Tactical HF Broadband Dipole Antenna

Operating Manual

version 0.2 draft using prototype 4

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1 Description of antenna

Thank you for buying a Cross Country Wireless Tactical HF Broadband Dipole antenna.

Although we describe the antenna as a Broadband Dipole antenna it’s really a kit bag of antenna components that can be used in different ways to install a HF antenna to suit the space or terrain available. This manual describes several different antenna systems that can be built and includes broadband antennas for military and commercial frequency hopping and ALE use and narrow band antennas for operation on specific frequency bands for amateur radio enthusiasts.

SAFETY FIRST!

Don’t mount the antenna close to electricity overhead lines or telephone wires.

In some countries high voltage overhead lines look like telephone installations.
What's in the kit?

The bag can be set up as a waist or shoulder bag and is compatible with MOLLE load bearing equipment and backpacks.

In the bag are the following:

1 off Cross Country Wireless Dual Balun for low and high impedance antennas
2 off Cross Country Wireless Resistor load units
2 off Black wires (10m long) terminated in wire thimbles with stainless steel carabiners
2 off Grey wires (4m long) terminated in wire thimbles with stainless steel carabiners
2 off Paracord tie-off lines (5m long) terminated in wire thimbles with stainless steel carabiners
2 off Wire winders
1 off 10m coaxial cable with BNC male connectors
1 off Laminated quick start guide to allow unskilled users to install the antenna
The optional extension kit comes with an identical bag and has:

2 off Black wires (40m long) terminated in wire thimbles with stainless steel carabiners
3 Dual Balun

The Dual Balun has two separate balun systems built into a common enclosure.

The High impedance input and outputs match broadband antennas, end fed, V beams and Beverage antennas.

The Low impedance balun is designed to match a half wave dipole for specific amateur radio bands.

Both baluns have very high common mode rejection (typically 40 dB or more). This prevents RF noise coming up the coaxial cable from power supplies, computers or vehicle generators getting to the antenna elements and feeding back to the radio receiver.

Due to the reduced RF noise on receive this allows a radio link to be set up with lower power levels than would otherwise be used giving useful savings of battery power and helping to reduce the chance of interception.
Antenna installation – broadband dipole

This antenna can be mounted from a centre mast, mounted with three masts or sloping from a high point to ground.

The coaxial cable is connected to the HIGH BNC connector. The black wires are connected to the HIGH wing nuts. The Resistor units are connected to the other ends of each black wire. The grey wires connect to the other ends of the Resistor units. The paracord lines can be used to tie off the antenna to trees, fences stationary vehicles.

This antenna will give good results from 3 to 30 MHz. If mounted at a low height less than 10m it will give excellent NVIS (Near vertical incidence skywave) between 3 MHz and 8 MHz.

If mounted above 10m it will give excellent long distance (greater than 3000 km) especially if the terrain is sloping or free of clutter (trees, buildings, vehicles) in the direction of the target station.
This antenna can be mounted from two masts or trees.

The coaxial cable is connected to the HIGH BNC connector. The black wires are connected to the HIGH wing nuts. The grey wires connect to the other ends of the black wires. The grey wires are connected to one of the Resistor units (see below for an option). The paracord lines can be used to tie off the antenna to trees, masts or trees.

When used with one Resistor unit this configuration gives an excellent VSWR match from 1 MHz to 30 MHz and is particularly good at rejecting local RF noise. It is recommended for receive only monitoring.

For improved efficiency on transmit connect both Resistor units in parallel to reduce losses. This will allow transmit use from 3 to 30 MHz with very low noise reception.

This antenna will give good results from 3 to 30 MHz. If mounted at a low height less than 10m it will give excellent NVIS (Near vertical incidence skywave) between 3 MHz and 8 MHz.

If mounted above 10m it will give excellent long distance (greater than 3000 km) especially if the terrain is sloping or free of clutter (trees, buildings, vehicles) in the direction of the target station.
This antenna can be mounted up a vertical mast or sloping from a high point to ground.

The coaxial cable is connected to the HIGH BNC connector. One black wire is connected to one of the HIGH wing nuts. A grey wire is connected to the other end of the black wire. A Resistor unit is connected to the other end of the grey wire. The other grey wire is connected to the other end of the Resistor unit. The paracord lines can be used to tie off the antenna to trees, fences stationary vehicles.

The remaining black wire is connected to the other HIGH wing nut terminal and run out on the ground or just above it as a counterpoise wire.

This antenna will give excellent long distance (greater than 3000 km) from 3 to 30 MHz especially if the terrain is sloping or free of clutter (trees, buildings, vehicles) in the direction of the target station. It will also give excellent results on ground wave out to 20 km from 3 to 10 MHz for local communications.

This configuration is not recommended for NVIS (Near vertical incidence skywave) use.
This antenna can be mounted on a house. The balun is placed either outside or just inside a upper floor window.

The coaxial cable is connected to the HIGH connector.

One black wire is connected to one of the HIGH wing nut terminals. The other end of the wire is connected to a resistor unit. The other terminal on the resistor unit is connected to a grey wire. Paracord lines are used to tie off the antenna to existing trees, fences or other structures. If it is possible to elevate the far end it will improve the antenna performance.

A grey wire is connected to the other HIGH wing nut terminal on the balun unit to act as a counterpoise. This can be held off the building structure using paracord to tie off to any existing structure.

This antenna will give good results from 3 to 30 MHz. If mounted at a low height less than 10m it will give excellent NVIS (Near vertical incidence skywave) between 3 MHz and 8 MHz.
Antenna installation – Sloping broadband end fed on a high building

This antenna can be mounted on a tall building. The balun is placed either outside or just inside an upper floor window.

