Figure 5. 40m CHA LINK-D SWR Graph.

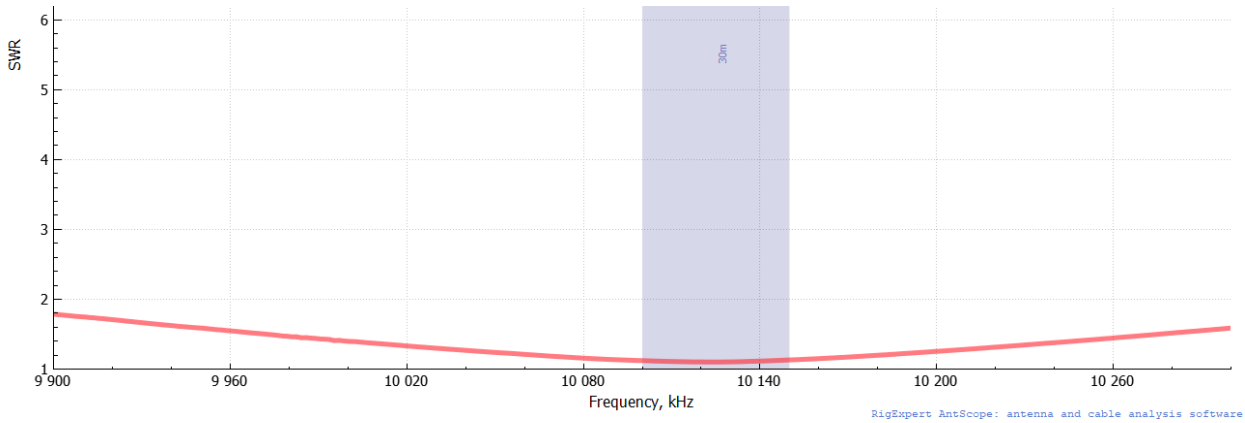


Figure 6. 30m CHA LINK-D SWR Graph.

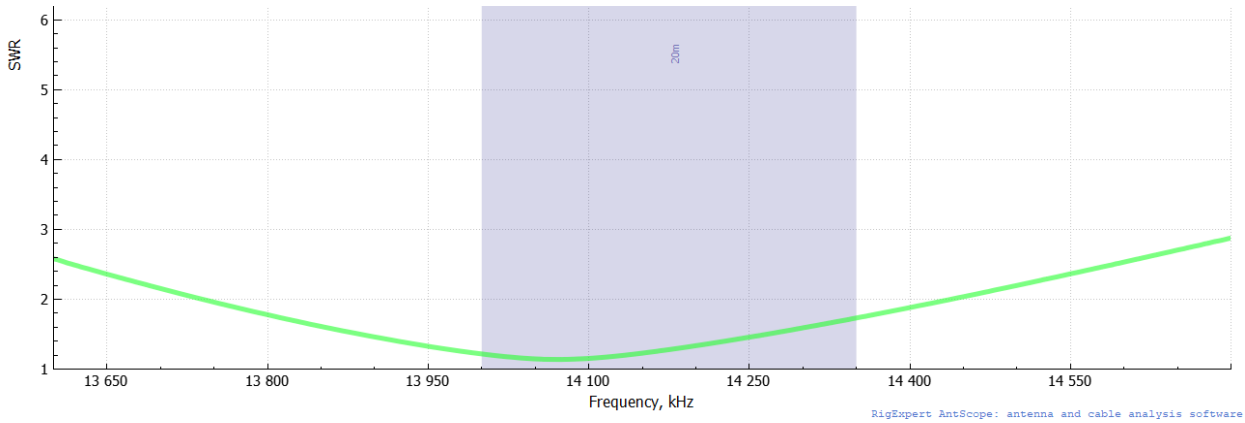


Figure 7. 20m CHA LINK-D SWR Graph.