The coaxial cable is connected to the HIGH connector.

One black wire is connected to one of the HIGH wing nut terminals. A second black wire is connected to the first one. The other end of the wire is connected to a resistor unit. The other terminal on the resistor unit is connected to a grey wire. Paracord lines are used to tie off the antenna to existing trees, fences or other structures. If it is possible to elevate the far end it will improve the antenna performance.

A grey wire is connected to the other HIGH wing nut terminal on the balun unit to act as a counterpoise. If possible this can be held off the building structure using paracord to tie off to any existing structure.

This antenna will give good results from 3 to 30 MHz. If mounted at a low height less than 10m it will give excellent NVIS (Near vertical incidence skywave) between 3 MHz and 8 MHz.
Antenna installation – narrow band dipole

This antenna can be mounted from a centre mast, mounted with three masts or sloping from a high point to ground.

The coaxial cable is connected to the LOW BNC connector. The black wires are connected to the LOW wing nuts. The paracord lines can be used to tie off the antenna to trees, fences stationary vehicles.

This antenna will be tuned to the 7 MHz (40m) amateur band. If mounted at a low height less than 10m it will give excellent NVIS (Near vertical incidence skywave) when propagation permits.

It will also operate on the third harmonic to cover the 21 MHz (15m) amateur band.

If mounted above 10m it will give excellent long distance (greater than 3000 km) especially if the terrain is sloping or free of clutter (trees, buildings, vehicles) in the direction of the target station.

If this antenna configuration is extended by adding the grey wires to the ends of the black wires it will then be tuned to the 5.2 MHz (60m) amateur band. It will also operate on the 18 MHz (17m) amateur band on it’s third harmonic.

If the black wires are replaced by the two wires in the extension kit it will cover the 1.8 MHz (160m) amateur band.
Antenna installation – narrow band end fed

This antenna can be mounted up a vertical mast, or sloping from a high point to ground.

The coaxial cable is connected to the HIGH BNC connector. Wires are connected to one of the HIGH wing nuts (see the table below for options). Unused wires are connected to the other HIGH wing nut terminal to act as a counterpoise wire. The paracord lines can be used to tie off the antenna to trees, fences, stationary vehicles.

This antenna will give excellent long distance (greater than 3000 km) results especially if the terrain is sloping or free of clutter (trees, buildings, vehicles) in the direction of the target station.

Where the wire is too long for the vertical mast or support then the remainder can be run horizontally to form an inverted L antenna.

<table>
<thead>
<tr>
<th>Wire used in vertical section</th>
<th>Frequency bands</th>
</tr>
</thead>
<tbody>
<tr>
<td>One black wire</td>
<td>14 MHz (20m) + 28 MHz (10m)</td>
</tr>
<tr>
<td>One black wire + one grey wire</td>
<td>10.1 MHz (30m) + 21 MHz (15m)</td>
</tr>
<tr>
<td>Two black wires</td>
<td>7 MHz (40m) + 14 MHz (20m)</td>
</tr>
<tr>
<td>Two black wires + two grey wires*</td>
<td>5.2 MHz (60m) + 10.1 MHz (30m)</td>
</tr>
<tr>
<td>One extension kit wire</td>
<td>3.5 MHz (80m) + 7 MHz (40m)</td>
</tr>
<tr>
<td>Two extension kit wires</td>
<td>1.8 MHz (160m) + 3.5 MHz (80m)</td>
</tr>
</tbody>
</table>

* Additional wire needed for counterpoise
11 Extension kit installation – V beam

This antenna can be mounted from a centre mast or sloping from a high point to ground.

The coaxial cable is connected to the HIGH BNC connector. The long black wires are connected to the HIGH wing nuts. The Resistor units are connected to the other ends of each long black wire. The standard black wires connect to the other ends of the Resistor units. The paracord lines can be used to tie off the antenna to trees, fences stationary vehicles.

This antenna will give good results from 3 to 30 MHz. If mounted at a low height less than 10m it will give excellent NVIS (Near vertical incidence skywave) between 3 MHz and 8 MHz.

If mounted above 10m it will give excellent long distance (greater than 3000 km) especially if the terrain is sloping or free of clutter (trees, buildings, vehicles) in the direction of the target station.

The use of the Resistor units make the V beam unidirectional. If the enclosed angle is 45 to 30 degrees the very high gain results in the wanted direction.

This configuration is particularly good for a long distance point to point link.
12 Extension kit installation – Beverage antenna

This antenna configuration can be mounted at a low level up to 2m high or with the main wire laid on the ground.

The coaxial cable is connected to the HIGH BNC connector. One of the long black wires is connected to the HIGH wing nuts. The second long black wire can be connected to the end of the first long black wire. The other end of the second long black wire connects to a Resistor unit. Two grey wires connect to the other terminal of the Resistor unit and are laid on the ground at right angles to the main wire.

One of the standard black wires is run as a loop on the ground with both ends of the wire connecting to the other HIGH wing nut terminal on the Dual Balun.

This antenna configuration is a classic Beverage antenna. This is typically a highly directional receive antenna that is used for point to point links or for monitoring a particular target area. It is excellent at rejecting stations not in the main direction of the antenna.
This antenna requires two 9 – 10m supports separated by 30m.

A 40m wire is connected to one of the HIGH wing nut terminals. The wire is run up one of the 10m supports, slung across to the other support and then run down to connect to one terminal of a resistor unit.

From the other terminal on the resistor unit two black wires and two grey wires are connected together and run along or just above ground to connect back to the other HIGH wing nut terminal on the balun.

This antenna gives excellent results on long distance and local NVIS (near vertical incidence skywave).

It is also good at rejecting local electrical noise sources.