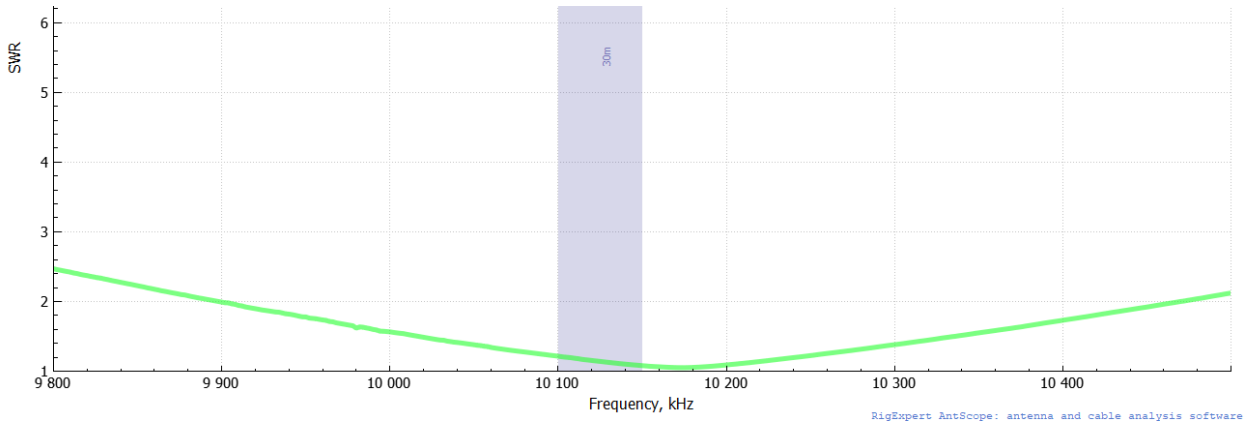


Figure 8. 30 Meter CHA WARC-D SWR Graph.

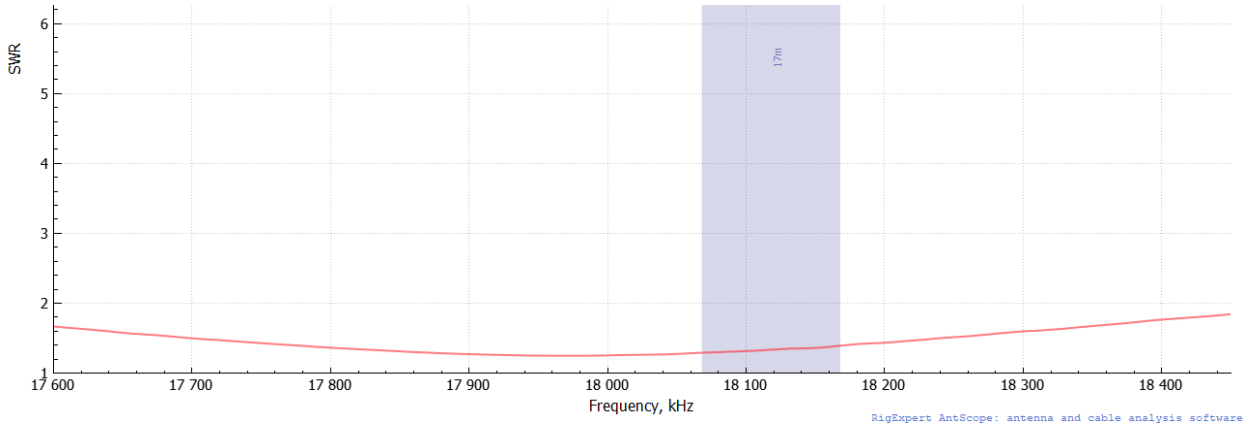


Figure 9. 17 Meter CHA WARC-D SWR Graph.

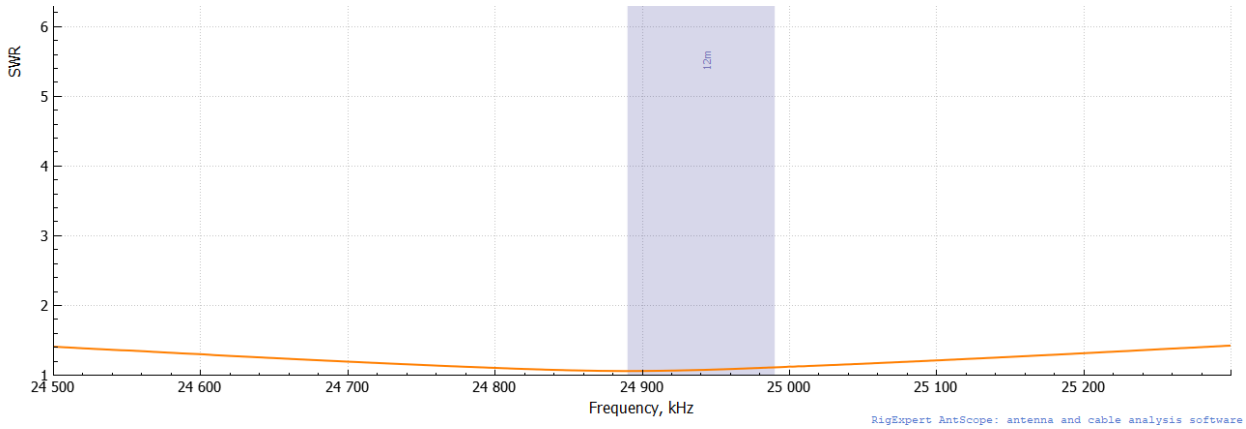


Figure 10. 12 Meter CHA WARC-D SWR Graph.

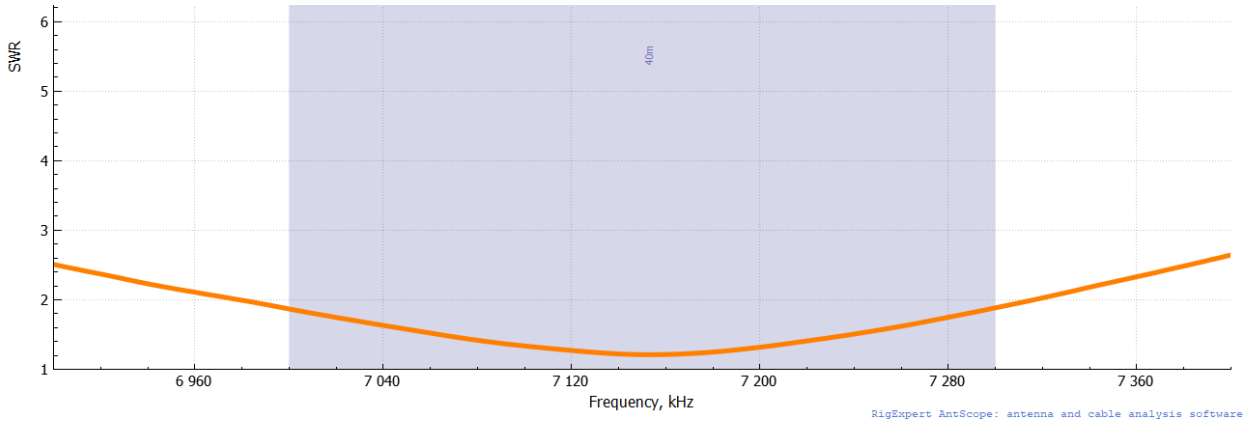


Figure 11. 40m CHA LINK-D15 SWR Graph.

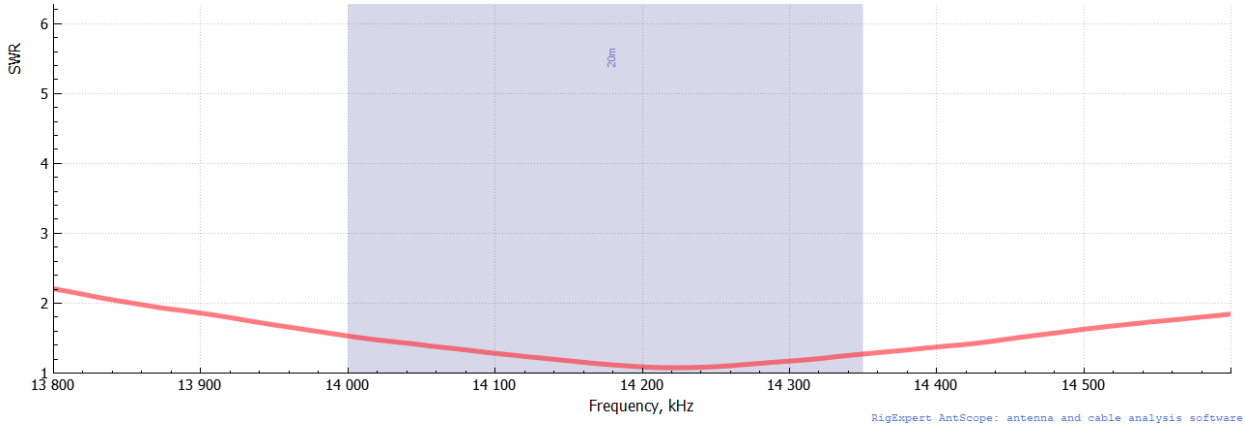


Figure 12. 20m CHA LINK-D15 SWR Graph.

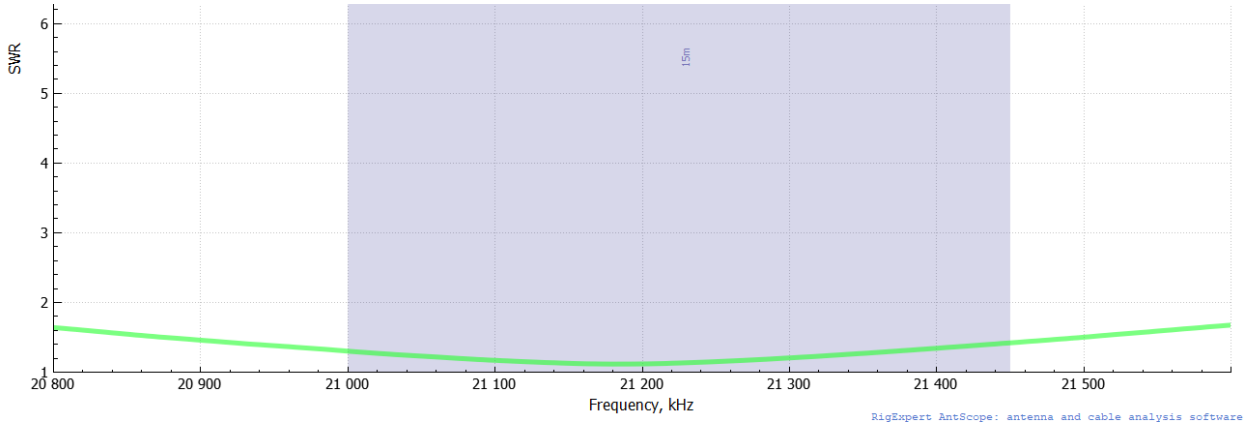


Figure 13. 15m CHA LINK-D15 SWR Graph.

Accessories

The following add-ons to the LEFS 4010 are available from www.chameleonantenna.com or your local dealer.

- **CHA LINK-D** - Linked Dipole kit for 40, 30, and 20 meters for use with the LEFS 4010.
- **CHA WARC-D** – Three single band dipoles for the WARC Bands (30, 17, and 12 meters) for use with the LEFS 4010.
- **CHA LINK-D15** – Linked Dipole kit for 40, 20, and 15 meters for use with the LEFS 4010.

Recommended non-supplied accessories:

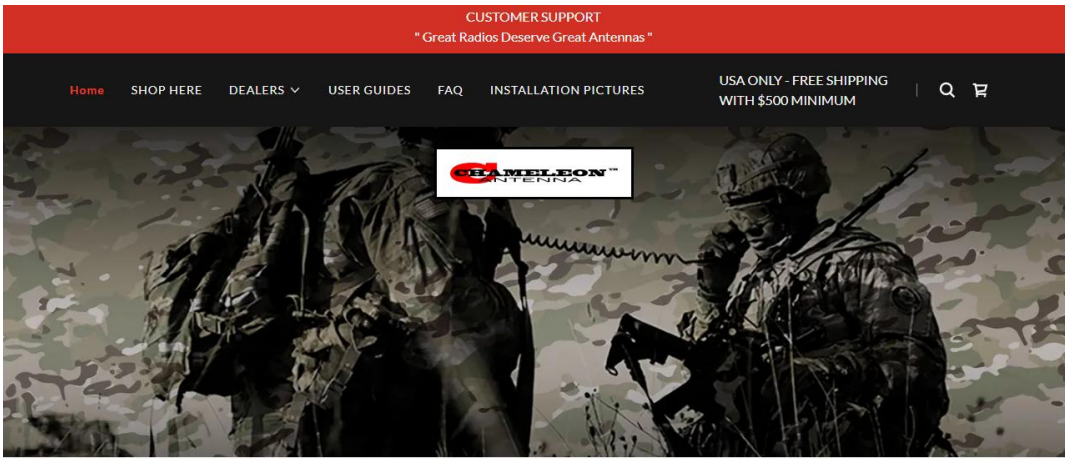
- **CHA PARACORD-50** – A two pack of 50 foot micro-paracord and Line Winders.
- **CHA TENT** Stakes – A pack of four wire-style tent stakes.
- **CHA THROW BAG** – A marshland camouflaged pattern arborist throwing weight.
- **Slick String** – 1/8" Dyneema rope. You need at least 50 feet.

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.

Chameleon Antenna™ Products

Please go to http://chameleonantenna.com for information about additional quality antenna products available for purchase from Chameleon Antenna™ – The Portable Antenna Pioneer. See website for warranty information.



THE PORTABLE ANTENNA PIONEER BECAUSE GREAT RADIOS DESERVE GREAT ANTENNAS

Chameleon Antenna™ products are available from these great dealers:

HRO
DX ENGINEERING
GIGAPARTS
WIMO
MOONRAKER
RADIOWORLD UK
R&L ELECTRONICS
ML&S MARTIN LYNCH
PILEUPDX
LUTZ-ELECTRONICS
RADIOWORLD CANADA
GPS CENTRAL
PASSION-RADIO.COM
CHATT RADIO